CAPACITY, MANAGEMENT, OPERATIONS & MAINTENANCE (CMOM) PLAN FOR THE MADISON METROPOLITAN SEWERAGE DISTRICT

Revised December 4, 2023

Madison Metropolitan Sewerage District
1600 Moorland Road
Madison, WI
www.madsewer.org

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

CCTV	Closed Circuit Television
CARPC	Capital Area Regional Planning Commission
CMAR	Compliance Maintenance Annual Report
CMOM	Capacity, Management, Operations and Maintenance
CIP	Capital Improvement Program
CIPP	Cured-in-place pipe
CWF	Clean Water Fund
CWA	Clean Water Act
District	Madison Metropolitan Sewerage District
DNR	Wisconsin Department of Natural Resources
EPA	United States Environmental Protection Agency
EOM	Emergency Operations Manual
GIS	Geographic Information System
GPS	Global Positioning System
I/I	Infiltration/Inflow
ITCP	Inspector Training and Certification Program
MH	Manhole
MMSD	Madison Metropolitan Sewerage District
NASSCO	National Association of Sewer Service Companies
NASTT	National American Society for Trenchless Technology
PACP	Pipeline Assessment Certification Program
SIM	Sustainable Infrastructure Management Program
SCADA	Supervisory Control and Data Acquisition
SSO	Sanitary Sewer Overflow
RCM	Reliability Centered Maintenance Program
WEF	Water Environment Federation
WPDES	Wisconsin Pollutant Discharge Elimination System

LIST OF DEFINITIONS

- **CMOM** Capacity, Management, Operations and Maintenance. A program to efficiently operate and maintain collection system assets to minimize performance failures and overflows.
- **Collection System** as defined by Madison Metropolitan Sewerage District (MMSD) consists of components of the collection system, including: interceptor sewers, manholes, pump stations and related equipment, force mains and other related appurtenances.
- **Infiltration** as defined in NR 110.03(16) refers to water other than wastewater that enters a sewerage system (including sewer service connections) from the ground through such sources as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow.
- **Inflow** as defined in NR 110.03(17) refers to water other than wastewater that enters a sewerage system (including sewer service connections) from sources such as roof leaders, cellar drains, yard drains, area drains, foundation drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration.
- **Interceptor System** is defined as the MMSD sanitary sewer system including gravity sewers and force mains.
- **Level of Service** refers to the planning, engineering, operations and maintenance efforts that are required to mitigate sanitary sewer overflows from the collection system.
- **Sanitary Sewer Overflow (SSO)** is a condition whereby untreated sewage from the interceptor system is discharged into the environment prior to reaching treatment facilities, thereby escaping wastewater treatment. It is also considered a discharge of sewage to waters of the state or to a land surface from the sewer system prior to the point the collection system enters the wastewater treatment plant. When caused by rainfall it is also known as a wet weather overflow. SSO is also referred to as "confirmed sewage spill", "bypass", "sewer overflow," or "overflow."
- **Satellite Community** is a MMSD customer (city, village or sanitary district) that discharges to the MMSD collection system.
- **Wisconsin Pollutant Discharge Elimination System (WPDES)**. The DNR regulates the discharge of pollutants to waters of the state through the WPDES program.

CHAPTER 1 – EXECUTIVE SUMMARY

1.1 Background and Information

All WPDES permit holders are required to develop and implement a CMOM Plan.

This Capacity, Management, Operations and Maintenance (CMOM) Plan has been prepared for Madison Metropolitan Sewerage District (MMSD) to comply with the rule known as the "Sanitary Sewer Overflow (SSO) rule" which was adopted in the Wisconsin Administrative Code under Order WT-23-11 and is in the Register July 2013 No. 691 Code. This rule became effective as of August 1, 2013. Modifications to the rules, specifically NR 110, 208, and 210 were updated. Specific details regarding the SSO and CMOM rule requirements are found in NR 210.23.

Superior Engineering, LLC and MMSD staff completed the CMOM Plan before August 1, 2016 to comply with the SSO rule. MMSD staff are responsible for reviewing and updating the CMOM Plan.

Key points related to MMSD's collection system:

- All Wisconsin Pollutant Discharge Elimination System (WPDES) permit holders are required to complete a Capacity, Management, Operations and Maintenance Plan (CMOM) by August 1st, 2016. MMSD WPDES permit is WI-0024597-08-0.
- The Wisconsin Department of Natural Resources (DNR) CMOM handbook was developed to provide information to assist sanitary system collection owners in developing a CMOM Program.
- Notification requirements have changed. All SSOs are now required to be submitted to the public. At a minimum, the SSO shall be reported to a daily newspaper. (NR 210.21 (5))
- Basement backups are not an SSO. They could, however, be an indicator of sewer system problems.
- The CMOM program is an on-going program that will sustain and protect MMSD assets, protecting the waterways and allow continued growth in the community.

1.2 CMOM Program Objectives

DNR describes a CMOM program as one that achieves these primary objectives:

- Ensures that communities have adequate wastewater collection capacity.
- Improves the operation and performance of the municipal sanitary sewer collection system.

- Evaluates areas of excessive inflow of precipitation or groundwater into the system.
- Conducts maintenance and repairs needed to prevent problems.
- Reduces the frequency and occurrence of sewer overflows and basement backups.
- Provides more effective public notification when overflows do occur.

This CMOM Plan will define the proper operation and maintenance requirements of the collection system.

1.3 CMOM PROGRAM GOALS

The following goals have been identified and developed for operation of MMSD's collection system. Specific performance metrics and the activities performed to meet these goals are documented in Section 2.15.

- To manage risk and maximize wise investments in the expansion, replacement and refurbishment of physical assets
- Comply with WPDES permit
- Comply with regulatory requirements including U.S. EPA, WPDES, DNR rules including the 2013 Wisconsin "SSO Rule"
- Take all feasible steps to cease sanitary sewer overflows
- Improve or maintain system reliability
- Maintain assets cost-effectively through a rehabilitation and replacement program based on condition assessment
- Provide level of service as defined by MMSD staff
- Reduce the potential threat to human health from sewer overflows
- Provide adequate capacity to convey peak flows
- Take all feasible steps to eliminate excessive infiltration and inflow (I/I)
- Protect collection system worker health and safety
- Operate a continuous CMOM Program
- Assist satellite communities

1.4 CMOM PLAN COMPONENTS

The CMOM Plan includes the following components:

Chapter 2 - Management Plan. The Management Plan contains the goals and objectives and organization structure to manage the CMOM Program including operating and capital expenditures. It includes the legal authority to control infiltration and inflow (I/I, design criteria, and performance metrics).

Chapter 3 - Operation and Maintenance (O&M) Plan. The O&M Plan outlines the O&M activities relevant to collection systems including inspection and rehabilitation and replacement programs.

Chapter 4 – Asset Management Plan. The Asset Management Plan provides an overview of asset management and a description of the asset management plans being developed by MMSD.

Chapter 5 - Capacity Plan. The Capacity Plan outlines the evaluations for collection system and includes information related to capacity.

Chapter 6 – Emergency Overflow Response Plan (EORP). The EORP contains procedures to respond and report SSOs.

Chapter 7 - Communications Plan. The Communication Plan includes communicating the CMOM program to stakeholders including internal, regulatory and public stakeholders.

Chapter 8 - Audit Plan. The Audit Plan outlines the criteria for auditing the CMOM Plan on a continuous basis.

1.5 Relevant Documents

Critical related documents that contain information related to the CMOM program and plan are listed below. Based on concurrence with staff, it is recommended to not duplicate the information in these documents but rather to reference the applicable documents in this CMOM plan and include them as appendices to the CMOM Plan. These documents are:

- *MMSD Collection System Evaluation (2018).* Capital Area Regional Planning Commission (see Appendix A). Referred to as the CARPC Report in this document. This document provides:
    - Existing and projected wastewater flows and peaking factors
    - Interceptor and pump station capacities and relevant information
    - Capacity evaluation for interceptors and pump stations
    - Infiltration estimates
    - References to previous studies and design reports

2. *MMSD Collection System Facilities Plan Update (2011).* Referred to as the Facility Plan in this document (see Appendix B). This document provides detailed information on:
    - Asset Management and CMOM
    - Collection system improvements
    - System capacities and projected flows

- Condition and needs assessment
- Special projects and diversions
- Collection system maintenance
- Assessment of I/I issues and high flows

3. *MMSD Emergency Operations Manual (revised March 2023)*. This document includes detailed information on emergency response procedures and emergency contact information and is updated annually (see Appendix C).

4. *Madison Metropolitan Sewerage District Sewer Use Ordinance (August 18, 2017).* This ordinance outlines specific requirements that MMSD customers, including satellite communities and industrial users, must adhere to (see Appendix D).

5. *Madison Metropolitan Sewerage District Interceptor Maintenance Program Guidelines (November 2009).* This document provides a set of guidelines and standard operating procedures for the maintenance of MMSD's interceptors and force mains (see Appendix E).

6. *Madison Metropolitan Sewerage District Final Sustainable Asset Management Framework (June 2016).* This document establishes an overall framework for the implementation of a comprehensive asset management program at MMSD (see Appendix F).

7. *Infiltration and Inflow Reduction Program Plan (March 2021).* This document provides an overall framework for the implementation of a regional inflow and infiltration reduction program (see Appendix H).

1.6 CMOM Recommendations

Through several workshops and reviewing documents and plan components, it was determined that MMSD has all of the plan components for a CMOM Program via various programs and documents. MMSD has had an on-going operation and maintenance program for many years and as part of the CMOM Plan the following recommendations are proposed to be updated or implemented.

- Continue to perform periodic inspections of collection system assets (interceptors, manholes, easements and pump stations).
- Use 20 years of historical inspection data to compare the condition of assets over time to determine remaining asset life.

- MMSD staff recognizes the need to accurately locate all force mains. In 2020 MMSD hired two utility locators. All utility locating is done by MMSD staff.
- MMSD staff recognizes the need to inspect the force mains to determine the condition and critical repair needs. The Collection System Facility Plan Update will include recommendations for force main inspections.
- Develop a private property program for private connections to the collection system. MMSD has a consulting firm, HDR, working on creating technical and educational resources for the District and its owner communities focusing on reducing I/I from private property.
- Continue annual updates to the existing emergency operations manual to reflect updates including phone numbers and changes in requirements for sanitary sewer overflows.
- Review standard details and provide recommendations for additional standard details.
- Review fats, oil and grease (FOG) program to align with the budget goals.
- Develop satellite CMOM recommendations.
- Formalize and document inspections of easements.
- Investigate purchase of hydrogen sulfide monitoring equipment.
- Investigate measures to provide system resiliency and flexibility with regards to climate change.
- Update, maintain and periodically validate MMSD's hydraulic model. Use model to explore I/I reduction opportunities.
- Consider construction of permanent flow monitoring stations at key points in the collection system for use in service charge billing, capacity analysis, and I/I reduction.

CHAPTER 2 – MANAGEMENT PLAN

2.1 Background and Information

A successful CMOM Plan has proper procedures, management and training programs to provide the organizational structure to implement the programs. The United States Environmental Protection Agency's (U.S. EPA) "Guide for Evaluating Capacity, Management, Operation and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems" [EPA 305-B-05-002] states: "Collection system management activities form the backbone for operation and effective maintenance activities". The goals of a management program should include:

- Protection of public health and prevention of unnecessary property damage
- Minimization of infiltration, inflow and exfiltration, and maximum conveyance of wastewater to the wastewater treatment plant
- Provision of prompt response to service interruptions
- Efficient use of allocated funds
- Identification of and remedy solutions to design, construction, and operational deficiencies
- Performance of all activities in a safe manner to avoid injuries

2.2 Mission Statement

Mission statements are encouraged to develop a specific mission statement related to collection systems. From the Commission policy book, the District's purpose or mission statement is as follows:

MISSION STATEMENT

Protect public health, welfare and the environment by providing efficient and strategic wastewater management on behalf of our owner communities.

2.3 Goals

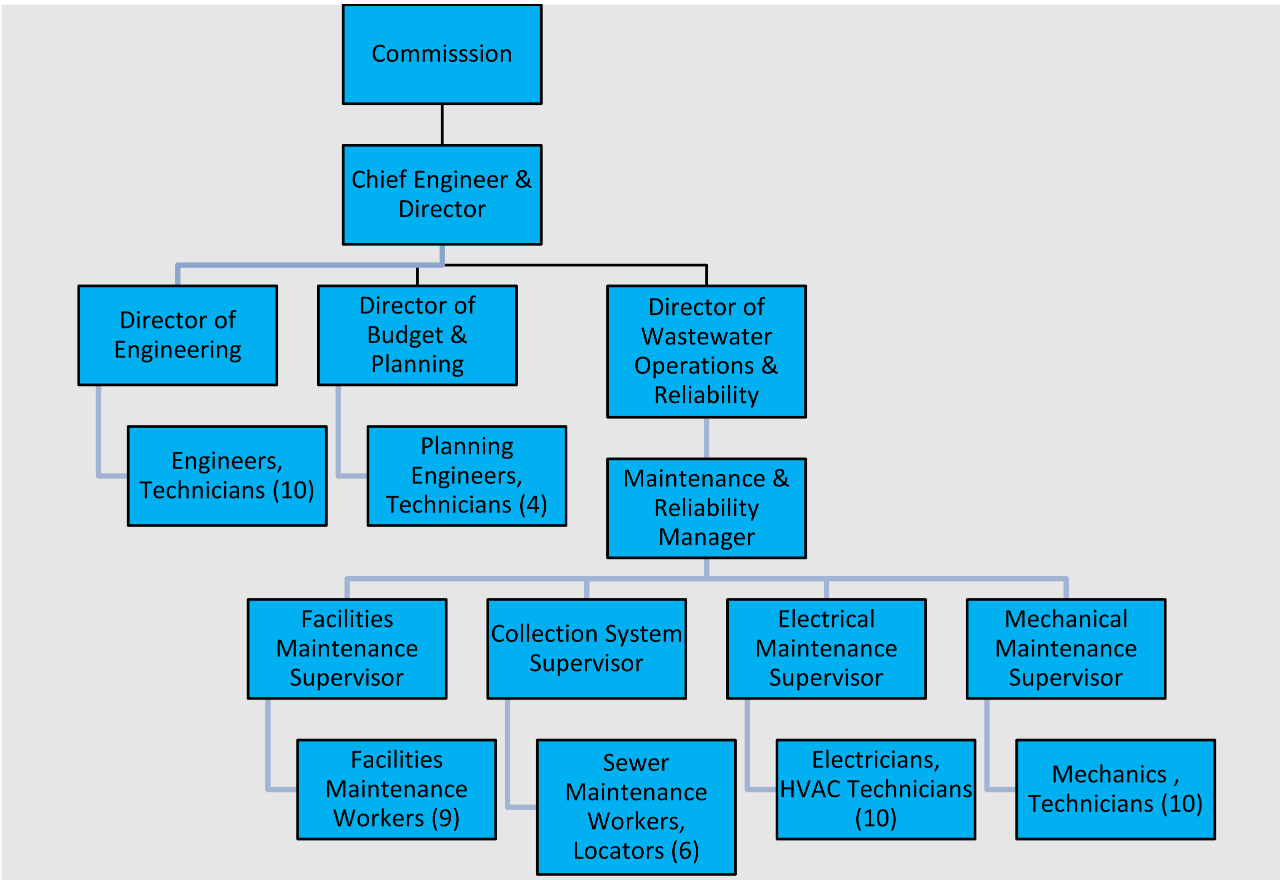
MMSD has identified specific goals for the CMOM Plan and to guide in the implementation of a CMOM program. MMSD has also identified performance metrics to track on a regular basis to support these goals. Specific performance metrics and the activities performed to meet these goals are documented in Section 2.15.

1. To manage risk and maximize wise investments in the expansion, replacement, and refurbishment of physical assets
2. Comply with WPDES permit
3. Comply with regulatory requirements including U.S. EPA, WPDES, DNR rules including the 2013 Wisconsin "SSO Rule"
4. Take all feasible steps to cease sanitary sewer overflows
5. Improve or maintain system reliability
6. Maintain assets cost-effectively through a rehabilitation and replacement program based on condition assessment
7. Provide level of service as defined by MMSD staff
8. Reduce the potential threat to human health from sewer overflows
9. Provide adequate capacity to convey peak flows
10. Take all feasible steps to eliminate excess infiltration and inflow (I/I)
11. Protect collection system worker health and safety
12. Operate a continuous CMOM Program
13. Assist satellite communities

2.4 Organizational Structure

The Management Plan also includes the organization requirements to implement the MMSD CMOM Program. Three departments have primary involvement in implementing the CMOM Program: Engineering, Budget and Planning, and Operations and Maintenance, all of which fall under the Chief Engineer and Director position. MMSD is governed by nine commissioners. The organization structure of the three departments is shown in Figure 2-1.

Figure 2-1 – MMSD Organization Chart for CMOM Implementation



Staffing, as well as outside services such as consulting and construction services, will be reviewed on an as-needed basis to ensure that the CMOM Plan is properly administered.

Preparation of the CMOM Plan and periodic updates and audits will be overseen by the Department of Budget and Planning. MMSD has assigned primary responsibility for implementation and administration of the CMOM Plan to the Director of Wastewater Operations and Reliability. Key responsibilities of staff members responsible for implementation of the CMOM Plan can be found in Table 2-1. Relevant contact information for staff can be found in Table 6-1, as well as in MMSD's Emergency Operations Manual.

Table 2-1 - Staff Responsibilities for CMOM Implementation

Collection Staff Responsibilities	
Title	**Responsibilities**
MMSD Commissioners	Provide governance for MMSD, including budget approval and establishment of policies.
Chief Engineer and Director	Oversees all aspects of MMSD's operations and mission, including the collection and conveyance of wastewater to the MMSD's treatment plant.
Director of Engineering	Oversees the engineering department and construction projects necessary for the effective operation of MMSD's collection and treatment systems.
Director of Budget and Planning	Oversees master planning, facility and capital planning, strategic asset management, long-range studies and strategic implementation plans, local government works and geographic information systems.
Planning Engineers	Responsible for development of MMSD's Capital Improvements Plan and primary contact for development and periodic updates to CMOM Program.
Project Engineers	Responsible for overall management of capital improvement projects in MMSD's collection system including planning, design and construction inspection.
Technicians	Responsible to maintain MMSD's GIS system, manage connections, validate data, and update mapping as needed.
Director of Wastewater Operations & Reliability	Oversees the operations and maintenance departments at MMSD to ensure the effective and efficient conveyance and treatment of wastewater.
Collection Staff Responsibilities	
Title	**Responsibilities**
Collection Systems Supervisor	Responsible for the overall operation and maintenance of MMSD's assets in the collection system (i.e. interceptors and force mains).
Monitoring Services/Sewer Maintenance Workers and Locators	Pipeline and easement inspections, manhole inspections, flow monitoring and sampling, valve maintenance and exercising, and field data validation including locating facilities as part of Digger's Hotline.
Facilities Maintenance Supervisor	Responsible for maintenance of MMSD's structural and land assets, including pump stations.
Facilities Maintenance Workers	Responsible for maintaining the grounds and facilities at pump stations owned and/or operated by MMSD.

Mechanical Maintenance Supervisor	Responsible for mechanical maintenance at pumps stations owned and/or operated by MMSD.
Mechanics and Technicians	Perform inspections and maintenance on pumping and related equipment owned and/or operated by MMSD.
Electrical Maintenance Supervisor	Responsible for electrical maintenance at pump stations owned and/or operated by MMSD.
Electricians and HVAC Technicians	Perform inspections and maintenance on electrical and HVAC equipment, control systems and instrumentation at pump stations owned and/or operated by MMSD.

(1). Note the responsibilities noted above are based on those responsibilities pertaining primarily to the collection system.
(2). Complete job descriptions can be found in the office of MMSD's Human Resources Manager.

2.5 MANAGEMENT OF ASSETS

Managing assets effectively is a key CMOM program goal. MMSD has established a reliability centered maintenance (RCM) program to optimize its maintenance activities. For more details on the Asset Management Plan see Chapter 4.

2.5.1 System Description

MMSD's interceptor system includes:

- 580,095 feet (109.9 miles) of gravity sewer ranging in diameter from 8-inches to 66- inches
- 1,664 gravity manholes
- 18 regional pumping stations
- 278,275 feet (52.7 miles) of force main
- 187.5 square miles of service area
- 25 satellite communities with estimated population of over 400,000 in 2023 (see Table 2-2 for list of community customers).

Specific details regarding the interceptor system can be found in the GIS, the Facility Plan and the CARPC report.

See Tables 3-2 and 3-4 for all control structures in the collection system, which summarizes where stop logs or gates are used to divert flow. Some of these control structures may be used during emergency situations to prevent basement backups or other public health concerns.

Table 2-2 MMSD Satellite Communities

Cities

- Fitchburg
- Madison
- Middleton
- Monona
- Verona

Villages

- Cottage Grove
- Dane
- DeForest
- Maple Bluff
- McFarland
- Shorewood Hills
- Waunakee
- Windsor

Town Sanitary/Utility Districts

- Dunn #1, #3 & #4
- Dunn – Kegonsa Sanitary District
- Pleasant Springs #1
- Verona – Marty Farms
- Verona #1
- Vienna #1 & #2
- Vienna – Wyst59 LLC
- Westport – Cherokee
- Westport Sewer Utility District

The major interceptor systems in MMSD's collection system are summarized in Table 2-3. Detailed information regarding the interceptor systems can be found in the Facility Plan and the CARPC Report.

Table 2-3: Major MMSD Interceptors

Interceptor System	Pipe Size (in)	Length (miles)
East	10" to 54"	8.63
Southeast	8" to 63"	9.01
Northeast	10" to 63"	33.65
Far East	18" to 42"	7.00
Lower Badger Mill Creek	24" to 36"	3.42
West	8" to 48"	19.74
Southwest	12" to 36"	6.50
South	10" to 24"	1.59
Nine Springs Valley	8" to 54"	18.97
Rimrock	10" to 15"	1.35

2.5.2 Maps

Collection system attributes and information are stored in the Geographical Information System (GIS). Collection system components include interceptors, force mains, siphons, manholes, and pump stations. Staff has access to the GIS through desktop and laptop computers as well as via handheld GPS devices. Collection system information is continually validated by the Collection System Services Department as part of its route inspections and related work and new features are updated by the Engineering Department due to project enhancements.

2.6 FINANCIAL

MMSD's annual Operating Budget and Capital Improvements Plan (CIP) address the critical needs to operate and maintain the infrastructure and to replace or rehabilitate aging infrastructure. The budget is approved by the MMSD Commission. The budget approval process is an annual process. MMSD also has a six-year CIP to ensure that projects are planned, budgeted, designed and constructed so that the assets are properly maintained and replaced or rehabilitated as needed.

MMSD has recognized specific items in the budget related to the collection system. These items include the following initiatives:

- Reducing fats, oils and grease (FOG) through pollution prevention and source control
- Conducting force main inspections to determine pipe condition and identify critical rehabilitation needs. This is a new initiative and is in the planning stages.
- Ensuring adequate capacity and reliable pumping exists in the collection system
- Managing assets through the RCM program.

The operating fund budget addresses the operation of the facilities and the capital fund budget addresses construction of new or replacement facilities.

2.7 CONDITION ASSESSMENT PROGRAM

MMSD staff currently reviews inspection data and reports to determine the condition of the asset, estimated service life and future recommendations. These assessments are used to define projects and to budget and plan for rehabilitation, repair and replacement projects which are documented in the CIP. See Chapter 3 for additional information on inspection and condition assessments.

2.7.1 Critical Infrastructure

MMSD has identified critical structures and interceptors in its system in the CARPC Report and the

Facilities Plan Update. Interceptors with siphons are one example of a critical collection system feature. Siphons are interruptions in the gravity profile of a sewer and are constructed to allow for the conveyance of wastewater beneath an obstacle such as a streambed or large utility line. Due to the low velocity in siphons there is a tendency for suspended solids and other large obstacles such as grease and rocks to collect in them. For this reason most of MMSD's siphons are cleaned at a minimum of once per year. A listing of MMSD's 11 siphons and their location can be found in MMSD's *Interceptor Maintenance Program Guidelines (November, 2009)* and in Section 3.8 of Chapter 3.

Other critical infrastructure in MMSD's collection system includes its network of 18 pump stations and force mains. As part of the Collection System Facilities Plan Update in 2011 the condition of each of MMSD's pump stations was evaluated and prioritized. The score from each pump station was then multiplied by a weighting factor to arrive at a final ranking for each station. The weighting factor accounts for the critical nature of the station and includes factors such as the following: amount of flow passing through the pump station, amount of time that a pump station can be without power without causing a basement back-up or SSO, and the amount of redundancy for the pump station. A summary of the weighting factors, updated in 2016, can be found in Table 2-4 for each of the 18 pump stations. As might be expected, MMSD's five pump stations that pump wastewater directly to the treatment plant are considered to be the most critical facilities (i.e. PS 2, PS 7, PS 8, PS 11 and PS 18).

Table 2-4 Pump Station Criticality Ratings

Facility	Weighting (Criticality) Factor
Pump Station 1	1.75
Pump Station 2	1.95
Pump Station 3	1.00
Pump Station 4	1.15
Pump Station 5	1.20
Pump Station 6	1.30
Pump Station 7	1.75
Pump Station 8	1.85
Pump Station 9	1.10
Pump Station 10	1.70
Pump Station 11	1.70
Pump Station 12	1.50

Pump Station 13	1.30
Pump Station 14	1.15
Pump Station 15	1.25
Pump Station 16	1.10
Pump Station 17	1.15
Pump Station 18	1.75

In addition, each individual asset has a criticality rating relative to the process it is part of in the CMMS. This rating is used to prioritize work orders and monitor preventive maintenance activities to insure that important assets are maintained appropriately.

2.7.2 Equipment

To perform routine operations and maintenance, respond to emergencies and prevent sanitary sewer overflows it is critical to have the proper equipment to perform these functions. For the most part MMSD hires private contractors to perform emergency repairs that involve excavation and/or installation of large diameter pipe. As a result MMSD does not have a need to own heavy construction equipment and materials. Some repair parts and materials for critical assets are available from inventory. Pages 72 – 77 of the Emergency Operations Manual (Appendix C) contain a list of critical replacement parts kept in inventory. Part number, manufacturer, inventory quantity, and storage location are documented on these pages. Repair information for MMSD's 18 force mains is also included in the Emergency Operations Manual on pages 22 – 45, and includes details on type of pipe, supplier contact information, and availability of stocked repair parts.

All but one of MMSD's pump stations is equipped with dual power feeds. Four of the stations have on-site generators (3-fixed, 1-portable) and nine can be operated via portable generators. MMSD owns portable equipment, such as pumps and generators, for responding to emergencies. MMSD also can rent generators if necessary. The pump station power needs are identified in the MMSD EOM. A summary of MMSD's portable pumps and generators that can be used for responding to emergencies is summarized in Table 2.5.

Table 2-5 MMSD Collection System Emergency Equipment

MMSD Portable Generators and Pumps				
Description	**Model & Equipment No.**	**Qty**	**Capacity/Size**	**Year Purchased**
Portable Generator (MMSD Generator #3)	Caterpillar Diesel -Model XQ30P2	1	30KW	2006

Portable Generator (MMSD Generator #2)	Caterpillar Diesel Model XQ75P2	1	75KW	2002
Portable Generator (MMSD Generator #1)	Caterpillar Diesel Model XQ105P2	1	105KW	2003
Portable Generator (PS 17 unit)	Cummins/Onan 300 DFCB	1	300KW	2006
Portable Pump	2” Homelite	1	-	1997
Portable Pump	2” Wacker Model PG2A	2	259 gpm	2009
Portable Pump	4” Godwin	1	500-750 gpm	2000
Portable Pump	4” CH&E	1	-	1997
Portable Pump	6” Godwin CD150M	1	750-1000 gpm	1999
Portable Pump	6” Godwin CD150M	1	750-1000 gpm	2001

2.8 Data Management and Documentation

MMSD currently has several systems to manage data. The major systems include the following:

- Collection System Database & Geographic Information System. Used to store, manage, and display attribute information for all collection system assets.

- Supervisory Control and Data Acquisition (SCADA). Used to communicate with pump stations owned and/or operated by MMSD. Telemetry is used to provide performance data such as pump runtime hours, wet well levels, pump status and to provide notification of alarm conditions.

- Data Acquisition and Reporting Database. This database imports data from the SCADA system and makes it available to a number of users for performing queries and generating reports.

- Computerized Maintenance Management System (CMMS). The District’s CMMS is an Oracle database that is used to track and manage all collection system assets. Specific uses of the system include work order management, preventative maintenance scheduling, cost tracking and purchase order creation.

Long-term storage of documents is provided in MMSD’s On-Base record retention system. Documents such as Operations and Maintenance manuals are also stored on MMSD’s computer network and have links to the CMMS and SCADA systems.

Data from the field is captured via inspection forms. Past practice has involved collecting the inspection data in written form in the field and entering it into a database in the office. As part of its asset management program MMSD is developing workflows and databases such that inspection data can be gathered in the field via handheld devices to reduce data entry and make the data more readily accessible to end users.

2.9 CUSTOMER SERVICE

MMSD serves 25 customers, including cities, villages, towns, utility districts and sanitary districts within the greater Madison area. The size of the communities varies widely, from the City of Madison with approximately 66,000 customer connections to smaller sanitary districts comprised of a single business.

MMSD's current sewer use policy does not allow individual customers to directly connect to MMSD interceptors except in cases where the local system is not readily available. This policy has led to fewer customer complaints related to basement back-ups and odors from the public sewerage system.

2.10 LEGAL

Legal authority consists of the statutory authority to enforce codes and ordinances relating to use of the public sewerage system (i.e. Sewer Use Ordinance).

Wis. Stat. §§ 200.11(1)(d) and 823.02 grant legal authority to metropolitan sewerage commissions to commence legal actions to enforce any rule, regulation, or special order promulgated by the commission or district. Any person found in violation of the MMSD's Sewer Use Ordinance or any other rule, regulation, or special order, shall pay to the district such damages, losses, or expenses as may be sustained by the district as a result of the violation, together with such costs as may be collectible by law.

2.10.1 Sewer Use Ordinance

MMSD's Sewer Use Ordinance (SUO) was updated and approved by MMSD's Commission in August of 2017. The SUO is comprehensive and regulates the use of public and private sewers and drains, disposal of holding tank wastes into public sewers and the discharge of waters and wastes into the public sewerage systems within MMSD. It provides for the establishment of services charges, sets requirements for discharges, annexations to MMSD and sets requirements for connecting to MMSD sewers.

The intent of the SUO is to preserve and obtain the maximum public use of MMSD facilities for customers by regulating the characteristics and volumes of wastewater discharged into the system.

The challenge will be to provide consistent enforcement of the SUO to ensure compliance and to preserve MMSD facilities.

It is recommended to review this document on a regular basis and to provide recommendations to staff and to the Commission for revisions.

2.10.2 Pretreatment Program

MMSD has an ongoing pretreatment program. The program follows the U.S. EPA national pretreatment program that identifies specific requirements that apply to all industrial users (IU) and non-domestic sources of wastewater. The program currently addresses all significant industrial users (SIUs) and has certain requirements that apply to the Categorical Industrial Users (CIUs).

Future goals include reviewing the pretreatment program and providing recommendations for revision as needed. It is recommended per the CMOM and the Facility Plan Update to provide a more detailed procedure for monitoring and sampling industrial users in accordance with the EPA's guidance document.

2.10.3 Satellite Communities

As mentioned in Section 2.9, MMSD currently receives wastewater from a total of 25 customers, or satellite communities, over a service area of approximately 187.5 square miles. MMSD does not have agreements with each of the communities to discharge into the collection system. Instead these satellite communities are regulated under the SUO and their respective DNR general discharge permits.

MMSD works closely with its satellite communities on public outreach and education. An example of these efforts includes encouraging customers to reduce the use of salt in commercial and residential water softeners and to reduce the amount of road salting so that MMSD can meet its DNR discharge permit for chlorides. In 2020, MMSD formed an advisory committee with representatives from six owner communities to develop a program framework and take a more active role in working with its owner communities to reduce the amount of infiltration and inflow of clear water into the public sewerage system. Stronger restrictions on infiltration and inflow were incorporated into the latest revision of the SUO but more guidance by MMSD and coordination with the owner communities is envisioned going forward.

2.10.4 Other Legal Requirements

- The State Plumbing Code identified in Department of Safety and Professional Services (DSPS)

SPS 381

- DNR and other regulatory requirements pertaining to metropolitan sewerage districts

2.11 Utility Locates

MMSD is responsible for locating its infrastructure for utility locates as part of the Diggers Hotline Program. Two locators are part of the district workforce with four other Collection System Services staff and the supervisor as back-up. MMSD uses KorTerra software for notifications for Digger's Hotline. The software also notifes via email to district cell phones. Locates by staff include pump stations and their property, gravity interceptor sewers, pump station force mains, direct connection laterals to our pipes for connections after 2007, and effluent force mains.

2.11.1 Fats, Oil and Grease

Fats, oil and grease (FOG) can coat, congeal, and accumulate in pipes causing blockages and foul odors in the interceptor system and are prohibited from the collection system. MMSD requires that facilities comply with the state code regarding grease traps. Grease traps are not inspected by the MMSD.

Chapter 5 of MMSD's SUO prohibits the discharge of solids or viscous substances which will cause or contribute to obstruction to the flow in sewers or have a detrimental effect on the operation of the treatment plant. Additional prohibited FOG discharges include: (1). Petroleum oil, non-biodegradable cutting oil or products of mineral oil origin in amounts that will cause a detrimental effect or in amounts exceeding 50 mg/l; and (2). Wastewater containing more than 300 mg/l of polar oil or grease of animal or vegetable origin.

2.12 Standards for Design, Construction and Inspection

MMSD typically contracts out design and plan preparation services and uses consultant recommendations for most design details and specifications. In some instances MMSD staff design improvements for a project and coordinate with the consultant for preparation of the contract documents.

At this time MMSD does not have a complete set of specifications for pump station rehabilitation projects or pipeline projects that require excavation. Goals of MMSD with regard to contract administration include: (1). Updating MMSD's General Conditions section to more accurately reflect existing construction law and industry standards and requirements; and (2). Developing a master set of specifications for use on the aforementioned collection system projects. In the meantime MMSD will continue to review and revise specifications and design details provided by consultants on a project-by-project basis.

MMSD has developed a master set of specifications for pipeline rehabilitation projects incorporating the use of a cured-in-place liner. It is recommended to review and update these standard specifications on a periodic basis to ensure that they remain in accordance with NASSCO's *Performance Specification Guideline for Cured-in-Place Pipe (CIPP) Installation, June 2023.*

2.12.1 Standard Details and Plans

MMSD has developed and maintains the following standard design details that are used for specific projects and for general administration of its collection system: standard manhole, new manhole installed over interceptor sewer, inside and outside drops into manholes, chimney construction, house connection to manhole, sewer lateral locates, pipe bedding, lateral riser and lateral connection to interceptor. These details are located on MMSD's computer network on the Engineering server.

2.12.2 Construction Inspection

Construction inspection for projects is typically performed by staff engineers to ensure that the construction methods that are used conform to the plans and specifications. The Sewer Maintenance crew also inspects all sewer connections to the interceptor system to ensure that MMSD's standards and requirements are met.

MMSD does not inspect the construction of new or rehabilitated sewers in the sewerage systems of its satellite communities. MMSD's approval process for these projects does require that the satellite community provide a competent engineer or inspector to perform these inspections, however.

2.13 Training, Safety and Education Programs

MMSD has a well-established safety program, in accordance with Admin Code Ch. SPS 332, and employs a full-time Health and Safety Specialist staff person to provide training and address issues of worker safety. Training is generally performed on a monthly basis for all MMSD staff, with specific training conducted on an intermittent basis for smaller workgroups as needed.

MMSD has comprehensive, written safety plans to address a variety of topics. The safety plans are reviewed and updated on a regular basis. Training on these plans is also provided on a regular basis. The safety plans can be found in MMSD's records retention system (i.e. OnBase<Health and Safety/HS-Programs) and include the following topics (and corresponding standards with which the plans comply):

- Supervisor accident reporting
- Employee accident reporting
- Heavy equipment (29 CFR 1926.602)
- Bloodborne pathogens (29 CFR 1910.1030) – training conducted annually
- Respiratory protection (29 CFR 1910.134) – training conducted annually
- Personal protective equipment (29 CFR 1910.132-139 subpart I) – training conducted annually
- Vehicle safety
- Powered industrial trucks (29 CFR 1910.178)
- Fall protection (29 CFR 1910 and 1926) – training conducted annually
- Hearing conservation (29 CFR 1910.95) – training conducted annually
- Hazard communication (29 CFR 1910.1200) – training conducted annually
- Compressed gas cylinders (29 CFR 1910.101)

Other training or education materials that are pertinent to operation of the collection system include the following:

- Confined space entry. Classroom and hands-on training is performed on an annual basis for all employees that encounter confined spaces as part of their duties.
- Traffic control. Basic training has been provided to employees to familiarize them with the requirements of the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD). Each maintenance vehicle contains a *Work Zone Safety Guidelines* pocket book that provides instruction on basic work zone setups. Training is provided on a biennial basis to staff involved in activities requiring traffic control.
- Pump Station Operation and Maintenance manuals. O&M manuals for each piece of major equipment on a project must be provided by the contractor/supplier. Hard copies of these manuals are stored in the Engineering library as well as in the Electrical Maintenance and Mechanical Maintenance departments. Electronic copies of O&M's are also available on MMSD's computer network, with some also available through the Process Control System.
- Material Safety Data Sheets. An on-line program is available to all employees through MMSD's intranet site to investigate a wider range of materials by product name or manufacturer.

MMSD's existing safety and training program adequately addresses the safe and effective operation of the collection system. Two areas where additional attention is warranted include the following:

1. Traffic Control. MMSD's Collection System Services crew performs routine monitoring and sampling at over 60 locations in the sewer systems of its satellite customers for billing purposes. Many of these locations are in busy local streets. Training is provided every other year for this crew to ensure that they are operating in conformance with the MUTCD. In 2016 and 2017 the Monitoring Services Supervisor and Health and Safety Specialist reviewed monitoring and sampling sites to identify specific locations where additional procedures or sampling point relocation were needed to ensure proper work zone traffic safety. Review of monitoring and sampling points will be a recurring process.
2. SSO/Emergency Response. MMSD has a written Emergency Response Plan in place. The plan has been updated and included in the CMOM Plan to include new provisions required by WDNR's SSO rule, adopted in July of 2013. It is recommended that MMSD hold periodic training exercises to ensure that staff is satisfying all requirements set forth in the ERM, the CMOM Plan and in the SSO rule.

2.14 Private Property Programs

The SSO rule requires all infiltration and inflow sources on private property to be subject to oversight and control by the WPDES permit holder. MMSD has several private connections to its interceptors. MMSD's sewer use ordinance requires that users of the system take reasonable steps to prevent discharges of clear water to the sanitary sewer system.

MMSD is working with an engineering consultant in 2023-24 to develop public education materials related to the reduction of infiltration and inflow from sources on private property. The intent is to make these materials available to MMSD's satellite customers so they can be distributed to individual users.

2.15 Performance Metrics

MMSD has various performance metrics that are monitored on a regular basis. These metrics can be found in Table 2-6. The performance metrics are reviewed on an annual basis or as needed to document accomplishments and to compare actual results to the goals. These performance metrics are based on:

- U.S. EPA and DNR Regulations
- MMSD Goals

MMSD's overall CMOM goals are summarized in Table 2-7. Included in this table are the major performance metrics for these goals and the steps that have been taken to meet these goals.

Table 2-6 CMOM Performance Metrics

DESCRIPTION		GOALS %	GOALS Quantity	GOALS Unit	ACTUAL
SEWERS					**TBD**
Total gravity interceptor (ft)	580,095				
Total force main (ft)	278,275				
Interceptors cleaned		10%	58,010	ft/yr	
Interceptor inspected		10%	58,010	ft/yr	
Easements inspection			No goal	ft/yr	
Sewer failures/year			0	no.	
MANHOLES					
Gravity manholes inspected (each)	1,664	20%	333	no/yr	
Force main manholes inspected (each)	101	20%	20	no/yr	
REHABILITATION/REPLACEMENT DESCRIPTION					
Number of manholes repaired/rehabilitated		1%	15	MH/yr	
Number of manholes replaced			No goal	MH/yr	
Number of manhole castings replaced			50	MH/yr	
Number of chimneys replaced/repaired			35	no/yr	
Sewer rehabilitation (lining)		2%	12,000	ft/yr	
Force main replacement			No goal	ft/yr	
Pump stations rehabilitated			1	no/yr	
Private property rehabilitation			No goal	-	
MAINTENANCE ACTIVITIES					
PM's versus corrective maintenance pumps/equipment			No goal	-	
Root removal			As-needed	ft/yr	
Smoke testing & dye water flooding			As-needed	ft/yr	
Flow monitoring of collection system		15%	75,100	ft/yr	
PRETREATMENT COMPLIANCE					
Violations				All	
REPORTING					
Report per CMOM Plan					
Number of basement backups			0	each	
Total number of backups from MMSD			0	each	
Number of sanitary sewer overflows			0	each	

Table 2-7 CMOM Program Goals

CMOM Program Goals, Performance Metrics and Activities Performed		
Program Goals	**Performance Metrics (PMs)**	**Activities Performed**
1. Manage risk and maximize wise investments in the expansion, replacement and refurbishment of physical assets	PM's versus corrective maintenance pumps/equipment	In the fourth quarter of 2022, the Reliability Process workgroup was formed. The workgroup's core areas are asset management, inventory management and maintenance planning. The asset management section of the workgroup is primarily responsible for the ownership and maintenance of the electronic asset register for maintainable assets housed in the CMMS. In addition, the team manages the paper and electronic records associated with those assets to enable maintenance. To keep the source of records accurate, the team also manages the commission, modification and decommissioning processes. Finally, the team supports improvement initiatives by generating reports and datasets that document where savings in cost and labor can be achieved.
2. Comply with WPDES permit	Number of sanitary sewer overflows and basement backups caused by MMSD	Operate collection system in accordance with MMSD policies and guidelines and all applicable state and federal regulations.
3. Comply with regulatory requirements	Report with CMOM Plan	Development and maintenance of CMOM Plan. Periodic updates to Collection System Facilities Plan. An updated is scheduled to be completed in 2024.
4. Take all feasible steps to cease sanitary sewer overflows	Number of sanitary sewer overflows	Problematic (or repeated) overflows have not been of concern.
5. Improve or maintain system reliability	Interceptor cleaning	Continue to televise at least 10% of interceptors each year.

CMOM Program Goals, Performance Metrics and Activities Performed		
Program Goals	**Performance Metrics (PMs)**	**Activities Performed**
	Sewer failures/year Pump station outages	Conduct preventative maintenance as recommended by equipment manufacturers and MMSD staff. Recent implementation of predictive maintenance measures (i.e. pump vibration sensors, bearing temperatures, etc). Upgrade and maintain on regular basis District's remote telemetry system. Projects included in six-year capital improvements plan to install generators at all District pump stations by 2032.
6. Maintain assets cost-effectively through a rehabilitation and replacement program based on condition assessment	Number of manholes, interceptors and pump stations rehabilitated on annual basis	Recent upgrades to pipe condition scoring system utilizing Pipeline Assessment Certification Program (PACP). Ongoing project to develop database and scoring system to assess manhole condition. Development of new forms and processes to inspect and assess condition of pump station assets. Preparation and inclusion of business cases in 6-year Capital Improvements Plan to justify and outline scope of needed projects.
7. Provide level of service as defined by MMSD staff	Number of sanitary sewer overflows	Need to develop further performance criteria to ensure that sanitary sewer overflows do not occur. Assessment of design peaking factor in Collection System Facility Plan update.
8. Reduce the potential threat to human	Reports from Public Health	Coordination with public health agencies. Prompt notification of

CMOM Program Goals, Performance Metrics and Activities Performed		
Program Goals	**Performance Metrics (PMs)**	**Activities Performed**
health from sewer overflows	Department	sewer overflows to these agencies.
9. Provide adequate capacity to convey peak flows	Number of sanitary sewer overflows Pump station operating data	Conduct periodic long-range planning of collection system, including population and capacity forecasts. Initiate capacity upgrades based on study results. Collection System Facility Plan Update in 2011. Next update scheduled to be completed in 2024.
10. Take all feasible steps to eliminate excessive infiltration and inflow	Flow monitoring in collection system Pump station operating data	Enforce provisions of Sewer Use Ordinance. Infiltration and Inflow Reduction Program Plan completed in 2021. Developing a flow monitoring program plan in 2023.
11. Protect collection system worker health and safety	Worker's compensation claims	Retention of full-time position of Health and Safety Specialist. Regularly scheduled training for all workers.
12. Operate a continuous CMOM program	Preparation and maintenance of CMOM Plan.	Development of CMOM Plan in 2016. Revisions and audits on-going.
13. Assist satellite communities	Customer meetings Customer feedback	Meet with each major customer once every two years at minimum. Maintain lift stations for some customer communities. Provide technical assistance to customer communities as requested. Provide information on pollution prevention and source reduction strategies to customer communities.

CHAPTER 3 – OPERATION AND MAINTENANCE PLAN

3.1 BACKGROUND AND INFORMATION

An Operation and Maintenance (O&M) Plan is critical to properly operate and maintain the collection system and to provide recommendations for future rehabilitation, repair and replacement projects. MMSD has historically inspected and cleaned sewers, manholes and pump stations on a routine basis. These inspection programs are necessary to determine maintenance problems, structural integrity and defects, root problems, illegal connections and infiltration problems. In addition, MMSD has several programs that are used on an as-needed basis to properly maintain the system.

Chapter 7 of the Facility Plan Update contains a thorough description of MMSD's plan for collection system maintenance. MMSD has not encountered frequent or recurring building backups, but is aware of locations that may be affected by high flows in the collection system. Locations are documented in the Emergency Operations Manual (Appendix C). The following sections in this chapter document the inspection and maintenance activities performed by MMSD to prevent overflows and building backups from happening.

3.2 MMSD MAINTENANCE PROGRAM

The Facility Plan Update, Sustainable Asset Management Framework and CMOM Plan recommendations include the enhancement and optimization of the existing maintenance program with the following:

- Develop a risk-based condition assessment tool
- Optimize MMSD maintenance program *(with assistance from Sewer Maintenance, Mechanical & Electrical Maintenance and Facilities Maintenance)*
- Optimize MMSD monitoring program *(with assistance from Monitoring Services crew)*
- Optimize MMSD H2S monitoring program *(with assistance from Sewer Maintenance crew)*
- Develop a written safety program specific to collection systems *(with assistance from– Sewer Maintenance, Mechanical & Electrical Maintenance, Facilities Maintenance and Health & Safety Leader)*

3.3 INSPECTION – SEWERS

> ***DNR recommendations are to inspect and clean on a minimum 10 year cycle. MMSD inspects and cleans every 10 years with over 20 years of compiled data.***

Sewer inspections are used to assess the condition of the sewer using the Pipeline Assessment Certification Program (PACP). MMSD's goal is to inspect each interceptor no less than once every ten years on average. Based on the condition of the interceptor, recommendations are made for future inspection and cleaning schedules as well as rehabilitation, repair or replacement of the interceptors. Inspection data has been compiled for at least 20 years and is used to compare the condition of the assets over time.

The results of all inspections are documented and referred to, as needed, for applicable regulatory reporting and planning and budgeting. Additionally, based on the results of these inspections, the inspection cycle will be evaluated and modified as appropriate, depending on the condition of the sanitary sewer that was inspected. Future inspections of selected interceptors may occur more or less frequently than other areas depending upon the results of the inspections.

All sanitary sewer inspections and condition assessments are contracted out and are performed by using a closed circuit television camera (CCTV) with a pan and tilt feature or a digital pipeline scanner with 360 degree viewing capability. The district uses Pioneer by SewerAI software to capture the data that will be used to analyze the condition of the asset. The software complies with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP). The City of Madison assists MMSD with emergencies.

3.4 INSPECTION - MANHOLES

Manhole inspections are one of the most critical components of a CMOM program. It provides opportunities for staff to see the condition of the manhole and to visually inspect the surrounding area to determine if there are any other problems such as infiltration or inflow sources. Manholes have historically been inspected every three years. During inspections the GIS coordinates are validated via global positioning system (GPS) devices. Specialized tools are used to open manhole covers to reduce injuries.

Prior to 2015 manhole inspections were documented on a standard form and were used to assess the condition of the manholes. Information was written down on the forms in the field and then transferred to a database in the office. While this system has been adequate over the years, it requires duplication of effort for data transfer and lacks the robustness that is desired for MMSD's desired level of service and asset management needs.

MMSD now has a condition assessment database for manhole inspections. The new condition assessment tool will allow inspection data to be entered directly to a database in the field via a handheld device. The database will also use some elements of NASSCO's Manhole Assessment Certification Program (MACP) to provide for greater consistency in inspections. The overall goal of the new tool will be to assign a numerical score to each manhole that can then be used by MMSD for asset management. Full implementation of this tool is an ongoing process due to the amount of information that will be collected and for crew training. As a result, it is recommended that MMSD extend its inspection frequency for manholes from once every three years to once every five years. This frequency will be periodically evaluated to determine if it is appropriate.

3.5 Inspection of Force Mains

MMSD force mains have not historically been inspected for the following reasons: (1). Force mains typically have numerous vertical and horizontal bends which cannot be negotiated by conventional televising equipment; (2). Force mains are typically much longer than interceptors, making it difficult and risky to operate and retrieve televising equipment; (3). Most of the force main length is under water and this water must be removed to allow for televising; and (4). Force mains cannot be taken out of service for extended periods of time, making them ill-suited for conventional televising which requires time for dewatering, cleaning, and televising.

MMSD recognizes that force mains are critical components of the collection system and therefore has begun to implement a force main inspection program to inspect the condition of its force mains. Different technologies are currently being reviewed and an inspection plan is being prepared as part of the preparation of the 2023 Collection System Facilities Plan Update. Annual allowances of approximately $550,000 for force main inspections are included in MMSD's capital improvements plan from 2024 through 2029.

MMSD staff is also reviewing available technologies to better locate its force mains. This will assist in utility locates as required by Diggers Hotline.

3.6 Force Main Isolation Valve Exercising

There are 23 active isolation valves on MMSD's force mains. The valves are exercised twice a year to ensure that they will operate as designed. A summary of the isolation valves can be found in Table 3-1.

Table 3-1 Force Main Isolation Valves

#	Forcemain	MH Station	Comments
1	Old PS2 FM (30”) at Brittingham Park	2-0207 ("Valve 1")	30" double disc gate valve, 1963. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**
2	Crosstown FM at Brittingham Park	2-0035 ("Valve 2")	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**

#	Forcemain	MH Station	Comments
3	Crosstown FM at Brittingham Park	XT-0095R ("Valve 3")	20" resilient wedge gate valve, 1997. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**
4	Crosstown FM at Bedford Street	XT-3420	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**
5	Old PS3 FM before junction with old 30” PS2 FM	2-17010	8” hand-operated gate valve. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**
6	Old PS4 FM before junction with old 30” PS2 FM	4-0120	16” gate valve, 1967. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**
7	PS5 FM near PS5	5-22885	16" Val-Matic plug valve in valvebox, 1996. Normally open. Closes cw, 20 turns.
8	PS5 FM at junction with PS15FM	5-22384	16" double disc gate valve, 1959. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.
9	PS7 FM (1963) in vault in front of PS7	7-8526	36" double disc gate valve, 1963. Normally open. **Closes ccw**.
10	PS7 FM (1963) at NSWTP near Storage Building No. 1.	7-1551	36" double disc gate valve, 1963. Normally open. Closes cw.
11	PS7 FM (1948) at NSWTP near Storage Building No. 1.	7-1546A	36" double disc gate valve, 1963. Normally open. Closes cw.
12	PS9 New FM (1987) in valve box at PS9	9-20582	14" double disc gate valve, 1987. Normally open. Closes cw, 43 turns.
13	PS9 Old FM (1961) in manhole at PS9	9-20594	10" double disc gate valve, 1961. Normally closed. Opens ccw, 28 turns.
14	PS15 Old FM (to West Interceptor/PS8) at Allen Blvd.	15-1360	24" double disc gate valve, 1974. Keep valve open for flow to WI / PS8. Close valve to divert flow to PS16. Closes cw, 74 turns.

#	Forcemain	MH Station	Comments
15	PS15 New FM (diversion to PS16) at Allen Blvd.	15-5587	30" double disc gate valve, 1982. Open for flow to PS16. Closes cw, 70 turns. Note: this valve can be left open even when pumping to WI / PS8.
16	New PS2 FM. Behind PS2, closest to bldg. (Valve 1)	10+00	24" Val-Matic plug valve, 2001. Normally open. Closes cw, 60 turns.
17	New PS2 FM. Behind PS2, further from bldg. (Valve 2)	10+00	24" Val-Matic plug valve, 2001. Normally closed. Opens ccw, 60 turns.
18	PS4 to PS2 bypass. SW of PS2, near air release MH.	11+32	16" Val-Matic plug valve, 2001. Normally closed. Opens ccw, 20 turns.
19	New PS2 FM, prior to PS4 tee (behind PS4, near RR).	109+25	36" Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.
#	**Forcemain**	**MH Station**	**Comments**
20	New PS2 FM, after PS4 tee (behind PS4, near RR).	109+41	36" Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.
21	PS4 FM, prior to connection with new 36" PS2 FM.	109+33	16" Val-Matic plug valve, 2001. Normally open. Closes cw, 20 turns.
22	PS3 FM, prior to connection with new 36" PS2 FM.	173+28	8" resilient wedge gate valve, 2001. Normally open. Closes cw, 26 turns.
23	New XTFM. Behind PS2, furthest from bldg. (Valve 3)	0+20 (On connection)	30" Val-Matic plug valve, 2003. Normally open. Closes cw, 80 turns.
24	New XTFM. At SW corner of PS1.	9+69	24" resilient wedge gate valve, 2000. Normally open. Closes cw, 73 turns.
25	PS15 FM at junction with PS 5 FM	15-7264	24" resilient wedge gate valve. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.
26	PS10FM drain valve (at low-point of forcemain)	10-23080	6" plug valve with blind flange. ¼ -turn to open or close.
27	BM Creek Effluent Return	305+05	6" Waterous resilient wedge gate valve, 19 turns. Used for golf course irrigation trial.
28*	PS18 FM in PS18 Pump Room	N/A	36" DeZurik plug valve with Auma electrical actuator
29*	WI-West Point Ext FM at junction with FM from Westport's Mendota County Park Lift Station	44+70	6" manual valve, 1966. Normally open.

* Note: Table 3-1 is taken from MMSD *Interceptor Maintenance Program Guidelines (November, 2009).* It was updated on 5/20/16 to include Valve ID #28 and Valve ID #29.

3.7 Air Release Valve Inspection and Maintenance

There are 41 automated air release valves and 15 manual air release valves located on MMSD's force mains. The automated air release valves are inspected and cleaned twice a year. The proper functioning of the automated valves is critical to the proper operation of MMSD's force main system. These valves allow air that accumulates at high points to be expelled from the force main and in some cases allow air to be drawn into the pipeline to prevent vacuum conditions from occurring. If not properly maintained, however, these valves can accumulate grease and other solid debris that can become lodged in the valve when open and lead to sanitary sewer overflows. A summary of the air valves can be found in Table 3-2.

Table 3-2 Air Release Valves on Force Mains

#	Forcemain	MH Station	Location & Comments
1	PS02	2-17710	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and valve removed during 10th addition.***
2	PS07 (1963)	7-6750	Engel St. near WPS. ***MH with 2" gate valve and ARI automatic valve. 2" gate valve N.C. Opened only as-needed.***
3	PS08	8-4009	Under Beltline Nob Hill viaduct. ***Manual valve only. No automatic valve at this site.***
4	PS08	8-8079	Bram St. near Coliseum. ***Removed in 2008. Manual valve only. No automatic valve.***
5	PS08	8-11264	1722 Kenward St. ***Removed in 2008. Manual valve only. No automatic valve.***
6	PS09	9-1500	Between Paulson Road & Railroad
7	PS10	10-24760	Hwy 51 East R.O.W. south of Robertson Rd.
8	PS11	11-1073	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and standpipe removed during 10th addition.***
9	PS15 (to West Int.)	15-1525	2045 Allen Blvd. near Univ. Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***
10	PS15 (to West Int.)	15-2411	Thorstrand Rd. @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***
11	PS15 (to West Int.)	15-4827	Capital Drive @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***
12	PS15 Diversion to PS16	16-106	St. Dunstan's Drive. ***MH with 2" gate valve and automatic valve. 2" gate valve N.C. Opened only as-needed.***
13	PS17	17-2050	Bruce Street
14	PS17	17-3050	Locust Drive
15	PS17	17-4113	Hwy. M east of Locust Drive
16	PS17	17-8900	South of Verona Rd. and West of Hwy PB
17	BM Creek Effluent	6650	Near Goose Lake. South of USH 18/151 and

			West of Fitchrona Road.
18	BM Creek Effluent	10200	4’ Dia MH. 2” ball valve and 2” galvanized steel ***standpipe***. There is also a 1” corporation stop in the MH. No automatic air valve.
19	BM Creek Effluent	12900	4’ Dia MH. 2” ball valve and 2” galvanized steel ***standpipe***. There is also a 1” corporation stop in the MH. No automatic air valve.
20	BM Creek Effluent	29050	Longford Terrace
21	BM Creek Effluent	42000	McCoy Rd. near RR
22	BM Creek Effluent	44450	McCoy Rd. near Hwy 14
#	**Forcemain**	**MH Station**	**Location & Comments**
23	BM Creek Effluent	46500	Clayton Road
24	BM Creek Effluent	53720	NSWTP north of Moorland Road
25	Effluent 54"	2300	NSWTP north of Moorland Road
26	Effluent 54"	7090	North of Meadowview Road
27	Effluent 54"	11800	North of Goodland Park Road
28	Effluent 54"	13478	Lalor Road south of Goodland Park Road
29	Effluent 54"	16575	Lalor Road
30	Effluent 54"	20250	Lalor Road
31	Effluent 54"	25808	Back of 2399 White Oak Trail. ***Standpipe only. No air valve at this site.***
32	New 36” PS02	11+24	50’ SW of PS2
33	New 36” PS02	69+36	Corner of Van Deusen & Rowell Streets
34	New 36” PS02	111+81	South of PS4, along RR tracks. ***Trial in-progress in 2009 to determine if automatic valve can be removed. Gate valve only. Inspected for air every two weeks.***
35	New 36” PS02	151+52	South of Nob Hill Road, near bike path
36	New 30” XT	7+41	Brittingham Park at bike path intersection
37	New 30” XT	33+26	Next to Boathouse at Bedford Street
38	New 30” XT	38+17	Between bike path and North Shore Drive
39	New 30” XT	45+27	Near tennis courts, south of Broom Street
40	New 30” XT	103+61	RR embankment north of Monona Terrace
41	New 30” XT	113+90	Median of E. Wilson, in front of Essen Haus
42	New 30” XT	117+43	Between MG&E and RR tracks, north of Blair
43	New 30” XT	121+61	MG&E parking lot south of Blount Street
44	New 30” XT	127+13	Bike path, between Blount & Livingston
45	New 30” XT	135+72	Bike path, between Livingston & Patterson
46	New 30” XT	139+60	Bike path, between Patterson & Brearly
47	New 30” XT	146+75	Bike path, between Brearly & Ingersol
48	New 30” XT	157+29	East Wilson Street at Few Street
49	New 30” XT	179+85	Median of E. Wash. Ave, south of Thornton
50	New 30” XT	174+98	Between E. Wash. Ave. and Dickinson St.
51	PS07 (1948)	7-5385	Automatic 6” Air Release Valve installed 2002. Adjacent to 7-6750 MH. ***6” gate valve and***

			Vent-O-Mat automatic valve. 6" gate valve N.C. Opened only as-needed.
52	PS01	09300 +/-	30"x 4" tapping sleeve, 4" companion flange, 2" SS nipple, and 2" ball valve installed in 2006. East Wash Ave @ 2nd Street. ***No automatic valve. Manual air release only.***
53*	WI/West Point Ext FM	MHWP-03660	In front of 3029 Dianne Drive. Installed via tapping saddle in 4' diameter manhole. ***Manual air release only.***
#	**Forcemain**	**MH Station**	**Location & Comments**
54*	PS18	20+05	North perimeter road at NSWWTP. ***Manual air release only.***
55*	PS18	61+17	East of First Supply and south of Beltine Highway. ***Manual air release only.***
56*	PS18	92+07	In westbound lane of West Broadway, just east of Yahara River.
57*	PS18	116+75	In westbound lane of West Broadway, just west of Monona Drive.
58*	PS18	125+55	In westbound lane of East Broadway, just east of Roselawn Avenue. ***Manual air release only.***

* Note: Table 3-2 is taken from MMSD *Interceptor Maintenance Program Guidelines (November, 2009).* It was updated on 5/31/16 to include Valve ID's 53, 54, 55, 56, 57 and 58.

3.8 SIPHON CLEANING

There are eleven active inverted siphons in MMSD's collection system. All siphons are cleaned at least twice a year. All cleaning is contracted with either private vendors and/or the City of Madison Engineering Department. .

The majority of the siphons are single barrel designs. Newer siphons, such as the South Interceptor/Baird Street Relief, incorporate a double barrel design. In general MMSD has not experienced significant problems with blockages, although grease accumulation is a common occurrence. Problems associated with the build-up of grease in the siphons have been mitigated by increasing the frequency of siphon cleaning where needed. MMSD has taken a more active role in engaging its customer communities in the last two years on source reduction strategies to prevent grease from entering the system.

MMSD continues to assess the probability of failure and consequence of failure for all collection system assets. The results of this study will help determine the need for any potential operational or structural improvements to MMSD's siphons.

Table 3-3 Siphons

#	Interceptor	Location	Manholes	Comments
1*	WI West Point Ext.	Pheasant Branch Creek at Hwy. M	5-116 to 5-115A	2094 ft. of 14" AC pipe. ***Due to length, classified as a forcemain. Not routinely cleaned until 2015.***
2	West Int. Relief	Walnut Street Underpass at Campus Drive	2-517 to 2-516	105 ft. of 36" RCP
#	**Interceptor**	**Location**	**Manholes**	**Comments**
3	Old West Interceptor	Midvale Blvd. at University Ave.	2-054A to 2-053B	31 ft. of 16" CI pipe installed in 1958 to clear new storm sewer box conduit
4	Old West Interceptor	Shorewood Blvd. north of University Ave.	2-047B to 2-047A	21 ft. of 15" RCP installed in 1972 to clear City storm sewer. City agreed to maintain siphon.
5*	West Int. Replacement at UW Campus	Randall Avenue at Wendt Engineering Library	No manholes	120 ft. of 30" DI installed in 1999 to clear twin UW chilled water lines and MGE gas line.
6	West Int. Spring Street Relief	Brooks Street at College Court	2-309B to 2-309A	46 ft. of 24" CI pipe installed in 1975 to clear 5'x12' storm box
7	West Int. Spring Street Relief	Brooks Street at Regent Street	2-309 to 2-308	91 ft. of 24" CI pipe
8	West Int. Spring Street Relief	Brooks Street at Milton Street, near Meriter Hospital	2-307 to 2-306	63 ft. of 24" CI pipe
9	South Int. Baird Street Relief	Wingra Creek at Baird Street	4-312 to 4-311	Two barrels, 156 ft. of 14" and 10" DI pipe inside of 36" steel casing, grouted in place.
10	Southeast Int.	Siggelkow Road underpass at USHwy 51	7-218A21 to A20 to A19	185 ft. of 8" DI and CI pipe (145 ft. replaced with DI in 1992)
11	East Monona Interceptor	Fair Oaks Avenue at Starkweather Creek	6-108F to 6-108E	85 ft. of 14" CI pipe, crossing Starkweather Creek
NA	INACTIVE: Old West Int.	Regent Street at Murray Street	2-005A to 2-005	50 ft. of 24" CI pipe. Flow diverted to City sewer in 1995

* Note: Table 3-3 is taken from MMSD *Interceptor Maintenance Program Guidelines (November,*

2009). ID No. 1 and ID No. 5 were updated on 6/3/16.

3.9 Stop Log & Gate structures

MMSD has a number of structures containing stop logs or gates. These devices are used primarily to divert or isolate flow in the following ways:

- To allow high flows to overflow to nearby waterways in emergency events to mitigate the occurrence of basement backups. These overflows are routinely inspected to ensure that the device is not leaking and/or that water is not flowing into the sewerage system.
- To allow the inter-basin transfer of flow where interceptors intersect each other, allowing the diversion of flow between interceptors and possibly between pump stations.
- To allow water to be introduced into the collection system from nearby waterways to scour away accumulated debris. This practice is no longer used.
- To manage flow and facilitate construction of certain infrastructure improvements, such as the connection of a replacement sewer to an existing sewer.

A summary of the stop logs and gates in MMSD's collection system can be found in Table 3-4. Of the 24 devices shown in Table 3-4, 20 remain in place and four have been either removed or abandoned. MMSD personnel inspect each active device twice each year to ensure that the device is in good condition and is operating as intended.

Table 3-4 Stop Logs and Gates

#	Facility	MH	Location & Comments	Emergency Discharge Location
1	Bedford Street Stoplogs	CT-3420	Northshore Drive at end of Bedford Street, adjacent to Monona Bay. ***Abandoned in 2018.***	Emergency discharge for Pump Station 2 to Monona Bay
2	Burke Outfall Stoplog for diversion to 30"	93+10	Pennsylvania Ave south of Commercial Ave. ***Abandoned/removed during North Basin Interceptor project.***	
3	PS5 Stoplog	5-403	Mendota Drive across from PS5 ***Abandoned.***	Emergency discharge to Lake Mendota
4	PS6 Flapgate	6-102	Drainage ditch near PS6	Emergency discharge to Starkweather Creek at Capital City Trail
5	PS7 Stoplog	PS7	Entrance chamber behind PS7	Emergency discharge to Yahara River

6	PS8 Stoplog at Wingra Creek	8-100	North side of Wingra Creek across from PS8	Emergency discharge to Wingra Creek
7	SWI Junction MH for emergency diversion from PS2 to PS8.	8-106	Haywood Street at Wingra Drive, near entrance to Arboretum. ***New diversion manhole with stop logs installed in 2019 to allow emergency diversion from PS2 to PS 8.***	
8	SEI Flushing Valve (upstream of PS9)	9-108	East side of Hwy. 51, north of Yahara River, south of Yahara Drive. ***Abandoned 2023.***	Emergency discharge to Yahara River at USH 51
#	**Facility**	**MH**	**Location & Comments**	**Emergency Discharge Location**
9	NEI Flapgate upstream of PS10	10-114	At Starkweather Creek, south of Sycamore Ave and west of Walsh Rd. ***Removed in 2009 during NEI-PS10 to Lien Road Project.***	
10	PS11 Flapgate	PS11	PS11 near entrance chamber	Emergency discharge to Nine Springs Creek
11	NSVI MP Ext. Flapgate upstream of PS12	12-113	Along Badger Mill Creek, north of Nesbitt Road and west of Maple Grove Road. ***Flap gate removed in 2004 during City Greenway Modification Project. MH remains.***	
12	NEI Truax Ext Flapgate upstream of PS13	13-105	Along drainage ditch, west of Hwy 51 at Dane County Airport access road. ***Inside airport perimeter fence.***	Emergency discharge to drainage ditch tributary to Starkweather Creek
13	PS15 Slidegate with hole for gravity diversion to PS5	5-102A	130 feet south of PS15 along Allen Blvd., in Marshall Park.	
14	WI Relief junction with Old WI, allowing overflow to old WI d/s	2-513	South side of Campus Drive across from Veterinary Science ***Abandoned/removed during WI-Campus Relief Phase 4 Project***	

15	WI Campus Relief Phase 1 junction with WI Relief.	8-207	At UW Met. Engineering Bldg. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	
16	WI Campus Relief Phase I junction with Old WI	8-206	Randall Ave just south of RR. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	
#	**Facility**	**MH**	**Location & Comments**	**Emergency Discharge Location**
17	WI Relief junction with Old WI	2-014A	Randall Ave south of Dayton St. Slide gate blocks flow to Old WI d/s. ***Gate always in-place and flow always blocked to Old WI.***	
18	WI Randall Relief cross-connect with Old WI at MH 2-012B	8-122	Randall Ave. between Spring Street and Regent Street. ***Gate always in-place, but if flow is 2.5' +/- above invert of MH 8-122 it will overflow to MH02-012B in the Old WI.***	
19	WI Spring Street Relief cross-connect with Old WI	2-316B	Randall Ave. south of Monroe Street. ***Gate always in place. Diverts flow from Old WI (Monroe Street) into the WI Spring Street Relief.***	
20	PS16 Overflow to Gammon Extension	5-230	Gammon Road, just west of PS16. ***Brick dam to divert gravity flow from PS16 to PS5 via the WI Gammon Ext.***	
21 *	NEI–SEI to FEI Relief/Replacement, stop logs downstream of PS18	7-214C	South of PS18. Stop logs used to isolate PS18 bypass sewer from PS18 during PS 18 construction.	

#	Facility	MH	Location & Comments	Emergency Discharge Location
			Stop logs not needed for routine operation.	
22 *	NEI-SEI to FEI Relief/Replacement, stop logs to PS18 influent pipe	18-001	East of PS18. Stop logs used to isolate PS18 bypass sewer from PS18 during PS18 construction. Stop logs not needed for routine operation.	
23 *	NEI-SEI to FEI Relief/Replacement, sluice gate east of PS18	18-001	East of PS18. Sluice gate used to divert flow from PS18 bypass sewer to PS18. Gate normally closed.	
24 *	NEI-Pflaum Road Replacement	MH07-932	Between Progress Road and Certco warehouse. Stop logs used to facilitate construction of NEI-SEI to FEI. Stop logs not needed for routine operation.	

* Note: Table 3-4 is taken from MMSD *Interceptor Maintenance Program Guidelines (November, 2009).* ID No. 21, 22, 23 and 24 added on 6/3/16.

3.10 Inspection of Pump Stations

MMSD operates and maintains 18 regional pump stations and also operates and maintains 47 pump stations for its satellite communities. All MMSD pump stations are connected to the Supervisory Control and Data Acquisition (SCADA) system.
MMSD pump stations are monitored daily and inspected once a week to ensure that they are operating satisfactorily. The inspections are performed by a mechanic and a worker from the Facilities Maintenance staff. All pumps are started and observed for potential problems. The wet well is inspected for debris build-up and levels. The station and grounds are also inspected. Minor adjustments may be performed on-site at this time. Work orders are generated for all other items that require attention.

Pump stations are also inspected on an annual basis by supervisors from the Electrical Maintenance Department, Mechanical Maintenance Department, Facilities Maintenance Department, and the Reliability Manager to review the condition of the pump stations, pumps and associated equipment. Recommendations are made for replacement and rehabilitation of the facilities and equipment as part of this inspection. A summary of some of the key features of MMSD's regional pump stations is summarized in Table 3-5.

Table 3-5 MMSD Regional Pump Stations

Pump Station No.	Station Location		Year Placed into Service	Pumping Capacity (mgd)	
	Address	Municipality		Maximum	Firm
1	104 N. First Street	City of Madison	1950	38.3	35.3
2	833 W. Washington Ave.	City of Madison	1964	41.0	41.0
4	620 John Nolen Drive	City of Madison	1967	4.2	4.2
5	Spring Harbor Park	City of Madison	1996	3.6	3.6
6	402 Walter Street	City of Madison	1950	24.2	24.2
7	6300 Metropolitan Lane	City of Monona	1950	45.0	39.0
8	901 Plaenart Drive	City of Madison	1964	34.1	34.0
9	4612 Larsen Beach Road	Village of McFarland	1962	4.5	4.5
10	192 Regas Road	City of Madison	1965	42.2	42.2
11	4760 E. Clayton Road	Town of Dunn	1966	41.6	41.6
12	2739 Fitchrona Road	Town of Verona	1969	32.0	32.0
13	3634 Amelia Earhart Drive	City of Madison	1970	29.4	29.4
14	5000 School Road	City of Madison	1971	20.2	20.2
15	2115 Allen Boulevard	City of Madison	1975	9.6	8.6
16	1303 Gammon Road	City of Middleton	1982	18.7	18.7
17	405 Bruce Street	City of Verona	1996	4.6	4.6
18	1100 E. Broadway	City of Monona	2015	45.0	45.0

3.11 INSPECTION OF EASEMENTS

MMSD currently maintains easements for its facilities which are located on private property. It is critical to inspect easements on a regular basis to ensure that the manholes and interceptors are accessible to perform maintenance activities. Manholes are inspected every five years and any associated easements between manholes are generally inspected on this same schedule, although no formal documentation is recorded. MMSD should consider developing a more robust easement inspection program which documents the frequency of the inspections and includes any recommendations for maintaining or improving access to its facilities.

3.12 INSPECTION OF CRITICAL STRUCTURES

Inspections are completed for infrastructure that MMSD considers critical on a routine basis. Pump stations, siphons, isolation valves, air-release valves and diversion structures are all considered critical structures. Listings of these facilities and their locations have been summarized in previous sections. Other critical facilities can and will vary depending upon the situation (i.e. high flow event).

3.13 GREASE TRAP INSPECTIONS

MMSD's Sewer Use Ordinance requires its satellite communities to require the installation of grease traps for all of its commercial and industrial establishments that may discharge grease in excess of the allowable limits. All traps are to be installed and maintained by the individual user and inspected by the satellite community on a regular basis.

3.14 SEWER CLEANING PROGRAM

Interceptors are cleaned during interceptor inspections on a ten year cycle. This cycle should be continued to ensure that the interceptors have adequate capacity and that debris is removed to eliminate blockages and SSOs. Future cleaning schedules could result in some areas cleaned more frequently or less frequently than other areas.

3.15 PUMP STATION MAINTENANCE PROGRAM

3.15.1 Pump Station Wet Well Cleaning

District-owned station wet wells are cleaned once every four years, or as needed, by the Facilities Maintenance workgroup assisted by the City of Madison Engineering Department. Pump station wet wells are also inspected weekly for any debris, rags, or grease build-up. MMSD continues to engage its satellite communities on strategies to reduce rags and other problematic debris in the collection system.

3.15.2 Pump Station Maintenance MMSD

Pumps and associated equipment are maintained by MMSD's Mechanical Maintenance Department. Pump preventative maintenance is scheduled according to recommendations provided by the pump manufacturer and MMSD's mechanics. Maintenance schedules are generated via the CMMS.

3.15.3 Pump Station Maintenance – MMSD Satellite Communities

MMSD staff currently performs O&M on 47 satellite community pump stations that discharge to MMSD's collection system. The pump stations are also inspected along with MMSD pump stations on a weekly basis. MMSD should continue this practice as it ensures that the assets are properly maintained.

3.16 Manhole Maintenance

Minor manhole maintenance is performed by MMSD staff either during manhole inspections or scheduled via a work order. Examples of routine maintenance by Sewer Maintenance staff include casting replacements, chimney reconstructions and coating of chimney sections with flexible liners. It is expected that MMSD staff will also become more involved with the inspection of manhole rehabilitation projects going forward.

3.17 Sampling

There are over 90 monitoring and sampling sites in the collection system that are used as part of MMSD's User Charge billing program. The Monitoring Services crew performs sampling for one week at each site on a quarterly basis to determine wastewater strengths and characteristics for its satellite customers. This program should be reviewed on a regular basis to adjust sampling as necessary to meet MMSD's needs and those of its satellite communities.

3.18 Flow monitoring

To determine actual wastewater flows from the satellite communities portable flow monitors are installed in strategic locations in the collection system for a one-week period each quarter. See Chapter 5 for more information on flow monitoring.

3.19 Hydrogen Sulfide and Odor Control

Force mains, downstream of force mains, low-lying interceptors or interceptors with long detention times can be susceptible to hydrogen sulfide (H_2S) and odors. MMSD is investigating the use of portable and permanent H_2S monitors to install in the collection system to monitor for H_2S and potential corrosion. The Facility Plan Update also recommended that H_2S and odors be monitored and investigated as part of a routine maintenance activity.

3.20 Smoke Testing Program

Smoke testing can be used to identify sources of infiltration and inflow in the collection system. MMSD will use this method on an as-needed basis.

3.21 Dye Water Flooding

Dye water (flooding) testing can be used to identify sources of infiltration and inflow in the collection system. It is particularly helpful in identifying cross connections between the sanitary and storm sewer systems. MMSD rarely uses this method and will do so on an as-needed basis.

3.22 Root Control

Roots are typically removed during interceptor cleaning. Due to the depth of the interceptors, roots typically are not a problem in MMSD interceptors. Measures to address roots will be done as needed.

3.23 Code Compliance

MMSD has approximately 600 private connections which are directly connected to MMSD interceptor sewers. At this time MMSD does not have a program in place to routinely inspect these connections for compliance with local plumbing codes (i.e. illicit sump pump connections). It is recommended that MMSD investigate the establishment of a program that allows for greater inspection of suspected illegal connections and possible enforcement actions.

3.24 Standard Operating Procedures

MMSD has identified the need to develop standard operating procedures (SOPs) for collection system activities that are performed by staff. This is an ongoing task that will continue to be supported. SOPs can be found on MMSD's data network at P:\OandM\MAINTENANCE SOPs final. An example of a SOP for using GPS navigation to locate collection system facilities can be found in Appendix G.

CHAPTER 4 – ASSET MANAGEMENT PLAN

4.1 BACKGROUND AND INFORMATION

A comprehensive asset management plan ensures that the assets are operated, maintained rehabilitated and replaced cost-effectively. Key elements of an asset management plan are:

- Inventory and condition of assets (see section on data)
- Maintenance, rehabilitation, replacement and expansion for growth strategies in a life-cycle cost management approach.
- Defining the level of service and monitoring performance
- Recommending improvements to operations and maintenance processes
- Use of MMSD resources in a sustainable manner

MMSD addresses these key elements through the Collection System Facility Plan as well as several established practices and procedures as described in the previous chapters. An update to that plan is anticipated to be completed in 2024. In addition, the RCM program has identified a series of projects, listed below, that improve how MMSD manages assets (some of them are mentioned earlier, such as the Manhole Inspection Database/Tool):

- Condition assessment approach for all asset classes and on-site capture for inclusion in the CMMS
- Better reporting and analytical tools to help prioritize maintenance and rehab and replacement activities
- Reestablishment of work order management processes to align prioritization, planning, and scheduling of work
- Common consequence of failure assessment criticality scoring integration into CMMS

Other components to consider as outlined in Chapter 5 of the Facility Plan are:

- I/I reduction
- Demand-Side Management
- Excess capacity areas

4.2 CONDITION ASSESSMENT

MMSD's Condition Assessment Program involves documentation and inspection of the collection system to assess the condition of the infrastructure. The information gathered during the assessment is used to plan and budget for repair, rehabilitation and replacement of the assets.

From these assessments, recommendations for schedules for inspection, cleaning and rehabilitation are made. As documented in more detail in Section 4.3, MMSD has a comprehensive program for condition assessments for most collection system assets in place. MMSD is currently in the process of developing tools and determining priorities and schedules for other assets.

4.2.1 Condition Assessment Key Elements

To have a successful rehabilitation program, a condition assessment program needs to be in place. Program features include the following:

- Components include, but are not limited to: inspection, cleaning, smoke testing, dye water flooding and root control. See Chapter 3 for more details on these programs.
- Document work including inspection, cleaning, rehabilitation work and other work as performed in the collection system.
- Data from the inspections and cleaning is reviewed and evaluated by MMSD staff. The condition of the sewers are rated via the PACP assessment code and manholes are assessed for recommended improvements.
- Based on the condition assessment rating, recommendations are made on an on-going basis to repair, rehabilitate, and replace to properly maintain the assets.
- Analysis of system performance, maintenance history, age of materials and structural risk analysis is also used to help prioritize recommendations.

4.2.2 Asset Service Life

Asset Service Life is initially estimated based on industry standards. The depreciation schedule in MMSD's Financial Asset Management System (FAMS) is based on these estimates. However, maintenance, renewal and replacement activities are based on service life estimates that consider condition as well as capacity. The Collection System Facilities Plan includes these estimates. For capital improvement projects this is updated and captured in the annual CIP. MMSD is continually improving the available data and forecasting methodology to estimate remaining asset service life. MMSD is currently working on a project to translate condition assessment scores to a "life expectancy" curve.

Before equipment gets replaced energy costs, availability of spare parts, and life cycle costs get considered. For larger projects, this is captured in triple-bottom-line business cases in the CIP.

4.3 Condition Assessment Recommendations

Recommendations to repair, replace and rehabilitate the assets are based on the results of the inspections. The inspection data is reviewed and the condition of the asset is identified.

Rehabilitation and replacement design is either completed by MMSD staff or consultants depending upon the size of the project and availability and technical expertise of staff. Solutions for repair and rehabilitation will depend up on the condition of the asset, the effectiveness of reducing I/I and using the appropriate technology for the problem. Recommendations will be used for O&M budgets and the CIP.

4.4 REHABILITATION AND REPLACEMENT

Rehabilitation of the collection system is a critical component of an asset management plan. It is recommended by the Facility Plan Update and CMOM Plan that a formal rehabilitation program is developed to incorporate the results of CMOM activities.

4.4.1 Interceptors

Interceptors are identified for rehabilitation based on the interceptor inspections. MMSD staff reviews the condition data; identifies defects using PACP; and provides specific recommendations based on the condition of the asset, capacity of the interceptor and future wastewater flow projections. Replacement or rehabilitation recommendations are included in the CIP.
All televising of interceptors is performed by contractors or other outside entities.

4.4.2 Manholes

Manholes are identified for rehabilitation based on the manhole inspections. Minor repairs are performed by Sewer Maintenance workers. Major repairs or replacement are typically performed as part of an interceptor rehabilitation or replacement project.

4.4.3 Pump Stations and Associated Equipment

As noted in the pump station inspection, pump stations and associated equipment are inspected on an annual basis and recommendations are made based on the annual inspection as well as the weekly inspections. It is recommended to continue the annual inspection.

Pump station rehabilitation needs are also noted in the CARPC Report and the Collection System Facilities Plan. They are also included in the CIP with detailed business cases. Once a project approaches the implementation timeframe, a design project is initiated which reviews in detail the current condition, capacity and demand for all assets in the pump station. The design manual is used to provide required documentation for regulatory review purposes and ultimately for guiding the construction project.

4.4.4 Valves

There are air release and isolation valves on force mains as well as valves in each of the pump stations. Valve repair and replacement is on-going. Recommendations to replace pump station valves are incorporated into the pump repair and rehabilitation program.

4.4.5 Equipment

MMSD does not perform cleaning, inspection or sewer replacement and, therefore, equipment associated with those activities is not required. Other equipment such as flow meters and samplers are replaced as needed. MMSD staff also determines if additional flow meters and samplers are required to comply with the SUO and the CMOM Plan.

Repair or replacement of vehicles, flow meters, samplers and other equipment is included in the Operating Budget as needed.

4.4.6 Capital Improvements Plan

All of the rehabilitation and replacement recommendations are incorporated into the CIP unless the project is small enough for the Operations budget. The Facility Plan also includes recommendations that are incorporated into the CIP. Rehabilitation projects included in the CIP are those identified during the cleaning and inspection programs. In addition to rehabilitation projects, the CIP is evaluated and projects related to the reduction of peak wet weather flows, including the reduction of I/I, are added depending on budgetary constraints.

CHAPTER 5 – CAPACITY PLAN

5.1 Background and Information

MMSD's collection system needs to have sufficient capacity to safely manage and convey both dry and wet weather flows. The Facility Plan Update and the CARPC Report provide detailed information regarding existing and projected wastewater flows and system capacity for each interceptor in the collection system.

5.2 Capacity

Interceptor capacity is defined in the CARPC Report in detail. The following is a general assessment of available capacity throughout MMSD's collection system:

- Dry Weather Conditions. Adequate capacity exists for all portions of the system and, therefore, MMSD is not subject to any dry weather capacity restrictions.

- Wet Weather Conditions. MMSD continues to review and evaluate areas that experience excessive flows during wet weather events in order to determine the root cause of the excessive flows. Currently there are no areas that experience SSOs or are surcharged on a regular basis.

MMSD has an ongoing inspection program to identify areas experiencing I/I. Areas requiring rehabilitation are identified and are included in the CIP. MMSD continues to enforce the SUO on a continuous basis to ensure that illegal connections are disconnected in an effort to reduce I/I.

Climate change is not addressed in the CARPC Report. A discussion on climate change was included in the Facility Plan Update. Further considerations for climate change should be incorporated into the next facility plan and other long-range planning efforts. Due to the difficulty in determining how to design for climate change, the main goal is to provide system flexibility such that capacity can be added cost efficiently as needed in the future.

5.3 Field Investigations

MMSD performs field investigations, such as flow monitoring, on an as-needed basis to identify I/I, defects and other areas of concern. These investigations are typically based on resident complaints, staff observations and staff or consultant recommendations. Key features of the investigative process include the following:

- Areas of concern, excessive I/I locations and SSOs are investigated and the results are documented in staff memos or other appropriate documents.
- Observations and recommendations from field investigations will be used to evaluate the

effectiveness of the O&M Plan, to refine the O&M Plan as necessary, and to provide repair, rehabilitation and replacement recommendations.

5.4 Flow Modeling

MMSD uses a software model, PCSWMM, to analyze the collection system hydraulics. The model is also used for master planning and collection system rehabilitation and replacement optimization.

It is recommended that the model be updated on a regular basis to ensure that data is accurate and provides the ability to plan for future expansions and rehabilitation.

5.5 Flow Monitoring

Portable flow meters are used in specific locations to monitor satellite community flows. MMSD's primary measuring devices at this time are temporary weirs which are placed in the channels of manholes. In an effort to improve the accuracy of flow measurements and reduce the amount of confined space entries, MMSD recently implemented the use of other flow monitoring technology. These other technologies include laser flow meters and flow metering inserts, both of which can be installed without making entry into a manhole.

Portable flow meters are used at over 60 monitoring sites for service charge billing. These sites are generally located in a MMSD interceptor sewer or in a community sewer just upstream of its connection with a MMSD interceptor sewer. A complete listing of all MMSD sampling and monitoring sites can be found in MMSD's Emergency Operations Manual.

MMSD staff is reviewing installing permanent flow meters in several locations. Permanent flow metering stations will allow for more accurate measurements and provide safer working conditions for the Monitoring Services crew. It is recommended that permanent flow meters are installed in various locations not only for billing purposes but also to identify areas with high I/I and to document the need for additional capacity due to development. Flow meter locations should be reviewed to determine the best location to capture accurate flow data as well as to identify areas with high I/I.

5.6 I/I Reduction

I/I reduction for MMSD and the satellite communities is a critical aspect for MMSD's long range planning. High I/I can result in SSOs and the inability to provide the level of service and capacity for all of MMSD's customers. MMSD continues to address I/I reduction through its maintenance programs. Future efforts will focus on I/I reduction in the satellite communities through the SUO and the satellite communities CMOM programs.

The 2011 Facility Plan Update outlined several I/I strategies which are shown below. CMOM Plan recommendations are listed in italic.

- Review design standards and adopt higher peaking factors if necessary and cost-effective. *This is being evaluated as part of the Collection System Facility Plan update.*
- Review materials to reduce I/I. *Continue to review material selection based on the specific replacement or rehabilitation. A specific example where new materials are being used is through the use of internal barriers on manhole chimneys to prevent I/I from entering through the casting and adjusting rings.*
- Review flow data and inspect interceptors to identify defects. *Gravity sewers data is being reviewed and force mains are being programmed into the CIP.*
- Review flow data from MMSD satellite communities. *This will become more critical as collection system age increases. Currently the only permanent flow data is via pump stations and recommendations to expand permanent flow monitoring are included in the Flow Monitoring Program Plan to be finalized by the end of 2023.*
- Increase public education efforts in the area of water conservation. *This is an ongoing effort. MMSD should continue to develop a long-term strategy.*

Additional recommendations to reduce I/I include the following:

- Continue to inspect manholes every five years (at a minimum) and maintain a manhole rehabilitation program.
- Review satellite community CMOM plans.
- Develop a private property I/I reduction program.

5.7 SEWER EVALUATION AND CAPACITY ASSURANCE PLAN

Currently, MMSD is not required to have a sewer evaluation and capacity assurance plan (SECAP). If capacity in the sewer system becomes a problem, DNR may require a SECAP, including additional monitoring requirements, reduction of I/I, and expansion of the existing collection system or treatment plant.

MMSD should continue to evaluate its system, update the hydraulic model and implement the ongoing and recommended CMOM programs to ensure that a SECAP is not required.

CHAPTER 6 – EMERGENCY OVERFLOW RESPONSE PLAN

6.1 Background and Information

The Emergency Overflow Response Plan (EORP) provides procedures to respond to SSOs, document work performed to address SSOs, and documents notification provided to appropriate parties. The processes and procedures outlined in the EORP are intended to protect public health and the environment in the event of an SSO. The EORP is summarized in this section. Other emergency procedures such as pump failure, loss of power, telemetry radio emergencies, and sewer line emergencies can be found in the MMSD Emergency Operations Manual (Appendix C).

6.2 Procedure

The EORP defines procedures to respond to SSOs that include the following:

- SSO identification/receipt of information regarding an SSO
- Dispatching the appropriate personnel to address the SSO
- SSO documentation
- Provide containment and proper clean-up of the SSO so as to mitigate adverse impacts
- Investigate SSOs
- Notify applicable stakeholders of an SSO

6.3 SSO Identification

SSOs are identified by MMSD staff or the public. During wet weather events MMSD staff monitors the interceptor system through the SCADA system and dispatches field crews to potential overflow locations.

Emergency Contacts on www.madsewer.org include emergency phone numbers for sewer emergencies.

The emergency numbers to contact MMSD are clearly noted and visible on the MMSD website (www.madsewer.org). Emergency contact numbers for all hours of the day are provided. During normal business hours calls should first be directed to the Director of Wastewater Operations and Reliability at 608-222-1201 (ext. 130). In the event that the Director of Operations and Maintenance is unavailable the call will be routed to the Maintenance and Reliability Manager or Collection System Supervisor. Outside of normal business hours calls will be received by the operators at the treatment plant which staff the facility at all times of the day. Mobile phone numbers for the operators are 608-225-8470 and 608-576-9637.

Items noted at the time of emergency calls include:

- Time and date call was received
- Callers name and phone number
- Time that the potential overflow was noticed
- Specific location of the problem
- Description of the problem and observations
- Other information that could assist MMSD to quickly locate, assess and correct the problem.

6.4 DISPATCH

All sewer emergencies are investigated by the Collection Systems Supervisor or their designated representative. If the problem is noted as a SSO or potential SSO (including events related to loss of power and/or pump station communication failure), then the following steps should be taken:

UNTIL FIELD VERIFIED, THE REPORT OF A POSSIBLE SPILL WILL NOT BE REFERRED TO AS A SSO

- Notify the Director of Wastewater Operations and Reliability.
- Contact additional MMSD staff as needed, including sewer maintenance workers, mechanics and electricians, depending on the location and nature of the problem.
- Contact foreperson for utility contractor if SSO is believed to be related to MMSD construction project.
- Contact other utility contractors for emergency response if not related to construction project. See MMSD EOP for list and contact information for emergency contractors.
- Contact City of Madison for interceptor blockages.
- See MMSD EOP for additional procedures to be followed for situations such as: high flows (p. 19), sewer line emergencies (p. 22), pump station force main emergencies (pp. 22 – 45), power outages (p. 46), and radio emergencies (p. 80) in the collection system.

6.5 SSO DOCUMENTATION

DNR requires the location, any basement back-ups, volume and estimated time to be included in the reporting and notification. Provide the following:

- Location (manhole or nearest street address location) and any impacts on private property
- Estimate quantities of flow for the overflow
  - Estimate overflow quantities based on time and volume
  - Or if notified and it appears that this overflow has been occurring for a while – estimate start time

- Document time when SSO is contained
- Note date and time that event started
- Note date and time that event stopped
- If using a portable pump document actual start and stop time. Document pump capacity and calculate gallons pumped.
- All overflow quantities must be reported to the DNR. Notify DNR as noted in the next section.
- Calculations for overflows.
    - Pump: Gallons = pump time (minutes) x pump capacity in gallons per minute (gpm)
    - Ground: Gallons = width x length x depth (in feet) x 7.48 gallons/cubic foot)

6.6 SSO Mitigation, Containment and Cleanup

The following procedure will be followed to clean-up the SSO.

a. Determine the cause of the overflow and the necessary resources to correct it.
b. Identify the destination of the overflow (ditch, storm sewer, street, river, lake, etc.)
c. Secure the area to prevent contact by members of the public until the SSO has been addressed and cleaned up. This could include barricading the area and rerouting traffic around the area.
d. Take immediate steps to stop or minimize the impact of the SSO.
    i. Relieve MMSD interceptor blockage by cleaning the sewer (City of Madison or emergency contractor).
    ii. Flows may need to be pumped from one interceptor manhole to another manhole while removing the blockage to prevent or minimize the impact of an SSO.
    iii. Call emergency contractors or other municipalities for assistance as necessary.
e. Request additional personnel, materials, supplies, or equipment that will expedite and minimize the impact of the overflow.
f. Photograph and take video footage of the area to document all activities undertaken to stop SSO and to determine the extent of the impacted area.
g. Cleanup
    i. Secure the site.
    ii. Where practical thoroughly flush the area and clean any sewage or wash-down water. Solids and debris should be flushed, swept, picked up or transported for proper disposal. Liquids should be discharged to the sanitary sewer. Lime or disinfectant should be used to sanitize the area as necessary.

6.7 NOTIFICATION

In the event of an SSO in the collection system, or whenever there is a significant or potentially significant risk to public health, a notification will be made to the appropriate public health entities and water utilities. These entities will identify the protocols and procedures for notification of the public. Public notification will be made to persons who may be at risk from the effects of the overflow. Notification to various other stakeholders may be required. These notifications include the following:

- MMSD internal notification (See Table 6-1 for contact list).
- Verbal or e-mail notification to the DNR within 24 hours of the time that MMSD becomes aware of an SSO event. Contact Ashley Brechlin at 608-438-9930 or Ashley.Brechlin@Wisconsin.gov. To be completed by the Director of Wastewater Operations and Reliability.
- Electronic overflow report to the DNR within five (5) days of the SSO. The reporting form can be found on the online DNR switchboard (https://dnrx.wisconsin.gov/sbaccess) under Wastewater Reporting Forms, SSO/TFO Event Form. A template for legal notice can be found in Appendix I. To be completed by Director of Wastewater Operations and Reliability.
- Written notification to a daily newspaper. The SSO rule is silent on the timing, however, notification should occur in a timely manner and timing should be based on protecting public health. At a minimum, it is recommended that notification should occur within three days of the SSO event. A media advisory template is included in Appendix J. To be completed by the Director of Communications.
- E-mail notification to the appropriate water utilities (Table 6-2). To be completed by the Director of Wastewater Operations and Reliability.
- Local public health officials (Table 6-2). To be completed by Director of Wastewater Operations and Reliability.
- Notification of other public entities as necessary (Table 6-2).

Table 6-3 below contains a matrix for public notification based on the severity of the overflow (location, treatment facility (TFO) or SSO, contained to source, intended or unintended bypass, etc.). Though each overflow event will require a unique response, and notification procedures may vary, this matrix will serve as guidance for the type of public notification required for related scenarios.

Table 6-1 SSO Internal Notifications

Name	Title	Work Extension	Other Phone Number
Ray Schneider	Collection System Supervisor	259	608-347-3628
Eric Dundee*	Director of Wastewater Operations & Reliability	130	608-334-0066
Michael Mucha	Chief Engineer & Director	242	608-807-7273
Lisa Coleman	Director of Engineering	133	608-698-1295
Erik Rehr	Maintenance & Reliability Manager	294	608-514-3126
Carly Amstadt	Regulatory and Process Engineer	226	608-335-8624
Amanda Wegner	Director of Communications	125	608-422-2727
Todd Gebert	Capital Planning Engineer	235	608-556-3448
Jen Hurlebaus	Collection System Planning Engineer	248	608-438-8257

* Primary responsibility for providing DNR notification.

Table 6-2 SSO External Emergency Contacts

Contact	Telephone #
Diggers Hotline	1-800-242-8511 or dial 811
Alliant Energy	Primary: 800-255-4268 Secondary: 1-608-458-5755 (Customer Contact)
Madison Gas & Electric	Primary: 608-252-1550
City of Madison Sewer Lines	608-266-4430
City of Madison Water Lines	608-266-4665 (24-hour emergency service)

City of Madison Water Utility	608-266-4651 (general billing/office hours only)
Dane County-Truax Airport Operations	608-235-1001
Public Health Dept. - Madison & Dane Co.	608-266-4821
Dane County Public Works	608-267-0127
MMSD Contacts for locating assistance **during** regular business hours	
Ray Schneider (supervisor)	608-347-3628
Kody Wright (locator)	608-609-7759
Adam Carlson (locator)	608-338-7413
MMSD Contacts for locating assistance **after** regular business hours	
Collection System Services On-call	608-335-4030
Ray Schneider (supervisor)	608-347-3628

Contact	Telephone #
WDNR South Central District Office Ashley Brechlin-DNR Engineer	608-275-3266 or 608-275-3267 608-438-9930
Wisconsin DOT	608-246-3841
Wisconsin State Patrol	608-846-8520
Ross Hollfelder, Metrogro	608-609-7725 (c)
Honey Wagon	608-271-5008 or 608-873-6726 or 608-835-9588
Capitol Underground Brent Conwell Tom Morauske	 608-354-9428 (c) 608-333-9591 (c)

Table 6-3 Public Notification Matrix

	Confined to Source Area		Extends Outside Source Area	
	Scenario	Notifications	Scenario	Notifications
High potential impact (human health and the environment)	1. TFO in occupied working environment; potential occupational health impacts 2. Basement backups affecting multiple homes or buildings 3. Contained SSO in heavily used or public area; or overflow to environment with confined impacts to proximate water source	1. Legal notice, DNR, Public Health 2. Affected residents, legal notice, DNR, Public Health 3. Affected residents, legal notice, DNR, Public Health, possible water utilities, possible news release	1. Major TFO with documented or anticipated impacts on surface water, drinking or groundwater, occupational health, customer communities or service continuity 2. Major SSO or backups affecting large service area, significant business or transportation corridor or public facilities 3. Major SSO or bypass released to the environment with documented or anticipated impact on public health, surface water, drinking or groundwater, fish or wildlife	1. News release, legal notice, DNR, Public Health, water utilities, customer communities, website and social posts, possible Dane County Emergency Management 2. News release, legal notice, DNR, Public Health, water utilities, customer communities, website and social posts, possible Dane County Emergency Management 3. News release, legal notice, DNR, Public Health, water utilities, customer communities, website and social posts, possible Dane County Emergency Management
Low potential impact (human health and the environment)	1. TFO contained on plant grounds, no customer service effect 2. Basement backup affects a single residence or service connection block 3. Confined SSO or bypass; does not threaten groundwater or surface waters	1. Legal notice, DNR 2. Affected residents, legal notice, DNR 3. Affected residents, legal notice, DNR, Public Health if near residences, streets	1. Large TFO extending outside plant grounds, but low potential to reach surface water or affect customer service 2. Large SSO that is contained and cleaned without affecting public health or the environment	1. News release, legal notice, DNR, Public Health 2. News release, legal notice, DNR, Public Health, customer community

Table 6-4 Public Notification Responsibilities

Event Severity	Notifications	Responsible
Confined, Low Impact		
1. TFO contained on plant grounds, no customer service effect	Legal notice	O&M Director, Communications
	DNR	O&M Director
2. Basement backup affecting a single residence or service connection block	Affected residents	Collection System Supervisor
	Legal notice	O&M Director, Communications
	DNR	O&M Director
3. Confined SSO or bypass; does not threaten groundwater or surface waters	Affected residents	Collection System Supervisor
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
Confined, High Impact		
1. TFO in occupied working environment; potential occupational health impacts	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
2. Basement backups affecting multiple homes or buildings	Affected residents	Collection System Supervisor
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
3. Release to environment in heavily used or public area that is quickly contained; or release to environment with confined impacts to proximate water source	Affected residents	Collection System Supervisor
	Legal notice	O&M Director, Communications
	DNR	O&M Director

	Public Health	O&M Director
	Water Utilities (possible)	O&M Director
	News release (possible)	Communications
Not confined, low impact		
1. Large TFO extending outside plant grounds, but low potential to reach surface water or affect customer service	News release	Communications
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
2. Large SSO that is contained and cleaned before affecting public health or the environment	News release	Communications
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
	Customer Community	Communications, CED
Not confined, high impact		
1. Major TFO with documented or anticipated impacts on surface water, drinking or groundwater, occupational health, customer community or service continuity	News release	Communications
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
	Water Utilities	O&M Director
	Customer Community	Communications, CED
	Website	Communications
	Social Posts	Communications
	Dane County Emergency Management	O&M Director
2. Major SSO or backups affecting large service area, business or transportation corridor or public facilities	News release	Communications
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
	Water Utilities	O&M Director

	Customer Community	Communications, CED
	Website	Communications
	Social Posts	Communications
2. Major SSO or backups affecting large service area, business or transportation corridor or public facilities	Dane County Emergency Management	O&M Director
3. Major SSO or bypass released to the environment with documented or anticipated impact on public health, surface water, drinking or groundwater, fish or wildlife	News release	Communications
	Legal notice	O&M Director, Communications
	DNR	O&M Director
	Public Health	O&M Director
	Water Utilities	O&M Director
	Customer Community	Communications, CED
	Website	Communications
	Social Posts	Communications
	Dane County Emergency Management	O&M Director

6.8 Root Cause Failure Analysis

All SSOs are investigated to determine the root cause. Problems in the collection system, including excessive I/I, pump failure, blockages or basement backups, are also investigated in order to identify potential causes of the SSO. For large rain events and/or high flow situations a report or memorandum is typically prepared by the Planning Department and the Operations and Maintenance Department to document the situation and suggest corrective actions.

6.9 Weather Forecast

MMSD uses weather forecasts to predict wet weather events and melting snow events that may assist in predicting excessive high flows in the interceptor system, thereby allowing staff to be prepared to address potential problems in the interceptor system. Weather information can be found at:

- www.noaa.gov
- www.nws.noaa.gov
- www.weather.com

MMSD also uses rain gauge information from regional sites to determine quantity of rain. Rain gauge information from a variety of sites can be found at http://infos.countyofdane.com/rainfall. Rainfall information can also be obtained directly from the United States Geological Survey and the Dane County Regional Airport.

CHAPTER 7 – COMMUNICATION PLAN

7.1 Background and Information

MMSD routinely communicates with the DNR, Satellite Communities, MMSD Commission and other stakeholders regarding actions taken or to be taken on the collection system. Such actions may include, but are not limited to, the following:

- Providing notification of SSOs.
- Coordinating and communicating rehabilitation efforts of the collection system.
- Budgeting for future or additional rehabilitation efforts of the collection system.
- Identifying other areas of concern, especially in circumstances that arise outside of the normal budgeting, cleaning and inspection process and require the investment of capital in order to address potential failures of the collection system.
- Informing MMSD Commission members of collection system activities on a regular basis.

7.2 Satellite (Owner) Community Communication

MMSD currently serves 25 owner communities. MMSD communicates with the owner communities on a regular basis. Owner communities are assisted by MMSD in the following ways:

- Addressing complaints
- Support with technical issues
- Maintaining public lift stations (for some customer communities)
- Billing and rate questions
- Pollution prevention and source reduction efforts

7.3 CMOM Communication

Components of this CMOM Plan will be reviewed and modified on a periodic and on an as-needed basis. Note that the CMOM Plan does not have to be submitted to the DNR – but the DNR can request this document at any time. It is anticipated that it will be requested during permit review and other inspections, or if MMSD or owner community SSOs occur.

Topics of discussion related to the CMOM Plan are:

- Financial impact to the MMSD. Is the budget adequate to support initiatives, including, but not limited to: capital improvements, operation and maintenance activities, personnel and equipment?
- Is the CMOM Plan and related programs adequate to address the aging infrastructure and capacity?
- Problem areas in the system including clear water removal
- SSOs
- Communication to stakeholders
- Meeting the CMOM goals and performance metrics
- Public education
- Reducing I/I in the collection system cost-effectively
- Compliance with regulations

7.4 PUBLIC EDUCATION

Public education is an ongoing effort that MMSD focuses on. MMSD periodically conducts meetings with its customer communities and components of the CMOM Plan will continue to be addressed at these meetings. MMSD also works with local water utilities and other public agencies on pollution prevention and source reduction efforts. Finally, MMSD routinely provides tours of the wastewater treatment plant to schools and other entities as requested.

7.5 SSO REPORTING

See Chapter 6 of the CMOM Plan for SSO reporting requirements. All SSOs are required to be reported to the DNR within 24 hours (via phone or email) and a written report within 5 days.

7.6 COMPLIANCE MAINTENANCE ANNUAL REPORT (CMAR)

The DNR requires all permit holders to submit the Compliance Maintenance Annual Report (CMAR) on or before June 30 of each year.

Copies of the reports are provided to the appropriate MMSD staff and MMSD Commission. The MMSD Commission is also required to adopt a resolution approving the CMAR prior to the submittal of the CMAR. The CMAR schedule should be coordinated with MMSD Commission meetings to ensure adequate time to obtain MMSD Commission approval. The MMSD Commission meets twice a month with the exception of just one meeting in December.

CHAPTER 8 – CMOM AUDIT PLAN

8.1 BACKGROUND AND INFORMATION

A CMOM audit serves to ensure that the plan is properly implemented, goals and objectives are achieved, and performance metrics are reviewed, evaluated and updated. As part of the audit, the CMOM Plan will be reviewed to ensure that the regulatory requirements are met.

This CMOM Plan provides the framework and documentation required to implement the various programs utilized to ensure proper operation and maintenance of the collection system. The CMOM Plan is intended to be a working document and will be updated as needed.

Audits should be performed on an annual basis, if possible, and should be done in conjunction with preparation of the DNR's CMAR which is due June 30th of each year. Typically performance metrics are reviewed and updated.

A thorough audit of the entire program is recommended every five years to evaluate each of the program elements to determine if the CMOM program is effective, sustainable, and meets the regulatory requirements.

The CMOM Plan is reviewed for compliance with the WPDES permit, other regulations, performance metrics and MMSD goals. The CMOM Plan should be updated to incorporate applicable recommendations for the program and performance metrics based on the audit findings.

The audit will focus on ensuring the following:

- Review actual performance metrics and determine if the metrics align with the asset management plan as well as the CMOM Plan
- Goals are applicable to MMSD and are relevant to measure the program effectiveness.
- Monitor the implementation and measure the effectiveness of the program by reviewing and evaluating the performance metrics on an annual basis.
- Budget is adequate to meet the recommendations from the various CMOM components. Adjust service charges as necessary to meet the operating budget and CIP program requirements.
- WPDES permit requirements.
- Anticipated regulatory requirements.

8.1.1 WPDES Permit Requirements

MMSD's WPDES permit (WI-0024597-09-2) went into effect on May 1, 2020 and has an expiration date of March 31, 2025. During an audit, the most current WPDES permit will be reviewed to ensure that the program is in compliance. During the re-issuance of new permits, additional requirements such as additional flow monitoring, sampling, SSO reductions, satellite community programs and changes in reporting requirements may be included. These may impact the CMOM program and will be included in the CMOM audit report.

8.1.2 Regulatory Requirements

U.S. EPA does not have a specific CMOM rule in the Clean Water Act (CWA). In 2015, U.S. EPA updated the definition of "Waters of the United States" under the Clean Water Rule. This rule is controversial and was deemed illegal by the Cincinnati-based Court of Appeals for the Sixth District (Federal Register Vol 80 No. 124 June 29th, 2015 *Clean Water Rule - Definition of "Waters of the United States").* This rule is still currently being reviewed by U.S. EPA and the U.S. Army Corp of Engineers and may impact SSO reporting.

8.1.3 MMSD Goals and Objectives

The CMOM Program is an on-going program designed to eliminate SSOs and to ensure adequate capacity. As MMSD goals and objectives are updated, the CMOM Plan should be updated.

8.2 CMOM PLAN RECOMMENDATIONS & UPDATES

Provide recommendations to update the performance metrics as necessary. See Table 2-6 for performance metrics. Provide recommendations to update the CMOM plan and update the plan based on the audit, feedback from staff, DNR and other stakeholders.

REFERENCES

Department of Natural Resources 2009. *Wisconsin CMOM Handbook. PUB-WT-917-2009*

Federal Register Vol 80, No. 124 *Clean Water Rule: Definition of "Waters of the United States"* June 29th, 2015

Madison Metropolitan Sewerage District 2011. *Collection System Facilities Plan Update.* MMSD. December 2011

Madison Metropolitan Sewerage District 2018. *Collection System Evaluation 2018* MMSD and Capital Area Regional Planning Commission. November 2018

Madison Metropolitan Sewerage District 2023. *Emergency Operations Manual*. MMSD. March 2023

Madison Metropolitan Sewerage District 2017. *Madison Metropolitan Sewerage District Sewer Use Ordinance.* August 18, 2017

NASSCO 2023. *Performance Specification Guideline for the Installation of Cured-in-Place-Pipe (CIPP).* 2023 Edition

REVISION TRACKING

Original document prepared by Superior Engineering with assistance by District Staff.

Superior Engineering, LLC
S75W13139 Oxford Court
Muskego, WI 53150
(414) 232-1520

REVISION 1 – November 4, 2015

Revisions completed by District Staff

REVISION 2 – July 14, 2016

REVISION 3 – August 14, 2018

REVISION 4 – December 4, 2023

APPENDIX A – MMSD COLLECTION SYSTEM EVALUATION (2018)

Madison Metropolitan Sewerage District
Collection System Evaluation
2018

Prepared by the staff of the Capital Area Regional Planning Commission
in collaboration with the staff of the Madison Metropolitan Sewerage District

Table of Contents

Appendices

List of Tables

List of Figures

Executive Summary

The Madison Metropolitan Sewerage District's Collection System Evaluation is an important planning document that assesses and forecasts population, land use, and wastewater flow trends throughout MMSD's service area. The Regional Planning Commission uses the results of the latest U.S. census, municipal population projections, community development plans, and knowledge of the District's collection system to make population and flow forecasts for various time increments, up to and including the year 2040. These flow forecasts are used to determine existing and future capacity requirements throughout the collection system. The 2018 Collection System Evaluation will be used to inform the District's Collection System Facilities Plan and their annual Capital Improvements Planning process. The Regional Planning Commission performed similar studies for the District in 1999 and 2008.

MMSD's service area continues to experience a high rate of population growth and development. In 2016, three of the cities in the District's service area; Madison, Fitchburg, and Verona, were among the top 10 largest population gainers for all Wisconsin cities and villages.

Based on the results of this evaluation, the following segments of the MMSD Collections system are expected to need capacity upgrades during the planning period through 2040.

Interceptor Name	Segment	Segment Length (ft)	Capacity Reached
Cross-Town Force Main	RDXT-09244 to RDXT-10260	1,016	< 2020
Northeast Interceptor – Hwy 30 Ext.	MH10-305 to BD10-303	357	< 2020
PS 2 Force Main	PS 2 to RD02-01009	26	< 2020
West Interceptor	MH05-236 to MH16-211	12	< 2020
West Interceptor – Spring St. Relief	MH02-300 to MH02-101	3	< 2020
West Interceptor Relief	MH02-516 to MH08-228	10	< 2020
West Interceptor Relief	MH02-544A to MH02-535	4,865	< 2020
West Interceptor Relief	MH02-518 to MH02-516	204	2020 - 2025
West Interceptor Relief	MH02-531 to MH02-519	4,095	2020 - 2025
Northeast Interceptor – Waunakee Ext.	MH14-323 to MH14-315	4,055	2020 – 2025
West Interceptor Relief	MH02-531A to MH02-531	268	2025 - 2030
Nine Springs Valley Interceptor	MH11-116A to PS 11	8,718	2025 – 2030
Nine Springs Valley Interceptor	MH11-166A to MH11-161E	1,380	2025 – 2030
Nine Springs Valley Interceptor	MH12-110 to PS 12	3,522	2025 – 2030
Northeast Interceptor – Waunakee Ext.	MH14-333 to MH14-323	4,889	2025 – 2030
Northeast Interceptor – Waunakee Ext.	MH14-345 to MH14-338	2,859	2025 – 2030
PS 17 Force Main	PS 17 to MH17-14450	13,357	2025 – 2030
West Interceptor – Randall Relief	MH08-121 to MH08-120	16	2030 - 2035
West Interceptor Relief	MH02-535 to MH02-532	841	2030 - 2035
Door Creek Extension	MH07-425 to MH07-416	3,861	2030 – 2035
Door Creek Extension	MH07-729A to MH07-728	756	2030 – 2035
Nine Springs Valley Interceptor	MH11-127 to MH11-116A	4,855	2030 – 2035
Nine Springs Valley Interceptor	MH11-137 to MH11-129	3,996	2030 – 2035

Interceptor Name	Segment	Segment Length (ft)	Capacity Reached
Nine Springs Valley Interceptor	MH11-159 to MH11-158	340	2030 – 2035
Northeast Interceptor – Waunakee Ext.	MH14-356 to MH14-345	4,659	2030 – 2035
Rimrock Interceptor	MH03-108 to MH03-205	400	2030 – 2035
Southwest Interceptor	MH02-121 to MH08-109	117	2030 – 2035
West Interceptor – West Extension	MH05-113 to MH05-112A	227	2030 – 2035
West Interceptor – West Extension	PB05-105X544 to MH05-102A	961	2030 – 2035
West Interceptor Relief	MH02-546 to MH02-544A	248	2030 – 2035
Door Creek Extension	MH07-719 to MH07-426	9,497	2035 - 2040
Northeast Interceptor	MH10-145 to MH10-426	10,795	2035 - 2040
West Interceptor Relief	MH02-532 to MH02-531A	65	2035 - 2040
Door Creek Extension	MH07-728 to MH07-723	2,496	2035 – 2040
Nine Springs Valley Interceptor	MH11-129 to MH11-127	733	2035 – 2040
Nine Springs Valley Interceptor	MH11-156 to MH11-145	6,004	2035 – 2040
Nine Springs Valley Interceptor	MH11-161A to MH11-159	1,321	2035 – 2040
Old West Interceptor	MH02-020 to MH08-206	1,313	2035 – 2040
SEI – Blooming Grove Ext.	MH07-249 to MH07-242	2,794	2035 – 2040
Southwest Interceptor	MH02-124 to MH02-121	737	2035 – 2040

Chapter 1 Introduction and Background

Background and Overview

The Madison Metropolitan Sewerage District (MMSD) was formed in 1930 to provide area-wide wastewater collection and treatment for the communities around Lakes Mendota and Monona. The District initially served a 50 square mile area including Madison, Monona, Maple Bluff, Shorewood Hills, and surrounding towns. By 2016, the District's service area had grown to 183.6 square miles, including all of the communities that formerly discharged treated wastewater to the Yahara River lakes. A map of the current approved sewer service area that contributes to MMSD is shown in Figure 1-1.

All of the wastewater generated in the MMSD service area is collected and transmitted to the Nine Springs Wastewater Treatment Plant. Most of the treated effluent is discharged to Badfish Creek to divert treated wastewater around the Yahara River lakes. Some treated effluent is returned to Badger Mill Creek to offset the effects of inter-basin transfer on the base flow of Badger Mill Creek. The Badger Mill Creek outfall has a design capacity of 3.6 million gallons per day (mgd).

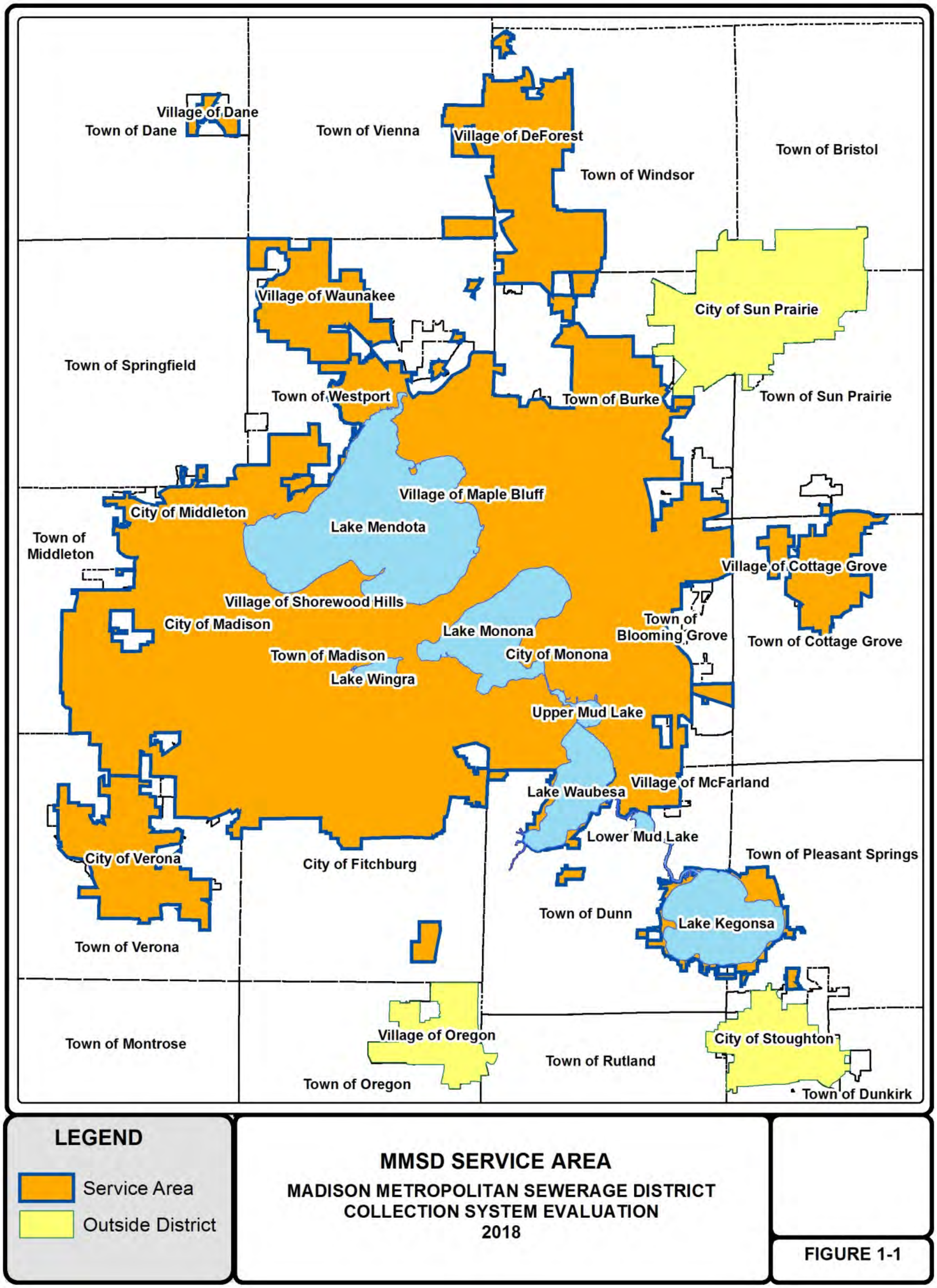
In 2016, the District's collection system included approximately 94.8 miles of gravity sewer, 31.7 miles of force main, and 18 major pumping stations. This collection system receives wastewater from the community sanitary sewer systems, and transmits the wastewater to the Nine Springs plant for treatment.

Previous Studies

Parts of the MMSD collection system date back to before 1900, and there have been numerous design studies of various sections or elements of the system over the years. The most significant system design studies and plans since 1960 are listed and described in Appendix A. These include:

- "Report on Sewerage and Sewage Treatment", 1961, Greeley and Hanson Engineers
- "Review of Project VII; West Side Collecting System", 1967, Mead & Hunt
- "Review of Project IV; Northeast Collecting System", 1969, Mead & Hunt
- "Report on Northeast Interceptor, Token Creek Extension", 1971, Mead & Hunt
- "Report on Sewage Treatment; Additions to the Nine Springs Sewage Treatment Works, 1971, Greeley and Hanson Engineers
- "Planning Report on the Fifth Addition to the Nine Springs Sewage Treatment Works", 1973, Dane County Regional Planning Commission (DCRPC)

Figure 1-1: MMSD Service Area



In 1976, MMSD completed a major, comprehensive, facilities plan for the overall wastewater management needs for the entire district. As part of that facilities planning effort, the DCRPC and MMSD developed flow forecasts, evaluated the collection system, and considered regionalization or interconnection possibilities.

Several facilities plans, design studies, and reports concerning specific improvements and interceptor extensions were conducted between 1976 and 1986. These studies are summarized in Appendix A. They include design studies for:

- The Esser Pond Interceptor (1978)
- The Cottage Grove Extension of the Far East Interceptor (1978)
- The Mendota Extension of the Nine Springs Valley Interceptor (1979)
- The City of Middleton Sewer Plan (1982)
- The Facilities Plan for the Dunn-Kegonsa Sanitary District (1985)
- The Facilities Plan for the Town of Pleasant Springs portion of the Kegonsa service area (1986)
- The Design Study for the McFarland Relief Sewer (1986)

A comprehensive four-year study of the MMSD collection system was completed in 1993 with the publication of a report titled “MMSD Collection System Evaluation”. The study, a collaboration between the DCRPC and MMSD, utilized socioeconomic data generated by the DCRPC for transportation planning, to forecast flows for small geographic areas (sub-basins).

Several additional design studies and reports concerning specific improvements and interceptor extensions were conducted between 1993 and 1998. These studies are also summarized in Appendix A. They include design studies for:

- The City of Verona connection to MMSD (1993)
- The Badger Mill Creek effluent return project (1993)
- The Morrisonville Urban Service Area connection to MMSD (1995)
- The Lien Interceptor Extension (1995)
- The Village of Dane connection to MMSD (1997)
- The Far East Interceptor – Door Creek Extension (1997)

In 1999, the DCRPC and MMSD collaborated on an update to the 1993 collection system evaluation. The update also utilized socioeconomic data generated by the DCRPC for transportation planning, to forecast flows for small geographic areas (sub-basins).

Between 1999 and 2017, there were several additional design studies and reports addressing specific improvements. Two facility plans pertaining to the collection system were also conducted during this time period. These studies and facility plans are summarized in Appendix A. They include:

- Summary Design Memo West Interceptor Replacement at UW Campus (1999)
- Collection System Facilities Plan (2002)
- The Lower Badger Mill Creek Sewer Service Report (2005)
- Predesign Memo for West Interceptor Extension (2006)
- Design Memo for Southwest Interceptor North & South Legs Rehabilitation (2006)

- Design Report for Rehabilitation of Pumping Stations No. 6 and 8 (2007)
- Final Design Report Pump Station 13 and 14 Firm Capacity Improvements (2007)
- Northeast Interceptor – PS10 to Lien Road Relief / Replacement Planning Report (2008)
- Northeast Interceptor Truax Liner Engineering Design Report (2008)
- Design Report for Far East Interceptor – Cottage Grove Extension Liner (2009)
- 50-Year Master Plan (2009)
- Collection System Facilities Plan (2011)
- Design Report for Northeast Interceptor – Far East Interceptor to Southeast Interceptor (2012)
- Design Report for Pumping Station 18 (2013)
- Design Report for Pumping Station 18 Force Main (2013)
- Design Report for Pumping Station 11 and 12 Rehabilitation (2014)
- Design Report for Northeast Interceptor – MH13-116H to MH13-127 Rehabilitation (2014)
- Design Report for Rimrock Interceptor Rehabilitation ad Replacement (2015)
- Design Report for Pumping Station 15 Rehabilitation (2016)
- Pumping Station 12 Force Main Relocation (2016)
- Design Report for West Interceptor MH02-003 to MH02-014A Rehabilitation (2016)
- Design Report for Nine Springs Valley Interceptor – Morse Pond Extension (2017)

In 2008, the CARPC and MMSD collaborated on an update to the 1999 collection system evaluation. The update also utilized socioeconomic data generated by the CARPC for transportation planning, to forecast flows for small geographic areas (sub-basins).

Purpose and Approach to the Evaluation

The basic purpose of this collection system evaluation is to update the 2008 collection system evaluation, in order to anticipate future capacity problems and identify needs for the expansion or improvement of sections of the MMSD collection system. This evaluation follows a similar approach to the 2008 evaluation. The approach to the evaluation includes the following steps:

1. Pumping station service areas and sub-basin boundaries are updated based on additions and changes to the community sanitary sewer systems.
2. Historic wastewater flows and flow distributions throughout the system are analyzed.
3. Characteristics and capacities of elements of the collection system (pumping stations, force mains, and interceptor sewers) are determined.
4. Future wastewater flows are forecast, and estimated for specific sections and elements of the collection system. These forecasts are developed from, and are consistent with, population, and land use forecasts in adopted plans, as required by state statutes and administrative rules governing MMSD operations and facilities planning. Baseline and future flows are allocated to sub-areas (pumping station service areas and sub-basins) served by individual pumping stations or interceptor sewer sections.
5. The capacities of specific facilities are compared with baseline and future estimated wastewater flows to determine where there could be future capacity problems, and to assess the need for expansion or improvements to the collection system.

6. The evaluation includes the determination of long-term (2040) growth and development potential and flow forecasts, in order to provide guidance in selecting design flows and capacities for facility improvements.

The function of this report is to allow MMSD to adequately plan its collection system improvements to ensure pollution control into the future. This necessitates a conservative, yet reasonable, approach to estimating future development levels and wastewater generation rates. The identification of any area as a potential future growth area in this report is not intended to predict or promote growth in these areas, nor is it intended to be an indication of the likelihood that any specific area will be approved as an expansion of the urban service area in the future.

This collection system evaluation reflects the input and contribution from the staffs of both the Madison Metropolitan Sewerage District and the Capital Area Regional Planning Commission (CARPC). MMSD staff was primarily responsible for providing technical data and information regarding historic flows and distribution, delineation of pumping station service areas and sub-basins, characteristics and capacities of collection system components, and evaluation of the results and implications of the evaluation. CARPC staff was primarily responsible for population and land use data and forecasts, development of future flow forecasts, allocation of flows into pumping station service areas and sub-basins, and developing long-range forecasts of flows and service areas.

Chapter 2 Plans and Forecasts

Plan Consistency Requirements

The collection system evaluation is based on and consistent with adopted local and regional plans in order to satisfy the requirements in state statutes and administrative rules for plan consistency. The purpose of the plan consistency requirement is to ensure that decisions regarding sewerage are coordinated and consistent with other related planning decisions made by other agencies or units of government. The intent is to avoid conflict between plans and decisions of different agencies and units of government, and to coordinate the pursuit of common regional land use and development objectives. These consistency requirements are particularly important in the case of sanitary sewer systems, since the location and extension of sanitary sewers is often a major factor in the location of urban development. Coordinated and consistent planning allows the provision and extension of sanitary sewer service in a cost effective and efficient manner. Conversely, planned control over the timing and extension of sanitary sewer service is an important technique in guiding urban development.

State administrative rules governing water quality planning and wastewater facilities planning generally require that facilities planning, funding, and regulatory decisions be consistent with approved area-wide water quality management plans. The state also requires that all sanitary sewer extensions be consistent with the sewer service areas delineated in area-wide water quality management plans in designated areas, including Dane County. In addition to state water quality planning consistency requirements, state statutes governing metropolitan sewerage districts (Chapter 200, Wisconsin Statutes) require that plans of metropolitan sewerage districts be consistent with adopted regional plans.

Land Use and Sewer Service Area Plans

The *Vision 2020 Dane County Land Use and Transportation Plan* is still the overall comprehensive land use and development policy framework and guide for Dane County although it was adopted in 1997. The Capital Area Regional Planning Commission is currently in the process of an initiative to develop a shared vision and plan for development in the region called, A Greater Madison Vision, which will lead to an update of the regional land use plan.

The *Dane County Water Quality Plan*, is the official State area-wide water quality management plan for Dane County. The water quality plan outlines the planned sewer service areas throughout Dane County, which reflect the urban service areas (USA) and limited service areas (LSA) outlined in the land use and transportation plan. These plans also reflect the delineation of environmental corridors or environmentally sensitive areas that are to be protected from the impacts of urban development. Sections of the water quality plan are revised and updated on a periodic basis.

There are currently seven urban service areas and five limited service areas within the MMSD service area. Urban service areas are those areas in and around existing communities that are most suitable for urban development and capable of being provided with a full range of urban services. Urban services are the public services normally provided or needed in urban areas, including public water supply and distribution systems, sanitary sewerage systems, and urban stormwater management systems. Limited service areas are areas where only a few urban services, such as sanitary sewer service, are intended to be provided to special or unique areas (remote correctional facilities, sanitary landfills, etc.) or to areas of existing development experiencing sewage disposal problems. These areas are not intended to receive a full range of urban services and the potential for additional sewer service areas may be limited.

In 1999, the Wisconsin Legislature passed comprehensive planning legislation (§66.1001, Wisconsin Statutes) often referred to as the "Smart Growth" law. The law requires all Wisconsin communities that exercise land use authority to adopt a comprehensive plan by ordinance by 2010, and for land use decisions to be consistent with the adopted plan. Comprehensive plans are to serve as a guide for the future development and redevelopment of the local governmental unit over a 20-year planning period. Local comprehensive plans, as well as neighborhood development plans, provided information on the amount and location of future development in a community. The comprehensive planning law requires that adopted comprehensive plans be reviewed and updated at least once every 10 years (§66.1001(2)(i) Wisconsin Statutes). But, communities may choose to update the plan more frequently. The comprehensive plans of the following communities were reviewed as part of this study:

- City of Fitchburg (adopted March 24, 2009; latest amendment August 22, 2017)
- City of Madison (adopted January 17, 2006; as amended through March, 2012)
- City of Middleton (adopted, November 21, 2006; 2017 Comprehensive Plan update in progress)
- City of Monona (adopted, April 4, 2016)
- City of Verona (adopted January 19, 2009)
- Village of Cottage Grove (adopted, December 21 2009; amended July 21, 2014)
- Village of Dane (adopted August 3, 2011; amended June 1, 2015)
- Village of DeForest (adopted, March 3, 2015; amended March 16, 2016)
- Village of Maple Bluff (adopted, May 2003)
- Village of McFarland (adopted, August 2017)
- Village of Shorewood Hills (adopted, December 15, 2009)
- Village of Waunakee (adopted, January 16, 2017)
- Village of Windsor (adopted, April 19, 2016)
- Town of Dunn (adopted, August 15, 2016)
- Town of Pleasant Springs (adopted, October 17, 2017)
- Town of Vienna (April 24, 2006 version, amended July 9, 2012)
- Town of Westport (adopted, January 16, 2017)

The future land use plans contained in the Comprehensive Plans of each community were used to forecast the areas of future residential, commercial-institutional, and industrial and land use for the study.

Land Use Inventory

Every five years the Capital Area Regional Planning Commission prepares a map of actual current land use in the region called the land use inventory. The most recent land use inventory was conducted for 2015. This data is used to establish a baseline of land use against which the future land use plans in each community can be compared.

Population Data and Forecasts

In addition to land use data, the census data on population and households, and forecasts of future population are used to anticipate future growth and infrastructure needs. Table 2-1 illustrates historic and forecasted population for the MMSD service area. Population forecasts for urban and limited service areas in 2040 were developed by the CARPC by allocating municipal population forecasts, developed by the Demographic Services Center of the Wisconsin Department of Administration (DOA), to sewer service areas. These official population forecasts are required for use for facilities planning purposes. The CARPC population forecasts are based on the DOA population forecasts prepared in October 2013 from 2010 US Census data. The DOA population forecasts project population 30 years into the future at both the county and the municipal level. Population forecasts for Dane County communities and for each of the urban service areas are expected to be updated in 2023 from 2020 US Census data. The 2070 forecasts were developed from a least squares linear regression and are not official forecasts. The official 2070 population forecasts will not be developed until 2040.

Table 2-1: Population Trends and Forecasts for the MMSD

	1990	2000	2010	2040	*2070*
Central USA	245,390	268,850	302,935	367,749	*471,827*
Cottage Grove USA	1,131	4,059	6,230	9,509	*11,115*
Dane USA		799	995	1,400	*1,632*
Fox Bluff LSA		240	240	240	*240*
Kegonsa LSA		2,228	2,252	2,252	*2,252*
Morrisonville USA		352	323	340	*355*
Northern USA	7,160	9,901	13,022	18,892	*23,500*
Verona USA		7,306	10,645	16,878	*20,067*
Waubesa LSA		2,027	2,027	2,027	*2,027*
Waunakee USA	5,899	9,000	12,159	17,604	*21,595*
Windsor Prairie LSA		509	509	509	*509*
Westport LSA		377	377	377	*377*
MMSD	305,648	351,714	351,714	437,777	*555,496*

Historic and forecasted population figures for three urban service areas that are outside, but nearby, the current MMSD service area are shown in Table 2-2.

Table 2-2: Population Trends and Forecasts for Other USAs

	1990	2000	2010	2040	*2070*
Oregon USA	4,528	7,514	9,234	12,583	*17,541*
Stoughton USA	9,265	12,671	12,921	14,364	*18,223*
Sun Prairie USA	15,481	20,533	29,403	45,629	*62,256*

Since 2000, Dane County has been the location of the majority of population growth in the state. Between 2000 and 2010 Wisconsin's total population growth was 323,271, with 19% occurring in Dane County. Between 2010 and 2017 Wisconsin's total population growth was estimated to be 96,292, with 38% occurring in Dane County. Within Dane County, the central urban communities have been the location of most of that growth. Madison grew more than any other city in the state from 2015 to 2016. Between 2010 and 2017 Dane County's estimated total population growth was 36,714, with approximately 46% occurring in the City of Madison, 10% in the City of Sun Prairie, 7% in the City of Fitchburg, and 7% in the City of Middleton. In 2016, Madison, Fitchburg, Sun Prairie and Verona were among the top 10 largest population gainers for all Wisconsin cities and villages.

Figure 2-1: WI Population Growth By County

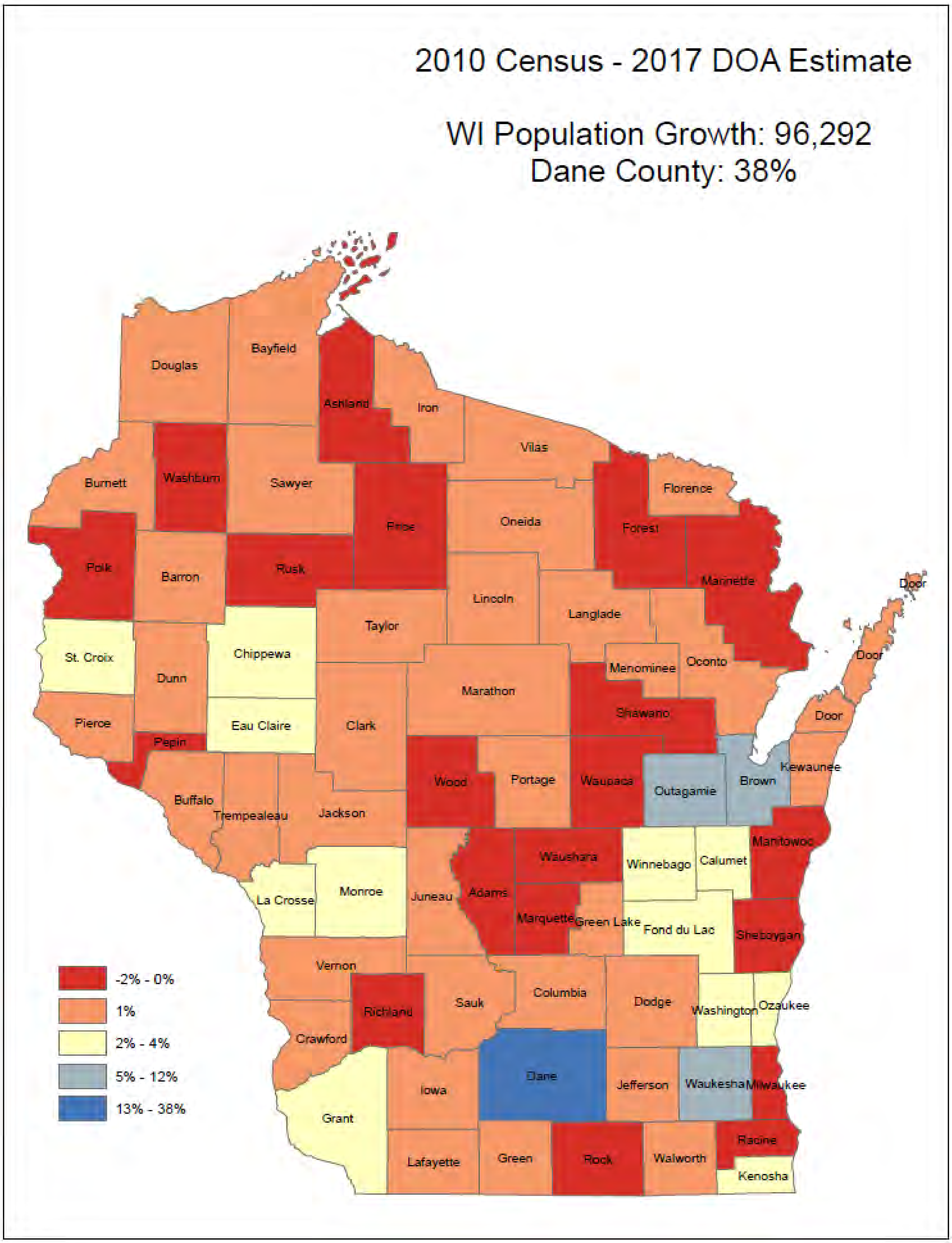


Figure 2-2: Municipal Population Growth in Dane County

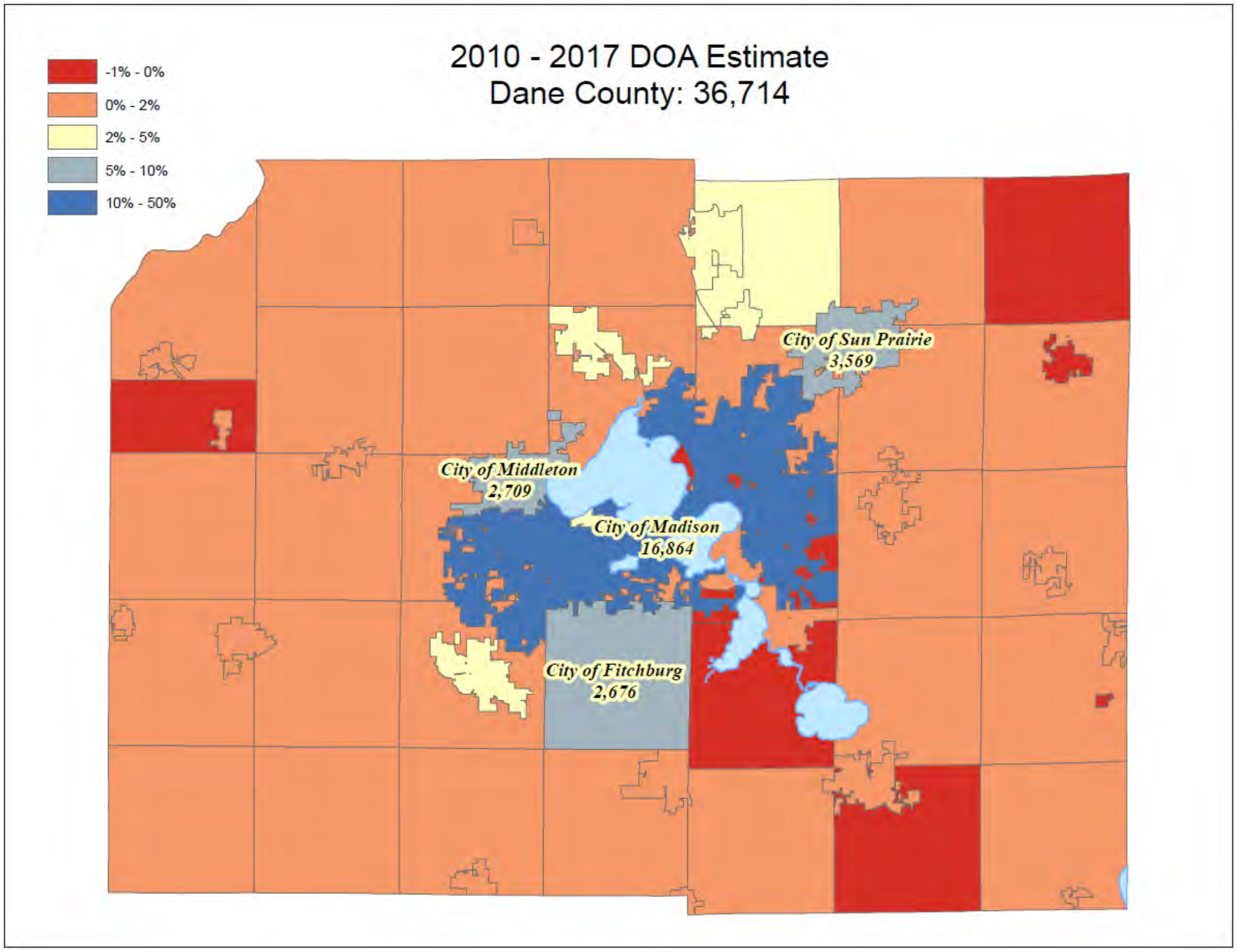


Figure 2-3: Approximate Housing Units Added Annually in MMSD Service Area

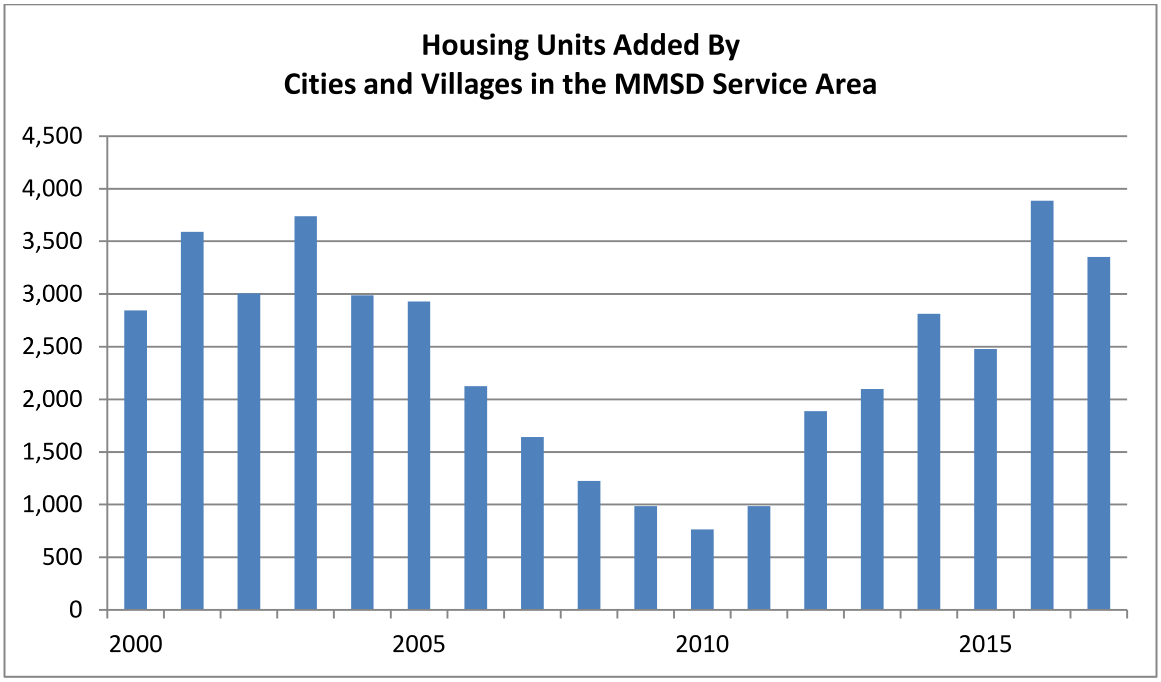


Table 2-3: Census and DOA Population Projections

	2010	2015	2020	2025	2030	2035	2040
City of Fitchburg	25,260	26,030	27,620	29,180	30,610	31,720	32,670
City of Madison	233,209	241,250	251,550	261,500	270,350	276,450	281,150
City of Middleton	17,442	18,540	19,670	20,770	21,780	22,570	23,230
City of Monona	7,533	7,440	7,320	7,195	7,035	6,805	6,560
City of Verona	10,619	11,620	12,800	13,960	15,070	16,010	16,850
Village of Cottage Grove	6,192	6,530	7,190	7,845	8,465	8,990	9,470
Village of Dane	995	1,055	1,135	1,215	1,285	1,350	1,400
Village of DeForest	8,936	9,310	9,945	10,560	11,150	11,610	12,010
Village of Maple Bluff	1,313	1,290	1,275	1,250	1,225	1,185	1,145
Village of McFarland	7,808	8,035	8,490	8,930	9,335	9,635	9,895
Village of Shorewood Hills	1,565	1,555	1,540	1,515	1,490	1,450	1,405
Village of Waunakee	12,097	12,750	13,850	14,920	15,940	16,780	17,530
Village of Windsor	6,345	6,720	7,175	7,635	8,055	8,380	8,675

Allocation of Population Data

The 2010 Census data and 2015 DOA estimates serve as the baseline for population data used in this study. CARPC has developed a "population point" GIS methodology in which population point represents an existing residential (single family, two family, or multi-family units) building. The census population data is disaggregated to this point data set based on a review and analysis of other available data sources including the 2010 and 2015 land use inventories, 2010 and 2014 aerial photography, and municipal property information. All residential units within the same census block are assumed to have the same average population per unit. By disaggregating the population data to building points, the population data can then be re-aggregated to estimate the population for any given pumping station sub-basin.

Future population forecasts were allocated geographically using the same GIS population point methodology. The 2020, 2025, 2030, and 2040 population forecasts were disaggregated to this point data set based on a review and analysis of other available data sources including plats, sewer extensions, sewer service area amendments, and municipal comprehensive plans and neighborhood development plans. The phasing of future population was assumed to generally follow the criteria in Table 2-4, with the DOA forecasted population growth for each municipality for a given time period used as a control total, except in the City of Madison. While this development timing is not universally true, it reflects the typical pace of development in the region on average. The DOA forecasted population was not used as control total in the City of Madison, due to the uncertainty of the specific geographic (sub-basin) location of population growth during a given 5-year time increment. While this is appropriately conservative for the capacity estimates, it may result in some of the interceptor segments being projected to reach capacity earlier than will occur if Madison’s population grows according to the DOA forecast.

Table 2-4: Population Allocation Methodology

Year	Criteria
2010	Residential in 2010 Land Use Inventory or appears as a dwelling on the 2010 aerial.
2015	Residential in 2015 Land Use Inventory or appears as a dwelling on the 2014 aerial.
2020	Currently platted lot and has existing sewer
2025	Currently has sewer extension approval
2030	Planned residential land use and currently in approved urban service area and adjacent to existing sewer extension approval
2035	Planned residential land use and currently in approved urban service area not adjacent to existing sewer extension approval
2040	Planned residential land use not currently in approved urban service area

For future planned residential development areas where a detailed land use plan has not yet been developed by the community, it was estimated that 60% of the gross area will be available for housing, which is typical for new development in the region. It was further estimated that lot sizes in these areas will be on average, similar to the average lot size in adjacent existing residential developments. The future population density of these areas were estimated to be an average of the surrounding areas with similar land uses / lot sizes.

Chapter 3 Wastewater Flows

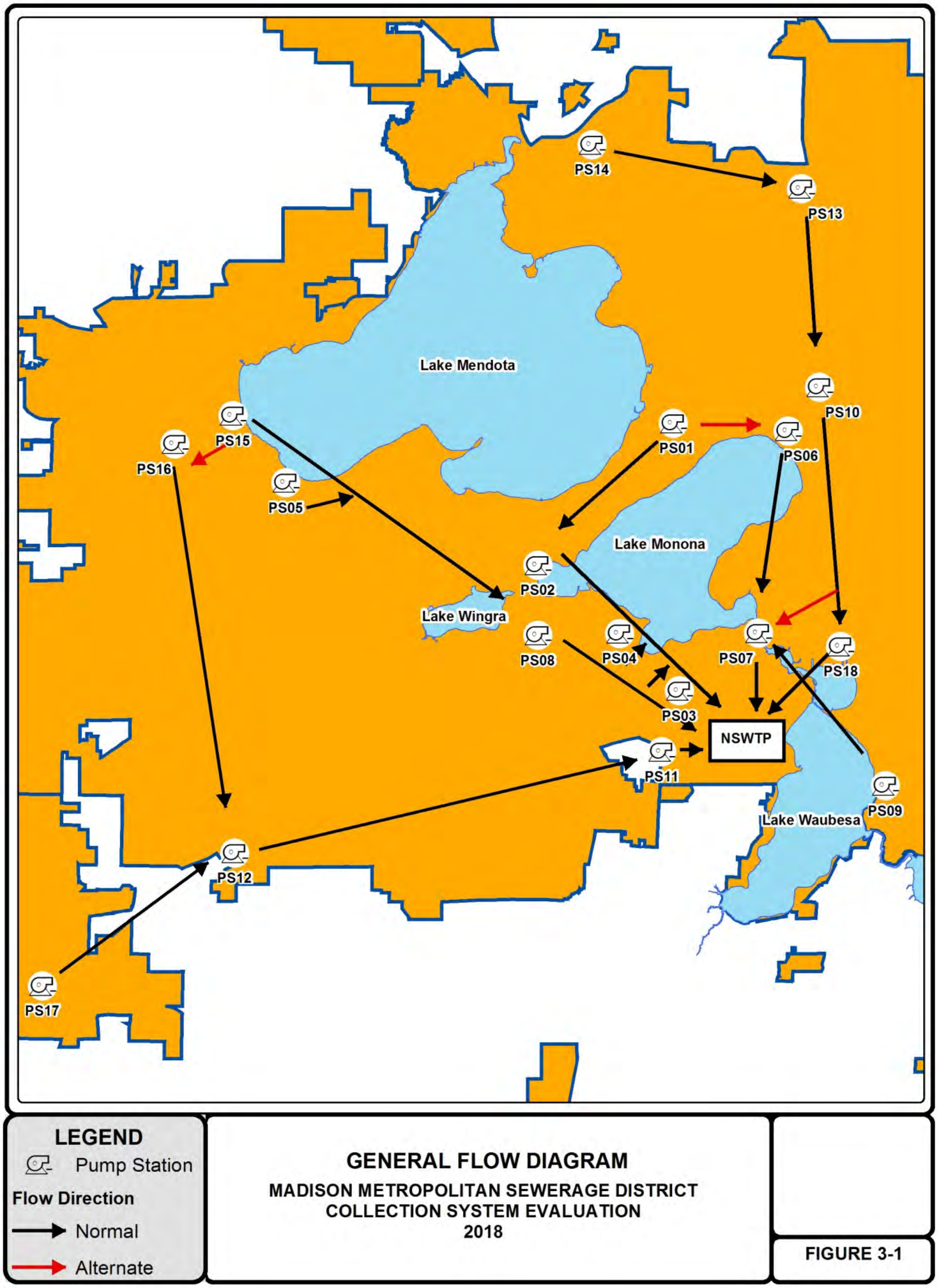
Collection System Description

The MMSD collections system includes approximately 126.6 miles of interceptor sewer and force main, and 18 major pumping stations that transmit wastewater from municipal sewer systems in the MMSD service area to the Nine Springs Wastewater Treatment Plant.

Pumping Station 18 was first operational in April 2015. The flow from Pumping Station 14, Pumping Station 13, and Pumping Station 10 is now routed through the Northeast Interceptor System to Pumping Station 18. Pumping Station 18 is configured such that none of the flow, a portion of the flow, or all of the flow in the Northeast Interceptor can be pumped by the station to the treatment plant. Any flow that bypasses the station is directed to Pumping Station 7 through the Southeast Interceptor.

There are two points in the collection system where the wastewater can be routed in different directions. The flow from Pumping Station 15 can be routed to Pumping Station 8 (normal) or to Pumping Station 16 (alternate). The flow from Pumping Station 1 can be routed to Pumping Station 2 (normal) or to Pumping Station 6 (alternate). While PS 9 does have two force mains, the flow passes through manhole MH07-218 on the Southeast Interceptor in both cases. This manhole is upstream of the Northeast Interceptor junction with the Southeast Interceptor. Flow from the SEI will only be conveyed to PS 18 if there is a hydraulic restriction in the SEI to PS 7. Figure 3-1 is a general flow diagram of the collection system. This schematic illustrates the current, normal operating mode of the system, in which the flow from Pumping Station 15 is routed to Pumping Station 8 and the flow from Pumping Station 1 is routed to Pumping Station 2. However, MMSD typically pumps an average of 150,000 gpd from Pumping Station 1 to Pumping Station 6 to flush the force main for maintenance.

Figure 3-1: General Flow Diagram

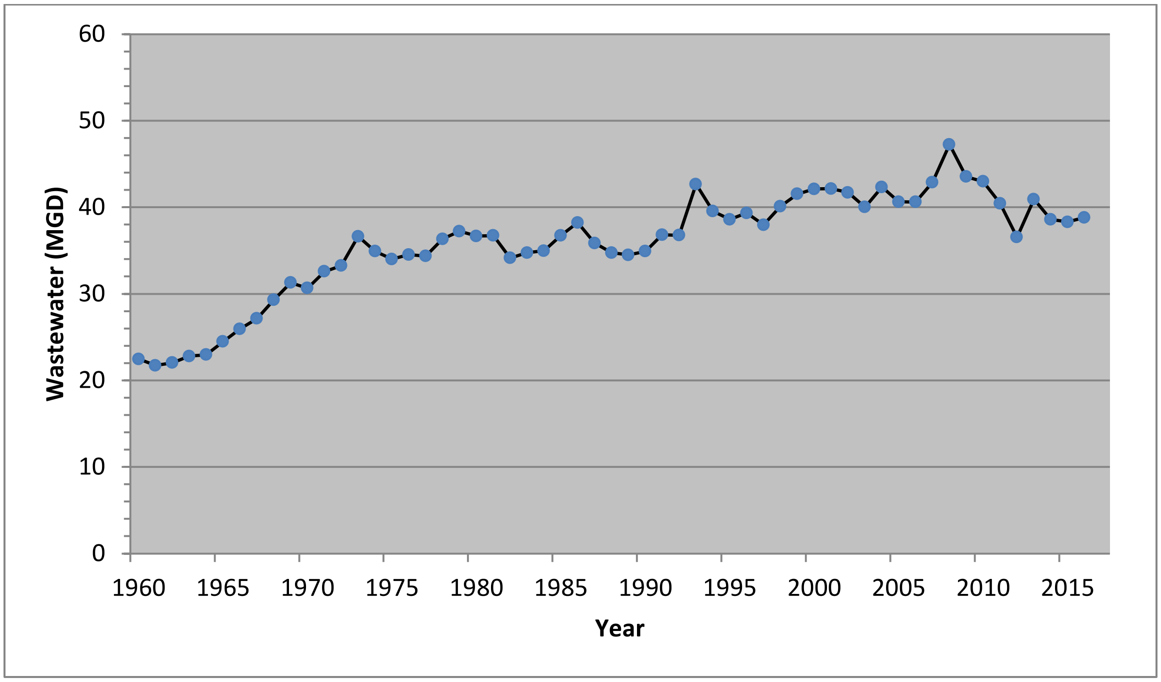


Water Use and Wastewater Flow Data

MMSD Metering

Figure 3-2 illustrates the total average daily wastewater flow at the Nine Springs Wastewater Treatment Plant for the period from 1960 to 2016. The average daily flow design capacity currently used for the plant is 50 mgd. A more specific measure of the design capacity of the treatment plant is determined by the design loading of each unit process used at the plant.

Figure 3-2: Average Daily Wastewater Flow at the Nine Springs Treatment Plant



MMSD measures the average daily flow of wastewater in the collection system with five venturi flow meters. They are located at the treatment plant and measure flow from Pumping Stations 2, 3, 4, 7, 8, 11 and 18. One of the five meters measures flow from Pumping Stations 2, 3 and 4 as these stations share a common force main downstream of Pumping Station 3.. In addition, there are flow meters at pumping stations 1, 2, 3, 5, 6, 10, 12, 15, 16, 17, and 18. MMSD calculates average daily flow at the remaining pumping stations from pump run time meters and pump capacities. These pumping station flow records are used as baseline flow data for each pumping station.

Water Utility Records

Annual water sales for every water utility are available from Public Service Commission reports. This data is used for estimating wastewater generation in municipalities served by the MMSD. The 2010 reports break down annual water sales data into the following categories:

- Residential (which includes single family and two family customers)
- Commercial (which includes commercial customers, multifamily apartments, and the UW)

- Industrial
- Public Authority Customers (which includes, local, state, and federal government customers)
- Sales for Resale (which includes sales to other water utilities)

Beginning in 2013, multifamily residential was split from the commercial category in the annual water utility reports to the Public Service Commission. It is now reported as a new category, separate from residential and commercial, which resulted in better estimating of this component of water use, and by corollary wastewater generation.

Large wastewater generators are defined as those contributing greater than 10,000 gpd, based on metered water data. A list of water customers using 10,000 gpd or more in 2010 or 2015 was obtained, where available, from each water utility in the MMSD service area. Appendix B summarizes the large wastewater generators in 2015 by pumping station service area.

The residential water sales records for the water utility in each community were divided by the population estimate for that water utility to estimate the per capita wastewater generation shown in Table 3-1. For sanitary districts without public water supplies (Dunn Kegonsa, Dunn No. 3, and Pleasant Springs), per capita rates were estimated from the MMSD estimates of average annual wastewater flow for the sanitary district.

Table 3-1: Estimated Per Capita Water Use (gpd)

	2010	2015
City of Fitchburg	56	50
City of Madison	58	55
City of Middleton	59	54
City of Monona[1]	73	48
City of Verona	55	50
Dunn Kegonsa S.D.	60	55
Dunn No. 3 SD	60	53
Morrisonville	52	48
Pleasant Springs S.D.	48	50
Town of Westport	53	58
Village of Cottage Grove	54	52
Village of Dane	48	45
Village of DeForest	52	50
Village of Maple Bluff	91	75
Village of McFarland	55	51
Village of Shorewood Hills	65	56
Village of Waunakee	62	59
Village of Windsor	57	56

[1] City of Monona water use records showed a significant decrease from 2010 to 2011 in all categories.

Similarly the non-residential water sales records for the water utility in each community were divided by the acres of industrial and commercial-institutional land use in each community to estimate the per acre wastewater generation shown in Table 3-2. Large non-residential generators and their associated acreage were excluded from these estimates.

Table 3-2: Estimated Per Acre Water Use (gpd)

	Commercial – Institutional		Industrial	
	2010	2015	2010	2015
City of Fitchburg	297	222	141	464
City of Madison	984	1095	1118	791
City of Middleton	867	1011	196	398
City of Monona	531	960	960	531
City of Verona	634	457	1054	1060
Dunn Kegonsa S.D.	NA	NA	NA	NA
Dunn No. 3 SD	NA	NA	NA	NA
Morrisonville	203	104	0	0
Pleasant Springs S.D.	NA	NA	NA	NA
Town of Westport[2]	288	370	288	370
Village of Cottage Grove	295	245	3796	3796
Village of Dane	218	310	206	198
Village of DeForest	327	290	118	148
Village of Maple Bluff	1,752	1,403	0	0
Village of McFarland	200	239	239	200
Village of Shorewood Hills	NA	NA	NA	NA
Village of Waunakee[2]	330	422	330	422
Village of Windsor	705	586	69	55

As was noted in the 2008 MMSD Collection System Evaluation report, there is a poor correlation between water use (and by extension wastewater generation) and number of employees, as well as between water use and land use acreage. Due to this weak correlation, it was determined that the best methodology for estimating the non-residential component of wastewater generation is to use actual water meter readings to the extent possible. Water use records were obtained for all commercial, industrial, and governmental accounts in the City of Madison (over 4,000 accounts in 2010 and over 5,000 accounts in 2015) and the City of Fitchburg (over 100 accounts in 2015). The water use records were geocoded by service address into each pumping station service area sub-basin. Water meter data from golf courses, greenhouses, heating plants, and similar places were not used, since these land uses consume large volumes of water that does not generate wastewater.

[2] Westport and Waunakee classifies most industrial land uses as commercial water customers, therefore commercial water use rates were used for both commercial/institutional and industrial land uses.

Approximately 44% of the University of Wisconsin campus buildings have individual water meters. The rest of the campus is provided water via the campus distribution system that is only metered in bulk at ten metering pits. The University of Wisconsin Facilities Planning and Management Department did not respond to requests for updated information on the percentage distributed to each building. Therefore the percentage of bulk water use by each facility was assumed to be the same as in the previous collection system study. While this information is out-of-date, it is the best information available.

Wastewater Flow Estimates and Forecasts

The years 2010 and 2015 were used as calibration years for the wastewater flow estimates, because census and DOA estimates are available for population and land use data is available from land use inventories conducted in those years. The basic approach to forecasting year 2020, 2025, 2030, 2035, and 2040 wastewater flows is to use the estimated per capita and per acre wastewater generation rates in each community and to multiply those rates by population and land use acreage forecasts for each pumping station sub-basin. This approach is based on the assumption that future residential growth and non-residential development will not have dramatic changes in water use compared to the baseline years of 2010 and 2015. Because collection system studies are updated every 10 years, this assumption is expected to be valid in the context of other factors of safety used in operating and maintaining the collection system. The wastewater flow estimates and forecasts for each pumping station service area sub-basin are composed of five main components: Known Non-Residential Water User, Residential, Unknown Institutional-Commercial, Unknown Industrial, and Infiltration / Inflow.

Pumping Station Sub-Basins

The collection system was divided into evaluation sections identified by key manhole inflow locations as determined by MMSD staff. Pumping station sub-basins boundaries, defined by which parcels contribute to each collection system section, were determined by MMSD staff based on available municipal sewer data. While this data is generally accurate, there may be some inaccuracies in the pumping station sub-basin boundaries due to out of date or inconclusive municipal sewer data. The potential future sub-basin boundaries reflect those areas that are currently planned for future development in community comprehensive plans, but are currently outside of the approved sewer service areas boundary in the Dane County Water Quality Plan.

Known Non-Residential Water User

The wastewater estimated from actual non-residential water meter readings in the City of Madison and City of Fitchburg, as well as the large (> 10,000 gpd) water user data from the remaining communities. Forecasts generally assume future flows will be the average of the 2010 and 2015 flows. For wastewater generators that did not exist in 2010, the 2015 flows were assumed to continue. For generators that were known to no longer be in operation, future flows were assumed to be zero.

Residential

The residential wastewater component (including single-family, two-family, and multi-family land uses) is estimated by the estimated population for the sub-basin times the per capita water use rate for that community. Forecasts assume the future per capita rates will be the average of the 2010 and 2015 rates.

Unknown Institutional - Commercial

The unknown institutional – commercial wastewater component (where these is no address level water meter data) is estimated by the estimated acreage of institutional and commercial land use for the sub-basin (not including the acreage with address level water meter data) times the per acre commercial water use rate for that community. Forecasts assume the future per acre rates will be the average of the 2010 and 2015 rates.

Unknown Industrial

The unknown industrial wastewater component (where these is no address level water meter data) is estimated by the estimated acreage of industrial land use for the sub-basin (not including the acreage with address level water meter data) times the per acre industrial water use rate for that community. Forecasts assume the future per acre rates will be the average of the 2010 and 2015 rates.

Infiltration / Inflow

The amount of infiltration and inflow (I/I) in each pumping station service area in 2010 and 2015 is estimated by subtracting the estimate of the total wastewater flow for the pumping station service area from MMSD's pumping station flow records. I/I is distributed among the sub-basins proportional to the percentage of wastewater the sub-basin area contributes to the total pumping station service area. In a few instances, this methodology resulted in an I/I estimate of zero, which is not likely to be true. Possible reasons this may occur include the following:

(1). The pump station metering data may be inaccurate;

(2). The per capita and/or per acre wastewater generation rates used to estimate wastewater flows are higher than actual; and

(3). Wastewater estimates for some large commercial/industrial users that are derived from water sales data are too high due to potable water that does not become wastewater.

Forecasts generally assume the future infiltration and inflow per acre rates will be the average of the 2010 and 2015 rates.

Figure 3-3: Pumping Station 1 Sub-Basins

Pumping Station 1

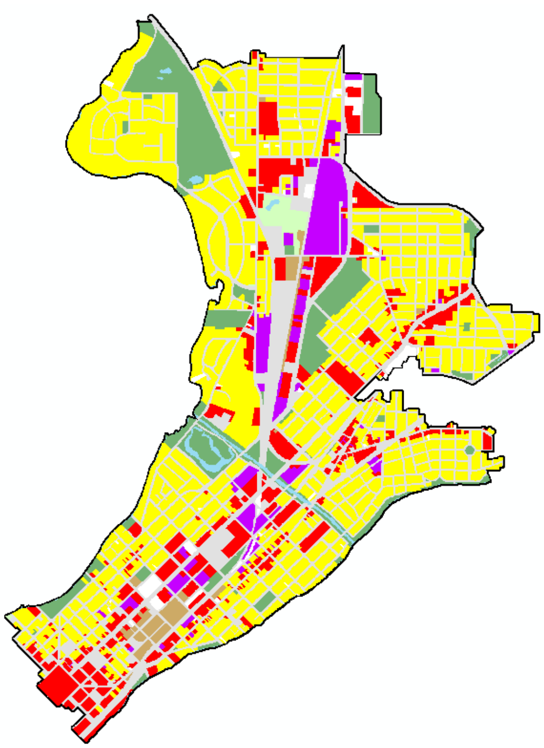
Service Area Description

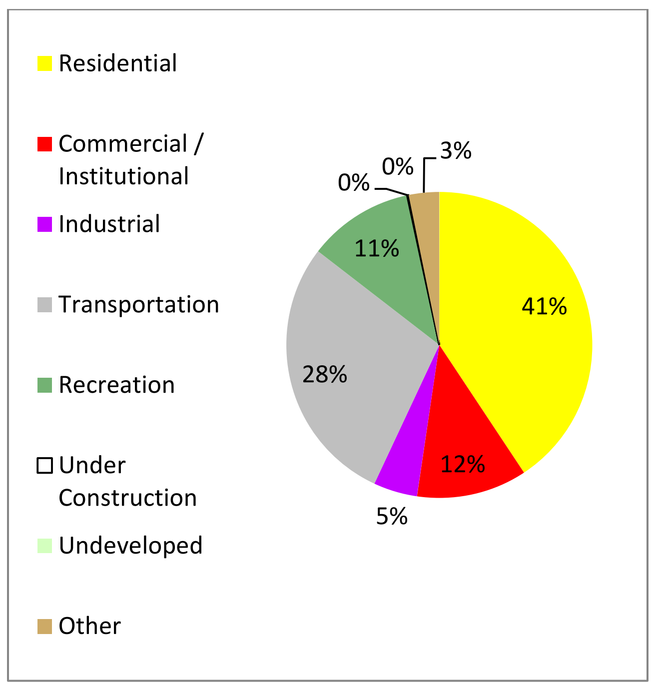
The Pumping Station 1 Service Area covers a general geographic area from the State Capitol northeast along the isthmus to the Village of Maple Bluff and State Highway 30 as shown in Figure 3-3. In 2018, the approved pumping station service area included approximately 2,824 acres in the Village of Maple Bluff, and parts of the City of Madison and the Town of Madison. The boundary of this pumping station service area is not expected to change.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 1 service area had an estimated population of 29,457. Population in this area is forecasted to increase to 36,084 by 2040. The forecasted population growth is primarily due to continued redevelopment, particularly along the East Washington Avenue corridor. This service area included an estimated 322.6 acres of commercial-institutional land use in 2015. This land use is projected to decrease to 307.7 acres by 2040. This service area included an estimated 144.9 acres of industrial land use in 2015. This land use is projected to increase to 194.6 acres by 2040. A detailed table is included in Appendix D. A significant unknown is how the future redevelopment of the closed Oscar Mayer facility will affect these forecasts.

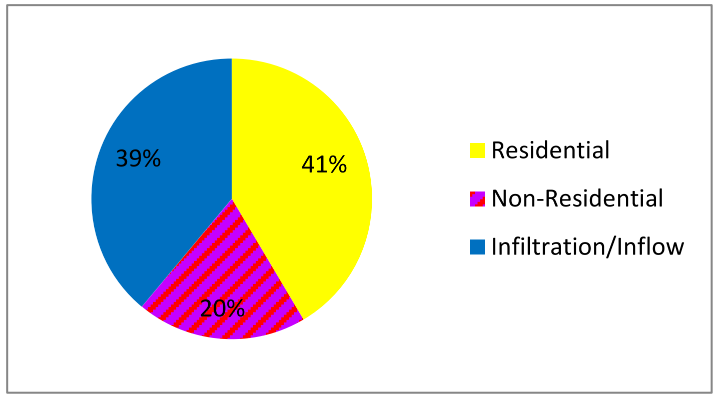
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 1 Service Area had an estimated average annual flow of 3.93 mgd of wastewater in 2015. Known water usage accounted for 99% of the non-residential wastewater flow estimate. Twelve large wastewater generators (> 10,000 gpd) accounted for 0.35 mgd or 45% of the non-residential wastewater. Kraft / Oscar Mayer Foods accounted for only 0.09 mgd, a significant decrease from the past, but still the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 1 Service Area are presented in Table 3-3. A detailed table is included in Appendix D. The total Pumping Station 1 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-4.

Table 3-3: PS 1 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH01-126	0.07	0.07	0.07	0.07	0.07
MH01-617	0.44	0.44	0.45	0.45	0.46
MH01-615	0.22	0.23	0.24	0.25	0.27
MH01-604	0.53	0.54	0.54	0.54	0.54
MH01-003	0.35	0.35	0.35	0.35	0.35
SAS 5543-003	0.59	0.59	0.59	0.59	0.59
SAS 5543-004	1.84	1.90	1.97	2.04	2.10
Total	4.04	4.13	4.21	4.30	4.39

Figure 3-4: PS 1 Sub-Basin Historic Flow Data and Forecast

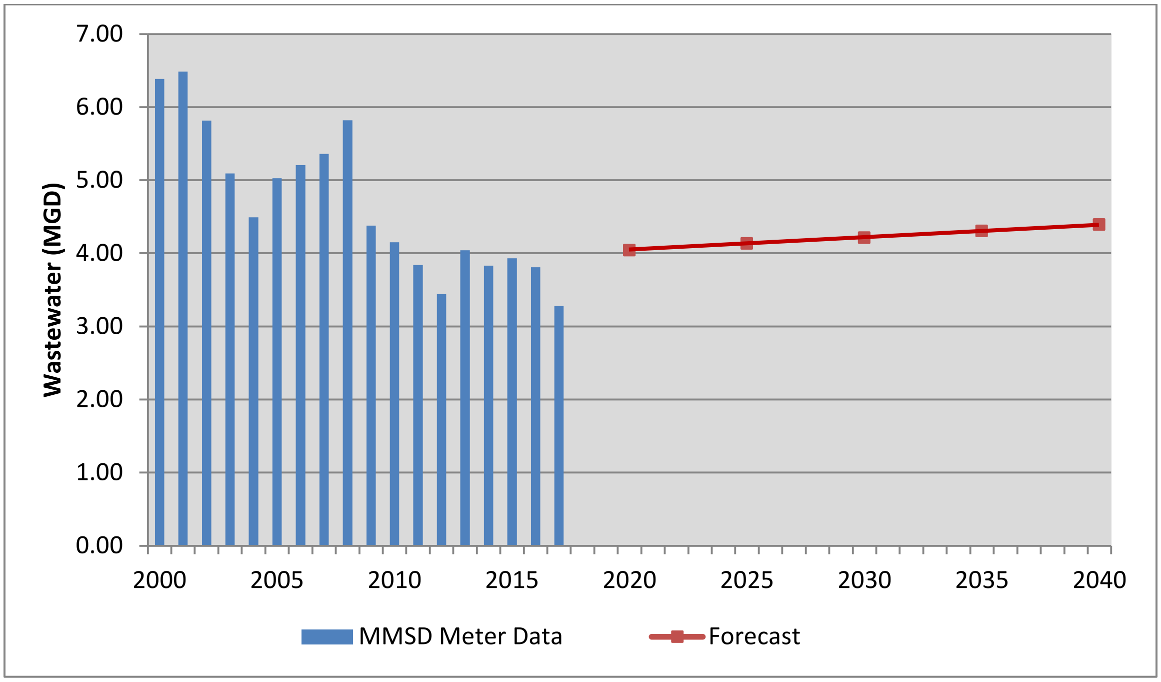


Figure 3-5: Pumping Station 2 Sub-Basins

Pumping Station 2

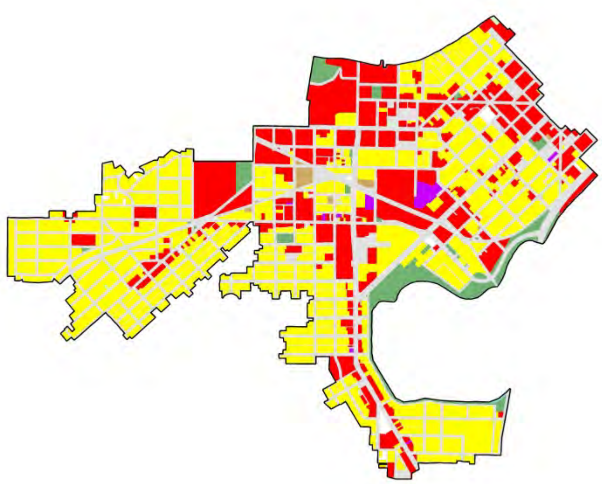
Service Area Description

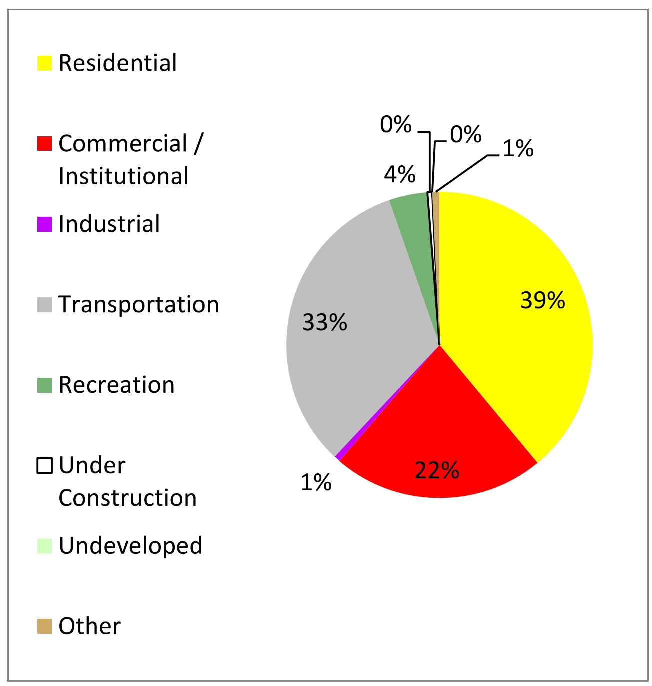
The Pumping Station 2 Service Area covers a general geographic area from the State Capitol southwest along the isthmus to the eastern portion of the University of Wisconsin campus as shown in Figure 3-5. In 2018, the approved pumping station service area included approximately 1,178 acres in the City of Madison. The boundary of this pumping station service area is not expected to change.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 2 service area had an estimated population of 44,073. Population in this area is forecasted to increase to 53,647 by 2040. The forecasted population growth is primarily due to continued redevelopment, particularly in the downtown and campus areas. This service area included an estimated 264.7 acres of commercial-institutional land use in 2015. This land use is projected to decrease to 245.0 acres by 2040. This service area included an estimated 10.4 acres of industrial land use in 2015. This land use is projected to decrease to 5.6 acres by 2040. A detailed table is included in Appendix D.

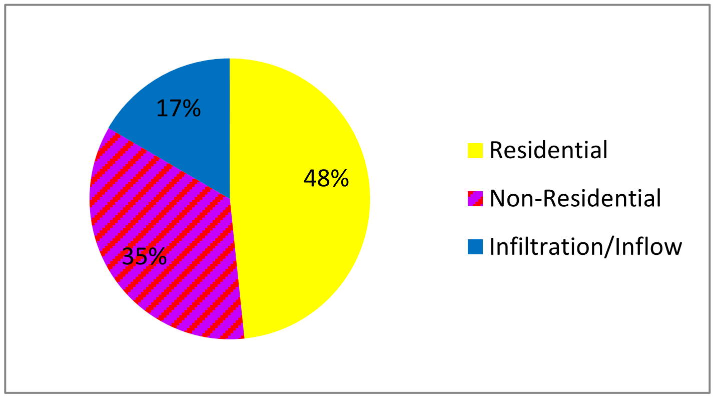
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 2 Service Area had an estimated average annual flow of 4.88 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Twenty-nine large wastewater generators (> 10,000 gpd) accounted for 0.73 mgd or 42% of the non-residential wastewater. Meriter Hospital accounted for 0.14 mgd, and is the largest nonresidential wastewater generator in this area.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 2 Service Area are presented in Table 3-3. A detailed table is included in Appendix D. The total Pumping Station 2 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-6.

Table 3-4: PS 2 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH02-014	0.40	0.40	0.41	0.41	0.41
MH02-012	0.35	0.35	0.35	0.35	0.35
MH02-011	0.10	0.10	0.10	0.10	0.10
MH02-010	0.10	0.10	0.10	0.10	0.10
MH02-008A	0.12	0.13	0.13	0.13	0.13
MH02-006A	0.51	0.53	0.54	0.55	0.56
MH02-005A	1.11	1.14	1.16	1.18	1.21
MH02-005	0.05	0.05	0.05	0.05	0.05
MH02-314A	0.27	0.28	0.29	0.30	0.31
MH02-306A	0.27	0.27	0.27	0.28	0.28
MH02-300	1.72	1.75	1.79	1.83	1.86
MH02-402	0.02	0.02	0.02	0.02	0.02
MH02-606	0.18	0.18	0.18	0.18	0.19
MH02-114	0.06	0.06	0.06	0.06	0.06
Total	5.26	5.36	5.45	5.55	5.64

Figure 3-6: PS 2 Sub-Basin Historic Flow Data and Forecast

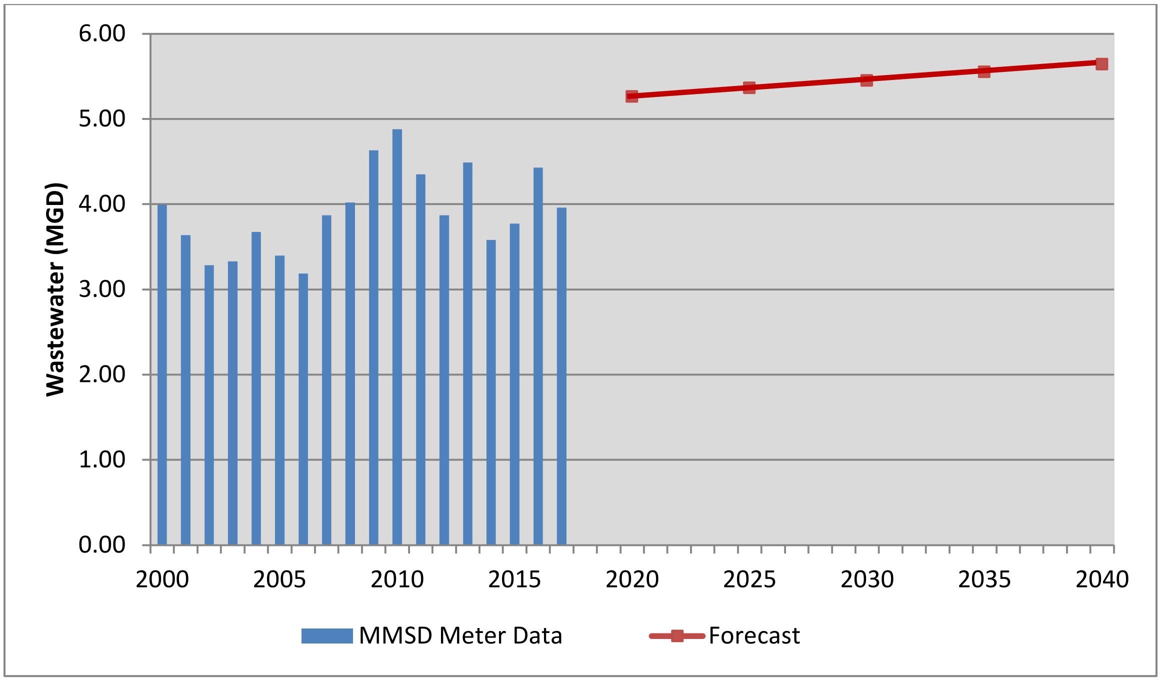
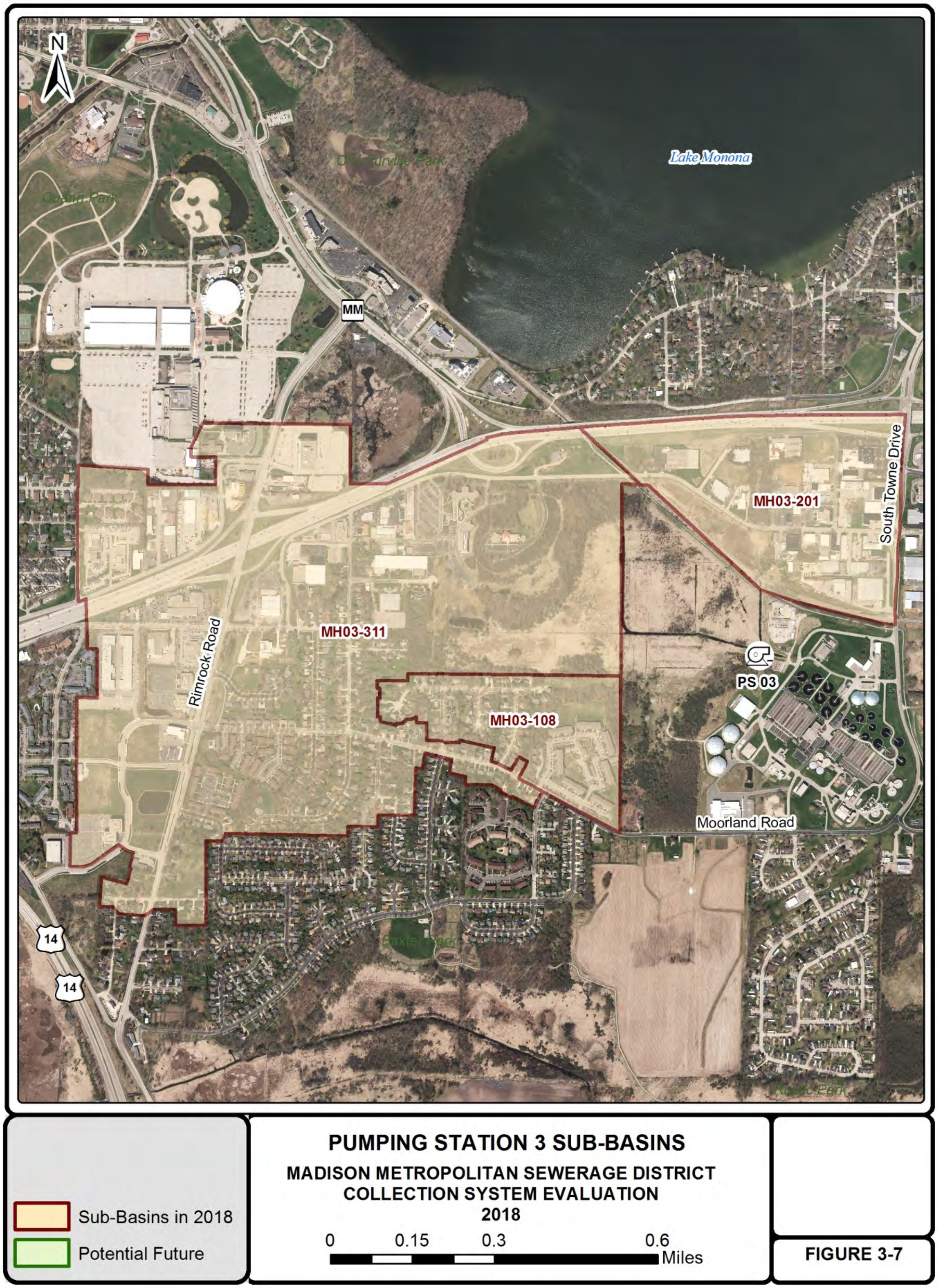


Figure 3-7: Pumping Station 3 Sub-Basin



Pumping Station 3

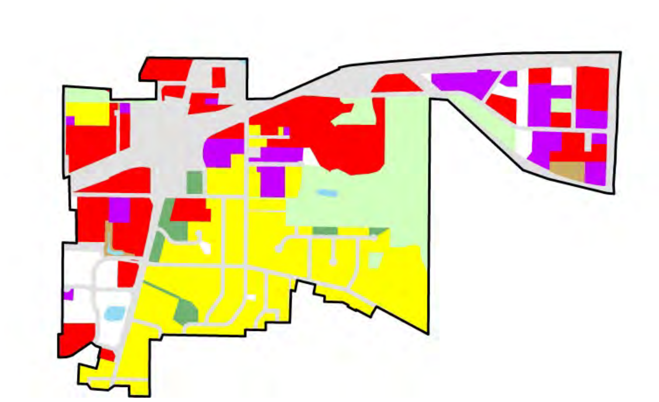
Service Area Description

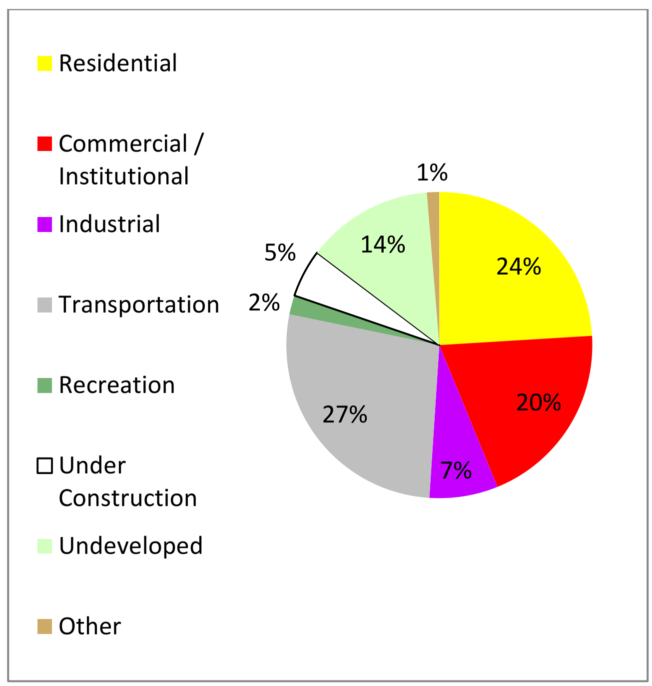
The Pumping Station 3 Service Area covers a general geographic area from south of the Beltline near Rimrock Road east to South Towne Drive as shown in Figure 3-7. In 2018, the approved pumping station service area included approximately 539 acres including parts of the Town of Madison, the City of Madison, City of Fitchburg, and the City of Monona. The boundary of this pumping station service area is not expected to change.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 3 service area had an estimated population of 2,426. Population in this area is forecasted to increase to 2,774 by 2040. The forecasted population growth is primarily due to continued development in the Novation plat area. This service area included an estimated 106.3 acres of commercial-institutional land use in 2015. This land use is projected to increase to 161.6 acres by 2040. This service area included an estimated 38.6 acres of industrial land use in 2015. This land use is projected to decrease to 30.4 acres by 2040. A detailed table is included in Appendix D.

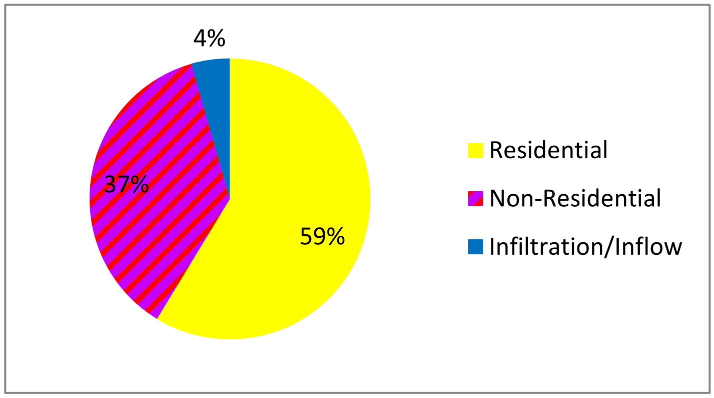
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 3 Service Area had an estimated average annual flow of 0.23 mgd of wastewater in 2015. Known water usage accounted for 71% of the non-residential wastewater flow estimate. There are no large wastewater generators (> 10,000 gpd) in this pumping station service area. Clarion Suites accounted for 8,248 gpd, and is the largest nonresidential wastewater generator in this area.

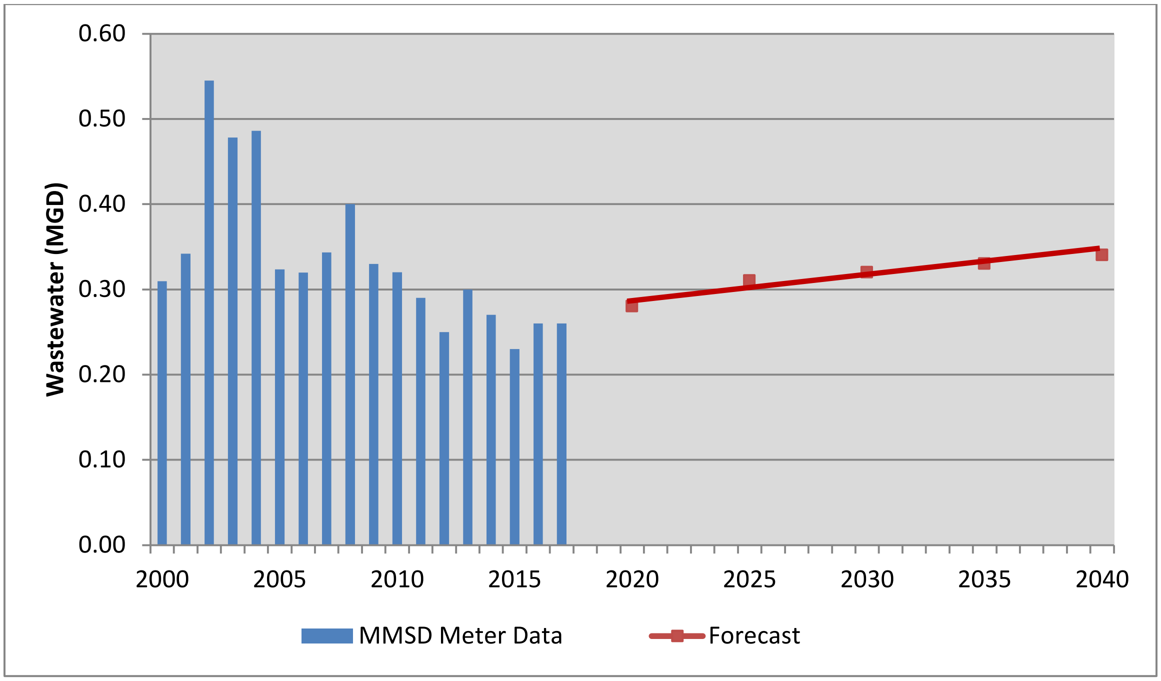


A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 3 Service Area are presented in Table 3-5. A detailed table is included in Appendix D. The total Pumping Station 3 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-8.

Table 3-5: PS 3 Sub-Basin Flow Forecast

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH03-311	0.18	0.21	0.22	0.23	0.24
MH03-108	0.05	0.05	0.05	0.05	0.05
MH03-102	0.04	0.05	0.05	0.05	0.05
Total	0.28	0.30	0.32	0.33	0.34

Figure 3-8: PS 3 Sub-Basin Historic Flow Data and Forecast



In March 2005, a magmeter was installed in the force main from Pumping Station 3. Prior to that time the flow was calculated from pump capacities and pump elapsed run time meters, which is less accurate.

Figure 3-9: Pumping Station 4 Sub-Basins

Pumping Station 4

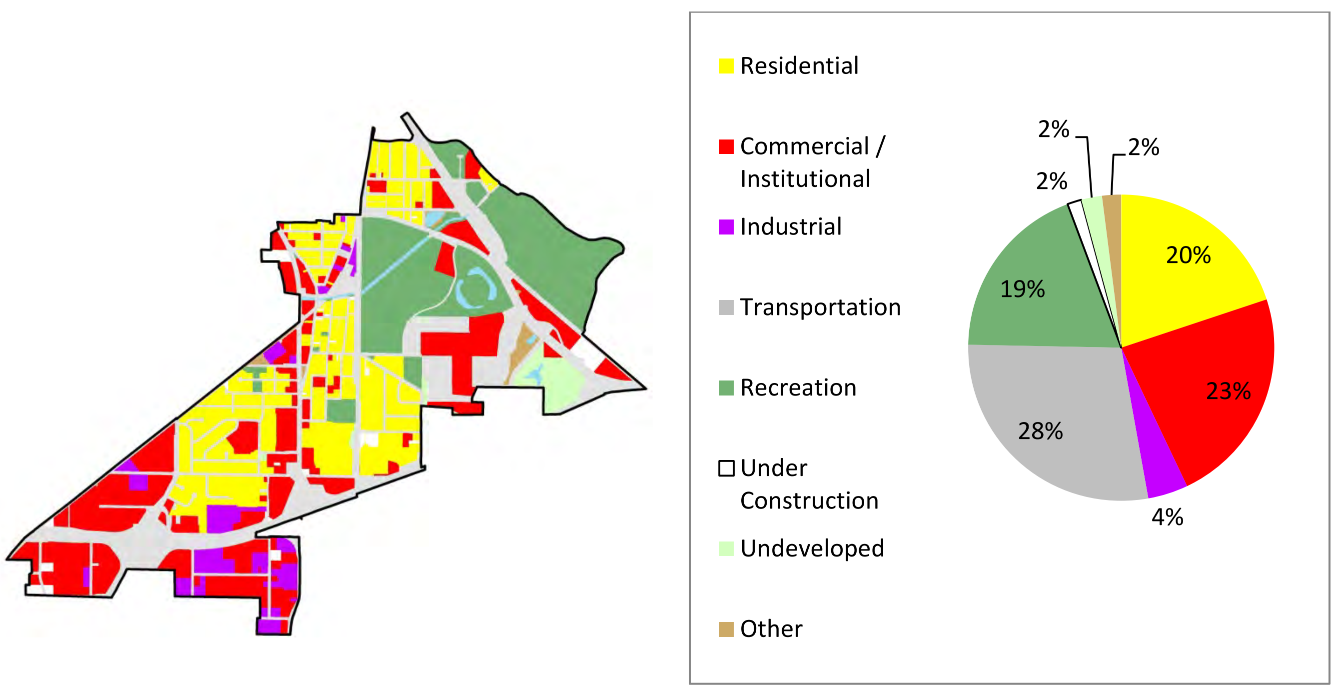
Service Area Description

The Pumping Station 4 Service Area covers a general geographic area from Greenway Cross and the Beltline near Fish Hatchery Road northeast to Lake Monona as shown in Figure 3-9. In 2018, the approved pumping station service area included approximately 1,332 acres including parts of the City of Madison and the Town of Madison. It is possible that flow from approximately 220 acres of land within the Pumping Station 4 service area could be diverted to the Pumping Station 8 service area as part of future improvements to the Cannonball Path in the southwest portion of the Pumping Station 4 basin. This change is not expected to occur before 2025, however.

Baseline Characteristics and Forecasts

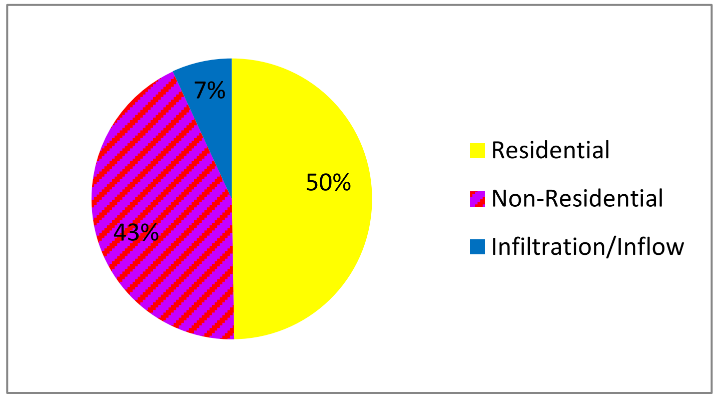
In the year 2015, the Pumping Station 4 service area had an estimated population of 7,081. Population in this area is forecasted to increase slightly to 7,139 by 2040. This service area included an estimated 381.6 acres of commercial-institutional land use in 2015. This land use is projected to increase slightly to 389.3 acres by 2040. This service area included an estimated 71.7 acres of industrial land use in 2015. This land use is projected to increase to 89.4 acres by 2040. A detailed table is included in Appendix D.

2015 Land Use



Wastewater Flow Estimates and Forecasts

The Pumping Station 4 Service Area had an estimated average annual flow of 0.78 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Six large wastewater generators (> 10,000 gpd) accounted for 0.19 mgd or 56% of the non-residential wastewater. Madison United Healthcare Linen (laundry service) accounted for 0.09 mgd, and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 4 Service Area are presented in Table 3-6. A detailed table is included in Appendix D. The total Pumping Station 4 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-10.

Table 3-6: PS 4 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH04-408	0.27	0.27	0.27	0.27	0.27
MH04-312	0.46	0.46	0.46	0.46	0.46
MH04-315	0.04	0.04	0.04	0.04	0.04
MH04-201B	0.10	0.10	0.10	0.10	0.10
MH04-209	0.09	0.09	0.09	0.09	0.09
Total	0.96	0.96	0.96	0.96	0.96

Figure 3-10: PS 4 Sub-Basin Historic Flow Data and Forecast

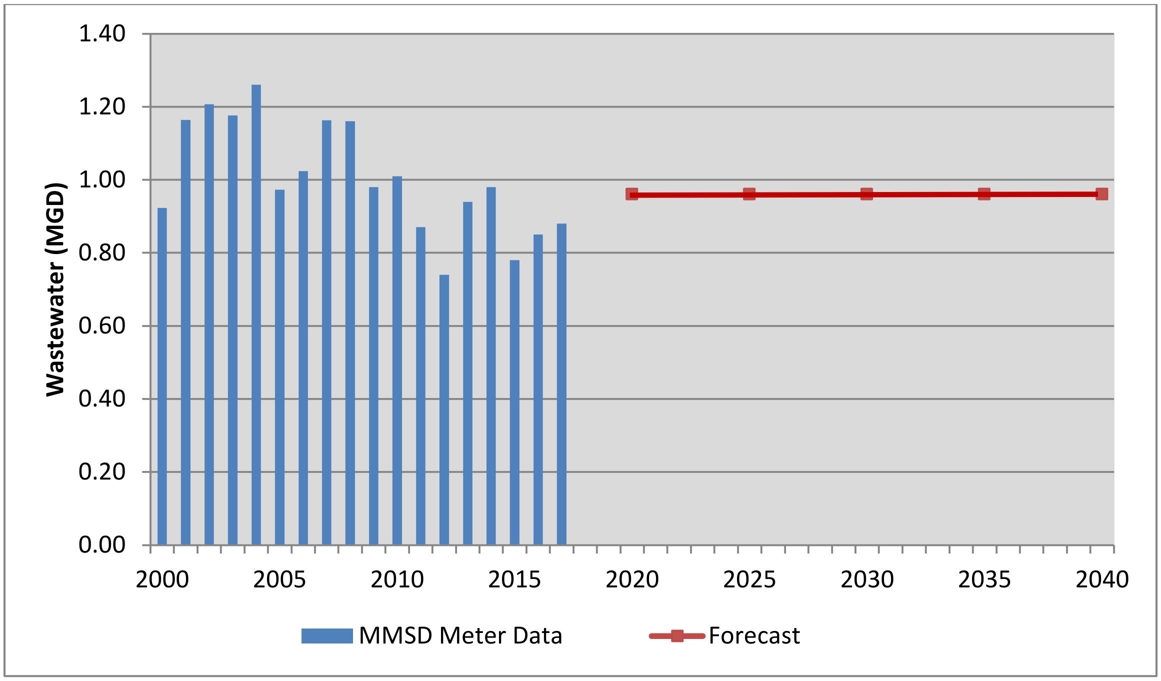


Figure 3-11: Pumping Station 5 Sub-Basins

Pumping Station 5

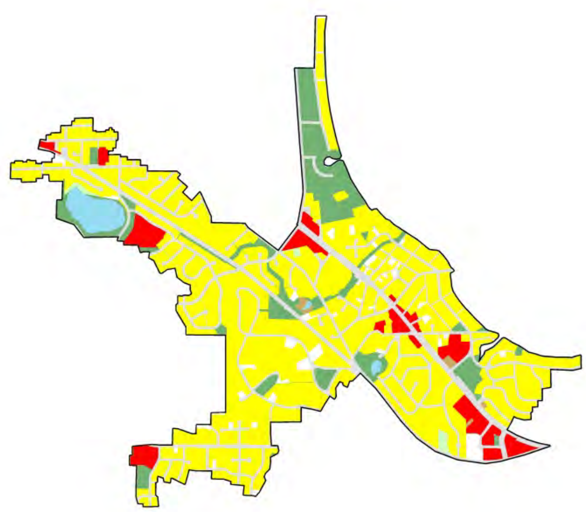
Service Area Description

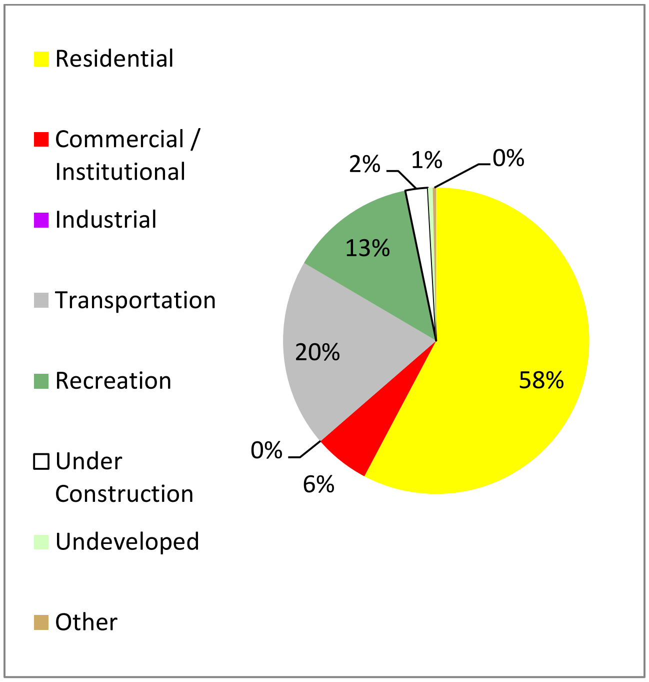
The Pumping Station 5 Service Area covers a general geographic area along the western end of University Avenue near Allen Boulevard south to Old Sauk Road as shown in Figure 3-11. In 2018, the approved pumping station service area included approximately 1,102 acres in the City of Madison and the City of Middleton. The boundary of this pumping station service area is not expected to change.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 5 service area had an estimated population of 5,247. Population in this area is forecasted to increase slightly to 5,277 by 2040. This service area included an estimated 64.8 acres of commercial-institutional land use in 2015. This land use is projected to decrease to 60.4 acres by 2040. This service area did not included any industrial land use in 2015. This is not expected to change. A detailed table is included in Appendix D.

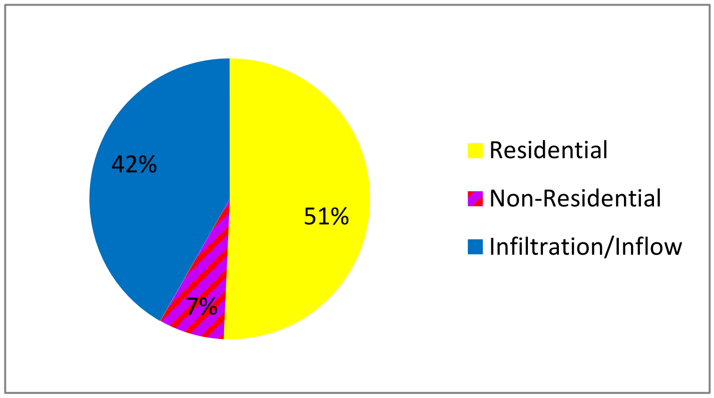
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 5 Service Area had an estimated average annual flow of 0.57 mgd of wastewater in 2015. Known water usage accounted for 68% of the non-residential wastewater flow estimate. There are no large non-residential wastewater generators (> 10,000 gpd) in this pumping station service area. A U.W. Health Clinic accounted for 4,559 gpd, and is the largest non-residential wastewater generator in this area.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 5 Service Area are presented in Table 3-7. A detailed table is included in Appendix D. The total Pumping Station 5 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-12.

Table 3-7: PS 5 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH05-223A	0.17	0.17	0.17	0.17	0.17
MH05-212	0.09	0.09	0.09	0.09	0.09
MH05-205	0.03	0.03	0.03	0.03	0.03
MH05-102	0.02	0.02	0.02	0.02	0.02
MH05-008	0.10	0.10	0.10	0.10	0.10
MH05-401	0.21	0.21	0.21	0.21	0.21
Total	0.64	0.64	0.64	0.64	0.64

Figure 3-12: PS 5 Sub-Basin Historic Flow Data and Forecast

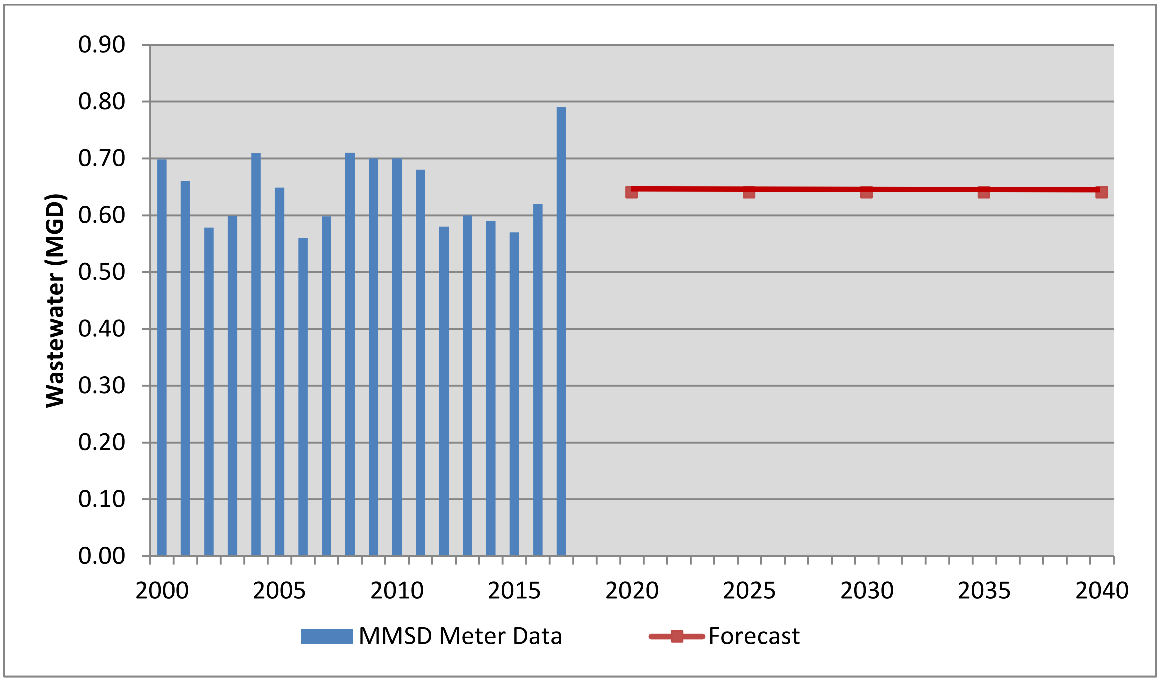
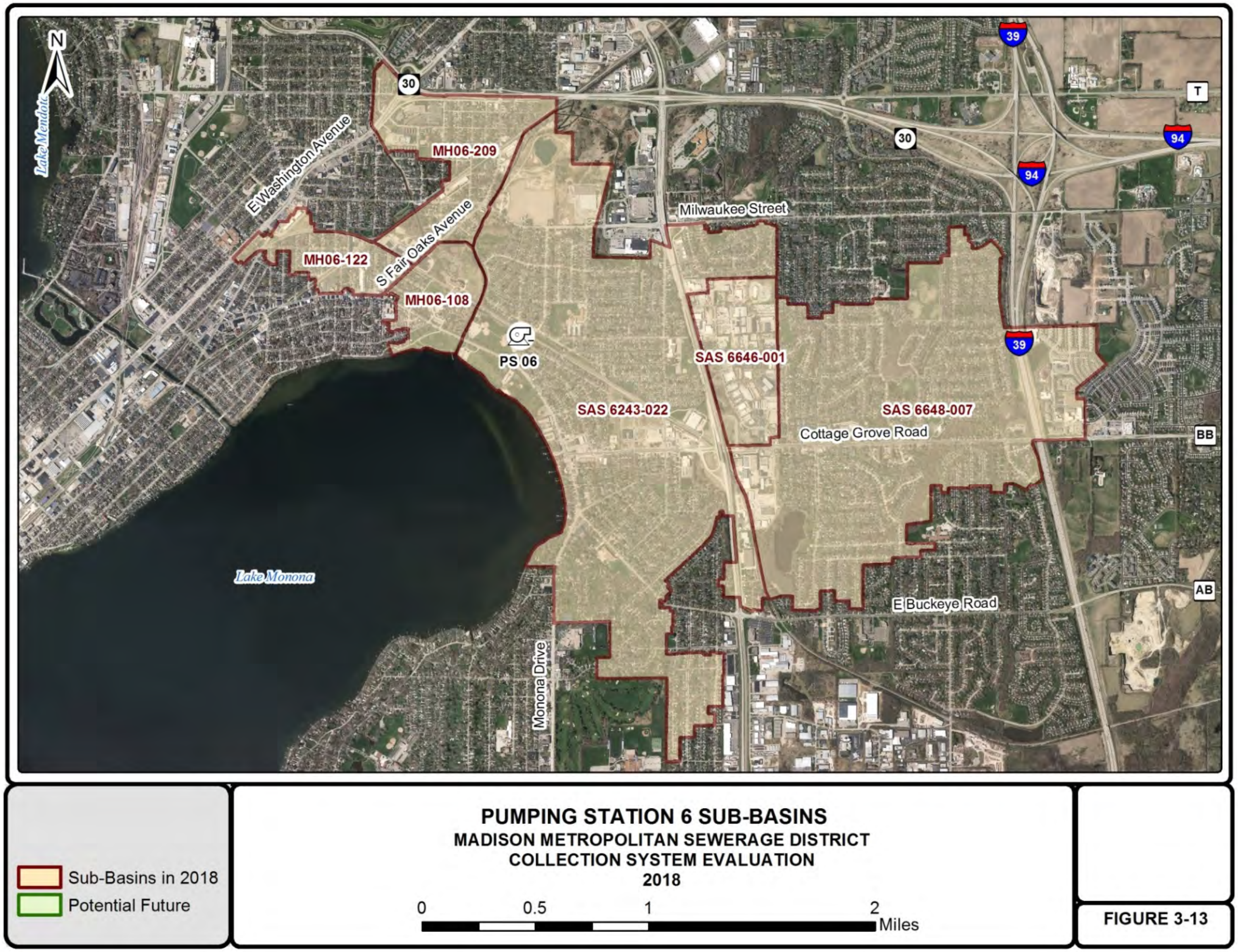


Figure 3-13: Pumping Station 6 Sub-Basins



Pumping Station 6

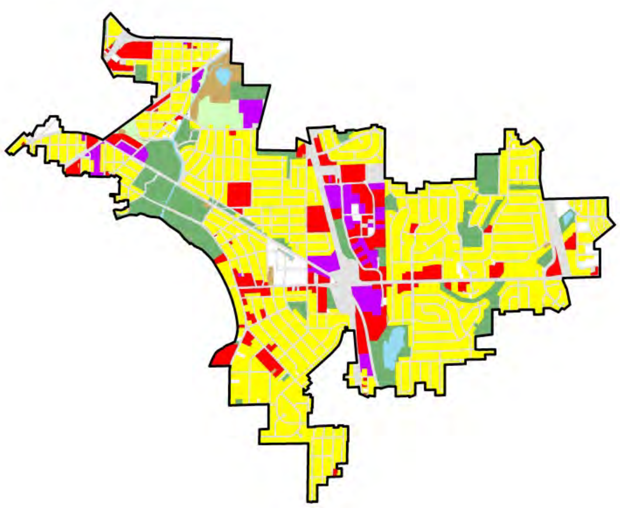
Service Area Description

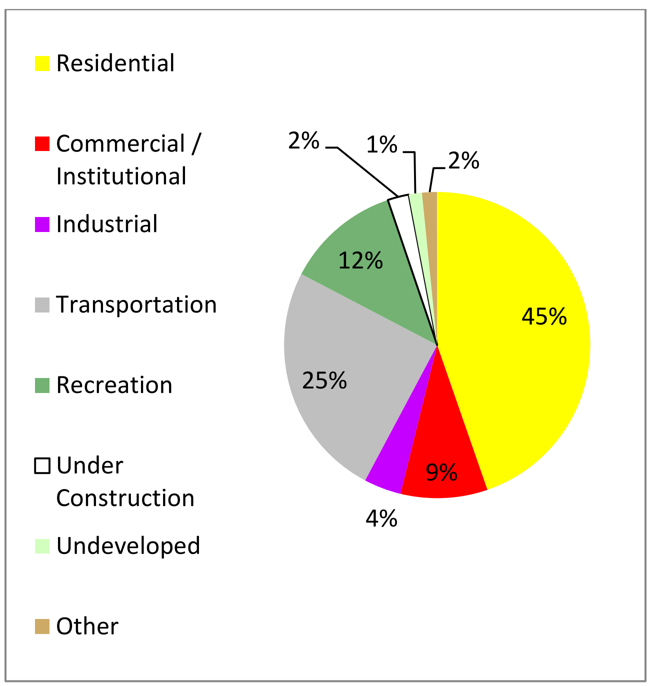
The Pumping Station 6 Service Area covers a general geographic area south of Milwaukee Street, north of East Buckeye Road, and northeast of Lake Monona to the Interstate as shown in Figure 3-13. In 2018, the approved pumping station service area included approximately 2,708 acres including parts of the City of Madison and the City of Monona. The boundary of this pumping station service area is not expected to change.

Baseline Characteristics and Forecasts

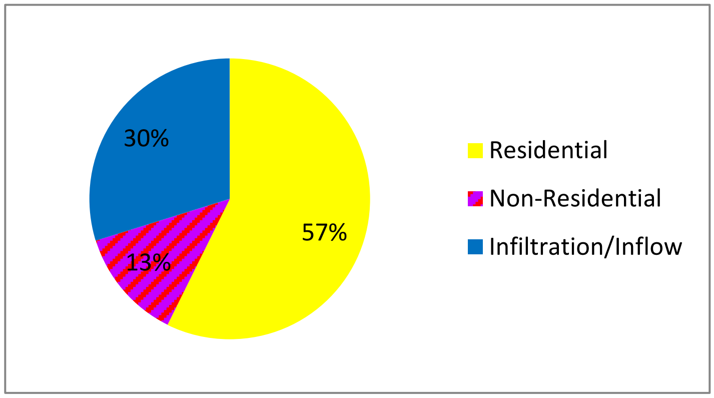
In the year 2015, the Pumping Station 6 service area had an estimated population of 17,087. Population in this area is forecasted to increase to 17,859 by 2040. The forecasted population growth is primarily due to continued redevelopment in the former Royster-Clark Site area. This service area included an estimated 257.7 acres of commercial-institutional land use in 2015. This land use is projected to remain unchanged through 2040. This service area included an estimated 125.3 acres of industrial land use in 2015. This land use is projected to remain unchanged through 2040. A detailed table is included in Appendix D.

2015 Land Use





Wastewater Flow Estimates and Forecasts



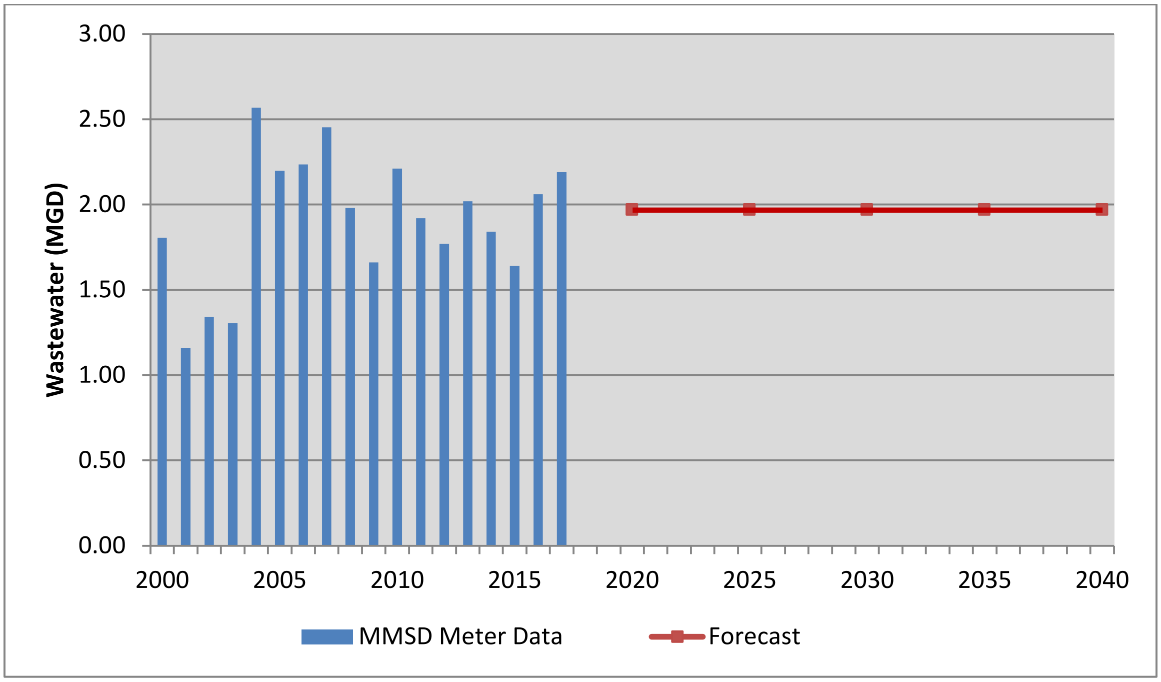
The Pumping Station 6 Service Area had an estimated average annual flow of 1.64 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Five large wastewater generators (> 10,000 gpd) accounted for 0.10 mgd or 48% of the non-residential wastewater. Madison Kipp Corp. accounted for 0.05 mgd (total for 2 locations), and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.

A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 6 Service Area are presented in Table 3-8. A detailed table is included in Appendix D. The total Pumping Station 6 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-14.

Table 3-8: PS 6 Sub-Basin Flow Forecasts

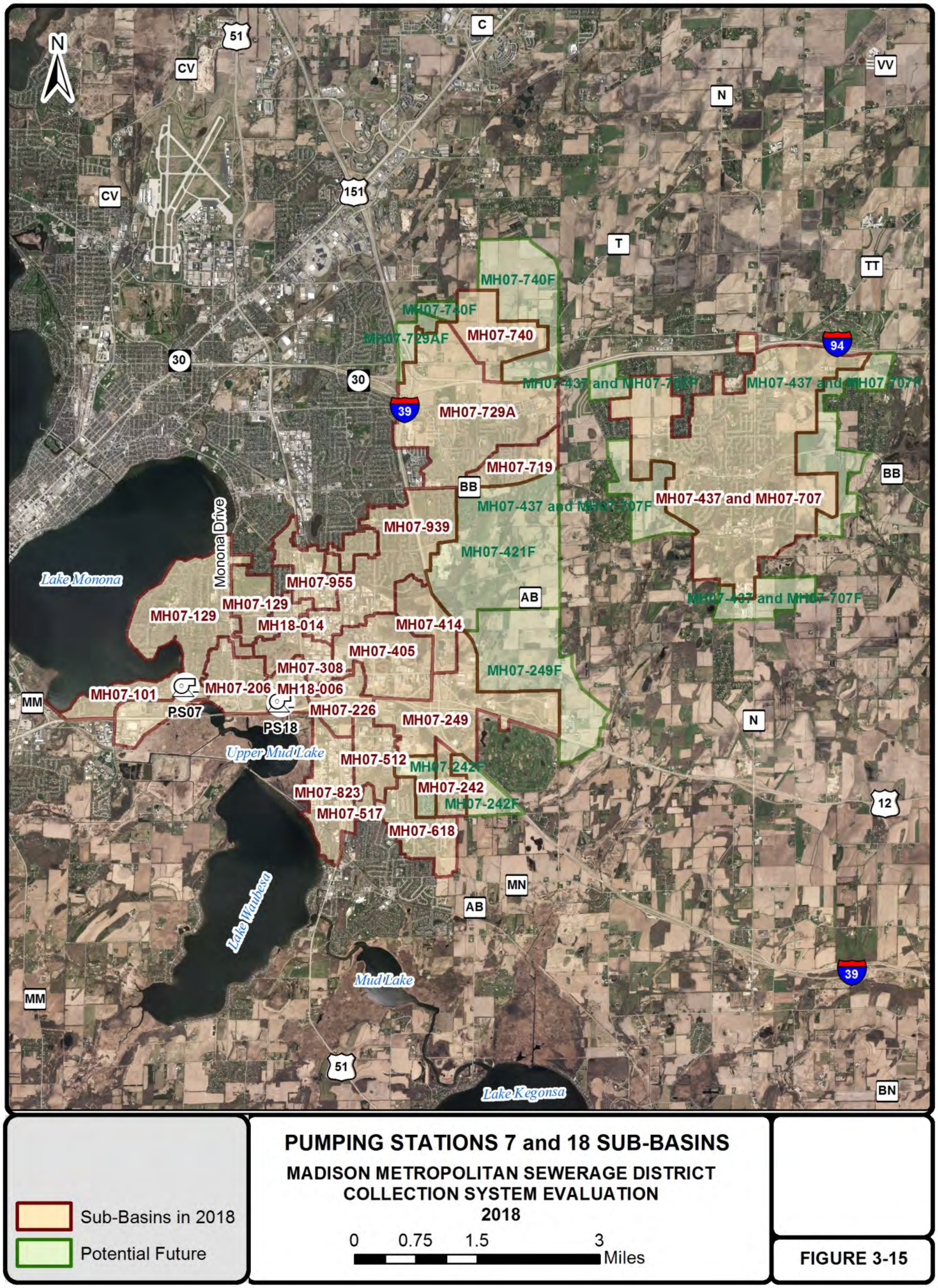
	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH06-122	0.14	0.14	0.14	0.14	0.14
MH06-209	0.19	0.19	0.19	0.19	0.19
MH06-108	0.05	0.05	0.05	0.05	0.05
SAS 6243-022	0.76	0.76	0.76	0.76	0.76
SAS 6646-001	0.06	0.06	0.06	0.06	0.06
SAS 6648-007	0.77	0.77	0.77	0.77	0.77
Total	1.97	1.97	1.97	1.97	1.97

Figure 3-14: PS 6 Sub-Basin Historic Flow Data and Forecast



MMSD typically pumps an average of 150,000 gpd from Pumping Station 1 to Pumping Station 6 to flush the force main for maintenance. This flow is not included in the wastewater forecasts. The 2008 to 2018 historical data is from pump runtime data. The venturi meter data was not used as it is thought to be in error during this time period.

Figure 3-15: Pumping Stations 7 and 18 Sub-Basins



Pumping Stations 7 and 18

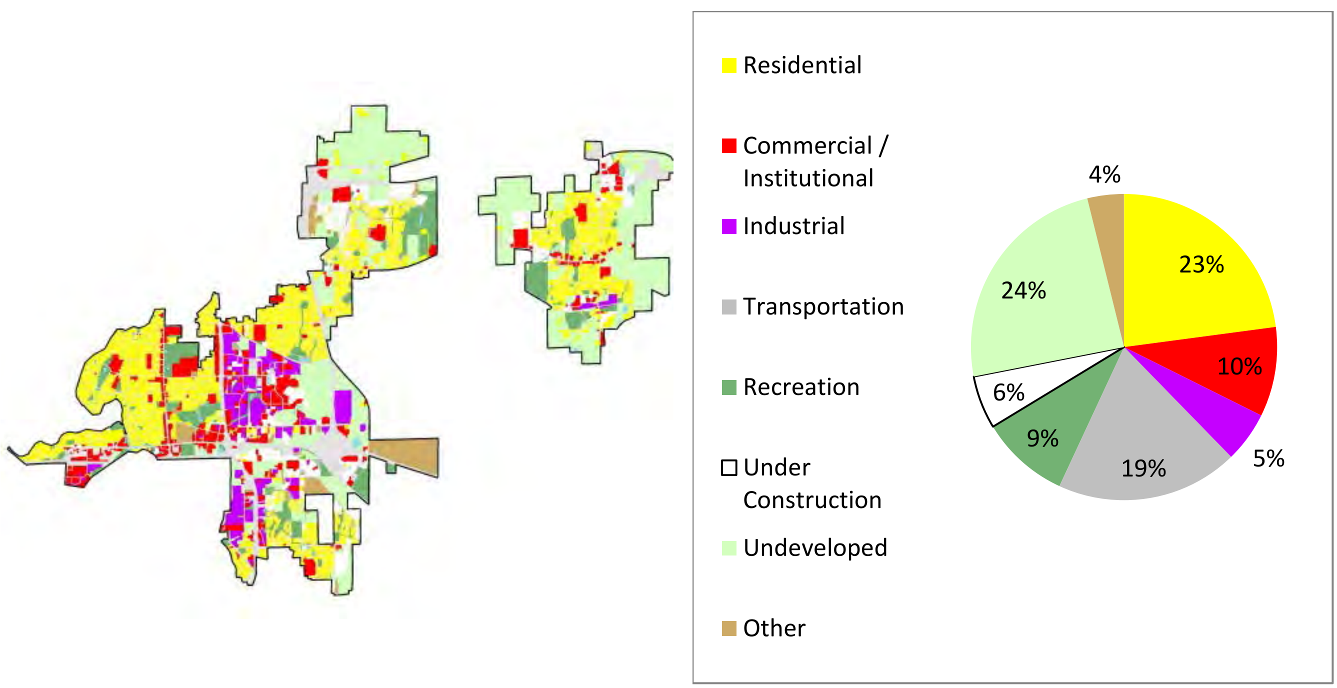
Service Area Description

The Pumping Station 7 and Pumping Station 18 Service Area covers a general geographic area east of Lake Monona and northeast of Lake Waubesa toward the Village of Cottage Grove as shown in Figure 3-15. In 2018, the approved pumping station service area included approximately 13,017 acres including the Village of Cottage Grove and parts of the City of Madison, the City of Monona, and the Village of McFarland. The boundaries of this pumping station service area are expected to grow significantly in the future. Approximately 4,986 acres may potentially be added in the future, based on current local comprehensive plans. Lands in the Village of McFarland which are located east of Holscher Road and south of Siggelkow Road currently drain to a pumping station which discharges to Pumping Station 7 through the SEI-McFarland Relief Sewer. In the future it is expected that the village's pumping station will be relieved with a village interceptor sewer which will drain to Pumping Station 9.

Baseline Characteristics and Forecasts

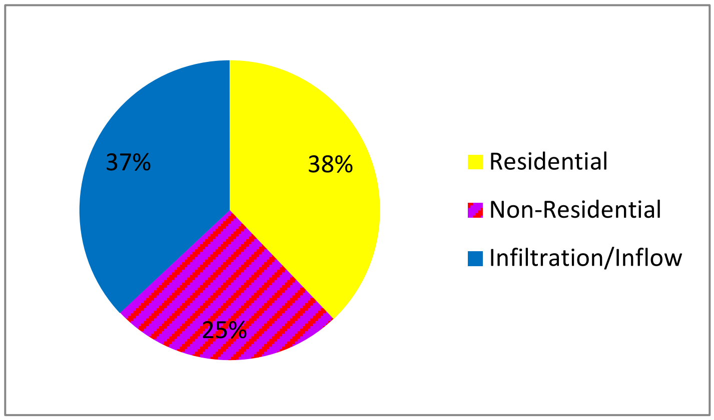
In the year 2015, the Pumping Station 7 and 18 service area had an estimated population of 34,277. Population in this area is forecasted to increase to 62,785 by 2040. The forecasted population growth is primarily due to continued development on the far east side of the City of Madison and in the Village of Cottage Grove. This service area included an estimated 1,165.9 acres of commercial-institutional land use in 2015. This land use is projected to increase to 2,100.9 acres by 2040. This service area included an estimated 713.3 acres of industrial land use in 2015. This land use is projected to increase to 1,388.8 acres by 2040. A detailed table is included in Appendix D.

2015 Land Use



Wastewater Flow Estimates and Forecasts

The combined Pumping Station 7 and Pumping Station 18 Service Area had an estimated average annual flow of 4.83 mgd of wastewater in 2015. Known water usage accounted for 74% of the non-residential wastewater flow estimate. Twelve large wastewater generators (> 10,000 gpd) accounted for 0.66 mgd or 27% of the non-residential wastewater. Hydrite Chemical Co,. in Cottage Grove, accounted for 0.24 mgd (including groundwater remediation system discharge), and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B



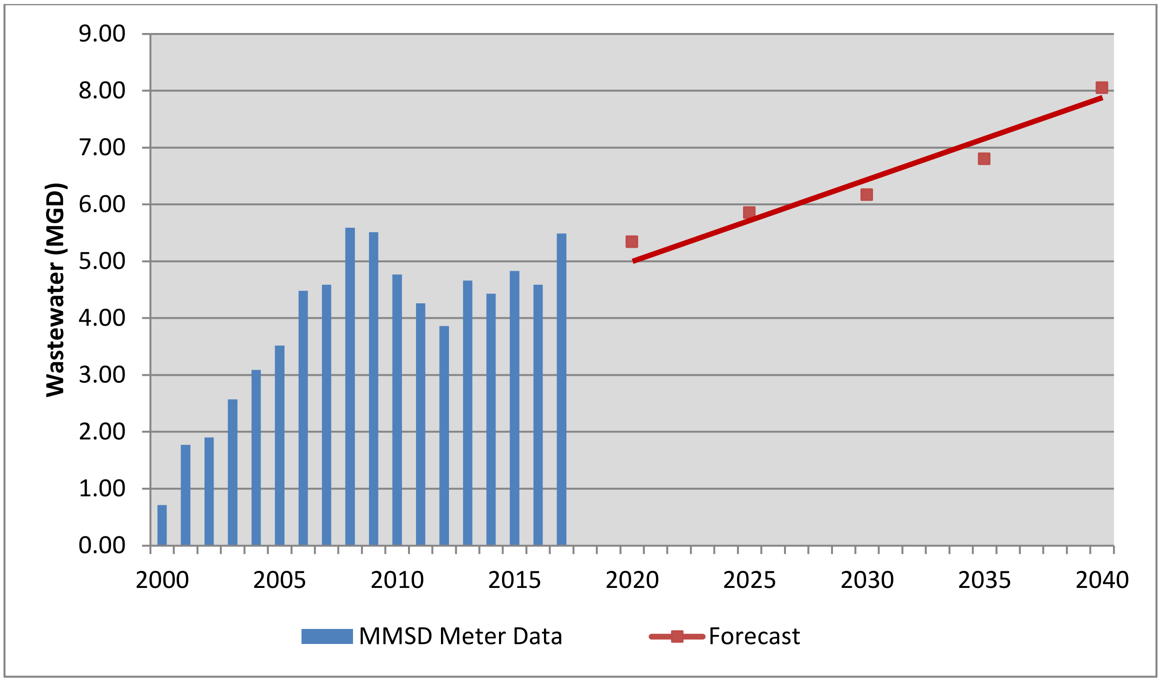
A summary of the year 2020 through 2040 wastewater flow forecasts generated in the combined Pumping Station 7 and Pumping Station 18 Service Area are presented in Table 3-9. A detailed table is included in Appendix D. The total combined Pumping Station 7 and Pumping Station 18 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-16.

Table 3-9: PS 7 and PS 18 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH07-955	0.23	0.24	0.24	0.25	0.26
MH07-939	0.88	0.88	0.88	0.88	0.88
MH07-740/740F	0.00	0.00	0.00	0.28	0.61
MH07-729A/729AF	0.52	0.67	0.72	0.81	0.87
MH07-719	0.12	0.12	0.13	0.14	0.14
MH07-437	0.73	0.82	0.90	0.97	1.04
MH07-421F	0.00	0.00	0.00	0.00	0.53
MH07-414	0.07	0.09	0.10	0.12	0.13
MH07-405	0.29	0.31	0.33	0.34	0.36
MH18-014	0.16	0.16	0.16	0.16	0.16
MH18-006	0.12	0.12	0.12	0.12	0.12
MH07-129 Madison	0.08	0.08	0.08	0.08	0.08
MH07-129 Monona	0.67	0.67	0.67	0.67	0.67
MH07-101	0.23	0.23	0.23	0.23	0.23
MH07-618	0.17	0.18	0.18	0.18	0.18
MH07-517	0.06	0.06	0.06	0.06	0.06
MH07-512	0.14	0.15	0.16	0.18	0.19
MH07-249/249F	0.14	0.25	0.33	0.40	0.59
MH07-242/242F	0.08	0.15	0.17	0.17	0.17
MH07-206	0.42	0.44	0.45	0.46	0.48

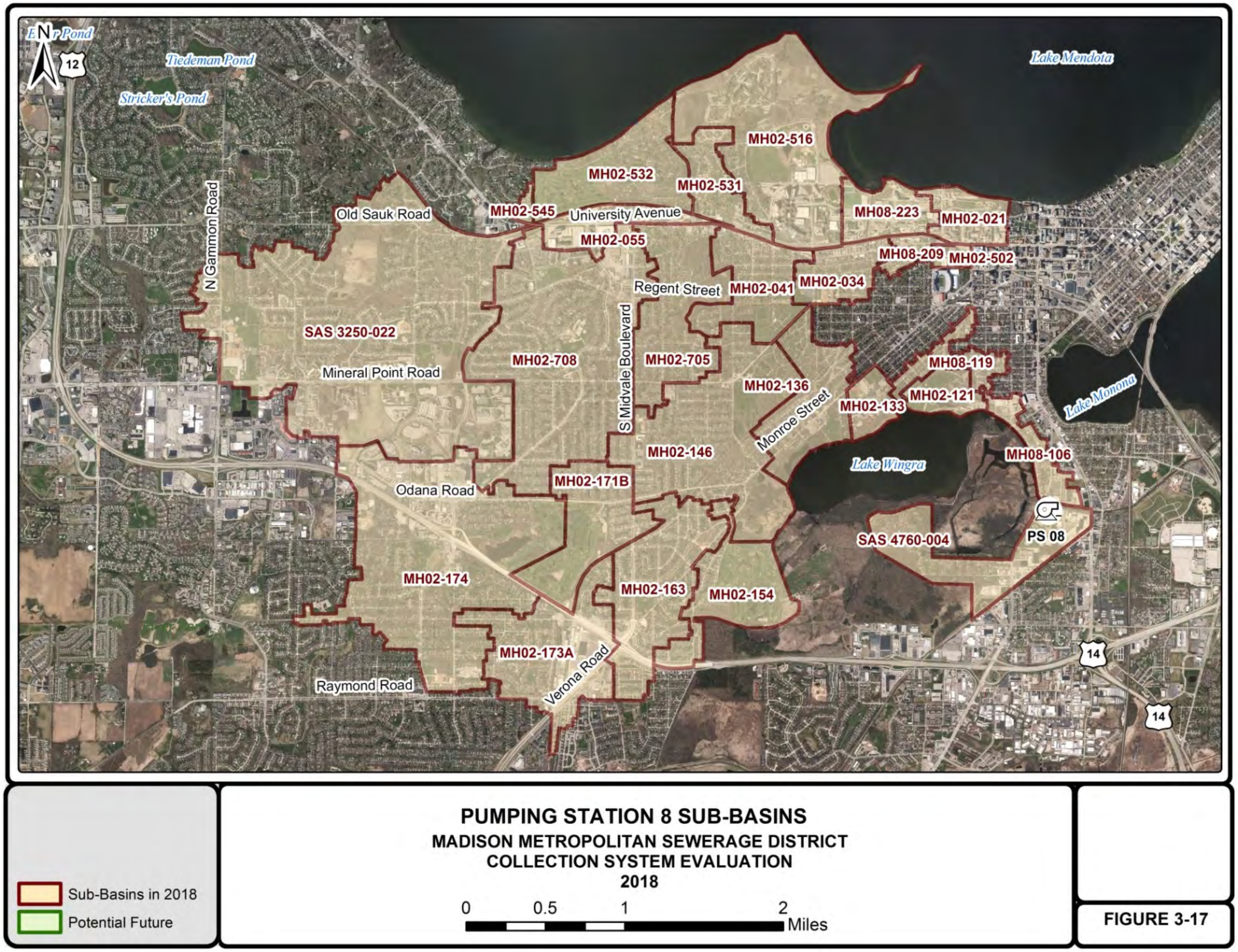
	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH07-226	0.06	0.07	0.09	0.11	0.12
MH07-308	0.03	0.03	0.03	0.03	0.03
MH07-823	0.14	0.14	0.14	0.15	0.15
Total	5.34	5.85	6.17	6.80	8.05

Figure 3-16: PS 7 and PS 18 Sub-Basin Historic Flow Data and Forecast



The increase in the wastewater forecasts from 2002 to 2003 is due to the Hydrite Chemical groundwater barrier (remediation) project that began in the fall of 2003.

Figure 3-17: Pumping Station 8 Sub-Basins



Pumping Station 8

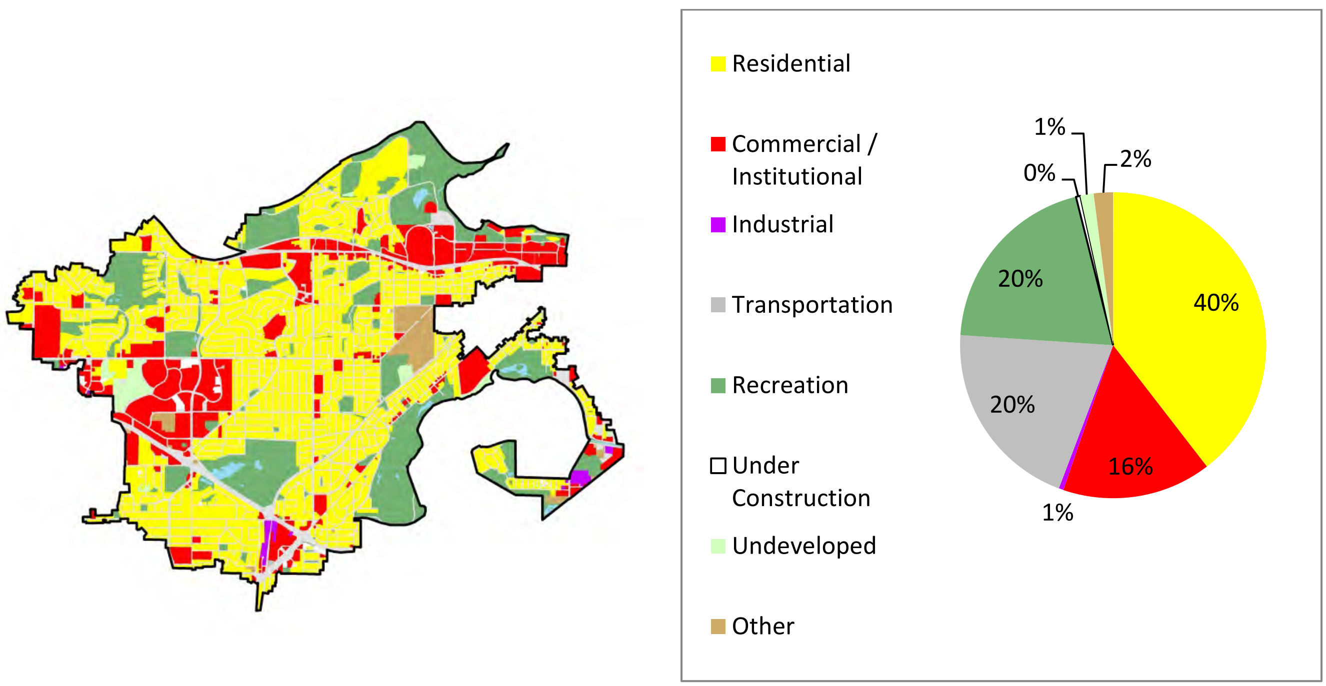
Service Area Description

The Pumping Station 8 Service Area covers a general geographic area from the western end of the University of Wisconsin campus, west to North Gammon Road and southwest to Raymond Road near Verona Road as shown in Figure 3-17 . In 2018, the approved pumping station service area included approximately 7,901 acres including the Village of Shorewood Hills and part of the City of Madison. It is possible that flow from approximately 220 acres of land within the Pumping Station 4 service area could be diverted to the Pumping Station 8 service area as part of future improvements to the Cannonball Path in the southwest portion of the Pumping Station 4 basin. This change is not expected to occur before 2025, however.

Baseline Characteristics and Forecasts

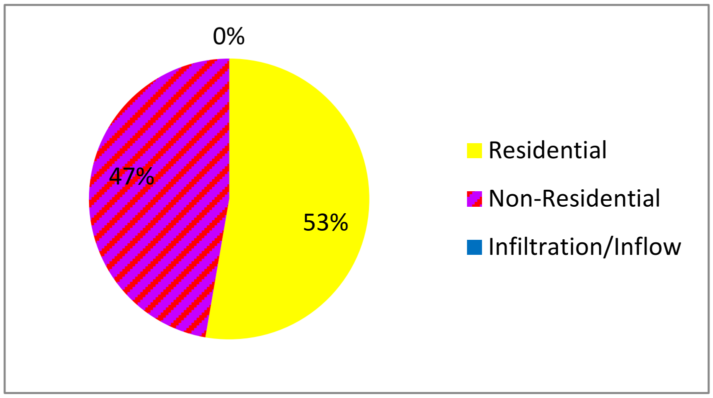
In the year 2015, the Pumping Station 8 service area had an estimated population of 49,860. Population in this area is forecasted to increase to 51,748 by 2040. The forecasted population growth is primarily due to continued redevelopment, particularly in the Hill Farms area and the University Avenue corridor. This service area included an estimated 1,494.3 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,536.4 acres by 2040. This service area included an estimated 39.9 acres of industrial land use in 2015. This land use is projected to increase to 61.9 acres by 2040. A detailed table is included in Appendix D.

2015 Land Use



Wastewater Flow Estimates and Forecasts

The Pumping Station 8 Service Area had an estimated average annual flow of 4.58 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Thirty-seven large wastewater generators (> 10,000 gpd) accounted for 1.55 mgd or 63% of the non-residential wastewater. U.W. Hospital accounted for 0.44 mgd and is the largest nonresidential wastewater generator in this area.



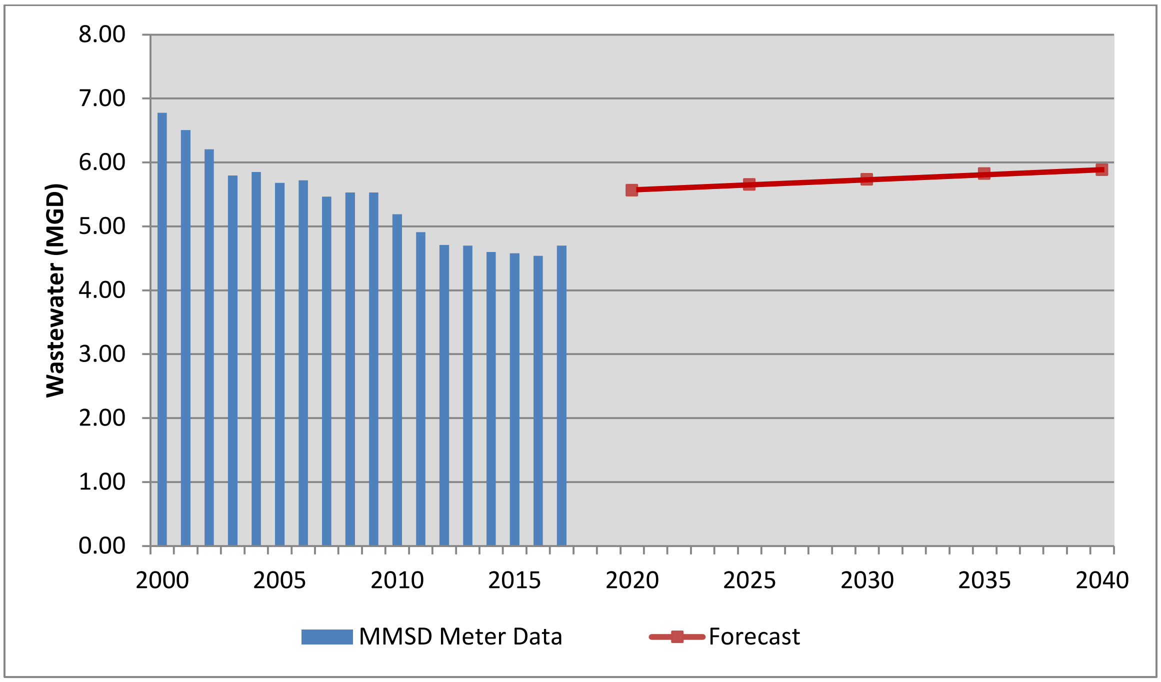
A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 8 Service Area are presented in Table 3-10. A detailed table is included in Appendix D. The total Pumping Station 8 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-18.

Table 3-10: PS 8 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH02-545	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SAS 3250-022	0.68	0.72	0.72	0.76	0.76
MH02-174	0.32	0.32	0.32	0.32	0.32
MH02-173A	0.16	0.16	0.17	0.17	0.17
MH02-171B	0.05	0.05	0.05	0.05	0.05
MH02-163	0.17	0.18	0.20	0.21	0.23
MH02-154	0.05	0.05	0.05	0.05	0.05
MH02-146	0.22	0.22	0.22	0.22	0.22
MH02-136	0.13	0.13	0.13	0.13	0.13
MH02-133	0.04	0.04	0.05	0.05	0.05
MH02-708	0.56	0.56	0.58	0.58	0.58
MH02-705	0.14	0.14	0.14	0.14	0.14
MH02-532	0.05	0.05	0.05	0.05	0.05
MH02-531	0.07	0.07	0.07	0.07	0.07
MH02-516	1.03	1.03	1.04	1.04	1.05
MH02-055	0.14	0.14	0.14	0.14	0.14
MH02-041	0.17	0.17	0.17	0.17	0.17
MH02-034	0.20	0.20	0.20	0.20	0.20
MH08-223	0.32	0.32	0.32	0.33	0.33
MH08-209	0.06	0.06	0.06	0.06	0.06
MH02-021	0.43	0.44	0.45	0.45	0.46
MH02-502	0.09	0.09	0.09	0.09	0.09

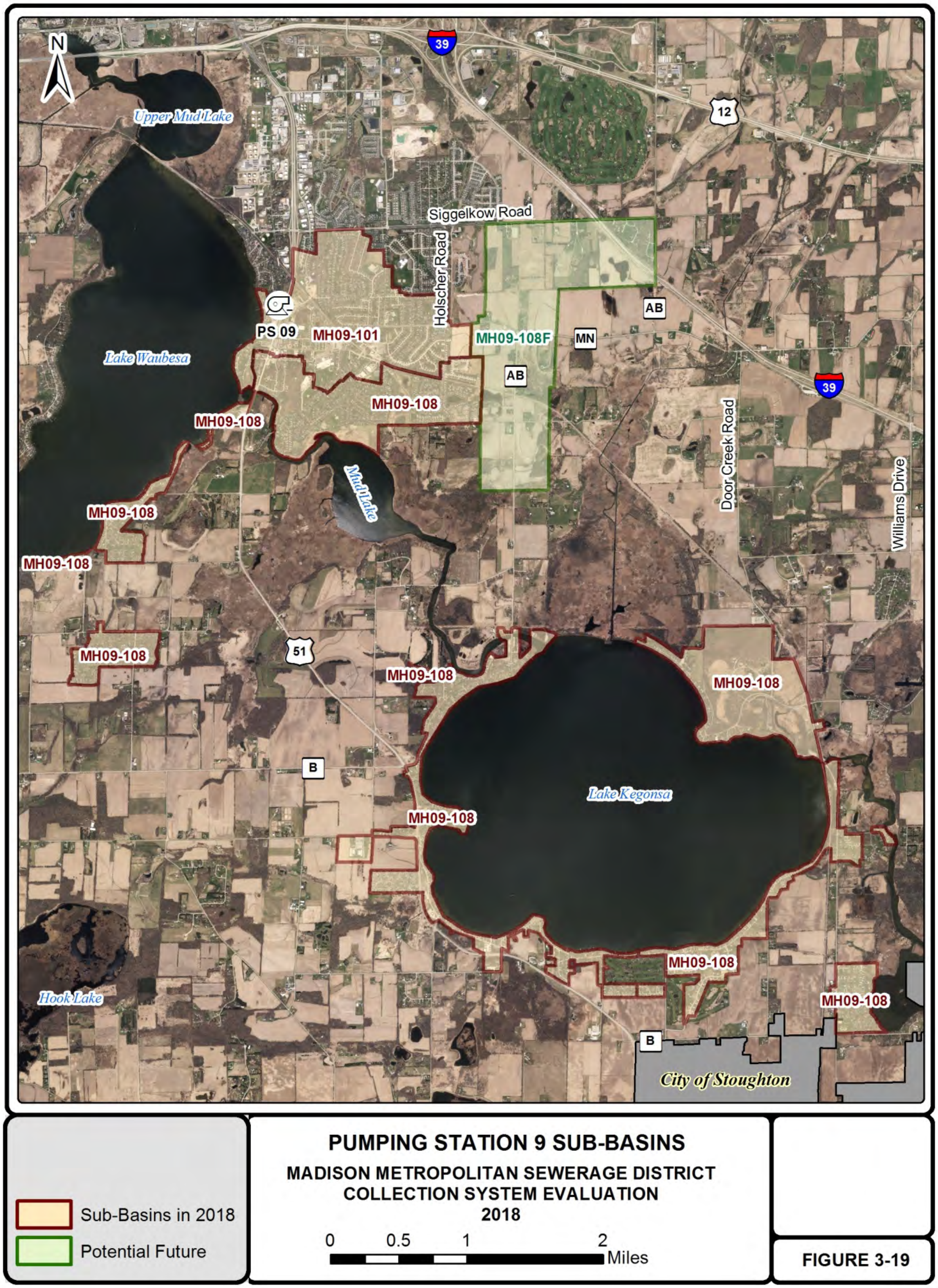
	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH02-121	0.08	0.08	0.08	0.08	0.08
MH08-106	0.20	0.21	0.22	0.23	0.24
MH08-119	0.08	0.08	0.08	0.08	0.08
SAS 4760-004	0.12	0.13	0.14	0.16	0.17
Total	5.56	5.65	5.73	5.82	5.88

Figure 3-18: PS 8 Sub-Basin Historic Flow Data and Forecast



In 2003, approximately 256 acres were removed from this pumping stations service area and added to the Pumping Station 2 Service Area due to a sewer reconstruction project by the City of Madison at the intersection of Randall Avenue and Regent Street.

Figure 3-19: Pumping Station 9 Sub-Basins



Pumping Station 9

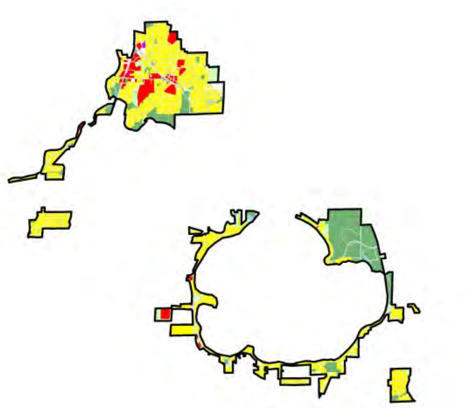
Service Area Description

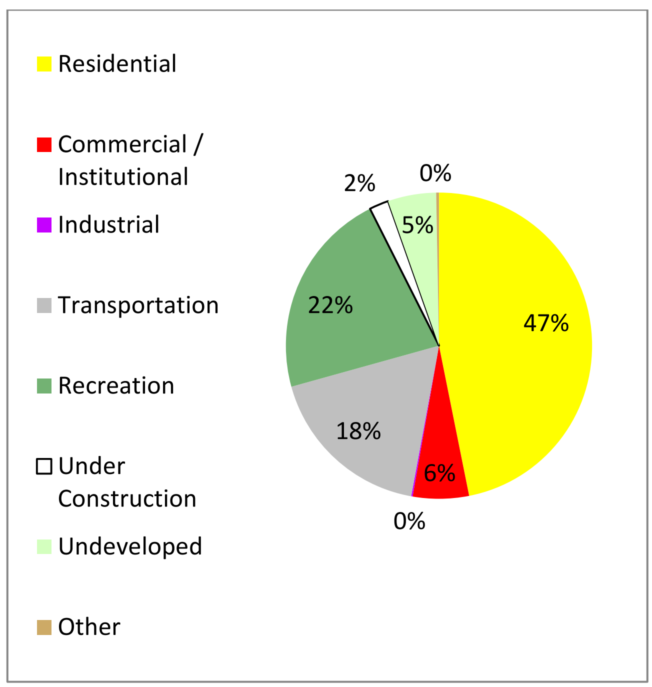
The Pumping Station 9 Service Area covers a general geographic area southwest of Interstate Highway 39 and Siggelkow Road, including the eastern shoreline of Lake Waubesa and the shoreline of Lake Kegonsa, as shown in Figure 3-19. In 2018, the approved pumping station service area included approximately 2,731 acres in the Village of McFarland and the Dunn – Kegonsa (DKSD), Dunn No. 3 (D3SD), and Pleasant Springs (PSSD) Sanitary Districts. Approximately 901 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 9 service area had an estimated population of 10,726. Population in this area is forecasted to increase to 14,174 by 2040. The forecasted population growth is primarily due to continued development in the Village of McFarland. This service area included an estimated 161.4 acres of commercial-institutional land use in 2015. This land use is projected to increase to 173.5 acres by 2040. This service area included an estimated 4.3acres of industrial land use in 2015. This land use is projected to increase to 45.3 acres by 2040. A detailed table is included in Appendix D.

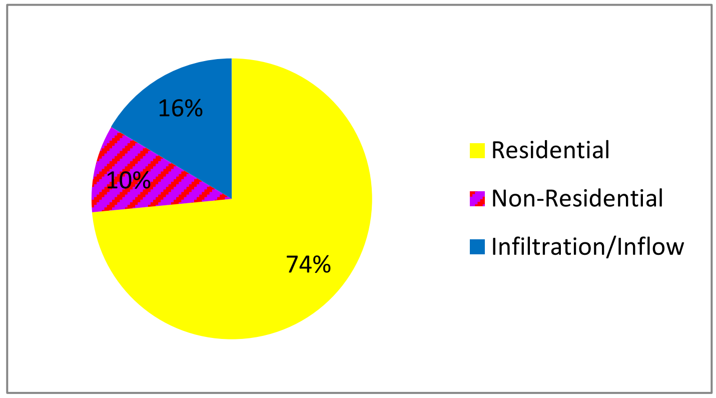
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 9 Service Area had an estimated average annual flow of 0.76 mgd of wastewater in 2015. There was no metered water usage data obtained for this pumping station service area since households in the sanitary districts have private wells and there are no large wastewater generators (> 10,000 gpd) in the is pumping station service area.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 9 Service Area are presented in Table 3-11. A detailed table is included in Appendix D. The total Pumping Station 9 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-20.

Table 3-11: PS 9 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH09-108 (PSSD)	0.08	0.08	0.08	0.08	0.08
MH09-108 (DKSD)	0.19	0.19	0.19	0.19	0.19
MH09-108 (D3SD)	0.08	0.08	0.08	0.08	0.08
MH09-108/108F (McFarland)	0.15	0.18	0.20	0.23	0.34
MH09-101 (McFarland)	0.31	0.31	0.31	0.31	0.31
Total	0.81	0.83	0.85	0.88	0.99

Figure 3-20: PS 9 Sub-Basin Historic Flow Data and Forecast

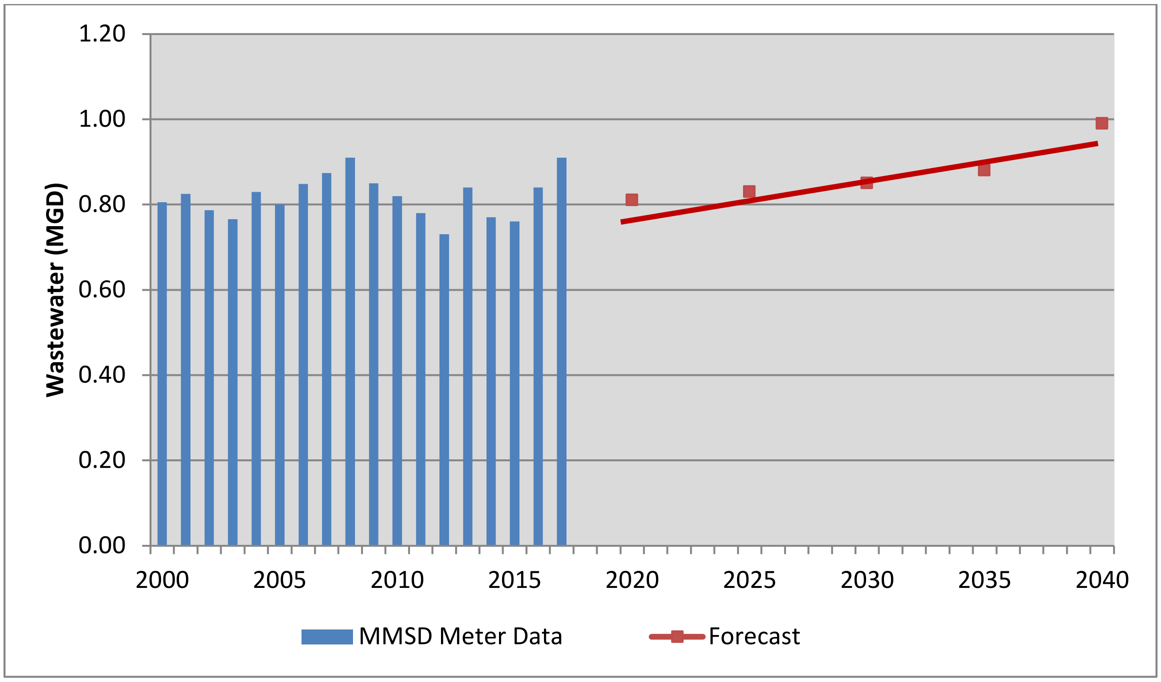
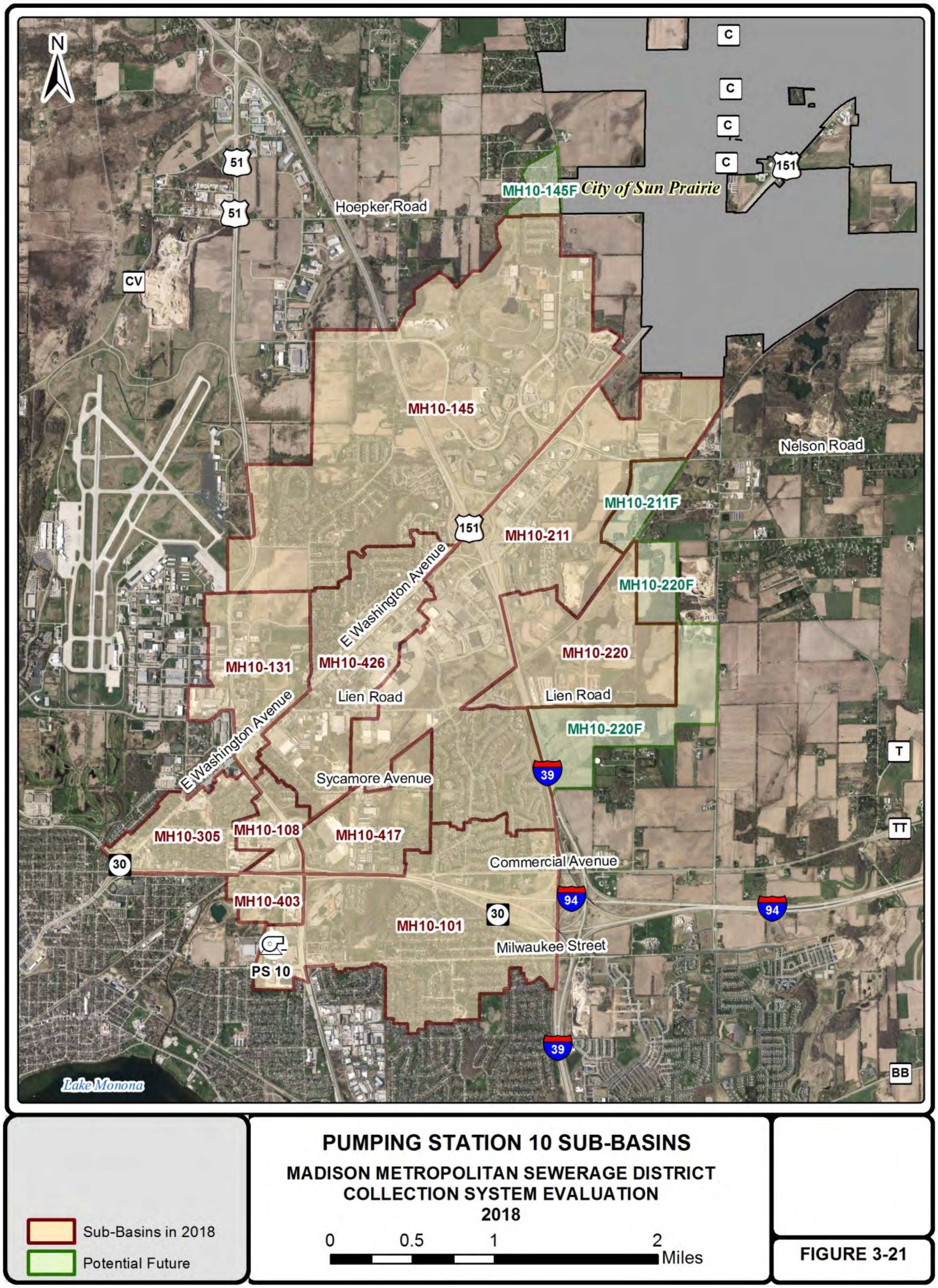


Figure 3-21: Pumping Station 10 Sub-Basins



Pumping Station 10

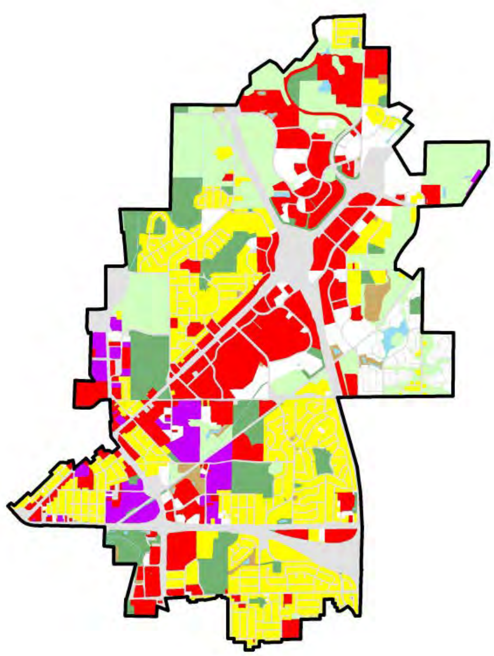
Service Area Description

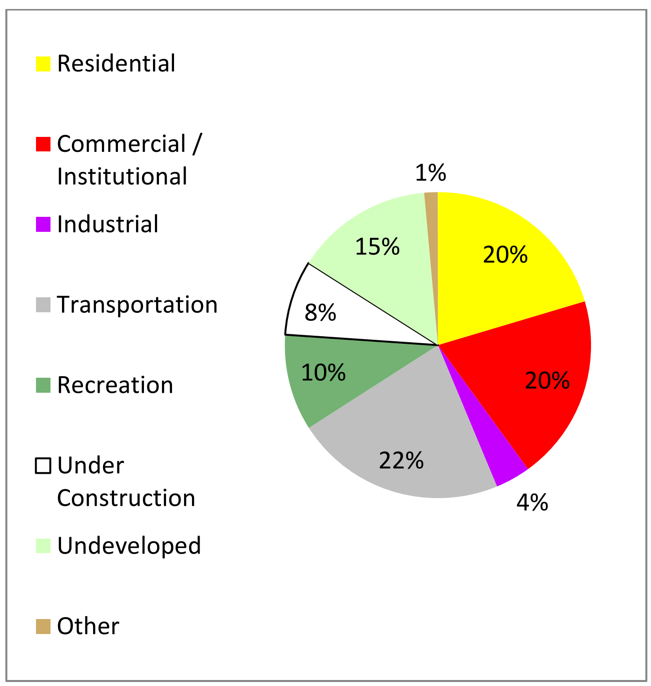
The Pumping Station 10 Service Area covers a general geographic area north of Milwaukee Street along the East Washington Avenue corridor toward the City of Sun Prairie, as shown in Figure 3-21. In 2018, the pumping station served approximately 6,268 acres in the City of Madison. Approximately 511 acres of new development may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 10 service area had an estimated population of 21,353. Population in this area is forecasted to increase to 32,574 by 2040. The forecasted population growth is primarily due to continued development in the Felland, Hanson Road, and Rattman Neighborhoods of the City of Madison. This service area included an estimated 1,201.1 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,672.7 acres by 2040. This service area included an estimated 232.4 acres of industrial land use in 2015. This land use is projected to increase to 286.7 acres by 2040. A detailed table is included in Appendix D.

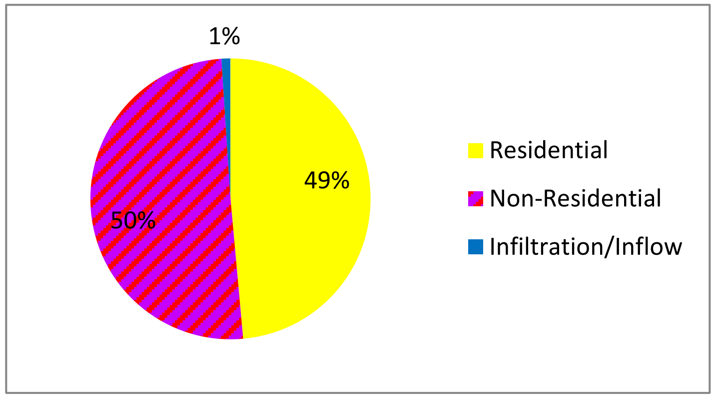
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 10 Service Area had an estimated average annual flow of 2.48 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Twenty-two large wastewater generators (> 10,000 gpd) accounted for 0.65 mgd or 52% of the non-residential wastewater. Aramark Uniform Services accounted for 0.17 mgd, and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.

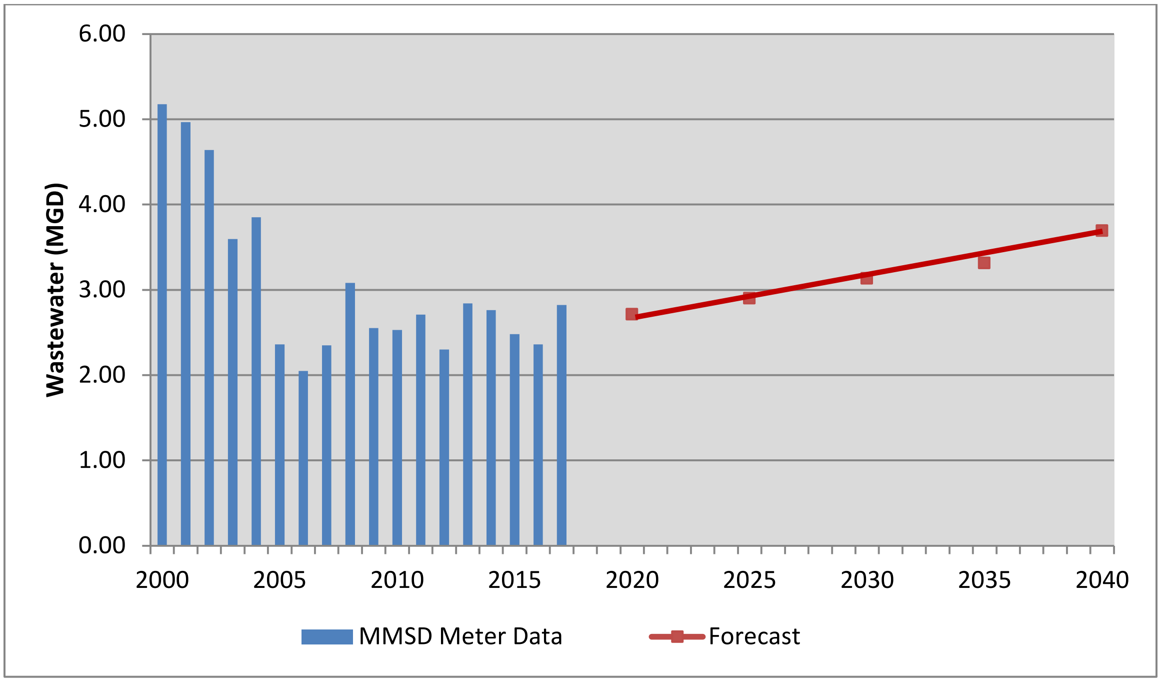


A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 10 Service Area are presented in Table 3-12. A detailed table is included in Appendix D. The total Pumping Station 10 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-22.

Table 3-12: PS 10 Sub-Basin Flow Forecasts

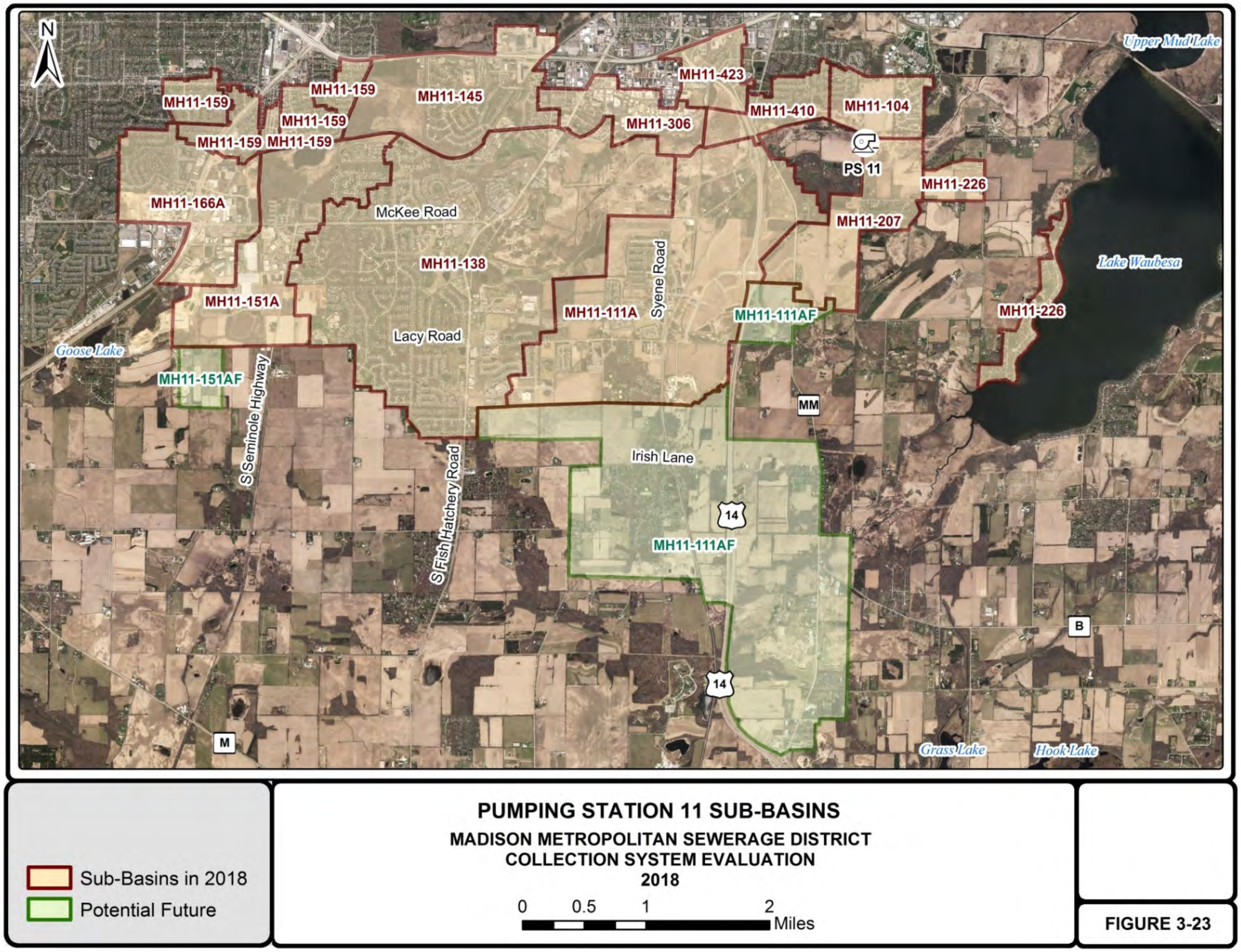
	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH10-145	0.63	0.70	0.79	0.85	0.94
MH10-131	0.17	0.17	0.18	0.18	0.18
MH10-426	0.41	0.42	0.42	0.42	0.43
MH10-220	0.04	0.08	0.18	0.21	0.42
MH10-211	0.47	0.52	0.55	0.63	0.69
MH10-417	0.06	0.06	0.07	0.07	0.07
MH10-403	0.01	0.01	0.01	0.01	0.02
MH10-108	0.17	0.17	0.17	0.17	0.17
MH10-305	0.23	0.23	0.23	0.23	0.23
MH10-101	0.53	0.53	0.53	0.54	0.54
Total	2.71	2.90	3.13	3.31	3.69

Figure 3-22: PS 10 Sub-Basin Historic Flow Data and Forecast



A new, more accurate, flow meter was installed at this pumping station in April 2005.

Figure 3-23: Pumping Station 11 Sub-Basins



Pumping Station 11

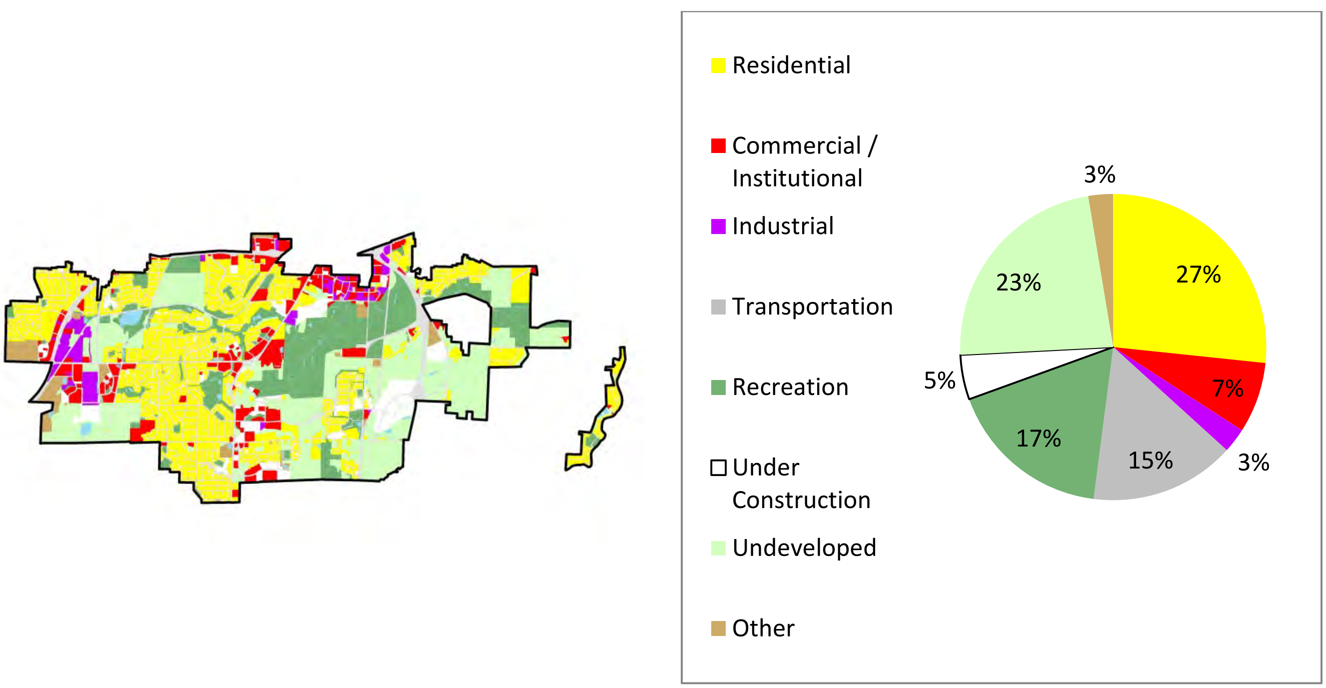
Service Area Description

The Pumping Station 11 Service Area covers a general geographic area south of the Beltline Highway from Verona Road east to Lake Waubesa, as shown in Figure 3-23. In 2018, the pumping station served approximately 9,331 acres in the City of Fitchburg, City of Madison, Town of Madison, and Dunn Sanitary Districts #1 and #4. Approximately 2,946 acres may potentially be added in the future, based on current local comprehensive plans

Baseline Characteristics and Forecasts

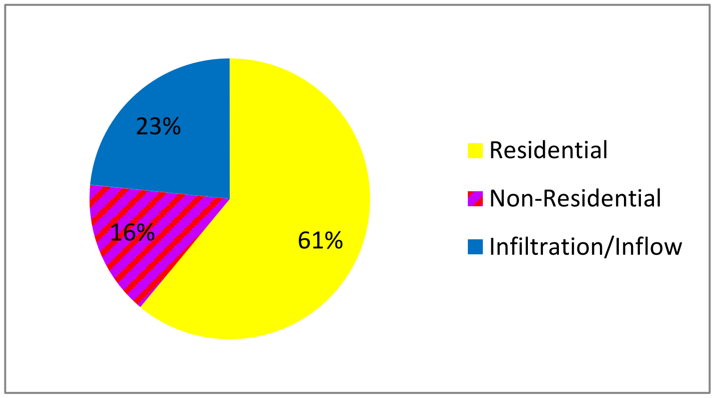
In the year 2015, the Pumping Station 11 service area had an estimated population of 36,734. Population in this area is forecasted to increase to 47,724 by 2040. The forecasted population growth is primarily due to continued development in the City of Fitchburg. This service area included an estimated 696.3 acres of commercial-institutional land use in 2015. This land use is projected to increase to 753.2 acres by 2040. This service area included an estimated 242.9 acres of industrial land use in 2015. This land use is projected to increase to 751.9 acres by 2040. A detailed table is included in Appendix D.

2015 Land Use



Wastewater Flow Estimates and Forecasts

The Pumping Station 11 Service Area had an estimated average annual flow of 3.10 mgd of wastewater in 2015. Known water usage accounted for 99% of the non-residential wastewater flow estimate. Four large wastewater generators (> 10,000 gpd) accounted for 0.22 mgd or 45% of the non-residential wastewater. Promega Corp. accounted for 0.08 mgd (total for 8 locations), and is the largest nonresidential wastewater generator in this area.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 11 Service Area are presented in Table 3-13. A detailed table is included in Appendix D. The total Pumping Station 11 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-24.

Table 3-13: PS 11 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH11-169	0.33	0.39	0.40	0.42	0.43
MH11-159 (Madison)	0.15	0.15	0.15	0.15	0.15
MH11-159 (Fitchburg)	0.24	0.24	0.24	0.24	0.24
MH11-151A	0.16	0.19	0.25	0.26	0.28
MH11-145	0.35	0.35	0.36	0.36	0.36
MH11-138	1.11	1.16	1.20	1.25	1.27
MH11-306	0.18	0.20	0.21	0.22	0.22
MH11-111A	0.31	0.31	0.32	0.32	0.35
MH11-423	0.20	0.21	0.21	0.21	0.22
MH11-410	0.06	0.06	0.06	0.06	0.06
MH11-104	0.17	0.17	0.17	0.17	0.17
MH11-226	0.15	0.15	0.15	0.15	0.15
MH11-207	0.05	0.09	0.11	0.13	0.18
Total	3.47	3.67	3.82	3.95	4.09

Figure 3-24: PS 11 Sub-Basin Historic Flow Data and Forecast

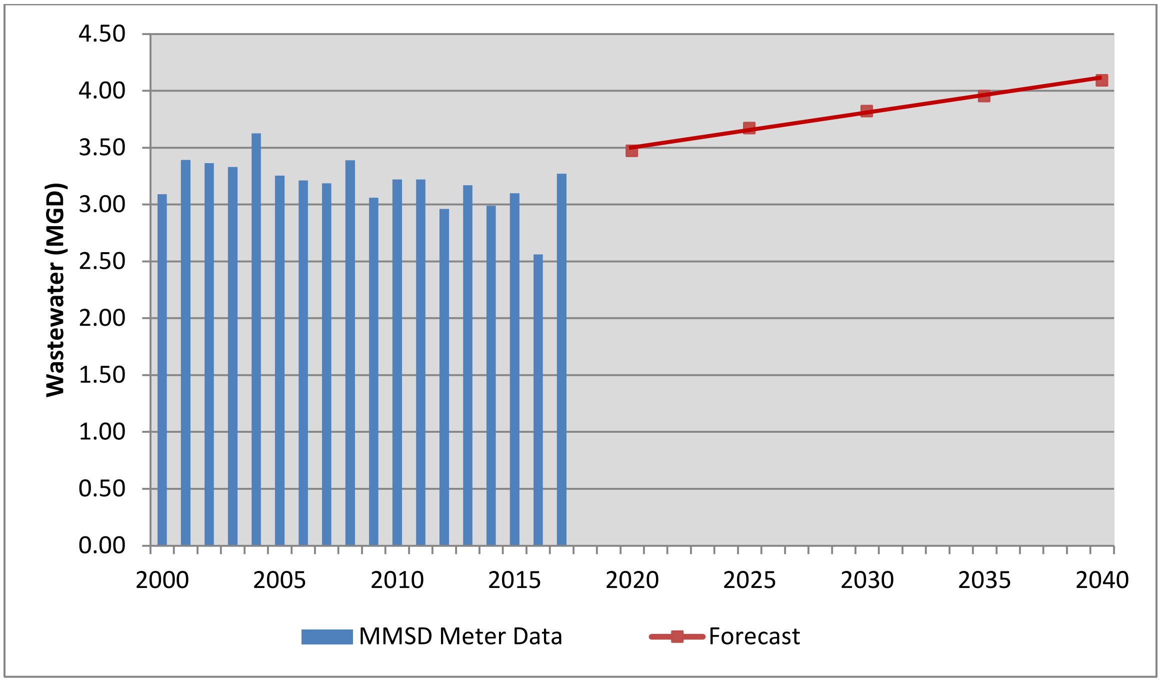
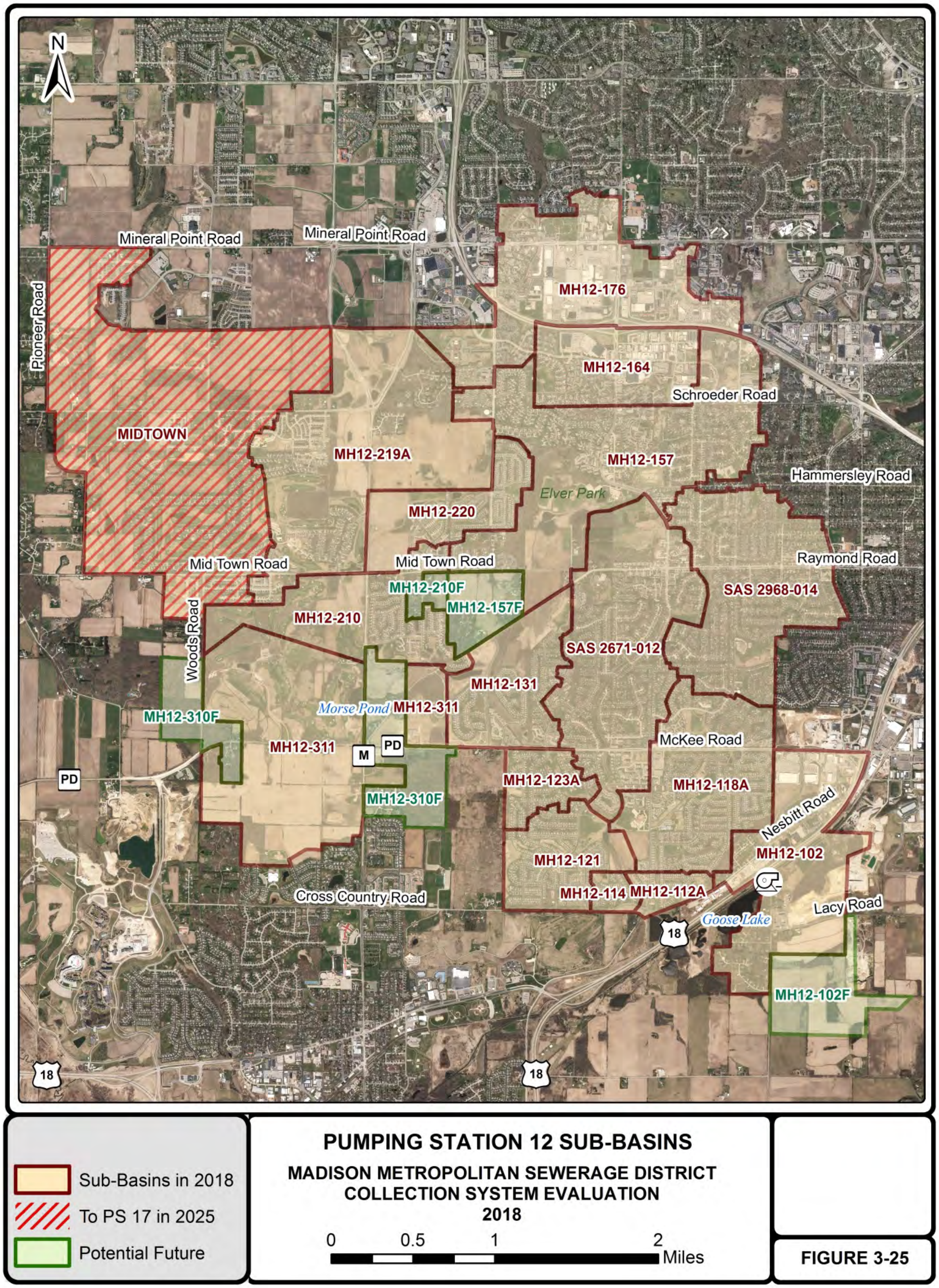


Figure 3-25: Pumping Station 12 Sub-Basins



Pumping Station 12

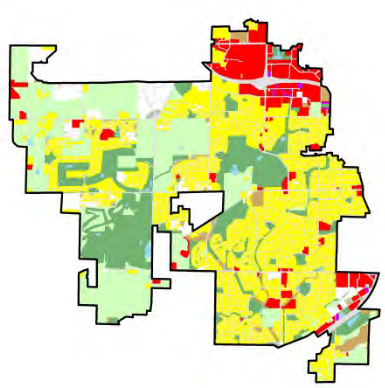
Service Area Description

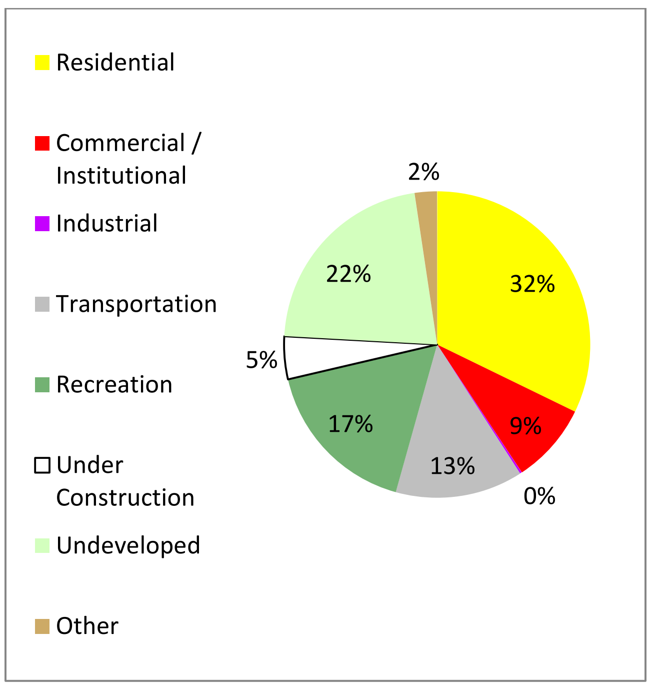
The Pumping Station 12 Service Area covers a general geographic area from Nesbitt Road northwest to Mineral Point Road and Pioneer Road, as shown in Figure 3-25. In 2018, the approved pumping station service area included approximately 8,951 acres in the Cities of Madison, Fitchburg, and Verona and the Towns of Verona and Middleton. Approximately 1,498 acres (Mid Town) are planned to be removed from this area in 2025 with the extension of the Lower Badger Mill Creek Interceptor and become part of the Pumping Station 17 Service Area. Approximately 694 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 12 service area had an estimated population of 39,257. Population in this area is forecasted to increase to 58,918 by 2040. The forecasted population growth is primarily due to continued development in the High Point – Raymond, Mid-Town, and Pioneer Neighborhoods of the City of Madison. This service area included an estimated 720.7 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,013.0 acres by 2040. This service area included an estimated 12.8 acres of industrial land use in 2015. This land use is projected to increase to 37.2 acres by 2040. A detailed table is included in Appendix D.

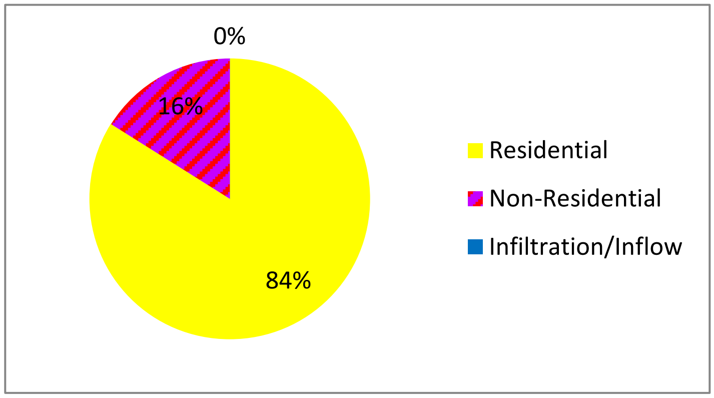
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 12 Service Area had an estimated average annual flow of 2.32 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Five large wastewater generators (> 10,000 gpd) accounted for 0.08 mgd or 20% of the non-residential wastewater. The West Towne Mall accounted for 0.03 mgd (all mall stores), and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.

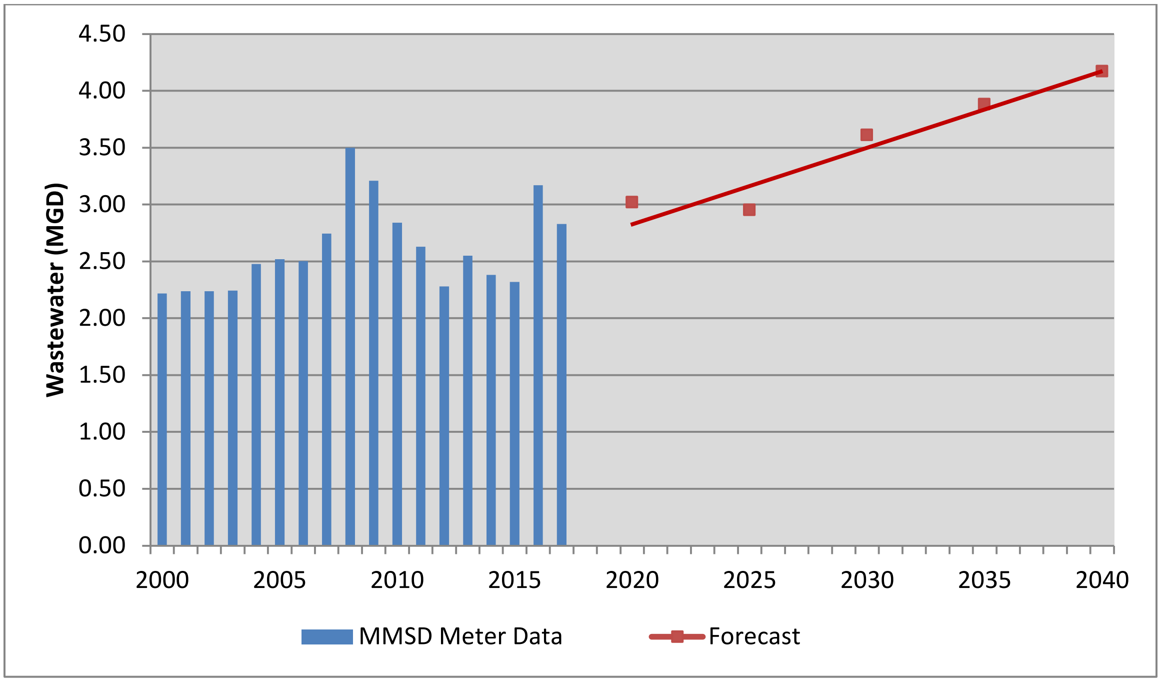


A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 12 Service Area are presented in Table 3-14. A detailed table is included in Appendix D. The total Pumping Station 12 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-26.

Table 3-14: PS 12 Sub-Basin Flow Forecasts

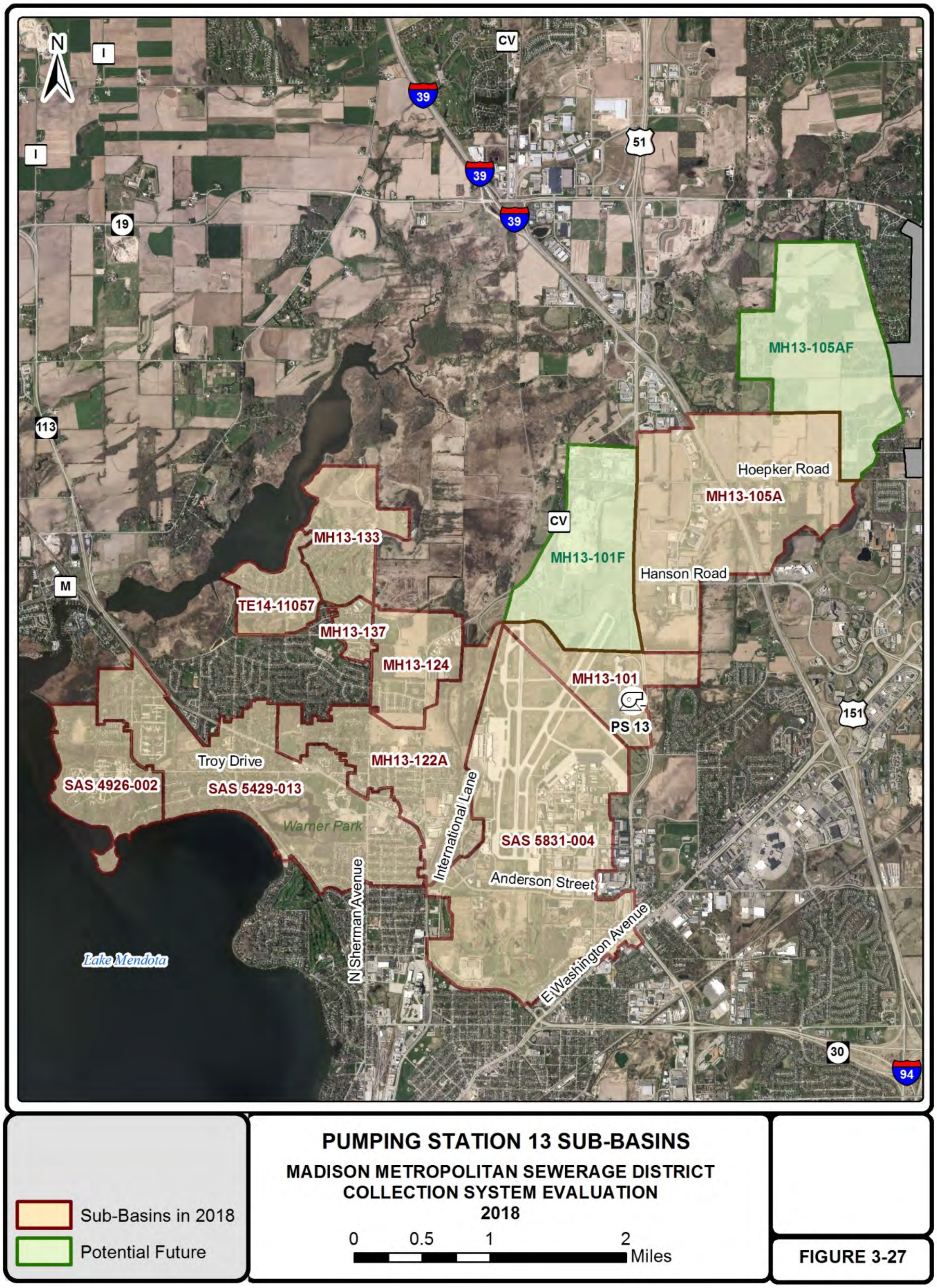
	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH12-220	0.13	0.13	0.20	0.20	0.20
MIDTOWN	0.19		TO PS 17		
MH12-219A	0.16	0.18	0.37	0.44	0.47
MH12-210	0.04	0.11	0.12	0.22	0.24
MH12-311	0.03	0.06	0.43	0.53	0.69
MH12-176	0.48	0.48	0.48	0.48	0.50
MH12-164	0.18	0.18	0.18	0.18	0.18
MH12-157	0.34	0.34	0.35	0.35	0.36
MH12-131	0.13	0.13	0.13	0.13	0.13
MH12-123A	0.04	0.04	0.04	0.04	0.04
SAS 2968-014	0.32	0.32	0.32	0.32	0.32
SAS 2671-012	0.39	0.39	0.39	0.39	0.40
MH12-121	0.11	0.11	0.11	0.11	0.11
MH12-118A	0.32	0.32	0.32	0.32	0.32
MH12-114	0.02	0.02	0.02	0.02	0.02
MH12-112A	0.04	0.04	0.04	0.04	0.04
MH12-102/102F	0.11	0.11	0.13	0.13	0.15
Total	3.02	2.95	3.61	3.88	4.17

Figure 3-26: PS 12 Sub-Basin Historic Flow Data and Forecast



A new flow meter was installed at Pumping Station 12 in August of 2016. The decrease in the wastewater flow forecasts from 2020 to 2025 is due to the scheduled completion of the Lower Badger Mill Creek Interceptor. Wastewater from the City of Madison's South Point and Mid Town lift stations will then flow by gravity to Pumping Station 17.

Figure 3-27: Pumping Station 13 Sub-Basins



Pumping Station 13

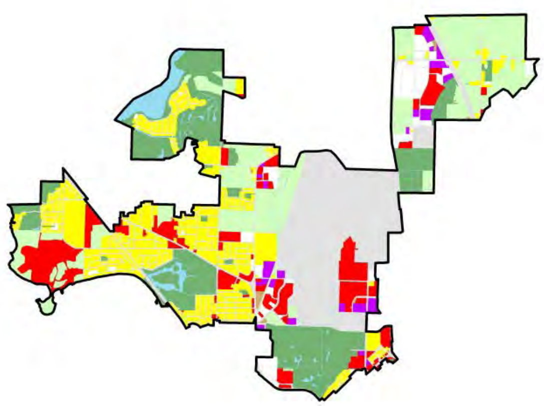
Service Area Description

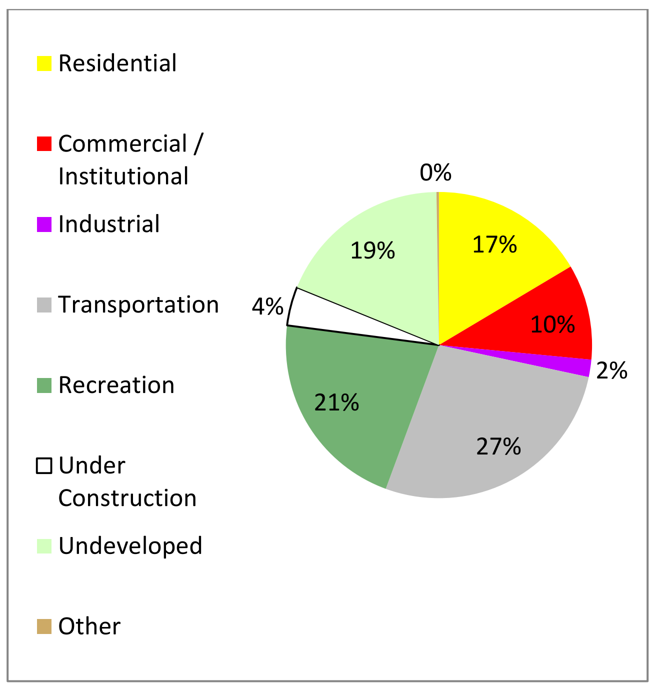
The Pumping Station 13 Service Area covers a general geographic area west of US Highway 51 northwest of East Washington Avenue, and north of the Village of Maple Bluff to the Yahara River, as shown in Figure 3-27. In 2018, the approved pumping station service area included approximately 6,295 acres in the City of Madison. Approximately 1,433 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 13 service area had an estimated population of 12,493. Population in this area is forecasted to increase to 21,801 by 2040. The forecasted population growth is primarily due to continued development in the Cherokee, Hanson Road, and Pumpkin Hollow Neighborhoods of the City of Madison. This service area included an estimated 682.6 acres of commercial-institutional land use in 2015. This land use is projected to increase to 704.6 acres by 2040. This service area included an estimated 113.7 acres of industrial land use in 2015. This land use is projected to increase to 475.0 acres by 2040. A detailed table is included in Appendix D.

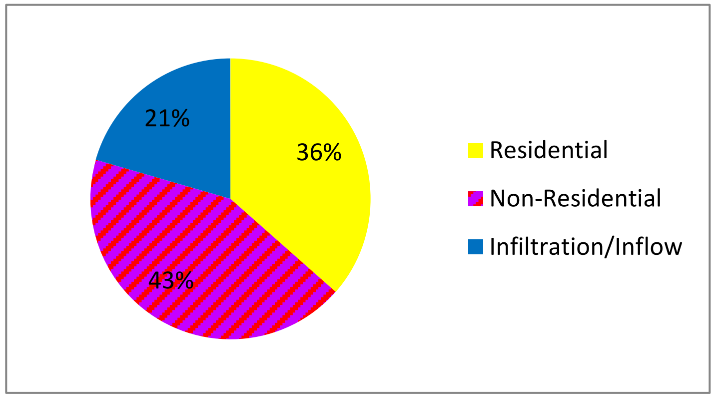
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 13 Service Area had an estimated average annual flow of 1.88 mgd of wastewater in 2015. Known water usage accounted for 100% of the non-residential wastewater flow estimate. Three large wastewater generators (> 10,000 gpd) accounted for 0.62 mgd or 77% of the non-residential wastewater. Covance accounted for 0.34 mgd, and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 13 Service Area are presented in Table 3-15. A detailed table is included in Appendix D. The total Pumping Station 13 Service Area flow forecasts through 2040 are compared to the historic MMSD meter data for the service area in Figure 3-28.

Table 3-15: PS 13 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
TE14-11057	0.03	0.03	0.03	0.03	0.03
MH13-137	0.08	0.08	0.08	0.08	0.08
MH13-133	0.01	0.01	0.01	0.01	0.01
MH13-124	0.05	0.10	0.10	0.10	0.11
SAS 4926-002	0.29	0.29	0.29	0.29	0.29
SAS 5429-013	0.52	0.52	0.52	0.52	0.52
SAS 5831-004	0.73	0.73	0.73	0.73	0.73
MH13-122A	0.26	0.27	0.28	0.28	0.28
MH13-105A	0.08	0.15	0.26	0.53	0.82
MH13-101	<0.01	<0.01	<0.01	<0.01	<0.01
Total	2.07	2.19	2.31	2.58	2.88

Figure 3-28: PS 13 Sub-Basin Historic Flow Data and Forecast

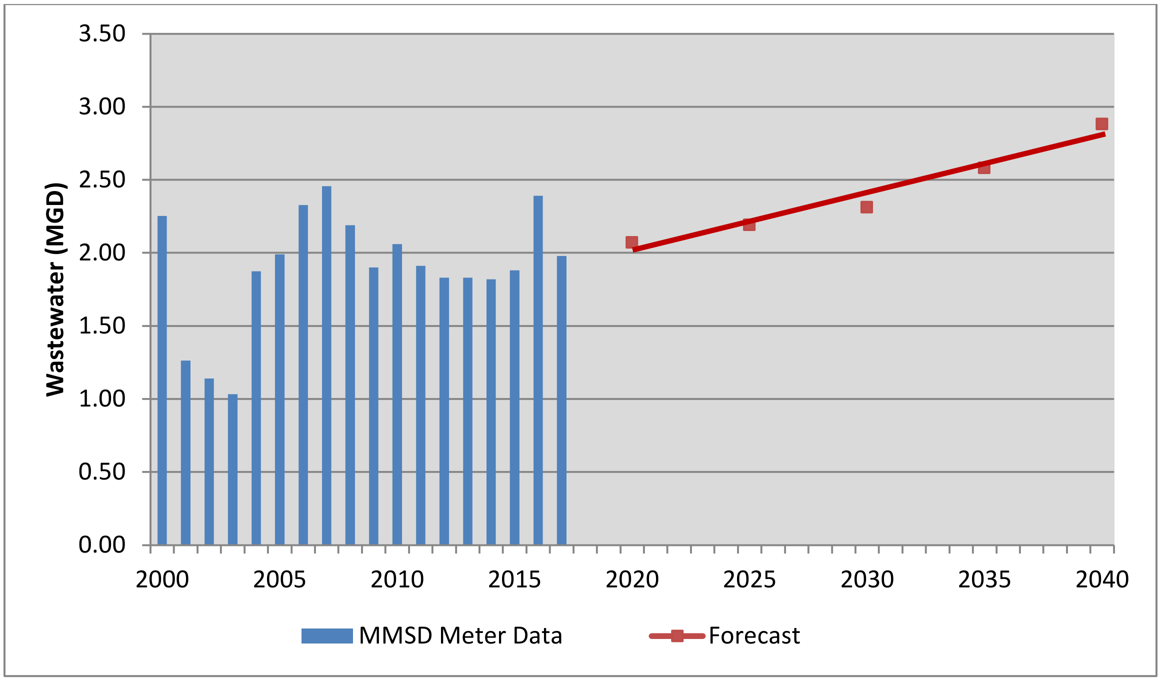


Figure 3-29: Pumping Station 14 Sub-Basins - East

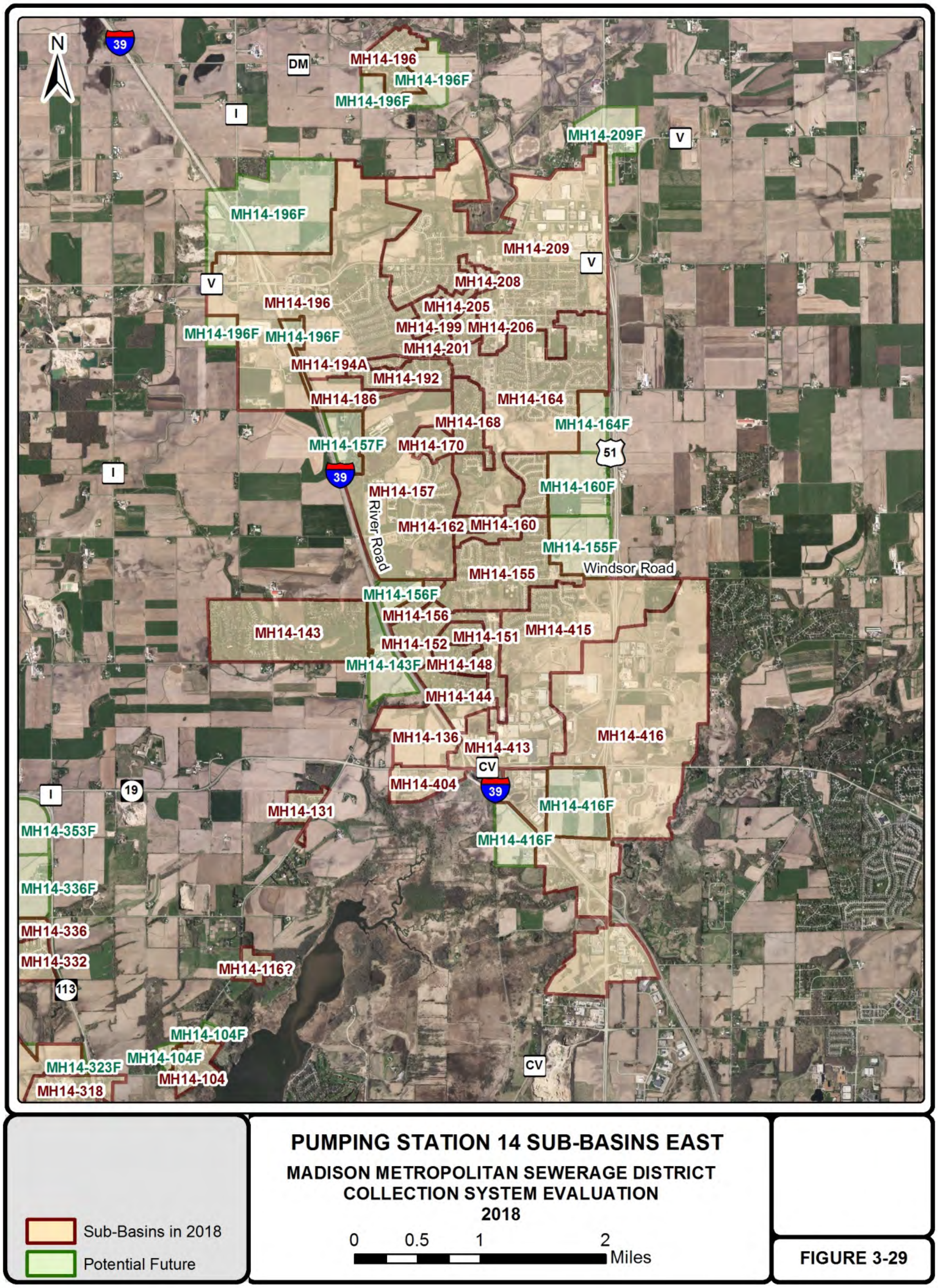
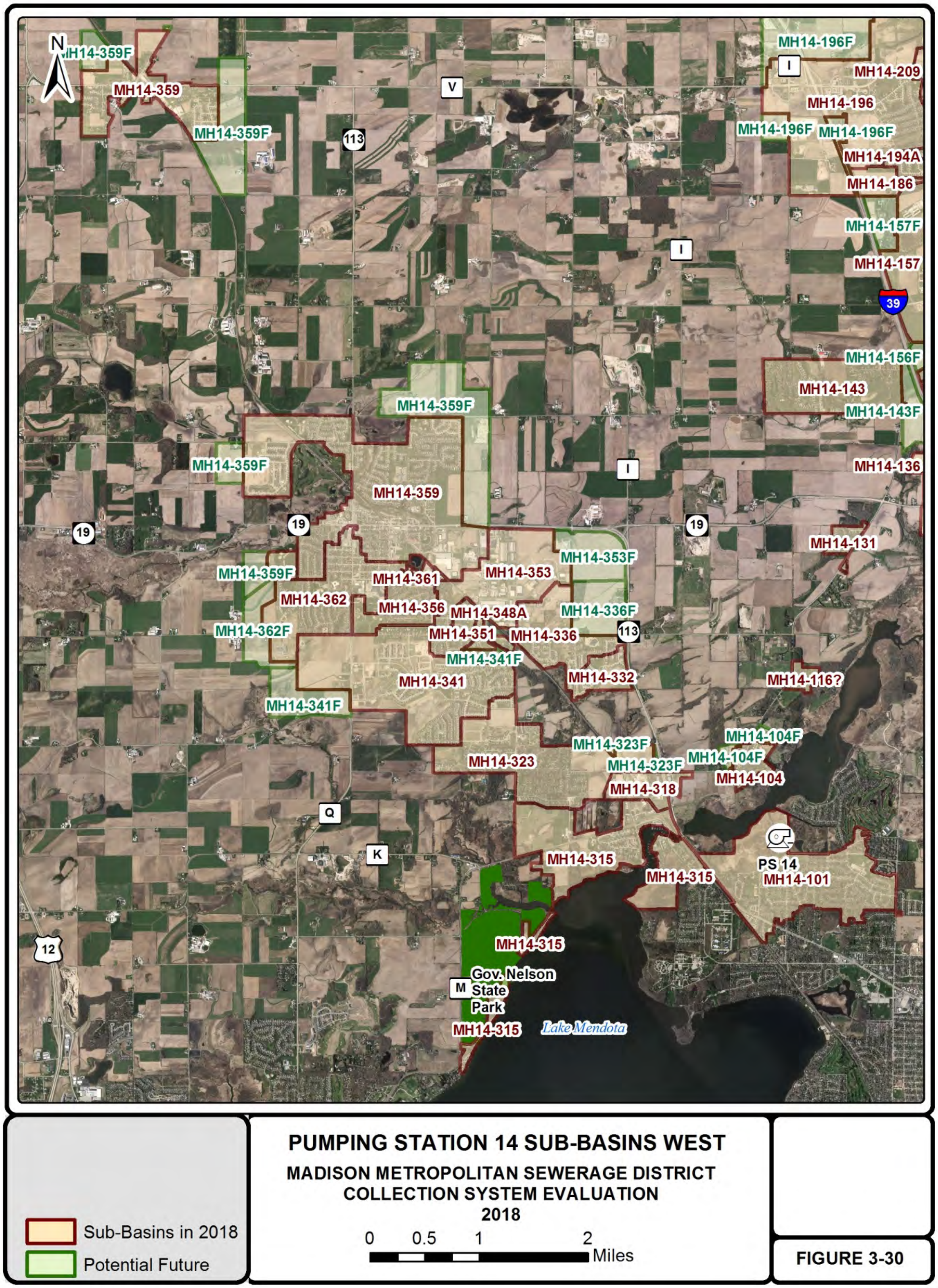


Figure 3-30: Pumping Station 14 Sub-Basins - West



Pumping Station 14

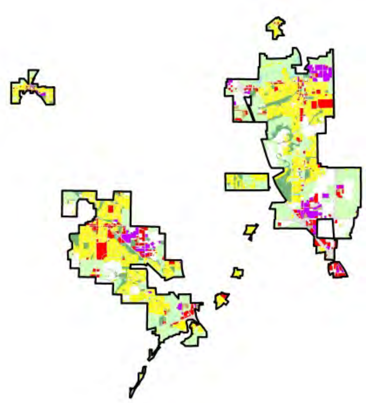
Service Area Description

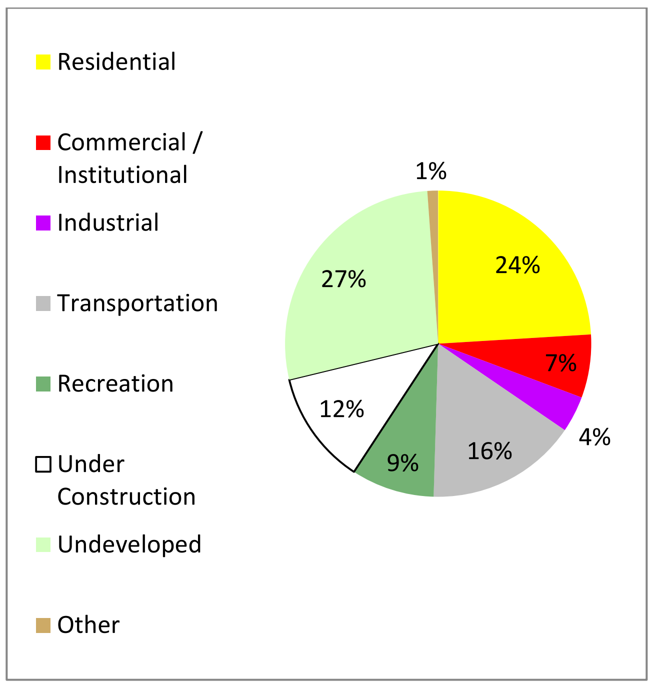
The Pumping Station 14 Service Area covers a general geographic area south from Morrisonville between Interstate 39 and United States Highway 51, as shown in Figure 3-29 and from the Village of Dane southeast to where the Yahara River enters Lake Mendota, as shown in Figure 3-30. In 2018, the approved pumping station service area included approximately 14,654 acres in the in the Villages of Dane, DeForest, Waunakee and Windsor, sanitary and utility districts in the Towns of Vienna and Westport, and part of the City of Madison. Approximately 3,026 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 14 service area had an estimated population of 35,937. Population in this area is forecasted to increase to 46,930 by 2040. The forecasted population growth is primarily due to continued development in the Villages of DeForest, Waunakee, and Windsor. This service area included an estimated 939.7 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,286.4 acres by 2040. This service area included an estimated 538.1 acres of industrial land use in 2015. This land use is projected to increase to 1,160.6 acres by 2040. A detailed table is included in Appendix D.

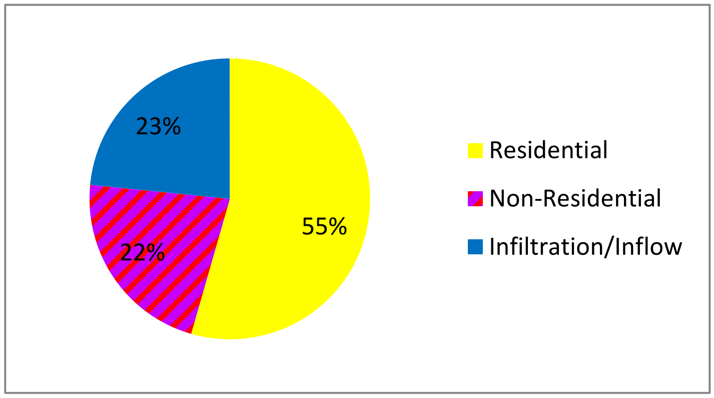
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 14 Service Area had an estimated average annual flow of 3.63 mgd of wastewater in 2015. Known water usage accounted for 29% of the non-residential wastewater flow estimate. Four large wastewater generators (> 10,000 gpd) accounted for 0.23 mgd or 29% of the non-residential wastewater. Scientific Protein Labs in Waunakee accounted for 0.19 mgd and is the largest nonresidential wastewater generator in this area. A detailed table is included in Appendix B.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 14 Service Area are presented in Table 3-16. A detailed table is included in Appendix D. The total Pumping Station 14 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-31.

Table 3-16: PS 14 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH14-359 Dane	0.06	0.07	0.08	0.08	0.08
MH14-359 Waunakee	0.83	0.85	0.87	0.92	0.95
MH14-362	0.24	0.26	0.28	0.30	0.31
MH14-361	0.01	0.01	0.01	0.01	0.01
MH14-360	0.01	0.01	0.01	0.01	0.01
MH14-356	0.10	0.10	0.10	0.10	0.10
MH14-355	<0.01	<0.01	<0.01	<0.01	<0.01
MH14-353	0.10	0.10	0.13	0.13	0.14
MH14-351	0.05	0.05	0.05	0.05	0.05
MH14-348A	0.01	0.01	0.01	0.01	0.01
MH14-343	<0.01	<0.01	<0.01	<0.01	<0.01
MH14-341	0.18	0.23	0.25	0.30	0.32
MH14-336	0.10	0.10	0.11	0.11	0.11
MH14-332	0.05	0.06	0.06	0.06	0.06
MH14-323	0.16	0.16	0.18	0.21	0.23
MH14-318	0.02	0.02	0.02	0.02	0.02
MH14-315	0.20	0.18	0.19	0.19	0.19
MH14-209	0.37	0.38	0.38	0.39	0.39
MH14-208	0.01	0.01	0.01	0.01	0.01
MH14-206	0.02	0.02	0.02	0.02	0.02
MH14-205	0.03	0.03	0.03	0.03	0.03
MH14-201	0.01	0.01	0.01	0.01	0.01
MH14-199	0.02	0.02	0.02	0.02	0.02

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH14-196	0.06	0.06	0.06	0.06	0.06
MH14-196	0.14	0.15	0.16	0.16	0.18
MH14-195	<0.01	<0.01	<0.01	<0.01	<0.01
MH14-194A	0.01	0.01	0.01	0.01	0.01
MH14-192	0.04	0.04	0.04	0.04	0.04
MH14-186/186F	<0.01	<0.01	<0.01	0.01	0.01
MH14-170	0.01	0.01	0.01	0.01	0.01
MH14-168	0.03	0.03	0.03	0.03	0.03
MH14-164	0.25	0.27	0.28	0.28	0.28
MH14-162	0.01	0.01	0.01	0.01	0.01
MH14-160/160F	0.08	0.08	0.08	0.09	0.09
MH14-157	0.04	0.05	0.05	0.05	0.05
MH14-156	0.01	0.01	0.01	0.01	0.01
MH14-155	0.14	0.14	0.14	0.14	0.14
MH14-152	0.09	0.09	0.09	0.09	0.09
MH14-151	0.01	0.01	0.01	0.01	0.01
MH14-148	0.01	0.01	0.01	0.01	0.01
MH14-144	0.02	0.02	0.02	0.02	0.02
MH14-143	0.04	0.04	0.04	0.04	0.04
MH14-136F	0.04	0.06	0.06	0.06	0.06
MH14-416	0.07	0.07	0.08	0.08	0.08
MH14-416	0.01	0.02	0.03	0.04	0.05
MH14-415	0.10	0.12	0.13	0.14	0.15
MH14-413	0.02	0.02	0.02	0.02	0.02
MH14-404	0.01	0.01	0.01	0.01	0.01
MH14-131	0.01	0.01	0.01	0.01	0.01
MH14-104	0.02	0.02	0.02	0.02	0.02
MH14-101	0.41	0.41	0.41	0.41	0.41
Total	4.25	4.40	4.60	4.78	4.94

Figure 3-31: PS 14 Sub-Basin Historic Flow Data and Forecast

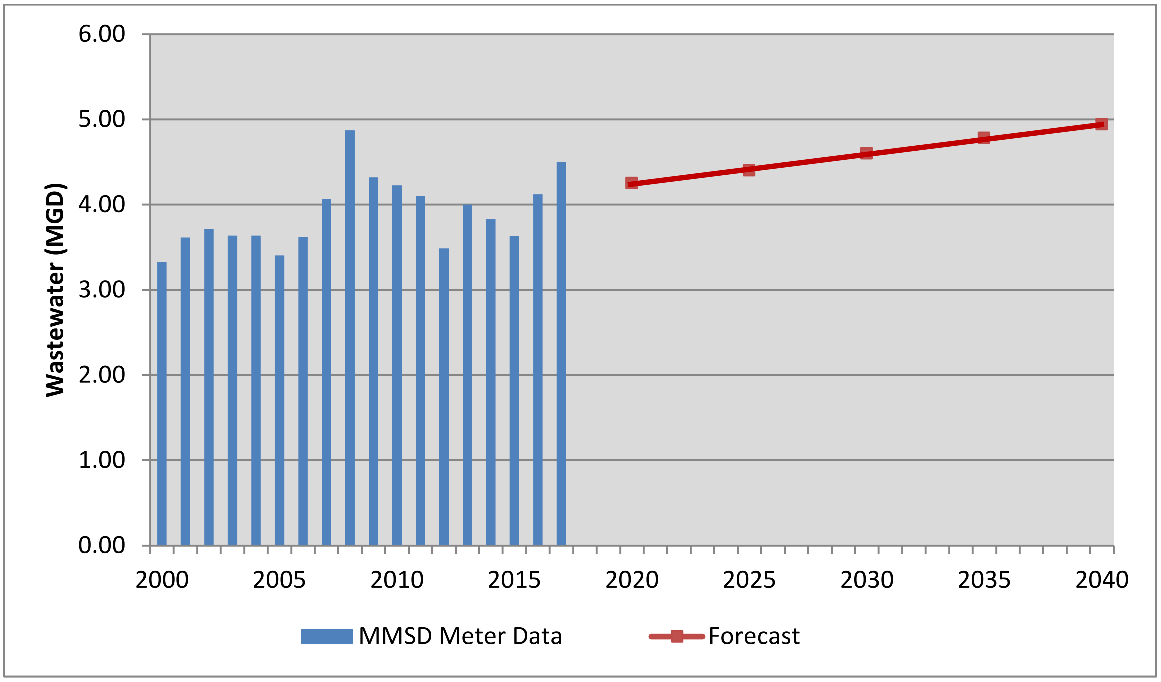
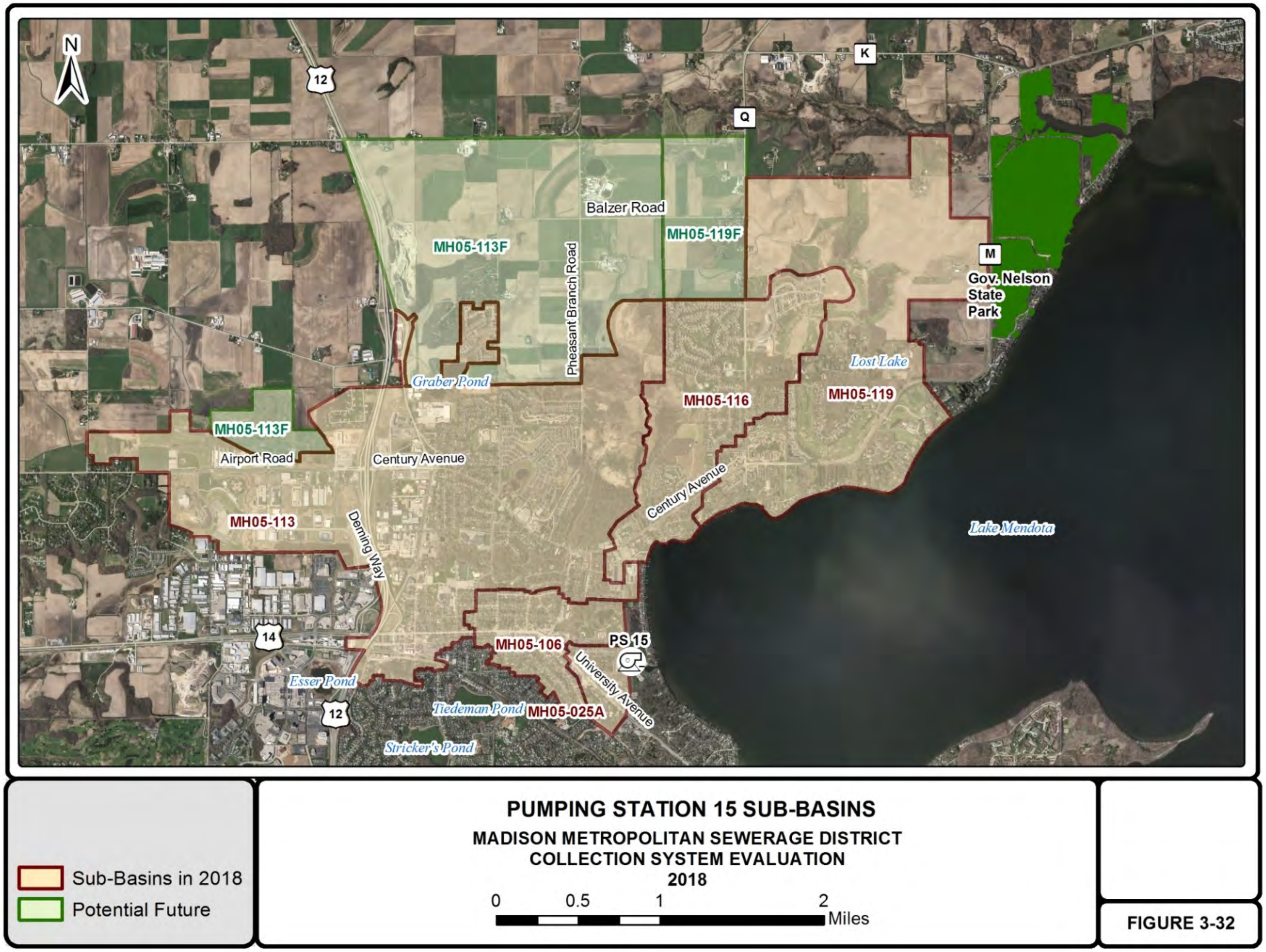


Figure 3-32: Pumping Station 15 Sub-Basins



Pumping Station 15

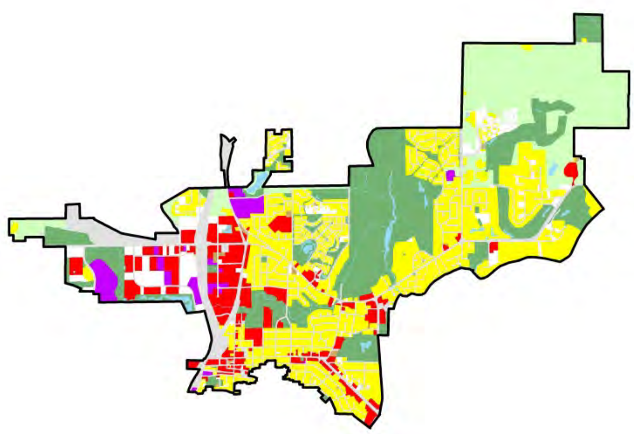
Service Area Description

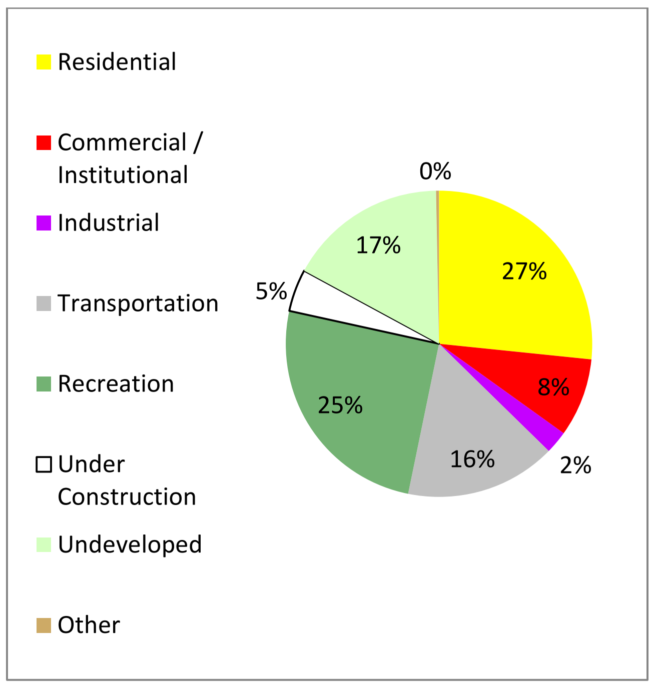
The Pumping Station 15 Service Area covers a general geographic area north of University Avenue in the City of Middleton, as shown in Figure 3-32. In 2018, the approved pumping station service area included approximately 4,834 acres in the City of Middleton and part of the Town of Westport. Approximately 1,916 acres may potentially be added in the future.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 15 service area had an estimated population of 14,917. Population in this area is forecasted to increase to 33,040 by 2040. The forecasted population growth is primarily due to continued development in the City of Middleton and Town of Westport. This service area included an estimated 400.3 acres of commercial-institutional land use in 2015. This land use is projected to increase to 428.2 acres by 2040. This service area included an estimated 112.1 acres of industrial land use in 2015. This land use is projected to increase to 178.1 acres by 2040. A detailed table is included in Appendix D.

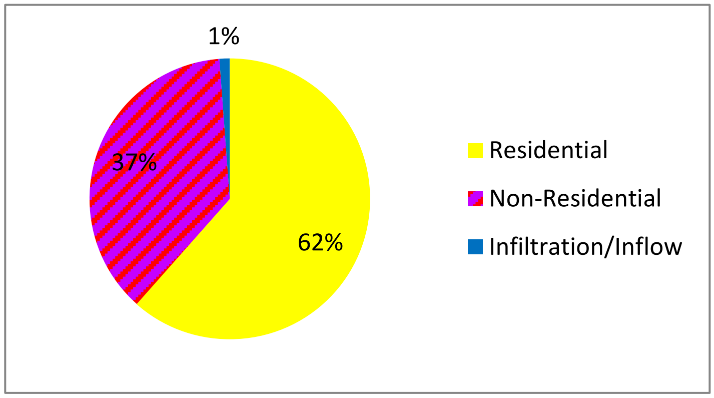
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 15 Service Area had an estimated average annual flow of 1.31 mgd of wastewater in 2015. Known water usage accounted for 26% of the non-residential wastewater flow estimate. Springs Window Fashions accounted for 0.10 mgd, or 20% of the non-residential wastewater, and is the only large nonresidential wastewater generator in this area. A detailed table is included in Appendix B.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 15 Service Area are presented in Table 3-17. A detailed table is included in Appendix D. The total Pumping Station 15 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-33.

Table 3-17: PS 15 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
MH05-119/119F	0.19	0.27	0.35	0.55	0.62
MH05-116	0.24	0.25	0.28	0.29	0.29
MH05-113/113F	0.87	0.88	0.89	1.10	1.34
MH05-106	0.10	0.10	0.10	0.10	0.10
MH05-025A	0.07	0.07	0.07	0.07	0.07
Total	1.48	1.58	1.69	2.11	2.43

Figure 3-33: PS 15 Sub-Basin Historic Flow Data and Forecast

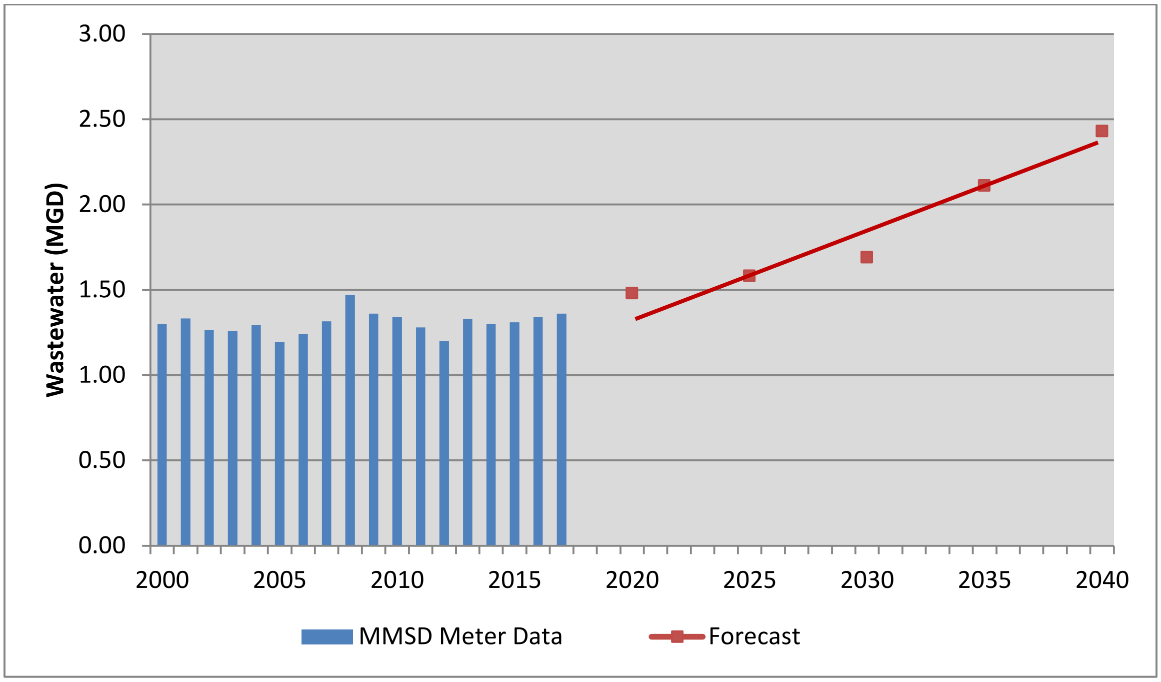
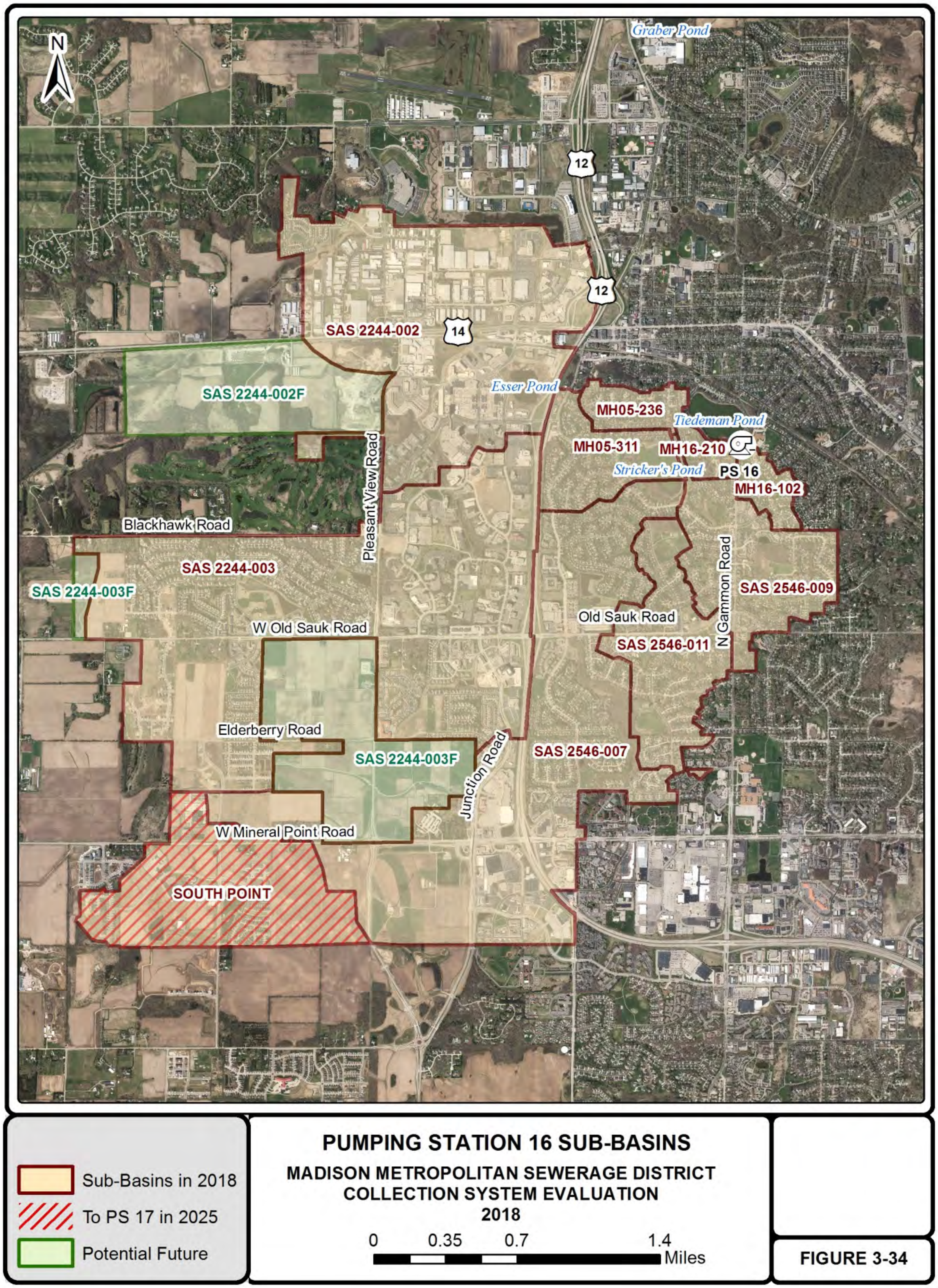


Figure 3-34: Pumping Station 16 Sub-Basins



Pumping Station 16

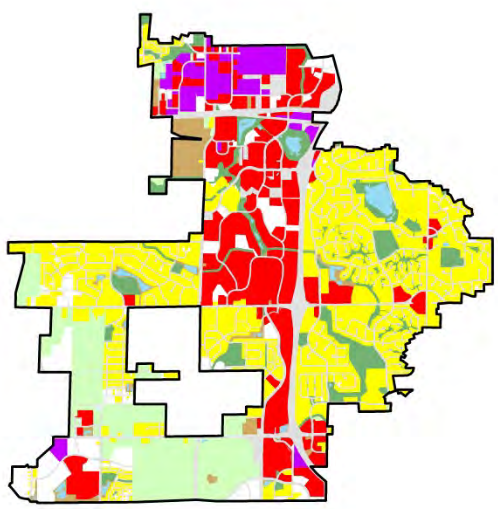
Service Area Description

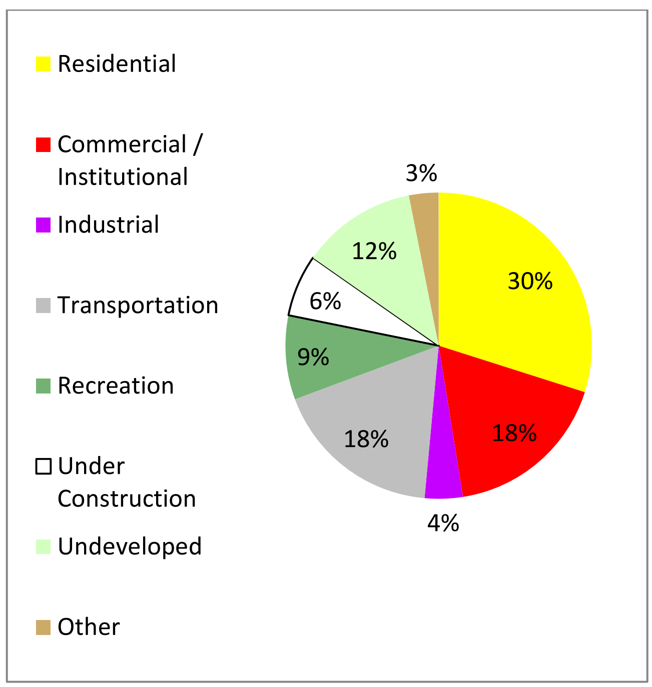
The Pumping Station 16 Service Area covers a general geographic area north of W. Mineral Point Road and west of N. Gammon Road, as shown in Figure 3-34. In 2018, the approved pumping station service area included approximately 4,703 acres in the City of Madison and City of Middleton. Approximately 420 acres (South Point) are planned to be removed from this area in 2025 and become part of the Pumping Station 17 Service Area. Approximately 756 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 16 service area had an estimated population of 18,370. Population in this area is forecasted to increase to 26,299 by 2040. The forecasted population growth is primarily due to continued development in the Blackhawk, Elderberry, Junction, and Pioneer Neighborhoods of the City of Madison. This service area included an estimated 842.1 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,061.6 acres by 2040. This service area included an estimated 183.7 acres of industrial land use in 2015. This land use is projected to increase to 278.7 acres by 2040. A detailed table is included in Appendix D.

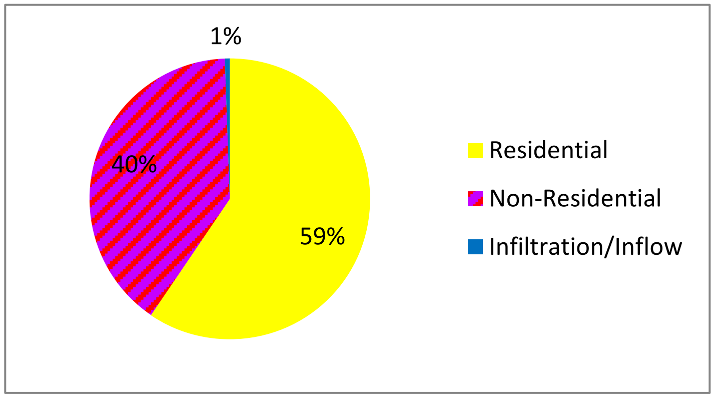
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 16 Service Area had an estimated average annual flow of 1.69 mgd of wastewater in 2015. Known water usage accounted for 99% of the non-residential wastewater flow estimate. Eleven large wastewater generators (> 10,000 gpd) accounted for 0.24 mgd or 36% of the non-residential wastewater. King Pharmeceuticals accounted for 0.05 mgd, and is the largest nonresidential wastewater generator in this area.



A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 16 Service Area are presented in Table 3-18. A detailed table is included in Appendix D. The total Pumping Station 16 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-35.

Table 3-18: PS 16 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
SAS 2244-003/F	0.72	0.88	0.91	0.94	1.18
SAS 2244-002	0.34	0.34	0.34	0.35	0.35
MH05-311	0.05	0.05	0.05	0.05	0.05
MH05-236	0.02	0.02	0.02	0.02	0.02
MH16-210	0.04	0.04	0.04	0.04	0.04
MH16-102	0.01	0.01	0.01	0.01	0.01
SAS 2546-007	0.46	0.57	0.61	0.65	0.69
SOUTH POINT	0.11		TO PS 17		
SAS 2546-011	0.12	0.12	0.12	0.12	0.12
SAS 2546-009	0.13	0.13	0.13	0.13	0.13
Total	2.00	2.16	2.24	2.31	2.59

Figure 3-35: PS 16 Sub-Basin Historic Flow Data and Forecast

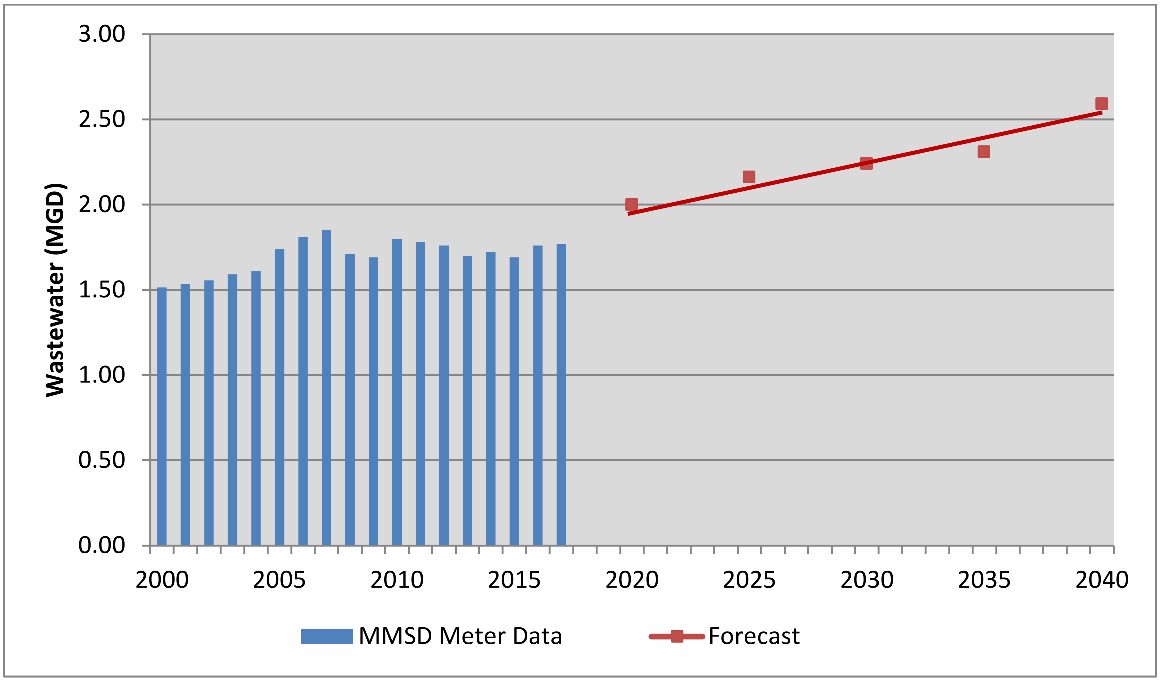
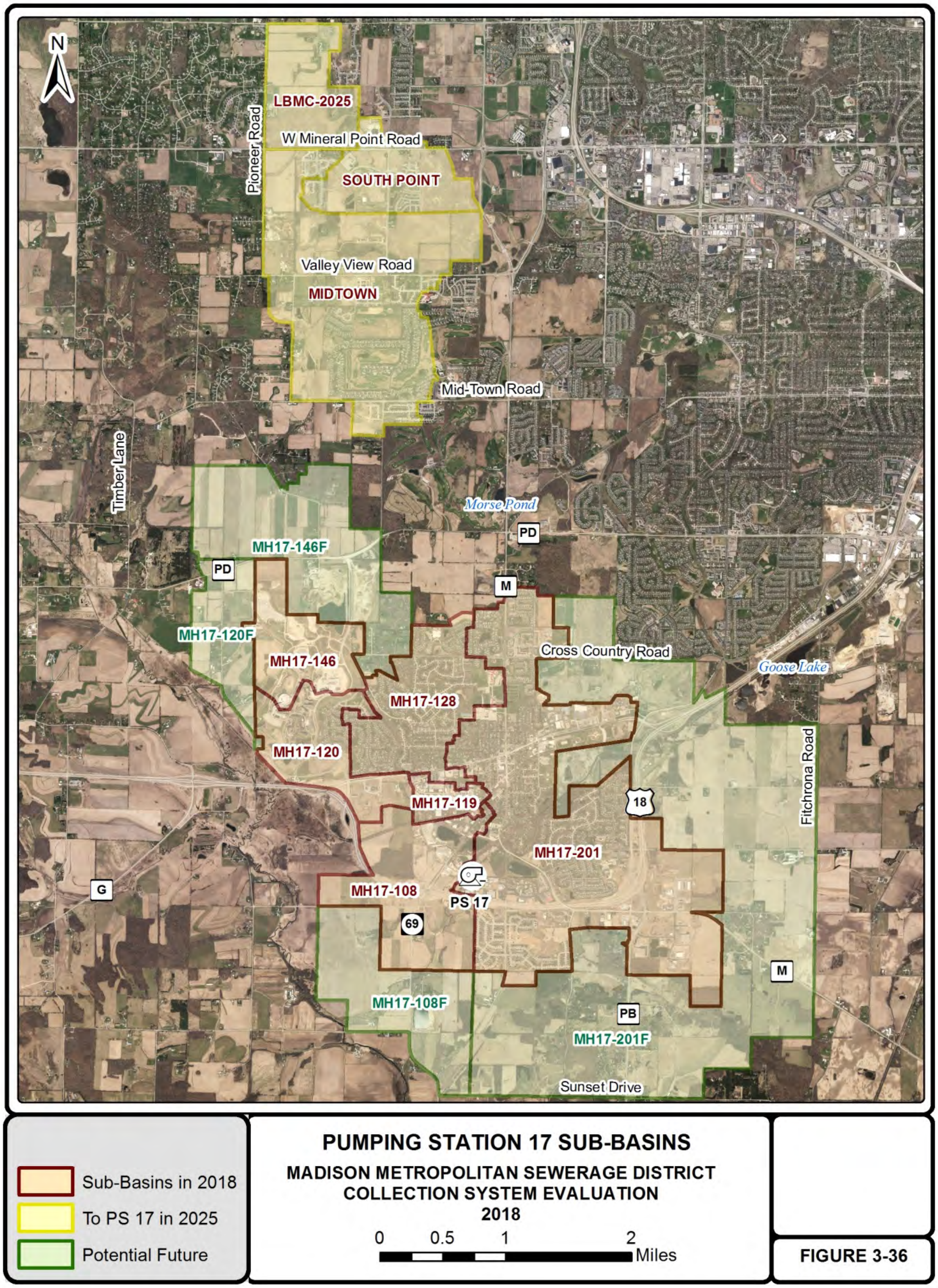


Figure 3-36: Pumping Station 17 Sub-Basins



Pumping Station 17

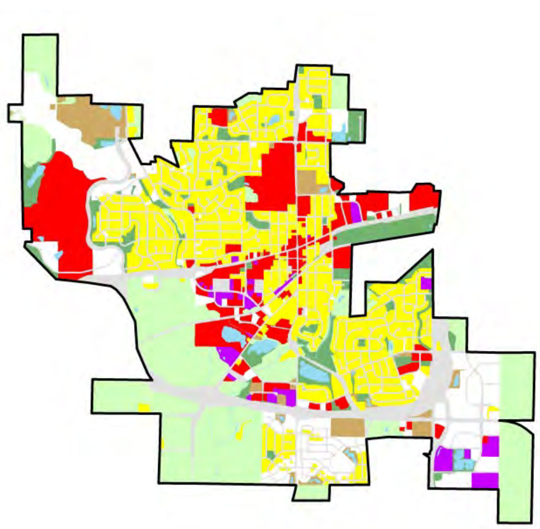
Service Area Description

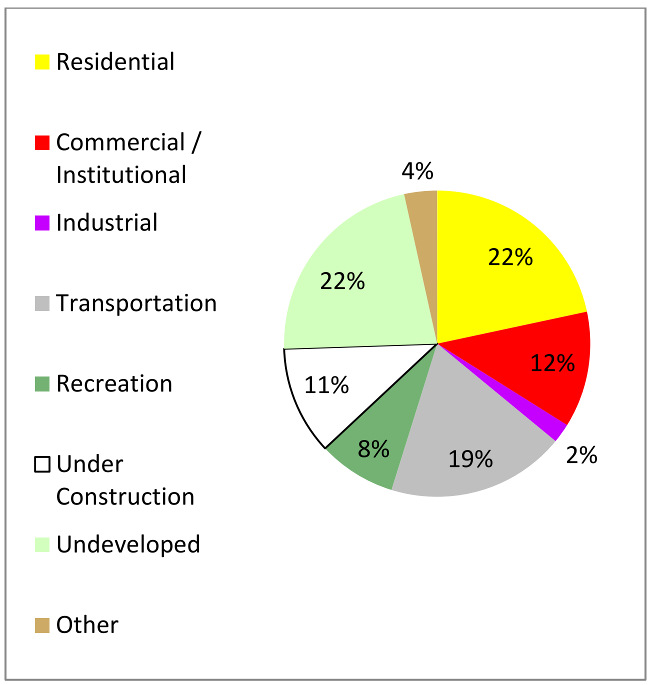
The Pumping Station 17 Service Area covers the general geographic area of the City of Verona, as shown in Figure 3-36. In 2018, the approved pumping station service area included approximately 4,684 acres in the City of Verona. The boundaries of this pumping station service area are expected to grow significantly, adding 2,328 acres in 2025 with the completion of the Lower Bader Mill Creek Interceptor. Approximately 5,492 acres may potentially be added in the future, based on current local comprehensive plans.

Baseline Characteristics and Forecasts

In the year 2015, the Pumping Station 17 service area had an estimated population of 12,430. Population in this area is forecasted to increase to 38,061 by 2040. The forecasted population growth is primarily due to continued development in the City of Verona, and the completion of the Lower Bader Mill Creek Interceptor. This service area included an estimated 552.7 acres of commercial-institutional land use in 2015. This land use is projected to increase to 1,721.6 acres by 2040. This service area included an estimated 14.2 acres of industrial land use in 2015. This land use is projected to increase to 457.5 acres by 2040. A detailed table is included in Appendix D.

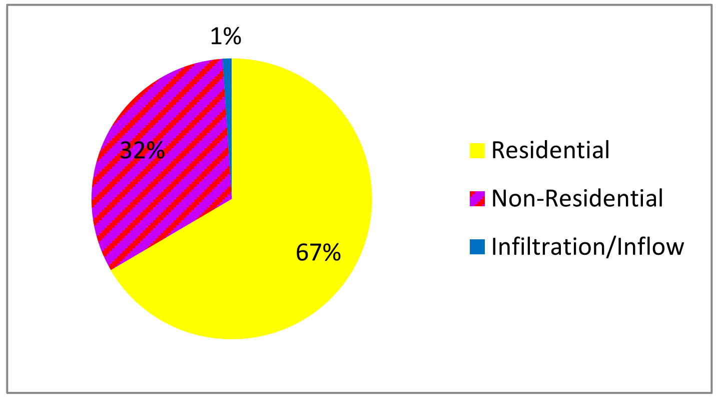
2015 Land Use





Wastewater Flow Estimates and Forecasts

The Pumping Station 17 Service Area had an estimated average annual flow of 0.93 mgd of wastewater in 2015. Two large wastewater generators (> 10,000 gpd) accounted for 0.04 mgd or 10% of the non-residential wastewater. Epic accounted for 0.03 mgd, and is the largest nonresidential wastewater generator in this area.

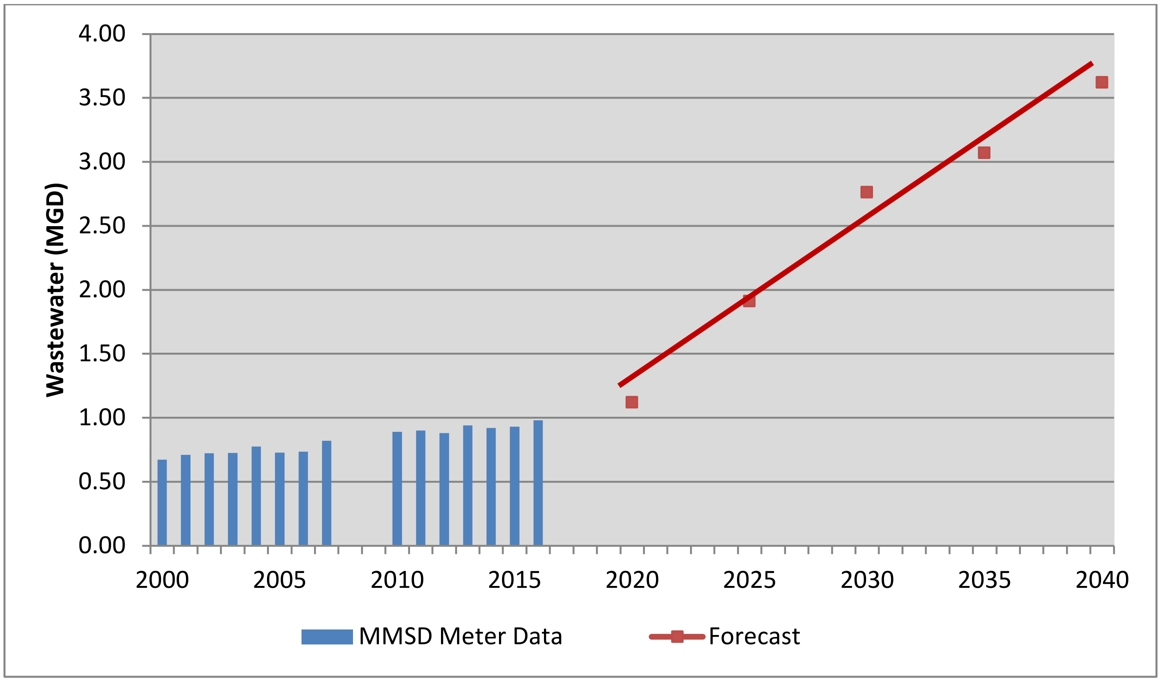


A summary of the year 2020 through 2040 wastewater flow forecasts generated in the Pumping Station 17 Service Area are presented in Table 3-19. A detailed table is included in Appendix D. The total Pumping Station 17 Service Area flow forecasts through 2040 are compared to the historic MMSD flow data for the pumping station service area in Figure 3-37.

Table 3-19: PS 17 Sub-Basin Flow Forecasts

	Wastewater Flows (mgd)				
Sub-Basin	2020	2025	2030	2035	2040
LBMC-2025		0.08	0.26	0.26	0.26
SOUTH POINT	TO PS 16	0.28	0.39	0.39	0.39
MIDTOWN	TO PS 12	0.23	0.65	0.81	0.81
MH17-146/F	0.05	0.09	0.12	0.18	0.28
MH17-128	0.26	0.26	0.26	0.26	0.27
MH17-120/F	0.09	0.17	0.18	0.18	0.29
MH17-119	0.03	0.04	0.04	0.05	0.06
MH17-108/F	0.06	0.08	0.15	0.20	0.48
MH17-201/F	0.63	0.68	0.71	0.74	0.79
Total	1.13	1.92	2.77	3.07	3.62

Figure 3-37: PS 17 Sub-Basin Historic Flow Data and Forecast



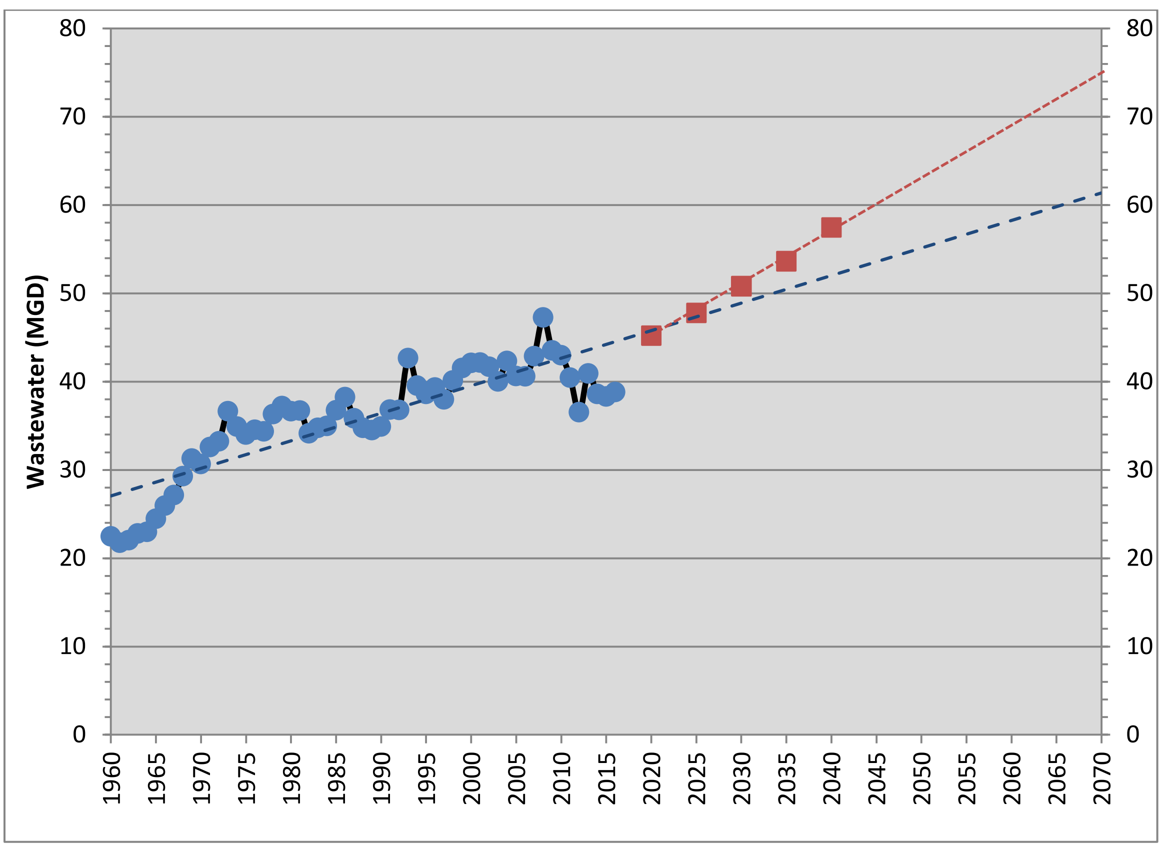
The sharp increase in forecasted wastewater flow in 2025 is due to the scheduled completion of the Lower Badger Mill Creek Interceptor. This interceptor will bring wastewater to Pumping Station 17 that is currently pumped to Pumping Station 12 and Pumping Station 16.

Cumulative Forecasts

The cumulative 2040 sub basin forecast projects the 2040 MMSD service area to contain a population of 551,397. This is 26% higher than the 2040 population estimate of 437,777 from Table 2-1, based on the CARPC / DOA population forecasts for the area. This is due to not using the CARPC / DOA population forecasts for the City of Madison as a control total, due to the uncertainty related to the geographic location and timing of population growth in that community. It is unlikely that all of the population growth allocated to the 2040 sub-basins in the City of Madison will occur by 2040. However it is probable that some of the sub-basin areas will develop to the levels allocated to the 2040 sub-basins by 2040.

The projected cumulative average daily wastewater flow for 2040 is 57.46 mgd, approximately equal to the current rated design capacity of the Nine Springs Treatment Plant of 57 mgd average daily flow. Therefore, the treatment plant is expected to reach current hydraulic design capacity near 2040 based on current projected growth rate assumptions. A linear extrapolation of this projection results in an estimated 2070 average daily flow to the treatment plant of about 75 mgd. A linear trend line of the District's historical average daily flow since 1960 results in an estimated 2070 average daily flow to the treatment plant of about 62 mgd. A more precise estimate of 2070 average daily flow can be provided when the official 2070 population forecasts are developed in 2040.

Figure 3-38: WWTP Meter Data vs Wastewater Forecasts



Chapter 4 Collection System Capacity Evaluation

Overall Analysis Approach

The collection system is divided into evaluation sections by MMSD staff. A section is defined as a distinct part or portion of the system that has similar hydraulic components, a generally larger division related by system capacity. The average wastewater flow for each pumping station sub-basin is added cumulatively as the flow from each sub basin enters the collection system. Peak flows were determined by applying the standard MMSD peaking factor formula, shown in Equation 1, to the cumulative average flows. A minimum peaking factor of 2.5 is applied for all flows in excess of 20 mgd, while a maximum peaking factor of 4.0 is used for all flows less than one mgd.

Equation 1: Peaking Factor

$$PeakFactor = \frac{4}{AverageFlow^{0.158}}$$

The peaking factors used for each sub-basin and the resulting cumulative peak flows are included in Appendix E. Detailed information on the hydraulic and pipe characteristics (i.e. invert elevation, size, slope, pipe material, friction factor and capacity) of each manhole segment from MMSD's collection system database is in Appendix F. A segment is defined as one run of sewer, the smallest part of the system, beginning at one manhole and ending at the next. Pumping station characteristics are described in Table 4-2. Nominal force main capacities are based on a velocity of 8 feet per second, except for the force main from Pumping Station 7. The Pumping Station 7 force main capacity is 55 mgd based on hydraulic transients.

Figures 4-1 through 4-23 show various sections of the MMSD collection system. Each section of the collection system is color-coded based on the 5-year date range when that section is projected to reach capacity at periods of peak flow. Summary tables including the collection system sections, nominal capacity, and peak flow projections follow each figure.

Figure 4-1: Pumping Station Firm Capacity

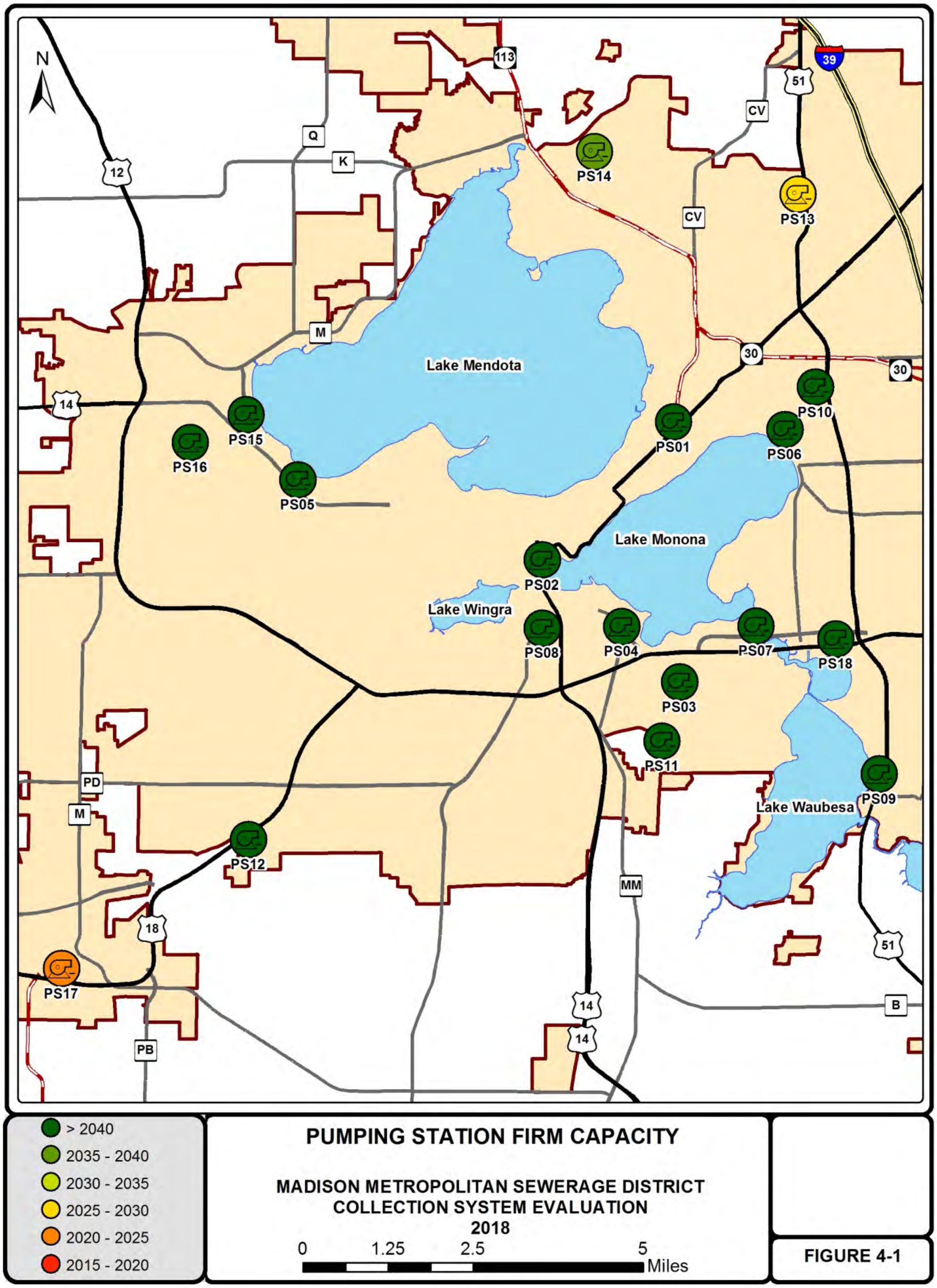


Table 4-1: Pumping Station Capacity Evaluation

Pumping Station	Station Capacity		*Peak Flows (mgd)* / Percent Firm Capacity													
	Maximum	Firm	2010		2015		2020		2025		2030		2035		2040	
1	38.3	35.3	*13.27*	38%	*12.67*	36%	*12.96*	37%	*13.19*	37%	*13.42*	38%	*13.66*	39%	*13.89*	39%
2	41.0	41.0	*26.99*	66%	*24.46*	60%	*27.66*	67%	*28.20*	69%	*28.72*	70%	*29.43*	72%	*30.05*	73%
3	1.5	1.5	*1.28*	85%	*0.91*	61%	*1.11*	74%	*1.22*	81%	*1.27*	84%	*1.31*	88%	*1.36*	91%
4	4.2	4.2	*4.05*	96%	*3.13*	75%	*3.84*	91%	*3.85*	92%	*3.85*	92%	*3.85*	92%	*3.85*	92%
5	3.6	3.6	*2.80*	78%	*2.27*	63%	*2.56*	71%	*2.56*	71%	*2.56*	71%	*2.56*	71%	*2.56*	71%
6	24.2	24.2	*7.79*	32%	*6.07*	25%	*7.07*	29%	*7.07*	29%	*7.07*	29%	*7.07*	29%	*7.07*	29%
7 (1)	45.0	39.0	*23.14*	59%	*20.64*	53%	*23.07*	59%	*24.15*	62%	*24.97*	64%	*26.00*	67%	*27.90*	72%
8	34.1	34.0	*20.51*	60%	*19.57*	58%	*20.68*	61%	*21.06*	62%	*21.42*	63%	*22.37*	66%	*23.06*	68%
9	4.5	4.5	*3.30*	73%	*3.02*	67%	*3.22*	72%	*3.33*	74%	*3.41*	76%	*3.52*	78%	*3.96*	88%
10	42.2	42.2	*25.02*	59%	*22.97*	54%	*25.52*	60%	*26.61*	63%	*27.89*	66%	*29.39*	70%	*31.30*	74%
11	41.6	41.6	*24.96*	60%	*23.74*	57%	*26.90*	65%	*29.45*	71%	*33.39*	80%	*35.13*	84%	*37.95*	91%
12	32.0	32.0	*17.00*	53%	*16.01*	50%	*18.47*	58%	*20.68*	65%	*24.52*	77%	*26.05*	81%	*28.70*	90%
13	20.2	20.0	*18.83*	94%	*16.80*	84%	*18.89*	94%	*19.57*	98%	*20.37*	102%	*21.50*	107%	*22.61*	113%
14	15.6	15.0	*13.49*	90%	*11.80*	79%	*13.54*	90%	*13.92*	93%	*14.46*	96%	*14.94*	100%	*15.34*	102%
15	9.0	9.0	*5.11*	57%	*5.02*	56%	*5.55*	62%	*5.89*	65%	*6.23*	69%	*7.51*	83%	*8.44*	94%
16	18.7	18.7	*6.58*	35%	*6.23*	33%	*7.20*	38%	*7.66*	41%	*7.89*	42%	*8.10*	43%	*8.92*	48%
17	4.6	4.6	*3.71*	81%	*3.71*	81%	*4.42*	96%	*6.92*	150%	*9.42*	205%	*10.29*	224%	*11.82*	257%
18 (1)	47.5	47.5			*23.46*	49%	*25.76*	54%	*27.07*	57%	*28.34*	60%	*30.33*	64%	*33.51*	71%

(1) Evaluation assumes 75% of flow in Northeast Interceptor system is pumped at PS 18. Remaining 25% is pumped at PS 7.

Table 4-2: Pumping Station Characteristics

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
1	104 N. First St. Madison 1950	1A (or 1B) + 1D 26,600 gpm 38.3 mgd	1A (or 1B) + 1C 24,475 gpm 35.3 mgd	1A	14,100	134	890	600	2005	1A & 1B are the new Crosstown pumps installed in 2005 and pump to PS#2. 1C & 1D are the old pumps (with re-wound motors) and pump to PS#6. 1A or 1B can pump with 1C or 1D. Pump 1D rating per 6/96 venturi analysis.
				1B	14,100	134	890	600	2005	
				1C	10,375	31	580	150	1950	
				1D	12,500	41	585	150	1950	
2	833 W. Washington (Brittingham Park) Madison 1964	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	2A	16,500	108	890	600	2005	All pumps were replaced during station rehab in 2005. All 4 pumps are equal size. 2A & 2B are VFD and 2C & 2D are constant speed. Data reflects new 36" FM online in 2001.
				2B	16,500	108	890	600	2005	
				2C	16,500	108	890	600	2005	
				2D	16,500	108	890	600	2005	
3	Nine Springs WWTP 1959	3A or 3B 1050 gpm 1.51 mgd	3A or 3B 1050 gpm 1.51 mgd	3A	1,050	60	1175	30	1980	New 36" FM (Aug. 2001) has no significant impact on capacities. New Headworks (Aug. 2005) added ~4' static. New impellers (13.0" vs 12.2") installed in 2004.
				3B	1,050	60	1175	30	1980	
4	620 John Nolen Dr. Madison 1967	4B or 4C 2,900 gpm 4.2 mgd	4B or 4C 2,900 gpm 4.2 mgd	4A	2,000	47	860	40	1967	Peak capacities include new 36" FM (8/2001), new Headworks (8/2005), WSEL=32, wetwell @ -7, PS3 @1,000gpm, PS2 @ 28,500 gpm. New impellers (17.0" vs 16.25") in 4B&4C in 2004.
				4B	2,900	95	1160	100	1967	
				4C	2,900	95	1160	100	1967	
5	Spring Harbor Park Madison 1996	Any two pumps 2,480 gpm 3.6 mgd	Any two pumps 2,480 gpm 3.6 mgd	5A	1,800	75	1256	50	1996	Variable speed units. Ratings per 1996 startup testing at 106% speed.
				5B	1,800	75	1256	50	1996	
				5C	1,800	75	1256	50	1996	

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
6	402 Walter Street Madison 1950	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	6A	7,700	45	890	125	2009	All ratings shown are after station rehabilitation in 2009. All 4 pumps are equal size. 6A is variable speed and 6B-6D are constant speed.
				6B	7,700	45	890	125	2009	
				6C	7,700	45	890	125	2009	
				6D	7,700	45	890	125	2009	
7	6300 Metropolitan Lane Monona 1950	7C + 7D 31,250 gpm 45.0 mgd	7B + 7C 27,100gpm 39.0 mgd	7A	11,500	47	695	60	1950	Dual pump ratings per 1996 high flow data. No major pump changes since station was rehabbed in 1992.
				7B	15,200	53	705	250	1992	
				7C	19,400	59	705	350	1992	
				7D	19,400	59	705	350	1992	
8	901 Plaenart Dr. Madison 1964	8C+8D+8A(or 8B) 7,900 gpm (ea) 23,700 gpm total 34.1 mgd total	8A+8B+8C(or 8D) 7,850 gpm (ea) 23,600 gpm total 34.0 mgd total	8A	12,800	58	585	250	2009	All ratings shown are after station rehabilitation in 2009. 8A&8B (formerly 8C&8D) are variable speed and equal size. 8C&8D (formerly 6C&6D) are constant speed and equal size.
				8B	12,800	58	585	250	2009	
				8C	13,900	60	705	300	2009	
				8D	13,900	60	705	300	2009	
9	4612 Larsen Beach McFarland 1962	Any two pumps 3,150 gpm 4.5 mgd	Any two pumps 3,150 gpm 4.5 mgd	9A	2,300	51	1185	40	2003	All American Well Works pumps were replaced with Fairbanks Morse Built-Togethers (5434S) between 2002 & 2007. New pumps are same capacity as old.
				9B	2,300	51	1185	40	2007	
				9C	2,300	51	1185	40	2002	
10	192 Regas Road Madison 1965	Any two pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	Any two pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	10A	18,900	94	890	600	2005	All pumps were replaced during station rehab in 2005. All 3 pumps are equal size. 10A & 10B are VFD and 10C is constant speed.
				10B	18,900	94	890	600	2005	
				10C	18,900	94	890	600	2005	

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
11	4760 E. Clayton Rd Town of Dunn 1966	Any 3 pumps 28,900 gpm total 41.6 mgd total	Any 3 pumps 28,900 gpm total 41.6 mgd total	11A	12,750	59	800	250	2016	All pumps replaced in 2016. Pump capacities are per analysis of certified pump curves and MMSD system curves. Single pump capacities verified by venturi. Max and firm capacities not confirmed. 11A & 11B are VFD.
				11B	12,750	59	800	250	2016	
				11C	12,750	59	800	250	2016	
				11D	12,750	59	800	250	2016	
12	2739 Fitchrona Rd. Town of Verona 1969	Any 3 pumps 22,200 gpm total 32.0 mgd total	Any 3 pumps 22,200 gpm total 32.0 mgd total	12A	10,400	55	520	200	2016	All pumps replaced in 2016. Pump capacities are per analysis of certified pump curves and MMSD system curves. Single pump capacities verified by venturi. Max and firm capacities not confirmed. 12A & 12B are VFD.
				12B	10,400	55	520	200	2016	
				12C	10,400	55	520	200	2016	
				12D	10,400	55	520	200	2016	
13	3634 Amelia Earhart Drive Madison 1970	13C 14,000 gpm 20.2 mgd	13A + 13B 13,900 gpm 20.0 mgd	13A	8,200	16	585	50	2008	Pump 13A replaced in 2008. 13A matches 13B. Pump 13B re-built, including new impeller (same size). Pump 13C unchanged.
				13B	8,200	16	585	50	1970	
				13C	14,000	20	505	100	1970	
14	5000 School Rd. Madison 1971	14C 10,800 gpm 15.6 mgd	14A + 14B 10,400 gpm 15.0 mgd	14A	7,200	24	705	60	2008	Pump 14A replaced in 2008. 14A matches 14B. Pump 14B re-built, including larger impeller (17.375" vs. 16.5"). Pump 14C re-built with larger impeller (22.0" vs. 20.5").
				14B	7,200	24	695	60	1971	
				14C	10,800	29	585	100	1971	
15	2115 Allen Blvd. Madison 1974	Any two pumps 6,250 gpm 9.0 mgd	Any two pumps 6,250 gpm 9.0 mgd	15A	4,225	87	1,200	125	2017	All pumps replaced during station rehab in 2017. Pump capacities are per analysis of certified pump curves and MMSD system curves. All pumps are VFD.
				15B	4,150	89	1,200	125	2017	
				15C	4,275	86	1,200	125	2017	

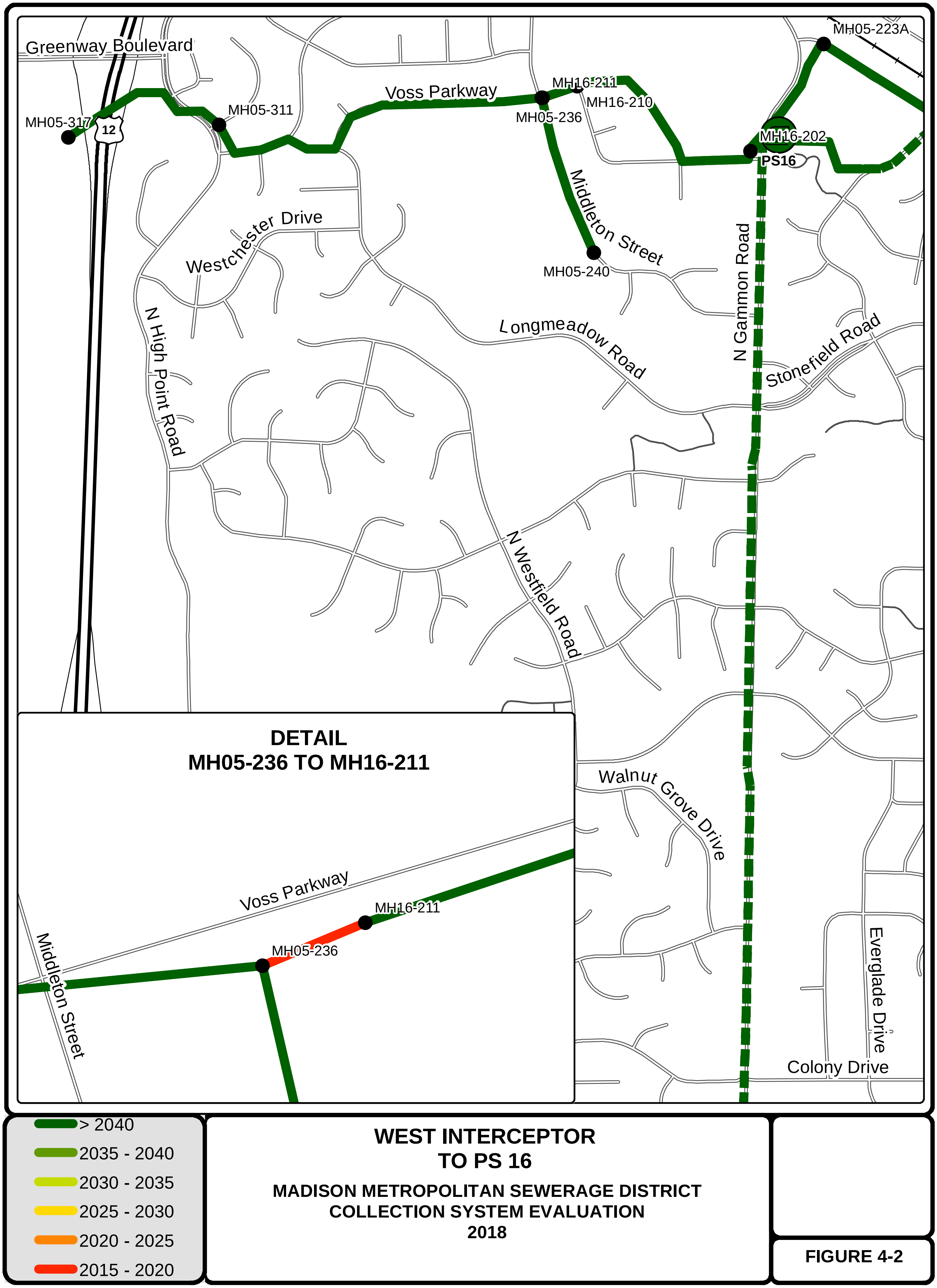
Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
16	1303 Gammon Rd. Middleton 1982	Any two pumps 13,000 gpm 18.7 mgd	Any two pumps 13,000 gpm 18.7 mgd	16A	7,000	182	1185	500	1982	
				16B	7,000	182	1185	500	1982	
				16C	7,000	182	1185	500	1982	
17	407 Bruce Street Verona 1996	Any two pumps at 118% speed 3,200 gpm 4.6 mgd	Any two pumps at 118% speed 3,200 gpm 4.6 mgd	17A	2,300	115	1290	100	1996	Variable speed pumps. Nominal 100% speed=1190 rpm. Ratings shown are for 118% max speed. Incorporated dual pumping in 2007. Capacity based on 2008 testing.
				17B	2,300	115	1290	100	1996	
				17C	2,300	115	1290	100	1996	
18	1100 E. Broadway Monona 2015	2 Large Pumps (C, D, or E) at 100% 33,000 gpm 47.5 MGD	2 Large Pumps (C, D, or E) at 100% 33,000 gpm 47.5 MGD	18A	7,000	49	890	125	2015	New station on-line in 2015. Pump capacities are per analysis of certified pump curves and MMSD system curves. Pump 18C is constant speed. All other pumps are VFD.
				18B	7,000	49	890	125	2015	
				18C	21,500	63	590	450	2015	
				18D	21,500	63	590	450	2015	
				18E	21,500	63	590	450	2015	

Notes:

i) Pump ratings are based on analysis of pump performance curves and system curves, and where available, flow meter data.

ii) For PS15 diversion to PS16, the pump rating for each pump (single pumping) is approximately 3,800 gpm @ 97'.

iii) Pump ratings are per pump turn-on level (high wetwell) and C=130.



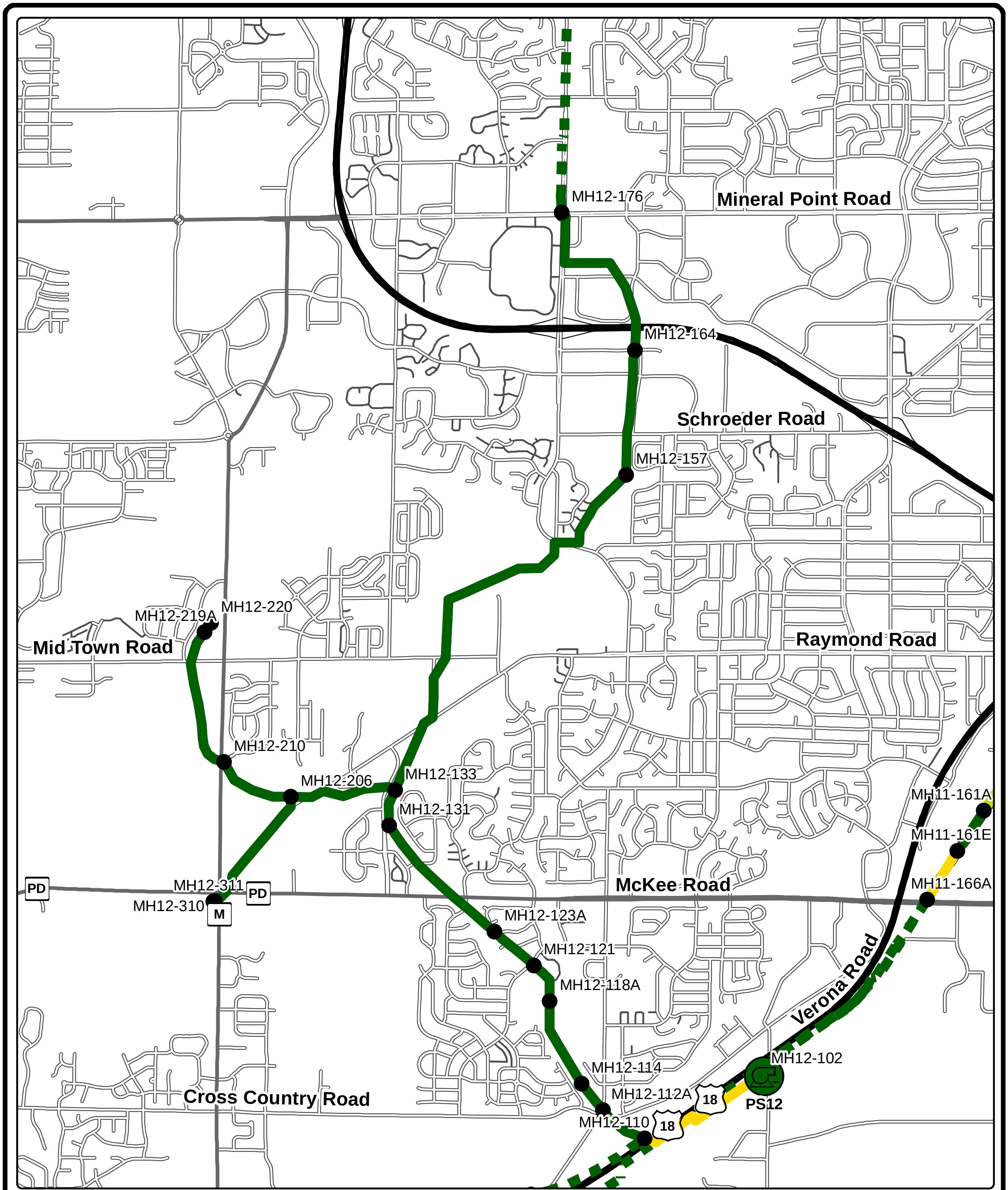
WEST INTERCEPTOR TO PS 16

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-2

Table 4-3: West Interceptor to PS 16

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH05-317	MH05-315	638	21	7.24	*3.87*	53%	*3.67*	51%	*4.19*	58%	*4.73*	65%	*4.85*	67%	*4.95*	68%	*5.72*	79%
MH05-315	MH05-311	750	18	6.18	*3.87*	63%	*3.67*	59%	*4.19*	68%	*4.73*	77%	*4.85*	78%	*4.95*	80%	*5.72*	93%
MH05-311	MH05-310	252	18	6.18	*4.06*	66%	*3.85*	62%	*4.35*	70%	*4.88*	79%	*5.00*	81%	*5.11*	83%	*5.87*	95%
MH05-310	MH05-306	824	18	7.74	*4.06*	52%	*3.85*	50%	*4.35*	56%	*4.88*	63%	*5.00*	65%	*5.11*	66%	*5.87*	76%
MH05-306	MH05-236	1,771	24	6.03	*4.06*	67%	*3.85*	64%	*4.35*	72%	*4.88*	81%	*5.00*	83%	*5.11*	85%	*5.87*	97%
MH05-240	MH05-236	1,252	24	4.62	*2.82*	61%	*2.63*	57%	*3.31*	72%	*3.28*	71%	*3.43*	74%	*3.59*	78%	*3.74*	81%
MH05-236	MH16-211	12	24	4.62	*6.40*	138%	*6.07*	131%	*7.03*	152%	*7.50*	162%	*7.73*	167%	*7.94*	172%	*8.76*	190%
MH16-211	MH16-210	282	36	16.99	*6.40*	38%	*6.07*	36%	*7.03*	41%	*7.50*	44%	*7.73*	45%	*7.94*	47%	*8.76*	52%
MH16-210	MH16-202	1,734	36	16.99	*6.53*	38%	*6.19*	36%	*7.15*	42%	*7.62*	45%	*7.85*	46%	*8.06*	47%	*8.87*	52%
MH16-202	PS 16	228	36	15.54	*6.53*	42%	*6.19*	40%	*7.15*	46%	*7.62*	49%	*7.85*	50%	*8.06*	52%	*8.87*	57%
MH16-102	PS 16	30	36	17.15	*0.06*	0%	*0.05*	0%	*0.06*	0%	*0.06*	0%	*0.06*	0%	*0.06*	0%	*0.06*	0%
PS 16	MH16-03385	7,214	36	39.34	*6.58*	17%	*6.23*	16%	*7.20*	18%	*7.66*	19%	*7.89*	20%	*8.10*	21%	*8.92*	23%
MH16-03385	MH12-177	2,965	30	27.37	*6.58*	24%	*6.23*	23%	*7.20*	26%	*7.66*	28%	*7.89*	29%	*8.10*	30%	*8.92*	33%
Junction with Nine Springs Valley Interceptor (Table 4-4)																		



- > 2040
- 2035 - 2040
- 2030 - 2035
- 2025 - 2030
- 2020 - 2025
- 2015 - 2020

NINE SPRINGS VALLEY INTERCEPTOR TO PS 12

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

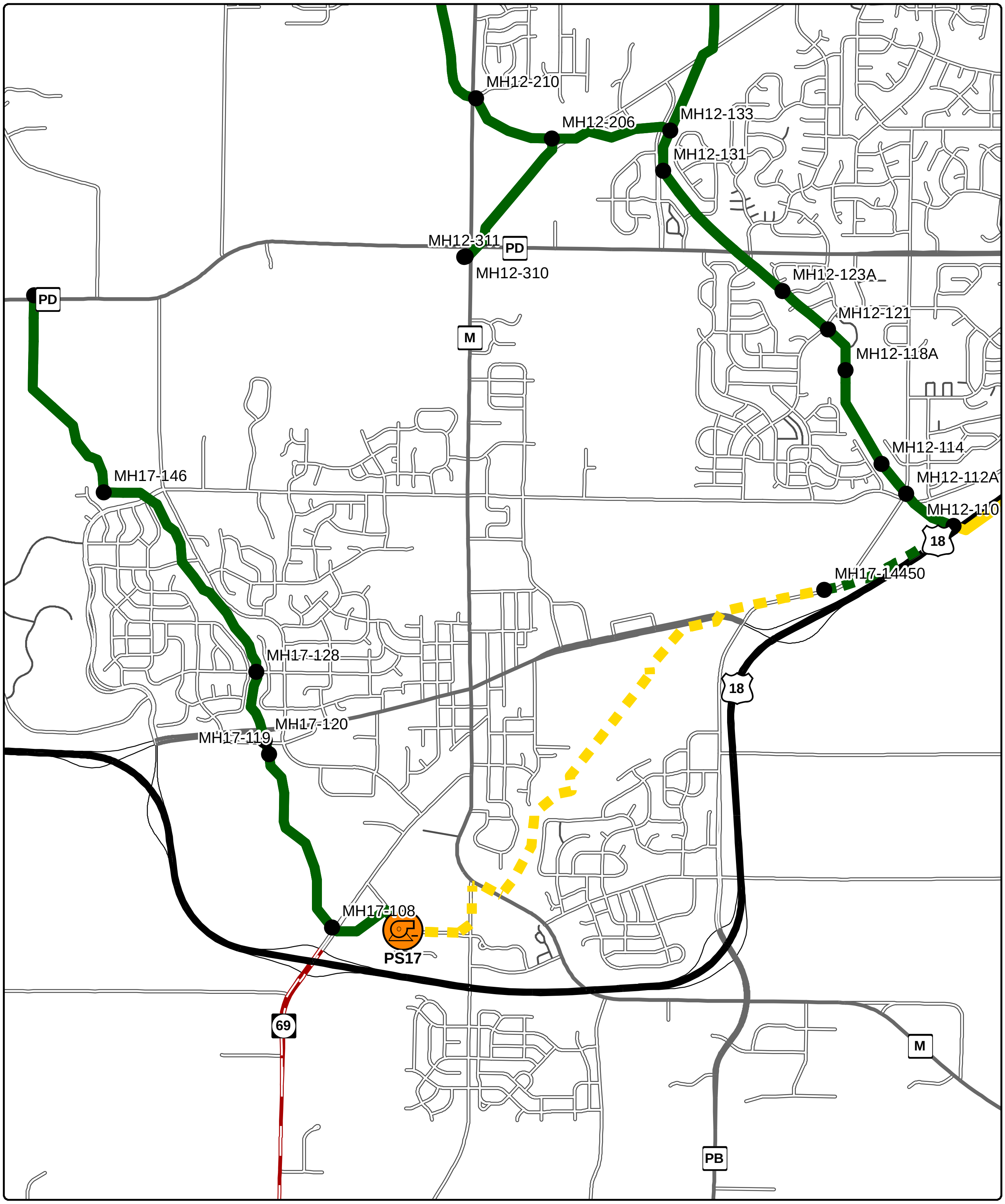
FIGURE 4-3

Table 4-4: Nine Springs Valley Interceptor to PS 12

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH12-177	MH12-176	400	33	17.42	*6.58*	38%	*6.23*	36%	*7.20*	41%	*7.66*	44%	*7.89*	45%	*8.10*	46%	*8.92*	51%
MH12-176	MH12-166	3,920	33	17.42	*8.03*	46%	*7.54*	43%	*8.61*	49%	*9.07*	52%	*9.28*	53%	*9.49*	54%	*10.36*	59%
MH12-166	MH12-164	732	30	17.77	*8.03*	45%	*7.54*	42%	*8.61*	48%	*9.07*	51%	*9.28*	52%	*9.49*	53%	*10.36*	58%
MH12-164	MH12-157	3,008	30	17.77	*8.57*	48%	*8.03*	45%	*9.13*	51%	*9.58*	54%	*9.80*	55%	*10.00*	56%	*10.87*	61%
MH12-157	MH12-156	544	30	17.77	*9.64*	54%	*8.93*	50%	*10.11*	57%	*10.56*	59%	*10.77*	61%	*10.97*	62%	*11.88*	67%
MH12-156	MH12-133	10,101	36	21.11	*9.64*	46%	*8.93*	42%	*10.11*	48%	*10.56*	50%	*10.77*	51%	*10.97*	52%	*11.88*	56%
Junction with Midtown Extension (Table 4-5)																		
MH12-133	MH12-131	884	36	21.11	*10.52*	50%	*9.85*	47%	*11.63*	55%	*11.88*	56%	*13.81*	65%	*14.71*	70%	*16.14*	76%
MH12-131	MH12-123A	3,603	36	21.11	*10.91*	52%	*10.21*	48%	*11.99*	57%	*12.24*	58%	*14.16*	67%	*15.05*	71%	*16.48*	78%
MH12-123A	MH12-121	1,253	36	21.11	*11.03*	52%	*10.31*	49%	*12.10*	57%	*12.35*	59%	*14.26*	68%	*15.16*	72%	*16.59*	79%
MH12-121	MH12-118A	1,035	36	21.11	*13.34*	63%	*12.42*	59%	*14.30*	68%	*14.54*	69%	*16.40*	78%	*17.27*	82%	*18.69*	89%
MH12-118A	MH12-114	2,165	36	21.11	*14.24*	67%	*13.23*	63%	*15.15*	72%	*15.39*	73%	*17.23*	82%	*18.09*	86%	*19.50*	92%
MH12-114	MH12-112A	823	36	21.11	*14.28*	68%	*13.27*	63%	*15.19*	72%	*15.43*	73%	*17.27*	82%	*18.13*	86%	*19.54*	93%
MH12-112A	MH12-112	261	36	21.11	*14.38*	68%	*13.37*	63%	*15.30*	72%	*15.54*	74%	*17.38*	82%	*18.24*	86%	*19.64*	93%
MH12-112	MH12-110	970	48	22.73	*14.38*	63%	*13.37*	59%	*15.30*	67%	*15.54*	68%	*17.38*	76%	*18.24*	80%	*19.64*	86%
Junction with PS 17 Force Main (Table 4-6)																		
MH12-110	MH12-102	3,415	48	22.73	*16.80*	74%	*15.82*	70%	*18.20*	80%	*20.41*	90%	*24.22*	107%	*25.75*	113%	*28.36*	125%
MH12-102	PS 12	107	48	22.73	*17.00*	75%	*16.01*	70%	*18.47*	81%	*20.68*	91%	*24.52*	108%	*26.05*	115%	*28.70*	126%

Table 4-5: NSVI – Midtown Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH12-220	MH12-210	3,771	24	12.21	*1.25*	10%	*1.26*	10%	*1.89*	15%	*1.24*	10%	*2.27*	19%	*2.54*	21%	*2.68*	22%
MH12-210	MH12-207	1,505	24	13.38	*1.25*	9%	*1.29*	10%	*2.03*	15%	*1.68*	13%	*2.74*	20%	*3.40*	25%	*3.65*	27%
MH12-207	MH12-206	445	30	14.04	*1.25*	9%	*1.29*	9%	*2.03*	14%	*1.68*	12%	*2.74*	19%	*3.40*	24%	*3.65*	26%
MH12-311	MH12-206	3,388	20	3.16	*0.00*	0%	*0.00*	0%	*0.14*	4%	*0.22*	7%	*1.71*	54%	*2.12*	67%	*2.76*	87%
MH12-206	MH12-133	2,605	30	14.04	*1.25*	9%	*1.29*	9%	*2.17*	15%	*1.91*	14%	*4.38*	31%	*5.25*	37%	*5.95*	42%
Junction with Nine Springs Valley Interceptor (Table 4-4)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

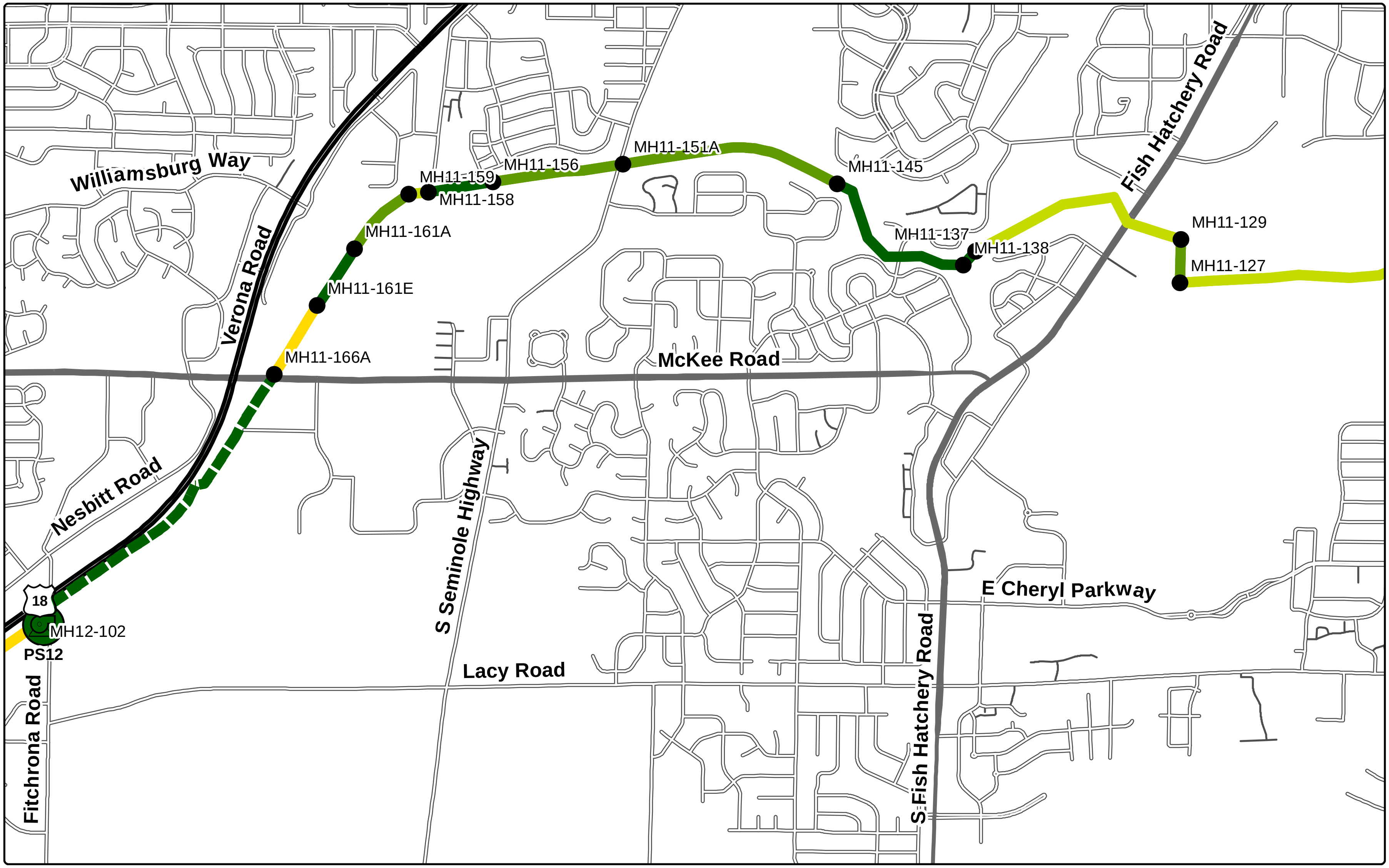
LOWER BADGER MILL CREEK INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-4

Table 4-6: Lower Badger Mill Creek Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
Midtown Rd	MH17-157			13.27							*2.39*	18%	*4.98*	38%	*5.50*	41%	*5.50*	41%
MH17-157	PB17-148XX196	3867	30	13.27							*2.39*	18%	*4.98*	38%	*5.50*	41%	*5.50*	41%
PB17-148XX196	MH17-144	1,684	30	14.97	*0.00*	0%	*0.00*	0%	*0.21*	1%	*2.73*	18%	*5.36*	36%	*6.05*	40%	*6.38*	43%
MH17-144	MH17-143	374	36	23.34	*0.00*	0%	*0.00*	0%	*0.21*	1%	*2.73*	12%	*5.36*	23%	*6.05*	26%	*6.38*	27%
MH17-143	MH17-136	2,162	30	14.97	*0.00*	0%	*0.00*	0%	*0.21*	1%	*2.73*	18%	*5.36*	36%	*6.05*	40%	*6.38*	43%
MH17-136	MH17-131	1,545	24	13.76	*0.00*	0%	*0.00*	0%	*0.21*	2%	*2.73*	20%	*5.36*	39%	*6.05*	44%	*6.38*	46%
MH17-131	MH17-129	401	30	21.80	*0.00*	0%	*0.00*	0%	*0.21*	1%	*2.73*	13%	*5.36*	25%	*6.05*	28%	*6.38*	29%
MH17-129	MH17-128	200	27	16.38	*0.00*	0%	*0.00*	0%	*0.21*	1%	*2.73*	17%	*5.36*	33%	*6.05*	37%	*6.38*	39%
MH17-128	MH17-127	130	27	16.38	*1.02*	6%	*1.02*	6%	*1.26*	8%	*3.78*	23%	*6.19*	38%	*6.86*	42%	*7.19*	44%
MH17-127	MH17-121	1,003	30	20.53	*1.02*	5%	*1.02*	5%	*1.26*	6%	*3.78*	18%	*6.19*	30%	*6.86*	33%	*7.19*	35%
MH17-121	MH17-120	405	30	17.37	*1.02*	6%	*1.02*	6%	*1.26*	7%	*3.78*	22%	*6.19*	36%	*6.86*	40%	*7.19*	41%
MH17-120	MH17-119	307	30	22.00	*1.26*	6%	*1.29*	6%	*1.61*	7%	*4.38*	20%	*6.73*	31%	*7.42*	34%	*8.05*	37%
MH17-119	MH17-112	2,189	30	22.00	*1.56*	7%	*1.40*	6%	*1.73*	8%	*4.51*	20%	*6.87*	31%	*7.57*	34%	*8.22*	37%
MH17-112	MH17-108	1,936	36	19.62	*1.56*	8%	*1.40*	7%	*1.73*	9%	*4.51*	23%	*6.87*	35%	*7.57*	39%	*8.22*	42%
MH17-108	MH17-101	1,791	36	19.62	*1.57*	8%	*1.55*	8%	*1.97*	10%	*4.78*	24%	*7.33*	37%	*8.16*	42%	*9.60*	49%
MH17-101	PS 17	70	36	16.60	*1.57*	9%	*1.55*	9%	*1.97*	12%	*4.78*	29%	*7.33*	44%	*8.16*	49%	*9.60*	58%
PS 17	MH17-14450	13,357	16	7.99	*3.71*	46%	*3.71*	46%	*4.42*	55%	*6.92*	87%	*9.42*	118%	*10.29*	129%	*11.82*	148%
MH17-14450	MH12-110	3,071	20	12.36	*3.71*	30%	*3.71*	30%	*4.42*	36%	*6.92*	56%	*9.42*	76%	*10.29*	83%	*11.82*	96%
Junction with Nine Springs Valley Interceptor (Table 4-4)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

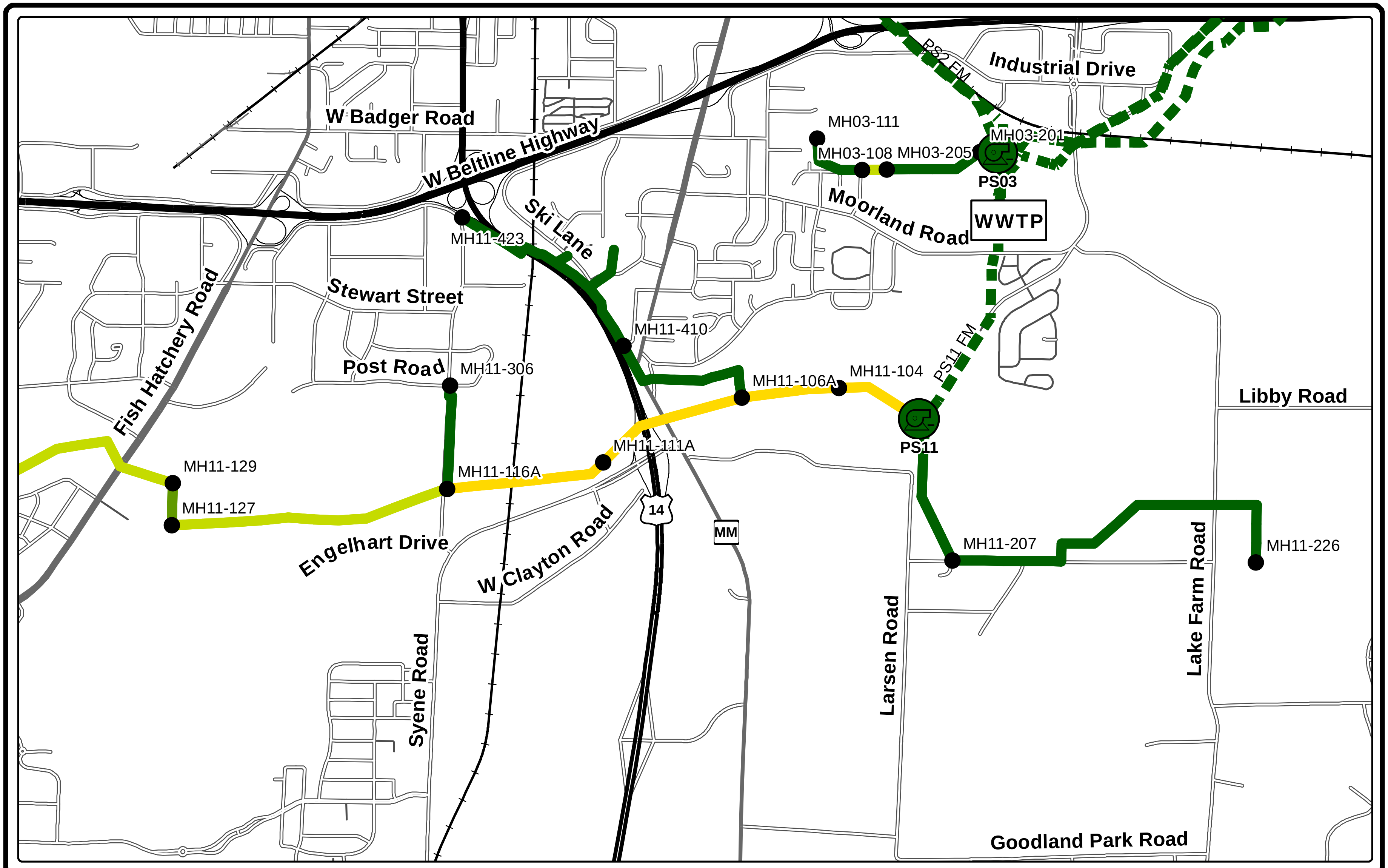
NINE SPRINGS VALLEY INTERCEPTOR
PS12 to MH11-127

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-5

Table 4-7: Nine Springs Valley Interceptor PS 12 to MH11-127

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
PS 12	MH11-166A	4,817	36	36.53	*17.00*	47%	*16.01*	44%	*18.47*	51%	*20.68*	57%	*24.52*	67%	*26.05*	71%	*28.70*	79%
MH11-166A	MH11-161E	1,380	42	25.17	*17.81*	71%	*16.81*	67%	*19.32*	77%	*21.64*	86%	*25.49*	101%	*27.05*	107%	*29.72*	118%
MH11-161E	MH11-161A	1,146	30	40.73	*17.81*	44%	*16.81*	41%	*19.32*	47%	*21.64*	53%	*25.49*	63%	*27.05*	66%	*29.72*	73%
MH11-161A	MH11-159	1,321	36	27.25	*17.81*	65%	*16.81*	62%	*19.32*	71%	*21.64*	79%	*25.49*	94%	*27.05*	99%	*29.72*	109%
MH11-159	MH11-158	340	36	27.25	*18.80*	69%	*17.78*	65%	*20.32*	75%	*22.62*	83%	*26.44*	97%	*27.99*	103%	*30.64*	112%
MH11-158	MH11-156	1,103	30	36.04	*18.80*	52%	*17.78*	49%	*20.32*	56%	*22.62*	63%	*26.44*	73%	*27.99*	78%	*30.64*	85%
MH11-156	MH11-151A	2,220	42	29.07	*18.80*	65%	*17.78*	61%	*20.32*	70%	*22.62*	78%	*26.44*	91%	*27.99*	96%	*30.64*	105%
MH11-151A	MH11-145	3,784	42	29.07	*19.14*	66%	*18.13*	62%	*20.72*	71%	*23.08*	79%	*27.02*	93%	*28.60*	98%	*31.28*	108%
MH11-145	MH11-141	1,558	36	37.81	*20.03*	53%	*19.02*	50%	*21.60*	57%	*23.95*	63%	*27.87*	74%	*29.44*	78%	*32.12*	85%
MH11-141	MH11-138	1,336	30	35.75	*20.03*	56%	*19.02*	53%	*21.60*	60%	*23.95*	67%	*27.87*	78%	*29.44*	82%	*32.12*	90%
MH11-138	MH11-137	312	30	35.75	*22.63*	63%	*21.72*	61%	*24.34*	68%	*26.76*	75%	*30.68*	86%	*32.36*	91%	*35.02*	98%
MH11-137	MH11-129	3,996	33	31.31	*22.63*	72%	*21.72*	69%	*24.34*	78%	*26.76*	85%	*30.68*	98%	*32.36*	103%	*35.02*	112%
MH11-129	MH11-127	733	36	35.00	*22.63*	65%	*21.72*	62%	*24.34*	70%	*26.76*	76%	*30.68*	88%	*32.36*	92%	*35.02*	100%



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

NINE SPRINGS VALLEY INTERCEPTOR to PS11

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-6

Table 4-8: Nine Springs Valley Interceptor to PS 11

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH11-127	MH11-116A	4,855	54	31.12	*22.63*	73%	*21.72*	70%	*24.34*	78%	*26.76*	86%	*30.68*	99%	*32.36*	104%	*35.02*	113%
Junction with NSVI - Syene Extension (Table 4-9)																		
MH11-116A	MH11-111A	2,788	54	31.12	*23.05*	74%	*22.12*	71%	*24.76*	80%	*27.24*	88%	*31.16*	100%	*32.86*	106%	*35.53*	114%
MH11-111A	MH11-106A	2,716	54	31.12	*23.42*	75%	*22.51*	72%	*25.50*	82%	*27.97*	90%	*31.89*	102%	*33.60*	108%	*36.31*	117%
Junction with NSVI - Highway 14 Extension (Table 4-10)																		
MH11-106A	MH11-104	1,689	54	31.12	*24.08*	77%	*23.09*	74%	*26.13*	84%	*28.60*	92%	*32.51*	104%	*34.22*	110%	*36.93*	119%
MH11-104	PS 11	1,525	54	31.12	*24.37*	78%	*23.39*	75%	*26.43*	85%	*28.89*	93%	*32.80*	105%	*34.50*	111%	*37.21*	120%
Junction with NSVI - Waubesa Extension (Table 4-11)																		
PS 11	WWTP	4,030	36	39.34	*24.96*	63%	*23.74*	60%	*26.90*	68%	*29.45*	75%	*33.39*	85%	*35.13*	89%	*37.95*	96%

Table 4-9: NSVI – Syene Extension

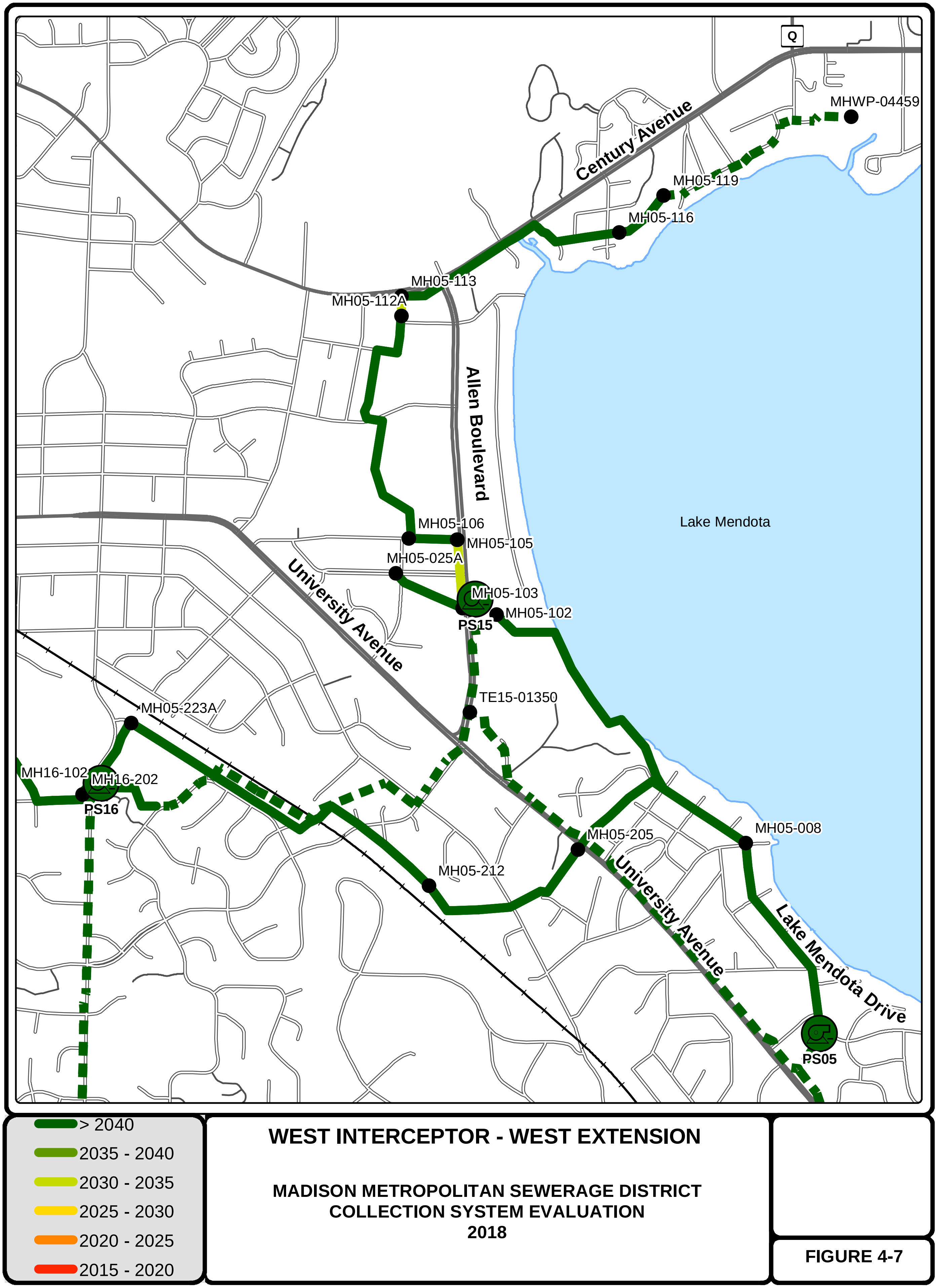
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH11-306	MH11-304	223	12	2.12	*0.70*	33%	*0.65*	31%	*0.71*	34%	*0.80*	38%	*0.84*	40%	*0.87*	41%	*0.91*	43%
MH11-304	MH11-116A	1,599	16	2.80	*0.70*	25%	*0.65*	23%	*0.71*	25%	*0.80*	29%	*0.84*	30%	*0.87*	31%	*0.91*	32%
Junction with Nine Springs Valley Interceptor (Table 4-8)																		

Table 4-10: NSVI – Highway 14 Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH11-423	MH11-416	1,929	10	1.17	*0.87*	74%	*0.72*	61%	*0.83*	71%	*0.85*	72%	*0.86*	73%	*0.87*	75%	*0.89*	76%
MH11-416	MH11-414	719	12	1.33	*0.87*	65%	*0.72*	54%	*0.83*	63%	*0.85*	64%	*0.86*	65%	*0.87*	66%	*0.89*	67%
MH11-414	MH11-410	1,190	15	1.97	*0.87*	44%	*0.72*	36%	*0.83*	42%	*0.85*	43%	*0.86*	44%	*0.87*	44%	*0.89*	45%
MH11-410	MH11-402	2,385	15	2.56	*1.10*	43%	*0.95*	37%	*1.06*	42%	*1.08*	42%	*1.09*	43%	*1.10*	43%	*1.12*	44%
MH11-402	MH11-106A	491	15	3.04	*1.10*	36%	*0.95*	31%	*1.06*	35%	*1.08*	35%	*1.09*	36%	*1.10*	36%	*1.12*	37%
Junction with Nine Springs Valley Interceptor (Table 4-8)																		

Table 4-11: NSVI – Waubesa Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH11-226	MH11-223	992	15	1.67	*0.77*	46%	*0.46*	27%	*0.61*	37%	*0.60*	36%	*0.60*	36%	*0.60*	36%	*0.60*	36%
MH11-223	MH11-221	696	18	2.80	*0.77*	27%	*0.46*	16%	*0.61*	22%	*0.60*	22%	*0.60*	22%	*0.60*	22%	*0.60*	22%
MH11-221	MH11-212	3,506	21	3.24	*0.77*	24%	*0.46*	14%	*0.61*	19%	*0.60*	19%	*0.60*	19%	*0.60*	19%	*0.60*	19%
MH11-212	MH-207	1,602	27	6.33	*0.77*	12%	*0.46*	7%	*0.61*	10%	*0.60*	10%	*0.60*	10%	*0.60*	10%	*0.60*	10%
MH-207	PS 11	2,712	27	6.33	*0.98*	16%	*0.59*	9%	*0.81*	13%	*0.96*	15%	*1.04*	16%	*1.12*	18%	*1.33*	21%
Junction with Nine Springs Valley Interceptor (Table 4-8)																		



WEST INTERCEPTOR - WEST EXTENSION

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-7

Table 4-12: West Interceptor – West Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MHWP-04459	MH05-119	2,557	14	6.09	*0.60*	10%	*0.59*	10%	*0.77*	13%	*1.10*	18%	*1.42*	23%	*2.20*	36%	*2.46*	40%
MH05-119	MH05-117	584	18	3.39	*0.60*	18%	*0.59*	17%	*0.77*	23%	*1.10*	32%	*1.42*	42%	*2.20*	65%	*2.46*	73%
MH05-117	MH05-116	108	18	7.50	*0.60*	8%	*0.59*	8%	*0.77*	10%	*1.10*	15%	*1.42*	19%	*2.20*	29%	*2.46*	33%
MH05-116	PB05-06607	1,258	14	4.40	*1.36*	31%	*1.31*	30%	*1.72*	39%	*2.11*	48%	*2.54*	58%	*3.38*	77%	*3.64*	83%
PB05-06607	MH05-115	836	14	4.40	*1.36*	31%	*1.31*	30%	*1.72*	39%	*2.11*	48%	*2.54*	58%	*3.38*	77%	*3.64*	83%
MH05-115	MH05-113	769	18	5.12	*1.36*	27%	*1.31*	26%	*1.72*	34%	*2.11*	41%	*2.54*	50%	*3.38*	66%	*3.64*	71%
MH05-113	MH05-112A	227	24	5.85	*4.52*	77%	*4.48*	77%	*5.00*	85%	*5.34*	91%	*5.69*	97%	*6.99*	119%	*7.93*	136%
MH05-112A	MH15-113	10	30	8.79	*4.52*	51%	*4.48*	51%	*5.00*	57%	*5.34*	61%	*5.69*	65%	*6.99*	79%	*7.93*	90%
MH15-113	MH15-104	2,248	36	19.05	*4.52*	24%	*4.48*	24%	*5.00*	26%	*5.34*	28%	*5.69*	30%	*6.99*	37%	*7.93*	42%
MH15-104	MH15-101	991	42	25.48	*4.52*	18%	*4.48*	18%	*5.00*	20%	*5.34*	21%	*5.69*	22%	*6.99*	27%	*7.93*	31%
MH05-106	PB05-105X544	16	24	6.20	*0.43*	7%	*0.39*	6%	*0.41*	7%	*0.41*	7%	*0.41*	7%	*0.41*	7%	*0.41*	7%
PB05-105X544	MH15-101	15	30	13.29	*0.43*	3%	*0.39*	3%	*0.41*	3%	*0.41*	3%	*0.41*	3%	*0.41*	3%	*0.41*	3%
MH15-101	PB05-105X006	523	30	13.29	*4.87*	37%	*4.80*	36%	*5.32*	40%	*5.66*	43%	*6.01*	45%	*7.30*	55%	*8.23*	62%
PB05-105X006	MH05-105	6	24	6.20	*4.87*	79%	*4.80*	77%	*5.32*	86%	*5.66*	91%	*6.01*	97%	*7.30*	118%	*8.23*	133%
MH05-105	MH05-103	808	30	7.01	*4.87*	69%	*4.80*	68%	*5.32*	76%	*5.66*	81%	*6.01*	86%	*7.30*	104%	*8.23*	117%
MH05-025A	MH05-103	880	12	2.06	*0.29*	14%	*0.27*	13%	*0.29*	14%	*0.29*	14%	*0.29*	14%	*0.29*	14%	*0.29*	14%
MH05-103	MH05-102A	147	30	7.01	*5.11*	73%	*5.02*	72%	*5.55*	79%	*5.89*	84%	*6.23*	89%	*7.51*	107%	*8.44*	120%
MH05-102A	PS 15	130	30	8.79	*5.11*	58%	*5.02*	57%	*5.55*	63%	*5.89*	67%	*6.23*	71%	*7.51*	85%	*8.44*	96%
PS 15	TE15-01350	1,360	24	17.70	*5.11*	29%	*5.02*	28%	*5.55*	31%	*5.89*	33%	*6.23*	35%	*7.51*	42%	*8.44*	48%
TE15-01350	BD15-02421	1,071	24	17.70	*5.11*	29%	*5.02*	28%	*5.55*	31%	*5.89*	33%	*6.23*	35%	*7.51*	42%	*8.44*	48%
BD15-02421	RD15-07254	4,837	20	12.36	*5.11*	41%	*5.02*	41%	*5.55*	45%	*5.89*	48%	*6.23*	50%	*7.51*	61%	*8.44*	68%
RD15-07254	TE05-22376	18	24	17.70	*5.11*	29%	*5.02*	28%	*5.55*	31%	*5.89*	33%	*6.23*	35%	*7.51*	42%	*8.44*	48%
Junction with PS 5 force main (Table 4-13)																		
TE15-01350	MH16-105	4,888	30	25.40	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH16-105	MH16-102	833	30	44.02	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%

> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

OLD WEST INTERCEPTOR TO PS 5
GAMMON EXTENSION

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

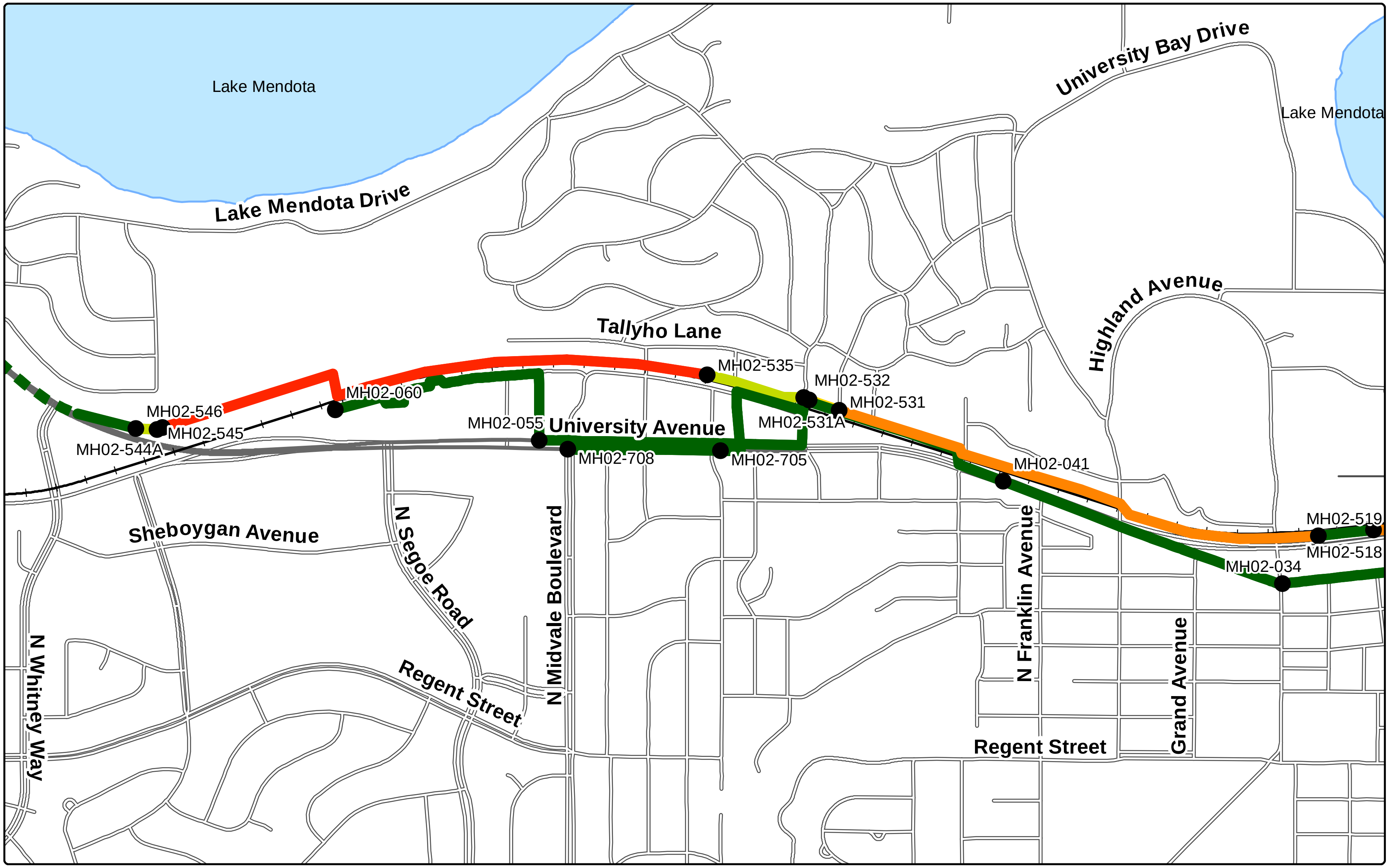
FIGURE 4-8

Table 4-13: Old West Interceptor to PS 5

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH05-102	MH05-021	303	30	7.01	*0.12*	2%	*0.09*	1%	*0.11*	2%	*0.11*	2%	*0.11*	2%	*0.11*	2%	*0.11*	2%
MH05-021	MH05-019	442	14	2.51	*0.12*	5%	*0.09*	4%	*0.11*	4%	*0.11*	4%	*0.11*	4%	*0.11*	4%	*0.11*	4%
MH05-019	MH05-011	2,350	14	2.26	*0.12*	5%	*0.09*	4%	*0.11*	5%	*0.11*	5%	*0.11*	5%	*0.11*	5%	*0.11*	5%
Junction with West Interceptor - Gammon Extension (Table 4-14)																		
MH05-011	MH05-008	1,148	18	2.54	*1.44*	57%	*1.13*	44%	*1.29*	51%	*1.29*	51%	*1.29*	51%	*1.29*	51%	*1.29*	51%
MH05-008	MH05-402	2,413	18	2.54	*1.92*	76%	*1.50*	59%	*1.72*	68%	*1.72*	68%	*1.72*	68%	*1.72*	68%	*1.72*	68%
MH05-402	MH05-401	92	24	6.91	*1.92*	28%	*1.50*	22%	*1.72*	25%	*1.72*	25%	*1.72*	25%	*1.72*	25%	*1.72*	25%
MH05-401	PS 5	28	24	6.91	*2.80*	41%	*2.27*	33%	*2.56*	37%	*2.56*	37%	*2.56*	37%	*2.56*	37%	*2.56*	37%
PS 5	TE05-22376	485	16	7.99	*2.80*	35%	*2.27*	28%	*2.56*	32%	*2.56*	32%	*2.56*	32%	*2.56*	32%	*2.56*	32%
Junction with PS 15 force main (Table 4-12)																		
TE05-22376	MH02-547	1,742	24	17.70	*7.28*	41%	*6.79*	38%	*7.51*	42%	*7.83*	44%	*8.16*	46%	*9.38*	53%	*10.28*	58%
Junction with West Interceptor Relief (Table 4-15)																		

Table 4-14: West Interceptor - Gammon Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH05-230	MH05-214	4,598	14	1.39	*0.80*	57%	*0.61*	44%	*0.71*	51%	*0.71*	51%	*0.71*	51%	*0.71*	51%	*0.71*	51%
MH05-214	MH05-212	719	10	1.91	*0.80*	42%	*0.61*	32%	*0.71*	37%	*0.71*	37%	*0.71*	37%	*0.71*	37%	*0.71*	37%
MH05-212	MH05-206	1,815	10	1.91	*1.20*	63%	*0.94*	49%	*1.07*	56%	*1.07*	56%	*1.07*	56%	*1.07*	56%	*1.07*	56%
MH05-206	MH05-205	336	12	2.01	*1.20*	60%	*0.94*	47%	*1.07*	53%	*1.07*	53%	*1.07*	53%	*1.07*	53%	*1.07*	53%
MH05-205	MH05-201	1,181	12	2.01	*1.32*	66%	*1.03*	51%	*1.18*	59%	*1.18*	59%	*1.18*	59%	*1.18*	59%	*1.18*	59%
MH05-201	MH05-011	168	18	2.35	*1.32*	56%	*1.03*	44%	*1.18*	50%	*1.18*	50%	*1.18*	50%	*1.18*	50%	*1.18*	50%
Junction with Old West Interceptor (Table 4-13)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

WEST / OLD WEST INTERCEPTORS
MIDVALE RELIEF

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-9

Table 4-15: West Interceptor Relief to MH02-519

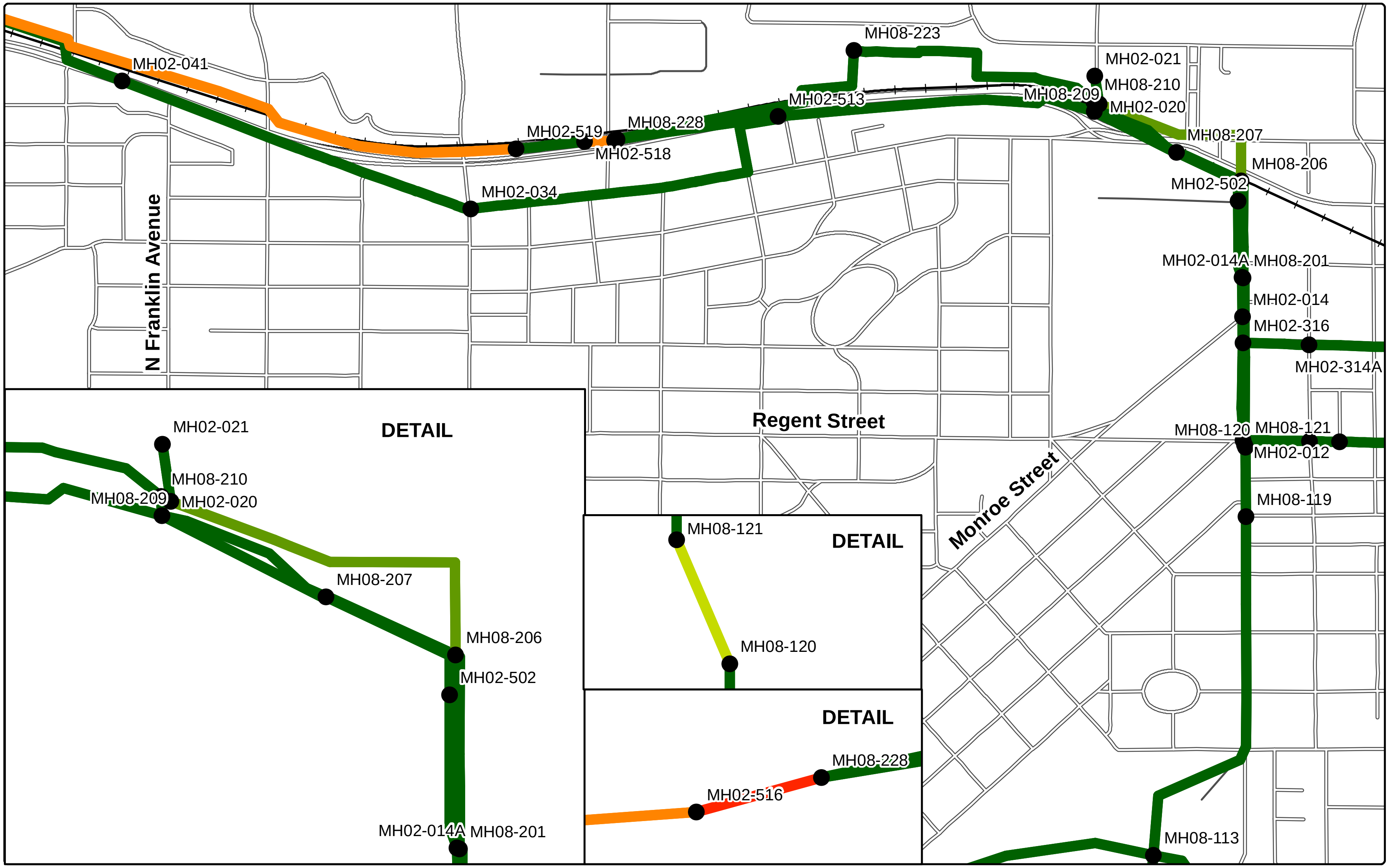
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-547	MH02-546	497	24	12.57	*7.28*	58%	*6.79*	54%	*7.51*	60%	*7.83*	62%	*8.16*	65%	*9.38*	75%	*10.28*	82%
MH02-546	MH02-545	192	27	8.95	*7.28*	81%	*6.79*	76%	*7.51*	84%	*7.83*	88%	*8.16*	91%	*9.38*	105%	*10.28*	115%
MH02-545	MH02-544A	56	27	8.95	*7.29*	81%	*6.80*	76%	*7.53*	84%	*7.84*	88%	*8.17*	91%	*9.39*	105%	*10.29*	115%
MH02-544A	MH02-542	1,505	27	8.95	*9.35*	105%	*8.76*	98%	*9.53*	106%	*9.93*	111%	*10.25*	115%	*11.53*	129%	*12.40*	139%
MH02-542	MH02-538	1,560	27	8.95	*9.35*	105%	*8.76*	98%	*9.53*	106%	*9.93*	111%	*10.25*	115%	*11.53*	129%	*12.40*	139%
MH02-538	MH02-536	1,200	24	8.52	*9.35*	110%	*8.76*	103%	*9.53*	112%	*9.93*	117%	*10.25*	120%	*11.53*	135%	*12.40*	146%
MH02-536	MH02-535	600	21	5.97	*9.35*	157%	*8.76*	147%	*9.53*	160%	*9.93*	166%	*10.25*	172%	*11.53*	193%	*12.40*	208%
MH02-535	MH02-532	841	21	10.44	*9.35*	90%	*8.76*	84%	*9.53*	91%	*9.93*	95%	*10.25*	98%	*11.53*	110%	*12.40*	119%
MH02-532	MH02-531A	65	36	12.19	*9.51*	78%	*8.89*	73%	*9.67*	79%	*10.08*	83%	*10.39*	85%	*11.67*	96%	*12.53*	103%
Junction with West Interceptor - Midvale Relief (Table 4-16)																		
MH02-531A	MH02-531	268	36	12.19	*11.50*	94%	*10.85*	89%	*11.63*	95%	*12.02*	99%	*12.39*	102%	*13.62*	112%	*14.47*	119%
MH02-531	MH05-519	4,095	36	12.19	*11.71*	96%	*11.03*	90%	*11.82*	97%	*12.22*	100%	*12.58*	103%	*13.81*	113%	*14.65*	120%

Table 4-16: West Interceptor – Midvale Relief

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-708	MH02-705	1,291	21	3.55	*2.26*	64%	*2.22*	62%	*2.24*	63%	*2.24*	63%	*2.33*	66%	*2.33*	66%	*2.33*	66%
MH02-705	MH02-531A	1,362	21	3.55	*2.84*	80%	*2.75*	77%	*2.80*	79%	*2.80*	79%	*2.89*	81%	*2.89*	81%	*2.89*	81%
Junction with West Interceptor Relief (Table 4-15)																		

Table 4-17: Old West Interceptor to MH02-034

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH02-542	MH02-060	305	12	1.34	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH02-060	MH02-055	2,461	12 - 18	2.09	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH02-055	MH02-047	2,597	15	2.09	*0.34*	16%	*0.49*	23%	*0.54*	26%	*0.54*	26%	*0.54*	26%	*0.54*	26%	*0.54*	26%
MH02-047	MH02-041	1,889	18	2.71	*0.34*	13%	*0.49*	18%	*0.54*	20%	*0.54*	20%	*0.54*	20%	*0.54*	20%	*0.54*	20%
MH02-041	MH02-038	1,063	18	2.71	*0.88*	32%	*1.15*	42%	*1.24*	46%	*1.24*	46%	*1.24*	46%	*1.24*	46%	*1.24*	46%
MH02-038	MH02-034	1,460	18	1.76	*0.88*	50%	*1.15*	65%	*1.24*	70%	*1.24*	70%	*1.24*	70%	*1.24*	70%	*1.24*	70%



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

WEST INTERCEPTOR RELIEF / OLD WEST INTERCEPTOR
CAMPUS RELIEF / RANDALL RELIEF

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-10

Table 4-18: West Interceptor Relief from MH02-519

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-519	MH02-518	465	36	25.85	*11.71*	45%	*11.03*	43%	*11.82*	46%	*12.22*	47%	*12.58*	49%	*13.81*	53%	*14.65*	57%
MH02-518	MH02-516	204	36	12.19	*11.71*	96%	*11.03*	90%	*11.82*	97%	*12.22*	100%	*12.58*	103%	*13.81*	113%	*14.65*	120%
MH02-516	MH08-228	10	36	12.19	*14.88*	122%	*13.42*	110%	*14.60*	120%	*14.99*	123%	*15.35*	126%	*16.54*	136%	*17.37*	142%
Junction with Campus Relief (Table 4-20)																		
MH08-228	MH02-513	1,112	36	12.19	*7.56*	62%	*6.82*	56%	*7.42*	61%	*7.62*	62%	*7.80*	64%	*8.41*	69%	*8.83*	72%
Junction with Old West Interceptor (Table 4-19)																		
MH02-513	MH08-209	2175	36	12.19	*8.81*	72%	*8.27*	68%	*8.92*	73%	*9.12*	75%	*9.29*	76%	*9.88*	81%	*10.29*	84%
Junction with Campus Relief (Table 4-20)																		
MH08-209	MH08-207	625	36	12.19	*4.31*	35%	*4.02*	33%	*4.33*	36%	*4.43*	36%	*4.52*	37%	*4.82*	40%	*5.02*	41%
Junction with Campus Relief (Table 4-20)																		
MH08-207	MH02-502	605	36	12.19	*6.27*	51%	*5.84*	48%	*6.30*	52%	*6.44*	53%	*6.58*	54%	*7.01*	57%	*7.30*	60%
MH02-502	MH02-014A	513	36	12.19	*6.52*	54%	*6.14*	50%	*6.58*	54%	*6.72*	55%	*6.85*	56%	*7.28*	60%	*7.57*	62%
Junction with Old West Interceptor (Table 4-19) & West Interceptor Randall Relief (Table 4-21)																		

Table 4-19: Old West Interceptor from MH02-038

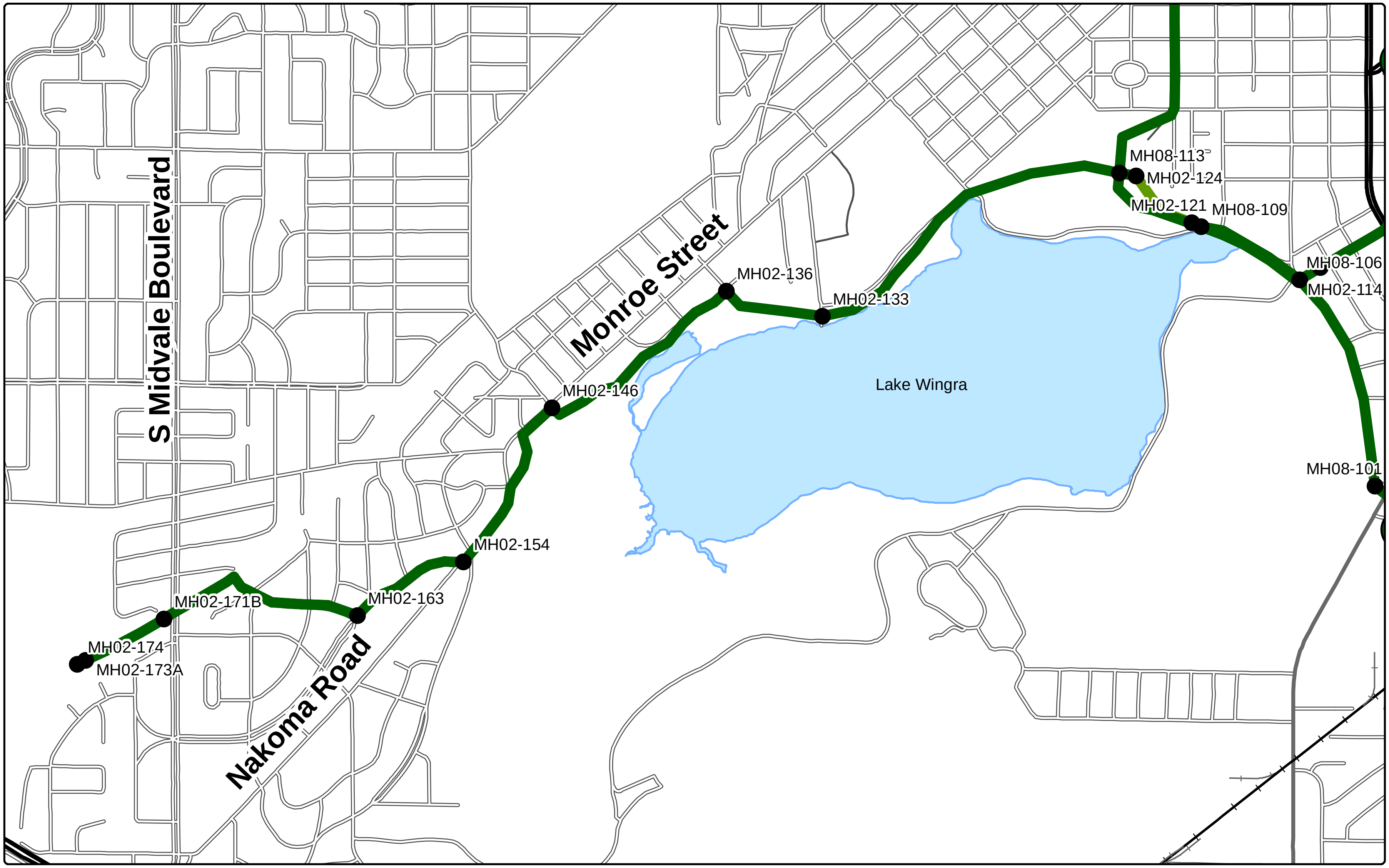
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-034	MH02-032	816	20	2.63	*1.70*	65%	*1.93*	73%	*2.04*	78%	*2.04*	78%	*2.04*	78%	*2.04*	78%	*2.04*	78%
MH02-032	MH02-513	1,704	22.5	3.52	*1.70*	48%	*1.93*	55%	*2.04*	58%	*2.04*	58%	*2.04*	58%	*2.04*	58%	*2.04*	58%
Junction with West Interceptor Relief (Table 4-18)																		
MH02-021	MH02-020	195	24	7.31	*1.69*	23%	*1.71*	23%	*1.74*	24%	*1.76*	24%	*1.78*	24%	*1.81*	25%	*1.83*	25%
Junction with West Interceptor - Campus Relief (Table 4-20)																		
MH02-020	MH08-206	1,313	24	7.31	*6.41*	88%	*6.03*	83%	*6.41*	88%	*6.55*	90%	*6.68*	91%	*7.05*	96%	*7.32*	100%
Junction with West Interceptor Relief (Table 4-18) & West Interceptor Randall Relief (Table 4-21)																		
MH08-206	MH02-014A	645	24	7.31	*4.78*	65%	*4.47*	61%	*4.79*	66%	*4.90*	67%	*5.00*	68%	*5.30*	73%	*5.52*	75%
MH02-014A	MH02-014	270	24	7.31	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH02-014	MH02-316	150	24	7.31	*1.73*	24%	*1.14*	16%	*1.60*	22%	*1.61*	22%	*1.62*	22%	*1.63*	22%	*1.64*	22%

Table 4-20: West Interceptor - Campus Relief

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH08-228	MH08-223	1,936	36	15.04	*9.03*	60%	*8.15*	54%	*8.86*	59%	*9.10*	60%	*9.31*	62%	*10.04*	67%	*10.54*	70%
MH08-223	MH08-221	161	36	15.04	*9.86*	66%	*9.06*	60%	*9.77*	65%	*10.01*	67%	*10.24*	68%	*10.96*	73%	*11.46*	76%
MH08-221	MH08-220	118	24 x 2	13.8	*9.86*	71%	*9.06*	66%	*9.77*	71%	*10.01*	73%	*10.24*	74%	*10.96*	79%	*11.46*	83%
MH08-220	MH08-216	514	36	15.04	*9.86*	66%	*9.06*	60%	*9.77*	65%	*10.01*	67%	*10.24*	68%	*10.96*	73%	*11.46*	76%
MH08-216	MH08-210	1,051	36	16.48	*9.86*	60%	*9.06*	55%	*9.77*	59%	*10.01*	61%	*10.24*	62%	*10.96*	67%	*11.46*	70%
MH08-210	MH02-020	39	24	12.6	*5.09*	40%	*4.67*	37%	*5.04*	40%	*5.17*	41%	*5.28*	42%	*5.66*	45%	*5.92*	47%
Junction with Old West Interceptor (Table 4-19)																		
MH08-210	MH08-209	64	36	15.04	*5.90*	39%	*5.42*	36%	*5.85*	39%	*6.00*	40%	*6.13*	41%	*6.57*	44%	*6.87*	46%
Junction with West Interceptor Relief (Table 4-18)																		
MH08-209	MH08-208	629	48	34.68	*10.37*	30%	*9.67*	28%	*10.43*	30%	*10.67*	31%	*10.89*	31%	*11.60*	33%	*12.09*	35%
MH08-208	MH08-207	12	36	15.04	*10.37*	69%	*9.67*	64%	*10.43*	69%	*10.67*	71%	*10.89*	72%	*11.60*	77%	*12.09*	80%
Junction with West Interceptor Relief (Table 4-18)																		
MH08-207	MH08-206	474	36	17.8	*8.62*	48%	*8.04*	45%	*8.67*	49%	*8.86*	50%	*9.04*	51%	*9.64*	54%	*10.05*	56%
Junction with West Interceptor Randall Relief (Table 4-21)																		
MH08-206	MH08-201	660	36	17.8	*10.10*	57%	*9.46*	53%	*10.14*	57%	*10.36*	58%	*10.57*	59%	*11.22*	63%	*11.68*	66%

Table 4-21: West Interceptor - Randall Relief to SWI

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-014A	MH08-201	29	33	25.11	*10.15*	40%	*9.53*	38%	*10.21*	41%	*10.43*	42%	*10.64*	42%	*11.30*	45%	*11.76*	47%
Junction with West Interceptor - Campus Relief (Table 4-20)																		
MH08-201	MH08-121	1,127	33	25.11	*18.15*	72%	*17.02*	68%	*18.24*	73%	*18.64*	74%	*19.01*	76%	*20.19*	80%	*21.00*	84%
MH08-121	MH08-120	16	30 x 2	19.23	*18.15*	94%	*17.02*	88%	*18.24*	95%	*18.64*	97%	*19.01*	99%	*20.19*	105%	*21.00*	109%
MH08-120	MH08-119	473	42	25.17	*18.15*	72%	*17.02*	68%	*18.24*	72%	*18.64*	74%	*19.01*	76%	*20.19*	80%	*21.00*	83%
MH08-119	MH08-113	2,680	42	25.17	*18.37*	73%	*17.22*	68%	*18.45*	73%	*18.85*	75%	*19.22*	76%	*20.39*	81%	*21.21*	84%
Junction with Southwest Interceptor (Table 4-22)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

SOUTHWEST INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-11

Table 4-22: Southwest Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH02-174	MH02-173A	100	30	3.48	*1.20*	34%	*1.19*	34%	*1.26*	36%	*1.27*	36%	*1.27*	37%	*1.28*	37%	*1.28*	37%
MH02-173A	MH02-172	700	20	3.48	*1.87*	54%	*1.82*	52%	*1.92*	55%	*1.92*	55%	*1.93*	56%	*1.94*	56%	*1.95*	56%
MH02-172	MH02-171B	307	15	4.87	*1.87*	38%	*1.82*	37%	*1.92*	39%	*1.92*	40%	*1.93*	40%	*1.94*	40%	*1.95*	40%
MH02-171B	MH02-171	92	15	4.87	*2.07*	42%	*2.01*	41%	*2.11*	43%	*2.12*	43%	*2.12*	44%	*2.13*	44%	*2.14*	44%
MH02-171	MH02-170	396	21	3.96	*2.07*	52%	*2.01*	51%	*2.11*	53%	*2.12*	53%	*2.12*	54%	*2.13*	54%	*2.14*	54%
MH02-170	MH02-163	1,950	12	4.49	*2.07*	46%	*2.01*	45%	*2.11*	47%	*2.12*	47%	*2.12*	47%	*2.13*	47%	*2.14*	48%
MH02-163	MH02-159	695	24	12.31	*2.71*	22%	*2.59*	21%	*2.79*	23%	*2.85*	23%	*2.91*	24%	*2.98*	24%	*3.04*	25%
MH02-159	MH02-157	302	18	13.87	*2.71*	20%	*2.59*	19%	*2.79*	20%	*2.85*	21%	*2.91*	21%	*2.98*	21%	*3.04*	22%
MH02-157	MH02-154	380	20	8.99	*2.71*	30%	*2.59*	29%	*2.79*	31%	*2.85*	32%	*2.91*	32%	*2.98*	33%	*3.04*	34%
MH02-154	MH02-150	1,021	18	5.26	*2.91*	55%	*2.78*	53%	*2.99*	57%	*3.05*	58%	*3.11*	59%	*3.17*	60%	*3.23*	61%
MH02-150	MH02-146	1,102	24	5.85	*2.91*	50%	*2.78*	48%	*2.99*	51%	*3.05*	52%	*3.11*	53%	*3.17*	54%	*3.23*	55%
MH02-146	MH02-142	854	24	13.07	*3.77*	29%	*3.64*	28%	*3.86*	30%	*3.92*	30%	*3.99*	30%	*4.04*	31%	*4.09*	31%
MH02-142	MH02-136	1,669	27	5.66	*3.77*	67%	*3.64*	64%	*3.86*	68%	*3.92*	69%	*3.99*	70%	*4.04*	71%	*4.09*	72%
MH02-136	MH02-133	1,161	30	7.49	*4.20*	56%	*4.10*	55%	*4.31*	57%	*4.36*	58%	*4.41*	59%	*4.46*	60%	*4.51*	60%
MH02-133	MH08-113	3,959	30	7.49	*4.35*	58%	*4.21*	56%	*4.44*	59%	*4.50*	60%	*4.56*	61%	*4.62*	62%	*4.67*	62%
Junction with West Interceptor Randall Relief (Table 4-21)																		
MH08-113	MH02-124	193	30	7.49	*3.93*	52%	*3.24*	43%	*4.01*	54%	*4.22*	56%	*4.41*	59%	*4.97*	66%	*5.36*	72%
MH02-124	MH02-121	737	24	5.06	*3.93*	78%	*3.24*	64%	*4.01*	79%	*4.22*	83%	*4.41*	87%	*4.97*	98%	*5.36*	106%
MH02-121	MH08-109	117	24	5.06	*4.24*	84%	*3.49*	69%	*4.29*	85%	*4.49*	89%	*4.68*	92%	*5.23*	103%	*5.62*	111%
Junction with West Interceptor Randall Relief (Table 4-23)																		
MH08-109	MH08-106	1,288	24	5.06	*3.09*	61%	*2.54*	50%	*3.15*	62%	*3.33*	66%	*3.51*	69%	*4.02*	80%	*4.33*	86%

- > 2040
- 2035 - 2040
- 2030 - 2035
- 2025 - 2030
- 2020 - 2025
- 2015 - 2020

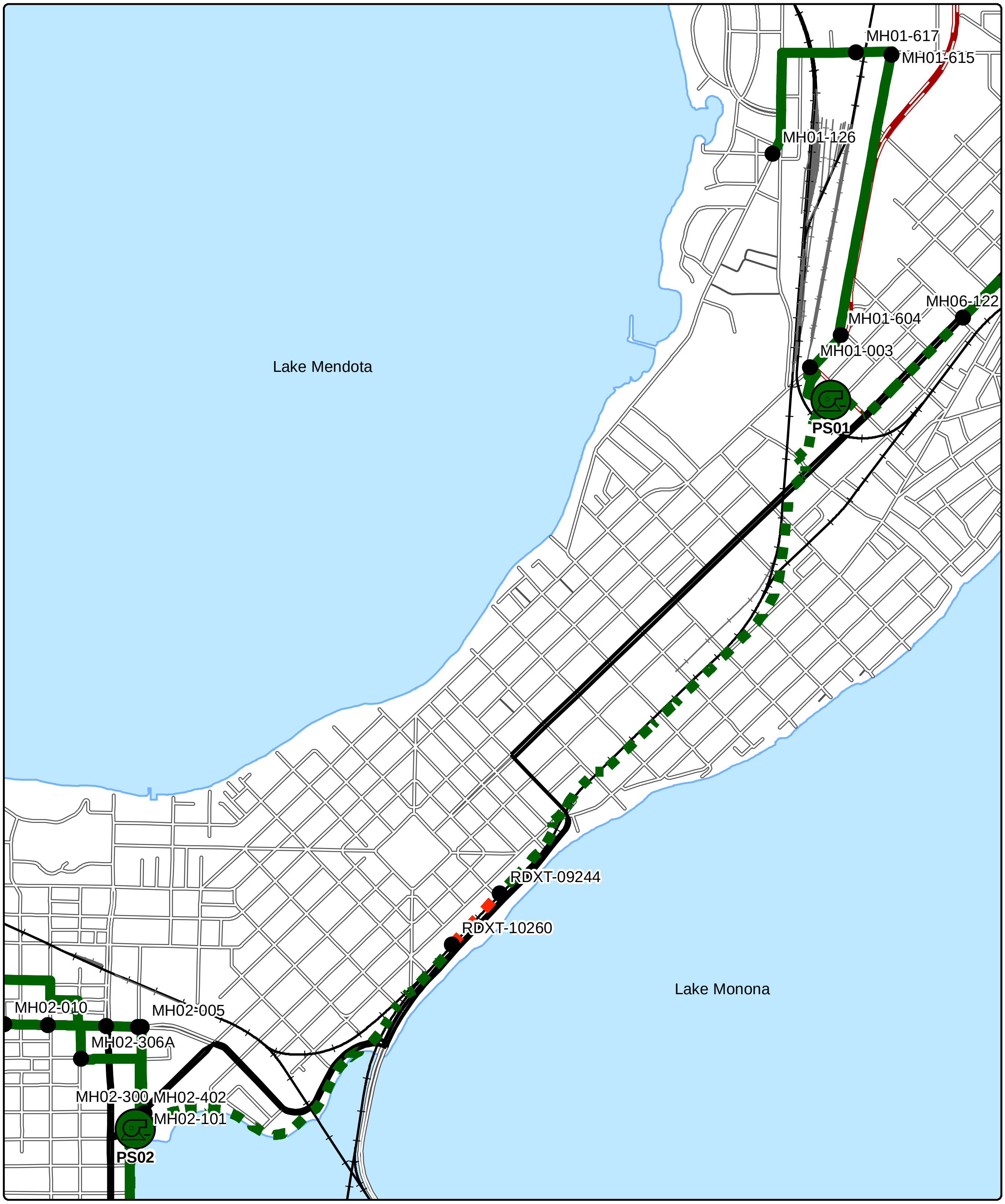
WI RANDALL RELIEF to PS 8 AND PS 8 FORCE MAIN

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-12

Table 4-23: West Interceptor - Randall Relief to PS 8

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH08-113	MH08-109	1,237	48	27.84	*18.68*	67%	*17.87*	64%	*18.78*	67%	*19.06*	68%	*19.33*	69%	*20.12*	72%	*20.68*	74%
Junction with Southwest Interceptor (Table 4-22)																		
MH08-109	MH08-106	1,279	48	27.84	*19.43*	70%	*18.47*	66%	*19.53*	70%	*19.85*	71%	*20.15*	72%	*21.04*	76%	*21.66*	78%
MH08-106	PS 8	3,179	48	30.78	*20.27*	66%	*19.30*	63%	*20.39*	66%	*20.74*	67%	*21.06*	68%	*21.98*	71%	*22.64*	74%
PS 8	RD08-13205	194	36	36.53	*20.51*	56%	*19.57*	54%	*20.68*	57%	*21.06*	58%	*21.42*	59%	*22.37*	61%	*23.06*	63%
RD08-13205	PB08-00192	13,210	42	49.72	*20.51*	41%	*19.57*	39%	*20.68*	42%	*21.06*	42%	*21.42*	43%	*22.37*	45%	*23.06*	46%
PB08-00192	WWTP	334	42	53.24	*20.51*	39%	*19.57*	37%	*20.68*	39%	*21.06*	40%	*21.42*	40%	*22.37*	42%	*23.06*	43%



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

NORTH END INTERCEPTOR AND CROSS-TOWN FORCE MAIN

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

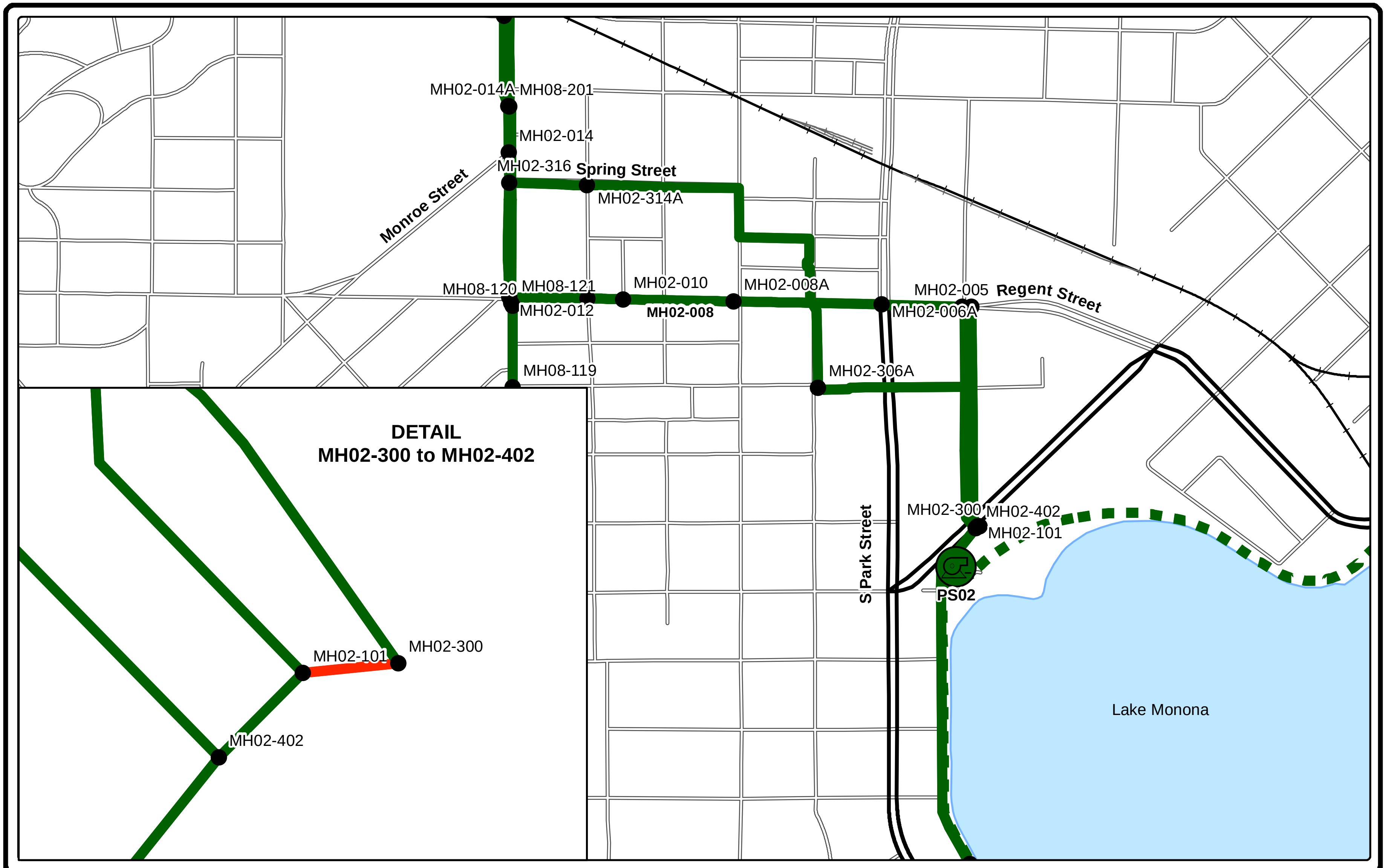
FIGURE 4-13

Table 4-24: North End Interceptor / East Interceptor - North Basin

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH01-126	MH01-123	650	10	0.45	*0.28*	63%	*0.28*	61%	*0.27*	61%	*0.27*	61%	*0.27*	61%	*0.28*	61%	*0.28*	61%
MH01-123	MH01-120	832	12	0.73	*0.28*	39%	*0.28*	38%	*0.27*	37%	*0.27*	38%	*0.27*	38%	*0.28*	38%	*0.28*	38%
MH01-120	MH01-617	1,085	18	2.54	*0.28*	11%	*0.28*	11%	*0.27*	11%	*0.27*	11%	*0.27*	11%	*0.28*	11%	*0.28*	11%
MH01-617	MH01-616	534	20	3.36	*2.07*	62%	*1.95*	58%	*2.02*	60%	*2.04*	61%	*2.07*	62%	*2.09*	62%	*2.12*	63%
MH01-616	MH01-615	46	36	16.10	*2.07*	13%	*1.95*	12%	*2.02*	13%	*2.04*	13%	*2.07*	13%	*2.09*	13%	*2.12*	13%
MH01-615	MH01-604	4,202	36	16.10	*3.65*	23%	*3.10*	19%	*2.89*	18%	*2.96*	18%	*3.04*	19%	*3.11*	19%	*3.18*	20%
MH01-604	MH01-304	787	42	24.29	*5.40*	22%	*5.05*	21%	*4.85*	20%	*4.91*	20%	*4.98*	21%	*5.04*	21%	*5.11*	21%
MH01-304	MH01-303	84	36	23.60	*5.40*	23%	*5.05*	21%	*4.85*	21%	*4.91*	21%	*4.98*	21%	*5.04*	21%	*5.11*	22%
MH01-003	MH01-001	189	30	8.38	*1.85*	22%	*0.95*	11%	*1.41*	17%	*1.41*	17%	*1.41*	17%	*1.41*	17%	*1.41*	17%
MH01-001	MH01-303	38	36	23.60	*1.85*	8%	*0.95*	4%	*1.41*	6%	*1.41*	6%	*1.41*	6%	*1.41*	6%	*1.41*	6%
MH01-303	PS 1	574	36	23.60	*6.84*	29%	*5.81*	25%	*5.97*	25%	*6.03*	26%	*6.10*	26%	*6.16*	26%	*6.22*	26%

Table 4-25: Cross-Town Force Main

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
PS 1	PBXT-01337	1,346	24	17.70	*13.27*	75%	*12.67*	72%	*12.96*	73%	*13.19*	75%	*13.42*	76%	*13.66*	77%	*13.89*	78%
PBXT-01337	RDXT-09244	8,092	30	27.37	*13.27*	48%	*12.67*	46%	*12.96*	47%	*13.19*	48%	*13.42*	49%	*13.66*	50%	*13.89*	51%
RDXT-09244	RDXT-10260	1,016	20	12.36	*13.27*	107%	*12.67*	102%	*12.96*	105%	*13.19*	107%	*13.42*	109%	*13.66*	110%	*13.89*	112%
RDXT-10260	TEXT-16380	6,121	30	27.37	*13.27*	48%	*12.67*	46%	*12.96*	47%	*13.19*	48%	*13.42*	49%	*13.66*	50%	*13.89*	51%
TEXT-16380	PS 2	164	30	27.37	*13.27*	48%	*12.67*	46%	*12.96*	47%	*13.19*	48%	*13.42*	49%	*13.66*	50%	*13.89*	51%



- > 2040
- 2035 - 2040
- 2030 - 2035
- 2025 - 2030
- 2020 - 2025
- 2015 - 2020

SPRING STREET RELIEF AND OLD WEST INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-14

Table 4-26: West Interceptor - Spring Street Relief

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-316	MH02-314A	443	24	6.54	*1.73*	26%	*1.14*	17%	*1.60*	25%	*1.61*	25%	*1.62*	25%	*1.63*	25%	*1.64*	25%
MH02-314A	MH02-306A	2,437	24	6.54	*2.59*	40%	*2.09*	32%	*2.67*	41%	*2.73*	42%	*2.78*	43%	*2.84*	43%	*2.90*	44%
MH02-306A	MH02-300	1,697	24	6.54	*3.59*	55%	*2.96*	45%	*3.77*	58%	*3.82*	58%	*3.88*	59%	*3.94*	60%	*4.00*	61%
MH02-300	MH02-101	3	24	6.54	*8.33*	127%	*7.47*	114%	*9.11*	139%	*9.26*	142%	*9.40*	144%	*9.55*	146%	*9.70*	148%
Junction with Old West Interceptor (Table 4-27)																		

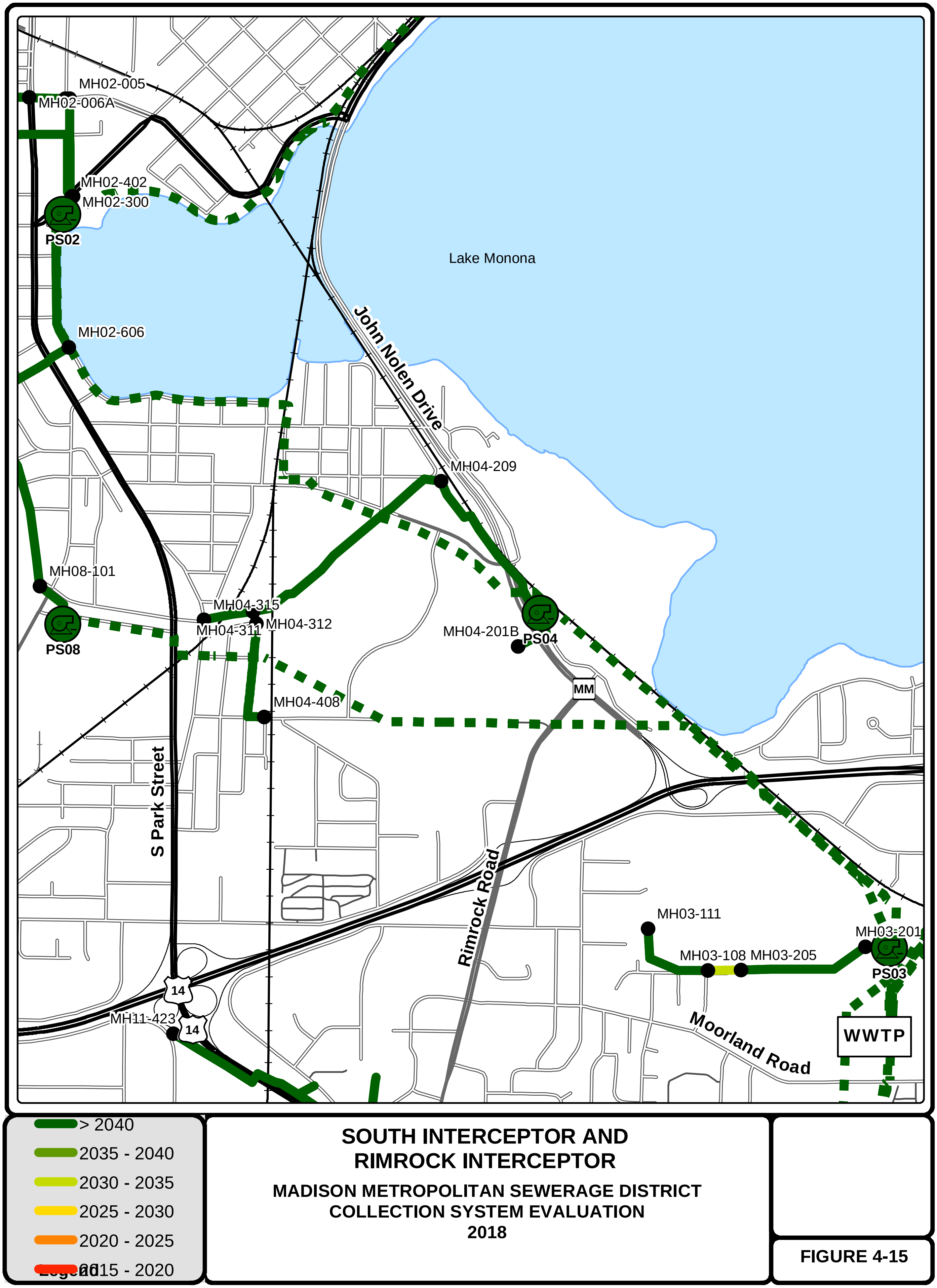
Table 4-27: Old West Interceptor from MH02-012

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH02-316	MH02-012	659	24	7.31	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH02-012	MH02-011	450	24	4.37	*1.37*	31%	*1.12*	26%	*1.41*	32%	*1.41*	32%	*1.41*	32%	*1.41*	32%	*1.41*	32%
MH02-011	MH02-010	200	24	4.37	*1.77*	41%	*1.43*	33%	*1.80*	41%	*1.80*	41%	*1.80*	41%	*1.81*	41%	*1.81*	41%
MH02-010	MH02-008A	660	24	4.37	*2.17*	50%	*1.79*	41%	*2.21*	51%	*2.21*	51%	*2.21*	51%	*2.22*	51%	*2.22*	51%
MH02-008A	MH02-006A	840	24	4.37	*2.64*	60%	*2.20*	50%	*2.70*	62%	*2.71*	62%	*2.73*	62%	*2.74*	63%	*2.75*	63%
MH02-006A	MH02-005A	460	24	4.98	*4.52*	91%	*3.79*	76%	*4.62*	93%	*4.68*	94%	*4.73*	95%	*4.78*	96%	*4.84*	97%
MH02-005A[3]	MH02-402	1,296	30	12.43	*7.80*	63%	*6.62*	53%	*8.07*	65%	*8.19*	66%	*8.30*	67%	*8.42*	68%	*8.53*	69%
MH02-005A	MH02-005	50	24	5.26	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH02-005	MH02-101	1,118	24	8.40	*0.19*	2%	*0.15*	2%	*0.19*	2%	*0.19*	2%	*0.19*	2%	*0.19*	2%	*0.19*	2%
Junction with West Interceptor - Spring Street Relief (Table 4-26)																		
MH02-101	MH02-402	10	36	26.21	*8.47*	32%	*7.59*	29%	*9.24*	35%	*9.39*	36%	*9.54*	36%	*9.69*	37%	*9.83*	38%
MH02-402	MH02-401	284	48	24.55	*14.64*	60%	*12.78*	52%	*15.58*	63%	*15.82*	64%	*16.05*	65%	*16.29*	66%	*16.52*	67%
Junction with Southwest Interceptor (Table 4-28)																		

[3] Section from MH02-005A to MH02-402 is the City of Madison's Frances Street Interceptor.

Table 4-28: Southwest Interceptor to PS2

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH08-106	MH02-114	276	24	5.06	*2.50*	49%	*1.99*	39%	*2.56*	51%	*2.75*	54%	*2.92*	58%	*3.41*	67%	*3.77*	74%
MH02-114	MH02-606	1,166	24	5.06	*2.73*	54%	*2.18*	43%	*2.80*	55%	*2.99*	59%	*3.16*	63%	*3.66*	72%	*4.02*	79%
MH02-606	MH02-401	1,770	36	14.4	*3.33*	23%	*2.73*	19%	*3.51*	24%	*3.70*	26%	*3.89*	27%	*4.33*	30%	*4.64*	32%
Junction with Old West Interceptor (Table 4-27)																		
MH02-401	PS 2	30	48	37.12	*16.81*	45%	*14.61*	39%	*17.84*	48%	*18.19*	49%	*18.54*	50%	*19.09*	51%	*19.55*	53%



SOUTH INTERCEPTOR AND RIMROCK INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-15

Table 4-29: Force Main from PS2 to PS4 to PS3 to WWTP

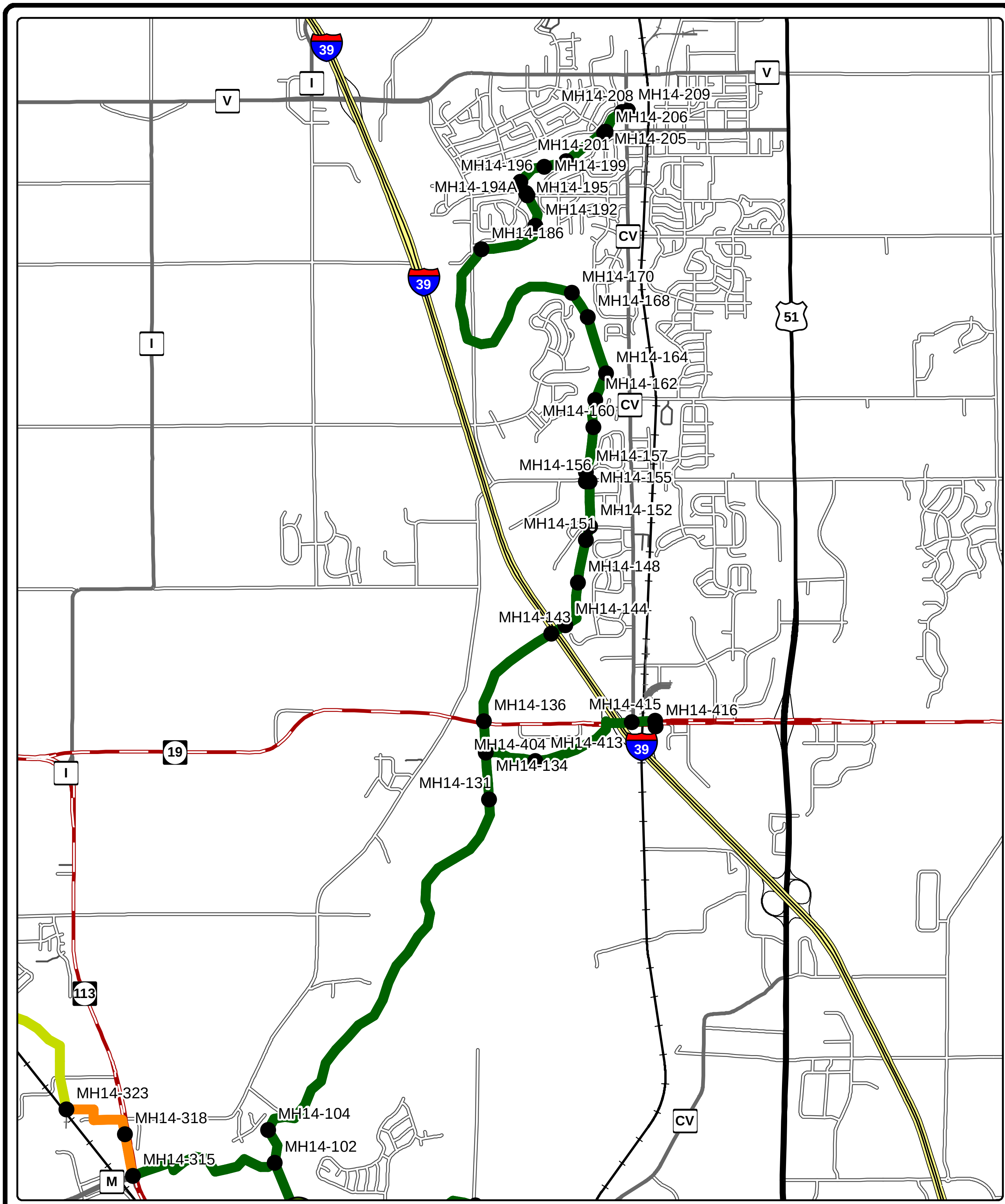
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
PS 2	RD02-01009	26	24	17.70	*26.99*	152%	*24.46*	138%	*27.66*	156%	*28.20*	159%	*28.72*	162%	*29.43*	166%	*30.05*	170%
RD02-01009	TE02-10933	9,890	36	39.34	*26.99*	69%	*24.46*	62%	*27.66*	70%	*28.20*	72%	*28.72*	73%	*29.43*	75%	*30.05*	76%
Junction with PS 4 Force Main (Table 4-30)																		
TE02-10933	TE02-17328	6,395	36	39.34	*29.36*	75%	*26.33*	67%	*29.90*	76%	*30.42*	77%	*30.94*	79%	*31.64*	80%	*32.25*	82%
Junction with PS 3 Force Main (Table 4-31)																		
TE02-17328	WWTP	1,111	36	39.34	*30.10*	77%	*26.86*	68%	*30.54*	78%	*31.12*	79%	*31.66*	80%	*32.39*	82%	*33.03*	84%

Table 4-30: South Interceptor& South Interceptor - Baird Street Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH04-408	MH04-313	1,414	15	2.61	*1.20*	46%	*0.87*	33%	*1.10*	42%	*1.10*	42%	*1.10*	42%	*1.10*	42%	*1.10*	42%
MH04-313	MH04-312	14	12	7.27	*1.20*	16%	*0.87*	12%	*1.10*	15%	*1.10*	15%	*1.10*	15%	*1.10*	15%	*1.10*	15%
MH04-312	MH04-311	156	10 & 14	4.00	*3.15*	79%	*2.39*	60%	*2.93*	73%	*2.94*	73%	*2.94*	73%	*2.94*	73%	*2.94*	73%
MH04-315	MH04-311	643	12	2.14	*0.15*	7%	*0.11*	5%	*0.14*	7%	*0.14*	7%	*0.14*	7%	*0.14*	7%	*0.14*	7%
MH04-311	MH04-209	3,048	24	5.46	*3.31*	61%	*2.50*	46%	*3.08*	56%	*3.08*	56%	*3.08*	56%	*3.08*	56%	*3.08*	56%
MH04-209	MH04-201	2,214	24	4.62	*3.65*	79%	*2.73*	59%	*3.44*	75%	*3.45*	75%	*3.45*	75%	*3.45*	75%	*3.45*	75%
MH04-201B	MH04-201	653	15	2.25	*0.40*	18%	*0.40*	18%	*0.40*	18%	*0.40*	18%	*0.40*	18%	*0.40*	18%	*0.40*	18%
MH04-201	PS4	30	24	5.27	*4.05*	77%	*3.13*	59%	*3.84*	73%	*3.85*	73%	*3.85*	73%	*3.85*	73%	*3.85*	73%
PS4	TE02-10933	153	16	7.20	*4.05*	56%	*3.13*	44%	*3.84*	53%	*3.85*	53%	*3.85*	53%	*3.85*	53%	*3.85*	53%
Junction with PS2 force main (Table 4-29)																		

Table 4-31: Rimrock Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH03-311	MH03-108	1,192	12	1.08	*0.70*	65%	*0.60*	55%	*0.72*	67%	*0.82*	76%	*0.86*	80%	*0.90*	83%	*0.94*	87%
MH03-108	MH03-205	400	12	1.08	*0.93*	86%	*0.79*	73%	*0.93*	86%	*1.03*	95%	*1.07*	99%	*1.11*	103%	*1.15*	106%
MH03-205	MH03-201	1,687	15	2.51	*0.93*	37%	*0.79*	31%	*0.93*	37%	*1.03*	41%	*1.07*	43%	*1.11*	44%	*1.15*	46%
MH03-201	PS 3	300	15	3.34	*1.28*	38%	*0.91*	27%	*1.11*	33%	*1.22*	36%	*1.27*	38%	*1.31*	39%	*1.36*	41%
PS 3	TE02-10933	26	8	1.80	*1.28*	71%	*0.91*	51%	*1.11*	62%	*1.22*	68%	*1.27*	70%	*1.31*	73%	*1.36*	76%
Junction with Northeast Interceptor (Table 4-36)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

NORTHEAST INTERCEPTOR
DEFOREST / HIGHWAY 19 EXTENSIONS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

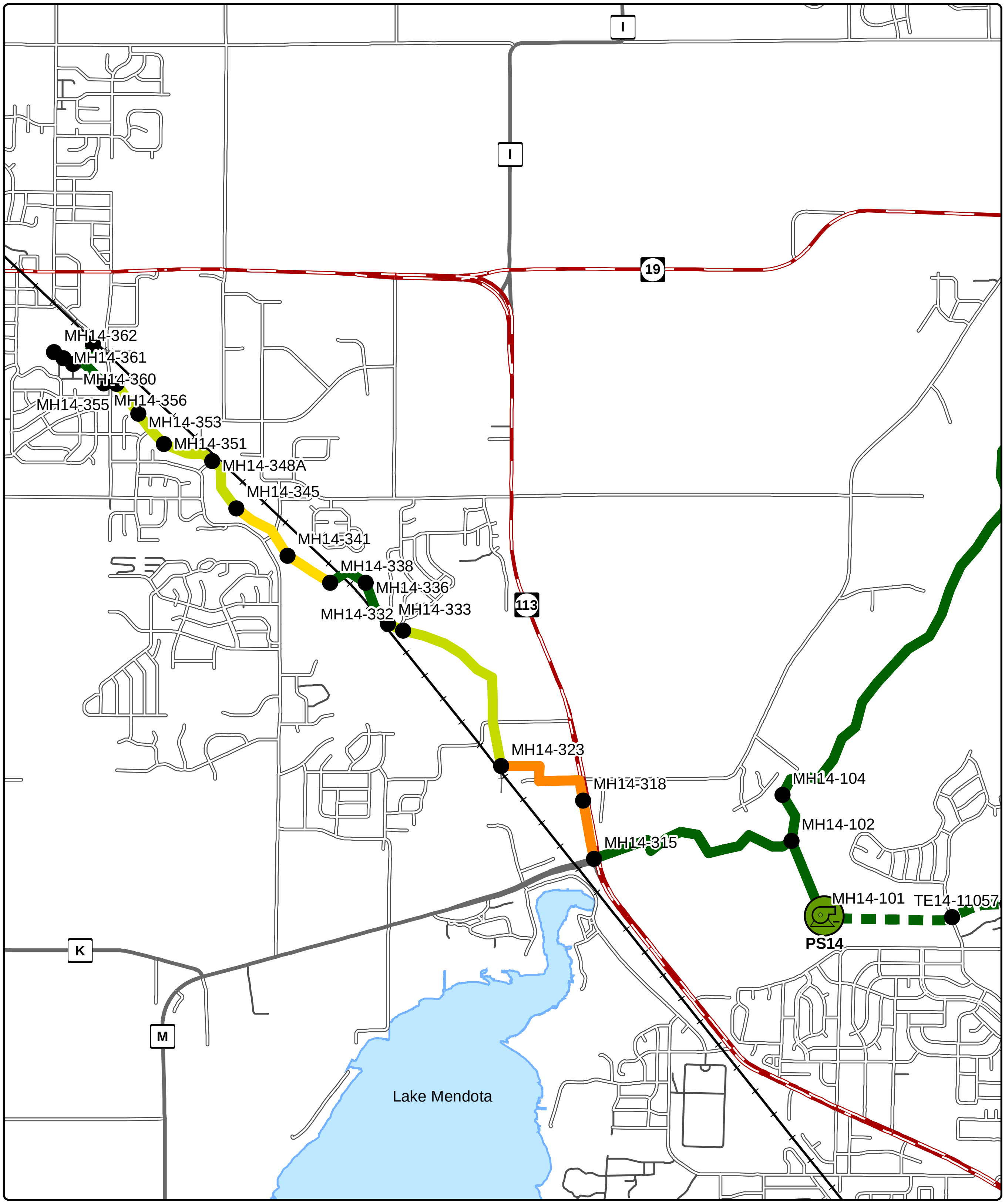
FIGURE 4-16

Table 4-32: Northeast Interceptor – DeForest Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH14-209	MH14-196	4,386	21	3.39	*1.78*	53%	*1.53*	45%	*1.81*	53%	*1.83*	54%	*1.83*	54%	*1.87*	55%	*1.87*	55%
MH14-196	MH14-193	1,203	21	3.39	*2.67*	79%	*2.29*	67%	*2.68*	79%	*2.72*	80%	*2.76*	81%	*2.79*	82%	*2.87*	85%
MH14-193	MH14-182	4,062	21	5.51	*2.86*	52%	*2.43*	44%	*2.84*	52%	*2.88*	52%	*2.92*	53%	*3.00*	54%	*3.08*	56%
MH14-182	MH14-171	5,724	21	5.51	*2.86*	52%	*2.43*	44%	*2.84*	52%	*2.88*	52%	*2.92*	53%	*3.00*	54%	*3.08*	56%
MH14-171	MH14-166	2,351	21	5.51	*2.98*	54%	*2.57*	47%	*3.00*	54%	*3.04*	55%	*3.08*	56%	*3.16*	57%	*3.23*	59%
MH14-166	MH14-165	488	21	5.51	*3.99*	72%	*3.41*	62%	*4.00*	73%	*4.09*	74%	*4.16*	76%	*4.22*	77%	*4.29*	78%
MH14-165	MH14-162	1,401	24	7.01	*3.99*	57%	*3.41*	49%	*4.00*	57%	*4.09*	58%	*4.16*	59%	*4.22*	60%	*4.29*	61%
MH14-162	MH14-156	2,687	24	7.01	*4.32*	62%	*3.84*	55%	*4.42*	63%	*4.53*	65%	*4.63*	66%	*4.71*	67%	*4.78*	68%
MH14-156	MH14-145	4,625	27	9.17	*5.34*	58%	*4.46*	49%	*5.29*	58%	*5.41*	59%	*5.51*	60%	*5.59*	61%	*5.65*	62%
MH14-145	MH14-143	964	30	9.18	*5.46*	59%	*4.78*	52%	*5.56*	61%	*5.71*	62%	*5.82*	63%	*5.91*	64%	*5.97*	65%
MH14-143	MH14-134	4,895	36	9.63	*5.46*	57%	*4.78*	50%	*5.56*	58%	*5.71*	59%	*5.82*	60%	*5.91*	61%	*5.97*	62%
Junction with Highway 19 Extension (Table 4-33)																		
MH14-134	MH14-102	16,679	36	9.63	*6.12*	64%	*5.75*	60%	*6.28*	65%	*6.52*	68%	*6.74*	70%	*6.88*	71%	*7.00*	73%
Junction with Waunakee Extension (Table 4-34)																		

Table 4-33: Northeast Interceptor - Highway 19 Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH14-416	MH14-415	193	12	1.15	*0.23*	20%	*0.31*	27%	*0.31*	27%	*0.36*	31%	*0.43*	37%	*0.48*	41%	*0.50*	43%
MH14-415	MH14-411	1,619	15	2.21	*0.72*	33%	*1.10*	50%	*0.81*	37%	*0.93*	42%	*1.06*	48%	*1.14*	52%	*1.22*	55%
MH14-411	MH14-409	622	15	3.23	*0.72*	22%	*1.10*	34%	*0.81*	25%	*0.93*	29%	*1.06*	33%	*1.14*	35%	*1.22*	38%
MH14-409	MH14-407	771	18	3.32	*0.72*	22%	*1.10*	33%	*0.81*	24%	*0.93*	28%	*1.06*	32%	*1.14*	34%	*1.22*	37%
MH14-407	MH14-134	3,059	18	2.35	*0.72*	31%	*1.10*	47%	*0.81*	34%	*0.93*	40%	*1.06*	45%	*1.14*	49%	*1.22*	52%
Junction with DeForest Extension (Table 4-32)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

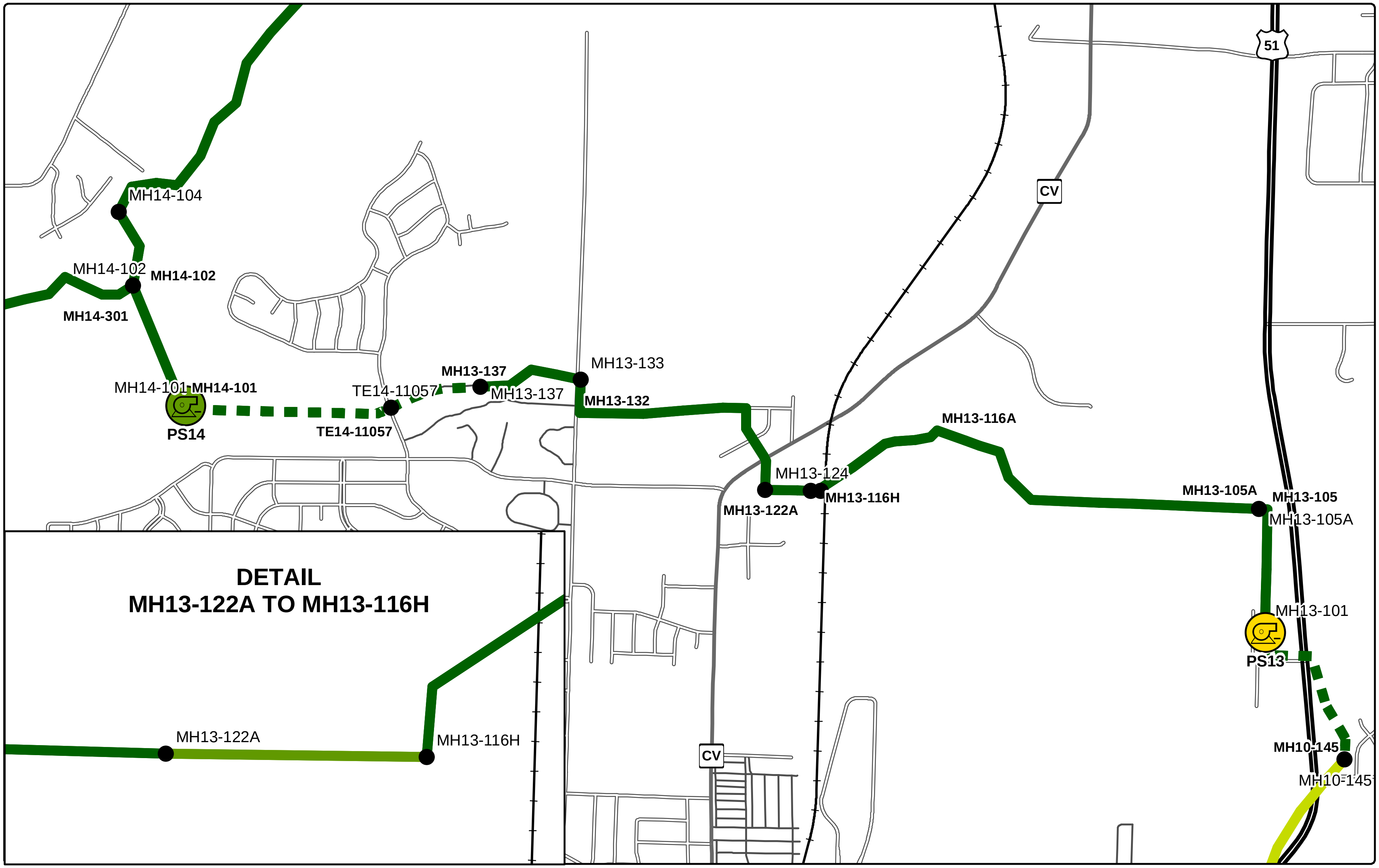
NORTHEAST INTERCEPTOR
WAUNAKEE EXTENSION

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-17

Table 4-34: Northeast Interceptor - Waunakee Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH14-359	MH14-358	494	24	5.47	*3.78*	69%	*2.92*	53%	*3.59*	66%	*3.67*	67%	*3.79*	69%	*4.01*	73%	*4.12*	75%
MH14-362	MH14-358	775	10	1.54	*0.99*	64%	*0.87*	57%	*1.04*	67%	*1.10*	72%	*1.19*	77%	*1.25*	81%	*1.31*	85%
MH14-358	MH14-356	674	24	5.47	*4.64*	85%	*3.79*	69%	*4.52*	83%	*4.64*	85%	*4.81*	88%	*5.04*	92%	*5.20*	95%
MH14-356	MH14-345	4,659	24	5.85	*5.52*	94%	*4.57*	78%	*5.38*	92%	*5.49*	94%	*5.73*	98%	*5.95*	102%	*6.15*	105%
MH14-345	MH14-338	2,859	21	6.31	*5.86*	93%	*5.01*	79%	*5.93*	94%	*6.22*	99%	*6.51*	103%	*6.86*	109%	*7.11*	113%
MH14-338	MH14-333	2,110	21	7.99	*6.16*	77%	*5.27*	66%	*6.23*	78%	*6.52*	82%	*6.83*	86%	*7.19*	90%	*7.43*	93%
MH14-333	MH14-323	4,889	30	7.01	*6.31*	90%	*5.43*	77%	*6.40*	91%	*6.70*	96%	*7.01*	100%	*7.36*	105%	*7.61*	108%
MH14-323	MH14-315	4,055	30	7.01	*6.92*	99%	*5.87*	84%	*6.96*	99%	*7.24*	103%	*7.60*	108%	*8.02*	114%	*8.35*	119%
MH14-315	MH14-301	5,251	30	9.18	*7.67*	84%	*6.36*	69%	*7.57*	82%	*7.78*	85%	*8.17*	89%	*8.57*	93%	*8.90*	97%
MH14-301	MH14-102	248	30	26.23	*7.67*	29%	*6.36*	24%	*7.57*	29%	*7.78*	30%	*8.17*	31%	*8.57*	33%	*8.90*	34%
MH14-102	MH14-101	1,873	42	20.55	*12.38*	60%	*10.85*	53%	*12.43*	60%	*12.83*	62%	*13.37*	65%	*13.86*	67%	*14.27*	69%
MH14-101	PS14	34	42	20.55	*13.49*	66%	*11.80*	57%	*13.54*	66%	*13.92*	68%	*14.46*	70%	*14.94*	73%	*15.34*	75%



> 2040

2035 - 2040

2030 - 2035

2025 - 2030

2020 - 2025

2015 - 2020

NORTHEAST INTERCEPTOR
PS 14 to PS 13

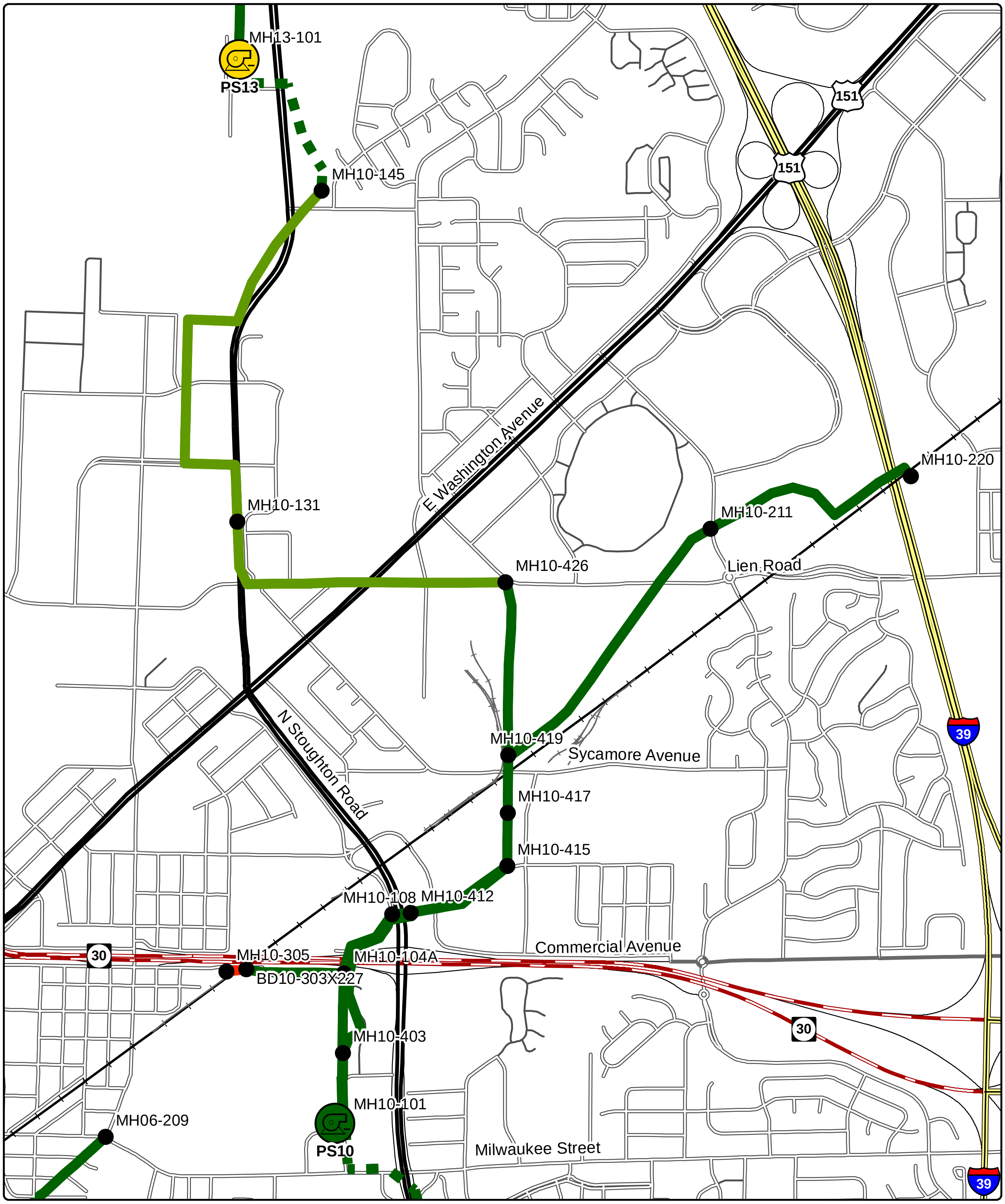
MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-18

Table 4-35: Northeast Interceptor – PS 14 to PS 13

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
PS14	TE14-11057	3,108	30	25.40	*13.49*	53%	*11.80*	46%	*13.54*	53%	*13.92*	55%	*14.46*	57%	*14.94*	59%	*15.34*	60%
TE14-11057[3]	MH13-137	1,358	30	25.40	*13.56*	53%	*11.87*	47%	*13.61*	54%	*14.00*	55%	*14.54*	57%	*15.01*	59%	*15.41*	61%
MH13-137	MH13-133	2,059	48	20.75	*13.79*	66%	*12.07*	58%	*13.82*	67%	*14.21*	68%	*14.74*	71%	*15.22*	73%	*15.62*	75%
MH13-133	MH13-122A	4,397	48	20.75	*13.97*	67%	*12.24*	59%	*14.00*	67%	*14.49*	70%	*15.04*	72%	*15.53*	75%	*15.94*	77%
MH13-122A	MH13-116H	153	48	20.75	*18.80*	91%	*16.75*	81%	*18.68*	90%	*19.19*	92%	*19.72*	95%	*20.19*	97%	*20.59*	99%
MH13-116H	MH13-116A	1,989	48	34.68	*18.80*	54%	*16.75*	48%	*18.68*	54%	*19.19*	55%	*19.72*	57%	*20.19*	58%	*20.59*	59%
MH13-116A	MH13-105A	5,168	48	26.70	*18.80*	70%	*16.75*	63%	*18.68*	70%	*19.19*	72%	*19.72*	74%	*20.19*	76%	*20.59*	77%
MH13-105A	PS13	1,883	48	24.55	*18.83*	77%	*16.80*	68%	*18.89*	77%	*19.57*	80%	*20.37*	83%	*21.50*	88%	*22.61*	92%

[4] The City of Madison's Cherokee #1 Lift Station pumps into the MMSD Collection System at TE14-11057.



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

NORTHEAST INTERCEPTOR
PS 13 to PS 10

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-19

Table 4-36: Northeast Interceptor - PS 13 to PS 10

			Pipe	Nominal	*Peak Flows (mgd)* / Percent Nominal Capacity													
		Length	Dia.	Capacity														
From	To	(ft)	(in)	(mgd)	2010		2015		2020		2025		2030		2035		2040	
PS13	MH10-145	1,927	36	36.50	*18.83*	52%	*16.80*	46%	*18.89*	52%	*19.57*	54%	*20.37*	56%	*21.50*	59%	*22.61*	62%
MH10-145	MH10-131	6,242	48	24.55	*19.92*	81%	*18.19*	74%	*20.46*	83%	*21.31*	87%	*22.31*	91%	*23.57*	96%	*24.88*	101%
MH10-131	MH10-426	4,553	48	24.55	*20.30*	83%	*18.65*	76%	*20.88*	85%	*21.74*	89%	*22.74*	93%	*24.00*	98%	*25.32*	103%
MH10-426	MH10-420	1,818	48	45.22	*21.37*	47%	*19.58*	43%	*21.89*	48%	*22.75*	50%	*23.76*	53%	*25.01*	55%	*26.33*	58%
MH10-420	MH10-419	637	54	45.04	*21.37*	47%	*19.58*	43%	*21.89*	49%	*22.75*	51%	*23.76*	53%	*25.01*	56%	*26.33*	58%
Junction Lien Extension (Table 4-37)																		
MH10-419	MH10-415	1,557	63	50.64	*22.61*	45%	*20.72*	41%	*23.12*	46%	*24.21*	48%	*25.49*	50%	*26.99*	53%	*28.91*	57%
Split at MH10-415: Assumed 50/50																		
MH10-415	MH10-411	1,616	54	33.57	*12.68*	38%	*11.63*	35%	*12.98*	39%	*13.59*	40%	*14.31*	43%	*15.15*	45%	*16.23*	48%
MH10-411	MH10-410	296	60	62.88	*12.68*	20%	*11.63*	18%	*12.98*	21%	*13.59*	22%	*14.31*	23%	*15.15*	24%	*16.23*	26%
MH10-410	MH10-408	676	54	30.03	*12.68*	42%	*11.63*	39%	*12.98*	43%	*13.59*	45%	*14.31*	48%	*15.15*	50%	*16.23*	54%
MH10-408	MH10-407	369	60	52.61	*12.68*	24%	*11.63*	22%	*12.98*	25%	*13.59*	26%	*14.31*	27%	*15.15*	29%	*16.23*	31%
MH10-407	MH10-403	1,280	54	30.03	*12.68*	42%	*11.63*	39%	*12.98*	43%	*13.59*	45%	*14.31*	48%	*15.15*	50%	*16.23*	54%
MH10-403	MH10-402	365	54	30.03	*12.70*	42%	*11.64*	39%	*13.00*	43%	*13.62*	45%	*14.34*	48%	*15.19*	51%	*16.27*	54%
MH10-402	PS10	672	54	30.03	*13.19*	44%	*12.18*	41%	*13.53*	45%	*14.14*	47%	*14.86*	49%	*15.70*	52%	*16.77*	56%
Split at MH10-415: Assumed 50/50																		
MH10-415	MH10-112	14	36	30.55	*12.68*	42%	*11.63*	38%	*12.98*	42%	*13.59*	44%	*14.31*	47%	*15.15*	50%	*16.23*	53%
MH10-112	MH10-104A	3,204	48	20.75	*13.01*	63%	*12.17*	59%	*13.44*	65%	*14.05*	68%	*14.76*	71%	*15.60*	75%	*16.67*	80%
Junction with Highway 30 Extension (Table 4-38)																		
MH10-104A	MH10-402	1,483	48	20.75	*13.67*	66%	*12.71*	61%	*14.06*	68%	*14.66*	71%	*15.37*	74%	*16.20*	78%	*17.27*	83%
MH10-402	MH10-101	586	48	20.75	*13.19*	64%	*12.18*	59%	*13.53*	65%	*14.14*	68%	*14.86*	72%	*15.70*	76%	*16.77*	81%
MH10-101	PS10	108	48	20.75	*14.72*	71%	*13.44*	65%	*14.94*	72%	*15.54*	75%	*16.26*	78%	*17.08*	82%	*18.15*	87%

Table 4-37: Northeast Interceptor - Lien Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH10-220	MH10-214	2,075	24	12.33	*0.10*	1%	*0.10*	1%	*0.14*	1%	*0.31*	3%	*0.71*	6%	*0.82*	7%	*1.66*	13%
MH10-214	MH10-212	804	24	8.00	*0.10*	1%	*0.10*	1%	*0.14*	2%	*0.31*	4%	*0.71*	9%	*0.82*	10%	*1.66*	21%
MH10-212	MH10-201	4,802	27	7.75	*2.02*	26%	*1.84*	24%	*2.03*	26%	*2.41*	31%	*2.90*	37%	*3.34*	43%	*4.34*	56%
MH10-201	MH10-419	29	30	14.00	*2.02*	14%	*1.84*	13%	*2.03*	14%	*2.41*	17%	*2.90*	21%	*3.34*	24%	*4.34*	31%
Junction with Northeast Interceptor (Table 4-36)																		

Table 4-38: Northeast Interceptor - Highway 30 Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH10-305	BD10-303	357	12	0.86	*0.98*	114%	*0.80*	93%	*0.93*	108%	*0.93*	108%	*0.93*	108%	*0.93*	108%	*0.93*	108%
BD10-303	MH10-104A	1,371	16	1.85	*0.98*	53%	*0.80*	43%	*0.93*	50%	*0.93*	50%	*0.93*	50%	*0.93*	50%	*0.93*	50%
Junction with Northeast Interceptor (Table 4-36)																		

> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

NEI - PS 10 to SEI AND EAST INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-20

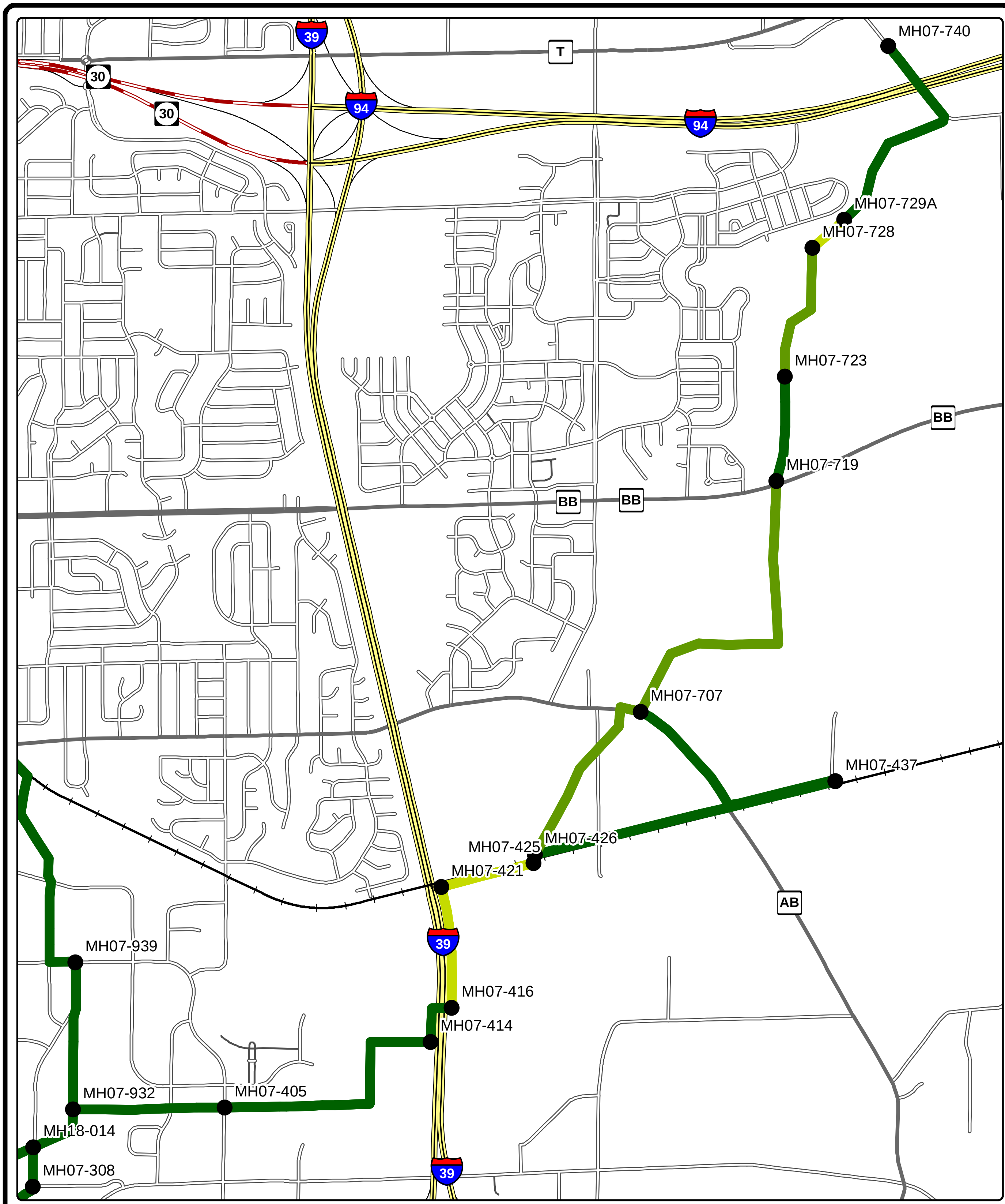
Table 4-39: Northeast Interceptor - PS 10 to Southeast Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
PS 10	MH07-955	11,109	36	36.50	*25.02*	69%	*22.97*	63%	*25.52*	70%	*26.61*	73%	*27.89*	76%	*29.39*	81%	*31.30*	86%
MH07-955	MH07-954	95	48	40.45	*25.51*	63%	*23.53*	58%	*26.06*	64%	*27.16*	67%	*28.46*	70%	*29.96*	74%	*31.88*	79%
MH07-954	PB07-953	40	48	57.20	*25.51*	45%	*23.53*	41%	*26.06*	46%	*27.16*	47%	*28.46*	50%	*29.96*	52%	*31.88*	56%
PB07-953	MH07-949	1,843	48	67.60	*25.51*	38%	*23.53*	35%	*26.06*	39%	*27.16*	40%	*28.46*	42%	*29.96*	44%	*31.88*	47%
MH07-949	MH07-945	1,083	42	50.37	*25.51*	51%	*23.53*	47%	*26.06*	52%	*27.16*	54%	*28.46*	57%	*29.96*	59%	*31.88*	63%
MH07-945	MH07-942	850	36	60.47	*25.51*	42%	*23.53*	39%	*26.06*	43%	*27.16*	45%	*28.46*	47%	*29.96*	50%	*31.88*	53%
MH07-942	MH07-939	790	42	68.27	*25.51*	37%	*23.53*	34%	*26.06*	38%	*27.16*	40%	*28.46*	42%	*29.96*	44%	*31.88*	47%
MH07-939	MH07-932	2,622	54	52.01	*27.45*	53%	*25.61*	49%	*28.13*	54%	*29.22*	56%	*30.50*	59%	*31.99*	62%	*33.89*	65%
Junction with Far East Interceptor - Door Creek Extension (Table 4-42)																		
MH07-932	MH18-014	1,114	60	68.88	*30.49*	44%	*29.28*	43%	*32.14*	47%	*33.81*	49%	*35.43*	51%	*37.97*	55%	*42.03*	61%
MH18-014	MH18-007	2,798	48	37.99	*17.20*	45%	*16.54*	44%	*18.13*	48%	*19.06*	50%	*19.96*	53%	*21.37*	56%	*23.64*	62%
MH18-007	MH18-006	205	54	45.04	*17.20*	38%	*16.54*	37%	*18.13*	40%	*19.06*	42%	*19.96*	44%	*21.37*	47%	*23.64*	52%
MH18-014	MH07-308	696	48	32.14	*17.20*	54%	*16.54*	51%	*18.13*	56%	*19.06*	59%	*19.96*	62%	*21.37*	67%	*23.64*	74%
MH07-308	MH18-006	2,158	48	32.14	*17.26*	54%	*16.61*	52%	*18.19*	57%	*19.12*	60%	*20.03*	62%	*21.45*	67%	*23.71*	74%
MH18-006	MH18-004	474	48	32.14	*10.16*	32%	*9.76*	30%	*10.71*	33%	*11.26*	35%	*11.79*	37%	*12.61*	39%	*13.93*	43%
MH18-006	MH18-004	473	54	45.04	*14.26*	32%	*13.69*	30%	*15.03*	33%	*15.80*	35%	*16.54*	37%	*17.70*	39%	*19.55*	43%
MH18-004	PS 18	876	60	65.95	*24.44*	37%	*23.46*	36%	*25.76*	39%	*27.07*	41%	*28.34*	43%	*30.33*	46%	*33.51*	51%
PS 18	WWTP	15,492	48	64.94	*24.44*	38%	*23.46*	36%	*25.76*	40%	*27.07*	42%	*28.34*	44%	*30.33*	47%	*33.51*	52%

(1) Evaluation assumes 75% of flow in Northeast Interceptor system is pumped at PS 18. Remaining 25% is pumped at PS 7.

Table 4-40: East Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH06-122	MH06-108A	4,813	36	23.88	*0.59*	2%	*0.50*	2%	*0.55*	2%	*0.55*	2%	*0.55*	2%	*0.55*	2%	*0.55*	2%
Junction with Fair Oaks / East Monona Interceptor (Table 4-41)																		
MH06-108A	MH06-103	1,526	36	23.88	*1.69*	7%	*1.33*	6%	*1.51*	6%	*1.51*	6%	*1.51*	6%	*1.51*	6%	*1.51*	6%
MH06-103	PS 6	1,483	42	30.48	*1.69*	6%	*1.33*	4%	*1.51*	5%	*1.51*	5%	*1.51*	5%	*1.51*	5%	*1.51*	5%
PS 6	MH07-129	7,214	36	36.50	*7.79*	21%	*6.07*	17%	*7.07*	19%	*7.07*	19%	*7.07*	19%	*7.07*	19%	*7.07*	19%
MH07-129	MH07-121A	3,126	36	41.05	*10.28*	25%	*8.01*	20%	*9.29*	23%	*9.29*	23%	*9.29*	23%	*9.29*	23%	*9.29*	23%
MH07-121A	MH07-111J	2,851	42	36.03	*10.28*	29%	*8.01*	22%	*9.29*	26%	*9.29*	26%	*9.29*	26%	*9.29*	26%	*9.29*	26%
MH07-111J	MH07-111A	1,844	36	36.01	*10.28*	29%	*8.01*	22%	*9.29*	26%	*9.29*	26%	*9.29*	26%	*9.29*	26%	*9.29*	26%
MH07-111A	MH07-101	3,484	42	30.48	*10.28*	34%	*8.01*	26%	*9.29*	30%	*9.29*	30%	*9.29*	30%	*9.29*	30%	*9.29*	30%
MH07-101	PS 7	115	42	30.48	*10.87*	36%	*8.67*	28%	*9.94*	33%	*9.94*	33%	*9.94*	33%	*9.94*	33%	*9.94*	33%



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

FAR EAST INTERCEPTOR
DOOR CREEK & COTTAGE GROVE EXTENSIONS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-21

Table 4-41: Fair Oaks / East Monona Interceptor

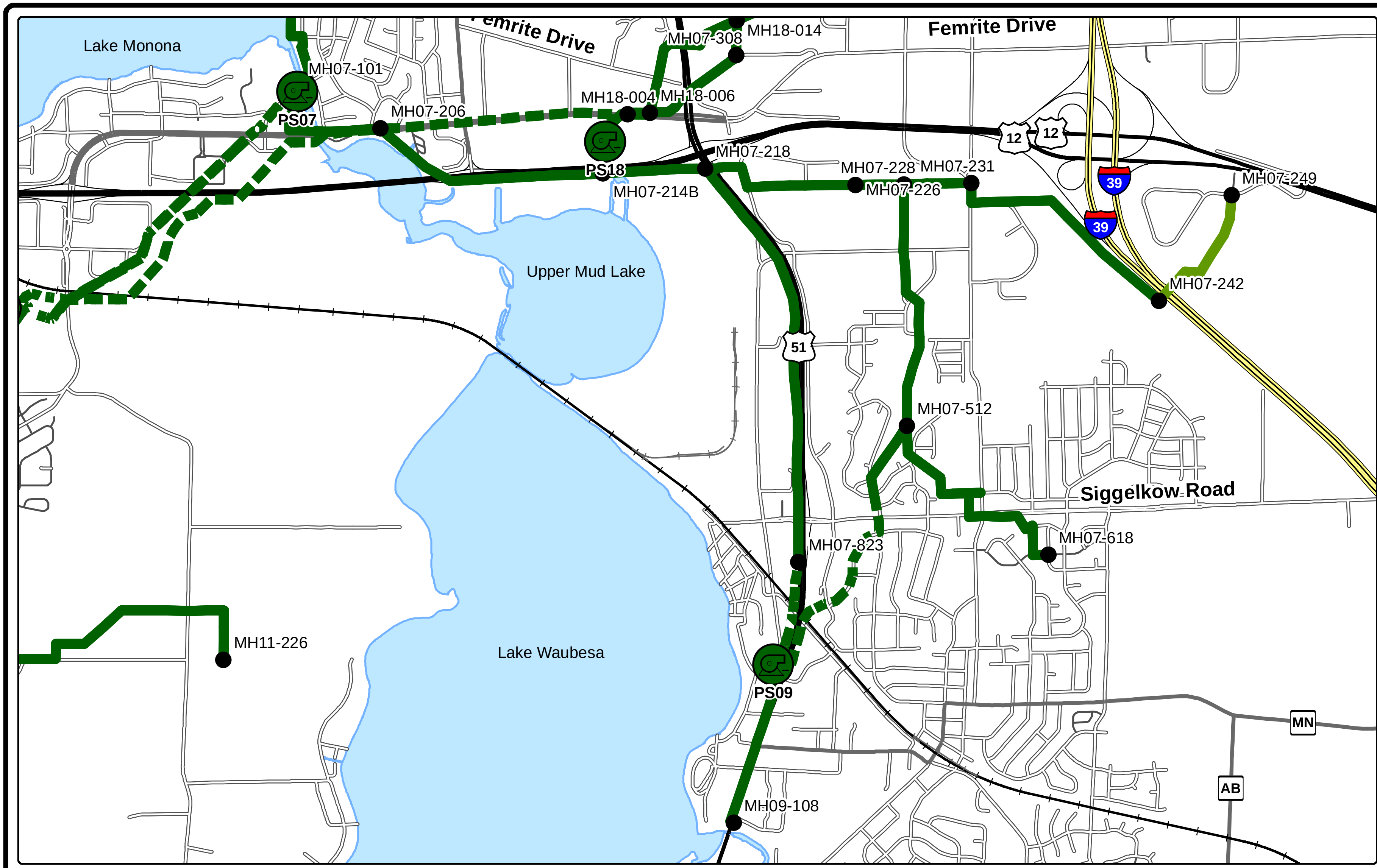
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH06-209	MH06-206	1,236	15	1.02	*0.87*	85%	*0.66*	65%	*0.76*	75%	*0.76*	75%	*0.76*	75%	*0.76*	75%	*0.76*	75%
MH06-206	MH06-205	85	14	1.04	*0.87*	83%	*0.66*	63%	*0.76*	73%	*0.76*	73%	*0.76*	73%	*0.76*	73%	*0.76*	73%
MH06-205	MH06-204	90	14	0.85	*0.87*	102%	*0.66*	78%	*0.76*	90%	*0.76*	90%	*0.76*	90%	*0.76*	90%	*0.76*	90%
MH06-204	MH06-108A	847	15	1.64	*0.87*	53%	*0.66*	40%	*0.76*	47%	*0.76*	47%	*0.76*	47%	*0.76*	47%	*0.76*	47%
Junction with East Interceptor (Table 4-40)																		

Table 4-42: Door Creek Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH07-740	MH07-735	1,693	18	4.39	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*1.14*	26%	*2.43*	55%
MH07-735	MH07-729A	2,666	21	4.20	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*1.14*	27%	*2.43*	58%
MH07-729A	MH07-728	756	21	4.20	*1.19*	28%	*1.64*	39%	*2.09*	50%	*2.67*	64%	*2.88*	69%	*4.32*	103%	*5.55*	132%
MH07-728	MH07-723	2,496	21	5.21	*1.19*	23%	*1.64*	31%	*2.09*	40%	*2.67*	51%	*2.88*	55%	*4.32*	83%	*5.55*	107%
MH07-723	MH07-719	1,876	24	5.66	*1.19*	21%	*1.64*	29%	*2.09*	37%	*2.67*	47%	*2.88*	51%	*4.32*	76%	*5.55*	98%
MH07-719	MH07-707	6,023	24	5.66	*1.64*	29%	*2.12*	37%	*2.57*	45%	*3.17*	56%	*3.40*	60%	*4.78*	84%	*6.00*	106%
MH07-707	MH07-426	3,474	24	7.12	*1.64*	23%	*2.12*	30%	*2.88*	40%	*3.81*	54%	*4.30*	60%	*5.79*	81%	*7.20*	101%
Junction with Cottage Grove Extension (Table 4-43)																		
MH07-426	MH07-425	153	36	12.19	*4.14*	34%	*4.59*	38%	*5.23*	43%	*5.97*	49%	*6.39*	52%	*7.79*	64%	*9.13*	75%
MH07-425	MH07-421	1,693	30	7.49	*4.14*	55%	*4.59*	61%	*5.23*	70%	*5.97*	80%	*6.39*	85%	*7.79*	104%	*9.13*	122%
MH07-421	MH07-416	2,168	30	7.49	*4.14*	55%	*4.59*	61%	*5.23*	70%	*5.97*	80%	*6.39*	85%	*7.79*	104%	*10.64*	142%
MH07-416	MH07-414	355	42	15.92	*4.14*	26%	*4.59*	29%	*5.23*	33%	*5.97*	37%	*6.39*	40%	*7.79*	49%	*10.64*	67%
MH07-414	MH07-405	4,776	42	15.92	*4.35*	27%	*4.75*	30%	*5.45*	34%	*6.24*	39%	*6.71*	42%	*8.14*	51%	*11.00*	69%
MH07-405	MH07-932	2,696	42	15.92	*5.02*	32%	*5.83*	37%	*6.37*	40%	*7.19*	45%	*7.70*	48%	*9.14*	57%	*12.00*	75%
Junction with Northeast Interceptor (Table 4-39)																		

Table 4-43: Far East Interceptor & Cottage Grove Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity													
					2010		2015		2020		2025		2030		2035		2040	
MH07-437	MH07-426	5,510	18	2.83	*2.53*	89%	*2.59*	92%	*2.62*	93%	*2.62*	93%	*2.62*	93%	*2.62*	93%	*2.62*	93%
Junction with Door Creek Extension (Table 4-42)																		



> 2040
2035 - 2040
2030 - 2035
2025 - 2030
2020 - 2025
2015 - 2020

SOUTHEAST INTERCEPTOR / MCFARLAND RELIEF
SIGGLEKOW AND BLOOMING GROVE EXTENSIONS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-22

Table 4-44: SEI – McFarland Relief & Southeast Interceptor

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH09-108	MH09-104	1,678	24	4.13	*2.01*	49%	*1.86*	45%	*1.98*	48%	*2.09*	51%	*2.18*	53%	*2.28*	55%	*2.72*	66%
MH09-104	MH09-101	1,373	27	5.66	*2.01*	36%	*1.86*	33%	*1.98*	35%	*2.09*	37%	*2.18*	38%	*2.28*	40%	*2.72*	48%
MH09-101	PS 9	285	24	4.62	*3.30*	71%	*3.02*	65%	*3.22*	70%	*3.33*	72%	*3.41*	74%	*3.52*	76%	*3.96*	86%
PS 9	TE09-20598	40	14	6.09	*3.30*	54%	*3.02*	50%	*3.22*	53%	*3.33*	55%	*3.41*	56%	*3.52*	58%	*3.96*	65%
Junction with Force Main to Southeast Inerceptor (Table 4-45)																		
TE09-20598	MH07-517	4,329	20	12.36	*3.30*	27%	*3.02*	24%	*3.22*	26%	*3.33*	27%	*3.41*	28%	*3.52*	28%	*3.96*	32%
MH07-517	MH07-515	392	20	13.44	*3.46*	26%	*3.28*	24%	*3.46*	26%	*3.57*	27%	*3.65*	27%	*3.75*	28%	*4.16*	31%
MH07-515	MH07-512	1,263	30	8.79	*3.46*	39%	*3.28*	37%	*3.46*	39%	*3.57*	41%	*3.65*	42%	*3.75*	43%	*4.16*	47%
Junction with Sigglekow Extension (Table 4-46)																		
MH07-512	MH07-228	5,012	30	8.79	*4.37*	50%	*4.29*	49%	*4.58*	52%	*4.75*	54%	*4.86*	55%	*4.98*	57%	*5.38*	61%
Junction with Blooming Grove Extension (Table 4-47)																		
MH07-228	MH07-226	995	30	10.26	*4.80*	47%	*4.90*	48%	*5.31*	52%	*6.03*	59%	*6.44*	63%	*6.79*	66%	*7.72*	75%
MH07-226	MH07-222	1,656	30	10.26	*4.93*	48%	*5.04*	49%	*5.49*	54%	*6.26*	61%	*6.71*	65%	*7.12*	69%	*8.09*	79%
MH07-222	MH07-218	1,647	36	10.55	*4.93*	47%	*5.04*	48%	*5.49*	52%	*6.26*	59%	*6.71*	64%	*7.12*	67%	*8.09*	77%
Junction with Southeast Interceptor (Table 4-45)																		
MH07-218	MH07-215	1,606	36	11.4	*5.39*	47%	*5.48*	48%	*5.94*	52%	*6.70*	59%	*7.15*	63%	*7.56*	66%	*8.52*	75%
MH07-215	MH07-214B	462	60	37.62	*5.39*	14%	*5.48*	15%	*5.94*	16%	*6.70*	18%	*7.15*	19%	*7.56*	20%	*8.52*	23%
MH07-214B	MH07-206	4,832	60	37.62	*13.62*	36%	*13.33*	35%	*14.57*	39%	*15.70*	42%	*16.56*	44%	*17.64*	47%	*19.63*	52%
MH07-206	PS 07	2524	60	37.62	*14.88*	40%	*14.23*	38%	*15.68*	42%	*16.84*	45%	*17.71*	47%	*18.81*	50%	*20.82*	55%

(1) Evaluation assumes 75% of flow in Northeast Interceptor system is pumped at PS 18. Remaining 25% is pumped at PS 7.

Table 4-45: Southeast Interceptor

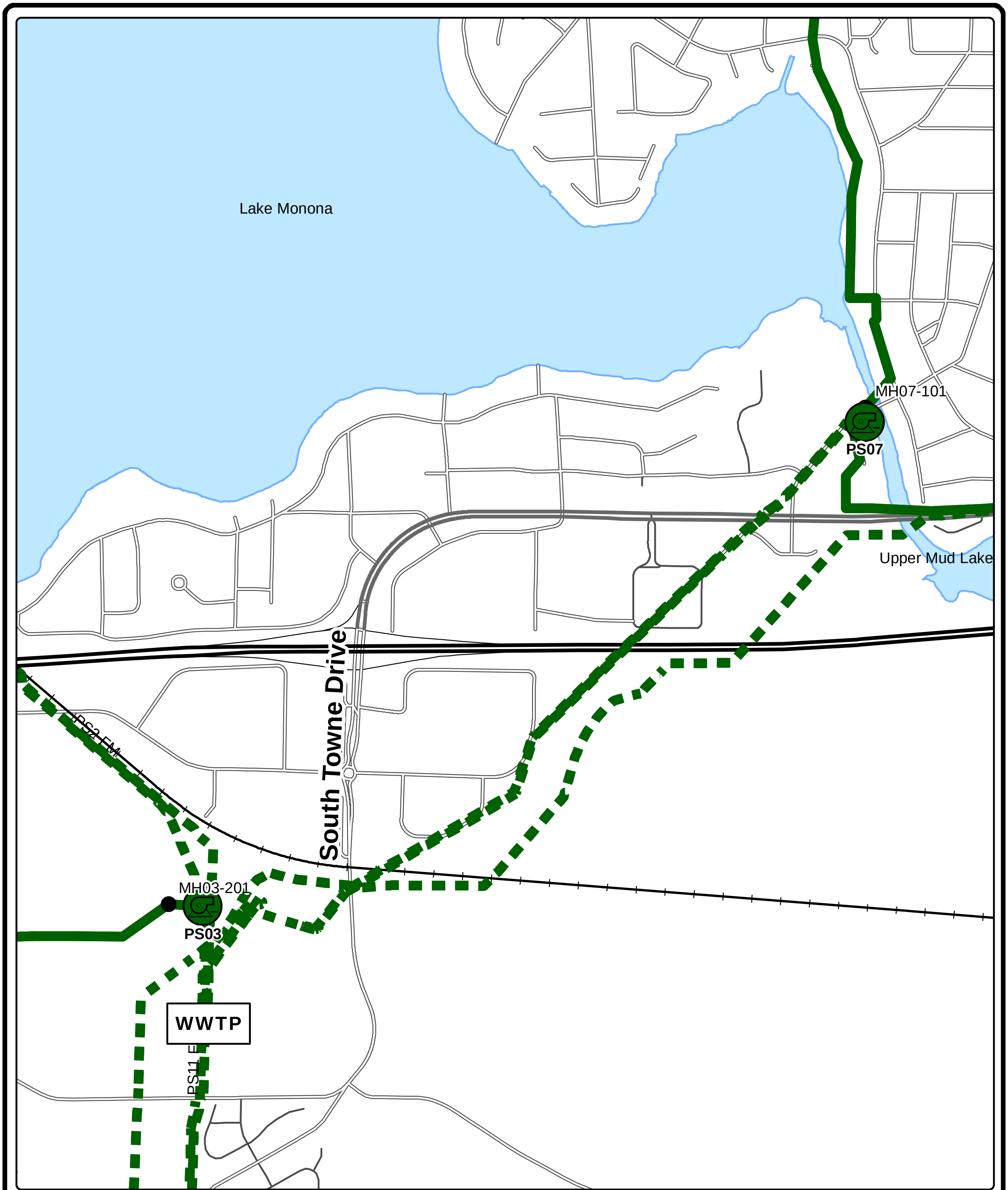
From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
TE09-20598	MH07-823	2,197	10	2.82	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%	*0.00*	0%
MH07-823	MH07-821	760	12	1.46	*0.58*	39%	*0.54*	37%	*0.56*	39%	*0.57*	39%	*0.58*	40%	*0.59*	40%	*0.59*	41%
MH07-821	MH07-819	184	8	1.46	*0.58*	39%	*0.54*	37%	*0.56*	39%	*0.57*	39%	*0.58*	40%	*0.59*	40%	*0.59*	41%
MH07-819	MH07-818	357	12	1.46	*0.58*	39%	*0.54*	37%	*0.56*	39%	*0.57*	39%	*0.58*	40%	*0.59*	40%	*0.59*	41%
MH07-818	MH07-810	3,201	12	2.36	*0.58*	24%	*0.54*	23%	*0.56*	24%	*0.57*	24%	*0.58*	25%	*0.59*	25%	*0.59*	25%
MH07-810	MH07-218	3,971	15	1.62	*0.58*	36%	*0.54*	34%	*0.56*	35%	*0.57*	35%	*0.58*	36%	*0.59*	36%	*0.59*	37%
Junction with McFarland Relief (Table 4-44)																		

Table 4-46: SEI – Siggelkow Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH07-618	MH07-610	2,334	12	1.41	*0.59*	42%	*0.61*	43%	*0.69*	49%	*0.73*	52%	*0.73*	52%	*0.73*	52%	*0.73*	52%
MH07-610	MH07-609	78	8	1.68	*0.59*	35%	*0.61*	36%	*0.69*	41%	*0.73*	44%	*0.73*	44%	*0.73*	44%	*0.73*	44%
MH07-609	MH07-512	2,666	12	1.22	*0.59*	48%	*0.61*	50%	*0.69*	57%	*0.73*	60%	*0.73*	60%	*0.73*	60%	*0.73*	60%
Junction with Southeast Interceptor (Table 4-45)																		

Table 4-47: SEI – Blooming Grove Extension

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
MH07-249	MH07-242	2,794	18	2.25	*0.33*	15%	*0.44*	20%	*0.57*	25%	*0.99*	44%	*1.30*	58%	*1.62*	72%	*2.36*	105%
MH07-242	MH07-231	4,974	24	3.87	*0.52*	13%	*0.74*	19%	*0.91*	23%	*1.61*	42%	*2.00*	52%	*2.31*	60%	*3.05*	79%
MH07-231	MH07-228	1,347	24	5.06	*0.52*	10%	*0.74*	15%	*0.91*	18%	*1.61*	32%	*2.00*	39%	*2.31*	46%	*3.05*	60%
Junction with McFarland Relief (Table 4-44)																		



- > 2040
- 2035 - 2040
- 2030 - 2035
- 2025 - 2030
- 2020 - 2025
- 2015 - 2020

PS 7 FORCE MAIN
PS 18 FORCE MAIN

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2018

FIGURE 4-23

Table 4-48: PS 7 Force Main

From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity 2010		2015		2020		2025		2030		2035		2040	
PS 07	TE07A-01520	6,996	2 x 36	55.00	*14.88*	27%	*14.23*	26%	*15.68*	29%	*16.84*	31%	*17.71*	32%	*18.81*	34%	*20.82*	38%
TE07A-01520	WWTP	1,655	48	55.00	*14.88*	27%	*14.23*	26%	*15.68*	29%	*16.84*	31%	*17.71*	32%	*18.81*	34%	*20.82*	38%

(1) Evaluation assumes 75% of flow in Northeast Interceptor system is pumped at PS 18. Remaining 25% is pumped at PS 7.

Chapter 5 Issues and Alternatives

There is the potential to postpone or avoid the projected need for capacity improvements if the projected flow increases can be offset by reducing infiltration and inflow, reducing per capita wastewater generation, or directing development to areas with excess capacity.

Infiltration and Inflow

Average daily infiltration and inflow in 2015 was estimated to be 6.2 mgd or approximately 16% of the total estimated wastewater flow.

Table 5-1 compares the municipal and sanitary district wastewater generation from MMSD records to their water sales from water utility reports to the Public Service Commission. It is expected that the ratio of wastewater to water sales would be less than 1, because some water uses do not contribute to wastewater, these include; lawn and garden watering, swimming pools, cooling towers, etc. A wastewater to water sales ratio of more than 1.1 indicates a problem with infiltration and inflow in that community, unless there are a large number of households with private water wells, but public sanitary sewer.

Table 5-1: Comparison of Wastewater Generation to Water Sales

Municipality / Sanitary District	2015 Wastewater (gpd)	2015 Water Sales (gpd)	Ratio Wastewater / Water Sales
City of Fitchburg	1,855,000	1,808,737	1.03
City of Madison	25,447,000	23,291,608	1.09
City of Middleton	1,862,000	1,916,707	0.97
City of Monona	688,000	576,945	1.19
City of Verona	927,000	1,061,704	0.87
Village of Cottage Grove	628,000	477,836	1.31
Village of Dane	50,000	53,901	0.93
Village of DeForest	712,000	633,112	1.12
Village of Maple Bluff	149,000	106,833	1.39
Village of McFarland	531,000	484,937	1.09
Village of Shorewood Hills	123,000	129,093	0.95
Village of Waunakee	1,368,000	1,073,953	1.27
Morrisonville Sanitary District	59,000	19,282	3.06
Windsor Sanitary District #1	243,000	247,318	0.98

The City of Madison, City of Monona, Village of Cottage Grove, Village of DeForest, Village of Maple Bluff, Village of McFarland, Village of Waunakee, and the Morrisonville Sanitary District all have a wastewater to water sales ratio of near 1.1 or greater. In the case of the Village of Cottage Grove, the difference is attributed to the Hydrite groundwater barrier project has pumped approximately 150,000 gpd of contaminated groundwater into the MMSD collection system since the fall of 2003. MMSD may wish to follow up with these communities regarding their municipal collection system televising and inspection programs to verify if infiltration is a problem and to encourage corrective measures to reduce clear water inputs into the collection system.

Excess Capacity Areas

The portions of the collection system and corresponding sub-basins that are projected to have at least 25% of their capacity remaining by 2040 are classified as excess capacity areas. This does not include areas that have excess capacity upstream, but are capacity restricted further downstream. Therefore capacity in the collection system is ultimately restricted by the capacity of the force mains entering the wastewater treatment plant as shown in Table 5-2.

Table 5-2: Projected Capacity of Force Mains to NSWTP

Force Main	Projected Capacity
Pumping Station 11 Force Main	96% of capacity in 2040
Pumping Station 8 Force Main	45% of capacity in 2040
Pumping Station 2/3/4 Force Main	85% of capacity in 2040
Pumping Station 7 Force Main	19% of capacity in 2040
Pumping Station 18 Force Main	66% of capacity in 2040

The Pumping Station 7, 8, and 18 force mains entering the wastewater treatment plant are projected to have excess capacity in 2040.

Appendix A: Previous Studies

1961 Report on Sewerage and Sewage Treatment

The earliest study reviewed is the Greeley and Hansen report of 1961, titled “Report on Sewerage and Sewage Treatment,” which was itself based on several reports by Greeley and Hansen Engineers in the 1940s and 1950s.

The 1961 study projected a population for the sewerage district of 222,000 to 290,000 for 1980 and 340,000 to 500,000 for 2010. The actual 1980 district population was approximately 228,500. The current estimated 2010 figure is between 330,000 and 340,000 (This is higher than the 2010 estimate in the 1999 Collection System Evaluation of between 277,000 and 282,600).

It is not clear how the estimated 2010 district boundary was determined. The total area of developable land within the boundary is also not known. The 1959 district had a total land area of 40,800 acres, and the 2010 estimated district boundary added 93,000 acres of usable land resulting in a total 2010 land area of over 133,800 acres. For comparison, the 2010 district total land estimate in the 1999 Collection System Evaluation was about 55,000 acres.

The 1961 Greeley and Hansen study assigned different population densities to 59 sub-basins within the estimated 2010 sewerage district and thus calculated design populations for each sub-basin. Wastewater flows were calculated by applying per capita flows to the estimated population. The per capita flows were derived from 1960 flows and by applying an increase of 4 gallons per capita per day (gpcd) per decade (115 gpcd in 1960 to 130 gpcd in 2010) for areas outside the 1940 city limits, and an increase of 2 gpcd per decade (85 gpcd in 1960 to 95 gpcd in 2010) for areas outside the 1940 city limits. Wastewater flows from the University of Wisconsin and Oscar Mayer Foods Corp. were added separately. Table A-1 shows the total flows the study projected:

Table A-1: Flow Projections in 1961 Greeley and Hansen Study

Total Flow (MGD)	1980	1990	2000	2010
Upper Range	36.80	43.92	51.35	58.95
Lower Range	30.60	34.84	39.06	43.67

For comparison, the actual flows were 36.66 in 1980, 34.92 in 1990, and 42.10 in 2000.

The peaking factor curve used in the Greeley and Hansen report were developed from actual pumpage records between 1956 and 1959. Peaking factors ranged between 2.2 and 4.5.

The Greeley and Hansen study recommended that six pumping stations and an intercepting sewer system be constructed ringing the west and south sides of the metropolitan area. This system was designed so that it would provide relief to the older inner system as it reached capacity as well as save the developable areas on the periphery of the metropolitan area.

The study also recommended pumping wastewater from the City of Sun Prairie to a proposed Starkweather Creek Interceptor and via a proposed pumping station No. 10 to pumping station No. 7. The new pumping station 10 as to be sized to serve the Blooming Grove pumping station service area and thus to provide relief to pumping station No. 6.

Mead and Hunt did several interceptor studies using the methodology as in the Greeley and Hansen report. These include:

- "Review of Project VII; West Side Collecting System", 1967
- "Review of Project IV; Northeast Collecting System", 1969
- "Report on Northeast Interceptor, Token Creek Extension", 1971

1967 West Side Collecting System

The 1967 report on the west side collecting system followed the same methodology as the Greeley and Hansen (1961) study. Figure A-1 shows the drainage areas included in the design of this part of the interceptor system.

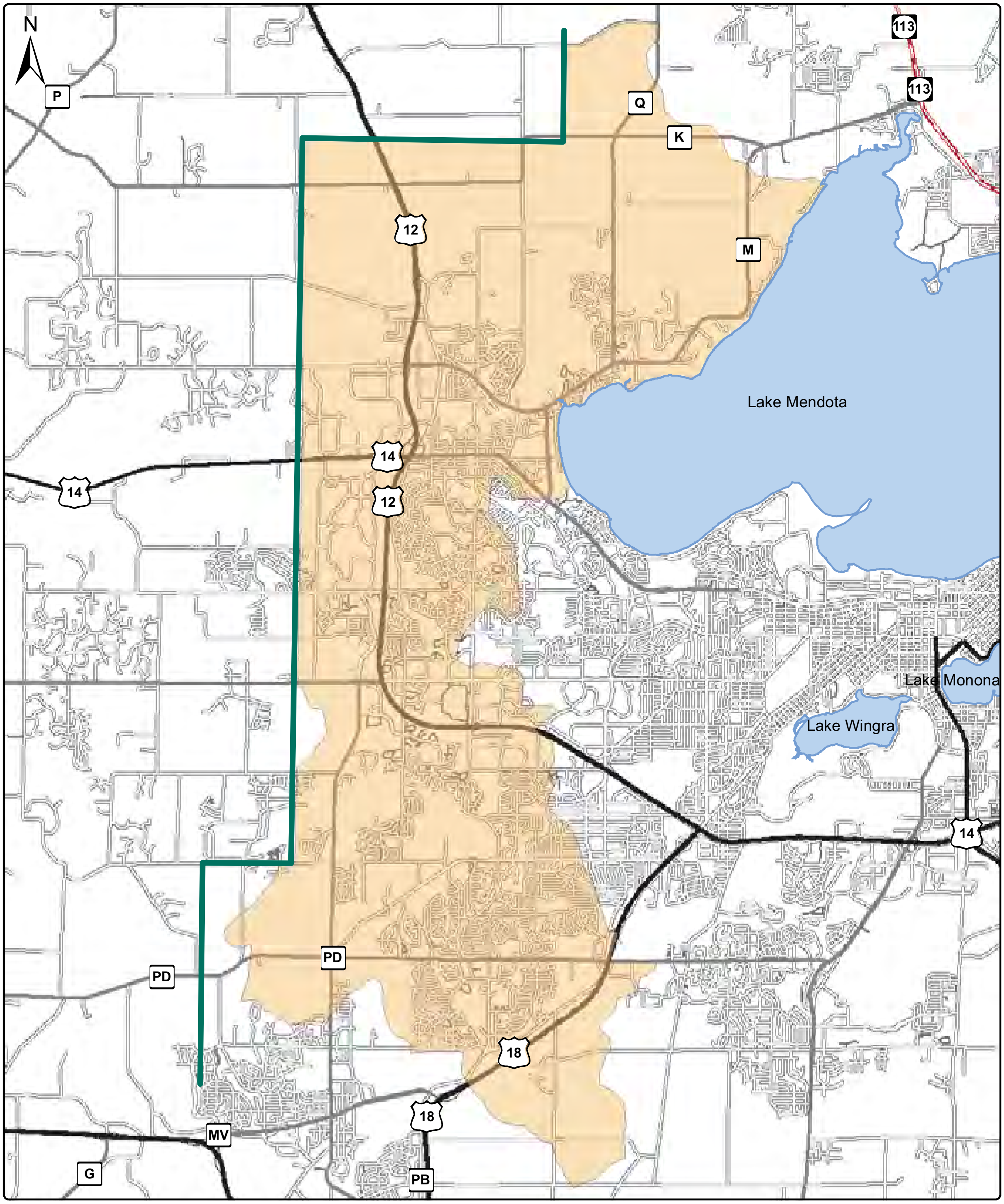
The areas currently served by the City of Madison's Shady Point and South Point lift stations are outside of the 1967 design service area for the west side collection system.

1969 Northeast Collecting System

The 1969 report on the Northeast Collecting System refined the Greeley and Hansen (1961) report. The Greeley and Hansen study had included Waunakee and Sun Prairie in the MMSD service area, but not DeForest or Windsor. The 1969 study did include flows from these two communities, but excluded flows from the City of Sun Prairie. Flows were calculated by applying 2010 population estimates for the communities to the 95 gpcd flows estimated by Greeley and Hansen (1961). Figure A-2 shows the drainage areas included in the design of the Waunakee and DeForest interceptors.

1971 Token Creek Extension

The 1971 study on the Token Creek Extension used the population density approach of Greeley and Hansen (1961) but updated the expected densities.



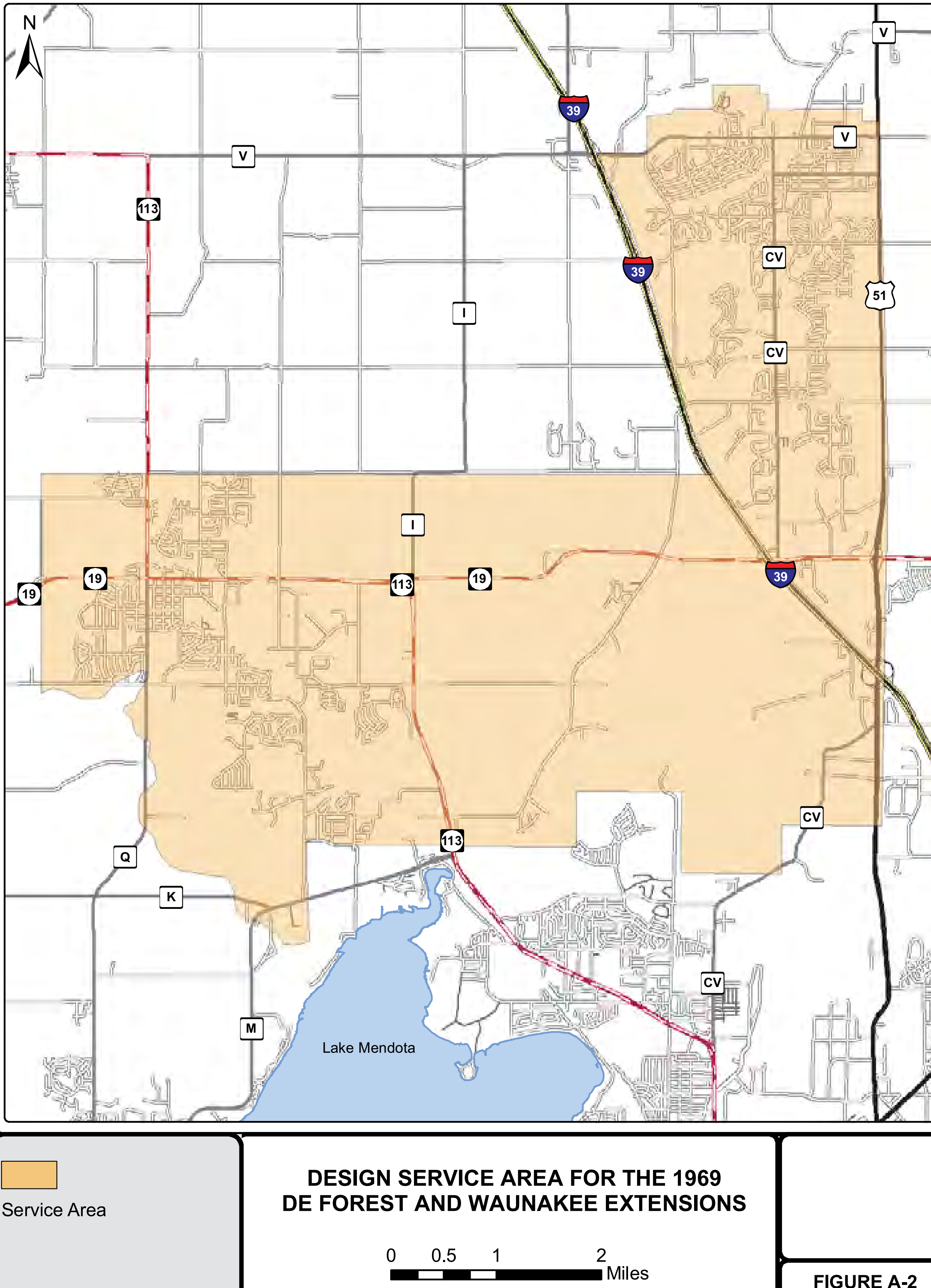
2010 MMSD District Limits

Service Area

DESIGN SERVICE AREA FOR THE WEST SIDE COLLECTING SYSTEM - 1967

0 1 2 4 Miles

FIGURE A-1



DESIGN SERVICE AREA FOR THE 1969 DE FOREST AND WAUNAKEE EXTENSIONS

FIGURE A-2

1971 Report on Sewage Treatment; Additions to the Nine Springs Sewage Treatment Works

In May 1970 Greeley and Hansen Engineers initiated a study of the needed revisions and additions to the Nine Springs Sewage Treatment Works for a 20-year period (1970-1990). The report for this study and a supplement were completed in 1971 under the title "Report on Sewage Treatment; Additions to the Nine Springs Sewage Treatment Works."

The basic methodology used in the 1971 study to forecast the future population to be served by the Nine Springs Sewage Treatment Works was to forecast the future extent of the district, and then to assign various estimated population densities to areas within the district. The future limits of the district were estimated for the year 2010 and were derived from the present pattern of annexation by the district. Future population densities, ranging from 2 to 16 persons per acre, were estimated for the year 2010 for various parts of the district, with higher values being assigned to the older and denser urban areas and the lower values being assigned to the predominantly undeveloped outlying areas. The result of this methodology was a projected increase in the population being served by the MMSD from 210,000 in 1970 to 550,000 in the year 2010. Based on a linear rate of growth between 1970 and 2010, a 1990 design year population of 380,000 people was estimated for the district. For comparison, the actual population of the district in 1990 was approximately 260,000.

Future wastewater flows to the Nine Springs Sewage Treatment Works were projected by applying per capita wastewater flows to the projected future population figures. During the ten years between 1960 and 1970, annual per capita flows to the Nine Springs plant ranged from 132 to 153 gpcd, with the lower figures occurring in the middle of the decade. These figures include the wastewater contribution from Oscar Mayer, which amounted to approximately 15 gpcd. A proposed per capita wastewater contribution of 150 gpcd was used for future expansion. This figure includes future contributions from Oscar Mayer. The resulting average design flow from this methodology was 57 million gallons per day for 1990. This study also used larger peaking factors compared to the 1961 Greeley and Hansen study.

1973 Planning Report on the Fifth Addition to the Nine Springs Sewage Treatment Works

In 1973 the Dane County Regional Planning Commission conducted a planning review of the Greeley and Hansen proposal entitled "Planning Report on the Fifth Addition to the Nine Springs Sewage Treatment Works." The DCRPC (1973) report modified the Greeley and Hansen study in several respects. It reduced the estimated rate of growth in the population. It also reduced the estimated service area to the then newly delineated urban service areas, outside of which sewered development is restricted.

The DCRPC (1973) study concluded that the 1990 population for the Nine Springs plant would range from 341,000 to 368,000 depending on whether the Sun Prairie Urban Service Area is included. The per capita wastewater flow was estimated to be 135 gpcd, and added to the flows from Oscar Mayer, estimated (in consultation with the company) to be 4.0 mgd. The projected 1990 flows from the 1973 DCRPC study ranged from 50.0 to 53.7 mgd. For comparison, the actual 1990 average daily flow was 34.92 mgd.

1976 Planning and Management Considerations

In 1976 the Dane County Regional Planning Commission completed another study of the MMSD facilities as part of the District's 201 Facilities Plan (Vol. VI) entitled, "Planning and Management Considerations." Three methodologies were used in this study to estimate average flows for the year 2000:

1. Year 2000 flow expressed as average gallons per capita per day usage times population and changes, if any, in major industrial flows. The per capita flow rate was based on the historical trend since 1954 and the projection was based on the curve developed.
2. Year 2000 flow expressed as average water use (from water pumping data for the City of Madison) added to the infiltration/inflow volumes estimated by the staff of MMSD in a 1972 analysis.
3. Year 2000 projections based on industrial waste discharges and anticipated per capita increases due to future industries and water consumption.

Table A-2 shows the results from the three methods.

Table A-2: Wastewater Flows for MMSD Planning Area by Urban Service Areas – Comparison of Alternative Methods Used

	Central Urbanizing Area Presently in the MMSD			Outlying Urban Service Area Presently Outside MMSD Limits[1]		
	1970	1990	2000	1970	1990	2000
Population	216,092	272,243	299,643	22,137	37,860	41,610
Method 1	31.168	43.047	49.472	2.684	4.440	4.875
Method 2	31.168	43.662	48.683	2.684	4.440	4.875
Method 3	31.168	43.702	48.851	2.684	4.440	4.875

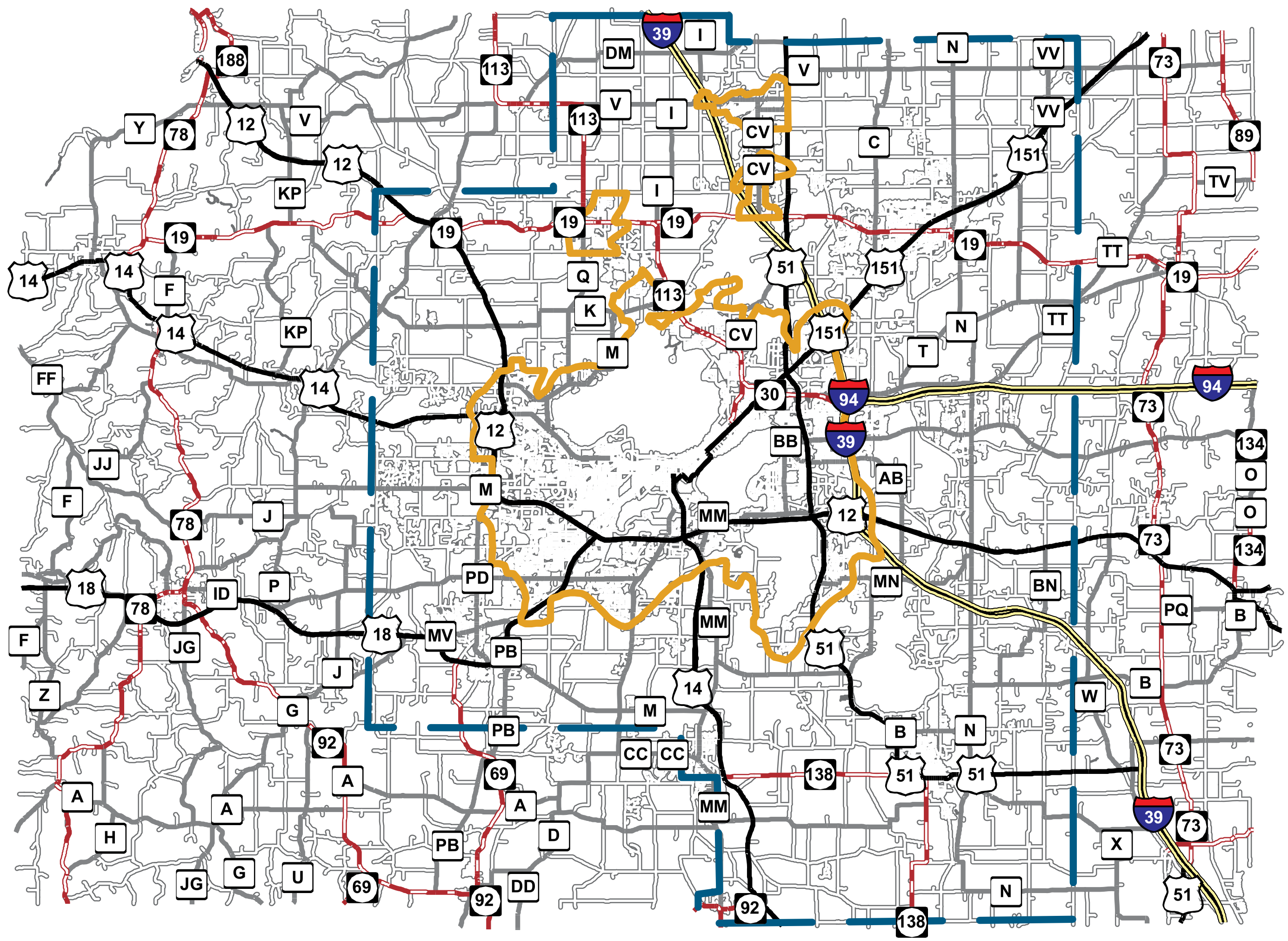
For comparison, the actual 2000 population of the district was 305,648 and the average daily flow was 42.10 mgd.

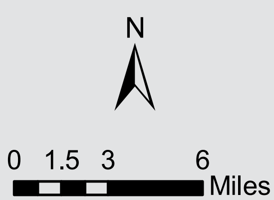
Figure A-3 shows the year 2000 service area for the district as outlined in the 1976 Regional Planning Commission study. The study concluded that 50 mgd would be an appropriate average flow for the year 2000 for the District.

The population forecast for the study was based in Dane County population estimates projected by the state and by assuming that urban service areas in the county will retain their relative share of total county population. The projected county population increase was then applied to the urban areas within the county. The appropriate population from urban areas were aggregated to derive at estimated District populations.

The 1976 study included an interceptor system analysis for the district. The capacities of the pumping stations were evaluated based on existing flows, the growth to be expected in the area tributary to each station, and per capita or per acre flows to be expected from the new development in each area.

[1] The Regionalization Study concluded that only the Village of Cottage Grove might join the MMSD Service Area.





1976 MMSD
WASTEWATER FACILITIES PLAN AREA

MMSD Planning Area

Year 2000 MMSD Service Area

FIGURE A-3

Unit flows were based on water use and wastewater generation for 1970 and 1975. For industrial land uses, a figure of 7,000 gallons per acre per day was used. For residential land uses, a wastewater flow of 100 gpcd was derived (62 gallons present use, 20 gallons for future water use increases, and 18 gallons due to infiltration/inflow.

The 1976 study also included an analysis of the feasibility of regionalized sewage services within the MMSD planning area. Figure A-3 shows this planning area, which included the communities of Brooklyn, Stoughton, Verona, Oregon, Cottage Grove, Sun Prairie, and Morrisonville. The analysis concluded that, with the exception of the Village of Cottage Grove, maintaining treatment plants in each of these communities would be more cost effective than connections to MMSD.

The 1976 MMSD Facilities Plan was the last comprehensive study of the District, although many studies followed concerning specific basins and interceptor improvements or extensions. A brief chronological review of these studies will serve to summarize their design.

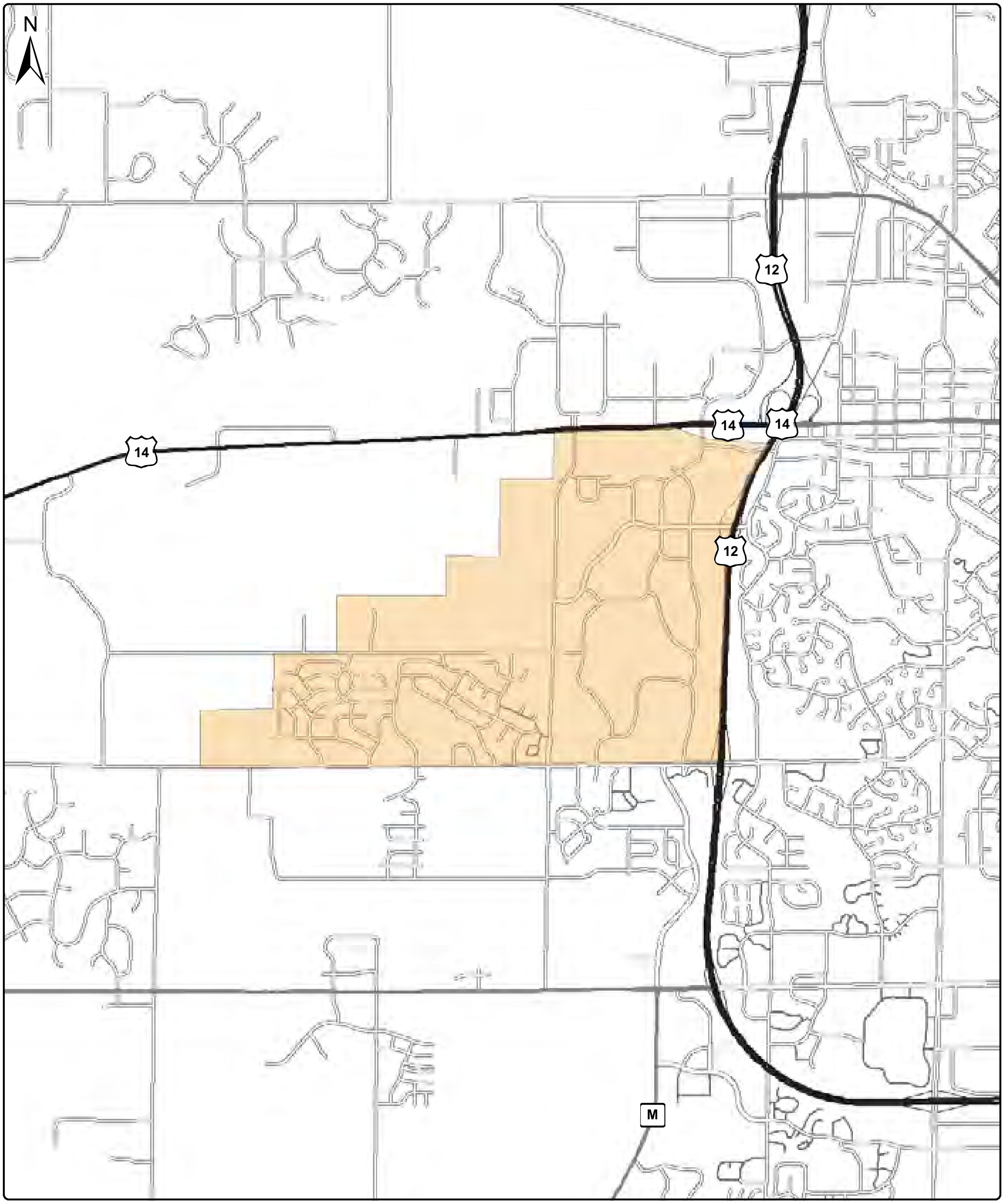
1978 Esser Pond Interceptor

The "Esser Pond Interceptor Design Report" (1978) was prepared to study the location of interceptors and pumping stations to serve the area west of the West Beltline, north of Old Sauk Road, and south of the Chicago, Milwaukee, St. Paul, and Pacific Railway (see Figure A-4 for service area).

The design of the Esser Pond interceptor was based on population densities projected form the design report for the Old Sauk Trails development and from reports on preliminary plans for sewers in the commercial-industrial area along the railway. The peaking factors were taken from the Greeley and Hansen (1961) report. Table A-3 shows the population and flows used for the design of this interceptor.

Table A-3: Design Parameters for the Esser Pond Interceptor

Population Equivalent	15,632 persons
Average Daily Flow @ 95 gpcd	1,485,040 gpd
Peaking Factor	3.77
Peak Flow	5.60 mgd



Service Area

DESIGN SERVICE AREA FOR THE ESSER POND INTERCEPTOR

0 0.25 0.5 1 Miles

FIGURE A-4

1978 Cottage Grove Extension of the Far East Interceptor

In 1978 the Far East Interceptor was extended to serve the Village of Cottage Grove. This interceptor was originally intended to serve acreage that included the City of Sun Prairie. In 1978, following the conclusions of a facilities planning study, the City of Sun Prairie had already committed itself to the construction of a new wastewater treatment facility (constructed in 1982). The MMSD revised its plans to account for new development on the east side of the City of Madison, to exclude the City of Sun Prairie, and to include the Village of Cottage Grove.

The Cottage Grove Extension was designed to provide a capacity of 2.78 mgd for a population of 6,850 discharging an average of 95 gallons per capita per day. Figure A-5 shows the design service area for the Cottage Grove Interceptor. For comparison, the 2000 population of the Cottage Grove USA was 4,059 in 2000 and is projected to reach 9,372 in 2030.

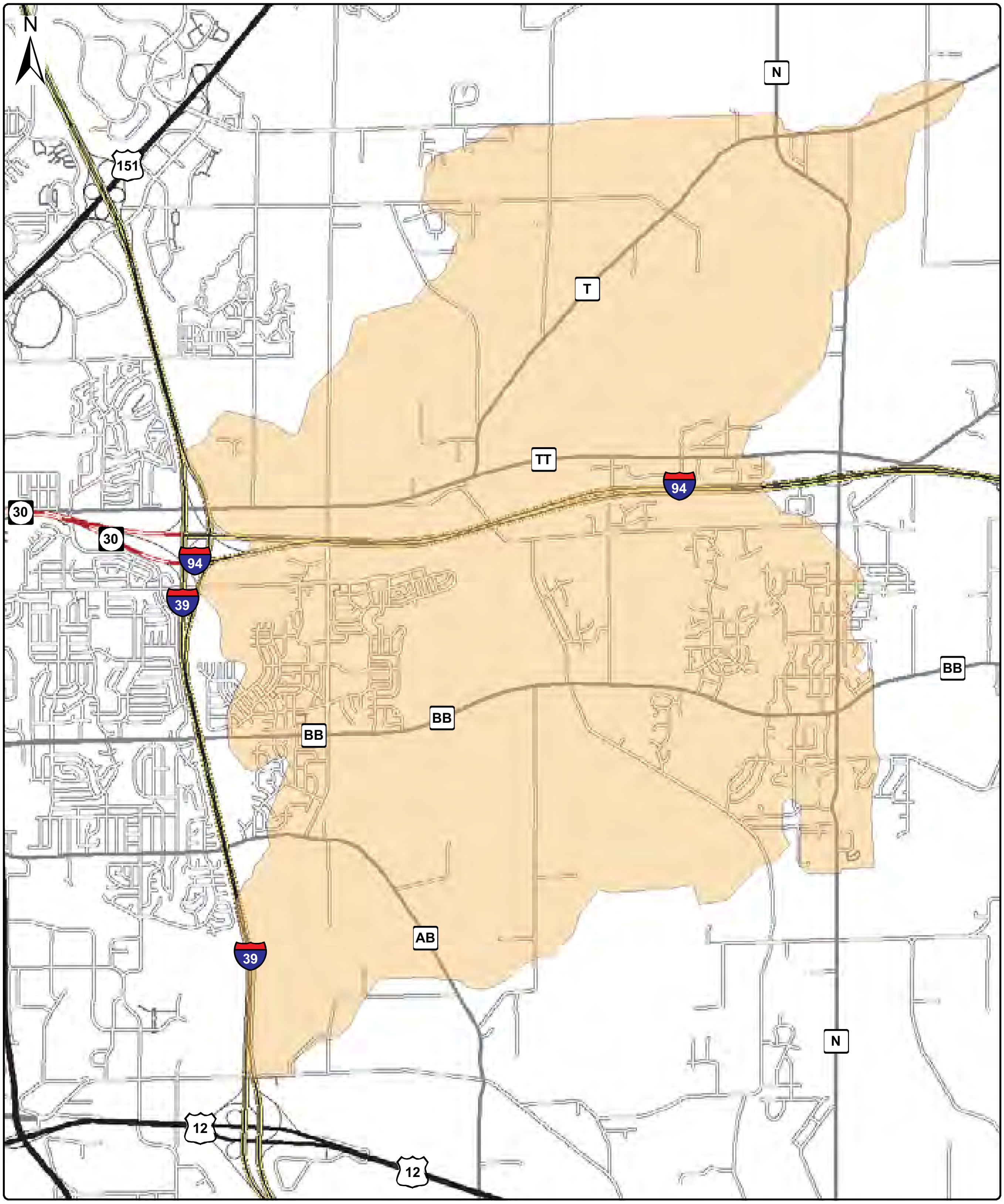
1979 Mendota Extension of the Nine Springs Valley Interceptor

In 1979, D'Onofrio, Kottke, and Associates completed a study on the Mendota Extension of the Nine Springs Valley Interceptor. This study investigated the construction of Pumping Station No. 16 on Gammon Road, south of the City of Middleton and a new force main extension from Pumping Station No. 16 to the Nine Springs Valley Interceptor / Mineral Point Extension. Figure A-6 shows the design service area of these facilities.

The design criteria were based on the City of Middleton Master Plan, the Town of Middleton Land Use Plan, and the City of Madison Land Use Plan. Table A-4 shows the criteria used in the design of the facility. The study used the Greeley and Hansen (1961) peaking factors.

Table A-4: Design Parameters for the Mendota Extension of NSVI

Land Use Density		
	Single Family Residential	3.5 people / dwelling unit
	Multi-Family Residential	2.3 people / dwelling unit
Wastewater Flows		
	Residential	70 gpcd
	Commercial	4,000 gal / gross acre / day
	Industrial	4,000 gal / gross acre / day

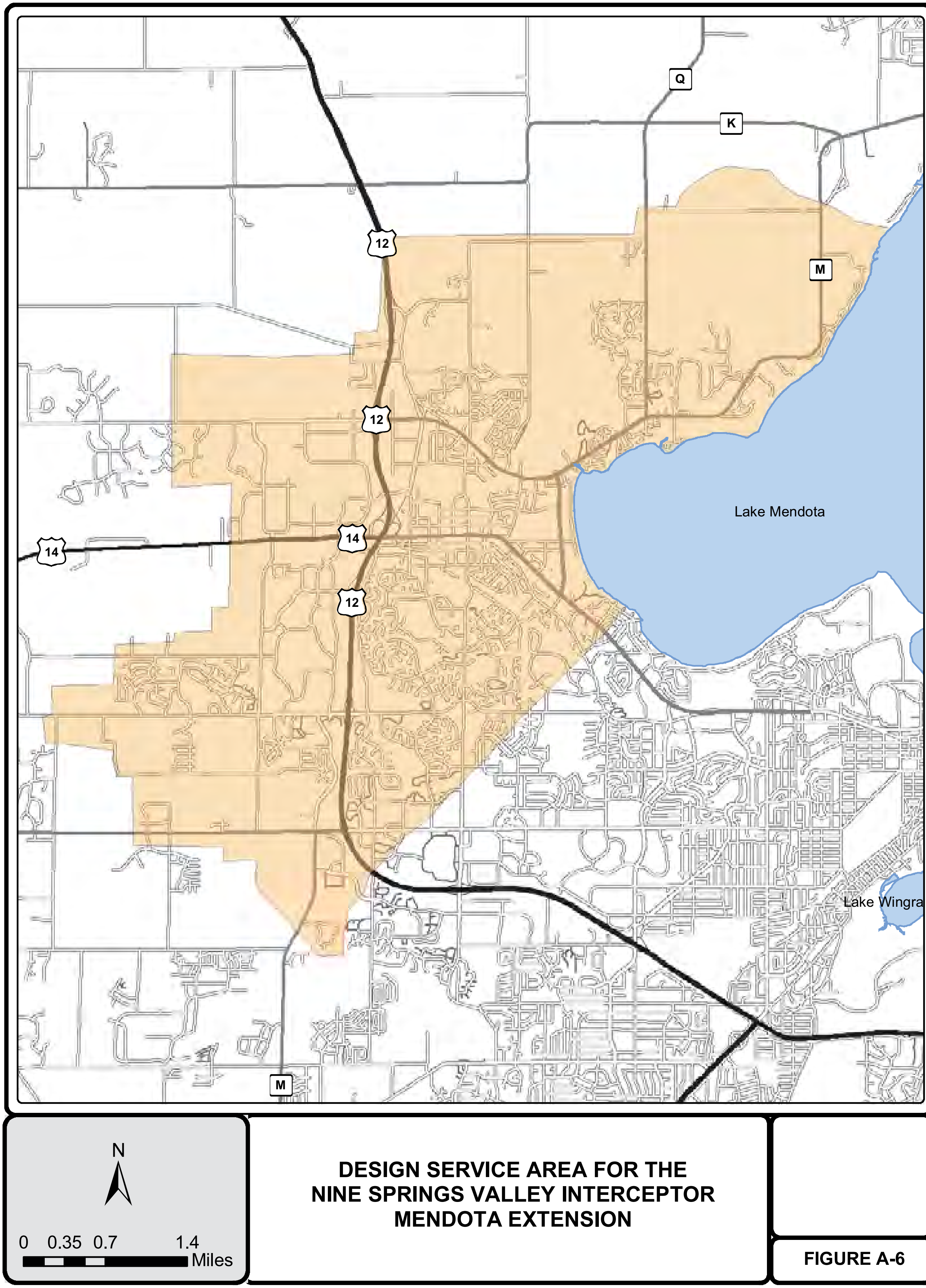


Service Area

ULTIMATE SERVICE AREA FOR THE COTTAGE GROVE INTERCEPTOR

0 0.375 0.75 1.5 Miles

FIGURE A-5



DESIGN SERVICE AREA FOR THE
NINE SPRINGS VALLEY INTERCEPTOR
MENDOTA EXTENSION

FIGURE A-6

1982 City of Middleton Sewer Plan

In 1982, Strand Associates completed a study of the sanitary sewer system in the City of Middleton. This study evaluated the growth potential for areas north and west of the City of Middleton and used 1980 Census and land use inventory data to project year 200 flows for the city. Table A-5 shows the design criteria used in this study.

Table A-5: Design Parameters for the City of Middleton Sewer Plan

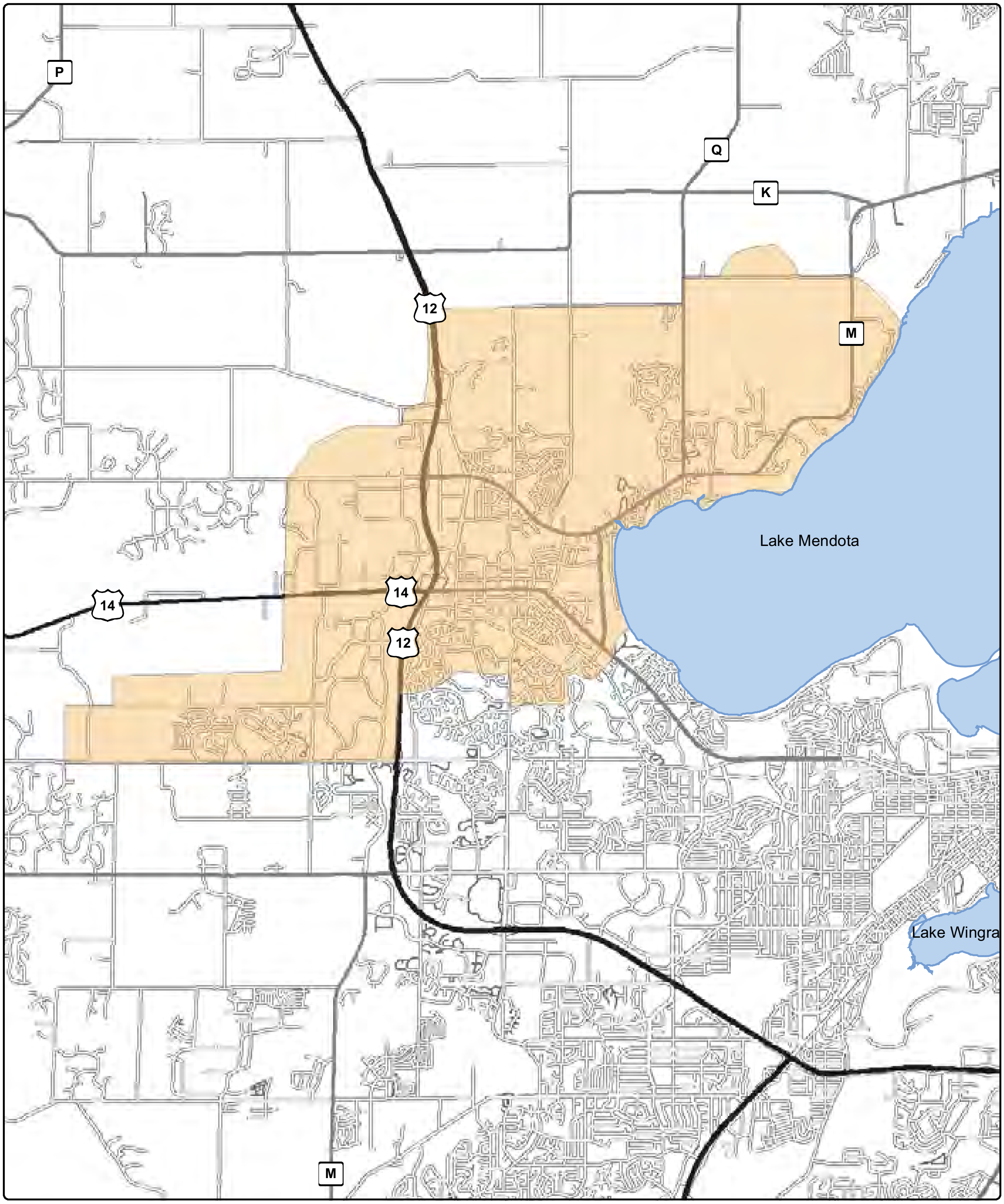
Land Use	Population per Dwelling Unit	Dwelling Units per Acre	Wastewater Flows
Single Family Residential	3.0	8	95 gcd
Duplex	2.5	11.5	95 gcd
Apartment	2.1	24	65 gcd
Industrial / Commercial			2,000 gpad

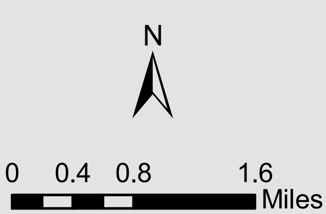
The report evaluated the Greeley and Hansen (1961) peaking factor curve and found its peaking factor values too high for low average daily flows. New peaking factors were derived from actual pumping flow data and are shown in Table A-6. Figure A-7 shows the design service area used in the Middleton Sanitary Sewer Plan

Table A-6: Peaking Factors for the City of Middleton Sewer Plan

Area Served	Peaking Factor
0-250 acres	4
250-500 acres	3.5
> 500 acres	2.5
Industrial	2.5

.





DESIGN SERVICE AREA FOR THE MIDDLETON SANITARY SEWER PLAN

FIGURE A-7

1985 Facilities Plan for the Dunn-Kegonsa Sanitary District

In 1985 Strand associates, Inc., completed a study titled "Environmental Information Document and Cost Effective Analysis; Town of Dunn-Kegonsa Sanitary District." This report paved the way for extending sewage collection service to the existing development around Lake Kegonsa, the process for which had been started with the formation of the Kegonsa Joint Sanitary District in 1967. The Kegonsa Limited Urban Service Area is not expected to grow through 2020 except for infill of vacant parcels. The design parameters used in the report are shown in Table A-7. Figure A-8 shows the design service area for the Town of Dunn portion of the service area.

Table A-7: Design Parameters for the Kegonsa (T. of Dunn) Sewer Area

Maximum Dwelling Units	670
	(480 existing, 150 vacant lots, 20 developable acres)
Residential Density	3 people per household
Maximum Population	2,010
Residential Flow Rate	70 gpcd
Max. Residential Flow	140,700 gpd
Max. Commercial Flow	79,200 gpd
Max. Infiltration / Inflow	33,100 gpd
Total Ultimate Flow	253,000 gpd

For comparison, the actual 2006 average daily flow from the Town of Dunn Kegonsa Sanitary District was 152,000 gpd according to the MMSD's annual report.

1986 Facilities Plan for the Town of Pleasant Springs Portion of the Kegonsa Service Area

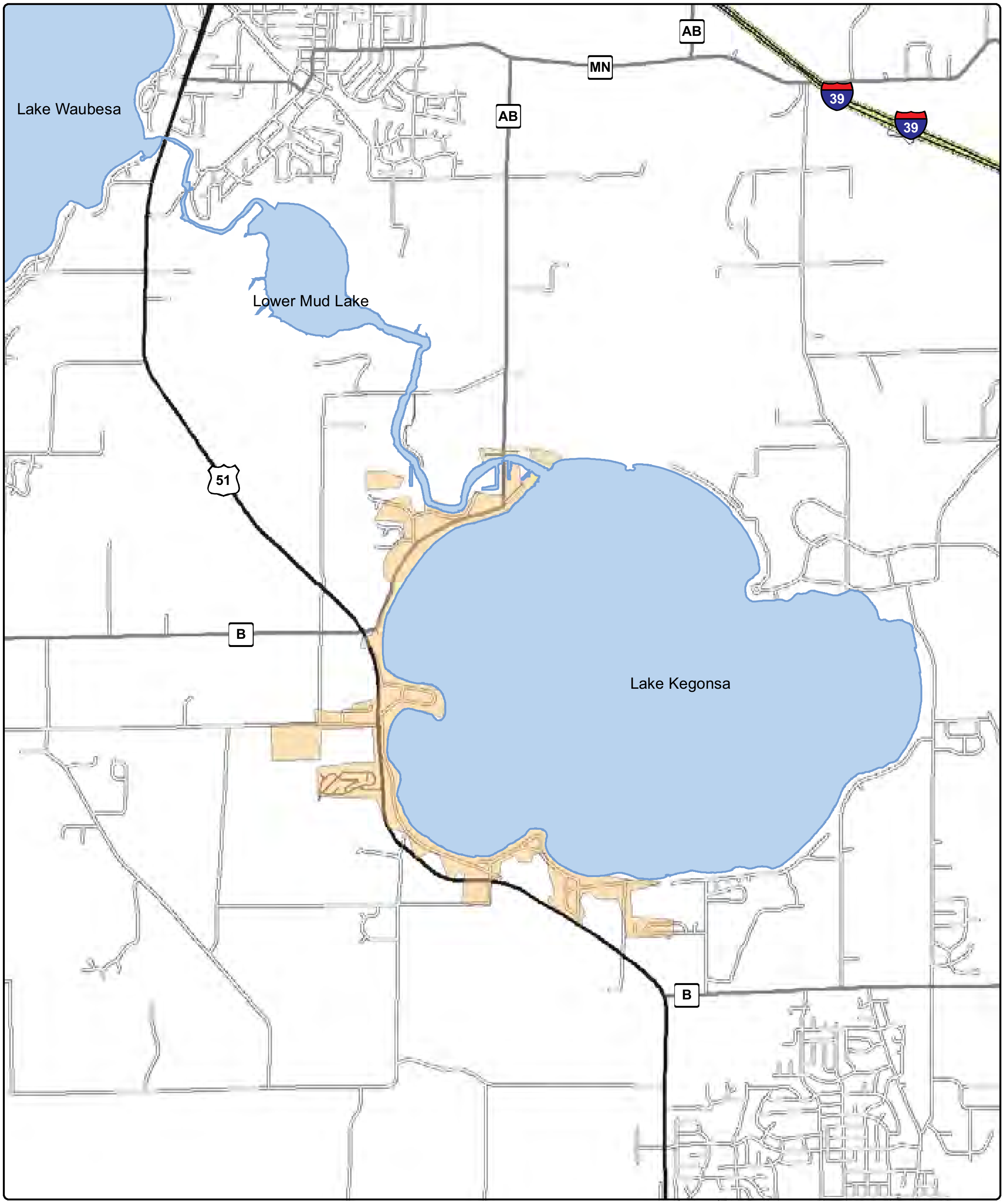
In 1986, Foth & Van Dyke Engineers completed a report on the Town of Pleasant Springs portion of the service area entitled "Town of Pleasant Springs: Facilities Plan for Wastewater Collection and Treatment." The design parameters used in the report are shown in Table A-8

Table A-8: Design Parameters for the Kegonsa (T. of Pleasant Springs) Sewer Area

Maximum Population	1,000
Residential Flow Rate	70 gpcd
Commercial Flow	4,250 gpd
2005 Average Flow	90,600 gpd

For comparison, the actual 2006 average daily flow from the Town of Pleasant Springs Sanitary District No. 1 was 91,600 gpd according to the MMSD's annual report.

Figure A-9 shows the sewage service area used in the study. It includes the Oak Knoll and Petty Acres subdivisions.

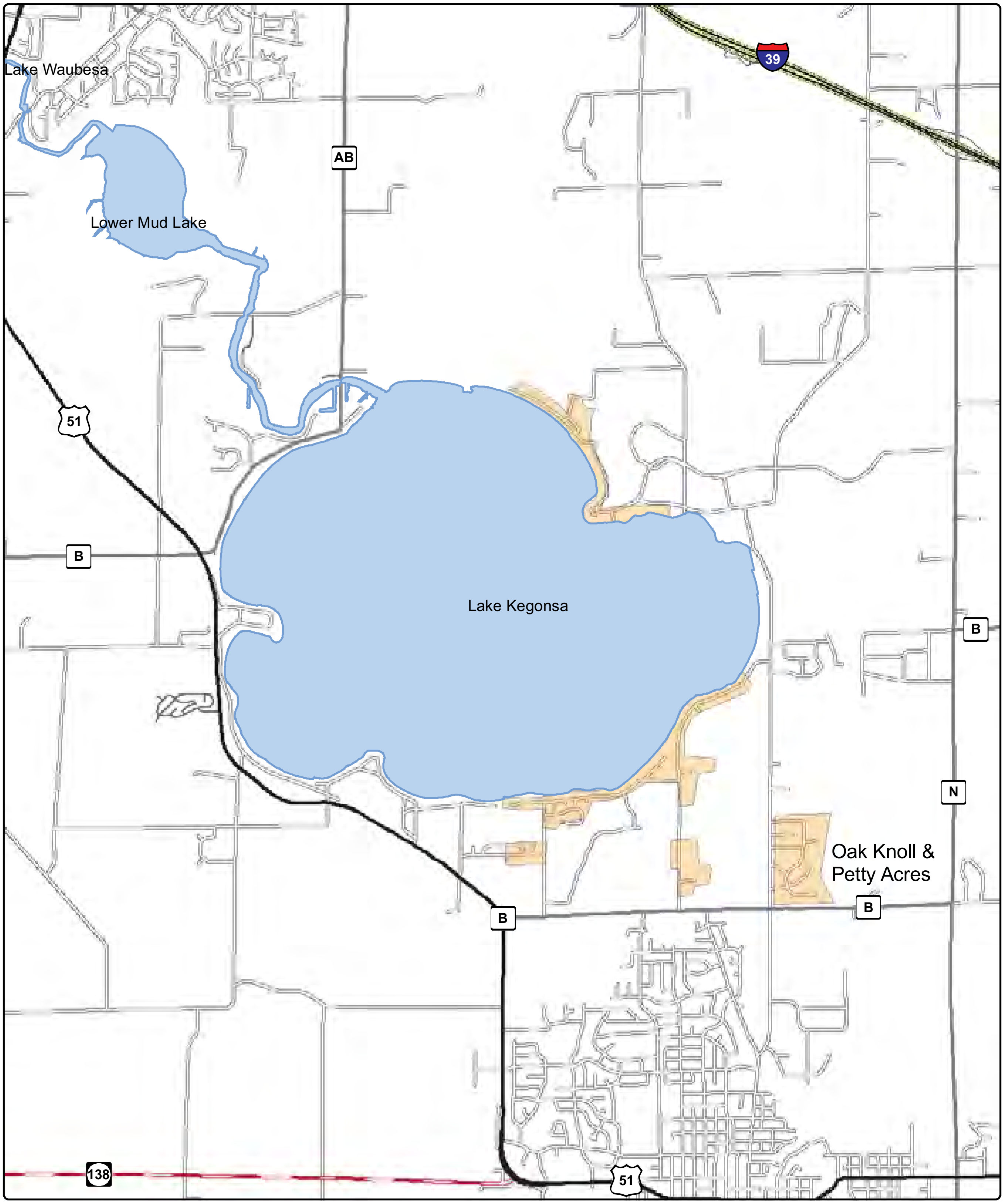


N

0 0.25 0.5 1 Miles

DESIGN SERVICE AREA FOR THE KEGONSA SANITARY DISTRICT (Town of Dunn Portion)

FIGURE A-8



DESIGN SERVICE AREA FOR THE KEGONSA SANITARY DISTRICT (Town of Pleasant Springs Portion)

FIGURE A-9

1986 Design Study for the McFarland Relief Sewer

In 1986 the engineering department of the MMSD completed a study of the McFarland Relief Sewer. The report on this study is titled "Design Report for the Southeast Interceptor McFarland Relief Sewer." The study measured the acreage within each of the drainage basins expected to contribute wastewater to Pumping Station No. 9 over fifty years.

Table A-9 shows the design flow assumptions used in the study. The study defined net sewered acres as 60 to 70 percent of gross sewered acres. It used the same peaking factors as the Greeley and Hansen (1961) report.

Table A-9: Design Parameters for the McFarland Relief Sewer

Population Density	10 persons per net sewered acre
Wastewater Contribution	65 gpcd
Design Average Daily Flow to Pumping Station 9	
Including Lake Kegonsa Area	2.22 mgd
Excluding Lake Kegonsa Area	1.13 mgd
Peak Design Flow to Pumping Station 9	
Including Lake Kegonsa Area	7.84 mgd
Excluding Lake Kegonsa Area	4.43 mgd

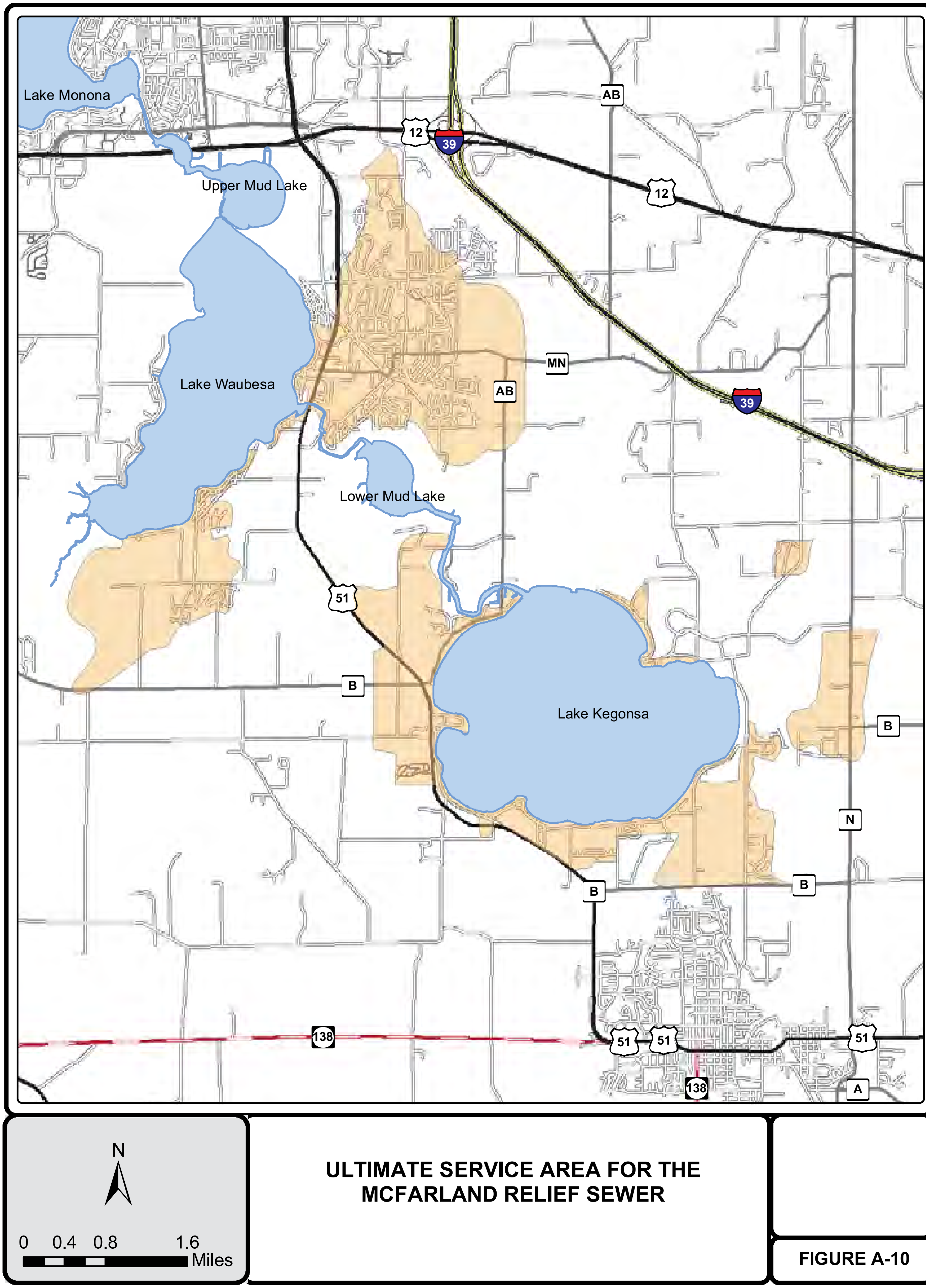
For comparison, the 2007 average daily flow at Pumping Station 9 was 0.87 mgd.

Figure A-10 shows the drainage basins included in the Pumping Station No. 9 design area in the 1986 study. Since Pumping Station No. 9 flows into the McFarland Relief Sewer, the same area applies to this sewer also. The planned future growth area for the Village of McFarland extends beyond the boundary of the 1986 design area.

1993 MMSD Collection System Evaluation

In 1993, the Dane County Regional Planning Commission prepared a report titled "Madison Metropolitan Sewerage District Collection System Evaluation". This report was the result of a three-year collaboration between the DCRPC and MMSD to conduct a detailed evaluation of collection system adequacy in light of the growth experienced in the service area. The study used socioeconomic data generated for transportation planning based on the 1980 Census data, and commercial and industrial employment data derived from place of employment surveys. The transportation socioeconomic data are sued to run trip generation models for discrete and small geographic areas. The study manipulated the socioeconomic data to generate aggregate data for small wastewater drainage areas or sub-basins. The sub-basin socioeconomic data was then used to create a model for wastewater forecasting and interceptor capacity evaluation.

The 1993 study generated a 2010 wastewater flow forecast for the entire MMSD collection system, identified segments that would need capacity expansion, and calculated long term (to the year 2040) general wastewater flow estimates to be used for interceptor design. The study estimated a year 2010 forecast of 44.5 mgd for the MMSD service area, including flows from the Verona (1 mgd) and Morrisonville (0.08 mgd) urban service areas.



ULTIMATE SERVICE AREA FOR THE MCFARLAND RELIEF SEWER

FIGURE A-10

1993 City of Verona Connection to MMSD / Badger Mill Creek Effluent Return Project

In 1993, SEC Donohue completed a facilities plan report recommending that the Verona wastewater treatment plant be abandoned and that Verona's wastewater be pumped to MMSD's Nine Springs Valley Interceptor and the Nine Springs Wastewater Treatment Plant for treatment. The DCRPC conducted an environmental assessment on this and other options for Verona a month later titled "Environmental Assessment: City of Verona Wastewater Facilities Planning Alternatives". The assessment highlighted the serious impacts of inter-basin water transfer on Badger Mill Creek entailed by the recommended alternative of the SEC Donohue report.

Through discussions with MMSD and the Wisconsin Department of Natural Resources, a strategy was devised to allow the pumping of Verona wastewater to the Nine Springs Wastewater Treatment Plant and to return highly treated effluent to Badger Mill creek to maintain its base flow and fishery. The approach retains the possibility of a satellite regional treatment facility in Verona at a future date. This satellite facility would receive wastewater flows from development within the Sugar River basin for treatment and release within the watershed. This option, however, would have to be cost-effective within the overall MMSD system constraints and expansion costs including the Nine Springs Valley Interceptor, Nine Springs Treatment Plant, and the Badfish Creek Outfall. Pumping Station No. 17 and the Pumping Station 17 force main were constructed in 1996 to convey wastewater to the NSVI, and an effluent return force main was completed in 1998.

1995 Morrisonville Urban Service Area Connection to MMSD

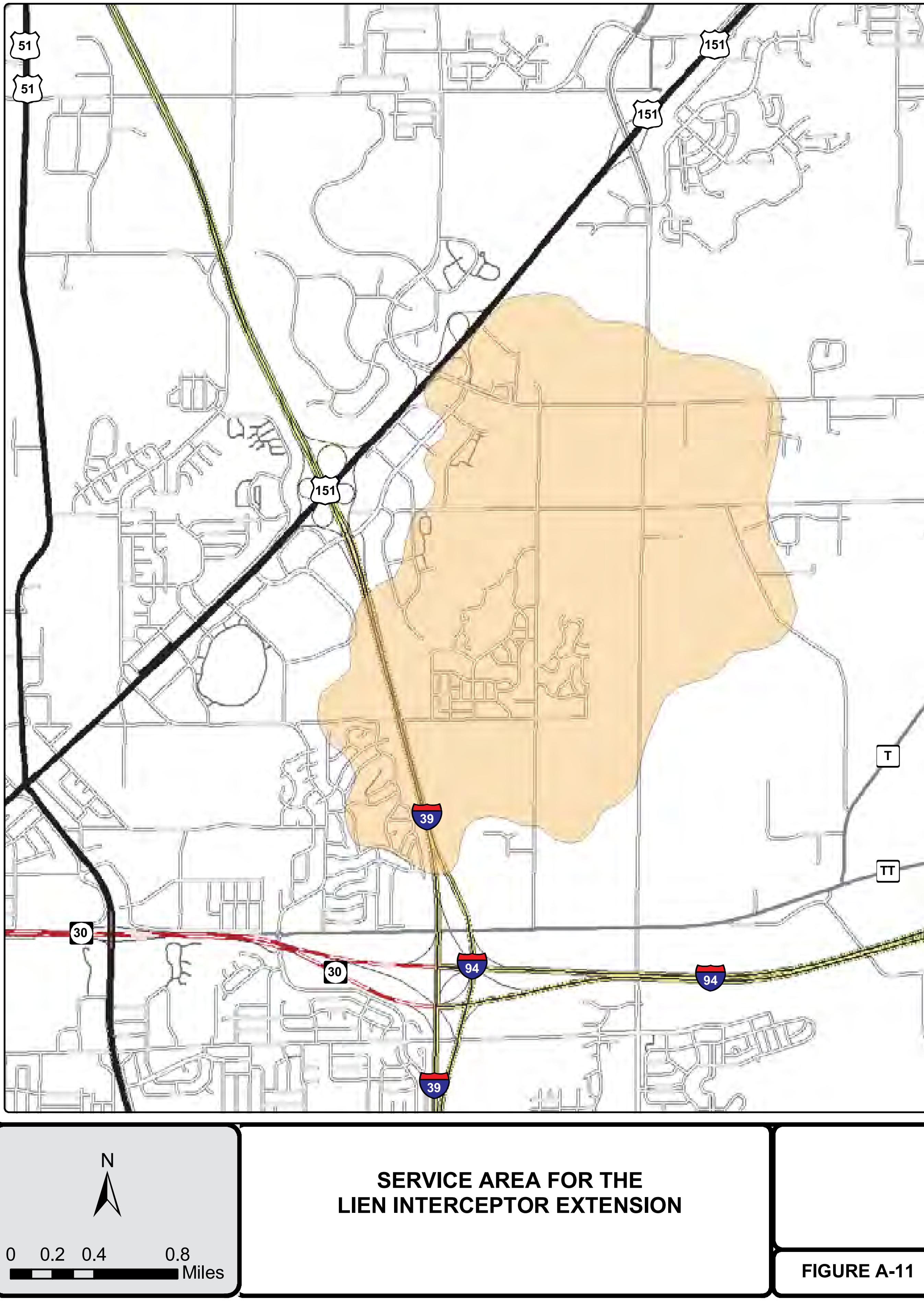
In 1995, Mid-State Associates completed a facilities plan report for the Morrisonville Urban Service Area, titled "Wastewater Facilities Plan for the Morrisonville Sanitary District #1". The report recommended the abandonment of the Morrisonville treatment plant and pumping Morrisonville wastewater to the MMSD Northeast Interceptor – DeForest Extension at the Village of DeForest. Morrisonville wastewater flow to the MMSD collection system began in 1998.

1995 Lien Interceptor Extension

In 1995, MMSD staff completed a design report for an extension of the Lien Interceptor to provide service to areas in northeast Madison (Nelson Neighborhood) and the Town of Burke. Figure A-11 shows the drainage basin considered in the design of the extension. The Lien Interceptor Extension is designed to convey a peak flow of 8 mgd. The planned future growth area of the City of Madison in this area is generally within the boundary of the 1995 design area.

1997 Village of Dane Connection to MMSD

In 1997, Mid-State Associates, Inc. completed a report titled "Wastewater Facility Plan, Village of Dane, Wisconsin", evaluating the cost-effectiveness of wastewater alternatives for the Village of Dane. The Village of Dane is approximately 3 miles northwest of the Village of Waunakee. The evaluation determined that connection to the Village of Waunakee and the MMSD Collection System was the most cost effective alternative for the Village of Dane. The report estimated the average flow from the Village to be 72,000 gpd to 120,000 gpd. Wastewater flow



SERVICE AREA FOR THE
LIEN INTERCEPTOR EXTENSION

FIGURE A-11

from the Village of Dane to the MMSD collection system began in 1999. For comparison, the actual 2006 average daily flow from the Village of Dane was 59,000 gpd according to the MMSD's annual report.

1997 Far East Interceptor – Door Creek Extension

In 1997, MMSD staff prepared a design report for the FEI – Door Creek Extension. The extension was designed to serve an area of approximately 8,000 acres east of the interstate highway including Madison's far east neighborhoods (Sprecher Neighborhood) as well as part of the towns of Blooming Grove, Burke, and Sun Prairie. The capacity for the extension is between 4.6 mgd and 6.1 mgd (the lower capacity is in the north end). It was not sized to accept wastewater from the City of Sun Prairie, because the City of Sun Prairie is in a different watershed (Koshkonong). Figure A-12 shows the design service area for the Door Creek Extension.

1999 MMSD Collection System Evaluation

In 1999, the Dane County Regional Planning Commission prepared an update to the 1993 Collection System Evaluation. The study projected future wastewater flows in 2020 from projected increases in dwelling units, and commercial and industrial average from 1990 to 2020. The study also identified potential future capacity problems in the collection system when compared to the projected 2020 peak flows.

1999 Summary Design Memo West Interceptor Replacement at UW Campus

In 1999 MMSD staff prepared a design memo for the West Interceptor Replacement project at the west end of the University of Wisconsin - Madison campus. The Old West Interceptor, constructed in 1916, is one of MMSD's oldest facilities. The interceptor was televised in the fall of 1993. The existing 24" cast iron Old West Interceptor was found to be significantly corroded, pitted, and showing internal build-up of iron tuberculation. The report determined that the condition of the old pipe and hydraulic capacity limitations required pipe replacement regardless of the PS15 flow. Since the incremental cost to provide the capacity for PS15 for the project was small (the difference in cost between a 36-inch and a 30-inch pipe was estimated to be less than 10% of the project cost), the project design incorporated the estimated PS15 flow. The design approach allowed flexibility for MMSD to direct PS15 flows to either the West Interceptor or the Nine Springs Valley Interceptor (NSVI), or a combination of both. Based on review of the UW study and flow monitoring results, MMSD concluded that the section of the Old West Interceptor along Randall Avenue appeared to be in need of capacity improvements in the short term, and that depending upon the actual future flow increases from the UW west campus, the Old West Interceptor from Babcock Drive to Randall Avenue would also be in need of capacity improvements in the medium term future. MMSD also concluded that the 36-inch West Interceptor Relief Sewer in the UW west campus was in need of capacity improvements in the short term if PS15 was included, and in the medium term future if PS15 was diverted back to the NSVI.

2002 Collection System Facilities Plan

In 1999 MMSD staff prepared a Collection System Facilities plan that divided the collection system into sections and evaluated the capacity needs of the system through 2020.

SERVICE AREA FOR THE DOOR CREEK EXTENSION

FIGURE A-12

2005 Lower Badger Mill Creek Sewer Service Report

In 2005, MMSD staff prepared a sewer service report for the Lower Badger Mill Creek Interceptor. The report analyzed options for providing sewer service in the Lower badger Mill Creek watershed that includes parts of the City of Madison, City of Verona, Town of Middleton, and Town of Verona. The report recommended the construction in 2007 of an upper section of the collection system with a temporary lift station at Midtown Road, a lower section of the collection system from Edwards Street to Pumping Station 17 to be constructed in 2007, and a middle section to be constructed between 2012 and 2020 depending on the rate of development in the service area.

2006 Predesign Memo for West Interceptor Extension

In 2006, MMSD staff prepared a pre-design memo for the West Interceptor Extension. The West Interceptor was built in 1957 using 24" reinforced concrete pipe. Various problems were found from section 5-105 to 5-111 when the pipe was televised in 2000. Construction records indicated that soil stability was a problem when this interceptor was originally constructed. The replacement sewer was designed for a peak flow of 14.2 mgd.

2006 Design Memo for Southwest Interceptor North & South Legs Rehabilitation

The Southwest Interceptor was built in 1955 using mostly reinforced concrete pipe. The Southwest Interceptor was last televised in 2000. Various problems were found including gaskets out of the joints, offset and leaky joints, root problems, dips in the line, and grease build-up problems. The report recommended that the offset joints be excavated and repaired and that a liner be installed from MH 2-202 to 2-215 in the south leg and from MH 2-174 to MH 2-189 in the north leg.

2007 Design Report for Rehabilitation of Pumping Stations No. 6 & 8

In 2007, Strand Associates prepared a design report for the rehabilitation of Pumping Station 6 and Pumping Station 8. MMSD defined the firm capacity design flows for Pumping Station 6 at 24.1 mgd and for Pumping Station 8 at 33.6 mgd. The selected alternative for Pumping Station 6 recommended that four new, equally sized, 125 hp pumps be installed in the 6A, 6B, 6C, and 6D pump locations. With three pumps in operation at full speed, the station will meet the 24.1 mgd firm pumping capacity. The selected alternative for Pumping Station 8 recommended that thirty-inch impellers be installed in the 8C and 8D rebuilt pumps. Rebuilt Pumps 6C and 6D from PS 6 with new 24-inch impellers will be installed in the Pump 8A and 8B slots at PS 8. One of the rebuilt pumps from PS 6 operating with the rebuilt 8C and 8D pumps from PS 8 will deliver the required 34.1 mgd firm capacity.

2007 Final Design Report Pump Station 13 and 14 Firm Capacity Improvements

In 2007, Earth Tech, Inc. prepared a design report for Pumping Station 13 and Pumping Station 14 firm capacity improvements. The firm pumping capacity to be provided for Pump Station 13 was 20 MGD, and the firm pumping capacity to be provided for Pump Station 14 was 15 MGD.

In order to provide the firm pumping capacity requirements, it was recommended that one new pump be provided at each of Pumping Stations 13 and 14.

2008 Northeast Interceptor – PS10 to Lien Road Relief / Replacement Planning Report

In 2008, MMSD staff prepared a planning report for the relief / replacement of the Northeast Interceptor (NEI) from Lien Road to Pumping Station 10 due to capacity and pipe corrosion concerns. There report found infiltration of ground water through many of the concrete pipe joints in this section of the NEI, which was constructed in 1964. The total estimated infiltration was listed as 36 gallons per minute for the NEI from PS10 to Lien Road. The report identified the biggest capacity concern in the Northeast Interceptor as the section from MH10-115 (just downstream of the Lien Extension) to MH10-118, which only has a calculated capacity of 18.2 MGD. For this report, an estimated design capacity of 42 MGD was used. This is equal to the design peak flow of the NEI/Pflaum Road Replacement constructed in 2005. This capacity estimate is also equal to the rated capacity of PS10 with all three pumps operating at full speed. The report evaluated several alternatives for a relief and/or replacement sewer for this section of the Northeast Interceptor.

2008 Northeast Interceptor Truax Liner Engineering Design Report

In 2008, MMSD staff prepared an engineering design report to evaluate the capacity, condition and criticality of the Northeast Interceptor System between Pumping Station 13 and Pumping Station 14. The report summarized the remaining useful life, condition, criticality and age of the major sections of interceptor between PS 14 and PS 13 as shown in Table A-10.

Table A-10: Northeast Interceptor Evaluation from PS 13 to PS 14

	Section 1 (end of PS 14 FM to MH13-122A)	Section 2 (MH13-122A to MH13-116A)	Section 3 (MH13-116A to PS 13)
Capacity	Reached in 2023	Beyond 2050	Reached in 2016
Condition	Moderate	Excellent	Moderate
Risk	Low	Low	High
Age	37 years	2 years	39 years

The report recommended that a cured-in- place liner be installed from MH 13-105 to MH 13-116H to prevent future deterioration of the pipeline, increase the structural capacity of the pipeline, reduce infiltration, and increase the pipeline capacity to handle peak flows to approximately 2022. The report further concluded that lining the existing interceptor through the Airport has the advantage of delaying major improvements to the NEI system until after long-term decisions are made concerning a possible north treatment plant.

2009 Design Report for Far East Interceptor – Cottage Grove Extension Liner

Routine televising of the Far East Interceptor-Cottage Grove Extension revealed deterioration in the top half of the pipe. This interceptor, which was originally installed in 1982, includes approximately 5,500 feet of 18-inch pipe, with portions installed on pilings. Since replacement of the sewer would be very difficult and expensive, the design report recommended that the sewer be lined to prevent future deterioration of the pipeline, to increase the structural capacity of the pipeline, and to reduce infiltration. The report further determined that the pipeline capacity is sufficient to convey peak flowrates to approximately the year 2030.

2009 50-Year Master Plan

In 2009, Malcom Pirnie and Strand Associates completed work on MMSD's 50-Year Master Plan. This document addressed four significant issues facing the district over the next fifty years: (1). Growth of the service area and its impact on facility needs; (2). Continued reliance on a one-plant model for providing regional sewer service; (3). Continued diversion of effluent to Badfish Creek; and (4). Effluent reuse options. The Master Plan incorporated work by the Capital Area Regional Planning Commission which showed population ranging from 475,000 to 560,000 in the year 2060 and average daily flows ranging from 60 mgd to 70 mgd. This planning document provides an analysis of MMSD's existing infrastructure and recommends a series of upgrades and improvements over the planning period based on the population and wastewater flow forecasts.

2011 Collection System Facilities Plan

In 2011, MMSD staff completed a comprehensive update to MMSD's Collection System Facilities Plan (2002). The 2002 plan reviewed and assessed the hydraulic capacity and condition of MMSD's collection system and presented a set of recommended future projects, with associated costs and timelines for completion. The district's policy is to update the facility plan every five to ten years. The 2011 update incorporated the population and wastewater flow forecasts provided by the Capital Area Regional Planning Commission for the years 2030 and 2060 as part of its MMSD Collection System Evaluation (2008). Using this information and evaluating other needs throughout the collection system, the facility plan recommended a total of 48 projects through the year 2030, with a total estimated cost of $157 million (in year 2010 dollars).

2012 Design Report for Northeast Interceptor – Far East Interceptor to Southeast Interceptor

The Northeast Interceptor, from the Far East Interceptor to the Southeast Interceptor, lacked sufficient capacity to convey peak flows. Additional capacity was provided by installing a new relief sewer parallel to the existing 48 inch sewer or by providing a larger replacement sewer where the existing 48" sewer was abandoned. In 2012 AECOM completed the design report for the new facilities in conjunction with the design of Pumping Station 18 and the Pumping Station 18 force main improvements. The design report identified several alternative routes for the relief and replacement interceptors and investigated pipe sizing, pipe materials, environmental impacts, and probable construction impacts. The report recommended that the relief sewer provide additional capacity of 33.9 mgd to the existing capacity of 32.1 mgd, resulting in an overall system capacity of 66.0 mgd.

2013 Design Report for Pumping Station 18

Capacity relief at MMSD Pumping Station 7 was identified as a need in MMSD's Collection System Facilities Plan (2002) and in MMSD's Collection System Facilities Plan Update (2011). Due to space constraints the required capacity could not be added at the existing Pumping Station 7 site. As an alternative, MMSD elected to construct Pumping Station 18 upstream of Pumping Station 7. This new pumping station provides the required system capacity and enhances the reliability and redundancy of MMSD's eastside collection system through its proximity and connection to Pumping Station 7. In 2013 AECOM completed a design report for Pumping Station 18. Among other things, the report evaluated the following items: peak flowrate requirements; flow splitting and flow balancing alternatives between Pumping Station 7 and Pumping Station 18; wastewater screening and screenings handling alternatives; wet well configuration; electrical utility power and standby power requirements; operation of major equipment; and recommended improvements at Pumping Station 7 after placing Pumping Station 18 into operation. PS 18 was designed to provide a capacity of 45 mgd up to the year 2030, with the ability to expand capacity to 66 mgd through the addition of a pump.

2013 Design Report for Pumping Station 18 Force Main

MMSD's collection system facility plans in 2002 and 2011 recommended construction of a new Pumping Station 18 to provide capacity relief for Pumping Station 7 and the district's eastside collection system. Approximately 15,000 feet of new force main needed to be constructed from the site of the new pumping station at East Broadway and Copps Avenue in the City of Monona to the Nine Springs Wastewater Treatment Plant. The design report for the new force main was completed in 2013 by AECOM and included the following aspects: discussion of three alternative routes for the force main; determination of force main pipe sizing and pipe materials; investigation of environmental and non-environmental impacts of construction; and probable construction costs. The force main was sized for a diameter of 48 inches and an ultimate peak flowrate of 66.0 mgd.

2014 Design Report for Pumping Station 11 and 12 Rehabilitation

In 2014, Strand Associates prepared a design report for the rehabilitation of Pumping Station 11 and Pumping Station 12. The report recommended increasing the firm capacity at Pumping Station 11 from 25.5 mgd to 38.0 mgd through the addition of four new equally sized pumps. The report also recommended that the firm capacity at Pumping Station 12 be increased from 16.6 mgd to 28.6 mgd. Similar to Pumping Station 11, this was accomplished through the addition of four new equally sized pumps. At both pumping stations two of the pumps are operated at constant speed and two are operated with variable frequency drives.

2014 Design Report for Northeast Interceptor – MH13-116H to MH13-127 Rehabilitation

In 2014, MMSD staff prepared a design report for the rehabilitation of approximately 2,100 feet of 48 inch sewer west of the Dane County Regional Airport. Prior inspection via closed circuit television revealed that the reinforced concrete pipe was deteriorating above the normal waterline. Since capacity increases in this section of sewer are not anticipated before the year 2050, the report recommended that the sewer be rehabilitated through installation of a cured-in-place liner.

2015 Design Report for Rimrock Interceptor Rehabilitation ad Replacement

In 2015, MMSD staff prepared a design report to provide capacity relief for the Rimrock Interceptor and to rehabilitate those segments containing defects. The existing sewer was installed in 1959 and consisted of approximately 3,800 feet of 12 inch concrete sewer. Segments of the sewer lacked adequate capacity, suffered from high rates of inflow and infiltration, and showed evidence of interior pipe corrosion above the normal waterline. Those sections of the sewer requiring capacity relief were replaced with a larger pipe, while the remainder of the sections were rehabilitated through the insertion of a cured-in-placer liner.

2016 Design Report for Pumping Station 15 Rehabilitation

In 2016, Baxter & Woodman Consulting Engineers prepared a design report for the rehabilitation of Pumping Station 15. The major objectives of this rehabilitation included an increase in firm pumping capacity, replacement of the electrical service, switchgear and motor control centers, upgrading of HVAC equipment, and a new building addition to allow for better access and equipment storage. The design report recommended increasing firm capacity at the station from 5.8 mgd to 8.4 mgd, which is the peak hourly flow that is anticipated in the year 2045. The report further recommended that the rehabilitation include the provision of three identical pumping units, with the firm capacity provided by any two of the pumps operating in parallel.

Pumping Station 12 Force Main Relocation

In 2016, MMSD staff prepared a design report for the replacement and relocation of a portion of the Pumping Station 12 force main. The existing force main and downstream interceptor were constructed in 1968 and showed evidence of corrosion. The interceptor was also expected to reach capacity by the year 2030. The force main and interceptor were located in the existing right-of-way of Verona Road, which was scheduled for major roadway improvements by the Wisconsin Department of Transportation. The design report recommended relocating the force main away from Verona Road into the Cannonball bike path corridor and extending the discharge point to County Highway PD, thereby allowing for the abandonment of 1,400 feet of existing 42 inch sewer and six manholes.

2016 Design Report for West Interceptor MH02-003 to MH02-014A Rehabilitation

In 2016, MMSD staff prepared a design report for the rehabilitation of approximately 4,575 feet of 24” pipe on Randall Avenue and Regent Street in the City of Madison. The original cast iron sewer was constructed in 1916 and is one of the oldest facilities in MMSD’s collection system. The sewer was suffering from tuberculation on the interior walls of the pipe, resulting in a loss of capacity and possible structural damage if not addressed. The design report evaluated future capacity needs by utilizing flow forecasts by the Capital Area Regional Planning Commission, performing field surveys, conducting flow monitoring, and evaluating water sales data from the City of Madison Water Utility. The report concluded that the existing pipeline had adequate capacity up to the year 2060. Therefore, it was determined that the condition defects in the West Interceptor could be addressed through removal of the iron deposits in the sewer and insertion of a cured-in-place liner.

2017 Design Report for Nine Springs Valley Interceptor – Morse Pond Extension

In 2017 MMSD staff prepared a report documenting the design flows required for a new sewer to serve the Morse Pond area near County Highway PD and County Highway M. The new sewer will serve lands within the City of Verona’s North Neighborhood Plan and within the City of Madison’s High Point – Raymond Neighborhood Development Plan. The report recommends that a 20 inch diameter pipe be installed with a capacity of 3.23 mgd.

Appendix B: Large Non-Residential Wastewater Generators

Pumping Station 1

Name	Address	2010 gpd	2015 gpd
Kraft Foods	910 Mayer Ave.	181,293	89,583
Schoeps Ice Cream	514 Division St.	130,979	56,314
Demetral Landfill	2199 Pennsylvania Ave.	56,164	43,836
Firststar Bank Bldg.	1 S Pinckney St.	15,356	26,955
Webcrafters	2105-2211 Fordem Ave.	195,901	24,675
Hilton Hotel	9 East Wilson St.	26,141	24,247
Monona Terrace	1 John Nolen Dr.	12,251	16,683
Machinery Row Complex	601-613 Williamson St.	17,094	14,424
Mister Car Wash	1039 E Washington Ave.	12,850	14,150
Madison East High School	2222 E Washington Ave.	13,045	12,053
State Office Building	1 W. Wilson St.	19,609	11,923
Bock Water Heaters Inc	110 S Dickinson St.	3,992	11,353
Total		684,675	346,196

Pumping Station 2

Name	Address	2010 gpd	2015 gpd
Meriter Hospital	202 Park St.	169,129	141,322
UW - Geology	1217 W Dayton St.	21,027	50,586
Municipal Bldg.	210 ML King Jr Blvd.	33,670	43,408
Public Safety Bldg.	115 W Doty St.	34,744	41,866
Concourse Hotel	1 W Dayton St.	43,742	37,307
UW - McLain Center	1436 Monroe St.	35,607	35,851
UW - 1220 Capitol Court	1220 Capitol Ct.	21,165	26,971
Best Western Inn on the Park	22 S Carroll St.	35,257	25,260
Edgewater Hotel	1001 Wisconsin Ave.	18,019	25,238
UW - Humanities	455 N Park St.	14,152	22,843
WI Institute of Discovery	330 N. Orchard St.	2,115	20,952
UW – Alumni Primate	22 N. Charter St.	17,023	19,008
UW - SERF	715 W Dayton St.	22,503	18,528
UW - Grainger Hall of Business	975 University Ave.	20,126	17,926
UW Medical Foundation	1 S Park St.	11,479	17,710
Overture Center	201 State St.	16,908	17,705
Mister Car Wash	907 S. Park St.	16,410	16,285
UW - Kohl Center	601 W Dayton St.	35,866	15,622
Gordon Dining Center	770 W. Dayton St.	0	15,500
U.W. Union South	1308 W. Dayton St.	0	14,804
UW - Primate Center	1223 Capitol Ct.	14,422	13,852
UW - Camp Randall Stadium	1440 Monroe St.	12,717	12,804

Name	Address	2010 gpd	2015 gpd
AT&T	315 W Mifflin St.	3,064	11,770
Double Tree Hotel	525 W Johnson St.	12,110	12,641
UW - Lowell Hall	610 Langdon St.	10,661	12,440
Hampton Inn	440 W. Johnson St.	0	12,427
UW - Chemistry	1100 W Johnson St.	20,822	11,303
WHEDA	201 W. Washington Ave.	13,686	10,807
UW - Field House	1450 Monroe St.	10,173	10,243
Total		666,597	732,979

Pumping Station 3
No large non-residential wastewater generators

Pumping Station 4

Name	Address	2010 gpd	2015 gpd
Madison United Hospital Laundry	1310 W Badger Rd.	84,581	94,698
Sheraton Hotel	706 John Nolen Dr.	26,389	25,125
Alliant Energy Center	701 John Nolen Dr.	21,027	20,044
Olin Landfill	101 E. Olin Ave.	14,520	26,301
Harlan Sprague Dawley	2826 Latham Dr.	12,380	13,249
Zimbrick	2626 Bryant Rd.	6,198	10,891
Total		165,095	190,308

Pumping Station 5
No large non-residential wastewater generators

Pumping Station 6

Name	Address	2010 gpd	2015 gpd
Madison Kipp Corp	201 Waubesa St.	20,857	29,232
Madison Kipp Corp	166 S Fair Oaks Ave.	12,889	17,150
Envigo Medical Lab	1401 S. Stoughton Rd.	10,329	11,477
Central Storage Warehouse	4313 Cottage Grove Rd.	15,607	27,787
Oak Park Place	702 Jupiter Dr.	11,819	11,033
Total		71,501	96,679

Pumping Stations 7 and 18

Name	Address	2010 gpd	2015 gpd
Hydrite Chemical Co. [5]	113-120 N Main St.	238,197	238,197
AGA Gas	4802 Pflaum Rd.	138,664	153,534
Danisco USA Inc.	3322 Agriculture Dr.	52,864	105,449
Cintas Corp	2222 Vondron Rd.	41,811	42,938
Total Water LLC	5002 Dairy Dr.	17,861	23,430
Dairy Equipment Corp.	1919 S Stoughton Rd.	12,198	17,310
WI Dept. Agriculture	2601 Agriculture Dr.	14,674	16,601
Certco Inc.	4802 Femrite Dr.	9,356	14,481
Ho Chunk Gaming	4002 Evan Acres	10,577	13,439
America's Best Value Inn	3438 USH 12 & 18	5,493	11,883
Ohmeda Inc	2930-3030 Ohmeda Dr.	22,644	11,049
La Follette High School	502-702 Pflaum Rd.	13,123	10,024
Total		577,462	658,335

Pumping Station 8

Name	Address	2010 gpd	2015 gpd
UW – Hospital	600 Highland Ave.	1,230,373	436,870
St Mary's Hospital	707 S Mills St.	153,684	152,697
UW – Vet Medicine	2015 Linden Dr.	91,051	91,676
UW – McArdle Lab	1400 University Ave.	76,300	76,823
Hilldale Mall	702 N Midvale Blvd.	71,094	75,035
UW – Medical Science	1300 University Ave.	68,365	68,834
Madison Newspapers Inc	1901 Fish Hatchery Rd.	45,865	65,507
CUNA Mutual Insurance	5710-5910 Mineral Point Rd.	69,058	56,505
UW – ERB	1500 University Ave.	55,953	56,337
Vilas Zoo	1400 Drake	85,960	49,828
Edgewood High School / College	2219 Monroe St.	39,138	25,787
UW - Engineering Hall	1410-1425 Engineering Dr.	27,224	23,811
UW – Carson Gulley Area	1515 Tripp	22,381	22,535
State Office Bldg.	4802 Sheboygan Ave	21,650	22,166
UW – Livestock Lab	1810 Linden Dr.	20,347	20,486
UW – Biotech	425 Henry Mall	21,290	20,388
UW – Bacteriology & Biophysics	1525 Linden Dr.	20,245	20,384
UW – Sterling Hall	475 N Charter St.	18,821	18,950
UW – Waisman	1500 Highland	15,769	15,877
UW – Hygiene Lab	465 Henry Mall	14,751	14,853
UW – Kronsage / Holt Commons	1650 Kronsage	14,751	14,853
State Office Bldg.	4638-4706 University Ave.	16,117	14,498
UW – Van Vleck	480 Lincoln	13,734	13,828

[5] Includes flow from groundwater remediation system. 2010 data unavailable, assumed same as 2015.

Name	Address	2010 gpd	2015 gpd
UW – Vet Science	1656 Linden Dr.	13,734	13,828
UW – Natatorium Gym	2000 Observatory Dr.	12,717	12,804
UW – Russel Lab	1630 Linden Dr.	12,717	12,804
UW – Genetics	445 Henry Mall	12,717	12,804
UW – Babcock Hall	1605 Linden Dr.	12,717	12,804
UW – Animal Science	1675 Observatory Dr.	12,717	12,804
Inntowner – Best Western	2424 University Ave.	11,028	12,272
UW – Van Hise	1220 Linden Dr.	11,292	11,370
SEIU Healthcare	4513 Vernon Blvd.	9,641	11,286
Mister Car Wash	2202 University Ave.	11,350	11,227
Madison West High School	30 Ash St.	16,356	11,150
James Madison School	201 S Gammon Rd.	13,182	10,833
UW – Chamberlain Hall	1150 University Ave.	10,682	10,755
Parkcrest Swim and Tennis	1 Yellowstone Dr.	2,980	10,180
Total		2,377,751	1,545,449

Pumping Station 9

No large non-residential wastewater generators

Pumping Station 10

Name	Address	2010 gpd	2015 gpd
Aramark Uniform Services	1212 N Stoughton Rd.	84,103	169,345
Bell Labs	3699 Kinsman Blvd.	28,362	74,137
American Family Insurance	6000 American Pky.	31,109	71,113
UW Clinic[6]	4602 Eastpark Blvd.	0	37,657
Mad-Prairie Landfill	6002 Nelson Rd.	47,945	28,219
Crowne Plaza Hotel	4402 E Washington Ave	33,324	28,048
American Family Insurance	302 N Walbridge Ave.	47,383	27,363
Madison College	1701 Wright St.	33,109	25,513
Silliker Labs	3688 Kinsman Blvd.	12,795	22,389
Alliant Energy	4902 Biltmore	6,023	18,594
Office/Commercial Complex	5109 West Terrace Dr.	4,427	13,597
Hy-Vee	3801 E. Washington Ave.	10,044	13,417
Hotel	4202 East Towne Blvd.	5,327	13,323
Princeton Club	1726 Eagan Rd.	9,889	13,166
East Towne Mall	64 - 171 East Towne Mall	15,305	13,147
US Post Office	3902 Milwaukee St.	11,770	12,844
Fairfield Inn	4765 Hayes Rd.	8,120	12,180
Marriot	2502 Crossroads Dr.	3,412	11,253

[6] 2015 data was abnormally high (304,890 gpd) due to construction, so 2016 data was used.

Name	Address	2010 gpd	2015 gpd
Mermaid Car Wash	4001 East Towne Blvd.	25,428	11,108
Fairfield Inn	2702 Crossroads Dr.	5,158	10,943
Best Western	4801 Annamark Dr.	10,973	10,691
La Quinta Inn	5217 East Terrace Dr.	4,732	10,475
Total		438,738	648,522

Pumping Station 11

Name	Address	2010 gpd	2015 gpd
Promega[7]	2800 Wood Hollow Rd.	76,393	76,393
Placon Corp.[9]	6124 McKee Rd.	58,448	58,448
Superior Health Linens	2905 Syene Rd.	86,465	52,463
Wolf Appliance, Inc.[9]	2866 Buds Dr.	30,657	30,657
Total		251,963	217,961

Pumping Station 12

Name	Address	2010 gpd	2015 gpd
West Towne Mall	3 – 215 West Towne Mall	37,214	28,023
Mermaid Car Wash	526 Grand Canyon Dr.	19,915	21,444
SSM Health Care	3401 Maple Grove Rd.	15,186	12,280
Radisson Inn & Restaurant	517 Grand Canyon Dr.	10,659	12,044
Olive Garden	7017 Mineral Point Rd.	10,171	10,196
Total		93,145	83,987

Pumping Station 13

Name	Address	2010 gpd	2015 gpd
Covance	3301 Kinsman Blvd.	306,951	338,858
Mendota Mental Health	301 Troy Dr.	200,592	214,142
Dane County Regional Airport[8]	4000 International Ln.	49,881	62,337
Total		557,424	615,337

[7] 2010 data unavailable, assumed same as 2015.
[8] Includes glycol deicing system discharge.

Pumping Station 14

Name	Address	2010 gpd	2015 gpd
Scientific Protein Labs	700 East Main St.	284,742	185,485
Waunakee Manor Health Care Center	801 Klein Dr.	9,011	11,447
Sanimax Grease Services	605 Bassett St.	11,203	26,107
Clack Corporation	4462 Duraform Ln.	10,418	10,926
Total		315,374	233,965

Pumping Station 15

Name	Address	2010 gpd	2015 gpd
Springs Window Fashions	7549 Graber Rd	60,345	96,965

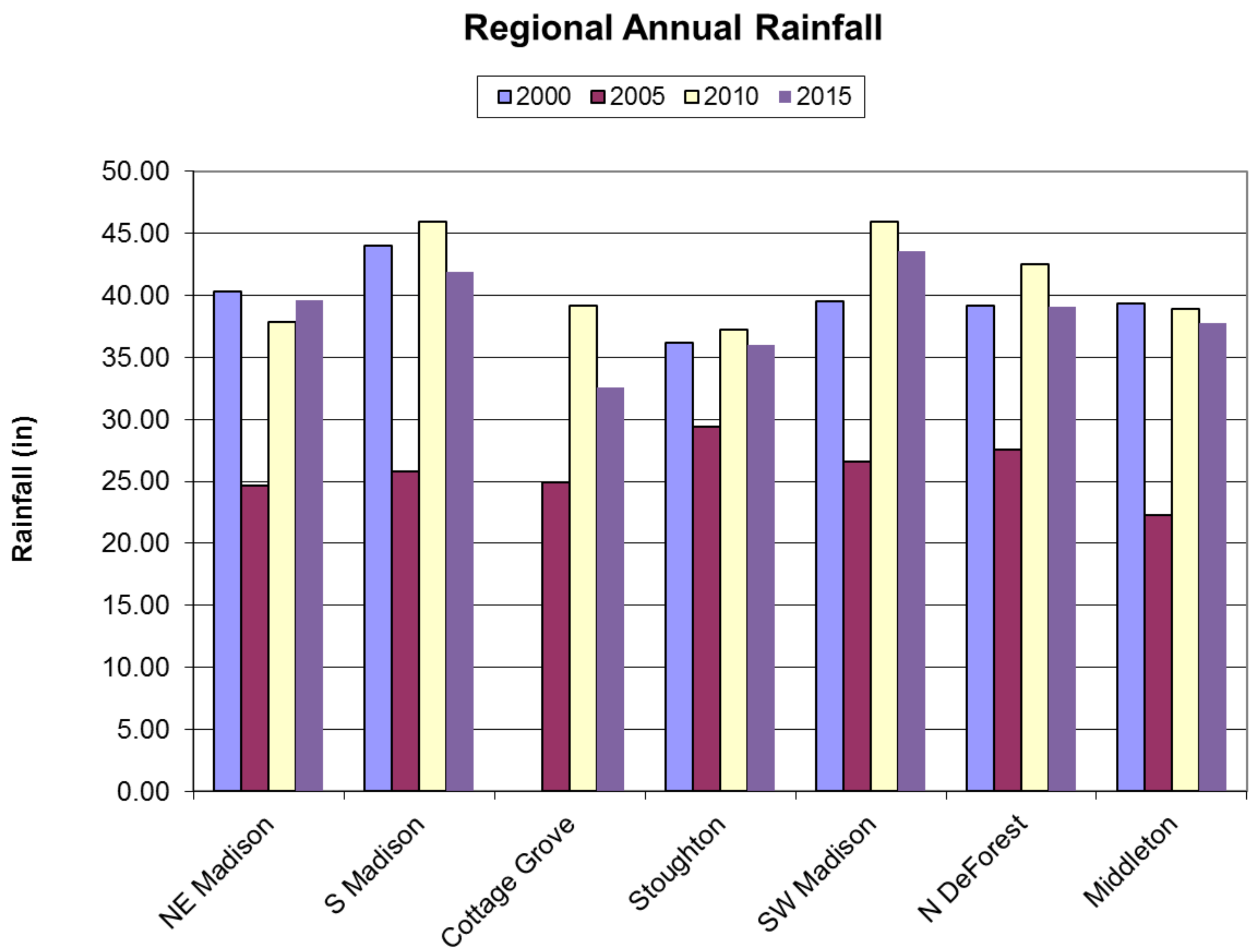
Pumping Station 16

Name	Address	2010 gpd	2015 gpd
King Pharmaceuticals	2232 Pleasant View Rd.	59,549	50,731
Marriott West	1313 John Q Hammonds	34,660	38,674
Catalent Pharma	726 Heartland Trl.	0	27,531
Holiday Inn	1109 Fourier Dr.	28,137	24,893
Princeton Club West	8010 Watts Rd.	23,602	19,884
Office Complex	525 Junction Rd.	12,469	17,080
Agracetus	2202 Parview Rd.	7,227	16,210
Greenway Office Center	8401 Greenway Blvd.	10,386	14,391
Hampton Inn	483 Commerce Dr.	10,551	10,581
Cowboy Jack’s	1262 John Q Hammons Dr.	3,238	10,459
Homewood Suites	479 Commerce Dr.	9,766	10,217
Total		199,585	240,651

Pumping Station 17

Name	Address	2010 gpd	2015 gpd
Epic	1979 Milky Way	43,104	29,049
Badger Prairie Health Care Center	1100 E Verona Ave	0	12,419
Total		43,104	41,468

Appendix C: Regional Annual Rainfall



17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	516	3.4	0.5	6	1,064	46,956	1,684	0	21,536	71,240
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,139	43.0	8.3	43	20,361	285,649	4,770	0	134,661	445,442
MH01-615	City of Madison	1,436	43.1	63.7	35	192,514	83,288	0	0	119,505	395,307
MH01-604	City of Madison	5,148	48.4	6.6	76	61,762	298,584	0	0	156,138	516,485
MH01-003	City and Town of Madison	2,044	11.5	11.3	14	204,606	118,552	0	0	140,024	463,182
SAS 5543-003	City of Madison	4,091	21.5	8.4	91	192,829	237,278	0	0	186,366	616,473
SAS 5543-004	City of Madison	12,489	154.7	36.1	337	423,256	724,362	0	0	497,263	1,644,881
	PS 1 Totals	28,863	325.6	134.9	602	1,096,392	1,794,669	6,454	0	1,255,493	4,153,008

		2015									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	516	3.5	0.5	8	2,365	38,700	2,102	0	25,723	68,891
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,139	43.3	13.0	63	20,281	235,425	5,957	0	155,925	417,587
MH01-615	City of Madison	1,436	42.1	72.8	47	102,352	78,980	0	0	108,056	289,388
MH01-604	City of Madison	5,148	48.0	6.6	93	57,481	283,140	0	0	202,976	543,598
MH01-003	City and Town of Madison	2,044	10.7	9.4	16	36,166	112,420	0	0	88,542	237,129
SAS 5543-003	City of Madison	4,091	21.3	7.5	113	112,895	225,005	0	0	201,355	539,255
SAS 5543-004	City of Madison	13,083	153.8	35.1	404	430,577	719,565	0	0	685,370	1,835,512
	PS 1 Totals	29,457	322.6	144.9	744	762,117	1,693,235	8,059	0	1,467,947	3,931,359

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	517	3.6	0.4	8	1,794	42,911	91	0	23,630	68,426
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,160	43.5	17.7	63	23,225	262,280	272	4,486	145,293	435,556
MH01-615	City of Madison	1,489	41.1	81.9	47	12,292	84,129	0	8,686	113,780	218,887
MH01-604	City of Madison	5,184	47.6	6.6	93	61,480	292,896	0	0	179,557	533,933
MH01-003	City and Town of Madison	2,051	9.9	7.6	16	121,444	115,882	0	0	114,283	351,609
SAS 5543-003	City of Madison	4,183	21.1	6.6	113	162,000	236,340	0	0	193,860	592,200
SAS 5543-004	City of Madison	14,353	152.8	34.0	404	435,722	810,945	0	0	591,316	1,837,983
	PS 1 Totals	30,937	319.6	154.8	744	817,957	1,845,381	363	13,172	1,361,720	4,038,594

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	517	3.7	0.4	8	1,794	42,911	183	0	23,630	68,518
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,180	43.8	22.4	63	23,225	263,940	544	8,972	145,293	441,974
MH01-615	City of Madison	1,541	40.0	91.0	47	12,292	87,067	0	17,372	113,780	230,511
MH01-604	City of Madison	5,218	47.2	6.6	93	61,480	294,817	0	0	179,557	535,854
MH01-003	City and Town of Madison	2,059	9.2	5.7	16	121,444	116,334	0	0	114,283	352,061
SAS 5543-003	City of Madison	4,191	20.9	5.7	113	162,000	236,792	0	0	193,860	592,652
SAS 5543-004	City of Madison	15,516	151.9	33.0	404	435,722	876,654	0	0	591,316	1,903,692
	PS 1 Totals	32,222	316.7	164.8	744	817,957	1,918,514	727	26,344	1,361,720	4,125,262

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	518	3.8	0.3	8	1,794	42,994	274	0	23,630	68,692
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,200	44.0	27.1	63	23,225	265,600	816	13,458	145,293	448,392
MH01-615	City of Madison	1,594	39.0	100.1	47	12,292	90,061	0	26,058	113,780	242,192
MH01-604	City of Madison	5,253	46.8	6.7	93	61,480	296,795	0	46	179,557	537,878
MH01-003	City and Town of Madison	2,066	8.4	3.9	16	121,444	116,729	0	0	114,283	352,456
SAS 5543-003	City of Madison	4,200	20.8	4.8	113	162,000	237,300	0	0	193,860	593,160
SAS 5543-004	City of Madison	16,678	151.0	31.9	404	435,722	942,307	0	0	591,316	1,969,345
	PS 1 Totals	33,509	313.7	174.8	744	817,957	1,991,786	1,090	39,563	1,361,720	4,212,116

		2035									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	519	3.8	0.3	8	1,794	43,077	366	0	23,630	68,867
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,220	44.3	31.8	63	23,225	267,260	1,087	17,945	145,293	454,810
MH01-615	City of Madison	1,647	38.0	109.2	47	12,292	93,056	0	34,744	113,780	253,872
MH01-604	City of Madison	5,287	46.4	6.7	93	61,480	298,716	0	46	179,557	539,799
MH01-003	City and Town of Madison	2,074	7.6	2.0	16	121,444	117,181	0	0	114,283	352,908
SAS 5543-003	City of Madison	4,209	20.6	3.9	113	162,000	237,809	0	0	193,860	593,669
SAS 5543-004	City of Madison	17,841	150.0	30.9	404	435,722	1,008,017	0	0	591,316	2,035,055
	PS 1 Totals	34,797	310.7	184.8	744	817,957	2,065,114	1,453	52,735	1,361,720	4,298,980

17CatchCon	Community	2040									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH01-126	Village of Maple Bluff and City of Madison	519	3.9	0.2	8	1,794	43,077	457	0	23,630	68,958
MH01-617	Village of Maple Bluff and City of Madison and Bu	3,240	44.6	36.4	63	23,225	268,920	1,359	22,381	145,293	461,178
MH01-615	City of Madison	1,700	37.0	118.2	47	12,292	96,050	0	43,378	113,780	265,501
MH01-604	City of Madison	5,322	45.9	6.7	93	61,480	300,693	0	40	179,557	541,770
MH01-003	City and Town of Madison	2,081	6.8	0.2	16	121,444	117,577	0	0	114,283	353,304
SAS 5543-003	City of Madison	4,218	20.4	3.0	113	162,000	238,317	0	0	193,860	594,177
SAS 5543-004	City of Madison	19,004	149.1	29.8	404	435,722	1,073,726	0	0	591,316	2,100,764
	PS 1 Totals	36,084	307.7	194.6	744	817,957	2,138,360	1,816	65,799	1,361,720	4,385,653

		2010									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	0	25.0	0.0	13	360,207	0	0	0	71,609	431,816
MH02-012	City of Madison	4,545	12.6	0.0	60	23,083	263,610	0	0	56,995	343,688
MH02-011	City of Madison	1,091	8.6	0.0	16	19,898	63,278	0	0	16,535	99,712
MH02-010	City of Madison	273	8.2	0.1	21	66,130	15,834	0	0	16,294	98,258
MH02-008A	City of Madison	1,607	0.9	0.5	11	5,296	93,206	0	0	19,582	118,084
MH02-006A	City of Madison	3,216	48.0	0.2	38	228,460	186,528	0	0	82,500	497,487
MH02-005A	City of Madison	11,003	43.9	1.3	79	240,114	638,174	0	0	174,604	1,052,892
MH02-005	City of Madison	689	0.0	0.0	0	0	39,962	0	0	7,944	47,906
MH02-314A	City of Madison	1,416	22.0	0.1	18	96,841	82,128	0	0	35,579	214,548
MH02-306A	City of Madison	499	7.1	0.0	4	180,529	28,942	0	0	41,643	251,113
MH02-300	City of Madison	13,924	64.0	6.9	193	437,725	807,592	0	0	247,569	1,492,886
MH02-402	City of Madison	259	7.6	0.0	3	2,306	15,022	0	0	3,445	20,772
MH02-606	City of Madison	1,782	11.1	2.1	41	21,316	103,356	0	0	24,785	149,457
MH02-114	City of Madison	338	6.8	0.0	8	28,629	19,604	0	0	9,589	57,822
	PS 2 Totals	40,642	265.8	11.2	505	1,710,533	2,357,236	0	0	808,673	4,876,442

		2015									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	123	24.9	0.0	14	279,017	6,765	0	0		285,782
MH02-012	City of Madison	4,594	14.5	0.0	72	27,771	252,670	0	0		280,441
MH02-011	City of Madison	1,091	8.6	0.0	17	17,738	60,005	0	0		77,743
MH02-010	City of Madison	273	8.1	0.1	23	75,030	15,015	0	0		90,045
MH02-008A	City of Madison	1,607	0.9	0.5	11	12,909	88,385	0	0		101,294
MH02-006A	City of Madison	3,530	47.9	0.2	40	203,164	194,150	0	0		397,314
MH02-005A	City of Madison	11,749	43.1	1.3	101	227,682	646,195	0	0		873,877
MH02-005	City of Madison	690	0.0	0.0	0	0	37,950	0	0		37,950
MH02-314A	City of Madison	1,471	21.2	0.1	20	154,650	80,905	0	0		235,555
MH02-306A	City of Madison	604	6.9	0.0	8	186,179	33,220	0	0		219,399
MH02-300	City of Madison	15,711	62.8	6.4	236	495,553	864,105	0	0		1,359,658
MH02-402	City of Madison	259	7.6	0.0	3	1,392	14,245	0	0		15,637
MH02-606	City of Madison	2,033	11.4	1.8	56	26,689	111,815	0	0		138,504
MH02-114	City of Madison	338	6.8	0.0	15	29,808	18,590	0	0		48,398
	PS 2 Totals	44,073	264.7	10.4	616	1,737,582	2,424,015	0	0	0	4,161,597

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	163	24.8	0.0	14	319,906	9,210	0	0	71,609	400,725
MH02-012	City of Madison	4,715	13.5	0.0	72	29,375	266,398	0	0	56,995	352,767
MH02-011	City of Madison	1,104	8.5	0.0	17	18,821	62,376	0	0	16,535	97,732
MH02-010	City of Madison	273	8.1	0.1	23	70,597	15,425	0	0	16,294	102,316
MH02-008A	City of Madison	1,659	0.9	0.5	11	9,102	93,734	0	0	19,582	122,418
MH02-006A	City of Madison	3,761	47.8	0.1	40	217,428	212,497	0	0	82,500	512,424
MH02-005A	City of Madison	12,158	42.2	1.3	101	252,785	686,927	0	0	174,604	1,114,316
MH02-005	City of Madison	690	0.0	0.0	0	0	38,985	0	0	7,944	46,929
MH02-314A	City of Madison	1,680	20.4	0.1	20	136,645	94,920	0	0	35,579	267,144
MH02-306A	City of Madison	770	6.6	0.0	8	188,592	43,505	0	0	41,643	273,740
MH02-300	City of Madison	17,242	61.7	5.8	236	494,230	974,173	0	0	247,569	1,715,972
MH02-402	City of Madison	262	7.6	0.0	3	1,849	14,803	0	0	3,445	20,097
MH02-606	City of Madison	2,179	11.7	1.4	56	28,324	123,114	312	0	24,785	176,535
MH02-114	City of Madison	341	6.9	0.0	15	30,008	19,267	104	0	9,589	58,967
	PS 2 Totals	46,997	260.7	9.3	616	1,797,663	2,655,331	416	0	808,673	5,262,081

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	204	24.7	0.0	14	319,906	11,526	0	0	71,609	403,041
MH02-012	City of Madison	4715	12.4	0	72	29,375	266,398	0	0	56,995	352,767
MH02-011	City of Madison	1,110	8.5	0.0	17	18,821	62,715	0	0	16,535	98,071
MH02-010	City of Madison	273	8.0	0.1	23	70,597	15,425	0	0	16,294	102,316
MH02-008A	City of Madison	1,711	0.9	0.5	11	9,102	96,672	0	0	19,582	125,356
MH02-006A	City of Madison	3,991	47.7	0.1	40	217,428	225,492	0	0	82,500	525,419
MH02-005A	City of Madison	12,567	41.4	1.3	101	252,785	710,036	0	0	174,604	1,137,424
MH02-005	City of Madison	690	0.0	0.0	0	0	38,985	0	0	7,944	46,929
MH02-314A	City of Madison	1,889	19.7	0.1	20	136,645	106,729	0	0	35,579	278,953
MH02-306A	City of Madison	778	6.3	0.0	8	188,592	43,957	0	0	41,643	274,192
MH02-300	City of Madison	17,892	60.5	5.3	236	494,230	1,010,898	0	0	247,569	1,752,697
MH02-402	City of Madison	264	7.6	0.0	3	1,849	14,916	0	0	3,445	20,210
MH02-606	City of Madison	2,220	12.0	1.1	56	28,324	125,430	624	0	24,785	179,163
MH02-114	City of Madison	356	7.0	0.0	15	30,008	20,114	208	0	9,589	59,919
	PS 2 Totals	48,660	256.7	8.5	616	1,797,663	2,749,290	832	0	808,673	5,356,457

		2030									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	244	24.6	0.0	14	319,906	13,786	0	0	71,609	405,301
MH02-012	City of Madison	4715	11.4	0.0	72	29,375	266,398	0	0	56,995	352,767
MH02-011	City of Madison	1,116	8.5	0.0	17	18,821	63,054	0	0	16,535	98,410
MH02-010	City of Madison	273	8.0	0.1	23	70,597	15,425	0	0	16,294	102,316
MH02-008A	City of Madison	1,763	0.9	0.5	11	9,102	99,610	0	0	19,582	128,294
MH02-006A	City of Madison	4,222	47.6	0.1	40	217,428	238,543	0	0	82,500	538,471
MH02-005A	City of Madison	12,976	40.5	1.3	101	252,785	733,144	0	0	174,604	1,160,533
MH02-005	City of Madison	690	0.0	0.0	0	0	38,985	0	0	7,944	46,929
MH02-314A	City of Madison	2,099	18.9	0.0	20	136,645	118,594	0	0	35,579	290,818
MH02-306A	City of Madison	785	6.1	0.0	8	188,592	44,353	0	0	41,643	274,587
MH02-300	City of Madison	18,542	59.4	4.7	236	494,230	1,047,623	0	0	247,569	1,789,422
MH02-402	City of Madison	267	7.6	0.0	3	1,849	15,086	0	0	3,445	20,379
MH02-606	City of Madison	2,260	12.3	0.7	56	28,324	127,690	936	0	24,785	181,735
MH02-114	City of Madison	370	7.0	0.0	15	30,008	20,905	208	0	9,589	60,710
	PS 2 Totals	50,322	252.8	7.4	616	1,797,663	2,843,193	1,143	0	808,673	5,450,672

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	284	24.5	0.0	14	319,906	16,046	0	0	71,609	407,561
MH02-012	City of Madison	4715	10.3	0.0	72	29,375	266,398	0	0	56,995	352,767
MH02-011	City of Madison	1,123	8.5	0.0	17	18,821	63,450	0	0	16,535	98,806
MH02-010	City of Madison	274	7.9	0.1	23	70,597	15,481	0	0	16,294	102,373
MH02-008A	City of Madison	1,815	0.9	0.5	11	9,102	102,548	0	0	19,582	131,232
MH02-006A	City of Madison	4,452	47.5	0.0	40	217,428	251,538	0	0	82,500	551,466
MH02-005A	City of Madison	13,385	39.6	1.3	101	252,785	756,253	0	0	174,604	1,183,641
MH02-005	City of Madison	691	0.0	0.0	0	0	39,042	0	0	7,944	46,986
MH02-314A	City of Madison	2,308	18.2	0.0	20	136,645	130,402	0	0	35,579	302,626
MH02-306A	City of Madison	793	5.8	0.0	8	188,592	44,805	0	0	41,643	275,039
MH02-300	City of Madison	19,192	58.2	4.2	236	494,230	1,084,348	0	0	247,569	1,826,147
MH02-402	City of Madison	269	7.6	0.0	3	1,849	15,199	0	0	3,445	20,492
MH02-606	City of Madison	2,301	12.6	0.4	56	28,324	130,007	1,247	0	24,785	184,363
MH02-114	City of Madison	384	7.1	0.0	15	30,008	21,696	312	0	9,589	61,604
	PS 2 Totals	51,986	248.7	6.5	616	1,797,663	2,937,209	1,559	0	808,673	5,545,103

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-014	City of Madison	324	24.5	0.0	14	319,906	18,306	0	0	71,609	409,821
MH02-012	City of Madison	4715	9.3	0.0	72	29,375	266,398	0	0	56,995	352,767
MH02-011	City of Madison	1,129	8.5	0.0	17	18,821	63,789	0	0	16,535	99,145
MH02-010	City of Madison	274	7.9	0.1	23	70,597	15,481	0	44	16,294	102,417
MH02-008A	City of Madison	1,867	0.9	0.5	11	9,102	105,486	0	0	19,582	134,170
MH02-006A	City of Madison	4,683	47.4	0.0	40	217,428	264,590	0	0	82,500	564,517
MH02-005A	City of Madison	13,793	38.8	1.3	101	252,785	779,305	0	0	174,604	1,206,693
MH02-005	City of Madison	691	0.0	0.0	0	0	39,042	0	0	7,944	46,986
MH02-314A	City of Madison	2,517	17.4	0.0	20	136,645	142,211	0	0	35,579	314,435
MH02-306A	City of Madison	801	5.5	0.0	8	188,592	45,257	0	0	41,643	275,491
MH02-300	City of Madison	19,842	57.0	3.7	236	494,230	1,121,073	0	0	247,569	1,862,872
MH02-402	City of Madison	272	7.6	0.0	3	1,849	15,368	0	0	3,445	20,662
MH02-606	City of Madison	2,341	13.0	0.0	56	28,324	132,267	1,663	0	24,785	187,039
MH02-114	City of Madison	398	7.2	0.0	15	30,008	22,487	416	0	9,589	62,499
	PS 2 Totals	53,647	245.0	5.6	616	1,797,663	3,031,056	2,079	44	808,673	5,639,514

17CatchCon	Community	2010									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,611	103.7	16.0	48	51,089	93,438	0	0	31,406	175,933
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	47,270	0	0	10,272	57,542
MH03-201	City of Madison and City of Monona	0	23.0	21.6	8	34,749	0	19,163	16,435	15,286	85,632
	PS 3 Totals	2,426	126.7	37.6	56	85,837	140,708	19,163	16,435	56,964	319,106

17CatchCon	Community	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,611	88.6	15.6	65	54,162	88,605	0	0	6,596	149,363
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	44,825	0	0	2,071	46,896
MH03-201	City of Madison and City of Monona	0	17.7	23.0	8	4,982	0	12,005	12,735	1,373	31,095
	PS 3 Totals	2,426	106.3	38.6	73	59,144	133,430	12,005	12,735	10,040	227,353

17CatchCon	Community	2020									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,694	98.1	13.3	65	55,972	95,711	9,896	0	19,001	180,580
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	46,048	0	0	6,171	52,219
MH03-201	City of Madison and City of Monona	0	19.2	23.7	8	5,577	0	14,283	16,017	8,330	44,206
	PS 3 Totals	2,509	117.4	37.0	73	61,549	141,759	24,179	16,017	33,502	277,004

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,959	107.6	11.0	65	55,972	110,684	19,792	0	19,001	205,448
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	46,048	0	0	6,171	52,219
MH03-201	City of Madison and City of Monona	0	20.8	24.4	8	5,577	0	15,884	16,666	8,330	46,456
	PS 3 Totals	2,774	128.4	35.3	73	61,549	156,731	35,676	16,666	33,502	304,123

		2030									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,959	117.2	8.6	65	55,972	110,684	29,688	0	19,001	215,344
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	46,048	0	0	6,171	52,219
MH03-201	City of Madison and City of Monona	0	22.3	25.0	8	5,577	0	17,484	17,315	8,330	48,706
	PS 3 Totals	2,774	139.5	33.7	73	61,549	156,731	47,173	17,315	33,502	316,269

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,959	126.7	6.3	65	55,972	110,684	39,584	0	19,001	225,240
MH03-108	City and Town of Madison	815	0.0	0.0	0	0	46,048	0	0	6,171	52,219
MH03-201	City of Madison and City of Monona	0	23.9	25.7	8	5,577	0	19,085	17,964	8,330	50,956
	PS 3 Totals	2,774	150.5	32.0	73	61,549	156,731	58,669	17,964	33,502	328,415

17CatchCon	Community	2040									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH03-311	City and Town of Madison	1,959	136.2	4.0	65	55,972	110,684	49,480	0	19,001	235,136
MH03-108	City and Town of Madison	815	0	0.0	0	0	46,048	0	0	6,171	52,219
MH03-201	City of Madison and City of Monona	0	25.4	26.4	8	5,577	0	20,686	18,613	8,330	53,206
	PS 3 Totals	2,774	161.6	30.4	73	61,549	156,731	70,166	18,613	33,502	340,561

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,624	74.3	46.0	9	2,416	210,192	0	0	86,361	298,970
MH04-312	City and Town of Madison	2,541	127.6	19.2	170	200,337	147,378	0	0	141,242	488,956
MH04-315	City of Madison	301	17.2	2.6	21	10,003	17,458	0	0	11,155	38,616
MH04-201B	City and Town of Madison	0	140.1	1.0	19	71,802	0	0	0	29,166	100,968
MH04-209	City of Madison	615	22.6	5.0	28	26,163	35,670	0	0	25,117	86,950
	PS 4 Totals	7,081	381.8	73.8	247	310,722	410,698	0	0	293,041	1,014,461

17CatchCon	Community	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,624	12.7	0.0	10	2,421	199,320	0	0	14,987	216,728
MH04-312	City and Town of Madison	2,541	188.8	64.9	225	214,482	139,755	0	0	26,316	380,554
MH04-315	City of Madison	301	18.4	0.8	31	9,143	16,555	0	0	1,909	27,607
MH04-201B	City and Town of Madison	0	139.1	1.0	26	93,302	0	0	0	6,931	100,233
MH04-209	City of Madison	615	22.6	5.0	37	20,141	33,825	0	0	4,009	57,975
	PS 4 Totals	7,081	381.6	71.7	329	339,489	389,455	0	0	54,153	783,097

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,666	26.4	0.0	10	2,420	207,107	14,237	0	50,674	274,439
MH04-312	City and Town of Madison	2,541	163.8	85.2	225	212,352	143,554	0	19,377	83,779	459,062
MH04-315	City of Madison	301	5.8	1.9	31	10,882	17,011	0	1,044	6,532	35,469
MH04-201B	City and Town of Madison	0	152.6	0.0	26	68,081	0	14,067	0	18,049	100,196
MH04-209	City of Madison	615	40.7	2.3	37	23,377	34,766	18,843	0	14,563	91,549
	PS 4 Totals	7,123	389.3	89.4	329	317,112	402,439	47,147	20,421	173,597	960,715

17CatchCon	Community	2025									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,669	26.4	0.0	10	2,420	207,294	14,237	0	50,674	274,626
MH04-312	City and Town of Madison	2,552	163.8	85.2	225	212,352	144,204	0	19,377	83,779	459,712
MH04-315	City of Madison	301	5.8	1.9	31	10,882	17,011	0	1,044	6,532	35,469
MH04-201B	City and Town of Madison	0	152.6	0.0	26	68,081	0	14,067	0	18,049	100,196
MH04-209	City of Madison	617	40.7	2.3	37	23,377	34,862	18,843	0	14,563	91,645
	PS 4 Totals	7,139	389.3	89.4	329	317,112	403,371	47,147	20,421	173,597	961,648

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,669	26.4	0.0	10	2,420	207,294	14,237	0	50,674	274,626
MH04-312	City and Town of Madison	2,552	163.8	85.2	225	212,352	144,204	0	19,377	83,779	459,712
MH04-315	City of Madison	301	5.8	1.9	31	10,882	17,011	0	1,044	6,532	35,469
MH04-201B	City and Town of Madison	0	152.6	0.0	26	68,081	0	14,067	0	18,049	100,196
MH04-209	City of Madison	617	40.7	2.3	37	23,377	34,862	18,843	0	14,563	91,645
	PS 4 Totals	7,139	389.3	89.4	329	317,112	403,371	47,147	20,421	173,597	961,648

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,669	26.4	0.0	10	2,420	207,294	14,237	0	50,674	274,626
MH04-312	City and Town of Madison	2,552	163.8	85.2	225	212,352	144,204	0	19,377	83,779	459,712
MH04-315	City of Madison	301	5.8	1.9	31	10,882	17,011	0	1,044	6,532	35,469
MH04-201B	City and Town of Madison	0	152.6	0.0	26	68,081	0	14,067	0	18,049	100,196
MH04-209	City of Madison	617	40.7	2.3	37	23,377	34,862	18,843	0	14,563	91,645
	PS 4 Totals	7,139	389.3	89.4	329	317,112	403,371	47,147	20,421	173,597	961,648

17CatchCon	Community	2040									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH04-408	City and Town of Madison	3,669	26.4	0.0	10	2,420	207,294	14,237	0	50,674	274,626
MH04-312	City and Town of Madison	2,552	163.8	85.2	225	212,352	144,204	0	19,377	83,779	459,712
MH04-315	City of Madison	301	5.8	1.9	31	10,882	17,011	0	1,044	6,532	35,469
MH04-201B	City and Town of Madison	0	152.6	0.0	26	68,081	0	14,067	0	18,049	100,196
MH04-209	City of Madison	617	40.7	2.3	37	23,377	34,862	18,843	0	14,563	91,645
	PS 4 Totals	7,139	389.3	89.4	329	317,112	403,371	47,147	20,421	173,597	961,648

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.1	0.0	0	0	84,252	14,255	0	100,674	199,181
MH05-212	City of Madison	845	6.4	0.0	1	867	49,010	0	0	50,974	100,851
MH05-205	City of Madison and City of Middleton	250	7.4	0.0	1	143	14,500	0	0	14,965	29,608
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	13,050	1,533	0	14,904	29,487
MH05-008	City of Madison	882	15.1	0.0	13	8,925	51,156	0	0	61,403	121,485
MH05-401	City of Madison	1,617	27.0	0.0	17	14,746	93,786	0	0	110,920	219,451
	PS 5 Totals	5,247	71.4	0.0	32	24,681	305,754	15,788	0	353,840	700,064

17CatchCon	Community	2015									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	77,112	12,311	0	64,117	153,540
MH05-212	City of Madison	845	6.5	0.0	1	499	46,475	0	0	33,680	80,654
MH05-205	City of Madison and City of Middleton	250	7.4	0.0	1	490	13,750	0	0	10,210	24,450
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,375	1,378	0	9,861	23,613
MH05-008	City of Madison	882	14.8	0.0	14	5,829	48,510	0	0	38,961	93,300
MH05-401	City of Madison	1,617	20.5	0.0	26	22,219	88,935	0	0	79,698	190,852
	PS 5 Totals	5,247	64.8	0.0	42	29,038	287,157	13,689	0	236,527	566,410

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	80,682	13,334	0	82,395	176,411
MH05-212	City of Madison	853	6.5	0.0	1	683	48,195	0	0	42,327	91,205
MH05-205	City of Madison and City of Middleton	264	7.4	0.0	1	317	14,916	0	0	12,588	27,821
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,713	1,455	0	12,382	26,550
MH05-008	City of Madison	890	14.1	0.0	14	7,389	50,285	0	0	50,182	107,856
MH05-401	City of Madison	1,617	20.3	0.0	26	22,595	91,361	0	0	95,309	209,264
	PS 5 Totals	5,277	63.9	0.0	42	30,983	298,151	14,789	0	295,183	639,106

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	80,682	13,334	0	82,395	176,411
MH05-212	City of Madison	853	6.5	0.0	1	683	48,195	0	0	42,327	91,205
MH05-205	City of Madison and City of Middleton	264	7.4	0.0	1	317	14,916	0	0	12,588	27,821
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,713	1,455	0	12,382	26,550
MH05-008	City of Madison	890	13.4	0.0	14	7,389	50,285	0	0	50,182	107,856
MH05-401	City of Madison	1,617	20.2	0.0	26	22,595	91,361	0	0	95,309	209,264
	PS 5 Totals	5,277	63.0	0.0	42	30,983	298,151	14,789	0	295,183	639,106

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	80,682	13,334	0	82,395	176,411
MH05-212	City of Madison	853	6.5	0.0	1	683	48,195	0	0	42,327	91,205
MH05-205	City of Madison and City of Middleton	264	7.4	0.0	1	317	14,916	0	0	12,588	27,821
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,713	1,455	0	12,382	26,550
MH05-008	City of Madison	890	12.6	0.0	14	7,389	50,285	0	0	50,182	107,856
MH05-401	City of Madison	1,617	20.0	0.0	26	22,595	91,361	0	0	95,309	209,264
	PS 5 Totals	5,277	62.2	0.0	42	30,983	298,151	14,789	0	295,183	639,106

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	80,682	13,334	0	82,395	176,411
MH05-212	City of Madison	853	6.5	0.0	1	683	48,195	0	0	42,327	91,205
MH05-205	City of Madison and City of Middleton	264	7.4	0.0	1	317	14,916	0	0	12,588	27,821
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,713	1,455	0	12,382	26,550
MH05-008	City of Madison	890	11.9	0.0	14	7,389	50,285	0	0	50,182	107,856
MH05-401	City of Madison	1,617	19.9	0.0	26	22,595	91,361	0	0	95,309	209,264
	PS 5 Totals	5,277	61.3	0.0	42	30,983	298,151	14,789	0	295,183	639,106

17CatchCon	Community	2040									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-223A	City of Middleton	1,428	14.2	0.0	0	0	80,682	13,334	0	82,395	176,411
MH05-212	City of Madison	853	6.5	0.0	1	683	48,195	0	0	42,327	91,205
MH05-205	City of Madison and City of Middleton	264	7.4	0.0	1	317	14,916	0	0	12,588	27,821
MH05-102	City of Madison and City of Middleton	225	1.4	0.0	0	0	12,713	1,455	0	12,382	26,550
MH05-008	City of Madison	890	11.2	0.0	14	7,389	50,285	0	0	50,182	107,856
MH05-401	City of Madison	1,617	19.7	0.0	26	22,595	91,361	0	0	95,309	209,264
	PS 5 Totals	5,277	60.4	0.0	42	30,983	298,151	14,789	0	295,183	639,106

17CatchCon	Community	2010									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	4.9	10.2	11	28,301	53,582	0	0	66,514	148,397
MH06-209	City of Madison and Blooming Grove	1,719	29.2	8.1	12	19,652	99,691	0	0	96,943	216,287
MH06-108	City of Madison	360	0.1	3.2	6	10,602	20,885	0	0	25,577	57,063
SAS 6243-022	City of Madison and Monona and To	6,714	105.6	58.5	76	74,635	389,393	0	0	376,930	840,959
SAS 6646-001	City of Madison	0	35.7	54.8	67	46,849	0	0	0	38,055	84,904
SAS 6648-007	City of Madison	7,370	50.4	16.7	46	46,674	427,472	0	0	385,149	859,296
	PS 6 Totals	17,087	225.9	151.5	218	226,713	991,024	0	0	989,168	2,206,905

17CatchCon	Community	2015									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	36,355	50,811	0	0	37,002	124,167
MH06-209	City of Madison and Blooming Grove	1,719	32.7	8.3	14	21,270	94,535	0	0	49,159	164,964
MH06-108	City of Madison	360	0.1	3.2	6	9,784	19,804	0	0	12,560	42,149
SAS 6243-022	City of Madison and Monona and To	6,714	113.2	31.4	99	61,845	369,252	0	0	183,001	614,098
SAS 6646-001	City of Madison	0	58.0	56.9	75	24,120	0	0	0	10,239	34,359
SAS 6648-007	City of Madison	7,370	48.5	17.1	55	57,844	405,361	0	0	196,631	659,836
	PS 6 Totals	17,087	257.7	125.3	262	211,218	939,764	0	0	488,592	1,639,574

17CatchCon	Community	2020									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	32,417	52,197	0	0	51,758	136,372
MH06-209	City of Madison and Blooming Grove	1,721	32.7	8.3	14	20,483	97,239	0	0	73,051	190,773
MH06-108	City of Madison	360	0.1	3.2	6	10,193	20,345	0	0	19,068	49,606
SAS 6243-022	City of Madison and Monona and To	7,311	113.2	31.4	99	68,797	413,066	0	0	279,966	761,829
SAS 6646-001	City of Madison	0	58.0	56.9	75	35,729	0	0	0	24,147	59,876
SAS 6648-007	City of Madison	7,543	48.5	17.1	55	52,484	426,178	0	0	290,890	769,552
	PS 6 Totals	17,859	258	125	262	220,102	1,009,025	0	0	738,880	1,968,007

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	32,417	52,197	0	0	51,758	136,372
MH06-209	City of Madison and Blooming Grove	1,721	32.7	8.3	14	20,483	97,239	0	0	73,051	190,773
MH06-108	City of Madison	360	0.1	3.2	6	10,193	20,345	0	0	19,068	49,606
SAS 6243-022	City of Madison and Monona and To	7,311	113.2	31.4	99	68,797	413,066	0	0	279,966	761,829
SAS 6646-001	City of Madison	0	58.0	56.9	75	35,729	0	0	0	24,147	59,876
SAS 6648-007	City of Madison	7,543	48.5	17.1	55	52,484	426,178	0	0	290,890	769,552
	PS 6 Totals	17,859	258	125	262	220,102	1,009,025	0	0	738,880	1,968,007

17CatchCon	Community	2030									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	32,417	52,197	0	0	51,758	136,372
MH06-209	City of Madison and Blooming Grove	1,721	32.7	8.3	14	20,483	97,239	0	0	73,051	190,773
MH06-108	City of Madison	360	0.1	3.2	6	10,193	20,345	0	0	19,068	49,606
SAS 6243-022	City of Madison and Monona and To	7,311	113.2	31.4	99	68,797	413,066	0	0	279,966	761,829
SAS 6646-001	City of Madison	0	58.0	56.9	75	35,729	0	0	0	24,147	59,876
SAS 6648-007	City of Madison	7,543	48.5	17.1	55	52,484	426,178	0	0	290,890	769,552
	PS 6 Totals	17,859	258	125	262	220,102	1,009,025	0	0	738,880	1,968,007

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	32,417	52,197	0	0	51,758	136,372
MH06-209	City of Madison and Blooming Grove	1,721	32.7	8.3	14	20,483	97,239	0	0	73,051	190,773
MH06-108	City of Madison	360	0.1	3.2	6	10,193	20,345	0	0	19,068	49,606
SAS 6243-022	City of Madison and Monona and To	7,311	113.2	31.4	99	68,797	413,066	0	0	279,966	761,829
SAS 6646-001	City of Madison	0	58.0	56.9	75	35,729	0	0	0	24,147	59,876
SAS 6648-007	City of Madison	7,543	48.5	17.1	55	52,484	426,178	0	0	290,890	769,552
	PS 6 Totals	17,859	258	125	262	220,102	1,009,025	0	0	738,880	1,968,007

17CatchCon	Community	2040									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH06-122	City of Madison	924	5.1	8.4	13	32,417	52,197	0	0	51,758	136,372
MH06-209	City of Madison and Blooming Grove	1,721	32.7	8.3	14	20,483	97,239	0	0	73,051	190,773
MH06-108	City of Madison	360	0.1	3.2	6	10,193	20,345	0	0	19,068	49,606
SAS 6243-022	City of Madison and Monona and To	7,311	113.2	31.4	99	68,797	413,066	0	0	279,966	761,829
SAS 6646-001	City of Madison	0	58.0	56.9	75	35,729	0	0	0	24,147	59,876
SAS 6648-007	City of Madison	7,543	48.5	17.1	55	52,484	426,178	0	0	290,890	769,552
	PS 6 Totals	17,859	257.7	125.3	262	220,102	1,009,025	0	0	738,880	1,968,007

17CatchCon	Community	2010									
					Known Non-Res Water Users	Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)		Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	72.8	98.4	58	49,072	76,676	3,942	0	76,569	206,259
MH07-939	City of Madison and Town of E	4,450	64.8	154.0	84	229,560	258,100	3,395	24,484	304,374	819,912
MH07-740/740F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-729A/729A	City of Madison and Town of E	3,214	29.7	0.0	5	885	186,412	0	0	110,580	297,878
MH07-719	City of Madison	1,211	12.6	0.0	3	623	70,238	0	0	41,836	112,697
MH07-437	Village of Cottage Grove	6,192	172.4	32.6	1	238,197	334,368	42,238	17,082	0	631,885
MH07-421F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	293	0.0	80.2	1	22,644	16,994	0	0	23,402	63,040
MH07-405	City of Madison and Town of E	10	116.4	88.7	61	127,939	580	0	0	75,878	204,397
MH18-014	City of Madison	1,268	38.7	61.1	42	17,140	73,544	0	0	53,540	144,223
MH18-006	City of Monona	175	54.1	7.8	0	0	12,775	51,936	7,488	42,626	114,825
MH07-129	City of Madison	515	61.4	0.0	15	21,737	29,870	0	0	30,469	82,075
MH07-129	City of Monona	5,109	109.3	0.0	16	16,717	372,957	100,224	0	289,236	779,134
MH07-101	City of Madison	2,234	6.1	0.0	7	3,548	129,572	0	0	78,594	211,713
MH07-618	Village of McFarland and City o	1,557	28.3	0.0	1	338	85,635	6,764	0	54,752	147,488
MH07-517	City of Madison	450	0.0	0.0	0	0	26,100	0	0	15,409	41,509
MH07-512	City of Madison and Town of E	991	1.4	41.0	15	4,919	57,478	0	0	36,839	99,236
MH07-249/249F	City of Madison and Town of E	51	51.0	7.8	14	36,988	2,958	12,045	0	30,695	82,686
MH07-242/242F	City of Madison and Town of E	514	0.0	0.0	0	0	29,812	0	0	17,601	47,413
MH07-206	City of Monona	2,085	140.1	15.7	1	11,748	152,205	119,424	15,072	176,204	474,653
MH07-226	City of Madison	138	39.2	37.9	23	17,041	8,004	0	0	14,787	39,832
MH07-308	City of Madison	73	18.3	24.0	14	10,456	4,234	0	0	8,673	23,364
MH07-823	Village of McFarland and City o	664	59.4	166.3	0	0	36,520	14,197	39,746	53,409	143,871
	PS 7 & PS 18 Totals	32,516	1,076	816	361	809,552	1,965,032	354,164	103,872	1,535,474	4,768,094

17CatchCon	Community	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	82.2	69.6	68	54,559	72,710	3,542	0	99,888	230,699
MH07-939	City of Madison and Town of E	4,455	78.6	126.2	118	227,484	245,025	3,050	17,323	376,365	869,247
MH07-740/740F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-729A/729A	City of Madison and Town of E	4,037	35.0	0.0	8	10,305	222,035	0	0	177,415	409,755
MH07-719	City of Madison	1,211	12.6	0.0	6	902	66,605	0	0	51,548	119,055
MH07-437	Village of Cottage Grove	6,512	184.9	32.6	1	238,197	338,624	54,546	17,082	0	648,449
MH07-421F	City of Madison	0	0	0	0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	293	0.0	76.4	1	11,049	16,115	0	0	20,742	47,906
MH07-405	City of Madison and Town of E	10	128.3	71.7	80	192,557	550	0	0	147,456	340,563
MH18-014	City of Madison	1,268	46.4	51.2	64	19,953	69,740	0	0	68,490	158,183
MH18-006	City of Monona	175	62.2	4.2	0	0	8,400	33,028	2,230	33,338	76,996
MH07-129	City of Madison	515	61.4	0.0	21	20,253	28,325	0	0	37,094	85,672
MH07-129	City of Monona	5,118	109.3	0.0	20	14,317	245,664	55,436	0	240,853	556,271
MH07-101	City of Madison	2,241	6.7	0.0	12	3,374	123,255	0	0	96,694	223,323
MH07-618	Village of McFarland and City o	1,565	28.3	0.0	1	374	79,815	5,660	0	65,554	151,403
MH07-517	City of Madison	657	0.0	0.0	0	0	36,135	0	0	27,593	63,728
MH07-512	City of Madison and Town of E	1,031	21.2	29.6	26	9,308	56,705	0	0	50,407	116,420
MH07-249/249F	City of Madison and Town of E	51	50.4	11.2	21	49,240	2,805	10,824	0	48,007	110,875
MH07-242/242F	City of Madison and Town of E	775	0.0	0.0	0	0	42,625	0	0	32,548	75,173
MH07-206	City of Monona	2,166	141.8	15.7	1	12,088	103,968	66,959	8,337	146,116	337,468
MH07-226	City of Madison	138	39.4	44.6	29	16,589	7,590	0	0	18,463	42,643
MH07-308	City of Madison	73	17.8	24.3	31	11,218	4,015	0	0	11,632	26,864
MH07-823	Village of McFarland and City o	664	59.4	156.0	0	0	33,864	11,880	31,200	58,754	135,698
	PS 7 & PS 18 Totals	34,277	1,165.9	713.3	508	891,767	1,804,570	244,926	76,172	1,808,958	4,826,392

17CatchCon	Community	2020									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	80.3	77.1	68	54,323	74,693	3,742	7,159	88,228	228,146
MH07-939	City of Madison and Town of E	4,986	80.3	135.9	118	229,736	281,709	4,948	20,904	340,369	877,666
MH07-740/740F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-729A/729A	City of Madison and Town of E	6,247	49.2	0.0	8	10,205	352,956	14,740	0	143,998	521,899
MH07-719	City of Madison	1,211	16.2	0.5	6	793	68,422	3,701	439	46,692	120,046
MH07-437	Village of Cottage Grove	7,190	226.1	42.2	1	238,197	381,070	61,047	53,524	0	733,838
MH07-421F	City of Madison	0	0	0	0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	293	13.2	61.1	1	16,847	16,555	13,721	0	22,072	69,195
MH07-405	City of Madison and Town of E	10	139.6	76.9	80	164,817	565	11,788	4,982	111,667	293,819
MH18-014	City of Madison	1,270	48.4	52.2	64	19,351	71,755	2,079	955	61,015	155,155
MH18-006	City of Monona	175	93.9	0.0	0	0	10,588	70,002	0	37,982	118,572
MH07-129	City of Madison	517	61.4	0.0	21	21,600	29,211	0	0	33,781	84,592
MH07-129	City of Monona	5,118	109.9	0.0	20	15,938	309,639	77,830	0	265,044	668,451
MH07-101	City of Madison	2,388	6.8	0.0	12	3,530	134,922	125	0	87,644	226,220
MH07-618	Village of McFarland and City o	2,005	28.2	0.0	1	356	106,265	6,190	0	60,153	172,964
MH07-517	City of Madison	663	0.0	0.0	0	0	37,460	0	0	21,501	58,961
MH07-512	City of Madison and Town of E	1,274	17.0	42.4	26	7,578	71,981	0	12,179	43,623	135,361
MH07-249/249F	City of Madison and Town of E	51	55.8	57.4	21	38,840	2,882	17,027	44,060	39,351	142,159
MH07-242/242F	City of Madison and Town of E	1,053	0.0	0.0	0	0	59,495	0	0	25,075	84,569
MH07-206	City of Monona	2,166	155.2	20.4	1	11,918	131,043	104,027	15,178	161,160	423,327
MH07-226	City of Madison	141	42.2	58.7	29	17,017	7,967	2,869	13,478	16,625	57,955
MH07-308	City of Madison	73	18.1	24.9	31	11,165	4,125	353	554	10,152	26,349
MH07-823	Village of McFarland and City o	681	55.3	168.0	0	0	36,093	12,138	36,885	56,082	141,198
	PS 7 & PS 18 Totals	38,834	1,297	818	508	862,210	2,189,391	406,328	210,295	1,672,216	5,340,441

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	78.4	84.6	68	54,323	74,693	3,742	14,318	88,228	235,304
MH07-939	City of Madison and Town of E	4,986	81.9	145.5	118	229,736	281,709	6,674	20,904	340,369	879,392
MH07-740/740F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-729A/729A	City of Madison and Town of E	7,422	125.5	0.0	8	10,205	419,343	94,033	0	143,998	667,579
MH07-719	City of Madison	1,211	19.7	0.9	6	793	68,422	7,401	878	46,692	124,186
MH07-437	Village of Cottage Grove	7,845	267.4	51.8	1	238,197	415,785	72,198	89,965	0	816,145
MH07-421F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	405	26.4	45.8	1	16,847	22,883	27,443	0	22,072	89,245
MH07-405	City of Madison and Town of E	10	151.0	82.1	80	164,817	565	23,576	9,965	111,667	310,590
MH18-014	City of Madison	1,270	48.4	52.2	64	19,351	71,755	2,079	955	61,015	155,155
MH18-006	City of Monona	175	93.9	0.0	0	0	10,588	70,002	0	37,982	118,572
MH07-129	City of Madison	517	61.4	0.0	21	21,600	29,211	0	0	33,781	84,592
MH07-129	City of Monona	5,118	109.9	0.0	20	15,938	309,639	77,830	0	265,044	668,451
MH07-101	City of Madison	2,388	6.9	0.0	12	3,530	134,922	249	0	87,644	226,345
MH07-618	Village of McFarland and City o	2,197	28.1	0.0	1	356	116,441	6,168	0	60,153	183,118
MH07-517	City of Madison	663	0.0	0.0	0	0	37,460	0	0	21,501	58,961
MH07-512	City of Madison and Town of E	1,353	12.7	55.1	26	7,578	76,445	0	24,359	43,623	152,004
MH07-249/249F	City of Madison and Town of E	51	63.5	160.0	21	38,840	2,882	25,010	142,049	39,351	248,132
MH07-242/242F	City of Madison and Town of E	2,282	0.0	0.0	0	0	128,933	0	0	25,075	154,008
MH07-206	City of Monona	2,166	168.7	25.0	1	11,918	131,043	114,047	18,652	161,160	436,820
MH07-226	City of Madison	141	44.9	72.8	29	17,017	7,967	5,738	26,955	16,625	74,301
MH07-308	City of Madison	73	18.5	25.5	31	11,165	4,125	707	1,107	10,152	27,256
MH07-823	Village of McFarland and City o	681	51.2	180.1	0	0	36,093	11,238	39,528	56,082	142,941
	PS 7 & PS 18 Totals	42,276	1,458	982	508	862,210	2,380,900	548,136	389,634	1,672,216	5,853,096

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	76.6	92.1	68	54,323	74,693	3,742	21,476	88,228	242,463
MH07-939	City of Madison and Town of E	4,986	83.6	155.2	118	229,736	281,709	8,399	20,904	340,369	881,117
MH07-740/740F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-729A/729A	City of Madison and Town of E	7,532	170.7	0.0	8	10,205	425,558	141,102	0	143,998	720,863
MH07-719	City of Madison	1,211	23.3	1.4	6	793	68,422	11,102	1,317	46,692	128,326
MH07-437	Village of Cottage Grove	8,465	308.6	61.4	1	238,197	448,645	83,322	126,407	0	896,571
MH07-421F	City of Madison	0	0.0	0.0	0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	405	39.6	30.6	1	16,847	22,883	41,164	0	22,072	102,966
MH07-405	City of Madison and Town of E	10	162.3	87.4	80	164,817	565	35,364	14,947	111,667	327,360
MH18-014	City of Madison	1,270	48.4	52.2	64	19,351	71,755	2,079	955	61,015	155,155
MH18-006	City of Monona	175	93.9	0.0	0	0	10,588	70,002	0	37,982	118,572
MH07-129	City of Madison	517	61.4	0.0	21	21,600	29,211	0	0	33,781	84,592
MH07-129	City of Monona	5,118	109.9	0.0	20	15,938	309,639	77,830	0	265,044	668,451
MH07-101	City of Madison	2,388	7.1	0.0	12	3,530	134,922	374	0	87,644	226,470
MH07-618	Village of McFarland and City o	2,197	28.0	0.0	1	356	116,441	6,146	0	60,153	183,096
MH07-517	City of Madison	663	0.0	0.0	0	0	37,460	0	0	21,501	58,961
MH07-512	City of Madison and Town of E	1,353	8.5	67.9	26	7,578	76,445	0	36,538	43,623	164,184
MH07-249/249F	City of Madison and Town of E	51	69.9	234.5	21	38,840	2,882	31,746	213,121	39,351	325,940
MH07-242/242F	City of Madison and Town of E	2,627	0.0	0.0	0	0	148,426	0	0	25,075	173,500
MH07-206	City of Monona	2,166	182.1	29.7	1	11,918	131,043	124,066	22,126	161,160	450,314
MH07-226	City of Madison	141	47.7	87.0	29	17,017	7,967	8,607	40,433	16,625	90,648
MH07-308	City of Madison	73	18.8	26.0	31	11,165	4,125	1,060	1,661	10,152	28,163
MH07-823	Village of McFarland and City o	681	47.1	192.1	0	0	36,093	10,338	42,170	56,082	144,683
	PS 7 & PS 18 Totals	43,351	1,587	1,117	508	862,210	2,439,467	656,445	542,055	1,672,216	6,172,393

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of E	1,322	74.7	99.6	68	54,323	74,693	3,742	28,635	88,228	249,622
MH07-939	City of Madison and Town of E	4,986	85.2	164.8	118	229,736	281,709	10,125	20,904	340,369	882,843
MH07-740/740F	City of Madison	3,982	57.7	0.0	0	0	224,996	59,979	0	0	284,975
MH07-729A/729A	City of Madison and Town of E	9,360	158.2	0.0	8	10,205	528,827	128,087	0	143,998	811,117
MH07-719	City of Madison	1,330	26.8	1.8	6	793	75,145	14,802	1,756	46,692	139,189
MH07-437	Village of Cottage Grove	8,990	349.9	71.0	1	238,197	476,470	94,473	162,848	0	971,988
MH07-421F	City of Madison				0	0	0	0	0	0	0
MH07-414	City of Madison and Town of E	405	52.8	15.3	1	16,847	22,883	54,886	0	22,072	116,687
MH07-405	City of Madison and Town of E	10	173.7	92.6	80	164,817	565	47,152	19,930	111,667	344,130
MH18-014	City of Madison	1,270	48.4	52.2	64	19,351	71,755	2,079	955	61,015	155,155
MH18-006	City of Monona	175	93.9	0.0	0	0	10,588	70,002	0	37,982	118,572
MH07-129	City of Madison	517	61.4	0.0	21	21,600	29,211	0	0	33,781	84,592
MH07-129	City of Monona	5,118	109.9	0.0	20	15,938	309,639	77,830	0	265,044	668,451
MH07-101	City of Madison	2,388	7.2	0.0	12	3,530	134,922	499	0	87,644	226,594
MH07-618	Village of McFarland and City o	2,197	27.9	0.0	1	356	116,441	6,124	0	60,153	183,074
MH07-517	City of Madison	663	0.0	0.0	0	0	37,460	0	0	21,501	58,961
MH07-512	City of Madison and Town of E	1,353	4.2	80.6	26	7,578	76,445	0	48,718	43,623	176,363
MH07-249/249F	City of Madison and Town of E	51	76.5	308.8	21	38,840	2,882	38,586	284,097	39,351	403,756
MH07-242/242F	City of Madison and Town of E	2,627	0.0	0.0	0	0	148,426	0	0	25,075	173,500
MH07-206	City of Monona	2,166	195.6	34.3	1	11,918	131,043	134,086	25,600	161,160	463,807
MH07-226	City of Madison	141	50.4	101.1	29	17,017	7,967	11,476	53,910	16,625	106,994
MH07-308	City of Madison	73	19.2	26.6	31	11,165	4,125	1,414	2,214	10,152	29,070
MH07-823	Village of McFarland and City o	681	43.0	204.2	0	0	36,093	9,439	44,813	56,082	146,426
	PS 7 & PS 18 Totals	49,805	1,717	1,253	508	862,210	2,802,281	764,781	694,381	1,672,216	6,795,869

17CatchCon	Community	2040									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH07-955	City of Madison and Town of B	1,322	72.8	107.1	68	54,323	74,693	3,742	35,794	88,228	256,781
MH07-939	City of Madison and Town of B	4,986	86.9	174.5	118	229,736	281,709	11,850	20,904	340,369	884,568
MH07-740/740F	City of Madison	9,405	72.1	0.0	0	0	531,373	74,948	0	0	606,321
MH07-729A/729A	City of Madison and Town of B	9,824	189.1	0.0	8	10,205	555,065	160,187	0	143,998	869,455
MH07-719	City of Madison	1,330	30.4	2.3	6	793	75,145	18,503	2,195	46,692	143,329
MH07-437	Village of Cottage Grove	9,470	391.1	80.6	1	238,197	501,910	105,597	199,290	0	1,044,994
MH07-421F	City of Madison	4,702	255.2	0.0	0	0	265,663	265,280	0	0	530,943
MH07-414	City of Madison and Town of B	405	66.0	0.0	1	16,847	22,883	68,607	0	22,072	130,409
MH07-405	City of Madison and Town of B	10	185.0	97.8	80	164,817	565	58,940	24,912	111,667	360,901
MH18-014	City of Madison	1,270	48.4	52.2	64	19,351	71,755	2,079	955	61,015	155,155
MH18-006	City of Monona	175	93.9	0.0	0	0	10,588	70,002	0	37,982	118,572
MH07-129	City of Madison	517	61.4	0.0	21	21,600	29,211	0	0	33,781	84,592
MH07-129	City of Monona	5,118	109.9	0.0	20	15,938	309,639	77,830	0	265,044	668,451
MH07-101	City of Madison	2,388	7.3	0.0	12	3,530	134,922	624	0	87,644	226,719
MH07-618	Village of McFarland and City o	2,197	27.8	0.0	1	356	116,441	6,102	0	60,153	183,052
MH07-517	City of Madison	663	0.0	0.0	0	0	37,460	0	0	21,501	58,961
MH07-512	City of Madison and Town of B	1,353	0.0	93.4	26	7,578	76,445	0	60,897	43,623	188,543
MH07-249/249F	City of Madison and Town of B	1,962	83.0	383.3	21	38,840	110,853	45,322	355,169	39,351	589,536
MH07-242/242F	City of Madison and Town of B	2,627	0.0	0.0	0	0	148,426	0	0	25,075	173,500
MH07-206	City of Monona	2,166	209.0	39.0	1	11,918	131,043	144,105	29,075	161,160	477,301
MH07-226	City of Madison	141	53.2	115.2	29	17,017	7,967	14,345	67,388	16,625	123,341
MH07-308	City of Madison	73	19.5	27.2	31	11,165	4,125	1,767	2,768	10,152	29,977
MH07-823	Village of McFarland and City o	681	38.9	216.2	0	0	36,093	8,539	47,456	56,082	148,169
	PS 7 & PS 18 Totals	62,785	2,100.9	1,388.8	508	862,210	3,533,971	1,138,370	846,802	1,672,216	8,053,569

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0.0	0.0	0	0	3,596				3,596
SAS 3250-022	City of Madison	7,781	398.8	0.7	131	251,270	451,298				702,568
MH02-174	City of Madison	3,282	180.9	0.0	89	109,011	190,356				299,367
MH02-173A	City of Madison and City of Fitchb	2,295	47.9	16.3	41	35,999	133,110				169,109
MH02-171B	City of Madison	838	1.2	0.0	1	299	48,604				48,903
MH02-163	City of Madison	2,450	28.3	0.0	13	18,447	142,100				160,547
MH02-154	City of Madison	747	0.5	0.0	2	6,034	43,326				49,360
MH02-146	City of Madison	3,406	29.5	0.0	27	18,810	197,548				216,358
MH02-136	City of Madison	1,722	6.0	0.0	21	15,123	99,876				114,999
MH02-133	City of Madison	0	60.7	0.0	13	44,941	0				44,941
MH02-708	City of Madison	7,499	78.7	0.0	41	130,495	434,942				565,437
MH02-705	City of Madison	2,151	9.4	0.0	15	19,665	124,758				144,423
MH02-532	Village of Shorewood Hills	820	0.0	0.0	0	0	53,300				53,300
MH02-531	Village of Shorewood Hills and Cit	1,157	22.4	0.0	0	0	75,205				75,205
MH02-516	City of Madison and Village of Sho	2,845	110.0	0.0	19	1,012,617	165,010				1,177,627
MH02-055	Village of Shorewood Hills and Cit	440	75.6	0.0	24	56,350	28,600				84,950
MH02-041	City of Madison	1,880	10.5	0.2	20	25,198	109,040				134,238
MH02-034	City of Madison	2,784	13.9	0.0	15	44,803	161,472				206,275
MH08-223	City of Madison	888	58.9	0.0	30	236,709	51,504				288,213
MH08-209	City of Madison	504	6.4	0.0	11	17,838	29,232				47,070
MH02-021	City of Madison	1,887	52.7	0.0	34	312,450	109,446				421,896
MH02-502	City of Madison	12	19.1	0.0	6	83,071	696				83,767
MH02-121	City of Madison	0	25.5	0.0	1	90,104	0				90,104
MH08-106	City of Madison	503	34.7	0.0	15	162,772	29,174				191,946
MH08-119	City of Madison	1,416	2.0	0.0	4	2,267	82,128				84,395
SAS 4760-004	City and Town of Madison	499	26.1	18.7	16	65,495	28,942				94,437
	PS 8 Totals	47,868	1299.7	35.9	589	2,759,767	2,793,263	0	0	0	5,553,030

17CatchCon	Community	2015									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0.0	0.0	0	0	3,410				3,410
SAS 3250-022	City of Madison	7,783	419.5	1.9	147	229,417	428,065				657,482
MH02-174	City of Madison	3,424	181.5	0.0	115	109,942	188,320				298,262
MH02-173A	City of Madison and City of Fitchb	2,295	46.9	19.1	49	30,776	126,225				157,001
MH02-171B	City of Madison	838	1.2	0.0	1	256	46,090				46,346
MH02-163	City of Madison	2,450	24.1	0.0	15	11,956	134,750				146,706
MH02-154	City of Madison	747	0.5	0.0	2	6,658	41,085				47,743
MH02-146	City of Madison	3,448	50.2	0.0	34	23,921	189,640				213,561
MH02-136	City of Madison	1,885	7.2	0.0	31	17,747	103,675				121,422
MH02-133	City of Madison	0	50.2	0.0	14	32,034	0				32,034
MH02-708	City of Madison	7,499	99.3	0.0	45	141,445	412,445				553,890
MH02-705	City of Madison	2,151	30.1	0.0	18	15,563	118,305				133,868
MH02-532	Village of Shorewood Hills	820	0.0	0.0	0	0	45,920				45,920
MH02-531	Village of Shorewood Hills and Cit	1,157	43.0	0.0	0	0	64,792				64,792
MH02-516	City of Madison and Village of Sho	2,845	129.2	0.0	24	720,065	156,475				876,540
MH02-055	Village of Shorewood Hills and Cit	921	95.2	0.0	40	71,061	51,576				122,637
MH02-041	City of Madison	2,237	30.4	0.2	38	40,899	123,035				163,934
MH02-034	City of Madison	2,784	34.4	0.0	18	43,215	153,120				196,335
MH08-223	City of Madison	1,328	81.5	0.0	30	238,235	73,040				311,275
MH08-209	City of Madison	697	25.8	0.0	11	15,359	38,335				53,694
MH02-021	City of Madison	2,059	58.9	0.0	34	313,546	113,245				426,791
MH02-502	City of Madison	12	19.1	0.0	6	93,305	660				93,965
MH02-121	City of Madison	0	25.5	0.0	1	63,202	0				63,202
MH08-106	City of Madison	503	12.6	0.0	15	161,300	27,665				188,965
MH08-119	City of Madison	1,416	1.9	0.0	4	1,413	77,880				79,293
SAS 4760-004	City and Town of Madison	499	26.1	18.7	20	80,640	27,445				108,085
	PS 8 Totals	49,860	1494.3	39.9	712	2,461,956	2,745,198	0	0	0	5,207,154

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0.0	0.0	0	0	3,503	0	0		3,503
SAS 3250-022	City of Madison	7,785	420.3	4.5	147	240,977	439,853	852	2,463		684,145
MH02-174	City of Madison	3,426	174.6	1.3	115	120,435	193,569	0	1,203		315,207
MH02-173A	City of Madison and City of Fitchb	2,295	47.4	18.5	49	34,071	129,668	541	0		164,279
MH02-171B	City of Madison	838	1.2	0.0	1	278	47,347	0	0		47,625
MH02-163	City of Madison	2,510	37.2	0.0	15	15,255	141,815	13,617	0		170,687
MH02-154	City of Madison	747	0.5	0.0	2	6,346	42,206	0	0		48,551
MH02-146	City of Madison	3,493	45.1	0.0	34	22,151	197,355	0	0		219,506
MH02-136	City of Madison	1,885	6.7	0.0	31	19,182	106,503	0	0		125,684
MH02-133	City of Madison	0	52.3	0.0	14	38,805	0	2,183	0		40,988
MH02-708	City of Madison	7,499	93.2	0.0	45	136,300	423,694	0	0		559,993
MH02-705	City of Madison	2,151	26.0	0.0	18	17,651	121,532	0	0		139,183
MH02-532	Village of Shorewood Hills	820	0.0	0.0	0	0	49,610	0	0		49,610
MH02-531	Village of Shorewood Hills and Cit	1,157	38.9	0.0	0	0	69,999	0	0		69,999
MH02-516	City of Madison and Village of Sho	2,845	132.6	0.0	24	866,588	160,743	3,555	0		1,030,886
MH02-055	Village of Shorewood Hills and Cit	1,055	91.0	0.0	40	72,397	63,828	0	0		136,225
MH02-041	City of Madison	2,321	26.3	0.2	38	42,305	131,137	0	0		173,441
MH02-034	City of Madison	2,784	30.3	0.0	18	44,071	157,296	0	0		201,367
MH08-223	City of Madison	1,328	85.1	0.0	30	237,473	75,032	3,742	0		316,247
MH08-209	City of Madison	697	21.9	0.0	11	16,599	39,381	0	0		55,979
MH02-021	City of Madison	2,059	64.2	0.0	34	312,998	116,334	5,530	0		434,862
MH02-502	City of Madison	12	19.2	0.0	6	88,188	678	62	0		88,929
MH02-121	City of Madison	0	25.5	0.0	1	83,011	0	0	0		83,011
MH08-106	City of Madison	503	22.7	0.0	15	162,036	28,420	10,499	0		200,954
MH08-119	City of Madison	1,425	1.8	0.0	4	1,840	80,513	0	0		82,352
SAS 4760-004	City and Town of Madison	499	38.7	19.9	20	73,195	28,194	13,118	1,107		115,614
	PS 8 Totals	50,196	1,503	44	712	2,652,152	2,848,202	53,701	4,773	0	5,558,827

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0	0	0	0	3,503	0	0		3,503
SAS 3250-022	City of Madison	8386	421.14	7.06	147	240,977	473,809	1,705	4,925		721,416
MH02-174	City of Madison	3426	167.66	2.52	115	120,435	193,569	0	2,405		316,409
MH02-173A	City of Madison and City of Fitchb	2295	47.94	17.9	49	34,071	129,668	1,081	0		164,819
MH02-171B	City of Madison	838	1.2	0	1	278	47,347	0	0		47,625
MH02-163	City of Madison	2,510	50.3	0	15	15,255	141,815	27,235	0		184,305
MH02-154	City of Madison	747	0.5	0	2	6,346	42,206	0	0		48,551
MH02-146	City of Madison	3,493	40.0	0	34	22,151	197,355	0	0		219,506
MH02-136	City of Madison	1,885	6.1	0	31	19,182	106,503	0	0		125,684
MH02-133	City of Madison	0	54.4	0	14	38,805	0	4,366	0		43,171
MH02-708	City of Madison	7513	87.18	0	45	136,300	424,485	0	0		560,784
MH02-705	City of Madison	2151	21.86	0	18	17,651	121,532	0	0		139,183
MH02-532	Village of Shorewood Hills	820	0	0	0	0	49,610	0	0		49,610
MH02-531	Village of Shorewood Hills and Cit	1157	34.76	0	0	0	69,999	0	0		69,999
MH02-516	City of Madison and Village of Sho	2845	136.04	0	24	866,588	160,743	7,110	0		1,034,441
MH02-055	Village of Shorewood Hills and Cit	1055	86.8	0	40	72,397	63,828	0	0		136,225
MH02-041	City of Madison	2321	22.12	0.2	38	42,305	131,137	0	0		173,441
MH02-034	City of Madison	2784	26.2	0	18	44,071	157,296	0	0		201,367
MH08-223	City of Madison	1328	88.7	0	30	237,473	75,032	7,484	0		319,989
MH08-209	City of Madison	697	18.04	0	11	16,599	39,381	0	0		55,979
MH02-021	City of Madison	2059	69.54	0	34	312,998	116,334	11,060	0		440,392
MH02-502	City of Madison	12	19.22	0	6	88,188	678	125	0		88,991
MH02-121	City of Madison	0	25.5	0	1	83,011	0	0	0		83,011
MH08-106	City of Madison	503	32.8	0	15	162,036	28,420	20,998	0		211,453
MH08-119	City of Madison	1425	1.78	0	4	1,840	80,513	0	0		82,352
SAS 4760-004	City and Town of Madison	499	51.34	21.02	20	73,195	28,194	26,237	2,214		129,840
	PS 8 Totals	50,811	1,511	49	712	2,652,152	2,882,950	107,401	9,545	0	5,652,047

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0	0	0	0	3,503	0	0		3,503
SAS 3250-022	City of Madison	8336	421.96	9.64	147	240,977	470,984	2,557	7,388		721,906
MH02-174	City of Madison	3426	160.74	3.78	115	120,435	193,569	0	3,608		317,612
MH02-173A	City of Madison and City of Fitchb	2295	48.46	17.3	49	34,071	129,668	1,622	0		165,360
MH02-171B	City of Madison	838	1.2	0	1	278	47,347	0	0		47,625
MH02-163	City of Madison	2,510	63.4	0	15	15,255	141,815	40,852	0		197,922
MH02-154	City of Madison	747	0.5	0	2	6,346	42,206	0	0		48,551
MH02-146	City of Madison	3,493	34.9	0	34	22,151	197,355	0	0		219,506
MH02-136	City of Madison	1,885	5.6	0	31	19,182	106,503	0	0		125,684
MH02-133	City of Madison	0	56.5	0	14	38,805	0	6,549	0		45,354
MH02-708	City of Madison	7890	81.12	0	45	136,300	445,785	0	0		582,085
MH02-705	City of Madison	2151	17.74	0	18	17,651	121,532	0	0		139,183
MH02-532	Village of Shorewood Hills	820	0	0	0	0	49,610	0	0		49,610
MH02-531	Village of Shorewood Hills and Cit	1157	30.64	0	0	0	69,999	0	0		69,999
MH02-516	City of Madison and Village of Sho	2845	139.46	0	24	866,588	160,743	10,665	0		1,037,996
MH02-055	Village of Shorewood Hills and Cit	1055	82.6	0	40	72,397	63,828	0	0		136,225
MH02-041	City of Madison	2321	17.98	0.2	38	42,305	131,137	0	0		173,441
MH02-034	City of Madison	2784	22.1	0	18	44,071	157,296	0	0		201,367
MH08-223	City of Madison	1328	92.3	0	30	237,473	75,032	11,227	0		323,731
MH08-209	City of Madison	697	14.16	0	11	16,599	39,381	0	0		55,979
MH02-021	City of Madison	2059	74.86	0	34	312,998	116,334	16,590	0		445,922
MH02-502	City of Madison	12	19.28	0	6	88,188	678	187	0		89,053
MH02-121	City of Madison	0	25.5	0	1	83,011	0	0	0		83,011
MH08-106	City of Madison	503	42.9	0	15	162,036	28,420	31,497	0		221,952
MH08-119	City of Madison	1425	1.72	0	4	1,840	80,513	0	0		82,352
SAS 4760-004	City and Town of Madison	499	63.96	22.18	20	73,195	28,194	39,355	3,322		144,065
	PS 8 Totals	51,138	1,520	53	712	2,652,152	2,901,425	161,102	14,318	0	5,728,996

17CatchCon	Community	2035									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0	0	0	0	3,503	0	0		3,503
SAS 3250-022	City of Madison	8946	422.78	12.22	147	240,977	505,449	3,410	9,850		759,686
MH02-174	City of Madison	3426	153.82	5.04	115	120,435	193,569	0	4,811		318,815
MH02-173A	City of Madison and City of Fitchb	2295	48.98	16.7	49	34,071	129,668	2,162	0		165,901
MH02-171B	City of Madison	838	1.2	0	1	278	47,347	0	0		47,625
MH02-163	City of Madison	2,510	76.5	0	15	15,255	141,815	54,470	0		211,540
MH02-154	City of Madison	747	0.5	0	2	6,346	42,206	0	0		48,551
MH02-146	City of Madison	3,493	29.8	0	34	22,151	197,355	0	0		219,506
MH02-136	City of Madison	1,885	5.0	0	31	19,182	106,503	0	0		125,684
MH02-133	City of Madison	0	58.6	0	14	38,805	0	8,732	0		47,537
MH02-708	City of Madison	7890	75.06	0	45	136,300	445,785	0	0		582,085
MH02-705	City of Madison	2151	13.62	0	18	17,651	121,532	0	0		139,183
MH02-532	Village of Shorewood Hills	820	0	0	0	0	49,610	0	0		49,610
MH02-531	Village of Shorewood Hills and Cit	1157	26.52	0	0	0	69,999	0	0		69,999
MH02-516	City of Madison and Village of Sho	2845	142.88	0	24	866,588	160,743	14,220	0		1,041,551
MH02-055	Village of Shorewood Hills and Cit	1055	78.4	0	40	72,397	63,828	0	0		136,225
MH02-041	City of Madison	2321	13.84	0.2	38	42,305	131,137	0	0		173,441
MH02-034	City of Madison	2784	18	0	18	44,071	157,296	0	0		201,367
MH08-223	City of Madison	1328	95.9	0	30	237,473	75,032	14,969	0		327,474
MH08-209	City of Madison	697	10.28	0	11	16,599	39,381	0	0		55,979
MH02-021	City of Madison	2059	80.18	0	34	312,998	116,334	22,121	0		451,452
MH02-502	City of Madison	12	19.34	0	6	88,188	678	249	0		89,116
MH02-121	City of Madison	0	25.5	0	1	83,011	0	0	0		83,011
MH08-106	City of Madison	503	53	0	15	162,036	28,420	41,996	0		232,451
MH08-119	City of Madison	1425	1.66	0	4	1,840	80,513	0	0		82,352
SAS 4760-004	City and Town of Madison	499	76.58	23.34	20	73,195	28,194	52,474	4,429		158,291
	PS 8 Totals	51,748	1,528	58	712	2,652,152	2,935,890	214,802	19,090	0	5,821,934

17CatchCon	Community	2040									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH02-545	City of Madison	62	0	0	0	0	3,503	0	0		3,503
SAS 3250-022	City of Madison	8946	423.6	14.8	147	240,977	505,449	4,262	12,313		763,001
MH02-174	City of Madison	3426	146.9	6.3	115	120,435	193,569	0	6,013		320,017
MH02-173A	City of Madison and City of Fitchb	2295	49.5	16.1	49	34,071	129,668	2,703	0		166,441
MH02-171B	City of Madison	838	1.2	0	1	278	47,347	0	0		47,625
MH02-163	City of Madison	2510	89.6	0	15	15,255	141,815	68,087	0		225,157
MH02-154	City of Madison	747	0.5	0	2	6,346	42,206	0	0		48,551
MH02-146	City of Madison	3,493	24.7	0	34	22,151	197,355	0	0		219,506
MH02-136	City of Madison	1,885	4.5	0	31	19,182	106,503	0	0		125,684
MH02-133	City of Madison	0	60.7	0	14	38,805	0	10,915	0		49,719
MH02-708	City of Madison	7890	69	0	45	136,300	445,785	0	0		582,085
MH02-705	City of Madison	2151	9.5	0	18	17,651	121,532	0	0		139,183
MH02-532	Village of Shorewood Hills	820	0	0	0	0	49,610	0	0		49,610
MH02-531	Village of Shorewood Hills and Cit	1157	22.4	0	0	0	69,999	0	0		69,999
MH02-516	City of Madison and Village of Sho	2845	146.3	0	24	866,588	160,743	17,775	0		1,045,106
MH02-055	Village of Shorewood Hills and Cit	1055	74.2	0	40	72,397	63,828	0	0		136,225
MH02-041	City of Madison	2321	9.7	0.2	38	42,305	131,137	0	0		173,441
MH02-034	City of Madison	2784	13.9	0	18	44,071	157,296	0	0		201,367
MH08-223	City of Madison	1328	99.5	0	30	237,473	75,032	18,711	0		331,216
MH08-209	City of Madison	697	6.4	0	11	16,599	39,381	0	0		55,979
MH02-021	City of Madison	2059	85.5	0	34	312,998	116,334	27,651	0		456,982
MH02-502	City of Madison	12	19.4	0	6	88,188	678	312	0		89,178
MH02-121	City of Madison	0	25.5	0	1	83,011	0	0	0		83,011
MH08-106	City of Madison	503	63.1	0	15	162,036	28,420	52,495	0		242,950
MH08-119	City of Madison	1425	1.6	0	4	1,840	80,513	0	0		82,352
SAS 4760-004	City and Town of Madison	499	89.2	24.5	20	73,195	28,194	65,592	5,536		172,517
	PS 8 Totals	51,748	1536.4	61.9	712	2,652,152	2,935,890	268,503	23,863	0	5,880,407

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,213	0.3	0.0	0	58,224	700	0	0	13,641	72,565
MH09-108	Dunn - Kegonsa SD	1,838	20.5	0.0	0	110,280	49,000	0	0	36,873	196,153
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	69,960	100	0	0	16,219	86,279
MH09-108/108	Village of McFarland	2,108	17.8	0.0	0	115,940	4,254	0	0	27,825	148,019
MH09-101	Village of McFarland	4,205	118.3	4.3	0	231,275	28,274	1,028	0	60,323	320,900
	PS 9 Totals	10,530	161	4	0	585,679	82,328	1,028	0	154,882	823,916

17CatchCon	Community	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,235	1.3	0.0	0	61,750	1,000	0	0	12,362	75,112
MH09-108	Dunn - Kegonsa SD	1,841	20.5	0.0	0	101,255	47,000	0	0	29,206	177,461
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	61,798	100	0	0	12,194	74,092
MH09-108/108	Village of McFarland	2,189	17.8	0.0	0	111,639	3,560	0	0	22,694	137,893
MH09-101	Village of McFarland	4,295	117.7	4.3	0	219,045	23,540	860	0	47,959	291,404
	PS 9 Totals	10,726	161.4	4.3	0	555,487	75,200	860	0	124,415	755,962

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,271	1.1	0.0	0	62,279	850	0	0	13,001	76,130
MH09-108	Dunn - Kegonsa SD	1,841	20.3	0.0	0	105,858	48,000	0	0	33,040	186,897
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	65,879	100	0	0	14,206	80,185
MH09-108/108	Village of McFarland	2,336	18.1	0.0	0	123,808	3,964	0	0	25,260	153,032
MH09-101	Village of McFarland	4,310	118.9	3.4	0	228,430	26,107	755	0	54,141	309,433
	PS 9 Totals	10,924	163	3	0	586,254	79,022	755	0	139,648	805,678

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,271	0.9	0.0	0	62,279	850	0	0	13,001	76,130
MH09-108	Dunn - Kegonsa SD	1,841	20.1	0.0	0	105,858	48,000	0	0	33,040	186,897
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	65,879	100	0	0	14,206	80,185
MH09-108/108	Village of McFarland	2,836	18.3	0.0	0	150,308	4,021	0	0	25,260	179,589
MH09-101	Village of McFarland	4,310	120.2	2.6	0	228,430	26,380	566	0	54,141	309,517
	PS 9 Totals	11,424	164	3	0	612,754	79,351	566	0	139,648	832,319

17CatchCon	Community	2030									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,271	0.7	0.0	0	62,279	850	0	0	13,001	76,130
MH09-108	Dunn - Kegonsa SD	1,841	20.0	0.0	0	105,858	48,000	0	0	33,040	186,897
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	65,879	100	0	0	14,206	80,185
MH09-108/108	Village of McFarland	3,236	18.6	0.0	0	171,508	4,078	0	0	25,260	200,846
MH09-101	Village of McFarland	4,310	121.4	1.7	0	228,430	26,652	378	0	54,141	309,600
	PS 9 Totals	11,824	165	2	0	633,954	79,680	378	0	139,648	853,659

		2035									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,271	0.5	0.0	0	62,279	850	0	0	13,001	76,130
MH09-108	Dunn - Kegonsa SD	1,841	19.8	0.0	0	105,858	48,000	0	0	33,040	186,897
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	65,879	100	0	0	14,206	80,185
MH09-108/108	Village of McFarland	3,546	24.0	36.2	0	187,938	5,277	7,946	0	25,260	226,420
MH09-101	Village of McFarland	4,310	122.7	0.9	0	228,430	26,924	189	0	54,141	309,684
	PS 9 Totals	12,134	171	37	0	650,384	81,151	8,135	0	139,648	879,317

17CatchCon	Community	2040									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH09-108	Pleasant Springs No. 1 SD	1,271	0.3	0.0	0	62,279	850	0	0	13,001	76,130
MH09-108	Dunn - Kegonsa SD	1,841	19.6	0.0	0	105,858	48,000	0	0	33,040	186,897
MH09-108	Dunn No. 3 SD	1,166	4.1	0.0	0	65,879	100	0	0	14,206	80,185
MH09-108/108	Village of McFarland	5,586	25.6	45.3	0	296,058	5,619	9,943	0	25,260	336,880
MH09-101	Village of McFarland	4,310	123.9	0.0	0	228,430	27,196	0	0	54,141	309,767
	PS 9 Totals	14,174	173.5	45.3	0	758,504	81,765	9,943	0	139,648	989,860

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	4,296	311.5	0.0	56	131,153	249,168	0	0	53,777	434,098
MH10-131	City of Madison and Town of Burke	468	67.6	45.4	50	107,929	27,144	0	0	19,099	154,172
MH10-426	City of Madison	1,974	200.4	69.0	120	265,427	114,492	0	0	53,721	433,640
MH10-220	City of Madison and Town of Burke	299	44.3	0.0	3	5,318	17,342	0	0	3,204	25,865
MH10-211/F	City of Madison and Town of Burke	3,736	324.7	18.0	122	202,952	216,688	0	0	59,337	478,977
MH10-417	City of Madison	467	54.6	43.5	31	19,527	27,086	0	0	6,591	53,204
MH10-403	City of Madison and Town of Blooming Grove	0	14.9	0.0	3	5,859	0	0	0	829	6,688
MH10-108	City of Madison	288	10.2	30.9	23	90,195	16,704	0	0	15,115	122,014
MH10-305	City of Madison	2,986	33.4	22.6	44	40,620	173,188	0	0	30,232	244,041
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,839	137.7	0.4	41	107,560	396,662	0	0	71,297	575,519
	PS 10 Totals	21,353	1,199.3	229.8	493	976,540	1,238,474	0	0	313,203	2,528,217

17CatchCon	Community	2015									
					Known	Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	4,735	318.8	0	76	281,856	260,425	0	0	5,694	547,975
MH10-131	City of Madison and Town of Burke	468	67.6	47.4	63	152,355	25,740	0	0	1,870	179,965
MH10-426	City of Madison	1,974	200.4	64.4	155	257,658	108,570	0	0	3,845	370,073
MH10-220	City of Madison and Town of Burke	299	28.1	0	3	7,769	16,445	0	0	254	24,468
MH10-211/F	City of Madison and Town of Burke	3,747	325.5	15.3	171	223,838	206,085	0	0	4,514	434,437
MH10-417	City of Madison	467	65.9	41.8	45	23,079	25,685	0	0	512	49,276
MH10-403	City of Madison and Town of Blooming Grove	3	9.3	0	3	5,225	165	0	0	57	5,447
MH10-108	City of Madison	288	11.4	40	38	178,869	15,840	0	0	2,044	196,754
MH10-305	City of Madison	3,028	34.7	23.1	57	31,311	166,540	0	0	2,077	199,929
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,843	139.3	0.4	49	85,429	376,365	0	0	4,849	466,643
	PS 10 Totals	21,852	1,201.0	232.4	660	1,247,389	1,201,860	0	0	25,717	2,474,967

17CatchCon	Community	2020									
					Known Non-Res Water Users	Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)		Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	5,387	378.6	0.0	76	229,840	304,366	62,162	0	29,736	626,104
MH10-131	City of Madison and Town of Burke	473	70.4	46.6	63	131,029	26,725	2,890	0	10,485	171,128
MH10-426	City of Madison	1,992	201.1	67.7	155	263,914	112,548	686	3,112	28,783	409,043
MH10-220	City of Madison and Town of Burke	299	38.1	0.0	3	6,544	16,894	10,437	0	1,729	35,603
MH10-211/F	City of Madison and Town of Burke	4,157	345.0	19.6	171	180,050	234,871	20,291	4,066	31,926	471,203
MH10-417	City of Madison	502	63.3	45.7	45	23,845	28,363	0	3,723	3,552	59,482
MH10-403	City of Madison and Town of Blooming Grove	3	11.2	0.0	3	5,542	170	1,996	0	443	8,150
MH10-108	City of Madison	386	11.3	40.2	38	140,241	21,809	0	210	8,580	170,840
MH10-305	City of Madison	3,169	34.8	23.1	57	36,606	179,049	146	0	16,155	231,955
MH10-101	City of Madison, Town of Burke, Town of Blooming	6,872	141.5	0.4	49	101,084	388,268	2,287	0	38,073	529,712
	PS 10 Totals	23,240	1,295.3	243.3	660	1,118,696	1,313,060	100,894	11,110	169,460	2,713,221

17CatchCon	Community	2025									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	5,663	438.4	0.0	76	229,840	319,960	124,324	0	29,736	703,860
MH10-131	City of Madison and Town of Burke	473	73.2	45.8	63	131,029	26,725	5,780	0	10,485	174,018
MH10-426	City of Madison	2,041	201.7	70.9	155	263,914	115,317	1,372	6,223	28,783	415,609
MH10-220	City of Madison and Town of Burke	855	48.2	0.0	3	6,544	48,308	20,873	0	1,729	77,453
MH10-211/F	City of Madison and Town of Burke	4,661	364.5	23.8	171	180,050	263,347	40,582	8,132	31,926	524,036
MH10-417	City of Madison	502	60.7	49.6	45	23,845	28,363	0	7,445	3,552	63,205
MH10-403	City of Madison and Town of Blooming Grove	3	13.1	0.0	3	5,542	170	3,992	0	443	10,146
MH10-108	City of Madison	386	11.2	40.4	38	140,241	21,809	0	420	8,580	171,050
MH10-305	City of Madison	3,169	35.0	23.1	57	36,606	179,049	291	0	16,155	232,101
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,872	143.7	0.4	49	101,084	388,268	4,574	0	38,073	531,999
	PS 10 Totals	24,625	1,389.7	254.1	660	1,118,696	1,391,313	201,788	22,221	169,460	2,903,477

17CatchCon	Community	2030										
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)						
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	6,058	498.2	0.0	76	229,840	342,277	186,486	0	29,736	788,339
MH10-131	City of Madison and Town of Burke	473	75.9	45.1	63	131,029	26,725	8,669	0	10,485	176,907
MH10-426	City of Madison	2,041	202.4	74.2	155	263,914	115,317	2,058	9,335	28,783	419,407
MH10-220	City of Madison and Town of Burke	2,427	58.2	0.0	3	6,544	137,126	31,310	0	1,729	176,708
MH10-211/F	City of Madison and Town of Burke	4,661	384.1	28.1	171	180,050	263,347	60,873	12,199	31,926	548,394
MH10-417	City of Madison	502	58.0	53.5	45	23,845	28,363	0	11,168	3,552	66,927
MH10-403	City of Madison and Town of Blooming Grove	3	15.1	0.0	3	5,542	170	5,988	0	443	12,142
MH10-108	City of Madison	386	11.1	40.7	38	140,241	21,809	0	630	8,580	171,260
MH10-305	City of Madison	3,169	35.1	23.1	57	36,606	179,049	437	0	16,155	232,246
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,872	145.9	0.4	49	101,084	388,268	6,861	0	38,073	534,286
	PS 10 Totals	26,592	1,484.0	265.0	660	1,118,696	1,502,448	302,682	33,331	169,460	3,126,617

17CatchCon	Community	2035									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	6,058	558.0	0.0	76	229,840	342,277	248,648	0	29,736	850,501
MH10-131	City of Madison and Town of Burke	473	78.7	44.3	63	131,029	26,725	11,559	0	10,485	179,797
MH10-426	City of Madison	2,041	203.0	77.4	155	263,914	115,317	2,744	12,447	28,783	423,205
MH10-220	City of Madison and Town of Burke	2,752	68.3	0.0	3	6,544	155,488	41,746	0	1,729	205,507
MH10-211/F	City of Madison and Town of Burke	5,653	403.6	32.3	171	180,050	319,395	81,164	16,265	31,926	628,799
MH10-417	City of Madison	502	55.4	57.4	45	23,845	28,363	0	14,890	3,552	70,650
MH10-403	City of Madison and Town of Blooming Grove	3	17.0	0.0	3	5,542	170	7,983	0	443	14,138
MH10-108	City of Madison	386	11.0	40.9	38	140,241	21,809	0	840	8,580	171,470
MH10-305	City of Madison	3,169	35.3	23.1	57	36,606	179,049	582	0	16,155	232,392
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,872	148.1	0.4	49	101,084	388,268	9,148	0	38,073	536,573
	PS 10 Totals	27,909	1,578.4	275.8	660	1,118,696	1,576,859	403,575	44,442	169,460	3,313,032

17CatchCon	Community	2040									
					Known	Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH10-145/F	City of Madison	6,610	617.8	0.0	76	229,840	373,465	310,811	0	29,736	943,852
MH10-131	City of Madison and Town of Burke	473	81.5	43.5	63	131,029	26,725	14,449	0	10,485	182,687
MH10-426	City of Madison	2,041	203.7	80.7	155	263,914	115,317	3,430	15,558	28,783	427,003
MH10-220	City of Madison and Town of Burke	6,282	78.3	0.0	3	6,544	354,933	52,183	0	1,729	415,389
MH10-211/F	City of Madison and Town of Burke	6,236	423.1	36.6	171	180,050	352,334	101,455	20,331	31,926	686,095
MH10-417	City of Madison	502	52.8	61.3	45	23,845	28,363	0	18,613	3,552	74,373
MH10-403	City of Madison and Town of Blooming Grove	3	18.9	0.0	3	5,542	170	9,979	0	443	16,134
MH10-108	City of Madison	386	10.9	41.1	38	140,241	21,809	0	1,050	8,580	171,680
MH10-305	City of Madison	3,169	35.4	23.1	57	36,606	179,049	728	0	16,155	232,538
MH10-101	City of Madison, Town of Burke, Town of Bloomin	6,872	150.3	0.4	49	101,084	388,268	11,435	0	38,073	538,860
	PS 10 Totals	32,574	1,672.7	286.7	660	1,118,696	1,840,431	504,469	55,552	169,460	3,688,609

		2010									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	2,898	106.7	98.8	25	101,406	162,288	0	0	52,343	316,037
MH11-159-MAD	City of Madison	2,006	3.8	0.0	7	1,750	116,348	0	0	23,442	141,541
MH11-159-FITC	City of Fitchburg	3,639	13.7	1.1	3	3,395	203,784	0	0	41,125	248,304
MH11-151A	City of Fitchburg	1,249	46.2	46.4	14	44,935	69,944	0	0	22,803	137,682
MH11-145	City of Madison, Town of Madison, City	4,133	102.0	3.9	43	54,395	239,714	0	0	58,381	352,489
MH11-138	City of Fitchburg	12,460	289.6	17.6	51	185,000	697,760	0	0	175,228	1,057,987
MH11-306	City of Madison and City of Fitchburg	1,900	68.3	75.5	86	38,706	106,400	0	0	28,804	173,910
MH11-111A	City of Fitchburg	2,208	18.3	0.0	2	1,668	123,648	0	0	24,875	150,192
MH11-423	City of Madison, Town of Madison, City	1,498	27.2	17.5	14	93,593	86,884	0	0	35,825	216,301
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	48,140	0	0	9,556	57,696
MH11-104	City of Madison, Town of Madison, City	1,754	3.1	0.0	1	271	101,732	0	0	20,248	122,251
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	590	6.2	0.0	0	0	35,400	3,010	0	153,600	192,010
MH11-207	City of Fitchburg, Dunn SD No.	180	0.0	0.0	0	0	10,800	0	0	43,190	53,990
	PS 11 Totals	35,345	686.0	260.8	246	525,118	2,002,842	3,010	0	689,419	3,220,390

17CatchCon	Community	2015									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	2,898	91.6	102.8	25	101,406	144,900	0	0	65,887	312,193
MH11-159-MAD	City of Madison	2,006	3.8	0.0	12	1,251	110,330	0	0	29,848	141,429
MH11-159-FITC	City of Fitchburg	3,662	13.5	1.1	3	3,600	183,100	0	0	49,942	236,642
MH11-151A	City of Fitchburg	1,298	43.8	46.4	14	44,935	64,900	0	0	29,381	139,216
MH11-145	City of Madison, Town of Madison, City	4,133	96.8	7.3	53	49,412	227,315	0	0	74,024	350,751
MH11-138	City of Fitchburg	13,497	287.8	16.5	51	185,000	674,850	0	0	230,010	1,089,859
MH11-306	City of Madison and City of Fitchburg	1,900	92.6	49.3	139	33,992	95,000	0	0	34,505	163,497
MH11-111A	City of Fitchburg	2,488	28.9	0.8	2	1,668	124,400	0	0	33,723	159,792
MH11-423	City of Madison, Town of Madison, City	1,498	28.4	18.7	17	59,384	82,390	0	0	37,925	179,699
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	45,650	0	0	12,211	57,861
MH11-104	City of Madison, Town of Madison, City	1,754	2.9	0.0	1	157	96,470	0	0	25,848	122,475
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	590	5.3	0.0	0	0	32,450	2,397	0	79,942	114,789
MH11-207	City of Fitchburg, Dunn SD No.	180	0.0	0.0	0	0	9,900	0	0	22,711	32,611
	PS 11 Totals	36,734	696.3	242.9	317.0	480,805	1,891,655	2,397	0	725,957	3,100,814

17CatchCon	Community	2020									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	3,074	88.3	135.6	25	101,406	162,922	0	15,228	59,115	338,671
MH11-159-MAD	City of Madison	2,175	3.8	0.0	12	1,669	122,888	0	0	26,645	151,202
MH11-159-FITC	City of Fitchburg	3,763	13.6	1.1	3	3,497	199,439	30	0	45,534	248,499
MH11-151A	City of Fitchburg	1,414	56.3	74.3	14	44,935	74,942	3,707	12,964	26,092	162,640
MH11-145	City of Madison, Town of Madison, City	4,135	99.4	6.6	53	52,661	233,628	2,723	0	66,202	355,214
MH11-138	City of Fitchburg	13,910	282.1	25.2	51	185,000	737,230	0	4,037	202,619	1,128,885
MH11-306	City of Madison and City of Fitchburg	1,900	81.5	68.2	139	37,253	100,700	0	8,770	31,654	178,377
MH11-111A	City of Fitchburg	5,125	32.5	11.3	2	1,668	271,625	1,063	4,881	29,299	308,537
MH11-423	City of Madison, Town of Madison, City	1,609	28.7	21.9	17	76,790	90,909	312	3,035	36,875	207,920
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	46,895	0	0	10,884	57,779
MH11-104	City of Madison, Town of Madison, City	1,754	2.9	0.4	1	214	100,855	42	401	23,048	124,559
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	593	5.6	0.0	0	0	34,098	2,605	0	116,771	153,474
MH11-207	City of Fitchburg, Dunn SD No.	305	0.0	0.0	0	0	16,165	0	0	32,951	49,116
	PS 11 Totals	40,587	695.5	344.7	317.0	505,092	2,192,294	10,482	49,317	707,688	3,464,872

17CatchCon	Community	2025									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	3,784	85.0	168.4	25	101,406	200,552	0	30,457	59,115	391,530
MH11-159-MAD	City of Madison	2,175	3.8	0.0	12	1,669	122,888	0	0	26,645	151,202
MH11-159-FITC	City of Fitchburg	3,763	13.6	1.1	3	3,497	199,439	30	0	45,534	248,499
MH11-151A	City of Fitchburg	1,669	68.8	102.3	14	44,935	88,457	7,413	25,928	26,092	192,825
MH11-145	City of Madison, Town of Madison, City	4,135	102.0	5.9	53	52,661	233,628	5,447	0	66,202	357,938
MH11-138	City of Fitchburg	14,825	276.3	33.9	51	185,000	785,725	0	8,074	202,619	1,181,417
MH11-306	City of Madison and City of Fitchburg	2,162	70.4	87.1	139	37,253	114,586	0	17,539	31,654	201,033
MH11-111A	City of Fitchburg	5,125	36.1	21.8	2	1,668	271,625	2,127	9,763	29,299	314,482
MH11-423	City of Madison, Town of Madison, City	1,609	29.0	25.1	17	76,790	90,909	624	6,071	36,875	211,267
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	46,895	0	0	10,884	57,779
MH11-104	City of Madison, Town of Madison, City	1,754	3.0	0.8	1	214	100,855	83	802	23,048	125,002
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	593	5.8	0.0	0	0	34,098	0	0	116,771	150,869
MH11-207	City of Fitchburg, Dunn SD No.	1,061	0	0.0	0	0	56,233	0	0	32,951	89,184
	PS 11 Totals	43,485	695	447	317	505,092	2,345,888	15,723	98,633	707,688	3,673,024

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	3,784	81.6	201.3	25	101,406	200,552	0	45,685	59,115	406,758
MH11-159-MAD	City of Madison	2,175	3.8	0.0	12	1,669	122,888	0	0	26,645	151,202
MH11-159-FITC	City of Fitchburg	3,763	13.6	1.1	3	3,497	199,439	30	0	45,534	248,499
MH11-151A	City of Fitchburg	2,382	81.2	130.2	14	44,935	126,246	11,120	38,892	26,092	247,285
MH11-145	City of Madison, Town of Madison, City	4,135	104.7	5.3	53	52,661	233,628	8,170	0	66,202	360,661
MH11-138	City of Fitchburg	15,354	270.6	42.6	51	185,000	813,762	0	12,110	202,619	1,213,491
MH11-306	City of Madison and City of Fitchburg	2,162	59.4	106.0	139	37,253	114,586	0	26,309	31,654	209,802
MH11-111A	City of Fitchburg	5,125	34.3	32.4	2	1,668	271,625	1,616	14,644	29,299	318,852
MH11-423	City of Madison, Town of Madison, City	1,609	29.3	28.2	17	76,790	90,909	936	9,106	36,875	214,614
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	46,895	0	0	10,884	57,779
MH11-104	City of Madison, Town of Madison, City	1,754	3.0	1.3	1	214	100,855	125	1,203	23,048	125,444
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	593	6.1	0.0	0	0	34,098	0	0	116,771	150,869
MH11-207	City of Fitchburg, Dunn SD No.	1,442	5.3	0.0	0	0	76,426	0	0	32,951	109,377
	PS 11 Totals	45,108	694	548	317	505,092	2,431,907	21,996	147,950	707,688	3,814,633

		2035									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	3,784	78.3	234.1	25	101,406	200,552	0	60,914	59,115	421,987
MH11-159-MAD	City of Madison	2,175	3.8	0.0	12	1,669	122,888	0	0	26,645	151,202
MH11-159-FITC	City of Fitchburg	3,763	13.6	1.1	3	3,497	199,439	30	0	45,534	248,499
MH11-151A	City of Fitchburg	2,382	93.7	158.2	14	44,935	126,246	14,826	51,857	26,092	263,956
MH11-145	City of Madison, Town of Madison, City	4,135	107.3	4.6	53	52,661	233,628	10,894	0	66,202	363,384
MH11-138	City of Fitchburg	16,378	264.8	51.3	51	185,000	868,034	0	16,147	202,619	1,271,800
MH11-306	City of Madison and City of Fitchburg	2,162	48.3	124.9	139	37,253	114,586	0	35,078	31,654	218,572
MH11-111A	City of Fitchburg	5,125	37.9	42.9	2	1,668	271,625	2,679	19,525	29,299	324,797
MH11-423	City of Madison, Town of Madison, City	1,609	29.6	31.4	17	76,790	90,909	1,247	12,141	36,875	217,961
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	46,895	0	0	10,884	57,779
MH11-104	City of Madison, Town of Madison, City	1,754	3.1	1.7	1	214	100,855	166	1,604	23,048	125,887
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	593	6.3	0.0	0	0	34,098	0	0	116,771	150,869
MH11-207	City of Fitchburg, Dunn SD No.	1,817	5.3	0.0	0	0	96,301	0	0	32,951	129,252
	PS 11 Totals	46,507	693	650	317	505,092	2,506,054	29,843	197,266	707,688	3,945,943

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH11-166A	City of Fitchburg	3,784	75.0	266.9	25	101,406	200,552	0	76,142	59,115	437,215
MH11-159-MAD	City of Madison	2,175	3.8	0.0	12	1,669	122,888	0	0	26,645	151,202
MH11-159-FITC	City of Fitchburg	3,763	13.6	1.1	3	3,497	199,439	30	0	45,534	248,499
MH11-151A	City of Fitchburg	2,382	106.2	186.1	14	44,935	126,246	18,533	64,821	26,092	280,626
MH11-145	City of Madison, Town of Madison, City	4,135	109.9	3.9	53	52,661	233,628	13,617	0	66,202	366,108
MH11-138	City of Fitchburg	16,584	259.1	60.0	51	185,000	878,952	0	20,184	202,619	1,286,754
MH11-306	City of Madison and City of Fitchburg	2,162	37.2	143.8	139	37,253	114,586	0	43,848	31,654	227,341
MH11-111A	City of Fitchburg	5,125	102.6	53.4	2	1,668	271,625	21,889	24,406	29,299	348,888
MH11-423	City of Madison, Town of Madison, City	1,609	29.9	34.6	17	76,790	90,909	1,559	15,177	36,875	221,309
MH11-410	City of Madison and City of Fitchburg	830	0.9	0.0	0	0	46,895	0	0	10,884	57,779
MH11-104	City of Madison, Town of Madison, City	1,754	3.1	2.1	1	214	100,855	208	2,004	23,048	126,329
MH11-226	Dunn Sanitary Districts No. 1 and No. 4	593	6.6	0.0	0	0	34,098	0	0	116,771	150,869
MH11-207	City of Fitchburg, Dunn SD No.	2,828	5.3	0.0	0	0	149,884	0	0	32,951	182,835
	PS 11 Totals	47,724	753	752	317	505,092	2,570,555	55,836	246,583	707,688	4,085,754

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	2,100	1.6	0.0	1	367	121,802	0	0	8,320	130,489
MIDTOWN	City of Madison	1,374	0.0	0.0	0	0	79,692	0	0	5,427	85,119
MH12-219A	City of Madison	1,539	14.5	0.0	1	734	89,262	0	0	6,129	96,125
MH12-210	City of Madison	3	10.0	0	4	955	145	0	0	75	1,175
MH12-311	City of Verona and City of Madison	Morse Pond Extension Constructed in 2017									
MH12-176	City of Madison	3,319	344.0	1.7	202	260,994	192,476	0	0	30,881	484,352
MH12-164	City of Madison and Middleton UD No	2,402	105.7	7.6	45	30,855	139,339	0	0	11,590	181,783
MH12-157	City of Madison	5,121	64.6	3.0	27	49,898	297,000	0	0	23,624	370,522
MH12-131	City of Madison	2,212	2.0	0.0	4	1,711	128,299	0	0	8,854	138,864
MH12-123A	City of Madison	688	0.0	0.0	0	0	39,911	0	0	2,718	42,629
SAS 2968-014	City of Madison	5,278	22.9	0.0	13	6,446	306,147	0	0	21,288	333,880
SAS 2671-012	City of Madison and Town of Middletc	6,326	21.8	0.0	16	8,964	366,900	0	0	25,596	401,461
MH12-121	City of Madison	1,790	0.7	0.0	1	506	103,800	0	0	7,103	111,409
MH12-118A	City of Madison	5,006	50.6	0.0	17	24,011	290,367	0	0	21,409	335,787
MH12-114	City of Madison	265	0.0	0.0	0	0	15,354	0	0	1,046	16,399
MH12-112A	City of Madison	584	0.0	0.0	0	0	33,899	0	0	2,309	36,207
MH12-102/102F	City of Fitchburg and Verona UD No. 1	314	69.6	0.0	20	56,137	17,608	0	0	5,022	78,766
	PS 12 Totals	38,321	708	12	351	441,578	2,222,000	0	0	181,390	2,844,968

17CatchCon	Community	2015									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	2,100	1.6	0.0	1	526	115,502	0	0	0	116,028
MIDTOWN	City of Madison	1,675	0.0	0.0	0	0	92,125	0	0	0	92,125
MH12-219A	City of Madison	1,920	14.5	0.0	1	970	105,600	0	0	0	106,570
MH12-210	City of Madison	3	4.4	0.0	9	7,146	138	0	0	0	7,284
MH12-311	City of Verona and City of Madison	Morse Pond Extension Constructed in 2017									
MH12-176	City of Madison	3,319	349.0	1.7	273	246,364	182,521	0	0	0	428,885
MH12-164	City of Madison and Middleton UD No	2,440	106.6	8.1	69	31,607	134,177	0	0	0	165,785
MH12-157	City of Madison	5,121	65.8	3.0	28	26,843	281,638	0	0	0	308,481
MH12-131	City of Madison	2,212	2.0	0.0	6	2,045	121,663	0	0	0	123,707
MH12-123A	City of Madison	688	0.0	0.0	0	0	37,847	0	0	0	37,847
SAS 2968-014	City of Madison	5,278	22.7	0.0	18	10,123	290,312	0	0	0	300,435
SAS 2671-012	City of Madison and Town of Middleto	6,434	18.3	0.0	17	6,128	353,843	0	0	0	359,971
MH12-121	City of Madison	1,790	0.7	0.0	1	1,423	98,431	0	0	0	99,853
MH12-118A	City of Madison	5,006	50.3	0.0	18	23,661	275,348	0	0	0	299,008
MH12-114	City of Madison	265	0.0	0.0	0	0	14,560	0	0	0	14,560
MH12-112A	City of Madison	681	0.0	0.0	0	0	37,450	0	0	0	37,450
MH12-102/102F	City of Fitchburg and Verona UD No. 1	327	84.6	0.0	20	56,137	16,331	0	0	0	72,468
	PS 12 Totals	39,257	720.7	12.8	461	412,973	2,157,484	0	0	0	2,570,456

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	2,100	3.7	0.0	1	447	118,652	2,180	0	4,160	125,439
MIDTOWN	City of Madison	3,324		0.0	0	0	187,806		0	2,714	190,520
MH12-219A	City of Madison	2,189	41.4	0.0	1	852	123,679	27,963	0	3,064	155,557
MH12-210	City of Madison	471	10.3	0.0	9	4,122	26,614	6,214	0	37	36,987
MH12-311	City of Verona and City of Madison	476	26.4	0.0	3	5,583	26,894	0	0	2,212	34,689
MH12-176	City of Madison	3,368	355.1	2.1	273	265,630	190,283	6,298	329	15,441	477,981
MH12-164	City of Madison and Middleton UD No	2,440	107.4	8.3	69	34,158	137,837	795	242	5,795	178,827
MH12-157	City of Madison	5,123	70.3	3.0	28	38,372	289,457	4,643	0	11,812	344,283
MH12-131	City of Madison	2,212	2.0	0.0	6	1,893	124,981	0	0	4,427	131,300
MH12-123A	City of Madison	688	0.0	0.0	0	0	38,879	0	0	1,359	40,238
SAS 2968-014	City of Madison	5,278	22.8	0.0	18	10,199	298,230	43	0	10,644	319,116
SAS 2671-012	City of Madison and Town of Middleto	6,470	20.1	0.3	17	7,559	365,549	1,875	319	12,798	388,101
MH12-121	City of Madison	1,856	0.7	0.0	1	964	104,871	0	0	3,552	109,387
MH12-118A	City of Madison	5,082	50.3	0.0	18	23,836	287,158	0	0	10,705	321,699
MH12-114	City of Madison	265	0.0	0.0	0	0	14,957	0	0	523	15,479
MH12-112A	City of Madison	726	0.0	0.0	0	0	40,993	0	0	1,154	42,147
MH12-102/102F	City of Fitchburg and Verona UD No. 1	869	88.3	3.9	20	56,137	46,071	1,082	1,822	2,511	107,623
	PS 12 Totals	42,937	799	18	464	449,753	2,422,910	51,093	2,712	92,907	3,019,375

17CatchCon	Community	2025									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	2,100	3.7	0.0	1	447	118,650	2,136	0	4,160	125,393
MIDTOWN	City of Madison										
MH12-219A	City of Madison	2,189	68.3	0.0	1	852	123,679	55,925	0	3,064	183,520
MH12-210	City of Madison	1,803	10.3	0.0	9	4,122	101,870	6,166	0	37	112,195
MH12-311	City of Verona and City of Madison	833	26.4	0.0	3	5,583	47,065	0	0	3,585	56,233
MH12-176	City of Madison	3,368	355.1	2.1	273	265,630	190,292	6,323	353	15,441	478,039
MH12-164	City of Madison and Middleton UD No	2,440	107.4	8.3	69	34,158	137,860	831	197	5,795	178,841
MH12-157	City of Madison	5,123	70.3	3.0	28	38,372	289,450	4,685	20	11,812	344,339
MH12-131	City of Madison	2,212	2.0	0.0	6	1,893	124,978	0	0	4,427	131,298
MH12-123A	City of Madison	688	0.0	0.0	0	0	38,872	0	0	1,359	40,231
SAS 2968-014	City of Madison	5,278	22.8	0.0	18	10,199	298,207	64	0	10,644	319,114
SAS 2671-012	City of Madison and Town of Middleto	6,470	20.1	0.3	17	7,559	365,555	1,895	286	12,798	388,094
MH12-121	City of Madison	1,856	0.7	0.0	1	964	104,864	0	0	3,552	109,380
MH12-118A	City of Madison	5,082	50.3	0.0	18	23,836	287,133	0	0	10,705	321,674
MH12-114	City of Madison	265	0.0	0.0	0	0	14,973	0	0	523	15,495
MH12-112A	City of Madison	726	0.0	0.0	0	0	41,019	0	0	1,154	42,173
MH12-102/102F	City of Fitchburg and Verona UD No. 1	869	88.3	3.9	20	56,137	46,057	1,085	1,810	2,511	107,600
	PS 12 Totals	41,302	826	18	464	449,753	2,330,522	79,111	2,667	91,567	2,953,619

17CatchCon	Community	2030									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	3,347	3.7	0.0	1	447	189,106	2,136	0	4,160	195,849
MIDTOWN	City of Madison										
MH12-219A	City of Madison	5,006	95.2	0.0	1	852	282,839	83,888	0	3,064	370,643
MH12-210	City of Madison	1,905	10.3	0.0	9	4,122	107,633	6,166	0	37	117,958
MH12-311	City of Verona and City of Madison	6,997	26.4	0.0	3	5,583	395,331	0	0	27,302	428,216
MH12-176	City of Madison	3,368	355.1	2.1	273	265,630	190,292	6,323	353	15,441	478,039
MH12-164	City of Madison and Middleton UD No	2,440	107.4	8.3	69	34,158	137,860	831	197	5,795	178,841
MH12-157	City of Madison	5,143	70.3	3.0	28	38,372	290,580	4,685	20	11,812	345,469
MH12-131	City of Madison	2,212	2.0	0.0	6	1,893	124,978	0	0	4,427	131,298
MH12-123A	City of Madison	688	0.0	0.0	0	0	38,872	0	0	1,359	40,231
SAS 2968-014	City of Madison	5,278	22.8	0.0	18	10,199	298,207	64	0	10,644	319,114
SAS 2671-012	City of Madison and Town of Middleto	6,470	20.1	0.3	17	7,559	365,555	1,895	286	12,798	388,094
MH12-121	City of Madison	1,856	0.7	0.0	1	964	104,864	0	0	3,552	109,380
MH12-118A	City of Madison	5,082	50.3	0.0	18	23,836	287,133	0	0	10,705	321,674
MH12-114	City of Madison	265	0.0	0.0	0	0	14,973	0	0	523	15,495
MH12-112A	City of Madison	726	0.0	0.0	0	0	41,019	0	0	1,154	42,173
MH12-102/102F	City of Fitchburg and Verona UD No. 1	1,207	88.3	3.9	20	56,137	63,971	1,085	1,810	2,511	125,514
	PS 12 Totals	51,990	853	18	464	449,753	2,933,211	107,074	2,667	115,284	3,607,988

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	3,347	3.7	0.0	1	447	189,106	2,136	0	4,160	195,849
MIDTOWN	City of Madison										
MH12-219A	City of Madison	5,709	122.1	0.0	1	852	322,559	111,850	0	3,064	438,325
MH12-210	City of Madison	3,649	10.3	0.0	9	4,122	206,169	6,166	0	37	216,494
MH12-311	City of Verona and City of Madison	8,680	26.4	0.0	3	5,583	490,420	0	0	33,778	529,781
MH12-176	City of Madison	3,368	355.1	2.1	273	265,630	190,292	6,323	353	15,441	478,039
MH12-164	City of Madison and Middleton UD No	2,440	107.4	8.3	69	34,158	137,860	831	197	5,795	178,841
MH12-157	City of Madison	5,143	70.3	3.0	28	38,372	290,580	4,685	20	11,812	345,469
MH12-131	City of Madison	2,212	2.0	0.0	6	1,893	124,978	0	0	4,427	131,298
MH12-123A	City of Madison	688	0.0	0.0	0	0	38,872	0	0	1,359	40,231
SAS 2968-014	City of Madison	5,278	22.8	0.0	18	10,199	298,207	64	0	10,644	319,114
SAS 2671-012	City of Madison and Town of Middleto	6,470	20.1	0.3	17	7,559	365,555	1,895	286	12,798	388,094
MH12-121	City of Madison	1,856	0.7	0.0	1	964	104,864	0	0	3,552	109,380
MH12-118A	City of Madison	5,082	50.3	0.0	18	23,836	287,133	0	0	10,705	321,674
MH12-114	City of Madison	265	0.0	0.0	0	0	14,973	0	0	523	15,495
MH12-112A	City of Madison	726	0.0	0.0	0	0	41,019	0	0	1,154	42,173
MH12-102/102F	City of Fitchburg and Verona UD No. 1	1,207	88.3	3.9	20	56,137	63,971	1,085	1,810	2,511	125,514
	PS 12 Totals	56,120	879.6	17.6	464	449,753	3,166,556	135,037	2,667	121,759	3,875,771

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH12-220	City of Madison	3,347	12.1	0.0	1	447	189,106	10,868	0	4,160	204,581
MIDTOWN	City of Madison										
MH12-219A	City of Madison	5,709	149.0	0.0	1	852	322,559	139,813	0	3,064	466,288
MH12-210	City of Madison	3,649	34.3	0.0	9	4,122	206,169	31,114	0	37	241,442
MH12-311	City of Verona and City of Madison	11,326	33.6	0.0	3	5,583	639,919	0	0	43,959	689,461
MH12-176	City of Madison	3,368	379.3	3.5	273	265,630	190,292	31,479	1,690	15,441	504,532
MH12-164	City of Madison and Middleton UD No	2,440	110.4	9.4	69	34,158	137,860	3,950	1,247	5,795	183,009
MH12-157	City of Madison	5,143	88.1	3.0	28	38,372	290,580	23,188	20	11,812	363,972
MH12-131	City of Madison	2,212	2.0	0.0	6	1,893	124,978	0	0	4,427	131,298
MH12-123A	City of Madison	688	0.0	0.0	0	0	38,872	0	0	1,359	40,231
SAS 2968-014	City of Madison	5,278	22.9	0.0	18	10,199	298,207	168	0	10,644	319,218
SAS 2671-012	City of Madison and Town of Middleto	6,470	27.3	1.7	17	7,559	365,555	9,380	1,623	12,798	396,915
MH12-121	City of Madison	1,856	0.7	0.0	1	964	104,864	0	0	3,552	109,380
MH12-118A	City of Madison	5,082	50.3	0.0	18	23,836	287,133	0	0	10,705	321,674
MH12-114	City of Madison	265	0.0	0.0	0	0	14,973	0	0	523	15,495
MH12-112A	City of Madison	726	0.0	0.0	0	0	41,019	0	0	1,154	42,173
MH12-102/102F	City of Fitchburg and Verona UD No. 1	1,359	102.9	19.6	20	56,137	72,027	5,422	9,094	2,511	145,191
	PS 12 Totals	58,918	1,013.0	37.2	464	449,753	3,324,111	255,381	13,674	131,940	4,174,859

		2010									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	357	0.0	0.0	0	20,706	0	0	0	7,725	28,431
MH13-137	City of Madison	1,058	0.0	0.0	0	61,364	0	0	0	22,895	84,259
MH13-133	City of Madison (Cherokee #2 L.S.)	146	0.0	0.0	0	8,468	0	0	0	3,159	11,627
MH13-124	City of Madison and Burke UD No. 1	682	35.4	5.4	51	39,556	0	0	2,263	15,603	57,422
SAS 4926-002	City of Madison (Veith L.S.)	295	155.2	0.0	1	17,110	0	0	200,593	81,225	298,928
SAS 5429-013	City of Madison (Fremont L.S.)	6,154	90.6	0.0	54	356,932	0	0	62,230	156,389	575,551
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	62,698	0	0	476,664	201,236	740,598
MH13-122A	City of Madison	2,553	105.7	25.9	51	148,074	0	0	36,341	68,805	253,220
MH13-105A/F	City of Madison and Token Creek SD	6	61.7	35.7	24	348	0	0	6,872	2,694	9,914
MH13-101	City of Madison	0	24.4	0.0	2	0	0	0	82	31	113
	PS13 Totals	12,332	675.0	100.4	347	715,256	0	0	785,044	559,762	2,060,062

		2015									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	361	0.0	0.0	0	19,855	0	0	0	5,123	24,978
MH13-137	City of Madison	1,065	0.0	0.0	0	58,575	0	0	0	15,112	73,687
MH13-133	City of Madison (Cherokee #2 L.S.)	146	0.0	0.0	0	8,030	0	0	0	2,072	10,102
MH13-124	City of Madison and Burke UD No. 1	688	35.4	5.4	51	37,840	0	0	2,511	10,411	50,762
SAS 4926-002	City of Madison (Veith L.S.)	295	155.2	0.0	1	16,225	0	0	214,142	59,435	289,802
SAS 5429-013	City of Madison (Fremont L.S.)	6,154	90.6	0.0	54	338,470	0	0	33,907	96,073	468,451
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	59,455	0	0	503,799	145,320	708,574
MH13-122A	City of Madison	2,697	108.1	25.9	51	148,335	0	0	41,435	48,961	238,731
MH13-105A/F	City of Madison and Token Creek SD	6	66.9	49.0	24	330	0	0	12,989	3,436	16,755
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	314	81	394
	PS13 Totals	12,493	682.6	113.7	349	687,115	0	0	809,097	386,023	1,882,235

		2020									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	364	0.0	0.0	0	20,566	0	0	0	6,424	26,990
MH13-137	City of Madison	1,065	0.0	0.0	0	60,173	0	0	0	19,004	79,176
MH13-133	City of Madison (Cherokee #2 L.S.)	181	0.0	0.0	0	10,227	0	0	0	2,616	12,842
MH13-124	City of Madison and Burke UD No. 1	688	35.4	5.4	51	38,872	0	0	2,655	13,007	54,534
SAS 4926-002	City of Madison (Veith L.S.)	298	155.2	0.0	1	16,837	0	0	207,368	70,330	294,534
SAS 5429-013	City of Madison (Fremont L.S.)	6,190	90.6	0.0	54	349,735	0	0	48,656	126,231	524,623
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	61,077	0	0	498,324	173,278	732,678
MH13-122A	City of Madison	2,721	110.5	25.9	51	153,737	2,495	0	43,492	58,883	258,606
MH13-105A/F	City of Madison and Token Creek SD	0	66.2	120.6	24	0	-728	68,342	11,692	3,065	82,371
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	257	56	313
	PS13 Totals	12,588	684.3	185.3	349	711,222	1,767	68,342	812,443	472,892	2,066,667

		2025									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	364	0.0	0.0	0	20,566	0	0	0	6,424	26,990
MH13-137	City of Madison	1,065	0.0	0.0	0	60,173	0	0	0	19,004	79,176
MH13-133	City of Madison (Cherokee #2 L.S.)	181	0.0	0.0	0	10,227	0	0	0	2,616	12,842
MH13-124	City of Madison and Burke UD No. 1	1,338	38.8	6.2	51	75,597	3,534	764	2,655	13,007	95,557
SAS 4926-002	City of Madison (Veith L.S.)	298	155.2	0.0	1	16,837	0	0	207,368	70,330	294,534
SAS 5429-013	City of Madison (Fremont L.S.)	6,190	90.6	0.0	54	349,735	0	0	48,656	126,231	524,623
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	61,077	0	0	498,324	173,278	732,678
MH13-122A	City of Madison	2,950	112.9	25.9	51	166,675	4,990	0	43,492	58,883	274,039
MH13-105A/F	City of Madison and Token Creek SD	0	65.5	192.2	24	0	-1,455	136,684	11,692	3,065	149,986
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	257	56	313
	PS13 Totals	13,467	689.4	257.7	349	760,886	7,069	137,448	812,443	472,892	2,190,738

17CatchCon	Community	2030									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	364	0.0	0.0	0	20,566	0	0	0	6,424	26,990
MH13-137	City of Madison	1,065	0.0	0.0	0	60,173	0	0	0	19,004	79,176
MH13-133	City of Madison (Cherokee #2 L.S.)	181	0.0	0.0	0	10,227	0	0	0	2,616	12,842
MH13-124	City of Madison and Burke UD No. 1	1,338	42.2	7.0	51	75,597	7,069	1,527	2,655	13,007	99,854
SAS 4926-002	City of Madison (Veith L.S.)	298	155.2	0.0	1	16,837	0	0	207,368	70,330	294,534
SAS 5429-013	City of Madison (Fremont L.S.)	6,190	90.6	0.0	54	349,735	0	0	48,656	126,231	524,623
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	61,077	0	0	498,324	173,278	732,678
MH13-122A	City of Madison	2,977	115.3	25.9	51	168,201	7,484	0	43,492	58,883	278,060
MH13-105A/F	City of Madison and Token Creek SD	774	64.8	263.8	24	43,731	-2,183	205,027	11,692	3,065	261,331
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	257	56	313
	PS13 Totals	14,268	695	330	349	806,142	12,370	206,554	812,443	472,892	2,310,401

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	364	0.0	0.0	0	20,566	0	0	0	6,424	26,990
MH13-137	City of Madison	1,065	0.0	0.0	0	60,173	0	0	0	19,004	79,176
MH13-133	City of Madison (Cherokee #2 L.S.)	181	0.0	0.0	0	10,227	0	0	0	2,616	12,842
MH13-124	City of Madison and Burke UD No. 1	1,338	45.6	7.8	51	75,597	10,603	2,291	2,655	13,007	104,152
SAS 4926-002	City of Madison (Veith L.S.)	298	155.2	0.0	1	16,837	0	0	207,368	70,330	294,534
SAS 5429-013	City of Madison (Fremont L.S.)	6,190	90.6	0.0	54	349,735	0	0	48,656	126,231	524,623
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	61,077	0	0	498,324	173,278	732,678
MH13-122A	City of Madison	2992	117.7	25.9	51	169,048	9,979	0	43,492	58,883	281,402
MH13-105A/F	City of Madison and Token Creek SD	4,278	64.1	335.4	24	241,707	-2,911	273,369	11,692	3,065	526,922
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	257	56	313
	PS13 Totals	17,787	700	403	349	1,004,966	17,672	275,660	812,443	472,892	2,583,632

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Residential	Institutional - Commercial	Industrial	Known Non-Res Water Users	I/I	Total
TE14-11057	City of Madison (Cherokee #1 L.S.)	364	0.0	0.0	0	20,566	0	0	0	6,424	26,990
MH13-137	City of Madison	1,065	0.0	0.0	0	60,173	0	0	0	19,004	79,176
MH13-133	City of Madison (Cherokee #2 L.S.)	181	0.0	0.0	0	10,227	0	0	0	2,616	12,842
MH13-124	City of Madison and Burke UD No. 1	1,338	48.8	8.7	51	75,597	13,929	3,150	2,655	13,007	108,338
SAS 4926-002	City of Madison (Veith L.S.)	298	155.2	0.0	1	16,837	0	0	207,368	70,330	294,534
SAS 5429-013	City of Madison (Fremont L.S.)	6,190	90.6	0.0	54	349,735	0	0	48,656	126,231	524,623
SAS 5831-004	City of Madison (Truax L.S.)	1,081	202.0	33.4	164	61,077	0	0	498,324	173,278	732,678
MH13-122A	City of Madison	3,011	120.1	25.9	51	170,122	12,474	0	43,492	58,883	284,970
MH13-105A/F	City of Madison and Token Creek SD	8,273	63.5	407.0	24	467,425	-3,534	341,711	11,692	3,065	820,358
MH13-101	City of Madison	0	24.4	0.0	4	0	0	0	257	56	313
	PS13 Totals	21,801	704.6	475.0	349	1,231,757	22,869	344,861	812,443	472,892	2,884,822

		2010									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	995	8.6	14.9	0	47,760	2,666	3,069	0	971	54,466
MH14-359/359F	Village of Waunakee	4,887	90.8	74.2	1	302,994	38,318	11,352	289,036	248,979	890,679
MH14-362/362F	Village of Waunakee	2,145	68.9	0.0	1	126,232	29,076	0	9,011	63,756	228,074
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,386	0	0	0	2,478	8,864
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,378	0	0	0	2,863	10,241
MH14-356	Villageof Waunakee and Town of Westport	897	49.9	0.0	0	55,614	21,058	0	0	29,749	106,420
MH14-355	Village of Waunakee	0	4.1	0.0	0	0	1,730	0	0	671	2,402
MH14-353/353F	Village of Waunakee	191	95.3	44.9	1	11,842	40,217	18,104	2,512	28,198	100,872
MH14-351	Village of Waunakee	592	2.2	0.0	0	36,704	928	0	0	14,601	52,234
MH14-348A	Villageof Waunakee and Town of Westport	121	0.0	0.0	0	7,502	0	0	0	2,911	10,413
MH14-343	Town of Westport	3	0.0	0.0	0	159	0	0	0	62	221
MH14-341/341F	Village of Waunakee	1,249	4.8	0.0	0	77,438	2,026	0	0	30,832	110,295
MH14-336/336F	Village of Waunakee	901	29.5	0.0	0	55,862	12,449	0	0	26,505	94,816
MH14-332	Village of Waunakee	568	0.0	0.0	0	35,216	0	0	0	13,664	48,880
	Monitoring Point Q096	12,771	354	134	3	771,087	148,467	32,525	300,559	466,238	1,718,876
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,107	3.7	2.7	0	68,634	1,561	1,139	0	101,196	172,531
MH14-318	Westport - UD No. 2	15	19.0	17.2	0	795	7,030	6,364	0	12,926	27,115
MH14-315	Westport - UD No. 2 (Q075)	1,506	36.5	1.8	9	56,286	8,769	666	64,553	118,721	248,995
MH14-209	Village of DeForest	3,172	59.8	157.2	1	164,944	17,342	18,550	11,203	143,550	355,589
MH14-208	Village of DeForest	74	8.1	0.8	0	3,848	2,349	94	0	4,259	10,551
MH14-206	Village of DeForest	183	3.7	0.0	0	9,516	1,073	0	0	7,169	17,758
MH14-205	Village of DeForest	370	0.8	0.0	0	19,240	232	0	0	13,183	32,655
MH14-201	Village of DeForest	133	0.0	0.0	0	6,916	0	0	0	4,682	11,598
MH14-199	Village of DeForest	203	0.0	0.0	0	10,556	0	0	0	7,146	17,702
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	377	5.5	0.0	0	19,604	572	0	0	44,208	64,384
MH14-196	Village of DeForest and Vienna UD No. 1	1,400	30.2	20.9	1	72,800	8,758	2,006	4,759	59,795	148,118
MH14-195	Village of DeForest	31	0.0	0.0	0	1,612	0	0	0	1,091	2,703
MH14-194A	Village of DeForest	78	0.0	0.0	0	4,056	0	0	0	2,746	6,802
MH14-192	Village of DeForest	469	3.2	0.0	0	24,388	928	0	0	17,139	42,455
MH14-186/186F	Village of DeForest	43	0.0	0.0	0	2,236	0	0	0	1,514	3,750
MH14-170	Village of DeForest	0	0.0	0.0	0	0	0	0	0	0	0
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,712	0	0	0	7,012	30,724
MH14-164	Village of DeForest	2,334	102.0	2.3	0	121,368	29,580	271	0	102,376	253,595
MH14-162	Windsor - Hidden Springs SD	60	0.0	0.0	0	3,420	0	0	0	2,315	5,735
MH14-160/160F	Windsor - SD No. 1 (Q140)	724	0.0	0.0	0	41,268	0	0	0	27,938	69,206
MH14-157	Village of DeForest	261	1.8	0.0	0	13,572	522	0	0	9,542	23,636
	Monitoring Point Q139	10,328	215	181	2	543,056	61,356	20,921	15,962	455,665	1,096,960
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,985	0	0	0	7,511	13,496
MH14-155	Windsor - SD No. 1 (Q097)	1,167	12.0	0.9	0	66,519	7,032	62	0	92,367	165,980

		2010									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	587	2.6	14.0	1	33,459	1,524	545	10,418	57,662	103,608
MH14-151	Windsor - Lake Windsor SD	59	0.0	0.0	0	3,363	0	0	0	2,368	5,731
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,959	0	0	0	3,491	8,450
MH14-144	Windsor - Lake Windsor SD	164	0.0	0.0	0	9,348	0	0	0	6,581	15,929
	Lake Windsor (Q007)	310	0.0	0	0	17,670	0	0	0	12,440	30,110
MH14-143	Vienna UD No. 2 (Q121)	577	0.0	0.0	0	30,011	0	0	0	6,115	36,126
MH14-136F	Village of DeForest	0	0.0	0.0	0	0	0	0	0	0	0
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	43	145.7	49.0	1	2,236	39,150	5,782	7,819	1,267	56,254
MH14-416	Village of Windsor	0	0.0	0.0	0	0	0	0	0	0	0
MH14-415	Village of Windsor	148	36.5	113.0	0	8,436	21,389	7,797	0	54,477	92,099
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	5	17.7	12.2	0	285	10,372	842	0	16,655	28,154
MH14-404	Village of DeForest	0	6.0	0.0	0	0	1,740	0	0	2,520	4,260
MH14-131	Westport UD No. 4 (Q116)	164	0.0	0.0	0	8,708	0	0	0	4,618	13,326
MH14-104	Westport UD No. 3 (Q061)	166	16.4	0.0	0	8,817	6,068	0	0	2,336	17,221
MH14-101	City of Madison (Q082)	4,751	44.5	0.0	2	239,134	48,728	0	48,420	74,063	410,344
	PS14 Totals	33,751	910	526	18	1,861,117	363,186	76,644	447,731	1,486,776	4,235,454

		2015									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,067	11.1	15.2	0	48,015	2,420	3,010	0	6,413	59,858
MH14-359/359F	Village of Waunakee	5,157	95.6	75.2	1	304,263	31,548	9,207	180,914	143,054	668,986
MH14-362/362F	Village of Waunakee	2,206	69.6	0.0	1	123,723	22,968	0	11,447	43,014	201,152
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,077	0	0	0	1,653	7,730
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,021	0	0	0	1,910	8,931
MH14-356	Villageof Waunakee and Town of Westport	897	49.9	0.0	0	52,923	16,467	0	0	18,874	88,264
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,254	0	0	341	1,595
MH14-353/353F	Village of Waunakee	191	88.8	60.1	1	11,269	29,304	19,173	2,841	17,024	79,611
MH14-351	Village of Waunakee	592	2.2	0.0	0	34,928	726	0	0	9,698	45,352
MH14-348A	Villageof Waunakee and Town of Westport	124	0.0	0.0	0	7,316	0	0	0	1,990	9,306
MH14-343	Town of Westport	3	0.0	0.0	0	174	0	0	0	47	221
MH14-341/341F	Village of Waunakee	1,764	8.7	0.0	0	104,076	2,871	0	0	29,090	136,037
MH14-336/336F	Village of Waunakee	908	31.8	0.0	0	53,572	10,494	0	0	17,426	81,492
MH14-332	Village of Waunakee	653	0.0	0.0	0	38,527	0	0	0	10,479	49,006
	Monitoring Point Q096	13,784	362	151	3	791,884	118,052	31,390	195,202	301,012	1,437,539
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,256	3.1	3.3	0	74,104	1,023	1,089	0	50,331	126,547
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	870	5,530	4,954	0	1,907	13,261
MH14-315	Westport - UD No. 2 (Q075)	1,508	37.5	1.8	9	61,712	7,114	518	64,553	22,446	156,343
MH14-209	Village of DeForest	3,175	77.2	148.4	1	158,750	25,244	21,963	26,107	80,526	312,591
MH14-208	Village of DeForest	74	7.6	0.8	0	3,700	2,485	118	0	2,187	8,491
MH14-206	Village of DeForest	183	2.5	0.0	0	9,150	818	0	0	3,459	13,426
MH14-205	Village of DeForest	370	0.8	0.0	0	18,500	262	0	0	6,510	25,272
MH14-201	Village of DeForest	133	0.0	0.0	0	6,650	0	0	0	2,308	8,958
MH14-199	Village of DeForest	203	0.0	0.0	0	10,150	0	0	0	3,522	13,672
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	379	4.6	0.0	0	18,192	934	0	0	42,374	61,500
MH14-196	Village of DeForest and Vienna UD No. 1	1,426	31.5	25.7	1	71,300	10,301	3,226	4,699	31,065	120,591
MH14-195	Village of DeForest	31	0.0	0.0	0	1,550	0	0	0	538	2,088
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,900	0	0	0	1,353	5,253
MH14-192	Village of DeForest	469	3.2	0.0	0	23,450	1,046	0	0	8,500	32,997
MH14-186/186F	Village of DeForest	43	0.0	0.0	0	2,150	0	0	0	746	2,896
MH14-170	Village of DeForest	0	0.0	0.0	0	0	0	0	0	0	0
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,296	0	0	0	10,954	34,250
MH14-164	Village of DeForest	2,451	101.5	2.3	0	122,550	33,191	340	0	54,160	210,241
MH14-162	Windsor - Hidden Springs SD	60	0.0	0.0	0	3,360	0	0	0	1,166	4,526
MH14-160/160F	Windsor - SD No. 1 (Q140)	885	0.0	0.0	0	49,560	0	0	0	17,197	66,757
MH14-157	Village of DeForest	531	1.4	0.0	0	26,550	458	0	0	9,372	36,380
	Monitoring Point Q139	10,907	230	177	2	552,758	74,738	25,648	30,806	275,938	959,888
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,880	0	0	0	1,105	6,985
MH14-155	Windsor - SD No. 1 (Q097)	1,223	12.5	0.9	0	68,488	8,813	635	0	14,652	92,587

17CatchCon	Community (Monitoring Point)	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Wastewater (gpd)					
						Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	587	3.4	8.1	1	32,872	2,397	1,410	10,926	8,950	56,555
MH14-151	Windsor - Lake Windsor SD	59	0.0	0.0	0	3,304	0	0	0	1,054	4,358
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,872	0	0	0	1,554	6,426
MH14-144	Windsor - Lake Windsor SD	164	0.0	0.0	0	9,184	0	0	0	2,930	12,114
	Lake Windsor (Q007)	310	0	0	0	17,360	0	0	0	5,538	22,898
MH14-143	Vienna UD No. 2 (Q121)	606	0.0	0.0	0	30,310	0	0	0	3,637	33,947
MH14-136F	Village of DeForest	0	0.0	0.0	0	0	0	0	0	63,112	63,112
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	43	158.7	59.5	1	2,150	51,895	8,806	6,407	8,311	77,569
MH14-416	Village of Windsor	0	0.0	0.0	0	0	0	0	0	0	0
MH14-415	Village of Windsor	442	36.5	107.4	0	24,752	25,733	75,717	0	40,258	166,460
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	5	15.3	12.2	0	280	10,787	8,601	0	7,674	27,341
MH14-404	Village of DeForest	0	6.0	0.0	0	0	1,962	0	0	626	2,588
MH14-131	Westport UD No. 4 (Q116)	164	0.0	0.0	0	9,529	0	0	0	1,927	11,457
MH14-104	Westport UD No. 3 (Q061)	171	16.4	0.0	0	9,946	4,723	0	0	2,215	16,885
MH14-101	City of Madison (Q082)	4,810	39.3	0.0	2	230,010	38,671	0	36,530	36,625	341,837
	PS14 Totals	35,937	939.7	538.1	18	1,912,906	351,436	158,768	344,424	846,264	3,613,797

		2020									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,135	12.3	23.0	0	52,778	3,237	4,646	0	3,692	64,352
MH14-359/359F	Village of Waunakee	5,651	95.6	83.8	1	341,886	35,946	13,724	245,200	196,016	832,772
MH14-362/362F	Village of Waunakee	2,375	109.6	0.0	1	137,093	41,210	0	10,229	53,385	241,916
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,232	0	0	0	2,065	8,297
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,200	0	0	0	2,386	9,586
MH14-356	Villageof Waunakee and Town of Westport	901	49.9	0.0	0	54,511	18,762	0	0	24,311	97,584
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,429	0	0	506	1,935
MH14-353/353F	Village of Waunakee	191	96.3	81.3	1	11,556	36,209	29,817	2,677	22,611	102,868
MH14-351	Village of Waunakee	595	2.2	0.0	0	35,998	827	0	0	12,150	48,974
MH14-348A	Villageof Waunakee and Town of Westport	162	4.4	0.0	0	9,801	1,654	0	0	2,450	13,906
MH14-343	Town of Westport	3	0.0	0.0	0	167	0	0	0	55	221
MH14-341/341F	Village of Waunakee	2,186	34.2	0.0	0	132,253	12,859	0	0	29,961	175,073
MH14-336/336F	Village of Waunakee	932	47.1	0.0	0	56,386	17,710	0	0	21,965	96,061
MH14-332	Village of Waunakee	683	0.0	0.0	0	41,322	0	0	0	12,072	53,393
	Monitoring Point Q096	15,036	455	188	3	887,179	169,842	48,187	258,106	383,625	1,746,938
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,434	3.1	3.3	0	86,757	1,166	1,241	0	75,764	164,927
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	833	5,530	4,954	0	7,417	18,732
MH14-315	Westport - UD No. 2 (Q075)	1,521	39.4	1.8	9	59,774	7,661	518	64,553	70,583	203,089
MH14-209	Village of DeForest	3,180	77.2	421.2	1	162,180	23,816	56,020	18,655	112,038	372,709
MH14-208	Village of DeForest	74	7.6	0.8	0	3,774	2,345	106	0	3,223	9,448
MH14-206	Village of DeForest	193	2.5	0.0	0	9,843	771	0	0	5,314	15,928
MH14-205	Village of DeForest	370	0.8	0.0	0	18,870	247	0	0	9,846	28,963
MH14-201	Village of DeForest	133	0.0	0.0	0	6,783	0	0	0	3,495	10,278
MH14-199	Village of DeForest	203	0.0	0.0	0	10,353	0	0	0	5,334	15,687
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	385	4.6	0.0	0	19,250	706	0	0	43,291	63,247
MH14-196	Village of DeForest and Vienna UD No. 1	1,593	31.5	25.7	1	81,243	9,718	3,418	4,729	45,430	144,538
MH14-195	Village of DeForest	31	0.0	0.0	0	1,581	0	0	0	815	2,396
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,978	0	0	0	2,050	6,028
MH14-192	Village of DeForest	469	3.2	0.0	0	23,919	987	0	0	12,820	37,726
MH14-186/186F	Village of DeForest	43	0.0	0.0	0	2,193	0	0	0	1,130	3,323
MH14-170	Village of DeForest	141	0.0	0.0	0	7,191	0	0	0	0	7,191
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,504	0	0	0	8,983	32,487
MH14-164	Village of DeForest	2,748	101.5	2.3	0	140,148	31,313	306	0	78,268	250,034
MH14-162	Windsor - Hidden Springs SD	75	0.0	0.0	0	4,238	0	0	0	1,741	5,978
MH14-160/160F	Windsor - SD No. 1 (Q140)	947	0.0	0.0	0	53,506	0	0	0	22,568	76,073
MH14-157	Village of DeForest	681	1.4	0.0	0	34,731	432	0	0	9,457	44,620
	Monitoring Point Q139	11,760	230	450	2	607,284	70,335	59,850	23,384	365,801	1,126,654
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,933	0	0	0	4,308	10,241
MH14-155	Windsor - SD No. 1 (Q097)	1,324	12.5	0.9	0	74,806	8,069	56	0	53,509	136,440

17CatchCon	Community (Monitoring Point)	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	749	3.4	8.1	1	42,319	2,195	502	10,672	33,306	88,993
MH14-151	Windsor - Lake Windsor SD	77	0.0	0.0	0	4,351	0	0	0	1,711	6,061
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,916	0	0	0	2,523	7,438
MH14-144	Windsor - Lake Windsor SD	164	8.1	0.0	0	9,266	5,229	0	0	4,755	19,250
	Lake Windsor (Q007)	328	8	0	0	18,532	5,229	0	0	8,989	32,749
MH14-143	Vienna UD No. 2 (Q121)	650	0.0	0.0	0	33,157	0	0	0	4,876	38,033
MH14-136F	Village of DeForest	0	40.5	0.0	0	0	12,494	0	0	31,556	44,050
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	43	158.7	59.5	1	2,193	48,959	7,914	7,113	4,789	70,967
MH14-416	Village of Windsor	122			0	6,893	0	0	0	0	6,893
MH14-415	Village of Windsor	442	36.5	107.4	0	24,973	23,561	6,659	0	47,367	102,560
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	0	6.0	0.0	0	0	3,873	0	0	12,164	16,037
MH14-404	Village of DeForest	0	13.5	0.0	0	0	4,165	0	0	1,573	5,737
MH14-131	Westport UD No. 4 (Q116)	170	0.0	0.0	0	9,413	0	0	0	3,273	12,685
MH14-104	Westport UD No. 3 (Q061)	192	16.5	0.0	0	10,647	4,752	0	0	2,276	17,675
MH14-101	City of Madison (Q082)	4813	39.3	0.0	2	271,935	40,852	0	42,475	55,344	410,606
	PS14 Totals	38,704	1,082	836	18	2,142,625	408,681	129,880	406,303	1,166,520	4,254,008

		2025									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,215	13.4	30.8	0	56,498	3,543	6,222	0	3,692	69,954
MH14-359/359F	Village of Waunakee	5,826	95.6	92.4	1	352,473	35,946	16,958	245,200	196,016	846,593
MH14-362/362F	Village of Waunakee	2,375	149.6	0.0	1	137,093	56,250	0	10,838	53,385	257,565
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,232	0	0	0	2,065	8,297
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,200	0	0	0	2,386	9,586
MH14-356	Villageof Waunakee and Town of Westport	901	49.9	0.0	0	54,511	18,762	0	0	24,311	97,584
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,429	0	0	506	1,935
MH14-353/353F	Village of Waunakee	191	96.3	81.3	1	11,556	36,209	29,817	2,759	22,611	102,951
MH14-351	Village of Waunakee	595	2.2	0.0	0	35,998	827	0	0	12,150	48,974
MH14-348A	Villageof Waunakee and Town of Westport	162	4.4	0.0	0	9,801	1,654	0	0	2,450	13,906
MH14-343	Town of Westport	3	0.0	0.0	0	167	0	0	0	55	221
MH14-341/341F	Village of Waunakee	2,986	60.0	0	0	180,653	22,560	0	0	29,961	233,174
MH14-336/336F	Village of Waunakee	932	47.1	0.0	0	56,386	17,710	0	0	21,965	96,061
MH14-332	Village of Waunakee	749	0.0	0.0	0	45,315	0	0	0	12,072	57,386
	Monitoring Point Q096	16,157	522	205	3	953,879	194,889	52,996	258,797	383,625	1,844,186
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,634	3.1	3.3	0	98,857	1,166	1,241	0	63,047	164,311
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	833	5,530	4,954	0	4,662	15,978
MH14-315	Westport - UD No. 2 (Q075)	1,521	39.4	1.8	9	59,774	7,661	518	64,553	46,514	179,020
MH14-209	Village of DeForest	3,180	77.2	421.2	1	162,180	23,816	56,020	22,381	112,038	376,435
MH14-208	Village of DeForest	74	7.6	0.8	0	3,774	2,345	106	0	3,223	9,448
MH14-206	Village of DeForest	193	2.5	0.0	0	9,843	771	0	0	5,314	15,928
MH14-205	Village of DeForest	370	0.8	0.0	0	18,870	247	0	0	9,846	28,963
MH14-201	Village of DeForest	133	0.0	0.0	0	6,783	0	0	0	3,495	10,278
MH14-199	Village of DeForest	203	0.0	0.0	0	10,353	0	0	0	5,334	15,687
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	385	4.6	0.0	0	19,250	706	0	0	43,291	63,247
MH14-196	Village of DeForest and Vienna UD No. 1	1,715	31.5	25.7	1	87,465	9,718	3,418	4,714	45,430	150,745
MH14-195	Village of DeForest	31	0.0	0.0	0	1,581	0	0	0	815	2,396
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,978	0	0	0	2,050	6,028
MH14-192	Village of DeForest	469	3.2	0.0	0	23,919	987	0	0	12,820	37,726
MH14-186/186F	Village of DeForest	43	0.0	0.0	0	2,193	0	0	0	1,130	3,323
MH14-170	Village of DeForest	141	0.0	0.0	0	7,191	0	0	0	0	7,191
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,504	0	0	0	8,983	32,487
MH14-164	Village of DeForest	3,068	101.5	2.3	0	156,468	31,313	306	0	78,268	266,354
MH14-162	Windsor - Hidden Springs SD	75	0.0	0.0	0	4,238	0	0	0	1,741	5,978
MH14-160/160F	Windsor - SD No. 1 (Q140)	947	0.0	0.0	0	53,506	0	0	0	22,568	76,073
MH14-157	Village of DeForest	828	1.4	0.0	0	42,228	432	0	0	9,457	52,117
	Monitoring Point Q139	12,349	230	450	2	637,323	70,335	59,850	27,095	365,801	1,160,404
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,933	0	0	0	4,308	10,241
MH14-155	Windsor - SD No. 1 (Q097)	1,324	12.5	0.9	0	74,806	8,069	56	0	53,509	136,440

17CatchCon	Community (Monitoring Point)	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	749	3.4	8.1	1	42,319	2,195	502	10,799	33,306	89,120
MH14-151	Windsor - Lake Windsor SD	77	0.0	0.0	0	4,351	0	0	0	1,711	6,061
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,916	0	0	0	2,523	7,438
MH14-144	Windsor - Lake Windsor SD	164	11.8	0	0	9,266	7,617	0	0	4,755	21,638
	Lake Windsor (Q007)	328	12	0	0	18,532	7,617	0	0	8,989	35,138
MH14-143	Vienna UD No. 2 (Q121)	650	0	0	0	33,157	0	0	0	4,876	38,033
MH14-136F	Village of DeForest	0	77.5	0.0	0	0	23,909	0	0	31,556	55,465
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	43	158.7	59.5	1	2,193	48,959	7,914	6,760	4,789	70,614
MH14-416	Village of Windsor	322			0	18,193	0	0	0	0	18,193
MH14-415	Village of Windsor	742	36.5	107.4	0	41,923	23,561	6,659	0	47,367	119,510
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	0	6.0	0.0	0	0	3,873	0	0	12,164	16,037
MH14-404	Village of DeForest	0	21.0	0.0	0	0	6,479	0	0	1,573	8,051
MH14-131	Westport UD No. 4 (Q116)	170	0	0	0	9,413	0	0	0	3,273	12,685
MH14-104	Westport UD No. 3 (Q061)	192	16.5	0	0	10,647	4,752	0	0	2,276	17,675
MH14-101	City of Madison (Q082)	4813	39.3	0.0	2	271,935	40,852	0	39,503	55,344	407,633
	PS14 Totals	41,114	1,198	853	18	2,279,714	449,844	134,689	407,506	1,126,980	4,398,734

17CatchCon	Community (Monitoring Point)	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,285	14.6	38.6	0	59,753	3,849	7,797	0	3,692	75,091
MH14-359/359F	Village of Waunakee	6,180	95.6	101.0	1	373,890	35,946	20,191	245,200	196,016	871,243
MH14-362/362F	Village of Waunakee	2,509	189.6	0.0	1	145,200	71,290	0	10,534	53,385	280,408
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,232	0	0	0	2,065	8,297
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,200	0	0	0	2,386	9,586
MH14-356	Villageof Waunakee and Town of Westport	901	49.9	0.0	0	54,511	18,762	0	0	24,311	97,584
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,429	0	0	506	1,935
MH14-353/353F	Village of Waunakee	191	96.3	142.1	1	11,556	36,209	52,678	2,718	22,611	125,770
MH14-351	Village of Waunakee	595	2.2	0.0	0	35,998	827	0	0	12,150	48,974
MH14-348A	Villageof Waunakee and Town of Westport	162	4.4	0.0	0	9,801	1,654	0	0	2,450	13,906
MH14-343	Town of Westport	3	0.0	0.0	0	167	0	0	0	55	221
MH14-341/341F	Village of Waunakee	3,086	85.8	0	0	186,703	32,261	0	0	29,961	248,925
MH14-336/336F	Village of Waunakee	1,019	61.6	0.0	0	61,650	23,162	0	0	21,965	106,776
MH14-332	Village of Waunakee	749	0	0	0	45,315	0	0	0	12,072	57,386
	Monitoring Point Q096	16,902	604	282	3	997,972	225,388	80,666	258,451	383,625	1,946,102
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,804	3.1	3.3	0	109,142	1,166	1,241	0	69,405	180,954
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	833	5,530	4,954	0	6,039	17,355
MH14-315	Westport - UD No. 2 (Q075)	1,521	39.4	1.8	9	59,774	7,661	518	64,553	58,549	191,055
MH14-209	Village of DeForest	3,255	77.2	421.2	1	166,005	23,816	56,020	20,518	112,038	378,397
MH14-208	Village of DeForest	74	7.6	0.8	0	3,774	2,345	106	0	3,223	9,448
MH14-206	Village of DeForest	193	2.5	0.0	0	9,843	771	0	0	5,314	15,928
MH14-205	Village of DeForest	370	0.8	0.0	0	18,870	247	0	0	9,846	28,963
MH14-201	Village of DeForest	133	0.0	0.0	0	6,783	0	0	0	3,495	10,278
MH14-199	Village of DeForest	203	0.0	0.0	0	10,353	0	0	0	5,334	15,687
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	385	4.6	0.0	0	19,250	706	0	0	43,291	63,247
MH14-196	Village of DeForest and Vienna UD No. 1	1,889	31.5	25.7	1	96,339	9,718	3,418	4,722	45,430	159,626
MH14-195	Village of DeForest	31	0.0	0.0	0	1,581	0	0	0	815	2,396
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,978	0	0	0	2,050	6,028
MH14-192	Village of DeForest	469	3.2	0.0	0	23,919	987	0	0	12,820	37,726
MH14-186/186F	Village of DeForest	43	0.0	0.0	0	2,193	0	0	0	1,130	3,323
MH14-170	Village of DeForest	141	0.0	0.0	0	7,191	0	0	0	0	7,191
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,504	0	0	0	8,983	32,487
MH14-164	Village of DeForest	3,281	101.5	2.3	0	167,331	31,313	306	0	78,268	277,217
MH14-162	Windsor - Hidden Springs SD	75	0.0	0.0	0	4,238	0	0	0	1,741	5,978
MH14-160/160F	Windsor - SD No. 1 (Q140)	1067	0.0	0.0	0	60,286	0	0	0	22,568	82,853
MH14-157	Village of DeForest	828	1.4	0.0	0	42,228	432	0	0	9,457	52,117
	Monitoring Point Q139	12,931	230	450	2	667,665	70,335	59,850	25,240	365,801	1,188,891
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,933	0	0	0	4,308	10,241
MH14-155	Windsor - SD No. 1 (Q097)	1,324	12.5	0.9	0	74,806	8,069	56	0	53,509	136,440

17CatchCon	Community (Monitoring Point)	2030									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Wastewater (gpd)					
						Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	749	3.4	8.1	1	42,319	2,195	502	10,736	33,306	89,057
MH14-151	Windsor - Lake Windsor SD	77	0.0	0.0	0	4,351	0	0	0	1,711	6,061
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,916	0	0	0	2,523	7,438
MH14-144	Windsor - Lake Windsor SD	164	15.9	0.0	0	9,266	10,263	0	0	4,755	24,285
	Lake Windsor (Q007)	328	15.9	0.0	0	18,532	10,263	0	0	8,989	37,784
MH14-143	Vienna UD No. 2 (Q121)	650	0	0	0	33,157	0	0	0	4,876	38,033
MH14-136F	Village of DeForest	0	77.5	50.3	0	0	23,909	6,690	0	31,556	62,155
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	165	158.7	59.5	1	8,415	48,959	7,914	6,937	4,789	77,013
MH14-416	Village of Windsor	532			0	30,058	0	0	0	0	30,058
MH14-415	Village of Windsor	952	36.5	107.4	0	53,788	23,561	6,659	0	47,367	131,375
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	0	6.0	0.0	0	0	3,873	0	0	12,164	16,037
MH14-404	Village of DeForest	0	28.5	0.0	0	0	8,792	0	0	1,573	10,365
MH14-131	Westport UD No. 4 (Q116)	170	0	0	0	9,413	0	0	0	3,273	12,685
MH14-104	Westport UD No. 3 (Q061)	192	16.5	0	0	10,647	4,752	0	0	2,276	17,675
MH14-101	City of Madison (Q082)	4,813	39.3	0.0	2	271,935	40,852	0	40,989	55,344	409,120
	PS14 Totals	43,153	1,291	980	18	2,394,386	485,304	169,049	406,904	1,146,750	4,602,393

		2035									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,350	15.7	46.4	0	62,775	4,155	9,373	0	3,692	79,995
MH14-359/359F	Village of Waunakee	6,960	95.6	109.6	1	421,080	35,946	23,425	245,200	196,016	921,667
MH14-362/362F	Village of Waunakee	2,509	229.6	0.0	1	145,200	86,330	0	10,686	53,385	295,600
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,232	0	0	0	2,065	8,297
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,200	0	0	0	2,386	9,586
MH14-356	Villageof Waunakee and Town of Westport	901	49.9	0.0	0	54,511	18,762	0	0	24,311	97,584
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,429	0	0	506	1,935
MH14-353/353F	Village of Waunakee	191	96.3	142.1	1	11,556	36,209	52,678	2,738	22,611	125,791
MH14-351	Village of Waunakee	595	2.2	0.0	0	35,998	827	0	0	12,150	48,974
MH14-348A	Villageof Waunakee and Town of Westport	162	4.4	0.0	0	9,801	1,654	0	0	2,450	13,906
MH14-343	Town of Westport	3	0.0	0.0	0	167	0	0	0	55	221
MH14-341/341F	Village of Waunakee	3,451	149.9	0	0	208,786	56,362	0	0	29,961	295,109
MH14-336/336F	Village of Waunakee	1,019	61.6	0.0	0	61,650	23,162	0	0	21,965	106,776
MH14-332	Village of Waunakee	749	0.0	0.0	0	45,315	0	0	0	12,072	57,386
	Monitoring Point Q096	18,112	709	298	3	1,070,267	264,836	85,475	258,624	383,625	2,062,827
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	1,916	3.1	59.8	0	115,918	1,166	22,485	0	66,226	205,795
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	833	5,530	4,954	0	5,351	16,666
MH14-315	Westport - UD No. 2 (Q075)	1,521	39.4	1.8	9	59,774	7,661	518	64,553	52,532	185,037
MH14-209	Village of DeForest	3,404	77.2	421.2	1	173,604	23,816	56,020	21,450	112,038	386,928
MH14-208	Village of DeForest	74	7.6	0.8	0	3,774	2,345	106	0	3,223	9,448
MH14-206	Village of DeForest	193	2.5	0.0	0	9,843	771	0	0	5,314	15,928
MH14-205	Village of DeForest	370	0.8	0.0	0	18,870	247	0	0	9,846	28,963
MH14-201	Village of DeForest	133	0.0	0.0	0	6,783	0	0	0	3,495	10,278
MH14-199	Village of DeForest	203	0.0	0.0	0	10,353	0	0	0	5,334	15,687
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	385	4.6	0.0	0	19,250	706	0	0	43,291	63,247
MH14-196	Village of DeForest and Vienna UD No. 1	1,889	31.5	25.7	1	96,339	9,718	3,418	4,718	45,430	159,623
MH14-195	Village of DeForest	31	0.0	0.0	0	1,581	0	0	0	815	2,396
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,978	0	0	0	2,050	6,028
MH14-192	Village of DeForest	469	3.2	0.0	0	23,919	987	0	0	12,820	37,726
MH14-186/186F	Village of DeForest	241	0.0	0.0	0	12,291	0	0	0	1,130	13,421
MH14-170	Village of DeForest	141	0.0	0.0	0	7,191	0	0	0	0	7,191
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,504	0	0	0	8,983	32,487
MH14-164	Village of DeForest	3,281	101.5	2.3	0	167,331	31,313	306	0	78,268	277,217
MH14-162	Windsor - Hidden Springs SD	75	0.0	0.0	0	4,238	0	0	0	1,741	5,978
MH14-160/160F	Windsor - SD No. 1 (Q140)	1205	0.0	0.0	0	68,083	0	0	0	22,568	90,650
MH14-157	Village of DeForest	828	1.4	0.0	0	42,228	432	0	0	9,457	52,117
	Monitoring Point Q139				2	693,159	70,335	59,850	26,167	365,801	1,215,312
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,933	0	0	0	4,308	10,241
MH14-155	Windsor - SD No. 1 (Q097)	1,324	12.5	0.9	0	74,806	8,069	56	0	53,509	136,440

		2035									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	749	3.4	8.1	1	42,319	2,195	502	10,767	33,306	89,088
MH14-151	Windsor - Lake Windsor SD	77	0.0	0.0	0	4,351	0	0	0	1,711	6,061
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,916	0	0	0	2,523	7,438
MH14-144	Windsor - Lake Windsor SD	164	15.9	0	0	9,266	10,263	0	0	4,755	24,285
	Lake Windsor (Q007)	328	16	0	0	18,532	10,263	0	0	8,989	37,784
MH14-143	Vienna UD No. 2 (Q121)	650	0	0	0	33,157	0	0	0	4,876	38,033
MH14-136F	Village of DeForest	0	77.5	50.3	0	0	23,909	6,690	0	31,556	62,155
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	165	158.7	59.5	1	8,415	48,959	7,914	6,848	4,789	76,925
MH14-416	Village of Windsor	750			0	42,375	0	0	0	0	42,375
MH14-415	Village of Windsor	1,064	36.5	107.4	0	60,116	23,561	6,659	0	47,367	137,703
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	0	6.0	0.0	0	0	3,873	0	0	12,164	16,037
MH14-404	Village of DeForest	0	36.0	0.0	0	0	11,106	0	0	1,573	12,679
MH14-131	Westport UD No. 4 (Q116)	170	0	0	0	9,413	0	0	0	3,273	12,685
MH14-104	Westport UD No. 3 (Q061)	192	16.5	0	0	10,647	4,752	0	0	2,276	17,675
MH14-101	City of Madison (Q082)	4,813	39.3	0.0	2	271,935	40,852	0	40,246	55,344	408,376
	PS14 Totals	31,874	1,173	603	18	2,517,596	527,065	195,102	407,205	1,136,865	4,783,834

		2040									
						Wastewater (gpd)					
17CatchCon	Community (Monitoring Point)	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-359	Village of Dane (E26)	1,400	16.9	54.3	0	65,100	4,462	10,969	0	3,692	84,222
MH14-359/359F	Village of Waunakee	7,401	95.6	118.3	1	447,761	35,946	26,696	245,200	196,016	951,619
MH14-362/362F	Village of Waunakee	2,509	269.6	0.0	1	145,200	101,370	0	10,610	53,385	310,564
MH14-361	Village of Waunakee	103	0.0	0.0	0	6,232	0	0	0	2,065	8,297
MH14-360	Village of Waunakee	119	0.0	0.0	0	7,200	0	0	0	2,386	9,586
MH14-356	Villageof Waunakee and Town of Westport	901	49.9	0.0	0	54,511	18,762	0	0	24,311	97,584
MH14-355	Village of Waunakee	0	3.8	0.0	0	0	1,429	0	0	506	1,935
MH14-353/353F	Village of Waunakee	191	96.3	176.5	1	11,556	36,209	65,612	2,728	22,611	138,715
MH14-351	Village of Waunakee	595	2.2	0.0	0	35,998	827	0	0	12,150	48,974
MH14-348A	Villageof Waunakee and Town of Westport	162	4.4	0.0	0	9,801	1,654	0	0	2,450	13,906
MH14-343	Town of Westport	3	0.0	0.0	0	167	0	0	0	55	221
MH14-341/341F	Village of Waunakee	3,816	144.3	0	0	230,868	54,257	0	0	29,961	315,086
MH14-336/336F	Village of Waunakee	1,019	61.6	0.0	0	61,650	23,162	0	0	21,965	106,776
MH14-332	Village of Waunakee	749	0	0	0	45,315	0	0	0	12,072	57,386
	Monitoring Point Q096	18,968	745	349	3	1,121,355	278,077	103,277	258,538	383,625	2,144,870
MH14-323	Village of Waunakee and Westport - UD No. 2 (Q076)	2,016	3.1	116.3	0	121,968	1,166	43,729	0	67,816	234,678
MH14-318	Westport - UD No. 2	15	19.2	17.2	0	833	5,530	4,954	0	5,695	17,011
MH14-315	Westport - UD No. 2 (Q075)	1,521	39.4	1.8	9	59,774	7,661	518	64,553	55,540	188,046
MH14-209	Village of DeForest	3,404	77.2	421.2	1	173,604	23,816	56,020	20,984	112,038	386,462
MH14-208	Village of DeForest	74	7.6	0.8	0	3,774	2,345	106	0	3,223	9,448
MH14-206	Village of DeForest	193	2.5	0.0	0	9,843	771	0	0	5,314	15,928
MH14-205	Village of DeForest	370	0.8	0.0	0	18,870	247	0	0	9,846	28,963
MH14-201	Village of DeForest	133	0.0	0.0	0	6,783	0	0	0	3,495	10,278
MH14-199	Village of DeForest	203	0.0	0.0	0	10,353	0	0	0	5,334	15,687
MH14-196	Windsor - Morrisonville SD No. 1 (E25)	385	4.6	0.0	0	19,250	706	0	0	43,291	63,247
MH14-196	Village of DeForest and Vienna UD No. 1	2,277	31.5	25.7	1	116,127	9,718	3,418	4,720	45,430	179,413
MH14-195	Village of DeForest	31	0.0	0.0	0	1,581	0	0	0	815	2,396
MH14-194A	Village of DeForest	78	0.0	0.0	0	3,978	0	0	0	2,050	6,028
MH14-192	Village of DeForest	469	3.2	0.0	0	23,919	987	0	0	12,820	37,726
MH14-186/186F	Village of DeForest	241	0.0	0.0	0	12,291	0	0	0	1,130	13,421
MH14-170	Village of DeForest	141	0.0	0.0	0	7,191	0	0	0	0	7,191
MH14-168	Windsor - Oak Springs SD (Q004)	416	0.0	0.0	0	23,504	0	0	0	8,983	32,487
MH14-164	Village of DeForest	3,281	101.5	2.3	0	167,331	31,313	306	0	78,268	277,217
MH14-162	Windsor - Hidden Springs SD	75	0.0	0.0	0	4,238	0	0	0	1,741	5,978
MH14-160/160F	Windsor - SD No. 1 (Q140)	1205	0.0	0.0	0	68,083	0	0	0	22,568	90,650
MH14-157	Village of DeForest	828	1.4	0.0	0	42,228	432	0	0	9,457	52,117
	Monitoring Point Q139	13,804	230	450	2	712,947	70,335	59,850	25,703	365,801	1,234,636
MH14-156	Windsor - SD No. 1	105	0.0	0.0	0	5,933	0	0	0	4,308	10,241
MH14-155	Windsor - SD No. 1 (Q097)	1,324	12.5	0.9	0	74,806	8,069	56	0	53,509	136,440

17CatchCon	Community (Monitoring Point)	2040									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Large Water Users	Residential	Institutional - Commercial	Industrial	Large Water Users	I/I	Total
MH14-152	Windsor - SD No. 1	749	3.4	8.1	1	42,319	2,195	502	10,751	33,306	89,073
MH14-151	Windsor - Lake Windsor SD	77	0.0	0.0	0	4,351	0	0	0	1,711	6,061
MH14-148	Windsor - Lake Windsor SD	87	0.0	0.0	0	4,916	0	0	0	2,523	7,438
MH14-144	Windsor - Lake Windsor SD	164	15.9	0	0	9,266	10,263	0	0	4,755	24,285
	Lake Windsor (Q007)	328	16	0	0	18,532	10,263	0	0	8,989	37,784
MH14-143	Vienna UD No. 2 (Q121)	650	0	0	0	33,157	0	0	0	4,876	38,033
MH14-136F	Village of DeForest	0	77.5	50.3	0	0	23,909	6,690	0	31,556	62,155
MH14-416	Village of DeForest and Town of Burke (Q101 + Q102 +Q13	165	158.7	59.5	1	8,415	48,959	7,914	6,892	4,789	76,969
MH14-416	Village of Windsor	830			0	46,895	0	0	0	0	46,895
MH14-415	Village of Windsor	1,280	36.5	107.4	0	72,320	23,561	6,659	0	47,367	149,907
MH14-413	Windsor SD No. 1 and SD No. 3 (Q095)	0	6.0	0.0	0	0	3,873	0	0	12,164	16,037
MH14-404	Village of DeForest	0	43.5	0.0	0	0	13,420	0	0	1,573	14,992
MH14-131	Westport UD No. 4 (Q116)	170	0	0	0	9,413	0	0	0	3,273	12,685
MH14-104	Westport UD No. 3 (Q061)	192	16.5	0	0	10,647	4,752	0	0	2,276	17,675
MH14-101	City of Madison (Q082)	4,813	39.3	0.0	2	271,935	40,852	0	40,617	55,344	408,748
	PS14 Totals	46,930	1,446.4	1,160.6	18	2,611,246	542,620	234,148	407,055	1,141,808	4,936,876

		2010									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	2,401	8.3	0.0	0	0	141,659	8,391	0	525	150,575
MH05-116	City of Middleton	2,964	13.3	0.2	0	0	174,876	13,446	39	659	189,021
MH05-113/113F	City of Middleton	6,469	316.7	96.3	4	120,132	381,671	298,043	13,406	2,846	816,099
MH05-106	City of Middleton	1,404	24.0	0.2	0	0	82,836	24,264	39	375	107,514
MH05-025A	City of Middleton and City of Madison	926	18.0	0.0	0	0	54,634	18,198	0	255	73,087
	PS 15 Totals	14,164	380.3	96.7	4	120,132	835,676	362,342	13,485	4,661	1,336,296

		2015									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	2,410	16.9	0.0	0	0	130,140	14,652	0	1,738	146,530
MH05-116	City of Middleton	3,060	13.3	4.5	0	0	165,240	11,531	1,791	2,143	180,705
MH05-113/113F	City of Middleton	7,115	327.9	107.4	4	126,346	384,210	265,302	31,641	9,690	817,189
MH05-106	City of Middleton	1,406	23.4	0.2	0	0	75,924	20,288	80	1,155	97,447
MH05-025A	City of Middleton and City of Madison	926	18.8	0.0	0	0	50,004	16,300	0	796	67,099
	PS 15 Totals	14,917	400.3	112.1	4	126,346	805,518	328,073	33,512	15,521	1,308,970

		2020									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	3,079	18.1	0.0	0	0	173,964	16,996	0	1,131	192,091
MH05-116	City of Middleton	3,914	14.7	4.5	0	0	221,141	13,803	1,337	1,401	237,682
MH05-113/113F	City of Middleton	7,531	330.6	120.6	4	123,239	425,502	289,832	27,532	6,268	872,372
MH05-106	City of Middleton	1,415	22.4	0.2	0	0	79,948	21,034	59	765	101,806
MH05-025A	City of Middleton and City of Madison	926	20.0	0.0	0	0	52,319	18,780	0	525	71,624
	PS 15 Totals	16,865	405.8	125.3	4	123,239	952,873	360,445	28,928	10,091	1,475,575

17CatchCon	Community	2025									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	4,519	19.4	0.0	0	0	255,324	18,217	0	1,131	274,671
MH05-116	City of Middleton	4,166	16.1	4.5	0	0	235,379	15,118	1,337	1,401	253,234
MH05-113/113F	City of Middleton	7,531	333.3	133.8	4	124,792	425,502	292,423	31,452	6,268	880,438
MH05-106	City of Middleton	1,415	22.4	0.2	0	0	79,948	21,034	59	765	101,806
MH05-025A	City of Middleton and City of Madison	926	20.2	0.0	0	0	52,319	18,968	0	525	71,812
	PS 15 Totals	18,557	411.4	138.5	4	124,792	1,048,471	365,759	32,848	10,091	1,581,961

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	5,899	20.7	0.0	0	0	333,294	19,437	0	1,131	353,862
MH05-116	City of Middleton	4,619	17.5	4.5	0	0	260,974	16,433	1,337	1,401	280,144
MH05-113/113F	City of Middleton	7,531	336.0	147.0	4	124,016	425,502	294,921	35,373	6,268	886,079
MH05-106	City of Middleton	1,415	22.4	0.2	0	0	79,948	21,034	59	765	101,806
MH05-025A	City of Middleton and City of Madison	926	20.5	0.0	0	0	52,319	19,250	0	525	72,094
	PS 15 Totals	20,390	417.1	151.7	4	124,016	1,152,035	371,074	36,769	10,091	1,693,984

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	9,367	22.0	0.0	0	0	529,236	20,658	0	1,131	551,025
MH05-116	City of Middleton	4,831	18.9	4.5	0	0	272,952	17,747	1,337	1,401	293,436
MH05-113/113F	City of Middleton	11,111	338.7	160.2	4	124,404	627,772	297,513	39,293	6,268	1,095,250
MH05-106	City of Middleton	1,415	22.4	0.2	0	0	79,948	21,034	59	765	101,806
MH05-025A	City of Middleton and City of Madison	926	20.7	0	0	0	52,319	19,437	0	525	72,282
	PS 15 Totals	27,650	423	165	4	124,404	1,562,225	376,389	40,689	10,091	2,113,798

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
MH05-119/119F	City of Middleton and Westport UD No.	10,481	23.5	0.0	0	0	592,177	22,067	0	1,131	615,374
MH05-116	City of Middleton	4,831	20.3	4.5	0	0	272,952	19,062	1,337	1,401	294,751
MH05-113/113F	City of Middleton	15,388	341.4	173.4	4	124,210	869,422	300,011	43,214	6,268	1,343,124
MH05-106	City of Middleton	1,415	22.4	0.2	0	0	79,948	21,034	59	765	101,806
MH05-025A	City of Middleton and City of Madison	926	20.9	0.0	0	0	52,319	19,625	0	525	72,469
	PS 15 Totals	33,041	428.5	178.1	4	124,210	1,866,817	381,797	44,609	10,091	2,427,524

17CatchCon	Community	2010									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	5,094	317.6	9.2	100	300,993	295,452	0	0	27,532	623,977
SAS 2244-002	City of Middleton	1,108	253.6	171.9	76	263,100	65,372	0	0	15,162	343,635
MH05-311	City of Middleton	750	3.7	0.7	0	0	44,250	3,741	137	2,222	50,349
MH05-236	City of Middleton	390	0.0	0.0	0	0	23,010	0	0	1,062	24,072
MH16-210	City of Middleton	694	0.0	0.0	0	0	40,946	0	0	1,890	42,836
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,691	0	0	678	15,369
SAS 2546-007	City of Madison	4,931	163.3	0.0	78	118,045	285,998	0	0	18,651	422,693
SOUTH POINT	City of Madison	218	45.7	11.6	7	6,771	12,644	0	0	896	20,312
SAS 2546-011	City of Madison	2,087	15.2	0.0	4	3,324	121,046	0	0	5,741	130,111
SAS 2546-009	City of Madison, City of Middleton	2,126	9.5	0.0	4	2,150	123,308	0	0	5,791	131,249
	PS 16 Totals	17,647	808.6	193.4	269	694,384	1,026,717	3,741	137	79,625	1,804,603

17CatchCon	Community	2015									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	5,398	334.5	0.0	113	304,276	296,890	0	0	3,396	604,562
SAS 2244-002	City of Middleton	1,315	265.4	171.4	70	239,992	71,010	0	0	1,757	312,759
MH05-311	City of Middleton	750	3.7	0.7	0	0	40,500	3,208	279	248	44,235
MH05-236	City of Middleton	390	0.0	0.0	0	0	21,060	0	0	119	21,179
MH16-210	City of Middleton	694	0.0	0.0	0	0	37,476	0	0	212	37,688
MH16-102	City of Middleton	249	0.0	0.0	0	0	13,446	0	0	76	13,522
SAS 2546-007	City of Madison	4,931	162.1	0.0	92	118,238	271,205	0	0	2,200	391,643
SOUTH POINT	City of Madison	430	51.5	11.6	9	5,995	23,650	0	0	167	29,813
SAS 2546-011	City of Madison	2,087	14.8	0.0	4	2,248	114,785	0	0	661	117,694
SAS 2546-009	City of Madison, City of Middleton	2,126	10.1	0.0	4	1,930	116,930	0	0	671	119,531
	PS 16 Totals	18,370	842.1	183.7	292	672,679	1,006,952	3,208	279	9,508	1,692,626

17CatchCon	Community	2020									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	6,527	350.0	0.0	113	317,444	368,776	16,133	0	15,464	717,816
SAS 2244-002	City of Middleton	1,315	268.4	175.7	70	251,546	74,298	2,798	1,271	8,460	338,373
MH05-311	City of Middleton	750	3.7	0.7	0	0	42,375	3,474	208	1,235	47,292
MH05-236	City of Middleton	390	0.0	0.0	0	0	22,035	0	0	591	22,626
MH16-210	City of Middleton	694	0.0	0.0	0	0	39,211	0	0	1,051	40,262
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,069	0	0	377	14,446
SAS 2546-007	City of Madison	5,146	185.4	20.5	92	118,653	290,749	24,220	19,567	10,425	463,614
SOUTH POINT	City of Madison	1,456	70.4	18.0	9	5,995	82,264	19,647	6,128	532	114,565
SAS 2546-011	City of Madison	2,087	14.9	0.0	4	2,786	117,916	83	0	3,201	123,986
SAS 2546-009	City of Madison, City of Middleton	2,126	10.0	0.0	4	2,040	120,119	0	0	3,231	125,390
	PS 16 Totals	20,740	902.8	214.9	292	698,464	1,171,810	66,356	27,174	44,566	2,008,370

17CatchCon	Community	2025				Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	8,695	388.9	3.1	113	317,444	491,268	56,590	2,959	15,464	883,725
SAS 2244-002	City of Middleton	1,315	271.4	180.0	70	245,769	74,298	5,596	2,542	8,460	336,665
MH05-311	City of Middleton	750	3.7	0.7	0	0	42,375	3,474	208	1,235	47,292
MH05-236	City of Middleton	390	0.0	0.0	0	0	22,035	0	0	591	22,626
MH16-210	City of Middleton	694	0.0	0.0	0	0	39,211	0	0	1,051	40,262
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,069	0	0	377	14,446
SAS 2546-007	City of Madison	6,348	209.5	34.8	92	118,653	358,662	49,272	33,217	10,425	570,229
SOUTH POINT	City of Madison	TO PS 17									
SAS 2546-011	City of Madison	2,087	15.0	0.0	4	2,786	117,916	166	0	3,201	124,069
SAS 2546-009	City of Madison, City of Middleton	2,126	9.9	0.0	4	2,040	120,119	0	0	3,231	125,390
	PS 16 Totals	22,654	898.3	218.6	283	686,691	1,279,951	115,100	38,926	44,035	2,164,703

17CatchCon	Community	2030									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	8,695	416.2	4.7	113	317,444	491,268	84,886	4,486	15,464	913,547
SAS 2244-002	City of Middleton	1,315	274.3	184.2	70	248,658	74,298	8,395	3,813	8,460	343,623
MH05-311	City of Middleton	750	3.7	0.7	0	0	42,375	3,474	208	1,235	47,292
MH05-236	City of Middleton	390	0.0	0.0	0	0	22,035	0	0	591	22,626
MH16-210	City of Middleton	694	0.0	0.0	0	0	39,211	0	0	1,051	40,262
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,069	0	0	377	14,446
SAS 2546-007	City of Madison	6,351	233.6	48.9	92	118,653	358,832	74,324	46,675	10,425	608,909
SOUTH POINT	City of Madison	TO PS 17									
SAS 2546-011	City of Madison	2,087	15.0	0.0	4	2,786	117,916	249	0	3,201	124,152
SAS 2546-009	City of Madison, City of Middleton	2,126	9.7	0.0	4	2,040	120,119	0	0	3,231	125,390
	PS 16 Totals	22,657	952.6	238.5	283	689,580	1,280,121	171,328	55,183	44,035	2,240,246

17CatchCon	Community	2035									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	8,695	443.4	6.2	113	317,444	491,268	113,181	5,918	15,464	943,274
SAS 2244-002	City of Middleton	1,315	277.3	188.5	70	247,213	74,298	11,193	5,085	8,460	346,248
MH05-311	City of Middleton	750	3.7	0.7	0	0	42,375	3,474	208	1,235	47,292
MH05-236	City of Middleton	390	0.0	0.0	0	0	22,035	0	0	591	22,626
MH16-210	City of Middleton	694	0.0	0.0	0	0	39,211	0	0	1,051	40,262
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,069	0	0	377	14,446
SAS 2546-007	City of Madison	6,351	257.7	63.2	92	118,653	358,832	99,376	60,324	10,425	647,610
SOUTH POINT	City of Madison	TO PS 17									
SAS 2546-011	City of Madison	2,087	15.1	0.0	4	2,786	117,916	333	0	3,201	124,235
SAS 2546-009	City of Madison, City of Middleton	2,126	9.6	0.0	4	2,040	120,119	0	0	3,231	125,390
	PS 16 Totals	22,657	1006.8	258.6	283	688,136	1,280,121	227,557	71,535	44,035	2,311,382

17CatchCon	Community	2040									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
SAS 2244-003/003F	City of Madison, City of Middleton	12,337	470.6	7.8	113	317,444	697,041	141,476	7,445	15,464	1,178,869
SAS 2244-002	City of Middleton	1,315	280.3	192.8	70	247,936	74,298	13,991	6,356	8,460	351,039
MH05-311	City of Middleton	750	3.7	0.7	0	0	42,375	3,474	208	1,235	47,292
MH05-236	City of Middleton	390	0.0	0.0	0	0	22,035	0	0	591	22,626
MH16-210	City of Middleton	694	0.0	0.0	0	0	39,211	0	0	1,051	40,262
MH16-102	City of Middleton	249	0.0	0.0	0	0	14,069	0	0	377	14,446
SAS 2546-007	City of Madison	6,351	281.8	77.4	92	118,653	358,832	124,428	73,878	10,425	686,216
SOUTH POINT	City of Madison	TO PS 17									
SAS 2546-011	City of Madison	2,087	15.2	0.0	4	2,786	117,916	416	0	3,201	124,319
SAS 2546-009	City of Madison, City of Middleton	2,126	10.0	0.0	4	2,040	120,119	0	0	3,231	125,390
	PS 16 Totals	26,299	1061.6	278.7	283	688,858	1,485,894	283,785	87,887	44,035	2,590,458

17CatchCon	Community	2010									
						Wastewater (gpd)					
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	Not Constructed / Served									
SOUTH POINT	City of Madison	To PS 16									
MIDTOWN	City of Madison	To PS 12									
MH17-146/146F	City of Verona	0	0.0	0.0	0	0	0	0	0		0
MH17-128	City of Verona	3,823	94.4	1.3	0	0	210,265	43,141	1,370		254,776
MH17-120/120F	City of Verona	294	136.7	0.0	1	43,104	16,170	0	0		59,274
MH17-119	City of Verona	127	93.0	24.2	0	0	6,985	42,501	25,507		74,993
MH17-108/108F	City of Verona	45	0.0	0.0	0	0	2,475	0	0		2,475
MH17-201/201F	City of Verona	6,800	216.1	63.4	1	13,756	374,000	81,620	66,824		536,200
	PS ~~16~~ Totals	11,089	540.2	88.9	2	56,860	609,895	167,262	93,701	0	927,718

		2015									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	Not Constructed / Served									
SOUTH POINT	City of Madison	To PS 16									
MIDTOWN	City of Madison	To PS 12									
MH17-146/146F	City of Verona	0	0.0	0.0	0	0	0	0	0	0	0
MH17-128	City of Verona	3,852	92.7	0.0	0	0	192,616	58,784	0	2,690	254,091
MH17-120/120F	City of Verona	639	148.1	0.0	1	29,049	31,926	7,215	0	730	68,920
MH17-119	City of Verona	127	30.3	1.4	0	0	6,335	19,185	1,495	289	27,303
MH17-108/108F	City of Verona	45	52.4	1.8	0	0	2,250	33,203	1,897	400	37,750
MH17-201/201F	City of Verona	7,767	229.2	11.0	1	12,419	388,350	121,563	11,692	5,714	539,738
	PS ~~16~~ Totals	12,430	552.7	14.2	2	41,468	621,477	239,950	15,084	9,822	927,802

		2020									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	Not Constructed / Served									
SOUTH POINT	City of Madison	To PS 16									
MIDTOWN	City of Madison	To PS 12									
MH17-146/146F	City of Verona	29	95.5	0.0	0	0	1,523	52,118	0	107	53,748
MH17-128	City of Verona	3,995	93.8	0.3	0	0	209,738	51,168	279	522	261,707
MH17-120/120F	City of Verona	682	162.0	0.0	1	36,077	35,805	13,789	0	171	85,842
MH17-119	City of Verona	127	34.9	5.3	0	0	6,668	19,041	5,640	63	31,412
MH17-108/108F	City of Verona	45	83.4	10.0	0	0	2,363	45,505	10,589	117	58,573
MH17-201/201F	City of Verona	9,154	252.6	20.7	1	13,088	480,585	117,363	21,878	1,266	634,179
	PS ~~16~~ Totals	14,032	722.3	36.3	2	49,164	736,680	298,984	38,386	2,246	1,125,461

		2025									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	581	49.9	0	0	0	32,827	51,871	0	169	84,867
SOUTH POINT	City of Madison	1,641	77.7	114.7	0	0	92,717	80,769	109,481	566	283,533
MIDTOWN	City of Madison	3,778	14.8	0	0	0	213,457	15,385	0	458	229,299
MH17-146/146F	City of Verona	29	153.7	0.0	0	0	1,523	83,818	0	171	85,511
MH17-128	City of Verona	3,995	94.9	0.5	0	0	209,738	51,757	558	524	262,577
MH17-120/120F	City of Verona	682	175.9	0.0	1	36,077	35,805	95,940	0	336	168,158
MH17-119	City of Verona	127	39.6	9.3	0	0	6,668	21,576	9,790	76	38,109
MH17-108/108F	City of Verona	45	114.5	18.2	0	0	2,363	62,441	19,286	168	84,258
MH17-201/201F	City of Verona	9,201	276.1	30.4	1	13,088	483,053	150,589	32,097	1,358	680,183
	PS ~~16~~ Totals	20,079	997	173	2	49,164	1,078,148	614,146	171,212	3,825	1,916,495

		2030									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	3,679	49.9	0	0	0	207,864	51,871	0	519	260,254
SOUTH POINT	City of Madison	3,489	77.7	114.7	0	0	197,129	80,769	109,481	775	388,154
MIDTOWN	City of Madison	11,211	14.8	0	0	0	633,422	15,385	0	1,298	650,104
MH17-146/146F	City of Verona	29	211.8	0.0	0	0	1,523	115,518	0	234	117,275
MH17-128	City of Verona	3,995	96.0	0.8	0	0	209,738	52,346	837	526	263,447
MH17-120/120F	City of Verona	682	189.8	0.0	1	36,077	35,805	103,522	0	351	175,754
MH17-119	City of Verona	127	44.2	13.2	0	0	6,668	24,110	13,940	89	44,807
MH17-108/108F	City of Verona	861	145.5	26.5	0	0	45,203	79,378	27,983	305	152,869
MH17-201/201F	City of Verona	9,405	299.5	40.0	1	13,088	493,763	163,358	42,316	1,425	713,949
	PS ~~16~~ Totals	33,478	1,129	195	2	49,164	1,831,111	686,257	194,557	5,522	2,766,611

17CatchCon	Community	2035									
		Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Wastewater (gpd)					
						Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	3,679	49.9	0	0	0	207,864	51,871	0	519	260,254
SOUTH POINT	City of Madison	3,489	77.7	114.7	0	0	197,129	80,769	109,481	775	388,154
MIDTOWN	City of Madison	14,030	14.8	0	0	0	792,695	15,385	0	1,616	809,696
MH17-146/146F	City of Verona	541	269.9	0.0	0	0	28,403	147,218	0	351	175,972
MH17-128	City of Verona	3,995	97.0	1.1	0	0	209,738	52,935	1,116	528	264,317
MH17-120/120F	City of Verona	682	203.7	0.0	1	36,077	35,805	111,103	0	366	183,351
MH17-119	City of Verona	127	48.8	17.1	0	0	6,668	26,644	18,089	103	51,504
MH17-108/108F	City of Verona	1,261	176.6	34.7	0	0	66,203	96,315	36,680	398	199,595
MH17-201/201F	City of Verona	9,405	322.9	49.7	1	13,088	493,763	176,127	52,535	1,471	736,983
	PS ~~16~~ Totals	37,209	1,261	217	2	49,164	2,038,265	758,367	217,902	6,127	3,069,825

		2040									
						Wastewater (gpd)					
17CatchCon	Community	Population	Institutional - Commercial Land Use (acres)	Industrial Land Use (acres)	Known Non-Res Water Users	Known Non-Res Water User	Residential	Unknown Institutional - Commercial	Unknown Industrial	I/I	Total
LBMC-2025	City of Madison	3,679	49.9	0	0	0	207,864	51,871	0	519	260,254
SOUTH POINT	City of Madison	3,489	77.7	114.7	0	0	197,129	80,769	109,481	775	388,154
MIDTOWN	City of Madison	14,030	14.8	0	0	0	792,695	15,385	0	1,616	809,696
MH17-146/146F	City of Verona	541	466.6	0.0	0	0	28,403	254,519	0	566	283,488
MH17-128	City of Verona	3,995	98.1	1.3	0	0	209,738	53,524	1,395	529	265,187
MH17-120/120F	City of Verona	682	392.2	0.0	1	36,077	35,805	213,956	0	572	286,409
MH17-119	City of Verona	127	53.5	21.0	0	0	6,668	29,179	22,239	116	58,202
MH17-108/108F	City of Verona	2,017	207.7	241.7	0	0	105,893	113,317	255,498	949	475,657
MH17-201/201F	City of Verona	9,501	361.1	78.7	1	13,088	498,803	196,975	83,154	1,584	793,603
	PS ~~16~~ Totals	38,061	1,721.6	457.5	2	49,164	2,082,995	1,009,495	471,768	7,227	3,620,648
	17										

From	To	2010				2015			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH14-209	MH14-196	445,852	0.45	4.0	1.78	382,410	0.38	4.0	1.53
MH14-196	MH14-193	222,007	0.67	4.0	2.67	189,433	0.57	4.0	2.29
MH14-193	MH14-182	46,205	0.71	4.0	2.86	35,893	0.61	4.0	2.43
MH14-182	MH14-171	0	0.71	4.0	2.86	0	0.61	4.0	2.43
MH14-171	MH14-166	30,724	0.74	4.0	2.98	34,250	0.64	4.0	2.57
MH14-166	MH14-162	253,595	1.00	4.0	3.99	210,241	0.85	4.0	3.41
MH14-162	MH14-156	98,577	1.10	3.9	4.32	107,663	0.96	4.0	3.84
MH14-156	MH14-143	313,193	1.41	3.8	5.34	179,025	1.14	3.9	4.46
MH14-143	MH14-134	36,126	1.45	3.8	5.46	97,059	1.24	3.9	4.78
MH14-416	MH14-415	56,254	0.06	4.0	0.23	77,569	0.08	4.0	0.31
MH14-415	MH14-134	124,512	0.18	4.0	0.72	196,389	0.27	4.0	1.10
MH14-134	MH14-102	30,547	1.66	3.7	6.12	28,341	1.54	3.7	5.75
MH14-362	MH14-358	247,179	0.25	4.0	0.99	217,812	0.22	4.0	0.87
MH14-359	MH14-358	945,145	0.95	4.0	3.78	728,843	0.73	4.0	2.92
MH14-358	MH14-356		1.19	3.9	4.64		0.95	4.0	3.79
MH14-356	MH14-345	272,341	1.46	3.8	5.52	224,128	1.17	3.9	4.57
MH14-345	MH14-338	110,516	1.58	3.7	5.86	136,258	1.31	3.8	5.01
MH14-338	MH14-333	94,816	1.67	3.7	6.16	81,492	1.39	3.8	5.27
MH14-333	MH14-323	48,880	1.72	3.7	6.31	49,006	1.44	3.8	5.43
MH14-323	MH14-315	199,646	1.92	3.6	6.92	139,807	1.58	3.7	5.87
MH14-315	MH14-102	248,995	2.17	3.5	7.67	156,343	1.73	3.7	6.36
MH14-102	MH14-101		3.83	3.2	12.38		3.27	3.3	10.85
MH14-101	PS 14	410,344	4.24	3.2	13.49	341,837	3.61	3.3	11.80
PS 14			4.24	3.2	13.49		3.61	3.3	11.80
PS 14	TE14-11057		4.24	3.2	13.49		3.61	3.3	11.80
TE14-11057	MH13-137	28,431	4.26	3.2	13.56	24,978	3.64	3.3	11.87
MH13-137	MH13-132	84,259	4.35	3.2	13.79	73,687	3.71	3.3	12.07
MH13-132	MH13-124	11,627	4.36	3.2	13.82	10,102	3.72	3.2	12.10
MH13-124	MH13-122A	57,422	4.42	3.2	13.97	50,762	3.77	3.2	12.24
SAS 4926-002	MH13-122A	298,928				289,802			
SAS 5429-013	MH13-122A	575,551				468,451			
SAS 5831-004	MH13-122A	740,598				708,574			
MH13-122A	MH13-105A	253,220	6.29	3.0	18.80	238,731	5.48	3.1	16.75
MH13-105A	MH13-101	9,914	6.30	3.0	18.83	16,755	5.50	3.1	16.79
MH13-101	PS 13	113	6.30	3.0	18.83	394	5.50	3.1	16.80
PS 13	MH10-145		6.30	3.0	18.83		5.50	3.1	16.80
MH10-145	MH10-131	434,098	6.73	3.0	19.92	547,975	6.04	3.0	18.19
MH10-131	MH10-426	154,172	6.88	2.9	20.30	179,965	6.22	3.0	18.65
MH10-426	MH10-419	433,640	7.32	2.9	21.37	370,073	6.59	3.0	19.58
MH10-220	MH10-211	25,865	0.03	4.0	0.10	24,468	0.02	4.0	0.10
MH10-211	MH10-419	478,977	0.50	4.0	2.02	434,437	0.46	4.0	1.84
MH10-419	MH10-417		7.82	2.9	22.61		7.05	2.9	20.72
MH10-417	MH10-415	53,204	7.88	2.9	22.74	49,276	7.10	2.9	20.84
MH10-415	MH10-108		3.94	3.2	12.68		3.55	3.3	11.63

		2010				2015			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH10-108	MH10-104A	122,014	4.06	3.2	13.01	196,754	3.75	3.2	12.17
MH10-305	MH10-104A	244,041	0.24	4.0	0.98	199,929	0.20	4.0	0.80
MH10-104A	MH10-402		4.30	3.2	13.67		3.95	3.2	12.71
MH10-415	MH10-403		3.94	3.2	12.68		3.55	3.3	11.63
MH10-403	MH10-402	6,688	3.94	3.2	12.70	5,447	3.56	3.3	11.64
MH10-402	MH10-402		8.25	2.9	23.64		7.50	2.9	21.83
MH10-402	MH10-101		4.12	3.2	13.19		3.75	3.2	12.18
MH10-101	PS 10	575,519	4.70	3.1	14.72	466,643	4.22	3.2	13.44
MH10-402	PS 10		4.12	3.2	13.19		3.75	3.2	12.18
PS 10			8.82	2.8	25.02		7.97	2.9	22.97
PS 10	MH07-955		8.82	2.8	25.02		7.97	2.9	22.97
MH07-955	MH07-939	206,259	9.03	2.8	25.51	230,699	8.20	2.9	23.53
MH07-939	MH07-932	819,912	9.85	2.8	27.45	869,247	9.07	2.8	25.61
MH07-740	MH07-729A	0	0.00		0.00	0	0.00		0.00
MH07-729A	MH07-719	297,878	0.30	4.0	1.19	409,755	0.41	4.0	1.64
MH07-719	MH07-707	112,697	0.41	4.0	1.64	119,055	0.53	4.0	2.12
MH07-707	MH07-426	0	0.41	4.0	1.64	0	0.53	4.0	2.12
MH07-437	MH07-426	631,885	0.63	4.0	2.53	648,449	0.65	4.0	2.59
MH07-426	MH07-421		1.04	4.0	4.14		1.18	3.9	4.59
MH07-421	MH07-414	0	1.04	4.0	4.14	0	1.18	3.9	4.59
MH07-414	MH07-405	63,040	1.11	3.9	4.35	47,906	1.23	3.9	4.75
MH07-405	MH07-932	204,397	1.31	3.8	5.02	340,563	1.57	3.7	5.83
MH07-932	MH18-014		11.16	2.7	30.49		10.64	2.8	29.28
MH18-014	MH18-014	144,223	11.30	2.7	30.82	158,183	10.79	2.7	29.65
MH18-014	MH18-006		5.65	3.0	17.20		5.40	3.1	16.54
MH18-014	MH07-308		5.65	3.0	17.20		5.40	3.1	16.54
MH07-308	MH18-006	23,364	5.68	3.0	17.26	26,864	5.42	3.1	16.61
MH18-006	MH18-006	114,825	11.44	2.7	31.14	76,996	10.90	2.7	29.89
MH18-006	PS 18		8.58	2.8	24.44		8.17	2.9	23.46
MH18-006	MH07-214B		2.86	3.4	9.69		2.72	3.4	9.30
PS 18	WWTP		8.58	2.8	24.44		8.17	2.9	23.46
MH09-108	MH09-101	503,016	0.50	4.0	2.01	464,558	0.46	4.0	1.86
MH09-101	PS 9	320,900	0.82	4.0	3.30	291,404	0.76	4.0	3.02
PS 9		823,916	0.82	4.0	3.30	755,962	0.76	4.0	3.02
PS 9	MH07-517	823,916	0.82	4.0	3.30	755,962	0.76	4.0	3.02

From	To	2010 Sub-Basin Flow (gpd)	2010 Cumulative Flow (MGD)	2010 Peak Factor	2010 Cumulative Peak Flow (MGD)	2015 Sub-Basin Flow (gpd)	2015 Cumulative Flow (MGD)	2015 Peak Factor	2015 Cumulative Peak Flow (MGD)
MH07-517	MH07-512	41,509	0.87	4.0	3.46	63,728	0.82	4.0	3.28
MH07-618	MH07-512	147,488	0.15	4.0	0.59	151,403	0.15	4.0	0.61
MH07-512	MH07-228	99,236	1.11	3.9	4.37	116,420	1.09	3.9	4.29
MH07-249	MH07-242	82,686	0.08	4.0	0.33	110,875	0.11	4.0	0.44
MH07-242	MH07-228	47,413	0.13	4.0	0.52	75,173	0.19	4.0	0.74
MH07-228	MH07-226		1.24	3.9	4.80		1.27	3.9	4.90
MH07-226	MH07-218	39,832	1.28	3.8	4.93	42,643	1.32	3.8	5.04
MH07-823	MH07-218	143,871	0.14	4.0	0.58	135,698	0.14	4.0	0.54
MH07-218	MH07-214B		1.43	3.8	5.39		1.45	3.8	5.48
MH07-214B	MH07-206		4.29	3.2	13.62		4.18	3.2	13.33
MH07-206	PS 7	474,653	4.76	3.1	14.88	337,468	4.51	3.2	14.23
MH06-122	MH06-108A	148,397	0.15	4.0	0.59	124,167	0.12	4.0	0.50
MH06-209	MH06-108A	216,287	0.22	4.0	0.87	164,964	0.16	4.0	0.66
MH06-108A	MH06-108		0.36	4.0	1.46		0.29	4.0	1.16
MH06-108	PS 6	57,063	0.42	4.0	1.69	42,149	0.33	4.0	1.33
SAS 6243-022	PS 6	840,959				614,098			
SAS 6646-001	PS 6	84,904				34,359			
SAS 6648-007	PS 6	859,296				659,836			
PS 6		2,206,905	2.21	3.5	7.79	1,639,574	1.64	3.7	6.07
PS 6	MH07-129		2.21	3.5	7.79	1,639,574	1.64	3.7	6.07
MH07-129	MH07-101	861,210	3.07	3.4	10.28	641,943	2.28	3.5	8.01
MH07-101	PS 7	211,713	3.28	3.3	10.87	223,323	2.50	3.5	8.67
PS 7	WWTP		8.04	2.9	23.14		7.02	2.9	20.64
MH04-408	MH04-312	298,970	0.30	4.0	1.20	216,728	0.22	4.0	0.87
MH04-312	MH04-311	488,956	0.79	4.0	3.15	380,554	0.60	4.0	2.39
MH04-315	MH04-311	38,616	0.04	4.0	0.15	27,607	0.03	4.0	0.11
MH04-311	MH04-209		0.83	4.0	3.31		0.62	4.0	2.50
MH04-209	MH04-201	86,950	0.91	4.0	3.65	57,975	0.68	4.0	2.73
MH04-201B	MH04-201	100,968	0.10	4.0	0.40	100,233	0.10	4.0	0.40
MH04-201	PS 4		1.01	4.0	4.05		0.78	4.0	3.13
MH03-311	MH03-108	175,933	0.18	4.0	0.70	149,363	0.15	4.0	0.60
MH03-108	MH03-201	57,542	0.23	4.0	0.93	46,896	0.20	4.0	0.79
MH03-201	PS 3	85,632	0.32	4.0	1.28	31,095	0.23	4.0	0.91
MH05-317	MH05-311	967,612	0.97	4.0	3.87	917,321	0.92	4.0	3.67
MH05-311	MH05-236	50,349	1.02	4.0	4.06	44,235	0.96	4.0	3.85
MH05-240	MH05-236	704,365	0.70	4.0	2.82	658,681	0.66	4.0	2.63

From	To	2010 Sub-Basin Flow (gpd)	2010 Cumulative Flow (MGD)	2010 Peak Factor	2010 Cumulative Peak Flow (MGD)	2015 Sub-Basin Flow (gpd)	2015 Cumulative Flow (MGD)	2015 Peak Factor	2015 Cumulative Peak Flow (MGD)
MH05-236	MH16-210	24,072	1.75	3.7	6.40	21,179	1.64	3.7	6.07
MH16-210	PS 16	42,836	1.79	3.6	6.53	37,688	1.68	3.7	6.19
MH16-102	PS 16	15,369	0.02	4.0	0.06	13,522	0.01	4.0	0.05
PS 16		1,804,603	1.80	3.6	6.58	1,692,626	1.69	3.7	6.23
PS 16	MH12-177		1.80	3.6	6.58		1.69	3.7	6.23
MH12-177	MH12-176		1.80	3.6	6.58		1.69	3.7	6.23
MH12-176	MH12-164	484,352	2.29	3.5	8.03	428,885	2.12	3.6	7.54
MH12-164	MH12-157	181,783	2.47	3.5	8.57	165,785	2.29	3.5	8.03
MH12-157	MH12-133	370,522	2.84	3.4	9.64	308,481	2.60	3.4	8.93
MH12-220	MH12-219A	130,489	0.13	4.0	0.52	116,028	0.12	4.0	0.46
MH12-219A	MH12-210	181,244	0.31	4.0	1.25	198,695	0.31	4.0	1.26
MH12-210	MH12-206	1,175	0.31	4.0	1.25	7,284	0.32	4.0	1.29
MH12-311	MH12-206	0	0.00	0.0	0.00	0	0.00	0.0	0.00
MH12-206	MH12-133		0.31	4.0	1.25		0.32	4.0	1.29
MH12-133	MH12-131		3.15	3.3	10.52		2.92	3.4	9.85
MH12-131	MH12-123A	138,864	3.29	3.3	10.91	123,707	3.04	3.4	10.21
MH12-123A	MH12-121	42,629	3.34	3.3	11.03	37,847	3.08	3.3	10.31
MH12-121	MH12-118A	846,750	4.18	3.2	13.34	760,260	3.84	3.2	12.42
MH12-118A	MH12-114	335,787	4.52	3.2	14.24	299,008	4.14	3.2	13.23
MH12-114	MH12-112A	16,399	4.53	3.2	14.28	14,560	4.15	3.2	13.27
MH12-112A	MH12-110	36,207	4.57	3.1	14.38	37,450	4.19	3.2	13.37
Midtown Rd	CTH PD	0	0.00	4.0	0.00	0	0.00	4.0	0.00
CTH PD	MH17-146	0	0.00	4.0	0.00	0	0.00	4.0	0.00
MH17-146	MH17-128	0	0.00	4.0	0.00	0	0.00	4.0	0.00
MH17-128	MH17-120	254,776	0.25	4.0	1.02	254,091	0.25	4.0	1.02
MH17-120	MH17-119	59,274	0.31	4.0	1.26	68,920	0.32	4.0	1.29
MH17-119	MH17-108	74,993	0.39	4.0	1.56	27,303	0.35	4.0	1.40
MH17-108	PS 17	2,475	0.39	4.0	1.57	37,750	0.39	4.0	1.55
MH17-201	PS 17	536,200	0.54	4.0	2.14	539,738	0.54	4.0	2.16
PS 17		927,718	0.93	4.0	3.71	927,802	0.93	4.0	3.71
PS 17	MH12-110		0.93	4.0	3.71		0.93	4.0	3.71
MH12-110	MH12-102		5.50	3.1	16.80		5.12	3.1	15.82
MH12-102	PS 12	78,766	5.58	3.0	17.00	72,468	5.19	3.1	16.01
MH11-166A	MH11-159	316,037	5.89	3.0	17.81	312,193	5.50	3.1	16.81
MH11-159	MH11-151A	389,845	6.28	3.0	18.80	378,072	5.88	3.0	17.78
MH11-151A	MH11-145	137,682	6.42	3.0	19.14	139,216	6.02	3.0	18.13
MH11-145	MH11-138	352,489	6.77	3.0	20.03	350,751	6.37	3.0	19.02
MH11-138	MH11-116A	1,057,987	7.83	2.9	22.63	1,089,859	7.46	2.9	21.72
MH11-306	MH11-116A	173,910	0.17	4.0	0.70	163,497	0.16	4.0	0.65
MH11-116A	MH11-111A		8.01	2.9	23.05		7.62	2.9	22.12

From	To	2010 Sub-Basin Flow (gpd)	2010 Cumulative Flow (MGD)	2010 Peak Factor	2010 Cumulative Peak Flow (MGD)	2015 Sub-Basin Flow (gpd)	2015 Cumulative Flow (MGD)	2015 Peak Factor	2015 Cumulative Peak Flow (MGD)
MH11-111A	MH11-106A	150,192	8.16	2.9	23.42	159,792	7.78	2.9	22.51
MH11-423	MH11-410	216,301	0.22	4.0	0.87	179,699	0.18	4.0	0.72
MH11-410	MH11-106A	57,696	0.27	4.0	1.10	57,861	0.24	4.0	0.95
MH11-106A	MH11-104		8.43	2.9	24.08		8.02	2.9	23.09
MH11-104	PS 11	122,251	8.55	2.8	24.37	122,475	8.14	2.9	23.39
MH11-226	MH11-207	192,010	0.19	4.0	0.77	114,789	0.11	4.0	0.46
MH11-207	PS 11	53,990	0.25	4.0	0.98	32,611	0.15	4.0	0.59
PS 11	WWTP		8.80	2.8	24.96		8.29	2.9	23.74
MHWP-04488	MH05-116	150,575	0.15	4.0	0.60	146,530	0.15	4.0	0.59
MH05-116	MH05-113	189,021	0.34	4.0	1.36	180,705	0.33	4.0	1.31
MH05-113	MH15-101	816,099	1.16	3.9	4.52	817,189	1.14	3.9	4.48
MH05-106	MH15-101	107,514	0.11	4.0	0.43	97,447	0.10	4.0	0.39
MH15-101	MH05-103		1.26	3.9	4.87		1.24	3.9	4.80
MH05-025A	MH05-103	73,087	0.07	4.0	0.29	67,099	0.07	4.0	0.27
MH05-103	PS 15		1.34	3.8	5.11		1.31	3.8	5.02
PS 15		1,336,296	1.34	3.8	5.11	1,308,970	1.31	3.8	5.02
MH05-230	MH05-212	199,181	0.20	4.0	0.80	153,540	0.15	4.0	0.61
MH05-212	MH05-205	100,851	0.30	4.0	1.20	80,654	0.23	4.0	0.94
MH05-205	MH05-011	29,608	0.33	4.0	1.32	24,450	0.26	4.0	1.03
MH05-102	MH05-011	29,487	0.03	4.0	0.12	23,613	0.02	4.0	0.09
MH05-011	MH05-008		0.36	4.0	1.44		0.28	4.0	1.13
MH05-008	MH05-401	121,485	0.48	4.0	1.92	93,300	0.38	4.0	1.50
MH05-401	PS 5	219,451	0.70	4.0	2.80	190,852	0.57	4.0	2.27
PS 5		700,064	0.70	4.0	2.80	566,410	0.57	4.0	2.27
PS 5	TE05-22376		0.70	4.0	2.80		0.57	4.0	2.27
TE05-22376	MH02-545		2.04	3.6	7.28		1.88	3.6	6.79
MH02-545	MH02-544A	3,596	2.04	3.6	7.29	3,410	1.88	3.6	6.80
MH02-544A	MH02-542	702,568	2.74	3.4	9.35	657,482	2.54	3.5	8.76
MH02-542	MH02-532		2.74	3.4	9.35		2.54	3.5	8.76
MH02-532	MH02-531A	53,300	2.80	3.4	9.51	45,920	2.58	3.4	8.89
MH02-542	MH02-055		0.00		0.00		0.00		0.00
MH02-055	MH02-041	84,950	0.08	4.0	0.34	122,637	0.12	4.0	0.49
MH02-041	MH02-034	134,238	0.22	4.0	0.88	163,934	0.29	4.0	1.15
MH02-034	MH02-513	206,275	0.43	4.0	1.70	196,335	0.48	4.0	1.93
MH02-708	MH02-705	565,437	0.57	4.0	2.26	553,890	0.55	4.0	2.22
MH02-705	MH02-531A	144,423	0.71	4.0	2.84	133,868	0.69	4.0	2.75
MH02-531A	MH02-531		3.51	3.3	11.50		3.27	3.3	10.85
MH02-531	MH02-516	75,205	3.58	3.3	11.71	64,792	3.33	3.3	11.03

		2010				2015			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH02-516	MH08-228	1,177,627	4.76	3.1	14.88	876,540	4.21	3.2	13.42
MH08-228	MH08-223		2.63	3.4	9.03		2.33	3.5	8.15
MH08-223	MH02-210	288,213	2.92	3.4	9.86	311,275	2.64	3.4	9.06
MH02-210	MH02-020		1.33	3.8	5.09		1.20	3.9	4.67
MH02-021	MH02-020	421,896	0.42	4.0	1.69	426,791	0.43	4.0	1.71
MH02-020	MH08-206		1.75	3.7	6.41		1.63	3.7	6.03
MH02-210	MH08-209		1.59	3.7	5.90		1.44	3.8	5.42
MH08-228	MH02-513		2.13	3.5	7.56		1.89	3.6	6.82
MH02-513	MH08-209		2.56	3.4	8.81		2.37	3.5	8.27
MH08-209	MH08-209	47,070	4.19	3.2	13.37	53,694	3.86	3.2	12.47
MH08-209	MH08-207		1.09	3.9	4.31		1.00	4.0	4.02
MH08-209	MH08-207		3.10	3.3	10.37		2.85	3.4	9.67
MH08-207	MH08-207		4.19	3.2	13.37		3.86	3.2	12.47
MH08-207	MH08-206		2.49	3.5	8.62		2.29	3.5	8.04
MH08-207	MH02-502		1.70	3.7	6.27		1.57	3.7	5.84
MH02-502	MH02-014A	83,767	1.79	3.6	6.52	93,965	1.66	3.7	6.14
MH08-206	MH08-206		4.24	3.2	13.50		3.92	3.2	12.64
MH08-206	MH02-014A		1.23	3.9	4.78		1.14	3.9	4.47
MH08-206	MH08-201		3.01	3.4	10.10		2.78	3.4	9.46
MH02-014A	MH02-014A		3.02	3.4	10.15		2.80	3.4	9.53
MH02-014A	MH08-201		3.02	3.4	10.15		2.80	3.4	9.53
MH02-014A	MH02-014		0.00		0.00		0.00		0.00
MH08-201	MH08-119		6.03	3.0	18.15		5.58	3.0	17.02
MH08-119	MH08-113	84,395	6.11	3.0	18.37	79,293	5.66	3.0	17.22
MH02-174	MH02-173A	299,367	0.30	4.0	1.20	298,262	0.30	4.0	1.19
MH02-173A	MH02-171B	169,109	0.47	4.0	1.87	157,001	0.46	4.0	1.82
MH02-171B	MH02-163	48,903	0.52	4.0	2.07	46,346	0.50	4.0	2.01
MH02-163	MH02-154	160,547	0.68	4.0	2.71	146,706	0.65	4.0	2.59
MH02-154	MH02-146	49,360	0.73	4.0	2.91	47,743	0.70	4.0	2.78
MH02-146	MH02-136	216,358	0.94	4.0	3.77	213,561	0.91	4.0	3.64
MH02-136	MH02-133	114,999	1.06	4.0	4.20	121,422	1.03	4.0	4.10
MH02-133	MH08-113	44,941	1.10	3.9	4.35	32,034	1.06	4.0	4.21
MH08-113	MH08-113		7.22	2.9	21.12		6.73	3.0	19.91
MH08-113	MH02-121		0.98	4.0	3.93		0.81	4.0	3.24
MH02-121	MH08-109	90,104	1.07	4.0	4.24	63,202	0.87	4.0	3.49
MH08-113	MH08-109		6.23	3.0	18.68		5.92	3.0	17.87
MH08-109	MH08-109		7.31	2.9	21.35		6.79	3.0	20.06
MH08-109	MH08-106		0.77	4.0	3.09		0.63	4.0	2.54
MH08-109	MH08-106		6.53	3.0	19.43		6.15	3.0	18.47
MH08-106	MH08-106	191,946	7.50	2.9	21.82	188,965	6.98	2.9	20.53

From	To	2010				2015			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH08-106	PS 8		6.87	2.9	20.27		6.48	3.0	19.30
SAS 4760-004	PS 8	94,437	6.97	2.9	20.51	108,085	6.59	3.0	19.57
PS 8	WWTP		6.97	2.9	20.51		6.59	3.0	19.57
MH08-106	MH02-114		0.63	4.0	2.50		0.50	4.0	1.99
MH02-114	MH02-606	57,822	0.68	4.0	2.73	48,398	0.55	4.0	2.18
MH02-606	MH02-401	149,457	0.83	4.0	3.33	138,504	0.68	4.0	2.73
MH01-126	MH01-617	71,240	0.07	4.0	0.28	68,891	0.07	4.0	0.28
MH01-617	MH01-615	445,442	0.52	4.0	2.07	417,587	0.49	4.0	1.95
MH01-615	MH01-604	395,307	0.91	4.0	3.65	289,388	0.78	4.0	3.10
MH01-604	MH01-303	516,485	1.43	3.8	5.40	543,598	1.32	3.8	5.05
MH01-003	MH01-303	463,182	0.46	4.0	1.85	237,129	0.24	4.0	0.95
MH01-303	PS 1		1.89	3.6	6.84		1.56	3.7	5.81
SAS 5543-003 a	PS 1	2,261,354	4.15	3.2	13.27	2,374,767	3.93	3.2	12.67
MH02-014	MH02-316	431,816	0.43	4.0	1.73	285,782	0.29	4.0	1.14
MH02-316	MH02-314A		0.43	4.0	1.73		0.29	4.0	1.14
MH02-314A	MH02-306A	214,548	0.65	4.0	2.59	235,555	0.52	4.0	2.09
MH02-306A	MH02-300	251,113	0.90	4.0	3.59	219,399	0.74	4.0	2.96
MH02-300	MH02-101	1,492,886	2.39	3.5	8.33	1,359,658	2.10	3.6	7.47
MH02-316	MH02-012		0	0	0		0	0	0
MH02-012	MH02-011	343,688	0.34	4.0	1.37	280,441	0.28	4.0	1.12
MH02-011	MH02-010	99,712	0.44	4.0	1.77	77,743	0.36	4.0	1.43
MH02-010	MH02-008A	98,258	0.54	4.0	2.17	90,045	0.45	4.0	1.79
MH02-008A	MH02-006A	118,084	0.66	4.0	2.64	101,294	0.55	4.0	2.20
MH02-006A	MH02-005A	497,487	1.16	3.9	4.52	397,314	0.95	4.0	3.79
MH02-005A	MH02-005A	1,052,892	2.21	3.5	7.80	873,877	1.82	3.6	6.62
MH02-005A	MH02-005		0.00		0.00		0.00		0.00
MH02-005	MH02-101	47,906	0.05	4.0	0.19	37,950	0.04	4.0	0.15
MH02-005A	MH02-402		2.21	3.5	7.80		1.82	3.6	6.62
MH02-101	MH02-402		2.44	3.5	8.47		2.14	3.5	7.59
MH02-402	MH02-401	20,772	4.67	3.1	14.64	15,637	3.97	3.2	12.78
MH02-401	PS 2		5.50	3.1	16.81		4.66	3.1	14.61
PS 2	TE02-10933		9.66	2.8	26.99		8.59	2.8	24.46
TE02-10933	TE02-17328		10.67	2.8	29.36		9.37	2.8	26.33
TE02-17328	WWTP		10.99	2.7	30.10		9.60	2.8	26.86

From	To	2020 Sub-Basin Flow (gpd)	2020 Cumulative Flow (MGD)	2020 Peak Factor	2020 Cumulative Peak Flow (MGD)	2025 Sub-Basin Flow (gpd)	2025 Cumulative Flow (MGD)	2025 Peak Factor	2025 Cumulative Peak Flow (MGD)
MH14-209	MH14-196	453,014	0.45	4.0	1.81	456,740	0.46	4.0	1.83
MH14-196	MH14-193	216,208	0.67	4.0	2.68	222,415	0.68	4.0	2.72
MH14-193	MH14-182	41,049	0.71	4.0	2.84	41,049	0.72	4.0	2.88
MH14-182	MH14-171	0	0.71	4.0	2.84	0	0.72	4.0	2.88
MH14-171	MH14-166	39,678	0.75	4.0	3.00	39,678	0.76	4.0	3.04
MH14-166	MH14-162	250,034	1.00	4.0	4.00	266,354	1.03	4.0	4.09
MH14-162	MH14-156	126,671	1.13	3.9	4.42	134,168	1.16	3.9	4.53
MH14-156	MH14-143	268,423	1.40	3.8	5.29	270,939	1.43	3.8	5.41
MH14-143	MH14-134	82,083	1.48	3.8	5.56	93,498	1.52	3.7	5.71
MH14-416	MH14-415	77,860	0.08	4.0	0.31	88,807	0.09	4.0	0.36
MH14-415	MH14-134	124,335	0.20	4.0	0.81	143,599	0.23	4.0	0.93
MH14-134	MH14-102	30,360	1.71	3.7	6.28	30,360	1.79	3.6	6.52
MH14-362	MH14-358	259,799	0.26	4.0	1.04	275,448	0.28	4.0	1.10
MH14-359	MH14-358	897,124	0.90	4.0	3.59	916,547	0.92	4.0	3.67
MH14-358	MH14-356		1.16	3.9	4.52		1.19	3.9	4.64
MH14-356	MH14-345	265,268	1.42	3.8	5.38	265,350	1.46	3.8	5.49
MH14-345	MH14-338	175,294	1.60	3.7	5.93	233,395	1.69	3.7	6.22
MH14-338	MH14-333	96,061	1.69	3.7	6.23	96,061	1.79	3.6	6.52
MH14-333	MH14-323	53,393	1.75	3.7	6.40	57,386	1.84	3.6	6.70
MH14-323	MH14-315	183,659	1.93	3.6	6.96	180,288	2.02	3.6	7.24
MH14-315	MH14-102	203,089	2.13	3.5	7.57	179,020	2.20	3.5	7.78
MH14-102	MH14-101		3.84	3.2	12.43		3.99	3.2	12.83
MH14-101	PS 14	410,606	4.25	3.2	13.54	407,633	4.40	3.2	13.92
PS 14			4.25	3.2	13.54		4.40	3.2	13.92
PS 14	TE14-11057		4.25	3.2	13.54		4.40	3.2	13.92
TE14-11057	MH13-137	26,990	4.28	3.2	13.61	26,990	4.43	3.2	14.00
MH13-137	MH13-132	79,176	4.36	3.2	13.82	79,176	4.50	3.2	14.21
MH13-132	MH13-124	12,842	4.37	3.2	13.85	12,842	4.52	3.2	14.24
MH13-124	MH13-122A	54,534	4.43	3.2	14.00	95,557	4.61	3.1	14.49
SAS 4926-002	MH13-122A	294,534				294,534			
SAS 5429-013	MH13-122A	524,623				524,623			
SAS 5831-004	MH13-122A	732,678				732,678			
MH13-122A	MH13-105A	258,606	6.24	3.0	18.68	274,039	6.44	3.0	19.19
MH13-105A	MH13-101	82,371	6.32	3.0	18.89	149,986	6.59	3.0	19.57
MH13-101	PS 13	313	6.32	3.0	18.89	313	6.59	3.0	19.57
PS 13	MH10-145		6.32	3.0	18.89		6.59	3.0	19.57
MH10-145	MH10-131	626,104	6.95	2.9	20.46	703,860	7.29	2.9	21.31
MH10-131	MH10-426	171,128	7.12	2.9	20.88	174,018	7.47	2.9	21.74
MH10-426	MH10-419	409,043	7.53	2.9	21.89	415,609	7.88	2.9	22.75
MH10-220	MH10-211	35,603	0.04	4.0	0.14	77,453	0.08	4.0	0.31
MH10-211	MH10-419	471,203	0.51	4.0	2.03	524,036	0.60	4.0	2.41
MH10-419	MH10-417		8.03	2.9	23.12		8.48	2.9	24.21
MH10-417	MH10-415	59,482	8.09	2.9	23.26	63,205	8.55	2.8	24.36
MH10-415	MH10-108		4.05	3.2	12.98		4.27	3.2	13.59

		2020				2025			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH10-108	MH10-104A	170,840	4.22	3.2	13.44	171,050	4.44	3.2	14.05
MH10-305	MH10-104A	231,955	0.23	4.0	0.93	232,101	0.23	4.0	0.93
MH10-104A	MH10-402		4.45	3.2	14.06		4.68	3.1	14.66
MH10-415	MH10-403		4.05	3.2	12.98		4.27	3.2	13.59
MH10-403	MH10-402	8,150	4.05	3.2	13.00	10,146	4.28	3.2	13.62
MH10-402	MH10-402		8.50	2.9	24.26		8.96	2.8	25.35
MH10-402	MH10-101		4.25	3.2	13.53		4.48	3.2	14.14
MH10-101	PS 10	529,712	4.78	3.1	14.94	531,999	5.01	3.1	15.54
MH10-402	PS 10		4.25	3.2	13.53		4.48	3.2	14.14
PS 10			9.03	2.8	25.52		9.49	2.8	26.61
PS 10	MH07-955		9.03	2.8	25.52		9.49	2.8	26.61
MH07-955	MH07-939	228,146	9.26	2.8	26.06	235,304	9.73	2.8	27.16
MH07-939	MH07-932	877,666	10.14	2.8	28.13	879,392	10.61	2.8	29.22
MH07-740	MH07-729A	0	0.00		0.00	0	0.00		0.00
MH07-729A	MH07-719	521,899	0.52	4.0	2.09	667,579	0.67	4.0	2.67
MH07-719	MH07-707	120,046	0.64	4.0	2.57	124,186	0.79	4.0	3.17
MH07-707	MH07-426	78,838	0.72	4.0	2.88	161,145	0.95	4.0	3.81
MH07-437	MH07-426	655,000	0.66	4.0	2.62	655,000	0.66	4.0	2.62
MH07-426	MH07-421		1.38	3.8	5.23		1.61	3.7	5.97
MH07-421	MH07-414	0	1.38	3.8	5.23	0	1.61	3.7	5.97
MH07-414	MH07-405	69,195	1.44	3.8	5.45	89,245	1.70	3.7	6.24
MH07-405	MH07-932	293,819	1.74	3.7	6.37	310,590	2.01	3.6	7.19
MH07-932	MH18-014		11.88	2.7	32.14		12.62	2.7	33.81
MH18-014	MH18-014	155,155	12.03	2.7	32.49	155,155	12.77	2.7	34.16
MH18-014	MH18-006		6.02	3.0	18.13		6.39	3.0	19.06
MH18-014	MH07-308		6.02	3.0	18.13		6.39	3.0	19.06
MH07-308	MH18-006	26,349	6.04	3.0	18.19	27,256	6.41	3.0	19.12
MH18-006	MH18-006	118,572	12.18	2.7	32.82	118,572	12.92	2.7	34.49
MH18-006	PS 18		9.13	2.8	25.76		9.69	2.8	27.07
MH18-006	MH07-214B		3.04	3.4	10.21		3.23	3.3	10.73
PS 18	WWTP		9.13	2.8	25.76		9.69	2.8	27.07
MH09-108	MH09-101	496,245	0.50	4.0	1.98	522,802	0.52	4.0	2.09
MH09-101	PS 9	309,433	0.81	4.0	3.22	309,517	0.83	4.0	3.33
PS 9		805,678	0.81	4.0	3.22	832,319	0.83	4.0	3.33
PS 9	MH07-517	805,678	0.81	4.0	3.22	832,319	0.83	4.0	3.33

From	To	2020				2025			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH07-517	MH07-512	58,961	0.86	4.0	3.46	58,961	0.89	4.0	3.57
MH07-618	MH07-512	172,964	0.17	4.0	0.69	183,118	0.18	4.0	0.73
MH07-512	MH07-228	135,361	1.17	3.9	4.58	152,004	1.23	3.9	4.75
MH07-249	MH07-242	142,159	0.14	4.0	0.57	248,132	0.25	4.0	0.99
MH07-242	MH07-228	84,569	0.23	4.0	0.91	154,008	0.40	4.0	1.61
MH07-228	MH07-226		1.40	3.8	5.31		1.63	3.7	6.03
MH07-226	MH07-218	57,955	1.46	3.8	5.49	74,301	1.70	3.7	6.26
MH07-823	MH07-218	141,198	0.14	4.0	0.56	142,941	0.14	4.0	0.57
MH07-218	MH07-214B		1.60	3.7	5.94		1.85	3.6	6.70
MH07-214B	MH07-206		4.64	3.1	14.57		5.07	3.1	15.70
MH07-206	PS 7	423,327	5.07	3.1	15.68	436,820	5.51	3.1	16.84
MH06-122	MH06-108A	136,372	0.14	4.0	0.55	136,372	0.14	4.0	0.55
MH06-209	MH06-108A	190,773	0.19	4.0	0.76	190,773	0.19	4.0	0.76
MH06-108A	MH06-108		0.33	4.0	1.31		0.33	4.0	1.31
MH06-108	PS 6	49,606	0.38	4.0	1.51	49,606	0.38	4.0	1.51
SAS 6243-022	PS 6	761,829				761,829			
SAS 6646-001	PS 6	59,876				59,876			
SAS 6648-007	PS 6	769,552				769,552			
PS 6		1,968,007	1.97	3.6	7.07	1,968,007	1.97	3.6	7.07
PS 6	MH07-129	1,968,007	1.97	3.6	7.07	1,968,007	1.97	3.6	7.07
MH07-129	MH07-101	753,043	2.72	3.4	9.29	753,043	2.72	3.4	9.29
MH07-101	PS 7	226,220	2.95	3.4	9.94	226,345	2.95	3.4	9.94
PS 7	WWTP		8.01	2.9	23.07		8.46	2.9	24.15
MH04-408	MH04-312	274,439	0.27	4.0	1.10	274,626	0.27	4.0	1.10
MH04-312	MH04-311	459,062	0.73	4.0	2.93	459,712	0.73	4.0	2.94
MH04-315	MH04-311	35,469	0.04	4.0	0.14	35,469	0.04	4.0	0.14
MH04-311	MH04-209		0.77	4.0	3.08		0.77	4.0	3.08
MH04-209	MH04-201	91,549	0.86	4.0	3.44	91,645	0.86	4.0	3.45
MH04-201B	MH04-201	100,196	0.10	4.0	0.40	100,196	0.10	4.0	0.40
MH04-201	PS 4		0.96	4.0	3.84		0.96	4.0	3.85
MH03-311	MH03-108	180,580	0.18	4.0	0.72	205,448	0.21	4.0	0.82
MH03-108	MH03-201	52,219	0.23	4.0	0.93	52,219	0.26	4.0	1.03
MH03-201	PS 3	44,206	0.28	4.0	1.11	46,456	0.30	4.0	1.22
MH05-317	MH05-311	1,056,189	1.06	4.0	4.19	1,220,389	1.22	3.9	4.73
MH05-311	MH05-236	47,292	1.10	3.9	4.35	47,292	1.27	3.9	4.88
MH05-240	MH05-236	827,556	0.83	4.0	3.31	819,688	0.82	4.0	3.28

From	To	2020 Sub-Basin Flow (gpd)	2020 Cumulative Flow (MGD)	2020 Peak Factor	2020 Cumulative Peak Flow (MGD)	2025 Sub-Basin Flow (gpd)	2025 Cumulative Flow (MGD)	2025 Peak Factor	2025 Cumulative Peak Flow (MGD)
MH05-236	MH16-210	22,626	1.95	3.6	7.03	22,626	2.11	3.6	7.50
MH16-210	PS 16	40,262	1.99	3.6	7.15	40,262	2.15	3.5	7.62
MH16-102	PS 16	14,446	0.01	4.0	0.06	14,446	0.01	4.0	0.06
PS 16		2,008,370	2.01	3.6	7.20	2,164,703	2.16	3.5	7.66
PS 16	MH12-177		2.01	3.6	7.20		2.16	3.5	7.66
MH12-177	MH12-176		2.01	3.6	7.20		2.16	3.5	7.66
MH12-176	MH12-164	477,981	2.49	3.5	8.61	478,039	2.64	3.4	9.07
MH12-164	MH12-157	178,827	2.67	3.4	9.13	178,841	2.82	3.4	9.58
MH12-157	MH12-133	344,283	3.01	3.4	10.11	344,339	3.17	3.3	10.56
MH12-220	MH12-219A	125,439	0.13	4.0	0.50	125,393	0.13	4.0	0.50
MH12-219A	MH12-210	346,077	0.47	4.0	1.89	183,520	0.31	4.0	1.24
MH12-210	MH12-206	36,987	0.51	4.0	2.03	112,195	0.42	4.0	1.68
MH12-311	MH12-206	34,689	0.03	4.0	0.14	56,233	0.06	4.0	0.22
MH12-206	MH12-133		0.54	4.0	2.17		0.48	4.0	1.91
MH12-133	MH12-131		3.55	3.3	11.63		3.64	3.3	11.88
MH12-131	MH12-123A	131,300	3.68	3.3	11.99	131,298	3.77	3.2	12.24
MH12-123A	MH12-121	40,238	3.72	3.2	12.10	40,231	3.81	3.2	12.35
MH12-121	MH12-118A	816,604	4.54	3.1	14.30	816,588	4.63	3.1	14.54
MH12-118A	MH12-114	321,699	4.86	3.1	15.15	321,674	4.95	3.1	15.39
MH12-114	MH12-112A	15,479	4.88	3.1	15.19	15,495	4.97	3.1	15.43
MH12-112A	MH12-110	42,147	4.92	3.1	15.30	42,173	5.01	3.1	15.54
Midtown Rd	CTH PD	0	0.00	4.0	0.00	597,699	0.60	4.0	2.39
CTH PD	MH17-146	0	0.00	4.0	0.00		0.60	4.0	2.39
MH17-146	MH17-128	53,748	0.05	4.0	0.21	85,511	0.68	4.0	2.73
MH17-128	MH17-120	261,707	0.32	4.0	1.26	262,577	0.95	4.0	3.78
MH17-120	MH17-119	85,842	0.40	4.0	1.61	168,158	1.11	3.9	4.38
MH17-119	MH17-108	31,412	0.43	4.0	1.73	38,109	1.15	3.9	4.51
MH17-108	PS 17	58,573	0.49	4.0	1.97	84,258	1.24	3.9	4.78
MH17-201	PS 17	634,179	0.63	4.0	2.54	680,183	0.68	4.0	2.72
PS 17		1,125,461	1.13	3.9	4.42	1,916,495	1.92	3.6	6.92
PS 17	MH12-110		1.13	3.9	4.42		1.92	3.6	6.92
MH12-110	MH12-102		6.05	3.0	18.20		6.93	2.9	20.41
MH12-102	PS 12	107,623	6.15	3.0	18.47	107,600	7.03	2.9	20.68
MH11-166A	MH11-159	338,671	6.49	3.0	19.32	391,530	7.43	2.9	21.64
MH11-159	MH11-151A	399,701	6.89	2.9	20.32	399,701	7.83	2.9	22.62
MH11-151A	MH11-145	162,640	7.05	2.9	20.72	192,825	8.02	2.9	23.08
MH11-145	MH11-138	355,214	7.41	2.9	21.60	357,938	8.38	2.9	23.95
MH11-138	MH11-116A	1,128,885	8.54	2.9	24.34	1,181,417	9.56	2.8	26.76
MH11-306	MH11-116A	178,377	0.18	4.0	0.71	201,033	0.20	4.0	0.80
MH11-116A	MH11-111A		8.72	2.8	24.76		9.76	2.8	27.24

From	To	2020 Sub-Basin Flow (gpd)	2020 Cumulative Flow (MGD)	2020 Peak Factor	2020 Cumulative Peak Flow (MGD)	2025 Sub-Basin Flow (gpd)	2025 Cumulative Flow (MGD)	2025 Peak Factor	2025 Cumulative Peak Flow (MGD)
MH11-111A	MH11-106A	308,537	9.03	2.8	25.50	314,482	10.07	2.8	27.97
MH11-423	MH11-410	207,920	0.21	4.0	0.83	211,267	0.21	4.0	0.85
MH11-410	MH11-106A	57,779	0.27	4.0	1.06	57,779	0.27	4.0	1.08
MH11-106A	MH11-104		9.29	2.8	26.13		10.34	2.8	28.60
MH11-104	PS 11	124,559	9.42	2.8	26.43	125,002	10.47	2.8	28.89
MH11-226	MH11-207	153,474	0.15	4.0	0.61	150,869	0.15	4.0	0.60
MH11-207	PS 11	49,116	0.20	4.0	0.81	89,184	0.24	4.0	0.96
PS 11	WWTP		9.62	2.8	26.90		10.71	2.8	29.45
MHWP-04488	MH05-116	192,091	0.19	4.0	0.77	274,671	0.27	4.0	1.10
MH05-116	MH05-113	237,682	0.43	4.0	1.72	253,234	0.53	4.0	2.11
MH05-113	MH15-101	872,372	1.30	3.8	5.00	880,438	1.41	3.8	5.34
MH05-106	MH15-101	101,806	0.10	4.0	0.41	101,806	0.10	4.0	0.41
MH15-101	MH05-103		1.40	3.8	5.32		1.51	3.7	5.66
MH05-025A	MH05-103	71,624	0.07	4.0	0.29	71,812	0.07	4.0	0.29
MH05-103	PS 15		1.48	3.8	5.55		1.58	3.7	5.89
PS 15		1,475,575	1.48	3.8	5.55	1,581,961	1.58	3.7	5.89
MH05-230	MH05-212	176,411	0.18	4.0	0.71	176,411	0.18	4.0	0.71
MH05-212	MH05-205	91,205	0.27	4.0	1.07	91,205	0.27	4.0	1.07
MH05-205	MH05-011	27,821	0.30	4.0	1.18	27,821	0.30	4.0	1.18
MH05-102	MH05-011	26,550	0.03	4.0	0.11	26,550	0.03	4.0	0.11
MH05-011	MH05-008		0.32	4.0	1.29		0.32	4.0	1.29
MH05-008	MH05-401	107,856	0.43	4.0	1.72	107,856	0.43	4.0	1.72
MH05-401	PS 5	209,264	0.64	4.0	2.56	209,264	0.64	4.0	2.56
PS 5		639,106	0.64	4.0	2.56	639,106	0.64	4.0	2.56
PS 5	TE05-22376		0.64	4.0	2.56		0.64	4.0	2.56
TE05-22376	MH02-545		2.11	3.6	7.51		2.22	3.5	7.83
MH02-545	MH02-544A	3,503	2.12	3.6	7.53	3,503	2.22	3.5	7.84
MH02-544A	MH02-542	684,145	2.80	3.4	9.53	721,416	2.95	3.4	9.93
MH02-542	MH02-532		2.80	3.4	9.53		2.95	3.4	9.93
MH02-532	MH02-531A	49,610	2.85	3.4	9.67	49,610	3.00	3.4	10.08
MH02-542	MH02-055		0.00		0.00		0.00		0.00
MH02-055	MH02-041	136,225	0.14	4.0	0.54	136,225	0.14	4.0	0.54
MH02-041	MH02-034	173,441	0.31	4.0	1.24	173,441	0.31	4.0	1.24
MH02-034	MH02-513	201,367	0.51	4.0	2.04	201,367	0.51	4.0	2.04
MH02-708	MH02-705	559,993	0.56	4.0	2.24	560,784	0.56	4.0	2.24
MH02-705	MH02-531A	139,183	0.70	4.0	2.80	139,183	0.70	4.0	2.80
MH02-531A	MH02-531		3.55	3.3	11.63		3.70	3.3	12.02
MH02-531	MH02-516	69,999	3.62	3.3	11.82	69,999	3.77	3.2	12.22

		2020				2025			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH02-516	MH08-228	1,030,886	4.65	3.1	14.60	1,034,441	4.80	3.1	14.99
MH08-228	MH08-223		2.57	3.4	8.86		2.65	3.4	9.10
MH08-223	MH02-210	316,247	2.89	3.4	9.77	319,989	2.97	3.4	10.01
MH02-210	MH02-020		1.32	3.8	5.04		1.36	3.8	5.17
MH02-021	MH02-020	434,862	0.43	4.0	1.74	440,392	0.44	4.0	1.76
MH02-020	MH08-206		1.75	3.7	6.41		1.80	3.6	6.55
MH02-210	MH08-209		1.57	3.7	5.85		1.62	3.7	6.00
MH08-228	MH02-513		2.08	3.6	7.42		2.15	3.5	7.62
MH02-513	MH08-209		2.59	3.4	8.92		2.66	3.4	9.12
MH08-209	MH08-209	55,979	4.22	3.2	13.45	55,979	4.33	3.2	13.75
MH08-209	MH08-207		1.10	3.9	4.33		1.13	3.9	4.43
MH08-209	MH08-207		3.12	3.3	10.43		3.21	3.3	10.67
MH08-207	MH08-207		4.22	3.2	13.45		4.34	3.2	13.75
MH08-207	MH08-206		2.51	3.5	8.67		2.57	3.4	8.86
MH08-207	MH02-502		1.72	3.7	6.30		1.76	3.7	6.44
MH02-502	MH02-014A	88,929	1.81	3.6	6.58	88,991	1.85	3.6	6.72
MH08-206	MH08-206		4.26	3.2	13.55		4.37	3.2	13.84
MH08-206	MH02-014A		1.24	3.9	4.79		1.27	3.9	4.90
MH08-206	MH08-201		3.02	3.4	10.14		3.10	3.3	10.36
MH02-014A	MH02-014A		3.04	3.4	10.21		3.12	3.3	10.43
MH02-014A	MH08-201		3.04	3.4	10.21		3.12	3.3	10.43
MH02-014A	MH02-014		0.00		0.00		0.00		0.00
MH08-201	MH08-119		6.06	3.0	18.24		6.22	3.0	18.64
MH08-119	MH08-113	82,352	6.14	3.0	18.45	82,352	6.30	3.0	18.85
MH02-174	MH02-173A	315,207	0.32	4.0	1.26	316,409	0.32	4.0	1.27
MH02-173A	MH02-171B	164,279	0.48	4.0	1.92	164,819	0.48	4.0	1.92
MH02-171B	MH02-163	47,625	0.53	4.0	2.11	47,625	0.53	4.0	2.12
MH02-163	MH02-154	170,687	0.70	4.0	2.79	184,305	0.71	4.0	2.85
MH02-154	MH02-146	48,551	0.75	4.0	2.99	48,551	0.76	4.0	3.05
MH02-146	MH02-136	219,506	0.97	4.0	3.86	219,506	0.98	4.0	3.92
MH02-136	MH02-133	125,684	1.09	3.9	4.31	125,684	1.11	3.9	4.36
MH02-133	MH08-113	40,988	1.13	3.9	4.44	43,171	1.15	3.9	4.50
MH08-113	MH08-113		7.28	2.9	21.27		7.45	2.9	21.70
MH08-113	MH02-121		1.00	4.0	4.01		1.06	4.0	4.22
MH02-121	MH08-109	83,011	1.09	3.9	4.29	83,011	1.15	3.9	4.49
MH08-113	MH08-109		6.27	3.0	18.78		6.39	3.0	19.06
MH08-109	MH08-109		7.36	2.9	21.48		7.54	2.9	21.91
MH08-109	MH08-106		0.79	4.0	3.15		0.83	4.0	3.33
MH08-109	MH08-106		6.57	3.0	19.53		6.70	3.0	19.85
MH08-106	MH08-106	200,954	7.56	2.9	21.97	211,453	7.75	2.9	22.42

From	To	2020				2025			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH08-106	PS 8		6.92	2.9	20.39		7.06	2.9	20.74
SAS 4760-004	PS 8	115,614	7.04	2.9	20.68	129,840	7.19	2.9	21.06
PS 8	WWTP		7.04	2.9	20.68		7.19	2.9	21.06
MH08-106	MH02-114		0.64	4.0	2.56		0.69	4.0	2.75
MH02-114	MH02-606	58,967	0.70	4.0	2.80	59,919	0.75	4.0	2.99
MH02-606	MH02-401	176,535	0.88	4.0	3.51	179,163	0.93	4.0	3.70
MH01-126	MH01-617	68,426	0.07	4.0	0.27	68,518	0.07	4.0	0.27
MH01-617	MH01-615	435,556	0.50	4.0	2.02	441,974	0.51	4.0	2.04
MH01-615	MH01-604	218,887	0.72	4.0	2.89	230,511	0.74	4.0	2.96
MH01-604	MH01-303	533,933	1.26	3.9	4.85	535,854	1.28	3.8	4.91
MH01-003	MH01-303	351,609	0.35	4.0	1.41	352,061	0.35	4.0	1.41
MH01-303	PS 1		1.61	3.7	5.97		1.63	3.7	6.03
SAS 5543-003 a	PS 1	2,430,182	4.04	3.2	12.96	2,496,344	4.13	3.2	13.19
MH02-014	MH02-316	400,725	0.40	4.0	1.60	403,041	0.40	4.0	1.61
MH02-316	MH02-314A		0.40	4.0	1.60		0.40	4.0	1.61
MH02-314A	MH02-306A	267,144	0.67	4.0	2.67	278,953	0.68	4.0	2.73
MH02-306A	MH02-300	273,740	0.94	4.0	3.77	274,192	0.96	4.0	3.82
MH02-300	MH02-101	1,715,972	2.66	3.4	9.11	1,752,697	2.71	3.4	9.26
MH02-316	MH02-012		0	0	0		0	0	0
MH02-012	MH02-011	352,767	0.35	4.0	1.41	352,767	0.35	4.0	1.41
MH02-011	MH02-010	97,732	0.45	4.0	1.80	98,071	0.45	4.0	1.80
MH02-010	MH02-008A	102,316	0.55	4.0	2.21	102,316	0.55	4.0	2.21
MH02-008A	MH02-006A	122,418	0.68	4.0	2.70	125,356	0.68	4.0	2.71
MH02-006A	MH02-005A	512,424	1.19	3.9	4.62	525,419	1.20	3.9	4.68
MH02-005A	MH02-005A	1,114,316	2.30	3.5	8.07	1,137,424	2.34	3.5	8.19
MH02-005A	MH02-005		0.00		0.00		0.00		0.00
MH02-005	MH02-101	46,929	0.05	4.0	0.19	46,929	0.05	4.0	0.19
MH02-005A	MH02-402		2.30	3.5	8.07		2.34	3.5	8.19
MH02-101	MH02-402		2.70	3.4	9.24		2.76	3.4	9.39
MH02-402	MH02-401	20,097	5.03	3.1	15.58	20,210	5.12	3.1	15.82
MH02-401	PS 2		5.90	3.0	17.84		6.04	3.0	18.19
PS 2	TE02-10933		9.94	2.8	27.66		10.17	2.8	28.20
TE02-10933	TE02-17328		10.90	2.7	29.90		11.13	2.7	30.42
TE02-17328	WWTP		11.18	2.7	30.54		11.43	2.7	31.12

From	To	2030				2035			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH14-209	MH14-196	458,702	0.46	4.0	1.83	467,232	0.47	4.0	1.87
MH14-196	MH14-193	231,297	0.69	4.0	2.76	231,293	0.70	4.0	2.79
MH14-193	MH14-182	41,049	0.73	4.0	2.92	51,147	0.75	4.0	3.00
MH14-182	MH14-171	0	0.73	4.0	2.92	0	0.75	4.0	3.00
MH14-171	MH14-166	39,678	0.77	4.0	3.08	39,678	0.79	4.0	3.16
MH14-166	MH14-162	277,217	1.05	4.0	4.16	277,217	1.07	4.0	4.22
MH14-162	MH14-156	140,948	1.19	3.9	4.63	148,745	1.22	3.9	4.71
MH14-156	MH14-143	273,522	1.46	3.8	5.51	273,553	1.49	3.8	5.59
MH14-143	MH14-134	100,187	1.56	3.7	5.82	100,187	1.59	3.7	5.91
MH14-416	MH14-415	107,071	0.11	4.0	0.43	119,300	0.12	4.0	0.48
MH14-415	MH14-134	157,777	0.26	4.0	1.06	166,419	0.29	4.0	1.14
MH14-134	MH14-102	30,360	1.86	3.6	6.74	30,360	1.91	3.6	6.88
MH14-362	MH14-358	298,290	0.30	4.0	1.19	313,483	0.31	4.0	1.25
MH14-359	MH14-358	946,334	0.95	4.0	3.79	1,001,662	1.00	4.0	4.01
MH14-358	MH14-356		1.24	3.9	4.81		1.32	3.8	5.04
MH14-356	MH14-345	288,170	1.53	3.7	5.73	288,190	1.60	3.7	5.95
MH14-345	MH14-338	249,146	1.78	3.7	6.51	295,330	1.90	3.6	6.86
MH14-338	MH14-333	106,776	1.89	3.6	6.83	106,776	2.01	3.6	7.19
MH14-333	MH14-323	57,386	1.95	3.6	7.01	57,386	2.06	3.6	7.36
MH14-323	MH14-315	198,309	2.14	3.5	7.60	222,461	2.29	3.5	8.02
MH14-315	MH14-102	191,055	2.34	3.5	8.17	185,037	2.47	3.5	8.57
MH14-102	MH14-101		4.19	3.2	13.37		4.38	3.2	13.86
MH14-101	PS 14	409,120	4.60	3.1	14.46	408,376	4.78	3.1	14.94
PS 14			4.60	3.1	14.46		4.78	3.1	14.94
PS 14	TE14-11057		4.60	3.1	14.46		4.78	3.1	14.94
TE14-11057	MH13-137	26,990	4.63	3.1	14.54	26,990	4.81	3.1	15.01
MH13-137	MH13-132	79,176	4.71	3.1	14.74	79,176	4.89	3.1	15.22
MH13-132	MH13-124	12,842	4.72	3.1	14.78	12,842	4.90	3.1	15.26
MH13-124	MH13-122A	99,854	4.82	3.1	15.04	104,152	5.01	3.1	15.53
SAS 4926-002	MH13-122A	294,534				294,534			
SAS 5429-013	MH13-122A	524,623				524,623			
SAS 5831-004	MH13-122A	732,678				732,678			
MH13-122A	MH13-105A	278,060	6.65	3.0	19.72	281,402	6.84	3.0	20.19
MH13-105A	MH13-101	261,331	6.91	2.9	20.37	526,922	7.37	2.9	21.49
MH13-101	PS 13	313	6.91	2.9	20.37	313	7.37	2.9	21.50
PS 13	MH10-145		6.91	2.9	20.37		7.37	2.9	21.50
MH10-145	MH10-131	788,339	7.70	2.9	22.31	850,501	8.22	2.9	23.57
MH10-131	MH10-426	176,907	7.88	2.9	22.74	179,797	8.40	2.9	24.00
MH10-426	MH10-419	419,407	8.30	2.9	23.76	423,205	8.82	2.8	25.01
MH10-220	MH10-211	176,708	0.18	4.0	0.71	205,507	0.21	4.0	0.82
MH10-211	MH10-419	548,394	0.73	4.0	2.90	628,799	0.83	4.0	3.34
MH10-419	MH10-417		9.02	2.8	25.49		9.66	2.8	26.99
MH10-417	MH10-415	66,927	9.09	2.8	25.65	70,650	9.73	2.8	27.16
MH10-415	MH10-108		4.54	3.1	14.31		4.86	3.1	15.15

		2030				2035			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH10-108	MH10-104A	171,260	4.72	3.1	14.76	171,470	5.03	3.1	15.60
MH10-305	MH10-104A	232,246	0.23	4.0	0.93	232,392	0.23	4.0	0.93
MH10-104A	MH10-402		4.95	3.1	15.37		5.27	3.1	16.20
MH10-415	MH10-403		4.54	3.1	14.31		4.86	3.1	15.15
MH10-403	MH10-402	12,142	4.56	3.1	14.34	14,138	4.88	3.1	15.19
MH10-402	MH10-402		9.51	2.8	26.64		10.14	2.8	28.14
MH10-402	MH10-101		4.75	3.1	14.86		5.07	3.1	15.70
MH10-101	PS 10	534,286	5.29	3.1	16.26	536,573	5.61	3.0	17.08
MH10-402	PS 10		4.75	3.1	14.86		5.07	3.1	15.70
PS 10			10.04	2.8	27.89		10.68	2.8	29.39
PS 10	MH07-955		10.04	2.8	27.89		10.68	2.8	29.39
MH07-955	MH07-939	242,463	10.28	2.8	28.46	249,622	10.93	2.7	29.96
MH07-939	MH07-932	881,117	11.16	2.7	30.50	882,843	11.81	2.7	31.99
MH07-740	MH07-729A	0	0.00		0.00	284,975	0.28	4.0	1.14
MH07-729A	MH07-719	720,863	0.72	4.0	2.88	811,117	1.10	3.9	4.32
MH07-719	MH07-707	128,326	0.85	4.0	3.40	139,189	1.24	3.9	4.78
MH07-707	MH07-426	241,571	1.09	3.9	4.30	316,988	1.55	3.7	5.79
MH07-437	MH07-426	655,000	0.66	4.0	2.62	655,000	0.66	4.0	2.62
MH07-426	MH07-421		1.75	3.7	6.39		2.21	3.5	7.79
MH07-421	MH07-414	0	1.75	3.7	6.39	0	2.21	3.5	7.79
MH07-414	MH07-405	102,966	1.85	3.6	6.71	116,687	2.32	3.5	8.14
MH07-405	MH07-932	327,360	2.18	3.5	7.70	344,130	2.67	3.4	9.14
MH07-932	MH18-014		13.34	2.7	35.43		14.48	2.6	37.97
MH18-014	MH18-014	155,155	13.49	2.7	35.78	155,155	14.64	2.6	38.31
MH18-014	MH18-006		6.75	3.0	19.96		7.32	2.9	21.37
MH18-014	MH07-308		6.75	3.0	19.96		7.32	2.9	21.37
MH07-308	MH18-006	28,163	6.78	3.0	20.03	29,070	7.35	2.9	21.45
MH18-006	MH18-006	118,572	13.64	2.6	36.11	118,572	14.78	2.6	38.64
MH18-006	PS 18		10.23	2.8	28.34		11.09	2.7	30.33
MH18-006	MH07-214B		3.41	3.3	11.24		3.70	3.3	12.03
PS 18	WWTP		10.23	2.8	28.34		11.09	2.7	30.33
MH09-108	MH09-101	544,059	0.54	4.0	2.18	569,633	0.57	4.0	2.28
MH09-101	PS 9	309,600	0.85	4.0	3.41	309,684	0.88	4.0	3.52
PS 9		853,659	0.85	4.0	3.41	879,317	0.88	4.0	3.52
PS 9	MH07-517	853,659	0.85	4.0	3.41	879,317	0.88	4.0	3.52

		2030				2035			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH07-517	MH07-512	58,961	0.91	4.0	3.65	58,961	0.94	4.0	3.75
MH07-618	MH07-512	183,096	0.18	4.0	0.73	183,074	0.18	4.0	0.73
MH07-512	MH07-228	164,184	1.26	3.9	4.86	176,363	1.30	3.8	4.98
MH07-249	MH07-242	325,940	0.33	4.0	1.30	403,756	0.40	4.0	1.62
MH07-242	MH07-228	173,500	0.50	4.0	2.00	173,500	0.58	4.0	2.31
MH07-228	MH07-226		1.76	3.7	6.44		1.87	3.6	6.79
MH07-226	MH07-218	90,648	1.85	3.6	6.71	106,994	1.98	3.6	7.12
MH07-823	MH07-218	144,683	0.14	4.0	0.58	146,426	0.15	4.0	0.59
MH07-218	MH07-214B		1.99	3.6	7.15		2.13	3.5	7.56
MH07-214B	MH07-206		5.40	3.1	16.56		5.82	3.0	17.64
MH07-206	PS 7	450,314	5.86	3.0	17.71	463,807	6.29	3.0	18.81
MH06-122	MH06-108A	136,372	0.14	4.0	0.55	136,372	0.14	4.0	0.55
MH06-209	MH06-108A	190,773	0.19	4.0	0.76	190,773	0.19	4.0	0.76
MH06-108A	MH06-108		0.33	4.0	1.31		0.33	4.0	1.31
MH06-108	PS 6	49,606	0.38	4.0	1.51	49,606	0.38	4.0	1.51
SAS 6243-022	PS 6	761,829				761,829			
SAS 6646-001	PS 6	59,876				59,876			
SAS 6648-007	PS 6	769,552				769,552			
PS 6		1,968,007	1.97	3.6	7.07	1,968,007	1.97	3.6	7.07
PS 6	MH07-129	1,968,007	1.97	3.6	7.07	1,968,007	1.97	3.6	7.07
MH07-129	MH07-101	753,043	2.72	3.4	9.29	753,043	2.72	3.4	9.29
MH07-101	PS 7	226,470	2.95	3.4	9.94	226,594	2.95	3.4	9.94
PS 7	WWTP		8.80	2.8	24.97		9.24	2.8	26.00
MH04-408	MH04-312	274,626	0.27	4.0	1.10	274,626	0.27	4.0	1.10
MH04-312	MH04-311	459,712	0.73	4.0	2.94	459,712	0.73	4.0	2.94
MH04-315	MH04-311	35,469	0.04	4.0	0.14	35,469	0.04	4.0	0.14
MH04-311	MH04-209		0.77	4.0	3.08		0.77	4.0	3.08
MH04-209	MH04-201	91,645	0.86	4.0	3.45	91,645	0.86	4.0	3.45
MH04-201B	MH04-201	100,196	0.10	4.0	0.40	100,196	0.10	4.0	0.40
MH04-201	PS 4		0.96	4.0	3.85		0.96	4.0	3.85
MH03-311	MH03-108	215,344	0.22	4.0	0.86	225,240	0.23	4.0	0.90
MH03-108	MH03-201	52,219	0.27	4.0	1.07	52,219	0.28	4.0	1.11
MH03-201	PS 3	48,706	0.32	4.0	1.27	50,956	0.33	4.0	1.31
MH05-317	MH05-311	1,257,170	1.26	3.9	4.85	1,289,522	1.29	3.8	4.95
MH05-311	MH05-236	47,292	1.30	3.8	5.00	47,292	1.34	3.8	5.11
MH05-240	MH05-236	858,451	0.86	4.0	3.43	897,235	0.90	4.0	3.59

		2030				2035			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH05-236	MH16-210	22,626	2.19	3.5	7.73	22,626	2.26	3.5	7.94
MH16-210	PS 16	40,262	2.23	3.5	7.85	40,262	2.30	3.5	8.06
MH16-102	PS 16	14,446	0.01	4.0	0.06	14,446	0.01	4.0	0.06
PS 16		2,240,246	2.24	3.5	7.89	2,311,382	2.31	3.5	8.10
PS 16	MH12-177		2.24	3.5	7.89		2.31	3.5	8.10
MH12-177	MH12-176		2.24	3.5	7.89		2.31	3.5	8.10
MH12-176	MH12-164	478,039	2.72	3.4	9.28	478,039	2.79	3.4	9.49
MH12-164	MH12-157	178,841	2.90	3.4	9.80	178,841	2.97	3.4	10.00
MH12-157	MH12-133	345,469	3.24	3.3	10.77	345,469	3.31	3.3	10.97
MH12-220	MH12-219A	195,849	0.20	4.0	0.78	195,849	0.20	4.0	0.78
MH12-219A	MH12-210	370,643	0.57	4.0	2.27	438,325	0.63	4.0	2.54
MH12-210	MH12-206	117,958	0.68	4.0	2.74	216,494	0.85	4.0	3.40
MH12-311	MH12-206	428,216	0.43	4.0	1.71	529,781	0.53	4.0	2.12
MH12-206	MH12-133		1.11	3.9	4.38		1.38	3.8	5.25
MH12-133	MH12-131		4.36	3.2	13.81		4.69	3.1	14.71
MH12-131	MH12-123A	131,298	4.49	3.2	14.16	131,298	4.83	3.1	15.05
MH12-123A	MH12-121	40,231	4.53	3.2	14.26	40,231	4.87	3.1	15.16
MH12-121	MH12-118A	816,588	5.34	3.1	16.40	816,588	5.68	3.0	17.27
MH12-118A	MH12-114	321,674	5.67	3.0	17.23	321,674	6.00	3.0	18.09
MH12-114	MH12-112A	15,495	5.68	3.0	17.27	15,495	6.02	3.0	18.13
MH12-112A	MH12-110	42,173	5.72	3.0	17.38	42,173	6.06	3.0	18.24
Midtown Rd	CTH PD	1,298,511	1.30	3.8	4.98	1,458,103	1.46	3.8	5.50
CTH PD	MH17-146		1.30	3.8	4.98		1.46	3.8	5.50
MH17-146	MH17-128	117,275	1.42	3.8	5.36	175,972	1.63	3.7	6.05
MH17-128	MH17-120	263,447	1.68	3.7	6.19	264,317	1.90	3.6	6.86
MH17-120	MH17-119	175,754	1.85	3.6	6.73	183,351	2.08	3.6	7.42
MH17-119	MH17-108	44,807	1.90	3.6	6.87	51,504	2.13	3.5	7.57
MH17-108	PS 17	152,869	2.05	3.6	7.33	199,595	2.33	3.5	8.16
MH17-201	PS 17	713,949	0.71	4.0	2.86	736,983	0.74	4.0	2.95
PS 17		2,766,611	2.77	3.4	9.42	3,069,825	3.07	3.4	10.29
PS 17	MH12-110		2.77	3.4	9.42		3.07	3.4	10.29
MH12-110	MH12-102		8.49	2.9	24.22		9.13	2.8	25.75
MH12-102	PS 12	125,514	8.61	2.8	24.52	125,514	9.26	2.8	26.05
MH11-166A	MH11-159	406,758	9.02	2.8	25.49	421,987	9.68	2.8	27.05
MH11-159	MH11-151A	399,701	9.42	2.8	26.44	399,701	10.08	2.8	27.99
MH11-151A	MH11-145	247,285	9.67	2.8	27.02	263,956	10.34	2.8	28.60
MH11-145	MH11-138	360,661	10.03	2.8	27.87	363,384	10.71	2.8	29.44
MH11-138	MH11-116A	1,213,491	11.24	2.7	30.68	1,271,800	11.98	2.7	32.36
MH11-306	MH11-116A	209,802	0.21	4.0	0.84	218,572	0.22	4.0	0.87
MH11-116A	MH11-111A		11.45	2.7	31.16		12.20	2.7	32.86

		2030				2035			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH11-111A	MH11-106A	318,852	11.77	2.7	31.89	324,797	12.52	2.7	33.60
MH11-423	MH11-410	214,614	0.21	4.0	0.86	217,961	0.22	4.0	0.87
MH11-410	MH11-106A	57,779	0.27	4.0	1.09	57,779	0.28	4.0	1.10
MH11-106A	MH11-104		12.04	2.7	32.51		12.80	2.7	34.22
MH11-104	PS 11	125,444	12.17	2.7	32.80	125,887	12.92	2.7	34.50
MH11-226	MH11-207	150,869	0.15	4.0	0.60	150,869	0.15	4.0	0.60
MH11-207	PS 11	109,377	0.26	4.0	1.04	129,252	0.28	4.0	1.12
PS 11	WWTP		12.43	2.7	33.39		13.20	2.7	35.13
MHWP-04488	MH05-116	353,862	0.35	4.0	1.42	551,025	0.55	4.0	2.20
MH05-116	MH05-113	280,144	0.63	4.0	2.54	293,436	0.84	4.0	3.38
MH05-113	MH15-101	886,079	1.52	3.7	5.69	1,095,250	1.94	3.6	6.99
MH05-106	MH15-101	101,806	0.10	4.0	0.41	101,806	0.10	4.0	0.41
MH15-101	MH05-103		1.62	3.7	6.01		2.04	3.6	7.30
MH05-025A	MH05-103	72,094	0.07	4.0	0.29	72,282	0.07	4.0	0.29
MH05-103	PS 15		1.69	3.7	6.23		2.11	3.6	7.51
PS 15		1,693,984	1.69	3.7	6.23	2,113,798	2.11	3.6	7.51
MH05-230	MH05-212	176,411	0.18	4.0	0.71	176,411	0.18	4.0	0.71
MH05-212	MH05-205	91,205	0.27	4.0	1.07	91,205	0.27	4.0	1.07
MH05-205	MH05-011	27,821	0.30	4.0	1.18	27,821	0.30	4.0	1.18
MH05-102	MH05-011	26,550	0.03	4.0	0.11	26,550	0.03	4.0	0.11
MH05-011	MH05-008		0.32	4.0	1.29		0.32	4.0	1.29
MH05-008	MH05-401	107,856	0.43	4.0	1.72	107,856	0.43	4.0	1.72
MH05-401	PS 5	209,264	0.64	4.0	2.56	209,264	0.64	4.0	2.56
PS 5		639,106	0.64	4.0	2.56	639,106	0.64	4.0	2.56
PS 5	TE05-22376		0.64	4.0	2.56		0.64	4.0	2.56
TE05-22376	MH02-545		2.33	3.5	8.16		2.75	3.4	9.38
MH02-545	MH02-544A	3,503	2.34	3.5	8.17	3,503	2.76	3.4	9.39
MH02-544A	MH02-542	721,906	3.06	3.4	10.25	759,686	3.52	3.3	11.53
MH02-542	MH02-532		3.06	3.4	10.25		3.52	3.3	11.53
MH02-532	MH02-531A	49,610	3.11	3.3	10.39	49,610	3.57	3.3	11.67
MH02-542	MH02-055		0.00		0.00		0.00		0.00
MH02-055	MH02-041	136,225	0.14	4.0	0.54	136,225	0.14	4.0	0.54
MH02-041	MH02-034	173,441	0.31	4.0	1.24	173,441	0.31	4.0	1.24
MH02-034	MH02-513	201,367	0.51	4.0	2.04	201,367	0.51	4.0	2.04
MH02-708	MH02-705	582,085	0.58	4.0	2.33	582,085	0.58	4.0	2.33
MH02-705	MH02-531A	139,183	0.72	4.0	2.89	139,183	0.72	4.0	2.89
MH02-531A	MH02-531		3.83	3.2	12.39		4.29	3.2	13.62
MH02-531	MH02-516	69,999	3.90	3.2	12.58	69,999	4.36	3.2	13.81

		2030				2035			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH02-516	MH08-228	1,037,996	4.94	3.1	15.35	1,041,551	5.40	3.1	16.54
MH08-228	MH08-223		2.73	3.4	9.31		2.98	3.4	10.04
MH08-223	MH02-210	323,731	3.05	3.4	10.24	327,474	3.31	3.3	10.96
MH02-210	MH02-020		1.39	3.8	5.28		1.51	3.7	5.66
MH02-021	MH02-020	445,922	0.45	4.0	1.78	451,452	0.45	4.0	1.81
MH02-020	MH08-206		1.84	3.6	6.68		1.96	3.6	7.05
MH02-210	MH08-209		1.66	3.7	6.13		1.80	3.6	6.57
MH08-228	MH02-513		2.21	3.5	7.80		2.42	3.5	8.41
MH02-513	MH08-209		2.72	3.4	9.29		2.93	3.4	9.88
MH08-209	MH08-209	55,979	4.44	3.2	14.03	55,979	4.79	3.1	14.95
MH08-209	MH08-207		1.16	3.9	4.52		1.25	3.9	4.82
MH08-209	MH08-207		3.28	3.3	10.89		3.54	3.3	11.60
MH08-207	MH08-207		4.44	3.2	14.03		4.79	3.1	14.95
MH08-207	MH08-206		2.64	3.4	9.04		2.84	3.4	9.64
MH08-207	MH02-502		1.80	3.6	6.58		1.95	3.6	7.01
MH02-502	MH02-014A	89,053	1.89	3.6	6.85	89,116	2.04	3.6	7.28
MH08-206	MH08-206		4.47	3.2	14.12		4.80	3.1	14.99
MH08-206	MH02-014A		1.30	3.8	5.00		1.40	3.8	5.30
MH08-206	MH08-201		3.17	3.3	10.57		3.40	3.3	11.22
MH02-014A	MH02-014A		3.20	3.3	10.64		3.43	3.3	11.30
MH02-014A	MH08-201		3.20	3.3	10.64		3.43	3.3	11.30
MH02-014A	MH02-014		0.00		0.00		0.00		0.00
MH08-201	MH08-119		6.37	3.0	19.01		6.84	3.0	20.19
MH08-119	MH08-113	82,352	6.45	3.0	19.22	82,352	6.92	2.9	20.39
MH02-174	MH02-173A	317,612	0.32	4.0	1.27	318,815	0.32	4.0	1.28
MH02-173A	MH02-171B	165,360	0.48	4.0	1.93	165,901	0.48	4.0	1.94
MH02-171B	MH02-163	47,625	0.53	4.0	2.12	47,625	0.53	4.0	2.13
MH02-163	MH02-154	197,922	0.73	4.0	2.91	211,540	0.74	4.0	2.98
MH02-154	MH02-146	48,551	0.78	4.0	3.11	48,551	0.79	4.0	3.17
MH02-146	MH02-136	219,506	1.00	4.0	3.99	219,506	1.01	4.0	4.04
MH02-136	MH02-133	125,684	1.12	3.9	4.41	125,684	1.14	3.9	4.46
MH02-133	MH08-113	45,354	1.17	3.9	4.56	47,537	1.19	3.9	4.62
MH08-113	MH08-113		7.62	2.9	22.11		8.10	2.9	23.29
MH08-113	MH02-121		1.12	3.9	4.41		1.29	3.8	4.97
MH02-121	MH08-109	83,011	1.20	3.9	4.68	83,011	1.38	3.8	5.23
MH08-113	MH08-109		6.49	3.0	19.33		6.81	3.0	20.12
MH08-109	MH08-109		7.70	2.9	22.31		8.19	2.9	23.49
MH08-109	MH08-106		0.88	4.0	3.51		1.01	4.0	4.02
MH08-109	MH08-106		6.82	3.0	20.15		7.18	2.9	21.04
MH08-106	MH08-106	221,952	7.92	2.9	22.85	232,451	8.42	2.9	24.05

From	To	2030 Sub-Basin Flow (gpd)	2030 Cumulative Flow (MGD)	2030 Peak Factor	2030 Cumulative Peak Flow (MGD)	2035 Sub-Basin Flow (gpd)	2035 Cumulative Flow (MGD)	2035 Peak Factor	2035 Cumulative Peak Flow (MGD)
MH08-106	PS 8		7.19	2.9	21.06		7.57	2.9	21.98
SAS 4760-004	PS 8	144,065	7.34	2.9	21.42	158,291	7.72	2.9	22.37
PS 8	WWTP		7.34	2.9	21.42		7.72	2.9	22.37
MH08-106	MH02-114		0.73	4.0	2.92		0.85	4.0	3.41
MH02-114	MH02-606	60,710	0.79	4.0	3.16	61,604	0.92	4.0	3.66
MH02-606	MH02-401	181,735	0.97	4.0	3.89	184,363	1.10	3.9	4.33
MH01-126	MH01-617	68,692	0.07	4.0	0.27	68,867	0.07	4.0	0.28
MH01-617	MH01-615	448,392	0.52	4.0	2.07	454,810	0.52	4.0	2.09
MH01-615	MH01-604	242,192	0.76	4.0	3.04	253,872	0.78	4.0	3.11
MH01-604	MH01-303	537,878	1.30	3.8	4.98	539,799	1.32	3.8	5.04
MH01-003	MH01-303	352,456	0.35	4.0	1.41	352,908	0.35	4.0	1.41
MH01-303	PS 1		1.65	3.7	6.10		1.67	3.7	6.16
SAS 5543-003 a	PS 1	2,562,505	4.21	3.2	13.42	2,628,723	4.30	3.2	13.66
MH02-014	MH02-316	405,301	0.41	4.0	1.62	407,561	0.41	4.0	1.63
MH02-316	MH02-314A		0.41	4.0	1.62		0.41	4.0	1.63
MH02-314A	MH02-306A	290,818	0.70	4.0	2.78	302,626	0.71	4.0	2.84
MH02-306A	MH02-300	274,587	0.97	4.0	3.88	275,039	0.99	4.0	3.94
MH02-300	MH02-101	1,789,422	2.76	3.4	9.40	1,826,147	2.81	3.4	9.55
MH02-316	MH02-012		0	0	0		0	0	0
MH02-012	MH02-011	352,767	0.35	4.0	1.41	352,767	0.35	4.0	1.41
MH02-011	MH02-010	98,410	0.45	4.0	1.80	98,806	0.45	4.0	1.81
MH02-010	MH02-008A	102,316	0.55	4.0	2.21	102,373	0.55	4.0	2.22
MH02-008A	MH02-006A	128,294	0.68	4.0	2.73	131,232	0.69	4.0	2.74
MH02-006A	MH02-005A	538,471	1.22	3.9	4.73	551,466	1.24	3.9	4.78
MH02-005A	MH02-005A	1,160,533	2.38	3.5	8.30	1,183,641	2.42	3.5	8.42
MH02-005A	MH02-005		0.00		0.00		0.00		0.00
MH02-005	MH02-101	46,929	0.05	4.0	0.19	46,986	0.05	4.0	0.19
MH02-005A	MH02-402		2.38	3.5	8.30		2.42	3.5	8.42
MH02-101	MH02-402		2.81	3.4	9.54		2.86	3.4	9.69
MH02-402	MH02-401	20,379	5.21	3.1	16.05	20,492	5.30	3.1	16.29
MH02-401	PS 2		6.18	3.0	18.54		6.40	3.0	19.09
PS 2	TE02-10933		10.39	2.8	28.72		10.70	2.8	29.43
TE02-10933	TE02-17328		11.35	2.7	30.94		11.66	2.7	31.64
TE02-17328	WWTP		11.67	2.7	31.66		11.99	2.7	32.39

		2040			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH14-209	MH14-196	466,766	0.47	4.0	1.87
MH14-196	MH14-193	251,083	0.72	4.0	2.87
MH14-193	MH14-182	51,147	0.77	4.0	3.08
MH14-182	MH14-171	0	0.77	4.0	3.08
MH14-171	MH14-166	39,678	0.81	4.0	3.23
MH14-166	MH14-162	277,217	1.09	3.9	4.29
MH14-162	MH14-156	148,745	1.23	3.9	4.78
MH14-156	MH14-143	273,537	1.51	3.7	5.65
MH14-143	MH14-134	100,187	1.61	3.7	5.97
MH14-416	MH14-415	123,864	0.12	4.0	0.50
MH14-415	MH14-134	180,937	0.30	4.0	1.22
MH14-134	MH14-102	30,360	1.94	3.6	7.00
MH14-362	MH14-358	328,446	0.33	4.0	1.31
MH14-359	MH14-358	1,035,841	1.04	4.0	4.12
MH14-358	MH14-356		1.36	3.8	5.20
MH14-356	MH14-345	301,114	1.67	3.7	6.15
MH14-345	MH14-338	315,307	1.98	3.6	7.11
MH14-338	MH14-333	106,776	2.09	3.6	7.43
MH14-333	MH14-323	57,386	2.14	3.5	7.61
MH14-323	MH14-315	251,689	2.40	3.5	8.35
MH14-315	MH14-102	188,046	2.58	3.4	8.90
MH14-102	MH14-101		4.53	3.2	14.27
MH14-101	PS 14	408,748	4.94	3.1	15.34
PS 14			4.94	3.1	15.34
PS 14	TE14-11057		4.94	3.1	15.34
TE14-11057	MH13-137	26,990	4.96	3.1	15.41
MH13-137	MH13-132	79,176	5.04	3.1	15.62
MH13-132	MH13-124	12,842	5.06	3.1	15.66
MH13-124	MH13-122A	108,338	5.16	3.1	15.94
SAS 4926-002	MH13-122A	294,534			
SAS 5429-013	MH13-122A	524,623			
SAS 5831-004	MH13-122A	732,678			
MH13-122A	MH13-105A	284,970	7.00	2.9	20.59
MH13-105A	MH13-101	820,358	7.82	2.9	22.61
MH13-101	PS 13	313	7.82	2.9	22.61
PS 13	MH10-145		7.82	2.9	22.61
MH10-145	MH10-131	943,852	8.77	2.8	24.88
MH10-131	MH10-426	182,687	8.95	2.8	25.32
MH10-426	MH10-419	427,003	9.38	2.8	26.33
MH10-220	MH10-211	415,389	0.42	4.0	1.66
MH10-211	MH10-419	686,095	1.10	3.9	4.34
MH10-419	MH10-417		10.48	2.8	28.91
MH10-417	MH10-415	74,373	10.55	2.8	29.09
MH10-415	MH10-108		5.28	3.1	16.23

From	To	2040			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH10-108	MH10-104A	171,680	5.45	3.1	16.67
MH10-305	MH10-104A	232,538	0.23	4.0	0.93
MH10-104A	MH10-402		5.68	3.0	17.27
MH10-415	MH10-403		5.28	3.1	16.23
MH10-403	MH10-402	16,134	5.29	3.1	16.27
MH10-402	MH10-402		10.97	2.7	30.06
MH10-402	MH10-101		5.49	3.1	16.77
MH10-101	PS 10	538,860	6.02	3.0	18.15
MH10-402	PS 10		5.49	3.1	16.77
PS 10			11.51	2.7	31.30
PS 10	MH07-955		11.51	2.7	31.30
MH07-955	MH07-939	256,781	11.77	2.7	31.88
MH07-939	MH07-932	884,568	12.65	2.7	33.89
MH07-740	MH07-729A	606,321	0.61	4.0	2.43
MH07-729A	MH07-719	869,455	1.48	3.8	5.55
MH07-719	MH07-707	143,329	1.62	3.7	6.00
MH07-707	MH07-426	389,994	2.01	3.6	7.20
MH07-437	MH07-426	655,000	0.66	4.0	2.62
MH07-426	MH07-421		2.66	3.4	9.13
MH07-421	MH07-414	530,943	3.20	3.3	10.64
MH07-414	MH07-405	130,409	3.33	3.3	11.00
MH07-405	MH07-932	360,901	3.69	3.3	12.00
MH07-932	MH18-014		16.34	2.6	42.03
MH18-014	MH18-014	155,155	16.49	2.6	42.37
MH18-014	MH18-006		8.25	2.9	23.64
MH18-014	MH07-308		8.25	2.9	23.64
MH07-308	MH18-006	29,977	8.28	2.9	23.71
MH18-006	MH18-006	118,572	16.64	2.6	42.69
MH18-006	PS 18		12.48	2.7	33.51
MH18-006	MH07-214B		4.16	3.2	13.29
PS 18	WWTP		12.48	2.7	33.51
MH09-108	MH09-101	680,093	0.68	4.0	2.72
MH09-101	PS 9	309,767	0.99	4.0	3.96
PS 9		989,860	0.99	4.0	3.96
PS 9	MH07-517	989,860	0.99	4.0	3.96

From	To	2040 Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH07-517	MH07-512	58,961	1.05	4.0	4.16
MH07-618	MH07-512	183,052	0.18	4.0	0.73
MH07-512	MH07-228	188,543	1.42	3.8	5.38
MH07-249	MH07-242	589,536	0.59	4.0	2.36
MH07-242	MH07-228	173,500	0.76	4.0	3.05
MH07-228	MH07-226		2.18	3.5	7.72
MH07-226	MH07-218	123,341	2.31	3.5	8.09
MH07-823	MH07-218	148,169	0.15	4.0	0.59
MH07-218	MH07-214B		2.45	3.5	8.52
MH07-214B	MH07-206		6.62	3.0	19.63
MH07-206	PS 7	477,301	7.09	2.9	20.82
MH06-122	MH06-108A	136,372	0.14	4.0	0.55
MH06-209	MH06-108A	190,773	0.19	4.0	0.76
MH06-108A	MH06-108		0.33	4.0	1.31
MH06-108	PS 6	49,606	0.38	4.0	1.51
SAS 6243-022	PS 6	761,829			
SAS 6646-001	PS 6	59,876			
SAS 6648-007	PS 6	769,552			
PS 6		1,968,007	1.97	3.6	7.07
PS 6	MH07-129	1,968,007	1.97	3.6	7.07
MH07-129	MH07-101	753,043	2.72	3.4	9.29
MH07-101	PS 7	226,719	2.95	3.4	9.94
PS 7	WWTP		10.04	2.8	27.90
MH04-408	MH04-312	274,626	0.27	4.0	1.10
MH04-312	MH04-311	459,712	0.73	4.0	2.94
MH04-315	MH04-311	35,469	0.04	4.0	0.14
MH04-311	MH04-209		0.77	4.0	3.08
MH04-209	MH04-201	91,645	0.86	4.0	3.45
MH04-201B	MH04-201	100,196	0.10	4.0	0.40
MH04-201	PS 4		0.96	4.0	3.85
MH03-311	MH03-108	235,136	0.24	4.0	0.94
MH03-108	MH03-201	52,219	0.29	4.0	1.15
MH03-201	PS 3	53,206	0.34	4.0	1.36
MH05-317	MH05-311	1,529,909	1.53	3.7	5.72
MH05-311	MH05-236	47,292	1.58	3.7	5.87
MH05-240	MH05-236	935,924	0.94	4.0	3.74

From	To	2040			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH05-236	MH16-210	22,626	2.54	3.5	8.76
MH16-210	PS 16	40,262	2.58	3.4	8.87
MH16-102	PS 16	14,446	0.01	4.0	0.06
PS 16		2,590,458	2.59	3.4	8.92
PS 16	MH12-177		2.59	3.4	8.92
MH12-177	MH12-176		2.59	3.4	8.92
MH12-176	MH12-164	504,532	3.09	3.3	10.36
MH12-164	MH12-157	183,009	3.28	3.3	10.87
MH12-157	MH12-133	363,972	3.64	3.3	11.88
MH12-220	MH12-219A	204,581	0.20	4.0	0.82
MH12-219A	MH12-210	466,288	0.67	4.0	2.68
MH12-210	MH12-206	241,442	0.91	4.0	3.65
MH12-311	MH12-206	689,461	0.69	4.0	2.76
MH12-206	MH12-133		1.60	3.7	5.95
MH12-133	MH12-131		5.24	3.1	16.14
MH12-131	MH12-123A	131,298	5.38	3.1	16.48
MH12-123A	MH12-121	40,231	5.42	3.1	16.59
MH12-121	MH12-118A	825,513	6.24	3.0	18.69
MH12-118A	MH12-114	321,674	6.56	3.0	19.50
MH12-114	MH12-112A	15,495	6.58	3.0	19.54
MH12-112A	MH12-110	42,173	6.62	3.0	19.64
Midtown Rd	CTH PD	1,458,103	1.46	3.8	5.50
CTH PD	MH17-146		1.46	3.8	5.50
MH17-146	MH17-128	283,488	1.74	3.7	6.38
MH17-128	MH17-120	265,187	2.01	3.6	7.19
MH17-120	MH17-119	286,409	2.29	3.5	8.05
MH17-119	MH17-108	58,202	2.35	3.5	8.22
MH17-108	PS 17	475,657	2.83	3.4	9.60
MH17-201	PS 17	793,603	0.79	4.0	3.17
PS 17		3,620,648	3.62	3.3	11.82
PS 17	MH12-110		3.62	3.3	11.82
MH12-110	MH12-102		10.24	2.8	28.36
MH12-102	PS 12	145,191	10.39	2.8	28.70
MH11-166A	MH11-159	437,215	10.82	2.7	29.72
MH11-159	MH11-151A	399,701	11.22	2.7	30.64
MH11-151A	MH11-145	280,626	11.50	2.7	31.28
MH11-145	MH11-138	366,108	11.87	2.7	32.12
MH11-138	MH11-116A	1,286,754	13.16	2.7	35.02
MH11-306	MH11-116A	227,341	0.23	4.0	0.91
MH11-116A	MH11-111A		13.38	2.7	35.53

		2040			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH11-111A	MH11-106A	348,888	13.73	2.6	36.31
MH11-423	MH11-410	221,309	0.22	4.0	0.89
MH11-410	MH11-106A	57,779	0.28	4.0	1.12
MH11-106A	MH11-104		14.01	2.6	36.93
MH11-104	PS 11	126,329	14.14	2.6	37.21
MH11-226	MH11-207	150,869	0.15	4.0	0.60
MH11-207	PS 11	182,835	0.33	4.0	1.33
PS 11	WWTP		14.47	2.6	37.95
MHWP-04488	MH05-116	615,374	0.62	4.0	2.46
MH05-116	MH05-113	294,751	0.91	4.0	3.64
MH05-113	MH15-101	1,343,124	2.25	3.5	7.93
MH05-106	MH15-101	101,806	0.10	4.0	0.41
MH15-101	MH05-103		2.36	3.5	8.23
MH05-025A	MH05-103	72,469	0.07	4.0	0.29
MH05-103	PS 15		2.43	3.5	8.44
PS 15		2,427,524	2.43	3.5	8.44
MH05-230	MH05-212	176,411	0.18	4.0	0.71
MH05-212	MH05-205	91,205	0.27	4.0	1.07
MH05-205	MH05-011	27,821	0.30	4.0	1.18
MH05-102	MH05-011	26,550	0.03	4.0	0.11
MH05-011	MH05-008		0.32	4.0	1.29
MH05-008	MH05-401	107,856	0.43	4.0	1.72
MH05-401	PS 5	209,264	0.64	4.0	2.56
PS 5		639,106	0.64	4.0	2.56
PS 5	TE05-22376		0.64	4.0	2.56
TE05-22376	MH02-545		3.07	3.4	10.28
MH02-545	MH02-544A	3,503	3.07	3.4	10.29
MH02-544A	MH02-542	763,001	3.83	3.2	12.40
MH02-542	MH02-532		3.83	3.2	12.40
MH02-532	MH02-531A	49,610	3.88	3.2	12.53
MH02-542	MH02-055		0.00		0.00
MH02-055	MH02-041	136,225	0.14	4.0	0.54
MH02-041	MH02-034	173,441	0.31	4.0	1.24
MH02-034	MH02-513	201,367	0.51	4.0	2.04
MH02-708	MH02-705	582,085	0.58	4.0	2.33
MH02-705	MH02-531A	139,183	0.72	4.0	2.89
MH02-531A	MH02-531		4.60	3.1	14.47
MH02-531	MH02-516	69,999	4.67	3.1	14.65

From	To	2040			
		Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH02-516	MH08-228	1,045,106	5.72	3.0	17.37
MH08-228	MH08-223		3.16	3.3	10.54
MH08-223	MH02-210	331,216	3.49	3.3	11.46
MH02-210	MH02-020		1.59	3.7	5.92
MH02-021	MH02-020	456,982	0.46	4.0	1.83
MH02-020	MH08-206		2.05	3.6	7.32
MH02-210	MH08-209		1.90	3.6	6.87
MH08-228	MH02-513		2.56	3.4	8.83
MH02-513	MH08-209		3.07	3.4	10.29
MH08-209	MH08-209	55,979	5.03	3.1	15.58
MH08-209	MH08-207		1.31	3.8	5.02
MH08-209	MH08-207		3.72	3.3	12.09
MH08-207	MH08-207		5.03	3.1	15.59
MH08-207	MH08-206		2.99	3.4	10.05
MH08-207	MH02-502		2.04	3.6	7.30
MH02-502	MH02-014A	89,178	2.13	3.5	7.57
MH08-206	MH08-206		5.03	3.1	15.60
MH08-206	MH02-014A		1.47	3.8	5.52
MH08-206	MH08-201		3.57	3.3	11.68
MH02-014A	MH02-014A		3.60	3.3	11.76
MH02-014A	MH08-201		3.60	3.3	11.76
MH02-014A	MH02-014		0.00		0.00
MH08-201	MH08-119		7.17	2.9	21.00
MH08-119	MH08-113	82,352	7.25	2.9	21.21
MH02-174	MH02-173A	320,017	0.32	4.0	1.28
MH02-173A	MH02-171B	166,441	0.49	4.0	1.95
MH02-171B	MH02-163	47,625	0.53	4.0	2.14
MH02-163	MH02-154	225,157	0.76	4.0	3.04
MH02-154	MH02-146	48,551	0.81	4.0	3.23
MH02-146	MH02-136	219,506	1.03	4.0	4.09
MH02-136	MH02-133	125,684	1.15	3.9	4.51
MH02-133	MH08-113	49,719	1.20	3.9	4.67
MH08-113	MH08-113		8.45	2.9	24.13
MH08-113	MH02-121		1.41	3.8	5.36
MH02-121	MH08-109	83,011	1.50	3.8	5.62
MH08-113	MH08-109		7.04	2.9	20.68
MH08-109	MH08-109		8.54	2.9	24.33
MH08-109	MH08-106		1.10	3.9	4.33
MH08-109	MH08-106		7.44	2.9	21.66
MH08-106	MH08-106	242,950	8.78	2.8	24.91

		2040			
From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
MH08-106	PS 8		7.84	2.9	22.64
SAS 4760-004	PS 8	172,517	8.01	2.9	23.06
PS 8	WWTP		8.01	2.9	23.06
MH08-106	MH02-114		0.94	4.0	3.77
MH02-114	MH02-606	62,499	1.00	4.0	4.02
MH02-606	MH02-401	187,039	1.19	3.9	4.64
MH01-126	MH01-617	68,958	0.07	4.0	0.28
MH01-617	MH01-615	461,178	0.53	4.0	2.12
MH01-615	MH01-604	265,501	0.80	4.0	3.18
MH01-604	MH01-303	541,770	1.34	3.8	5.11
MH01-003	MH01-303	353,304	0.35	4.0	1.41
MH01-303	PS 1		1.69	3.7	6.22
SAS 5543-003 a	PS 1	2,694,941	4.39	3.2	13.89
MH02-014	MH02-316	409,821	0.41	4.0	1.64
MH02-316	MH02-314A		0.41	4.0	1.64
MH02-314A	MH02-306A	314,435	0.72	4.0	2.90
MH02-306A	MH02-300	275,491	1.00	4.0	4.00
MH02-300	MH02-101	1,862,872	2.86	3.4	9.70
MH02-316	MH02-012		0	0	0
MH02-012	MH02-011	352,767	0.35	4.0	1.41
MH02-011	MH02-010	99,145	0.45	4.0	1.81
MH02-010	MH02-008A	102,417	0.55	4.0	2.22
MH02-008A	MH02-006A	134,170	0.69	4.0	2.75
MH02-006A	MH02-005A	564,517	1.25	3.9	4.84
MH02-005A	MH02-005A	1,206,693	2.46	3.5	8.53
MH02-005A	MH02-005		0.00		0.00
MH02-005	MH02-101	46,986	0.05	4.0	0.19
MH02-005A	MH02-402		2.46	3.5	8.53
MH02-101	MH02-402		2.91	3.4	9.83
MH02-402	MH02-401	20,662	5.39	3.1	16.52
MH02-401	PS 2		6.58	3.0	19.55
PS 2	TE02-10933		10.97	2.7	30.05
TE02-10933	TE02-17328		11.93	2.7	32.25
TE02-17328	WWTP		12.27	2.7	33.03

Appendix F: MMSD Collection System Characteristics

Main

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
EAST INTERCEPTOR/UPSTREAM OF PS-06 - 5																	
	MH06-122	MH06-121	GR	8.36	4.25	561	0.0073	36	35.5	41.91	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-121	MH06-120	GR	4.25	3.92	209	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-120	MH06-119B	GR	3.92	3.85	32	0.0022	36	35.5	23.01	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-119B	MH06-119A	GR	3.85	3.41	274	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-119A	MH06-119	GR	3.41	3.27	100	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-119	MH06-118	GR	3.27	2.73	348	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-118	MH06-117	GR	2.73	2.09	397	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-117	MH06-116	GR	2.09	1.61	314	0.0015	36	35.5	19.00	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-116	MH06-115	GR	1.61	1.12	308	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-115	MH06-114	GR	1.12	0.64	287	0.0017	36	35.5	20.23	PVCPW	1995	Yes	PS06	ACTIVE		0710064
	MH06-114	MH06-113	GR	0.64	0.20	280	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-113	MH06-112	GR	0.20	-0.24	273	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-112	MH06-111	GR	-0.24	-0.67	266	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-111	MH06-110	GR	-0.67	-1.00	216	0.0015	36	35.5	19.00	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-110	MH06-109A	GR	-1.00	-1.48	295	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-109A	MH06-109	GR	-1.48	-2.04	343	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-109	MH06-108A	GR	-2.04	-2.55	310	0.0016	36	35.5	19.62	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-108A	MH06-108	GR	-2.55	-2.56	9	0.0011	36	35.5	16.27	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-108	MH06-107	GR	-3.54	-4.70	557	0.0018	36	35.5	20.81	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-107	MH06-105	GR	-5.64	-5.79	62	0.0152	36	35.5	60.48	PVCPW	1995	Yes	PS06	ACTIVE		0710053
	MH06-105	MH06-104	GR	-5.79	-6.84	444	0.0024	36	35.5	24.03	PVCPW	1995	Yes	PS06	ACTIVE		0710054
	MH06-104	MH06-103	GR	-6.84	-7.90	454	0.0023	36	35.5	23.53	PVCPW	1995	Yes	PS06	ACTIVE		0710054
	MH06-103	MH06-102	GR	-7.90	-8.90	440	0.0023	42	42	31.17	RCP	1948	No	PS06	ACTIVE		0710054
	MH06-102	MH06-101	GR	-8.90	-9.61	357	0.002	42	42	29.07	RCP	1948	No	PS06	ACTIVE		0710054
	MH06-101	PS06	GR	-9.61	-10.89	686	0.0019	42	42	28.33	RCP	1948	No	PS06	ACTIVE		0710054
EAST INTERCEPTOR/NORTH END INTERCEPTOR - 8																	
	MH01-126	MH01-125	GR	1.73	1.56	114	0.001	10	10	0.45	VP	1927	No	PS01	ACTIVE		0710062
	MH01-125	MH01-124	GR	1.56	1.50	116	0.001	10	10	0.45	VP	1927	No	PS01	ACTIVE		0710062
	MH01-124	MH01-123	GR	1.50	1.02	420	0.001	10	10	0.45	VP	1927	No	PS01	ACTIVE		0710062
	MH01-123	MH01-122	GR	1.02	0.92	200	0.001	12	12	0.73	VP	1927	No	PS01	ACTIVE		0710062
	MH01-122	MH01-121	GR	0.92	0.62	312	0.001	12	12	0.73	VP	1927	No	PS01	ACTIVE		0710062
	MH01-121	MH01-120	GR	0.62	-0.15	320	0.001	12	12	0.73	VP	1927	No	PS01	ACTIVE		0710062
EAST INTERCEPTOR/EAST MONONA INTERCEPTOR - 9																	
	MH06-209	MH06-208	GR	0.75	0.48	468	0.0006	15	15	1.02	VP	1926	No	PS06	ACTIVE		0710054
	MH06-208	MH06-207	GR	0.48	0.30	303	0.0006	15	15	1.02	VP	1926	No	PS06	ACTIVE		0710054
	MH06-207	PB06-206X72	GR	0.30	0.04	393	0.0006	15	15	1.02	VP	1926	No	PS06	ACTIVE		0710054
	PB06-206X72	MH06-206	GR	0.04	0.00	72	0.0006	15	15	1.02	PVC	1997	No	PS06	ACTIVE		0710054
	MH06-206	MH06-205	SI	-5.00	-5.00	85	0	14	14	1.04	CI	1925	No	PS06	ACTIVE		0710054
	MH06-205	MH06-204	GR	0.03	-0.05	90	0.0006	14	14	0.85	CI	1925	No	PS06	ACTIVE		0710053
	MH06-204	MH06-203	GR	-0.05	-0.13	93	0.0009	15	15	1.48	PVC	1997	No	PS06	ACTIVE		0710053

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH06-203	MH06-202	GR	-0.13	-0.33	408	0.0009	15	15	1.48	PVC	1997	No	PS06	ACTIVE		0710053
	MH06-202	MH06-108A	GR	-0.33	-0.82	346	0.0013	15	15	1.78	PVC	1997	No	PS06	ACTIVE		0710053
EAST INTERCEPTOR/NORTHEAST INTERCEPTOR RELIEF - 10																	
	MH01-003	MH01-002	GR	-7.96	-8.17	165	0.001	30	30	8.38	CI	1937	No	PS01	ACTIVE		0710063
	MH01-002	MH01-001	GR	-8.17	-8.23	24	0.001	30	30	8.38	CI	1937	No	PS01	ACTIVE		0710063
EAST INTERCEPTOR/EAST JOHNSON STREET RELIEF - 11																	
	MH01-304	MH01-303	GR	-8.13	-8.42	84	0.003	36	36	23.60	RCP	1979	No	PS01	ACTIVE		0710063
	MH01-303	MH01-302	GR	-8.42	-8.52	65	0.003	36	36	23.60	RCP	1979	No	PS01	ACTIVE		0710063
	MH01-302	MH01-301	GR	-8.63	-9.05	177	0.003	36	36	23.60	RCP	1979	No	PS01	ACTIVE		0710063
	MH01-301	PS01	GR	-9.13	-8.00	332	0.003	36	36	23.60	RCP	1979	No	PS01	ACTIVE		0710063
	MH01-001	MH01-303	GR	-8.23	-8.42	38	0.003	36	36	23.60	RCP	1979	No	PS01	ACTIVE		0710063
EAST INTERCEPTOR/BURR JONES PARK LEG - 12																	
	LOCAL-GRAVITY	PS01	GR	-12.71	-12.95	10	0.001	42	42	20.55	RCP	1950	No	PS01	ACTIVE		0710063
EAST INTERCEPTOR/UPSTREAM OF PS-07 - 13																	
	MH07-129	MH07-128	GR	29.39	27.90	217	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-128	MH07-127	GR	27.90	25.17	402	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-127	MH07-126	GR	25.17	21.28	573	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-126	MH07-125	GR	21.28	18.94	345	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-125	MH07-124	GR	18.94	17.20	279	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-124	MH07-123A	GR	17.20	15.74	224	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710171
	MH07-123A	MH07-123	GR	15.74	15.00	103	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710174
	MH07-123	MH07-122	GR	15.00	13.14	331	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710174
	MH07-122	MH07-121A	GR	13.14	10.18	652	0.0065	36	36	41.05	RCPWT	1986	No	PS07	ACTIVE		0710174
	MH07-121A	MH07-120A	GR	10.18	8.17	498	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-120A	MH07-119A	GR	8.17	7.41	356	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-119A	MH07-118B	GR	7.41	6.87	280	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-118B	MH07-118A	GR	6.87	6.74	43	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-118A	MH07-117A	GR	6.74	5.77	374	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-117A	MH07-116A	GR	5.77	4.63	526	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-116A	MH07-115A	GR	4.50	3.77	517	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-115A	MH07-114A	GR	3.77	3.18	236	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-114A	MH07-111J	GR	3.18	3.12	21	0.0022	42	42	36.03	RCPWT	1990	No	PS07	ACTIVE		0710174
	MH07-111J	MH07-111I	GR	3.12	2.90	65	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710174
	MH07-111I	MH07-111H	GR	2.90	2.19	147	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710174
	MH07-111H	MH07-111G	GR	2.19	2.05	29	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710174
	MH07-111G	MH07-111F	GR	2.05	0.61	285	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710174
	MH07-111F	MH07-111E	GR	0.61	-0.86	289	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710202
	MH07-111E	MH07-111D	GR	-0.86	-2.49	322	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710202
	MH07-111D	MH07-111C	GR	-2.49	-2.86	70	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710202
	MH07-111C	MH07-111B	GR	-2.86	-4.65	358	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710202
	MH07-111B	MH07-111A	GR	-4.65	-6.03	279	0.005	36	36	36.01	RCPWT	1985	No	PS07	ACTIVE		0710202
	MH07-111A	MH07-110A	GR	-6.29	-7.38	408	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710202
	MH07-110A	MH07-109A	GR	-7.38	-7.55	155	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710202

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-109A	MH07-108A	GR	-7.55	-8.25	347	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710202
	MH07-108A	MH07-107A	GR	-8.25	-8.82	314	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710202
	MH07-107A	MH07-106A	GR	-8.82	-9.53	357	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710202
	MH07-106A	MH07-105A	GR	-9.53	-10.29	362	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-105A	MH07-104A	GR	-10.29	-10.69	203	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-104A	MH07-103C	GR	-10.69	-11.14	204	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-103C	MH07-103B	GR	-11.14	-11.17	32	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-103B	MH07-103A	GR	-11.17	-11.55	191	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-103A	MH07-103	GR	-11.55	-11.63	37	0.0022	42	42	30.48	DI	1990	No	PS07	ACTIVE		0710203
	MH07-103	MH07-102	GR	-11.63	-12.73	526	0.0022	42	42	30.48	RCP	1948	No	PS07	ACTIVE		0710203
	MH07-102	MH07-101	GR	-12.73	-13.75	348	0.0022	42	42	30.48	RCP	1948	No	PS07	ACTIVE		0710203
	MH07-101	PS07	GR	-13.75	-13.92	115	0.0022	42	42	30.48	RCP	1948	No	PS07	ACTIVE		0710203

EFFLUENT DIVERSION FORCE MAIN - 15

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MHED-27076	AEED-27561	FM	53.30	78.40	485		54	54		PCCP	1957	No	BC	ACTIVE		0610191
	MHED-25808	MHED-27076	FM	78.70	53.30	1268		54	54		PCCP	1957	No	BC	ACTIVE		0610191
	PBED-25648	MHED-25808	FM	78.70	78.70	160		54	54		PCCP	1957	No	BC	ACTIVE		0610183
	MHED-24800	PBED-25648	FM	3.10	78.70	848		54	54		PCCP	1957	No	BC	ACTIVE		0610183
	MHED-24195	MHED-24800	FM	-4.80	3.10	605		54	54		PCCP	1957	No	BC	ACTIVE		0610183
	MHED-23195	MHED-24195	FM	2.30	-4.80	1000		54	54		PCCP	1957	No	BC	ACTIVE		0610183
	MHED-21994	MHED-23195	FM	7.90	2.30	1201		54	54		PCCP	1957	No	BC	ACTIVE		0610183
	MHED-21400	MHED-21994	FM	-1.30	7.90	594		54	54		PCCP	1957	No	BC	ACTIVE		0610182
	MHED-20250	MHED-21400	FM	44.30	-1.30	1150		54	54		PCCP	1957	No	BC	ACTIVE		0610182
	MHED-18500	MHED-20250	FM	25.50	44.30	1750		54	54		PCCP	1957	No	BC	ACTIVE		0610073
	MHED-18400	MHED-18500	FM	24.80	25.50	100		54	54		PCCP	1957	No	BC	ACTIVE		0610073
	MHED-16575	MHED-18400	FM	39.80	24.80	1825		54	54		PCCP	1957	No	BC	ACTIVE		0610073
	MHED-14660	MHED-16575	FM	-4.90	39.80	1123		54	54		PCCP	1957	No	BC	ACTIVE		0610072
	MHED-13478	MHED-14660	FM	42.20	-4.90	1182		54	54		PCCP	1957	No	BC	ACTIVE		0610072
	MHED-12971	MHED-13478	FM	28.20	42.20	507		54	54		PCCP	1957	No	BC	ACTIVE		0610063
	MHED-11800	MHED-12971	FM	36.60	28.20	1171		54	54		PCCP	1957	No	BC	ACTIVE		0610063
	MHED-11244	MHED-11800	FM	8.00	36.60	556		54	54		PCCP	1957	No	BC	ACTIVE		0610063
	MHED-10424	MHED-11244	FM	8.50	8.00	820		54	54		PCCP	1957	No	BC	ACTIVE		0610063
	MHED-08708	MHED-10424	FM	9.40	8.50	1716		54	54		PCCP	1957	No	BC	ACTIVE		0610062
	MHED-07090	MHED-08708	FM	44.40	9.40	1618		54	54		PCCP	1957	No	BC	ACTIVE		0610062
	MHED-05645	MHED-07090	FM	-7.80	44.40	1445		54	54		PCCP	1957	No	BC	ACTIVE		0710313
	MHED-05100	MHED-05645	FM	-8.30	-7.80	545		54	54		PCCP	1957	No	BC	ACTIVE		0710313
	MHED-03844	MHED-05100	FM	6.10	-8.30	1256		54	54		PCCP	1957	No	BC	ACTIVE		0710312
	MHED-02300	MHED-03844	FM	33.00	6.10	1544		54	54		PCCP	1957	No	BC	ACTIVE		0710303
	MHED-01300	MHED-02300	FM	8.20	33.00	1000		54	54		PCCP	1957	No	BC	ACTIVE		0710303
	MHED-00800	MHED-01300	FM	0.50	8.20	500		54	54		PCCP	1957	No	BC	ACTIVE		0710303
	MHED-00740	MHED-00800	FM	0.50	0.50	60		54	54		PCCP	1957	No	BC	ACTIVE		0710303
	EFF PUMP HOUSE	MHED-00740	FM			240		54	54		PCCP	1957	No	BC	ACTIVE		0710303

BADGER MILL CREEK FORCE MAIN - 16

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	RDBMC-55960	BDBMC-55907	FM	-7.10	-6.06	53		20	20.94		DI	1997	No	BMC	ACTIVE		0710303
	BDBMC-55907	MHBMC-55750	FM	-6.06	-2.30	157		20	20.94		DI	1997	No	BMC	ACTIVE		0710303

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MHBMC-55750	TEBMC-55150	FM	-2.30	11.40	600		20	20.94		DI	1997	No	BMC	ACTIVE		0710303
	TEBMC-55150	BDBMC-54545	FM	11.40	19.40	605		20	20.94		DI	1997	No	BMC	ACTIVE		0710303
	BDBMC-54545	MHBMC-53720	FM	19.40	41.90	825		20	20.94		DI	1997	No	BMC	ACTIVE		0710303
	MHBMC-53720	BDBMC-51735	FM	41.90	2.90	1985		20	20.94		DI	1997	No	BMC	ACTIVE		0710312
	BDBMC-51735	BDBMC-51141	FM	2.90	-1.52	594		20	20.94		DI	1997	No	BMC	ACTIVE		0710312
	BDBMC-51141	BDBMC-50471	FM	-1.52	-1.10	670		20	20.94		DI	1997	No	BMC	ACTIVE		0710312
	BDBMC-50471	BDBMC-49588	FM	-1.10	8.40	883		20	20.94		DI	1997	No	BMC	ACTIVE		0609011
	BDBMC-49588	BDBMC-47904	FM	8.40	39.87	1685		20	20.94		DI	1997	No	BMC	ACTIVE		0609011
	BDBMC-47904	BDBMC-47520	FM	39.87	42.90	384		20	20.94		DI	1997	No	BMC	ACTIVE		0609011
	BDBMC-47520	BDBMC-47190	FM	42.90	42.90	330		20	20.94		DI	1997	No	BMC	ACTIVE		0609011
	BDBMC-47190	BDBMC-46795	FM	42.90	46.90	394		20	20.94		DI	1997	No	BMC	ACTIVE		0609011
	BDBMC-46795	MHBMC-46550	FM	46.90	50.40	246		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	MHBMC-46550	BDBMC-46525	FM	50.40	50.40	24		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-46525	BDBMC-45340	FM	50.40	9.20	1186		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-45340	BDBMC-45030	FM	9.20	-1.60	310		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-45030	BDBMC-44960	FM	-1.60	-2.60	70		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44960	BDBMC-44850	FM	-2.60	2.02	110		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44850	BDBMC-44745	FM	2.02	6.40	104		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44745	BDBMC-44500	FM	6.40	6.40	246		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44500	MHBMC-44450	FM	6.40	6.40	50		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	MHBMC-44450	BDBMC-44270	FM	6.40	2.80	180		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44270	BDBMC-44200	FM	2.80	2.40	70		20	20.94		DI	1997	No	BMC	ACTIVE		0609012
	BDBMC-44200	MHBMC-42000	FM	2.40	15.40	2200		20	20.94		DI	1997	No	BMC	ACTIVE		0609024
	MHBMC-42000	BDBMC-40600	FM	15.40	4.40	1400		20	20.94		DI	1997	No	BMC	ACTIVE		0609024
	BDBMC-40600	BDBMC-40081	FM	4.40	4.40	519		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-40081	HYBMC-39950	FM	4.40	4.40	131		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	HYBMC-39950	BDBMC-39630	FM	4.40	4.40	320		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-39630	BDBMC-39233	FM	4.40	4.40	244		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-39233	BDBMC-38695	FM	4.40	4.40	538		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-38695	BDBMC-38609	FM	4.40	4.40	86		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-38609	BDBMC-38205	FM	4.40	4.40	404		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-38205	BDBMC-37588	FM	4.40	4.40	617		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-37588	BDBMC-37528	FM	4.40	3.12	60		20	20.94		DI	1997	No	BMC	ACTIVE		0609023
	BDBMC-37528	BDBMC-36435	FM	3.12	-1.10	1093		20	20.94		DI	1997	No	BMC	ACTIVE		0609034
	BDBMC-36435	BDBMC-34416	FM	-1.10	2.40	2019		20	20.94		DI	1997	No	BMC	ACTIVE		0609034
	BDBMC-34416	BDBMC-33708	FM	2.40	4.40	708		20	20.94		DI	1997	No	BMC	ACTIVE		0609034
	BDBMC-33708	BDBMC-33022	FM	4.40	10.10	680		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	BDBMC-33022	BDBMC-32261	FM	10.10	16.90	705		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	BDBMC-32261	BDBMC-31376	FM	16.90	21.40	885		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	BDBMC-31376	BDBMC-30805	FM	21.40	23.20	572		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	BDBMC-30805	TEBMC-30505	FM	23.20	26.32	299		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	TEBMC-30505	RDBMC-30500	FM	26.32	26.32	5		20	20.94		DI	1997	No	BMC	ACTIVE		0609033
	RDBMC-30500	BDBMC-30000	FM	26.32	47.97	500		16.0	20.94		DI	1997	No	BMC	ACTIVE		0609033
	BDBMC-30000	RDBMC-29783	FM	47.97	59.40	217		16.0	20.94		DI	1997	No	BMC	ACTIVE		0609044
	RDBMC-29783	MHBMC-29050	FM	59.40	81.00	733		20	20.94		DI	1997	No	BMC	ACTIVE		0609044

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MHBMC-29050	BDBMC-28829	FM	81.00	79.92	221		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28829	BDBMC-28647	FM	79.92	79.02	182		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28647	BDBMC-28481	FM	79.02	78.21	166		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28481	BDBMC-28391	FM	78.21	76.40	90		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28391	BDBMC-28231	FM	76.40	62.32	160		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28231	BDBMC-28112	FM	62.32	64.71	128		20	20.94		DI	1997	No	BMC	ACTIVE		0609044
	BDBMC-28112	BDBMC-27676	FM	64.71	68.20	436		20	20.94		DI	1997	No	BMC	ACTIVE		0609042
	BDBMC-27676	BDBMC-26999	FM	68.20	70.40	677		20	20.94		DI	1997	No	BMC	ACTIVE		0609042
	BDBMC-26999	BDBMC-26799	FM	70.40	73.90	194		20	20.94		DI	1997	No	BMC	ACTIVE		0609042
	BDBMC-26799	BDBMC-23926	FM	73.90	86.90	2873		20	20.94		DI	1997	No	BMC	ACTIVE		0609051
	BDBMC-23926	BDBMC-23834	FM	86.90	86.90	92		20	20.94		DI	1997	No	BMC	ACTIVE		0609051
	BDBMC-23834	BDBMC-23249	FM	86.90	87.40	585		20	20.94		DI	1997	No	BMC	ACTIVE		0609051
	BDBMC-23249	BDBMC-22608	FM	87.40	90.40	641		20	20.94		DI	1997	No	BMC	ACTIVE		0609051
	BDBMC-22608	BDBMC-21950	FM	90.40	95.70	658		20	20.94		DI	1997	No	BMC	ACTIVE		0609053
	BDBMC-21950	BDBMC-21830	FM	95.70	95.70	120		20	20.94		DI	1997	No	BMC	ACTIVE		0609053
	BDBMC-21830	BDBMC-21644	FM	95.70	95.70	186		20	20.94		DI	1997	No	BMC	ACTIVE		0609053
	BDBMC-21644	BDBMC-19134	FM	95.70	97.31	2510		20	20.94		DI	1997	No	BMC	ACTIVE		0609053
	BDBMC-19134	BDBMC-18713	FM	97.31	100.87	421		20	20.94		DI	1997	No	BMC	ACTIVE		0609052
	BDBMC-18713	BDBMC-18399	FM	100.87	102.40	314		20	20.94		DI	1997	No	BMC	ACTIVE		0609052
	BDBMC-18399	BDBMC-18239	FM	102.40	107.90	169		20	20.94		DI	1997	No	BMC	ACTIVE		0609052
	BDBMC-18239	MHBMC-14392	FM	107.90	144.40	3847		20	20.94		DI	1997	No	BMC	ACTIVE		0609064
	MHBMC-14392	MHBMC-12900	FM	144.40	135.40	1492		20	20.94		DI	1997	No	BMC	ACTIVE		0609072
	MHBMC-12900	MHBMC-10200	FM	135.40	128.90	2682		20	20.94		DI	1997	No	BMC	ACTIVE		0609073
	MHBMC-10200	MHBMC-06650	FM	128.90	119.90	3550		20	20.94		DI	1997	No	BMC	ACTIVE		0608124
	MHBMC-06650	BDBMC-04350	FM	119.90	103.90	2300		20	20.94		DI	1997	No	BMC	ACTIVE		0608132
	BDBMC-04350	BDBMC-04027	FM	103.90	103.90	323		20	20.94		DI	1997	No	BMC	ACTIVE		0608132
	BDBMC-04027	BDBMC-02023	FM	103.90	104.40	2004		20	20.94		DI	1997	No	BMC	ACTIVE		0608132
	BDBMC-02023	AEBMC-02013	FM	104.40	104.00	10		20	20.94		DI	1997	No	BMC	ACTIVE		0608132
	EFF PUMP HOUSE	RDBMC-55960	FM	-2.92	-7.10	38		20	20.94		DI	1997	No	BMC	ACTIVE		0710303
FAR EAST INTERCEPTOR - 20																	
	MH07-416	MH07-415	GR	4.69	3.98	355	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-415	MH07-414	GR	3.98	3.70	595	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-414	MH07-413	GR	3.70	3.50	536	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-413	MH07-412	GR	3.50	3.02	550	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-412	MH07-411	GR	3.02	2.65	557	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-411	MH07-410	GR	2.65	2.35	540	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-410	MH07-409	GR	2.35	2.11	616	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-409	MH07-408A	GR	2.11		227	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-408A	MH07-408	GR		1.81	280	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-408	MH07-407A	GR	1.81		351	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-407A	MH07-407	GR		1.43	139	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710232
	MH07-407	MH07-406	GR	1.43	1.11	490	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710221
	MH07-406	MH07-405	GR	1.11	0.90	490	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710221
	MH07-405	MH07-404	GR	0.90	0.46	510	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710221

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-404	MH07-403	GR	0.46	0.13	550	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710221
	MH07-403	MH07-402A	GR	0.13	-0.10	275	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710221
	MH07-402A	MH07-402	GR	-0.10	-0.33	275	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710222
	MH07-402	MH07-401	GR	-0.33	-0.57	550	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710222
	MH07-401	MH07-932	GR	-0.57		536	0.0006	42	42	15.92	RCP	1970	No	PS07	ACTIVE		0710222
FAR EAST INTERCEPTOR/FAR EAST EXTENSION - 21																	
	MH07-426	MH07-425	GR	9.15	9.03	153	0.0008	36	36	12.19	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-425	MH07-424	GR	9.03	8.63	500	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-424	MH07-423	GR	8.63	8.25	462	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-423	MH07-422	GR	8.25	8.10	245	0.0008	30	30	7.49	DI	1981	No	PS07	ACTIVE		0710144
	MH07-422	MH07-421	GR	8.10	7.71	486	0.0008	30	30	7.49	DI	1981	No	PS07	ACTIVE		0710144
	MH07-421	MH07-420	GR	7.52	7.25	451	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-420	MH07-419	GR	7.25	7.13	220	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-419	MH07-418	GR	7.13	6.74	507	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710144
	MH07-418	MH07-417	GR	6.74	6.29	492	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710232
	MH07-417	MH07-416	GR	6.29	5.94	498	0.0008	30	30	7.49	RCP	1981	No	PS07	ACTIVE		0710232
FAR EAST INTERCEPTOR/COTTAGE GROVE EXTENSION - 22																	
	MH07-437	MH07-436	GR	20.76	19.74	498	0.0016	18	17.18	2.83	RCP	1981	Yes	PS07	ACTIVE		0710131
	MH07-436	MH07-435	GR	19.59	18.79	506	0.0016	18	17.18	2.83	RCP	1981	Yes	PS07	ACTIVE		0710131
	MH07-435	MH07-434	GR	18.64	17.82	489	0.0016	18	17.18	2.83	RCP	1981	Yes	PS07	ACTIVE		0710131
	MH07-434	MH07-433	GR	17.67	16.96	522	0.0016	18	17.18	2.83	RCP	1981	Yes	PS07	ACTIVE		0710133
	MH07-433	MH07-432	GR	16.96	16.09	460	0.0016	18	17.18	2.83	RCP	1981	Yes	PS07	ACTIVE		0710133
	MH07-432	MH07-431	GR	16.09	15.50	484	0.0016	18	17.3	2.89	DI	1981	Yes	PS07	ACTIVE		0710133
	MH07-431	MH07-430	GR	15.50	14.60	484	0.0016	18	17.3	2.89	DI	1981	Yes	PS07	ACTIVE		0710133
	MH07-430	MH07-429	GR	14.60	13.81	484	0.0016	18	17.3	2.89	DI	1981	Yes	PS07	ACTIVE		0710133
	MH07-429	MH07-428	GR	13.81	12.93	524	0.0016	18	17.3	2.89	DI	1981	Yes	PS07	ACTIVE		0710133
	MH07-428	MH07-427	GR	12.93	12.09	524	0.0016	18	17.3	2.89	DI	1981	Yes	PS07	ACTIVE		0710144
	MH07-427	MH07-426	GR	12.09	11.28	535	0.0016	18	17.18	2.83	DI	1981	Yes	PS07	ACTIVE		0710144
FAR EAST INTERCEPTOR/DOOR CREEK EXTENSION - 23																	
	PB07-734X467	MH07-734	GR	37.35	36.74	467	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0711062
	MH07-734	MH07-733	GR	36.74	35.92	552	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0711062
	MH07-733	MH07-732	GR	35.92	35.06	578	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-732	MH07-731	GR	35.06	34.41	490	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-731	MH07-730	GR	34.41	33.93	322	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-730	MH07-729A	GR	33.93	33.86	219	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-729A	MH07-729	GR	33.86	33.62	181	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-729	MH07-728	GR	33.38	32.43	575	0.0013	21	20.7	4.20	PVCPW	1998	No	PS07	ACTIVE		0710011
	MH07-728	MH07-727A	GR	32.43	31.89	271	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710014
	MH07-727A	MH07-727	GR	31.89	31.32	271	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710014
	MH07-727	MH07-726	GR	31.32	30.16	551	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710014
	MH07-726	MH07-725	GR	30.16	29.16	434	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710014
	MH07-725	MH07-724	GR	29.16	28.17	493	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710014
	MH07-724	MH07-723	GR	28.17	27.11	476	0.002	21	20.7	5.21	PVCPW	1998	No	PS07	ACTIVE		0710121

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-723	MH07-722	GR	27.11	26.47	450	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710121
	MH07-722	MH07-721	GR	26.47	25.97	441	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710121
	MH07-721	MH07-720	GR	25.92	25.31	505	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710121
	MH07-720	MH07-719	GR	25.26	24.48	480	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710121
	MH07-719	MH07-718	GR	24.48	23.90	466	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710121
	MH07-718	MH07-717	GR	23.90	23.24	449	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710124
	MH07-717	MH07-716	GR	23.29	22.69	476	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710124
	MH07-716	MH07-715	GR	22.69	22.09	471	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710124
	MH07-715	MH07-714	GR	22.07	21.39	505	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710124
	MH07-714	MH07-713	GR	21.39	20.68	536	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710124
	MH07-713	MH07-712	GR	20.68	20.12	417	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710131
	MH07-712	MH07-711	GR	20.12	19.49	466	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710131
	MH07-711	MH07-710	GR	19.49	18.83	539	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-710	MH07-709	GR	18.83	18.14	534	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-709	MH07-708	GR	18.14	17.40	577	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-708	MH07-707	GR	17.40	16.63	587	0.0012	24	23.5	5.66	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-707	MH07-706	GR	16.63	15.73	364	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-706	MH07-705	GR	15.73	15.14	357	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-705	MH07-704	GR	15.14	14.34	499	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-704	MH07-703	GR	14.34	13.40	518	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710132
	MH07-703	MH07-702	GR	13.40	12.35	534	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710141
	MH07-702	MH07-701	GR	12.35	11.30	602	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710141
	MH07-701	MH07-426	GR	11.27	10.27	600	0.0017	24	23.5	6.73	PVCPW	1998	No	PS07	ACTIVE		0710144
NINE SPRINGS VALLEY INTERCEPTOR - 30																	
	MH11-166A	MH11-166	GR	139.85	139.30	364	0.0015	42	42	25.17	RCP	1965	No	PS11	ACTIVE		0609064
	MH11-166	MH11-165	GR	139.30	138.41	524	0.0015	42	42	25.17	RCP	1965	No	PS11	ACTIVE		0609064
	MH11-165	MH11-164A	GR	138.41	138.05	243	0.0015	42	42	25.17	RCP	1965	No	PS11	ACTIVE		0609064
	MH11-164A	MH11-161E	GR	138.05	137.52	249	0.0015	42	42	25.17	RCP	1965	No	PS11	ACTIVE		0609064
	MH11-162	MH11-161B	GR	119.40	118.90	10	0.05	18	18	17.93	PVC	2001	No	PS11	ACTIVE		0609064
	MH11-161E	MH11-161D	GR	137.70	137.11	18	0.0328	30	29.5	54.23	PVC	2001	No	PS11	ACTIVE		0609064
	MH11-161D	MH11-161C	GR	137.11	123.95	598	0.022	30	29.5	44.41	PVC	2001	No	PS11	ACTIVE		0609064
	MH11-161C	MH11-161B	GR	123.95	116.60	505	0.0146	30	29.5	36.18	PVC	2001	No	PS11	ACTIVE		0609064
	MH11-161B	MH11-161A	GR	116.60	116.45	25	0.006	30	29.5	23.19	PVC	2001	No	PS11	ACTIVE		0609064
	MH11-161A	MH11-161	GR	116.45	114.58	498	0.004	36	36	27.25	RCP	1965	No	PS11	ACTIVE		0609064
	MH11-161	MH11-160	GR	114.58	112.48	303	0.004	36	36	27.25	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-160	MH11-159	GR	112.48	110.77	520	0.004	36	36	27.25	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-159	MH11-158	GR	110.77	109.48	340	0.004	36	36	27.25	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-158	MH11-157	GR	109.48	100.84	580	0.0185	30	30	36.04	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-157	MH11-156	GR	100.84	89.09	523	0.0185	30	30	36.04	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-156	MH11-155	GR	89.09	87.88	602	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-155	MH11-154	GR	87.88	86.72	596	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-154	MH11-153	GR	86.72	86.20	345	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609052
	MH11-153	MH11-152	GR	86.20	84.37	594	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609051
	MH11-152	MH11-151A	GR	84.37	84.22	83	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609051

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH11-151A	MH11-151	GR	84.22	83.30	514	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609051
	MH11-151	MH11-150	GR	83.30	82.23	565	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609051
	MH11-150	MH11-149	GR	82.23	80.99	564	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609051
	MH11-149	MH11-148	GR	80.99	80.22	492	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-148	MH11-147	GR	80.22	78.99	546	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-147	MH11-146	GR	78.99	77.68	556	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-146	MH11-145	GR	77.68	76.75	547	0.002	42	42	29.07	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-145	MH11-144	GR	76.75	74.03	284	0.0077	36	36	37.81	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-144	MH11-143A	GR	74.03	73.11	158	0.0077	36	36	37.81	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-143A	MH11-143	GR	73.11	71.62	256	0.0077	36	36	37.81	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-143	MH11-142	GR	71.62	68.80	421	0.0077	36	36	37.81	RCP	1965	No	PS11	ACTIVE		0609042
	MH11-142	MH11-141	GR	67.00	64.69	439	0.0077	36	36	37.81	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-141	MH11-140A	GR	64.69	61.45	230	0.0182	30	30	35.75	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-140A	MH11-140	GR	61.45	56.25	370	0.0182	30	30	35.75	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-140	MH11-139	GR	56.25	47.99	375	0.0182	30	30	35.75	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-139	MH11-138	GR	47.99	40.10	361	0.0182	30	30	35.75	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-138	MH11-137	GR	40.10	34.67	312	0.0182	30	30	35.75	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-137	MH11-136	GR	34.43	30.09	555	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609044
	MH11-136	MH11-135	GR	30.09	25.37	562	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-135	MH11-134	GR	25.37	20.97	559	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-134	MH11-133	GR	20.97	17.19	405	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-133	MH11-132	GR	17.19	12.80	472	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-132	MH11-131	GR	12.80	9.02	492	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-131	MH11-130B	GR	9.02	8.20	70	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-130B	MH11-130A	GR	8.20	7.36	127	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-130A	MH11-130	GR	7.36	6.45	87	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609033
	MH11-130	MH11-129A	GR	6.45	4.47	353	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-129A	MH11-129	GR	4.47	0.71	314	0.0084	33	33	31.31	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-129	MH11-128	GR	0.71	-1.47	331	0.0066	36	36	35.00	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-128	MH11-127	GR	-1.47	-4.13	402	0.0066	36	36	35.00	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-127	MH11-126	GR	-5.63	-6.00	524	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-126	MH11-125	GR	-6.00	-6.17	499	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-125	MH11-124	GR	-6.17	-6.80	503	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-124	MH11-123	GR	-6.80	-6.80	491	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-123	MH11-122	GR	-6.80	-7.20	445	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609034
	MH11-122	MH11-121	GR	-7.20	-7.09	420	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-121	MH11-120	GR	-7.09	-7.61	492	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-120	MH11-119	GR	-7.61	-8.39	505	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-119	MH11-118	GR	-8.39	-8.18	500	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-118	MH11-117	GR	-8.18	-8.32	438	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-117	MH11-116A	GR	-8.32	-8.32	38	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-116A	MH11-116	GR	-8.32	-8.77	454	0.006	54	54	98.40	RCP	1965	No	PS11	ACTIVE		0609023
	MH11-116	MH11-115	GR	-8.77	-8.99	550	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609024
	MH11-115	MH11-114	GR	-8.99	-9.51	497	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609024
	MH11-114	MH11-113	GR	-9.51	-9.52	503	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609024

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH11-113	MH11-112	GR	-9.52	-9.95	492	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609024
	MH11-112	MH11-111A	GR	-9.95	-10.17	292	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-111A	MH11-111	GR	-10.17	-10.40	303	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-111	MH11-110	GR	-10.40	-11.23	589	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-110	MH11-109	GR	-11.23	-10.94	607	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-109	MH11-108	GR	-10.94	-11.59	597	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-108	MH11-107	GR	-11.59	-12.34	604	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-107	MH11-106A	GR	-12.34	-12.36	16	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-106A	MH11-106	GR	-12.36	-12.99	578	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609012
	MH11-106	MH11-105	GR	-12.99	-12.84	600	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
	MH11-105	MH11-104	GR	-12.84	-13.02	511	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
	MH11-104	MH11-103	GR	-13.02	-13.25	504	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
	MH11-103	MH11-102	GR	-13.25	-13.43	533	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
	MH11-102	MH11-101	GR	-13.43	-13.56	437	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
	MH11-101	PS11	GR	-13.56	-13.56	51	0.0006	54	54	31.12	RCP	1965	No	PS11	ACTIVE		0609011
NINE SPRINGS VALLEY/MINERAL POINT EXT - 31																	
	MH12-177	MH12-176	GR	182.84	181.64	400	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708234
	MH12-176	MH12-175	GR	181.64	181.36	104	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-175	MH12-174	GR	181.36	181.01	104	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-174	MH12-173B	GR	181.01	180.66	152	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-173B	MH12-173A	GR	180.66	180.00	198	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-173A	MH12-173	GR	180.00	179.25	212	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-173	MH12-172A	GR	179.25	178.86	148	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-172A	MH12-172	GR	178.86	177.78	414	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-172	MH12-171	GR	177.78	176.27	542	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-171	MH12-170	GR	176.27	174.97	542	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-170	MH12-169	GR	174.97	174.11	351	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-169	MH12-168	GR	174.11	173.27	351	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-168	MH12-167	GR	173.27	172.46	401	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-167	MH12-166A	GR	172.26	171.89	178	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-166A	MH12-166	GR	171.89	171.42	223	0.0026	33	33	17.42	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-166	MH12-165	GR	171.42	169.95	328	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708252
	MH12-165	MH12-164	GR	169.95	168.55	404	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-164	MH12-163	GR	168.55	167.63	233	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-163	MH12-162	GR	167.63	166.31	331	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-162	MH12-161	GR	166.31	164.11	492	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-161	MH12-160A	GR	164.11	162.92	264	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-160A	MH12-160	GR	162.92	162.06	186	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-160	MH12-159B	GR	162.06	160.91	260	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-159B	MH12-159A	GR	160.91	159.91	225	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-159A	MH12-159	GR	159.91	159.84	15	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708253
	MH12-159	MH12-158	GR	159.84	157.62	501	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-158	MH12-157	GR	157.62	155.52	501	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-157	MH12-156A	GR	155.52	152.97	520	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708362

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH12-156A	MH12-156	GR	152.97	152.85	24	0.0045	30	30	17.77	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-156	MH12-155A	GR	152.85	152.05	250	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-155A	MH12-155	GR	152.05	151.25	250	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-155	MH12-154B	GR	151.25	151.22	20	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-154B	MH12-154A	GR	151.22	150.93	190	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-154A	MH12-154	GR	150.93	150.70	148	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-154	MH12-153A	GR	150.70	150.62	108	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-153A	MH12-153	GR	150.62	150.43	252	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-153	MH12-152	GR	150.43	150.23	270	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-152	MH12-151	GR	150.23	149.25	600	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-151	MH12-150	GR	149.25	148.76	300	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708362
	MH12-150	MH12-149	GR	148.76	147.99	453	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-149	MH12-148	GR	147.99	147.03	524	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-148	MH12-147	GR	147.03	146.07	454	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-147	MH12-146	GR	146.07	145.27	450	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-146	MH12-145	GR	145.27	144.52	450	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-145	MH12-144	GR	144.52	143.61	487	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-144	MH12-143	GR	143.61	142.76	467	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-143	MH12-142	GR	142.76	142.05	467	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-142	MH12-141A	GR	142.05		432	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-141A	MH12-141	GR		141.22	35	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0708354
	MH12-141	MH12-140	GR	141.22	140.13	550	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-140	MH12-139	GR	140.13	139.13	480	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-139	MH12-138	GR	139.13	138.47	475	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-138	MH12-137	GR	138.47	137.99	245	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-137	MH12-136	GR	137.99	137.25	426	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-136	MH12-135	GR	137.25	136.41	426	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-135	MH12-134	GR	136.41	135.45	496	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-134	MH12-133	GR	135.45	131.76	396	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608022
	MH12-133	MH12-132	GR	131.76	130.87	385	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-132	MH12-131	GR	130.87	129.97	499	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-131	MH12-130	GR	129.97	128.92	574	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-130	MH12-129	GR	128.92	127.66	592	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-129	MH12-128	GR	127.66	126.78	386	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-128	MH12-127	GR	126.78	126.12	380	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608023
	MH12-127	MH12-126A	GR	126.12	125.22	317	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-126A	MH12-126	GR	125.22	124.91	109	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-126	MH12-125A	GR	124.91	124.28	324	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-125A	MH12-125	GR	124.28	123.93	177	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-125	MH12-124	GR	123.93	122.90	500	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-124	MH12-123A	GR	122.90	122.40	244	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-123B	MH12-123	GR	122.11	121.86	125	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-123A	MH12-123B	GR	122.40	122.11	140	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-123	MH12-122A	GR	121.86	120.50	188	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-122A	MH12-122	GR	120.50	118.34	300	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH12-122	MH12-121A	GR	118.34	116.87	356	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-121A	MH12-121	GR	116.87	116.27	144	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-121	MH12-120A	GR	116.27	114.38	249	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-120A	MH12-120	GR	116.27	114.38	250	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-120	MH12-119	GR	114.38	113.36	401	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-119	MH12-118A	GR	113.36	113.06	135	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-118A	MH12-118	GR	113.06	112.46	265	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608111
	MH12-118	MH12-117	GR	112.46	111.48	400	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-117	MH12-116	GR	111.48	110.23	469	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-116	MH12-115	GR	110.23	109.02	472	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-115	MH12-114	GR	109.02	107.92	559	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-114	MH12-113	GR	107.92	106.46	542	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-113	MH12-112A	GR	106.46	105.34	281	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-112A	MH12-112	GR	105.34	105.10	261	0.0024	36	36	21.11	RCP	1968	No	PS12	ACTIVE	1968	0608123
	MH12-112	MH12-111	GR	104.30	103.93	476	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-111	MH12-110	GR	103.93	103.40	494	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-110	MH12-109	GR	103.40	103.43	279	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-109	MH12-108	GR	103.43	103.32	568	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-108	MH12-107	GR	103.32	103.01	510	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608123
	MH12-107	MH12-106	GR	103.01	102.60	130	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-106	MH12-105	GR	102.60	102.29	500	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-105	MH12-104	GR	102.29	102.17	500	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-104	MH12-103	GR	102.17	101.94	500	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-103	MH12-102	GR	101.94	101.64	428	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-102	MH12-101	GR	101.64	101.55	69	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
	MH12-101	PS12	GR	101.55	101.55	38	0.0006	48	48	22.73	RCP	1968	No	PS12	ACTIVE		0608124
NINE SPRINGS VALLEY/WAUBESA EXT - 32																	
	MH11-226	MH11-225	GR	10.15	9.47	331	0.0016	15	15	1.67	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-225	MH11-224	GR	9.47	8.96	331	0.0016	15	15	1.67	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-224	MH11-223	GR	8.96	8.53	330	0.0016	15	15	1.67	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-223	MH11-222	GR	8.33	7.76	352	0.0017	18	18	2.80	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-222	MH11-221	GR	7.76	7.10	344	0.0017	18	18	2.80	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-221	MH11-220	GR	6.98	6.60	450	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-220	MH11-219	GR	6.60	6.15	450	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-219	MH11-218	GR	6.15	5.48	465	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-218	MH11-217	GR	5.48	5.12	494	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-217	MH11-216	GR	5.12	4.60	512	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-216	MH11-214	GR	4.60	4.08	558	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-214	MH11-213	GR	4.08	3.72	302	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-213	MH11-212	GR	3.72	3.34	275	0.001	21	21	3.24	RCP	1971	No	PS11	ACTIVE		0710314
	MH11-212	MH11-211	GR	3.08	2.50	387	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-211	MH11-210	GR	2.50	2.34	330	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-210	MH11-209	GR	2.34	1.95	331	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-209	MH11-208	GR	1.95	1.55	219	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH11-208	MH11-207	GR	1.55	1.42	335	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-207	MH11-206	GR	1.42	0.85	462	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-206	MH11-205	GR	0.85	-0.04	355	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-205	MH11-204	GR	-0.04	-0.36	400	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-204	MH11-203	GR	-0.36	-0.12	410	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-203	MH11-202	GR	-1.31	-4.44	496	0.006	21	21	7.93	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-202	MH11-201	GR	-5.93	-6.57	470	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
	MH11-201	PS11	GR	-7.45	-7.64	119	0.001	27	27	6.33	RCP	1971	No	PS11	ACTIVE		0710313
NINE SPRINGS VALLEY/SYENE EXT - 33																	
	MH11-306	MH11-305	GR	2.12	0.94	181	0.0085	12	12	2.12	RCP	1975	No	PS11	ACTIVE		0609021
	MH11-305	MH11-304	GR	0.94	0.23	42	0.0085	12	12	2.12	RCP	1975	No	PS11	ACTIVE		0609021
	MH11-304	MH11-303	GR	-0.05	-2.04	387	0.0032	16	16	2.80	RCP	1975	No	PS11	ACTIVE		0609021
	MH11-303	MH11-302	GR	-2.04	-3.74	404	0.0032	16	16	2.80	RCP	1975	No	PS11	ACTIVE		0609021
	MH11-302	MH11-301	GR	-3.74	-4.26	404	0.0032	16	16	2.80	RCP	1975	No	PS11	ACTIVE		0609021
	MH11-301	MH11-116A	GR	-4.26	-5.12	404	0.0032	16	16	2.80	RCP	1975	No	PS11	ACTIVE		0609021
NINE SPRINGS VALLEY/HWY 14 EXT - 34																	
	MH11-423	MH11-422	GR	14.76	13.61	397	0.003	10	10	0.92	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-422	MH11-421	GR	13.61	12.38	401	0.003	10	10	0.92	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-421	MH11-420	GR	12.38	8.18	400	0.0105	10	10	1.71	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-420	MH11-419	GR	7.13	6.65	132	0.0038	10	10	1.03	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-419	MH11-418	GR	6.65	5.71	249	0.0038	10	10	1.03	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-418	MH11-417	GR	5.71	5.31	94	0.0038	10	10	1.03	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-417	MH11-416	GR	5.31	4.19	256	0.0044	10	10	1.11	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-416	MH11-415	GR	4.06	3.14	393	0.0024	12	12	1.33	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-415	MH11-414	GR	3.14	2.22	326	0.0024	12	12	1.33	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-414	MH11-413	GR	2.22	1.65	341	0.0016	15	15	1.97	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-413	MH11-412	GR	1.65	1.38	148	0.0016	15	15	1.97	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-412	MH11-411	GR	1.38	0.78	371	0.0016	15	15	1.97	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-411	MH11-410	GR	0.78	0.29	330	0.0016	15	15	1.97	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-410	MH11-409	GR	0.29	-0.62	399	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-409	MH11-408	GR	-0.62	-1.36	294	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-408	MH11-407	GR	-1.36	-1.73	169	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-407	MH11-406	GR	-1.73	-2.73	386	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-406	MH11-405	GR	-2.73	-3.63	406	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-405	MH11-404	GR	-3.63	-4.16	231	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-404	MH11-403	GR	-4.16	-4.59	203	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-403	MH11-402	GR	-4.59	-5.35	297	0.0027	15	15	2.56	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-402	MH11-401	GR	-5.35	-6.16	229	0.0038	15	15	3.04	PVC	1977	No	PS11	ACTIVE		0609012
	MH11-401	MH11-106A	GR	-6.16	-7.23	262	0.0038	15	15	3.04	PVC	1977	No	PS11	ACTIVE		0609012
NINE SPRINGS VALLEY/HWY 14 EXT-GRANADA WAY LEG - 35																	
	MH11-414D	MH11-414A	GR	12.79	9.59	296	0.0108	10	10	1.74	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-414C	MH11-414B	GR	14.64	13.61	366	0.0028	10	10	0.89	PVC	1977	No	PS11	ACTIVE		0709354
	MH11-414B	MH11-414D	GR	13.61	12.79	56	0.0108	10	10	1.74	PVC	1977	No	PS11	ACTIVE		0709354

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH11-414A	MH11-414	GR	9.59	8.53	116	0.0108	10	10	1.74	PVC	1977	No	PS11	ACTIVE		0709354
NINE SPRINGS VALLEY/HWY 14 EXT-SKI LANE LEG - 36																	
	MH11-416A	MH11-416	GR	6.50	4.19	236	0.0072	8	8	0.78	PVC	1977	No	PS11	ACTIVE		0709354
NINE SPRINGS VALLEY/MIDTOWN EXT - 37																	
	MH12-220	MH12-219A	GR	167.45	165.99	275	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0708343
	MH12-219A	MH12-219	GR	167.45	164.52	325	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0708343
	MH12-219	MH12-218	GR	164.37	162.01	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0708343
	MH12-218	MH12-217	GR	161.96	159.50	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-217	MH12-216	GR	159.40	156.99	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-216	MH12-215	GR	156.79	154.10	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-215	MH12-214	GR	154.05	152.53	330	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-214	MH12-213	GR	152.48	151.42	201	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-213	MH12-212	GR	151.42	150.88	200	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-212	MH12-211	GR	150.88	149.49	200	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-211	MH12-210	GR	149.43	148.02	240	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608032
	MH12-210	MH12-209	GR	147.93	145.14	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608031
	MH12-209	MH12-208	GR	145.14	142.11	500	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608034
	MH12-208	MH12-207	GR	142.04	139.16	505	0.0054	24	23.5	12.00	PVC	1999	No	PS12	ACTIVE		0608034
	MH12-207	MH12-206	GR	139.11	138.20	445	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608034
	MH12-206	MH12-205	GR	138.17	136.96	500	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608034
	MH12-205	MH12-204	GR	136.96	136.24	310	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608034
	MH12-204	MH12-203	GR	136.09	134.83	500	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608023
	MH12-203	MH12-202	GR	134.78	133.64	525	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608023
	MH12-202	MH12-201	GR	133.59	132.46	580	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608023
	MH12-201	MH12-133	GR	132.46	132.18	190	0.0022	30	29.5	14.04	PVC	1999	No	PS12	ACTIVE		0608023
NORTHEAST INTERCEPTOR - 45																	
	MH07-309A	MH07-309	GR	-3.44	-3.69	136	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	MH07-309	MH07-308	GR	-3.69	-4.13	325	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	MH07-308	BD07-307XX496	GR	-4.13	-4.22	76	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	BD07-307XX496	MH07-307	GR	-4.22	-4.70	496	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	MH07-307	MH07-306	GR	-4.70	-5.75	466	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	MH07-306	MH07-305	GR	-5.75	-5.86	366	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	MH07-305	BD07-304XX373	GR	-5.86	-6.28	231	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	BD07-304XX373	BD07-304XX234	GR	-6.18	-6.38	139	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	BD07-304XX234	MH07-304	GR	-6.38	-6.66	234	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	MH07-304	MH18-006	GR	-6.66	-6.86	150	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	MH07-303A	MH07-303	GR	-7.20	-7.45	185	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	MH07-303	MH18-004	GR	-7.45	-7.46	28	0.0012	48	48	32.14	RCP	1967	No	PS07	ACTIVE		0710281
	MH10-412	MH10-108	GR	-9.22	-9.28	260	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-402	MH10-102	GR	-10.80	-10.81	17	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH10-112	MH10-111	GR	-8.37	-8.63	415	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-111	MH10-110	GR	-8.63	-8.82	422	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-110	MH10-109B	GR	-8.82	-8.92	227	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH10-109B	MH10-109A	GR	-8.92	-8.97	102	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-109A	MH10-109	GR	-8.97	-9.05	182	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-109	MH10-412	GR	-9.05	-9.22	432	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-108	MH10-107	GR	-9.28	-9.40	386	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810334
	MH10-107	MH10-106	GR	-9.40	-9.93	383	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810333
	MH10-106	MH10-105	GR	-9.93	-6.21	357	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0810333
	MH10-105	MH10-104A	GR	-10.03	-10.05	38	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE	1996	0710042
	MH10-104A	MH10-104	GR	-10.05	-10.36	491	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE	1996	0710042
	MH10-104	MH10-103	GR	-10.36	-10.61	523	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH10-103	MH10-102A	GR	-10.61	-10.64	96	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH10-102A	MH10-402	GR	-10.64	-10.80	373	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH10-102	MH10-101	GR	-10.80	-10.97	569	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH10-101	PS10	GR	-10.97	-11.00	108	0.0005	48	48	20.75	RCP	1964	No	PS10	ACTIVE		0710042
	MH18-014	MH07-309A	GR	-3.00	-3.44	235	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
	MH18-006	MH07-303A	GR	-6.86	-7.20	261	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710281
	LOCAL-GRAVITY	MH18-014	GR	-2.64	-3.44	10	0.0012	48	48	32.14	RCP	1964	No	PS07	ACTIVE		0710223
NORTHEAST INTERCEPTOR/TRUAX EXTENSION - 47																	
	MH10-145	MH10-144	GR	5.08	4.79	398	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810213
	MH10-144	PB10-143X214	GR	4.79	4.56	384	0.0006	48	48	22.73	RCP	1969	No	PS10	ACTIVE		0810213
	PB10-143X214	MH10-143	GR	4.56	4.44	214	0.0006	48	48	22.73	RCP	1969	No	PS10	ACTIVE		0810213
	MH10-143	MH10-142	GR	4.44	3.88	627	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810213
	MH10-142	MH10-141	GR	3.88	3.52	586	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-141	MH10-140	GR	3.52	3.40	325	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-140	MH10-139	GR	3.40	3.11	350	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-139	MH10-138	GR	3.11	2.75	506	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-138	MH10-137	GR	2.75	2.44	545	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-137	MH10-136A	GR	2.44	2.17	357	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-136A	MH10-136	GR	2.17	2.02	208	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810282
	MH10-136	MH10-135	GR	2.02	1.75	410	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-135	MH10-134	GR	1.75	1.49	256	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-134	MH10-133	GR	1.49	1.07	457	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-133	MH10-132A	GR	1.07	0.96	178	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-132A	MH10-132	GR	0.96	0.82	222	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-132	MH10-131	GR	0.82	0.78	397	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-131	MH10-130	GR	0.78	0.32	300	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-130	MH10-129	GR	0.32	0.22	343	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-129	MH10-128	GR	0.22	0.02	276	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-128	MH10-127	GR	0.02	-0.36	385	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-127	MH10-126	GR	-0.36	-0.58	385	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-126	MH10-125	GR	-0.58	-0.88	494	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-125	MH10-124	GR	-0.88	-1.35	590	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-124	MH10-123	GR	-1.35	-1.72	600	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-123	MH10-122	GR	-1.72	-2.20	590	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810283
	MH10-122	MH10-426	GR	-2.20	-2.81	590	0.0007	48	48	24.55	RCP	1969	No	PS10	ACTIVE		0810331

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH13-116	MH13-115	GR	-1.11	-1.26	220	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-115	MH13-114	GR	-1.26	-1.66	320	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-114	MH13-113	GR	-1.66	-1.81	373	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-113	MH13-112	GR	-1.81	-2.16	485	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-112	MH13-111	GR	-2.16	-2.50	495	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-111	MH13-110	GR	-2.50	-2.88	495	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH13-110	MH13-109	GR	-2.88	-3.22	495	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-109	MH13-108	GR	-3.22	-3.52	515	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-108	MH13-107	GR	-3.52	-3.97	475	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-107	MH13-106	GR	-3.97	-4.32	490	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-106	MH13-105A	GR	-4.32	-4.47	365	0.0007	48	46.5	26.66	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-105A	MH13-105	GR	-4.47	-4.52	125	0.0007	48	48	24.55	RCP	1969	Yes	PS13	ACTIVE		0810201
	MH13-105	MH13-104	GR	-4.52	-5.03	442	0.0007	48	48	24.55	RCP	1969	No	PS13	ACTIVE		0810201
	MH13-104	MH13-103	GR	-5.03	-5.32	440	0.0007	48	48	24.55	RCP	1969	No	PS13	ACTIVE		0810201
	MH13-103	MH13-102	GR	-5.32	-5.51	440	0.0007	48	48	24.55	RCP	1969	No	PS13	ACTIVE		0810201
	MH13-102	MH13-101	GR	-5.51	-5.82	402	0.0007	48	48	24.55	RCP	1969	No	PS13	ACTIVE		0810213
	MH13-101	PS13	GR	-5.82	-6.00	34	0.0007	48	48	24.55	RCP	1969	No	PS13	ACTIVE		0810213
NORTHEAST INTERCEPTOR/LIEN EXTENSION - 48																	
	MH10-214	MH10-213	GR	6.00	5.09	304	0.003	24	24	8.00	RCP	1973	No	PS10	ACTIVE		0810273
	MH10-213	MH10-212	GR	5.09	3.59	500	0.003	24	24	8.00	RCP	1973	No	PS10	ACTIVE		0810273
	MH10-212	MH10-211A	GR	2.25	1.72	356	0.0015	27	27	7.75	RCP	1973	No	PS10	ACTIVE		0810273
	MH10-211A	MH10-211	GR	1.71	1.50	138	0.0015	27	27	7.75	RCP	1973	No	PS10	ACTIVE		0810273
	MH10-211	MH10-210	GR	0.36	-0.30	310	0.0015	27	27	7.75	RCP	1973	No	PS10	ACTIVE		0810273
	MH10-210	MH10-209	GR	-0.30	-0.88	384	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810273
	MH10-209	MH10-208	GR	-0.88	-1.43	363	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810273
	MH10-208	MH10-207A	GR	-1.43	-1.56	86	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810273
	MH10-207A	MH10-207	GR	-1.56	-2.27	450	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810273
	MH10-207	MH10-206	GR	-2.27	-3.11	560	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810342
	MH10-206	MH10-205A	GR	-3.11	-3.36	165	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810342
	MH10-205A	MH10-205	GR	-3.36	-3.95	395	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810342
	MH10-205	MH10-204	GR	-3.95	-4.79	560	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810331
	MH10-204	MH10-203	GR	-4.79	-5.14	235	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810331
	MH10-203	MH10-202	GR	-5.14	-5.74	400	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810331
	MH10-202	MH10-201A	GR	-5.74	-6.34	400	0.0015	27	27	7.75	RCP	1970	No	PS10	ACTIVE		0810331
NORTHEAST INTERCEPTOR/WAUNAKEE-DEFOREST EXT - 49																	
	MH13-137	MH13-136	GR	4.32	4.14	432	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-136	MH13-135	GR	4.14	3.88	399	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-135	MH13-134	GR	3.88	3.62	373	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-134	MH13-133A	GR	3.56	3.43	371	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-133A	MH13-133	GR	3.56	3.43	271	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-133	MH13-132	GR	3.43	2.76	484	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0809244
	MH13-132	MH13-131	GR	2.76	2.63	453	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0810192
	MH13-131	MH13-130	GR	2.63	2.63	474	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0810192
	MH13-130	MH13-129	GR	2.63	2.80	588	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0810192

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH13-129	MH13-128	GR	2.80	2.14	597	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0810192
	MH13-128	MH13-127	GR	2.14	2.07	343	0.0005	48	48	20.75	RCP	1971	No	PS13	ACTIVE		0810191
	MH13-127	MH13-126	GR	2.07	1.95	299	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-126	MH13-125A	GR	1.95	1.64	481	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-125A	MH13-125	GR	1.64	1.59	75	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-125	MH13-124	GR	1.59	1.21	427	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-124	MH13-123	GR	1.21	1.20	472	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-123	MH13-122A	GR	1.20	1.12	190	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-122A	MH13-116H	GR	1.12	1.02	153	0.0005	48	48	20.75	RCP	1971	Yes	PS13	ACTIVE		0810191
	MH13-116H	MH13-116G	GR	1.02	0.98	40	0.00104	48	48	35.37	FRP	2006	No	PS13	ACTIVE	2006	
	MH13-116G	MH13-116F	GR	0.98	0.40	556	0.00104	48	48	35.37	FRP	2006	No	PS13	ACTIVE	2006	
	MH13-116F	MH13-116E	GR	0.40	-0.20	580	0.00104	48	48	35.37	FRP	2006	No	PS13	ACTIVE	2006	
	MH13-116E	MH13-116D	GR	-0.20	-0.36	150	0.00104	30	39	20.33	FRP	2006	No	PS13	ACTIVE	2006	
	MH13-116D	MH13-116C	GR	-0.36	-0.67	300	0.00104	48	48	35.37	FRP	2006	No	PS13	ACTIVE	2006	
	MH13-116C	MH13-116B	GR	-0.67	-0.91	228	0.001	48	48	34.68	FRP	2007	No	PS13	ACTIVE		
	MH13-116B	MH13-116A	GR	-0.91	-1.05	135	0.00104	48	48	35.37	FRP	2007	No	PS13	ACTIVE		
	MH13-116A	MH13-116	GR	-1.05	-1.11	440	0.0007	48	48	24.55	RCP	1969	Yes	PS13	ACTIVE		0810202
	MH14-102	MH14-101	GR	-6.91	-8.98	1873	0.001	42	42	20.55	PCCP	1971	No	PS14	ACTIVE		0809231
	MH14-101	PS14	GR	-9.14	-9.17	34	0.001	42	42	20.55	PCCP	1971	No	PS14	ACTIVE		0809234
NORTHEAST INTERCEPTOR/WAUNAKEE-DEFOREST EXT-DEFOREST LEG - 50																	
	MH14-209	MH14-208	GR	70.19	69.68	200	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-208	MH14-207	GR	69.68	69.37	389	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-207	MH14-206	GR	69.37	69.04	480	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-206	MH14-205	GR	69.04	69.12	55	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-205	MH14-204	GR	69.12	68.67	263	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-204	MH14-203	GR	68.67	68.12	496	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-203	MH14-202	GR	68.12	67.55	389	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910181
	MH14-202	MH14-201	GR	67.55	67.31	397	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-201	MH14-200	GR	67.31	66.87	375	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-200	MH14-199	GR	66.87	66.52	360	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-199	MH14-198	GR	66.52	66.34	398	0.001	21	21	3.24	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-198	MH14-197	GR	66.34	65.82	307	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-197	MH14-196	GR	65.82	65.64	277	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-196	MH14-195	GR	65.64	65.54	398	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-195	MH14-194A	GR	65.54	64.84	94	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-194A	MH14-194	GR	65.54	64.84	320	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-194	MH14-193	GR	64.84	64.16	391	0.0012	21	21	3.55	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-193	MH14-192	GR	64.16	63.49	368	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-192	MH14-191	GR	63.49	62.77	368	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910183
	MH14-191	MH14-190	GR	62.77	61.96	293	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-190	MH14-189	GR	61.96	61.38	285	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-189	MH14-188	GR	61.38	60.78	390	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-188	MH14-187	GR	60.78	59.82	391	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-187	MH14-186	GR	59.82	59.38	390	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH14-186	MH14-185	GR	59.38	58.59	307	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-185	MH14-184	GR	58.59	57.65	383	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-184	MH14-183	GR	57.65	56.62	390	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-183	MH14-182	GR	56.62	55.93	497	0.002	21	21	4.58	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-182	MH14-181	GR	55.93	53.73	488	0.0045	21	21	6.87	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-181	MH14-180	GR	53.73	51.55	495	0.0045	21	21	6.87	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-180	MH14-179B	GR	51.55	50.72	289	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-179B	MH14-179A	GR	50.72	50.21	344	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-179A	MH14-179	GR	50.21	48.93	473	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-179	MH14-178	GR	48.93	47.96	411	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-178	MH14-177	GR	47.96	46.79	420	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-177	MH14-176	GR	46.79	45.66	487	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910193
	MH14-176	MH14-175	GR	45.66	44.52	487	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-175	MH14-174	GR	44.52	43.48	473	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-174	MH14-173	GR	43.48	42.43	382	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-173	MH14-172	GR	42.43	41.23	479	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910192
	MH14-172	MH14-171	GR	41.23	40.18	496	0.0024	21	21	5.01	RCP	1971	No	PS14	ACTIVE		0910191
	MH14-171	MH14-170	GR	40.18	38.66	399	0.0035	21	21	6.06	RCP	1971	No	PS14	ACTIVE		0910191
	MH14-170	MH14-169	GR	38.66	36.69	504	0.0035	21	21	6.06	RCP	1971	No	PS14	ACTIVE		0910191
	MH14-169	MH14-168	GR	36.69	35.00	442	0.0035	21	21	6.06	RCP	1971	No	PS14	ACTIVE		0910191
	MH14-168	MH14-167	GR	35.00	33.27	503	0.0035	21	21	6.06	RCP	1971	No	PS14	ACTIVE		0910191
	MH14-167	MH14-166	GR	33.27	31.92	503	0.0035	21	21	6.06	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-166	MH14-165	GR	31.92	27.28	488	0.0095	21	21	9.98	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-165	MH14-164A	GR	27.00	26.78	229	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-164A	MH14-164	GR	26.78	26.15	224	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-164	MH14-163	GR	26.15	25.37	474	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-163	MH14-162	GR	25.37	24.22	474	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910194
	MH14-162	MH14-161	GR	24.22	23.32	474	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-161	MH14-160	GR	23.32	22.56	420	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-160	MH14-159	GR	22.56	21.28	496	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-159	MH14-158	GR	21.28	19.96	507	0.0021	24	24	6.70	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-158	MH14-157	GR	19.96	17.74	488	0.0025	24	24	7.31	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-157	MH14-156A	GR	17.74	17.22	205	0.0025	24	24	7.31	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-156A	MH14-156	GR	17.22	16.99	97	0.0025	24	24	7.31	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-156	MH14-155	GR	16.99	16.70	112	0.0016	27	27	8.00	RCP	1971	No	PS14	ACTIVE		0910301
	MH14-155	MH14-154	GR	16.70	15.97	490	0.0016	27	27	8.00	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-154	MH14-153A	GR	15.97		180	0.0016	27	27	8.00	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-153A	MH14-153	GR	15.70	15.22	307	0.0016	27	27	8.00	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-153	MH14-152	GR	15.22	14.37	482	0.0016	27	27	8.00	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-152	MH14-151	GR	14.37	12.41	478	0.0035	27	27	11.84	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-151	MH14-150	GR	12.41	10.45	485	0.0035	27	27	11.84	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-150	MH14-149	GR	10.45	9.08	531	0.0035	27	27	11.84	RCP	1971	No	PS14	ACTIVE		0910304
	MH14-149	MH14-148	GR	9.08	8.43	397	0.0017	27	27	8.25	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-148	MH14-147	GR	8.43	7.92	433	0.0017	27	27	8.25	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-147	MH14-146	GR	7.92	7.27	365	0.0017	27	27	8.25	RCP	1971	No	PS14	ACTIVE		0910311

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH14-146	MH14-145	GR	7.27	6.41	365	0.0017	27	27	8.25	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-145	MH14-144	GR	6.11	5.90	426	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-144	MH14-143	GR	5.90	4.98	538	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-143	MH14-142	GR	4.09	3.82	557	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910311
	MH14-142	MH14-141	GR	3.82	3.57	550	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-141	MH14-140	GR	3.57	3.41	549	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-140	MH14-139	GR	3.41	2.98	609	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-139	MH14-138	GR	2.98	2.75	526	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-138	MH14-137	GR	2.75	2.67	487	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-137	MH14-136	GR	2.67	2.51	594	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-136	MH14-135	GR	2.51	2.41	512	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0910313
	MH14-135	MH14-134	GR	2.41	3.58	511	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-134	MH14-133	GR	2.08	1.69	512	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-133	MH14-132	GR	1.69	1.35	512	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-132	MH14-131	GR	1.35	1.11	512	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-131	MH14-130	GR	1.11	1.22	513	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-130	MH14-129	GR	1.22	1.15	407	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810063
	MH14-129	MH14-128	GR	1.15	0.66	398	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810063
	MH14-128	MH14-127	GR	0.66	0.61	512	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0810063
	MH14-127	MH14-126	GR	0.61	0.20	602	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-126	MH14-125	GR	0.20	-0.40	607	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-125	MH14-124	GR	-0.40	-0.72	596	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-124	MH14-123	GR	-0.72	-0.99	595	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-123	MH14-122	GR	-0.99	-1.08	429	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-122	MH14-121	GR	-1.08	-1.29	425	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809124
	MH14-121	MH14-120	GR	-1.29	-1.45	480	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-120	MH14-119	GR	-1.45	-1.82	601	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-119	MH14-118	GR	-1.82	-2.19	578	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-118	MH14-117	GR	-2.19	-2.45	608	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-117	MH14-116	GR	-2.45	-2.57	601	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-116	MH14-115	GR	-2.57	-2.98	595	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809131
	MH14-115	MH14-114	GR	-2.98	-3.24	578	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-114	MH14-113	GR	-3.24	-3.71	525	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-113	MH14-112	GR	-3.71	-3.96	557	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-112	MH14-111	GR	-3.96	-4.28	562	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-111	MH14-110	GR	-4.28	-4.77	607	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-110	MH14-109	GR	-4.77	-5.21	422	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809133
	MH14-109	MH14-108	GR	-5.21	-5.54	534	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-108	MH14-107	GR	-5.54	-5.25	551	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-107	MH14-106	GR	-5.25	-5.46	311	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-106	MH14-105	GR	-5.46	-5.80	365	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-105	MH14-104	GR	-5.80	-6.00	410	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-104	MH14-103	GR	-6.00	-6.22	587	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231
	MH14-103	MH14-102	GR	-6.22	-6.74	587	0.0005	36	36	9.63	RCP	1971	No	PS14	ACTIVE		0809231

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
NORTHEAST INTERCEPTOR/WAUNAKEE-DEFOREST EXT-WAUNAKEE LEG - 51																	
	MH14-359	MH14-358	GR	42.48	42.65	494	0.0014	24	24	5.47	RCP	1971	No	PS14	ACTIVE		0809081
	MH14-358	MH14-357	GR	42.65	41.29	338	0.0014	24	24	5.47	RCP	1971	No	PS14	ACTIVE		0809081
	MH14-357	MH14-356	GR	41.29	40.93	336	0.0014	24	24	5.47	RCP	1971	No	PS14	ACTIVE		0809081
	MH14-356	MH14-355	GR	40.93	40.42	299	0.0014	24	24	5.47	RCP	1971	No	PS14	ACTIVE		0809081
	MH14-355	MH14-354	GR	40.42	39.14	440	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809081
	MH14-354	MH14-353	GR	39.14	38.96	432	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-353	MH14-352	GR	38.96	38.17	444	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-352	MH14-351	GR	38.17	37.39	488	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-351	MH14-350	GR	37.39	36.60	588	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-350	MH14-349	GR	36.60	36.01	397	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-349	MH14-348A	GR	36.01	35.61	236	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-348A	MH14-348	GR	35.61	35.18	260	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-348	MH14-347	GR	35.18	34.44	481	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-347	MH14-346	GR	34.44	33.84	295	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809093
	MH14-346	MH14-345	GR	33.84	33.37	299	0.0016	24	24	5.85	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-345	MH14-344	GR	33.37	31.70	458	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-344	MH14-343	GR	31.70	30.13	504	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-343	MH14-342	GR	30.13	28.97	223	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-342	MH14-341	GR	28.97	26.89	493	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-341	MH14-340	GR	26.89	25.51	341	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-340	MH14-339	GR	25.51	24.30	339	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-339	MH14-338	GR	24.30	22.35	501	0.0038	21	21	6.31	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-338	MH14-337	GR	22.35	18.66	497	0.0061	21	21	7.99	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-337	MH14-336	GR	18.66	14.91	500	0.0061	21	21	7.99	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-336	MH14-335	GR	14.91	13.83	219	0.0061	21	21	7.99	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-335	MH14-334	GR	13.83	11.74	398	0.0061	21	21	7.99	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-334	MH14-333	GR	11.74	9.40	496	0.0061	21	21	7.99	RCP	1971	No	PS14	ACTIVE		0809161
	MH14-333	MH14-332	GR	8.35	8.13	390	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-332	MH14-331	GR	8.13	7.91	504	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-331	MH14-330	GR	7.91	7.80	501	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-330	MH14-329	GR	7.80	7.77	474	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-329	MH14-328	GR	7.77	7.19	516	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-328	MH14-327	GR	7.19	6.21	408	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-327	MH14-326	GR	6.21	6.18	510	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-326	MH14-325	GR	6.18	5.90	518	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-325	MH14-324	GR	5.90	5.53	527	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809153
	MH14-324	MH14-323	GR	5.53	5.25	541	0.0006	30	30	6.49	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-323	MH14-322	GR	5.25	4.97	435	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-322	MH14-321A	GR	4.97	4.42	459	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-321A	MH14-321	GR	4.42	4.10	352	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-321	MH14-320	GR	4.10	3.82	457	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-320	MH14-319	GR	3.82	3.48	483	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-319	MH14-318	GR	3.48	3.36	479	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH14-318	MH14-317	GR	3.36	3.04	503	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-317	MH14-316	GR	3.04	2.51	444	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809221
	MH14-316	MH14-315	GR	2.51	2.26	443	0.0007	30	30	7.01	RCP	1971	No	PS14	ACTIVE		0809224
	MH14-315	MH14-314	GR	2.26	1.56	432	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809224
	MH14-314	MH14-313	GR	1.56	1.08	433	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-313	MH14-312	GR	1.08	0.54	463	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-312	MH14-311	GR	0.54	0.29	272	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-311	MH14-310	GR	0.29	-0.18	467	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-310	MH14-309	GR	-0.18	-0.67	362	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-309	MH14-308	GR	-0.67	-1.13	394	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-308	MH14-307	GR	-1.13	-1.89	516	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-307	MH14-306	GR	-1.89	-2.22	359	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-306	MH14-305	GR	-2.22	-2.81	367	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-305	MH14-304	GR	-2.81	-3.11	344	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809233
	MH14-304	MH14-303	GR	-3.11	-3.57	299	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809234
	MH14-303	MH14-302	GR	-3.57	-3.81	298	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809234
	MH14-302	MH14-301	GR	-3.81	-4.22	245	0.0012	30	30	9.18	RCP	1971	No	PS14	ACTIVE		0809234
	MH14-301	MH14-102	GR	-4.22	-6.74	248	0.0098	30	30	26.23	RCP	1971	No	PS14	ACTIVE		0809234
NORTHEAST INTERCEPTOR/WAUNAKEE-DEFOREST EXT-WAUNAKEE UNION HS LE																	
	MH14-362	MH14-361	GR	51.79	48.65	259	0.0118	10	10	1.54	VP	1971	No	PS14	ACTIVE		0809081
	MH14-361	MH14-360	GR	48.65	45.52	261	0.0118	10	10	1.54	VP	1971	No	PS14	ACTIVE		0809081
	MH14-360	MH14-358	GR	45.52	42.65	255	0.0118	10	10	1.54	VP	1971	No	PS14	ACTIVE		0809081
NORTHEAST INTERCEPTOR/HIGHWAY 19 EXTENSION - 53																	
	MH14-417	MH14-411	GR	13.23	13.05	70	0.0007	12	12	0.61	RCP	1971	No	PS14	ACTIVE		0910314
	MH14-416	MH14-415	GR	18.27	17.79	193	0.0022	12	12	1.08	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-415	MH14-414	GR	17.55	16.55	363	0.0028	15	15	2.21	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-414	MH14-413	GR	16.55	15.40	419	0.0028	15	15	2.21	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-413	MH14-412	GR	15.40	14.43	337	0.0028	15	15	2.21	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-412	MH14-411	GR	14.43	12.98	500	0.0028	15	15	2.21	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-411	MH14-410	GR	12.98	11.91	187	0.0006	15	15	1.02	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-410	MH14-409	GR	11.91	9.13	435	0.0006	15	15	1.02	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-409	MH14-408	GR	9.13	8.10	386	0.0024	18	18	3.32	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-408	MH14-407	GR	8.10	7.38	385	0.0024	18	18	3.32	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-407	MH14-406	GR	7.38	6.57	490	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-406	MH14-405	GR	6.57	6.16	500	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-405	MH14-404	GR	6.16	5.68	400	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810061
	MH14-404	MH14-403	GR	5.68	5.20	410	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-403	MH14-402	GR	5.20	4.44	449	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-402	MH14-401	GR	4.44	4.12	414	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810062
	MH14-401	MH14-134	GR	4.12	3.58	396	0.0012	18	18	2.35	RCP	1971	No	PS14	ACTIVE		0810062
NORTHEAST INTERCEPTOR/LIEN INTERSTATE EXTENSION - 54																	
	MH10-220	MH10-219	GR	18.15	17.70	156	0.003	24	23.5	8.94	PVC	1995	No	PS10	ACTIVE		0810274
	MH10-219	MH10-218	GR	17.38	15.40	418	0.0048	24	23.5	11.31	PVC	1995	No	PS10	ACTIVE		0810274

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH10-218	MH10-217	GR	15.07	13.15	391	0.0048	24	23.5	11.31	PVC	1995	No	PS10	ACTIVE		0810274
	MH10-217	MH10-216	GR	13.15	8.70	377	0.012	24	23.5	17.89	PVC	1995	No	PS10	ACTIVE		0810274
	MH10-216	MH10-215	GR	8.53	7.30	405	0.003	24	23.5	8.94	PVC	1995	No	PS10	ACTIVE		0810274
	MH10-215	MH10-214	GR	7.19	6.20	328	0.003	24	23.5	8.94	PVC	1995	No	PS10	ACTIVE		0810274
NORTHEAST INTERCEPTOR/HIGHWAY 30 EXTENSION - 55																	
	MH10-305	BD10-303X227	GR	-1.03	-2.48	307	0.0014	12	12	0.86	AC	1966	No	PS10	ACTIVE		0710042
	BD10-303X227	RD10-303X204	GR	-2.48	-3.95	25	0.0014	12	12	0.86	DI	1996	No	PS10	ACTIVE		0710042
	RD10-303X204	BD10-303X202	GR	-2.48	-3.95	25	0.0014	12	12	0.86	DI	1996	No	PS10	ACTIVE		0710042
	BD10-303X202	MH10-303	GR	-3.95	-4.22	202	0.0014	16	16	1.85	DI	1996	No	PS10	ACTIVE		0710042
	MH10-303	MH10-302	GR	-4.22	-4.61	331	0.0014	16	16	1.85	DI	1996	No	PS10	ACTIVE		0710042
	MH10-302	MH10-301	GR	-4.61	-5.13	436	0.0014	16	16	1.85	DI	1996	No	PS10	ACTIVE		0710042
	MH10-301	MH10-104A	GR	-5.13	-5.65	402	0.0014	16	16	1.85	DI	1996	No	PS10	ACTIVE		0710042
PUMPING STATION 1 FORCE MAIN - 60																	
	BD01-10421	BD01-10291	FM	-5.50	-5.50	130		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
	BD01-10291	BD01-09899	FM	-5.50	7.40	363		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
	BD01-09899	BD01-09800	FM	7.40	9.30	99		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
	BD01-09800	MH01-09300	FM	9.30	13.00	500		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
	MH01-09300	MH01-122	FM	13.00	10.50	1479		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
	PS01	BD01-10421	FM	-5.50	-5.50	38		30	30		RCNCP	1948	No	PS06	ACTIVE		0710063
PUMPING STATION 2 FORCE MAIN - 61																	
	BD02-18392	NSWTP_HEADWO	FM	19.60	28.60	98		36	37.36		DI	2005	No	NSWTP	ACTIVE	2006	
	BD02-18136	BD02-18392	FM	22.50	22.50	256		36	37.36		DI	2005	No	NSWTP	ACTIVE	2006	
	BD02-18124	BD02-18136	FM	18.59	22.50	8		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	PB02-18100	BD02-18124	FM	18.39	18.59	24		36	37.36		DI	2000	No	NSWTP	ACTIVE		0710303
	TE02-17328	PB02-18100	FM	-2.50	-1.00	725		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-16470	TE02-17328	FM	-9.00	-2.50	858		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-16272	BD02-16470	FM	-4.00	-4.00	198		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	MH02-15152	BD02-16272	FM	0.68	-4.00	1120		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-14681	MH02-15152	FM	-1.00	0.68	471		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-14579	BD02-14681	FM	-1.00	-1.00	102		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-14105	BD02-14579	FM	-3.00	-1.00	474		36	37.36		DI	2000	No	NSWTP	ACTIVE		0709261
	BD02-13996	BD02-14105	FM	-3.00	-1.00	109		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	MH02-11181	BD02-13996	FM	-1.00	-1.00	2815		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709254
	VA02-10941	MH02-11181	FM	-6.00	-1.00	240		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	TE02-10933	VA02-10941	FM	-6.00	-6.00	8		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	VA02-10925	TE02-10933	FM	-6.00	-6.00	8		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-10674	VA02-10925	FM	-6.00	-6.00	251		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-10259	BD02-10674	FM	-6.00	-6.00	376		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	PB02-08861	BD02-10259	FM	-6.00	-6.00	1398		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709253
	PB02-08301	PB02-08861	FM	-1.00	-6.00	560		36	37.36		DI	2000	No	NSWTP	ACTIVE		0709253
	BD02-07519	PB02-08301	FM	-1.00	-1.00	782		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-07290	BD02-07519	FM	5.00	-1.00	229		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	PB02-07050	BD02-07290	FM	11.10	5.00	240		36	37.36		DI	2001	No	NSWTP	ACTIVE	2001	0709261

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD02-06971	PB02-07050	FM	13.00	11.10	79		36	37.36		DI	2001	No	NSWTP	ACTIVE	2001	0709261
	MH02-06936	BD02-06971	FM	13.00	13.00	40		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-06024	MH02-06936	FM	-1.75	13.00	912		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-05939	BD02-06024	FM	-3.68	-1.75	85		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-05798	BD02-05939	FM	-5.00	-3.68	141		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-05770	BD02-05798	FM	-5.00	-5.00	28		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-03704	BD02-05770	FM	-6.00	-5.00	2066		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-03611	BD02-03704	FM	-6.00	-6.00	93		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	BD02-02474	BD02-03611	FM	-6.00	-6.00	1137		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	BD02-01170	BD02-02474	FM	-6.00	-6.00	1304		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	TE02-01132	BD02-01170	FM	-4.62	-6.00	38		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	TE02-01132	VA02A-00005	FM	-4.62	-4.62	5		16	16.84		DI	2001	No	PS02	ACTIVE		0709233
	MH02-01124	TE02-01132	FM	-4.33	-4.62	8		36	37.36		DI	2001	No	NSWTP	ACTIVE		0709233
	MH02-01124	MH02-403	FM	-4.33	-4.62	15		6	6		PVC	2001	No	PS02	ACTIVE	2001	0709233
	RD02-01009	MH02-01124	FM	-2.38	-4.33	115		36	37.36		DI	2001	No	NSWTP	ACTIVE		0710303
	VA02-01006	RD02-01009	FM	-1.87	-2.37	3		24	25.06		DI	2001	No	NSWTP	ACTIVE		0710303
	TE02-01001	VA02-01006	FM	-1.87	-1.87	5		24	25.06		DI	2001	No	NSWTP	ACTIVE	2001	0709233
	PB02-00997	TE02-01001	FM	-1.87	-1.87	4		24	25.06		CI	1963	No	NSWTP	ACTIVE		0709233
	PB02-00985	PB02-00997	FM	-1.87	-1.87	12		24	25.06		CI	1963	No	NSWTP	ACTIVE		0709233
	BD02A-00013	MH02-403	FM	-4.62	-4.62	12		16	16.84		DI	2001	No	PS02	ACTIVE		0709233
	BD02A-00009	BD02A-00013	FM	-4.62	-4.62	4		16	16.84		DI	2001	No	PS02	ACTIVE	2002	0709233
	VA02A-00005	BD02A-00009	FM	-4.62	-4.62	4		16	16.84		DI	2001	No	PS02	ACTIVE		0709233
	PS02	PB02-00985	FM	-10.75	-1.87	2		24	25.06		CI	1960	No	NSWTP	ACTIVE		0709233
PUMPING STATION 3 FORCE MAIN - 62																	
	VA03-00021	TE02-17328	FM	-1.20	-2.50	4		8	8		DI	2001	No	NSWTP	ACTIVE		0710303
	BD03-00020	VA03-00021	FM	-1.20	-2.10	2		8	8		DI	2001	No	NSWTP	ACTIVE		0710303
	TE03-00009	BD03-00020	FM	-3.50		11		8	8		DI	2001	No	NSWTP	ACTIVE		0710303
	PS03	TE03-00009	FM	-8.77	-4.90	9		8	8		CI	1958	No	NSWTP	ACTIVE		0710303
PUMPING STATION 4 FORCE MAIN - 63																	
	BD04-00111	TE02-10933	FM	0.80	-6.00	42		16	16.84		DI	2000	No	NSWTP	ACTIVE		0710303
	VA04-00104	BD04-00111	FM	0.80	0.80	7		16	16.84		DI	2000	No	NSWTP	ACTIVE		0709253
	TE04-00098	VA04-00104	FM	0.80	0.80	6		16	16.84		DI	2000	No	NSWTP	ACTIVE		0709253
	TE04-00098	PL04B-00120	FM	0.80	0.50	22		16	16.84		CI	1967	No	NSWTP	ACTIVE		0709253
	BD04-00020	TE04-00098	FM	0.20	0.80	78		16	16.84		CI	1967	No	NSWTP	ACTIVE		0709253
	PS04	BD04-00020	FM	-10.71		20		16	16.84		CI	1967	No	NSWTP	ACTIVE		0709253
PUMPING STATION 5 FORCE MAIN - 64																	
	BD05-22858	VA05-22837	FM			21		16	16.84		DI	1994	No	PS08	ACTIVE		709184
	VA05-22837	TE05-22834	FM			3		16	16.84		DI	1994	No	PS08	ACTIVE		709184
	TE05-22834	MH05-22384	FM	-2.00		450		16	16.84		PCCP	1959	No	PS08	ACTIVE		0709184
	MH05-22384	TE05-22376	FM	4.80	4.50	8		16	16.84		PCCP	1959	No	PS08	ACTIVE		0709184
	TE05-22376	BD05-22043	FM		54.00	333		24	25.06		PCCP	1959	No	PS08	ACTIVE		0709184
	BD05-22043	BD05-21839	FM			204		24	25.06		PCCP	1959	No	PS08	ACTIVE		0709184
	BD05-21839	MH02-547	FM	4.50		1205		24	25.06		PCCP	1959	No	PS08	ACTIVE		0709184

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	PS05	BD05-22858	FM			3		16	16.84		DI	1994	No	PS08	ACTIVE		0709184
PUMPING STATION 6 FORCE MAIN - 65																	
	BD06-18518	BD06-18178	FM	-7.50	-8.50	340		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	BD06-18178	BD06-17838	FM	-8.50	-3.50	340		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	BD06-17838	BD06-16987	FM	-3.50	2.70	851		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	BD06-16987	BD06-16913	FM	2.70	3.50	74		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	BD06-16913	BD06-12053	FM	3.50	21.00	4860		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	BD06-12053	MH07-129	FM	21.00	26.25	730		36	37.36		RCNCP	1948	No	PS07	ACTIVE		0710054
	PS06	BD06-18518	FM	-7.50	-7.50	19		30	37.36		CI	1948	No	PS07	ACTIVE		0710054
PUMPING STATION 7 FORCE MAIN NO.1 - 66																	
	VA07-07200	RD07-07181	FM	-3.75	-3.75	17		30	31.16		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	RD07-07181	BD07-07179	FM	-3.75	-3.75	2		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-07179	BD07-07025	FM	-3.75	-2.50	154		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-07025	BD07-06133	FM	-2.50	5.60	892		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-06133	BD07-05818	FM	5.60	4.50	315		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-05818	MH07-05385	FM	4.50	11.50	373		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	MH07-05385	BD07-03067	FM	11.50	0.00	4112		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-03067	BD07-02546	FM	0.00	0.00	521		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-02546	BD07-00775	FM	0.00	2.00	1771		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	BD07-00775	PB07-00429	FM	2.00	-2.50	346		36	37.36		RCNCP	1948	No	NSWTP	ACTIVE		0710203
	PB07-00429	BD07-00416	FM	-2.50	-2.50	13		36	37.36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07-00416	BD07-00396	FM	-6.50	-6.50	20		36	37.36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07-00396	MH07-00374	FM	-6.50	-6.50	55		36	37.36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	MH07-00374	MH07-00287	FM	-6.50	-6.50	87		36	37.36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	MH07-00287	TE07A-01520	FM	-6.50	-7.00	26		36	37.36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	PS07	VA07-07200	FM	-3.75	-3.75	0		30	31.16		CI	1948	No	NSWTP	ACTIVE		0710203
PUMPING STATION 7 FORCE MAIN NO.2 - 67																	
	VA07A-08526	BD07A-08507	FM	-3.80	-3.80	19		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-08507	BD07A-08390	FM	-3.80	-7.50	117		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-08390	BD07A-07560	FM	-7.50	6.60	830		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-07560	BD07A-07264	FM	5.80	5.00	296		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-07264	MH07A-06750	FM	5.00	11.50	514		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	MH07A-06750	BD07A-04371	FM	11.50	0.00	2369		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-04371	BD07A-03863	FM	0.00	0.00	519		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-03863	BD07A-02080	FM	0.00	-2.50	1783		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-02080	BD07A-01675	FM	-2.50	-6.50	395		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-01675	BD07A-01651	FM	-6.50	-6.50	24		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-01651	MH07A-01551	FM	-6.50	-7.00	100		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	MH07A-01551	BD07A-01539	FM	-7.00	-7.00	12		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-01539	TE07A-01520	FM	-7.00	-7.00	19		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
	TE07A-01520	BD07A-01044	FM	-7.00	2.60	476		48	48		PCCP	1963	No	NSWTP	ACTIVE		0710303
	BD07A-01044	PB07A-00468	FM	2.60	13.00	580		48	48		PCCP	1963	No	NSWTP	ACTIVE		0710303
	PB07A-00468	BD07A-00450	FM	13.00	13.00	18		48	48		PCCP	1963	No	NSWTP	ACTIVE		0710303

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD07A-00450	PB07A-00186	FM	13.00	13.00	264		48	48		PCCP	1963	No	NSWTP	ACTIVE		0710303
	PB07A-00186	BD07C-XX238	FM	13.00	13.00	238		48	49.36		DI	2005	No	NSWTP	ACTIVE		
	BD07C-XX323	NSWTP_HEADWO	FM	28.00	28.00	0		48	49.36		DI	2005	No	NSWTP	ACTIVE		
	BD07C-XX271	BD07C-XX323	FM	13.00	28.00	52		48	49.36		DI	2005	No	NSWTP	ACTIVE		
	BD07C-XX250	BD07C-XX271	FM	13.00	13.00	21		48	49.36		DI	2005	No	NSWTP	ACTIVE		
	BD07C-XX238	BD07C-XX250	FM	13.00	13.00	12		48	49.36		DI	2005	No	NSWTP	ACTIVE		
	PS07	VA07A-08526	FM	-3.80	-3.80	5		36	36		PCCP	1963	No	NSWTP	ACTIVE		0710303
PUMPING STATION 8 FORCE MAIN - 68																	
	BD08-XX142	NSWTP_HEADWO	FM	28.30	28.30	0		42	43.46		DI	2005	No	NSWTP	ACTIVE		
	BD08-XX091	BD08-XX142	FM	13.30	13.30	52		42	43.46		DI	2005	No	NSWTP	ACTIVE		
	BD08-XX068	BD08-XX091	FM	13.30	13.30	22		42	43.46		DI	2005	No	NSWTP	ACTIVE		
	BD08-XX053	BD08-XX068	FM	13.30	13.30	15		42	43.46		DI	2005	No	NSWTP	ACTIVE		
	RD08-13205	MH08-11264	FM	-5.40	8.70	1927		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709263
	MH08-11264	MH08-10575	FM	8.70	-6.20	689		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709263
	MH08-10575	MH08-08079	FM	-6.20	7.10	2487		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709264
	MH08-08079	MH08-05029	FM	7.10	-4.50	3190		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709253
	MH08-05029	MH08-04009	FM	-4.50	11.20	1020		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709254
	MH08-04009	MH08-01667	FM	11.20	-9.90	2342		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709361
	MH08-01667	PB08-00192	FM	-9.90	13.30	1555		42	42		PCCP	1964	No	NSWTP	ACTIVE		0709303
	PB08-00192	BD08-XX053	FM	13.30	13.30	245		42	43.46		DI	2005	No	NSWTP	ACTIVE		
	PS08	RD08-13205	FM	-10.00	4.90	194		36	36		PCCP	1964	No	NSWTP	ACTIVE		0709263
PUMPING STATION 9 FORCE MAIN - 69																	
	TE09-20598	MH09-20594	FM	-0.90	-0.30	4		10	10		CI	1961	No	PS07	ACTIVE		0610032
	MH09-20594	BD09-20525	FM	-0.30	0.60	69		10	10		AC	1961	No	PS07	ACTIVE		0610032
	BD09-20525	BD09-20309	FM	0.60	3.30	216		10	10		AC	1961	No	PS07	ACTIVE		0610032
	BD09-20309	PB09-20296	FM	3.30	3.40	13		10	10		AC	1961	No	PS07	ACTIVE		0710343
	PB09-20296	BD09-20173	FM	3.40	5.70	123		10	10		CI	1961	No	PS07	ACTIVE		0710343
	BD09-20173	PB09-20118	FM	5.70	5.90	55		10	10		CI	1961	No	PS07	ACTIVE		0710343
	PB09-20118	PB09-19463	FM	5.90	13.00	655		10	10		AC	1961	No	PS07	ACTIVE		0710343
	PB09-19463	BD09-19404	FM	13.00	13.20	59		10	10		CI	1961	No	PS07	ACTIVE		0710343
	BD09-19404	PB09-19199	FM	13.20	14.10	205		10	10		CI	1961	No	PS07	ACTIVE		0710343
	PB09-19199	BD09-18855	FM	14.10	20.20	344		10	10		AC	1961	No	PS07	ACTIVE		0710343
	BD09-18855	BD09-18412	FM	20.20	44.50	443		10	10		AC	1961	No	PS07	ACTIVE		0710343
	BD09-18412	MH07-823	FM	44.50	44.80	11		10	10		AC	1961	No	PS07	ACTIVE		0710343
	PS09	TE09-20598	FM	-0.90	-0.40	40		14	14.7		CI	1961	No	PS07	ACTIVE		0610032
PUMPING STATION 9 FORCE MAIN/MCFARLAND RELIEF - 70																	
	TE09-20598	MH09A-00000	FM	-0.40	-0.90	5		20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-03844	MH07-517	FM	17.65	12.75	485		20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-03618	BD09A-03844	FM	19.91	17.65	226		20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-03384	BD09A-03618	FM	23.16	19.91	234		20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	PB09A-03100	BD09A-03384	FM	26.00	23.16	284	0.001	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-02960	PB09A-03100	FM	24.70	26.00	140	0.00093	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-02790	BD09A-02960	FM	20.90	24.70	170	0.0225	20	20.94		DI	1987	No	PS07	ACTIVE		0710343

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD09A-02610	BD09A-02790	FM	16.65	20.90	180	0.0225	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	TE09A-02600	BD09A-02610	FM	16.60	16.65	10	0.0225	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-02306	TE09A-02600	FM	20.20	16.60	294	0.007	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-01980	BD09A-02306	FM	21.00	20.20	326	0.007	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-01730	BD09A-01980	FM	22.80	21.00	250	0.007	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	MH09A-01500	BD09A-01730	FM	24.30	22.80	230	0.007	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-01416	MH09A-01500	FM	22.20	24.30	84	0.02	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-01214	BD09A-01416	FM	18.60	22.60	202	2	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	BD09A-00285	BD09A-01214	FM	0.00	18.60	929	2	20	20.94		DI	1987	No	PS07	ACTIVE		0710343
	MH09A-00000	BD09A-00285	FM	-0.90	0.00	285		20	20.94		DI	1987	No	PS07	ACTIVE		0710343
PUMPING STATION 10 FORCE MAIN - 71																	
	BD10-28339	BD10-27726	FM	-8.60	-0.92	613		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	BD10-27726	BD10-27170	FM	-0.92	6.63	556		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	BD10-27170	BD10-26683	FM	6.63	9.51	487		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	BD10-26683	MH10-24760	FM	6.63	28.11	1919		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	MH10-24760	BD10-23200	FM	28.10	10.80	1560		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	BD10-23200	MH10-23080	FM	10.80	9.94	120		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
	MH10-23080	BD10-22120	FM	9.94	11.50	960		36	36		PCCP	1964	No	PS07	ACTIVE		0710091
	BD10-22120	BD10-21006	FM	11.50	19.44	1114		36	36		PCCP	1964	No	PS07	ACTIVE		0710091
	BD10-21006	BD10-20930	FM	19.44	26.44	76		36	36		PCCP	1964	No	PS07	ACTIVE		0710091
	BD10-20930	BD10-17400	FM	26.44	32.78	3530		36	36		PCCP	1964	No	PS07	ACTIVE		0710091
	BD10-17400	MH07-955	FM	32.78	32.95	70		36	36		DI	2001	No	PS07	ACTIVE		0710091
	PS10	BD10-28339	FM	-9.80	-8.60	104		36	36		PCCP	1964	No	PS07	ACTIVE		0710044
PUMPING STATION 11 FORCE MAIN - 72																	
	BD11-XX067	NSWTP_HEADWO	FM	28.50	28.50	25		36	37.36		DI	2006	No	NSWTP	ACTIVE		
	BD11-XX049	BD11-XX067	FM	28.50	28.50	18		36	37.36		DI	2006	No	NSWTP	ACTIVE		
	BD11-XX015	BD11-XX049	FM	24.50	28.50	34		36	37.36		DI	2006	No	NSWTP	ACTIVE		
	BD11-05185	BD11-04715	FM	-12.00	-2.90	470		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	BD11-04715	BD11-03042	FM	-2.90	7.50	1673		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	BD11-03042	BD11-02200	FM	7.50	23.80	842		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	BD11-02200	BD11-01960	FM	23.80	23.80	240		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	BD11-01960	BD11-01876	FM	23.80	24.00	84		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	BD11-01876	PB11-01301	FM	24.00	24.50	575		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
	PB11-01301	BD11-XX015	FM	24.50	24.50	15		36	37.36		DI	2006	No	NSWTP	ACTIVE		
	PS11	BD11-05185	FM	-12.00	-12.00	54		36	37.36		PCCP	1965	No	NSWTP	ACTIVE		0609011
PUMPING STATION 12 FORCE MAIN - 73																	
	BD12-05870	BD12-02747	FM	107.35	124.50	3123		36	36		PCCP	1968	No	PS11	ACTIVE		0609072
	BD12-02747	BD12-02942	FM	124.50	142.80	1113		36	36		PCCP	1968	No	PS11	ACTIVE		0609072
	PS12	BD12-05870	FM	104.00	107.35	268		36	36		PCCP	1968	No	PS11	ACTIVE		0609072
PUMPING STATION 13 FORCE MAIN - 74																	
	BD13-13515	BD13-12854	FM	-0.50	1.25	265		36	36		PCCP	1969	No	PS10	ACTIVE		0810213
	BD13-12854	BD13-12082	FM	1.25	0.25	772		36	36		PCCP	1969	No	PS10	ACTIVE		0810213
	BD13-12082	BD13-11446	FM	0.25	4.75	559		36	36		PCCP	1969	No	PS10	ACTIVE		0810213

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD13-11446	MH10-145	FM	4.75	5.16	297		36	36		PCCP	1969	No	PS10	ACTIVE		0810213
	PS13	BD13-13515	FM	-3.50	-0.50	300		36	36		PCCP	1969	No	PS10	ACTIVE		0810213
PUMPING STATION 14 FORCE MAIN - 75																	
	BD14-14019	BD14-13912	FM	-4.75	-3.25	120		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	BD14-13912	BD14-11310	FM	-3.25	-0.57	2600		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	BD14-11310	BD14-11198	FM	-0.57	-0.85	134		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	BD14-11198	TE14-11057	FM	-0.85	-0.45	142		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	TE14-11057	BD14-10370	FM	-0.45	0.39	686		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	BD14-10370	BD14-10260	FM	0.39	0.51	112		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
	BD14-10260	MH13-137	FM	0.51	4.32	560		30	30		PCCP	1971	No	PS14	ACTIVE		0809243
	PS14	BD14-14019	FM	-6.25	-3.25	112		30	30		PCCP	1971	No	PS13	ACTIVE		0809243
PUMPING STATION 15 FORCE MAIN - 76																	
	MH15-07264	TE05-22376	FM	4.40		8		24	25.06		DI	1959	No	PS08	ACTIVE		0709184
	RD15-07254	MH15-07264	FM		4.40	10		24	25.06		DI	1972	No	PS08	ACTIVE		0709184
	TE15-07247	RD15-07254	FM			7		20	20.94		DI	1972	No	PS08	ACTIVE		0709184
	BD15-07244	TE15-07247	FM			3		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-07134	BD15-07244	FM			110		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-06880	BD15-07134	FM			254		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-06765	BD15-06880	FM			115		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-06585	BD15-06765	FM			180		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-05632	BD15-06585	FM			953		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-05567	BD15-05632	FM			75		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	MH15-04827	BD15-05567	FM	54.00		740		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-03979	MH15-04827	FM		54.00	848		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-03900	BD15-03979	FM			73		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	MH15-03537	BD15-03900	FM	13.50	34.40	363		20	20.94		DI	1972	No	PS08	ACTIVE		0709182
	BD15-03487	MH15-03537	FM	15.20	13.50	50		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	BD15-03361	BD15-03487	FM		13.50	126		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	BD15-02816	BD15-03361	FM			545		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	BD15-02768	BD15-02816	FM			48		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	RD15-02457	BD15-02768	FM			311		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	BD15-02421	RD15-02457	FM			36		20	20.94		DI	1972	No	PS08	ACTIVE		0708131
	MH15-02411	BD15-02421	FM	54.00		10		24	25.06		DI	1972	No	PS08	ACTIVE		0708131
	BD15-02061	MH15-02411	FM	64.00	54.00	350		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-01721	BD15-02061	FM			340		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	MH15-01525	BD15-01721	FM	64.00		196		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-01365	MH15-01525	FM	60.00	64.00	160		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	MH15-01360	BD15-01365	FM			5		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	TE15-01350	MH15-01360	FM	59.00	60.00	10		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-01325	TE15-01350	FM		59.00	25		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-00928	BD15-01325	FM		59.00	397		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-00546	BD15-00928	FM	14.40		382		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
	BD15-00489	BD15-00546	FM		14.40	57		24	25.06		DI	1981	No	PS08	ACTIVE		0708124
	BD15-00000	BD15-00489	FM	7.70		489		24	25.06		DI	1981	No	PS08	ACTIVE		0708124

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	PS15	BD15-00000	FM	7.60	7.70	10		24	25.06		DI	1972	No	PS08	ACTIVE		0708124
PUMPING STATION 15 FORCE MAIN/CRESTWOOD LEG - 77																	
	MH15A-00010	BD15A-00006	FM			4		6	6		DI	1972	No	STSWR	ACTIVE		0709184
	BD15A-00006	TE15-07247	FM			6		6	6		DI	1972	No	STSWR	ACTIVE		0709184
PUMPING STATION 15 FORCE MAIN DIVERSION - 78																	
	TE15-01350	BD15D-05596	FM		60.00	4		24	25.06		DI	1982	No	PS16	ACTIVE		0709124
	BD15D-05596	MH15D-05587	FM	60.00	60.00	9		24	25.06		DI	1982	No	PS16	ACTIVE		0709124
	MH15D-05587	RD15D-05583	FM	60.00	60.00	4		24	25.06		DI	1982	No	PS16	ACTIVE		0709124
	RD15D-05583	BD15D-05146	FM	60.00	70.20	437		30	30		PCCP	1982	No	PS16	ACTIVE		0709124
	BD15D-05146	BD15D-04940	FM	70.20		206		30	30		PCCP	1982	No	PS16	ACTIVE		0709124
	BD15D-04940	MH15D-04807	FM			133		30	30		PCCP	1982	No	PS16	ACTIVE		0709124
	MH15D-04807	BD15D-04486	FM		69.40	321		30	30		PCCP	1982	No	PS16	ACTIVE		0708131
	BD15D-04486	BD15D-04292	FM	69.40	60.00	190		30	30		PCCP	1982	No	PS16	ACTIVE		0708131
	BD15D-04292	BD15D-03860	FM	60.00	59.20	432		30	30		PCCP	1982	No	PS16	ACTIVE		0708131
	BD15D-03860	BD15D-02960	FM	59.20	63.00	900		30	30		PCCP	1982	No	PS16	ACTIVE		0708131
	BD15D-02960	BD15D-02818	FM	63.00	63.10	115		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-02818	BD15D-02245	FM	63.10		573		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-02245	BD15D-02130	FM			115		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-02130	BD15D-01605	FM		71.30	522		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-01605	BD15D-01420	FM	71.30	75.10	185		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-01420	BD15D-01280	FM	75.10	75.10	140		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-01280	BD15D-00937	FM	75.10	84.10	343		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-00937	BD15D-00837	FM	84.10	84.90	100		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
	BD15D-00837	MH16-105	FM	84.90	90.07	159		30	30		PCCP	1982	No	PS16	ACTIVE		0708132
PUMPING STATION 16 FORCE MAIN - 79																	
	BD16-07720	BD16-07520	FM	118.60	121.60	134		36	37.36	36.50	DI	1979	No	PS12	ACTIVE		0708144
	BD16-07520	PB16-05500	FM	71.30	165.20	2078		36	37.36	36.50	DI	1979	No	PS12	ACTIVE		0708144
	PB16-05500	BD16-05270	FM	165.20	177.00	250		36	37.36	36.50	DI	1980	No	PS12	ACTIVE		0708144
	BD16-05270	BD16-05100	FM	177.00	192.00	150		36	37.36	36.50	DI	1980	No	PS12	ACTIVE		0708144
	BD16-05100	MH16-03385	FM	192.00	235.50	2091		36	37.36	36.50	DI	1980	No	PS12	ACTIVE		0708144
	MH16-03385	BD16-01900	FM	235.50	190.20	1520		30	31.16	25.40	DI	1980	No	PS12	ACTIVE		0708231
	BD16-01900	BD16-01670	FM	190.20	190.50	200		30	31.16	25.40	DI	1980	No	PS12	ACTIVE		0708231
	BD16-01670	MH12-177	FM	190.50	182.84	1245		30	31.16	25.40	DI	1980	No	PS12	ACTIVE		0708231
	BD16-00162	BD16-07720	FM	71.30	118.60	2349		36	37.36	36.50	DI	1979	No	PS12	ACTIVE		0708144
	PS16	BD16-00162	FM	62.50	71.30	162		36	37.36	36.50	DI	1981	No	PS12	ACTIVE		0708132
PUMPING STATION 17 FORCE MAIN - 80																	
	BD17-14843	MH12-110	FM	135.90	104.00	2678		20	20.94		DI	1995	No	PS12	ACTIVE		0608132
	MH17-14450	BD17-14843	FM	139.90	135.90	393		20	20.94		DI	1995	No	PS12	ACTIVE		0608141
	BD17-12251	MH17-14450	FM	104.40	139.60	2199		16	16.84		DI	1995	No	PS12	ACTIVE		0608141
	BD17-12003	BD17-12251	FM	102.90	104.40	248		16	16.84		DI	1995	No	PS12	ACTIVE		0608141
	BD17-11308	BD17-12003	FM	98.90	102.90	695		16	16.84		DI	1995	No	PS12	ACTIVE		0608143
	BD17-10224	BD17-11308	FM	97.90	98.90	1084		16	16.84		DI	1995	No	PS12	ACTIVE		0608143
	BD17-10092	BD17-10224	FM	93.90	97.90	132		16	16.84		DI	1995	No	PS12	ACTIVE		0608143

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH17-08900	BD17-10092	FM	110.90	93.90	1192		16	16.84		DI	1995	No	PS12	ACTIVE		0608143
	BD17-07290	MH17-08900	FM	89.40	110.90	1610		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-06977	BD17-07290	FM	89.40	89.40	313		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-06696	BD17-06977	FM	89.40	89.40	281		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-06079	BD17-06696	FM	89.40	89.40	617		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-05974	BD17-06079	FM	89.40	89.40	105		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-05348	BD17-05974	FM	89.40	89.40	626		16	16.84		DI	1995	No	PS12	ACTIVE		0608221
	BD17-04504	BD17-05348	FM	92.40	89.40	844		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-04148	BD17-04504	FM	121.40	92.40	356		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-04136	BD17-04148	FM	121.40	121.40	12		16	16.84		DI	1995	No	PS12	ACTIVE	1995	0608224
	MH17-04113	BD17-04136	FM	121.40	121.40	23		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-03584	MH17-04113	FM	107.40	121.40	529		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-03522	BD17-03584	FM	106.10	107.40	62		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-03423	BD17-03522	FM	103.90	106.10	99		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	MH17-03050	BD17-03423	FM	114.40	103.90	373		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-02625	MH17-03050	FM	113.00	114.40	425		16	16.84		DI	1995	No	PS12	ACTIVE		0608224
	BD17-02290	BD17-02625	FM	112.10	113.00	335		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
	MH17-02050	BD17-02290	FM	114.90	112.10	240		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
	BD17-01216	MH17-02050	FM	89.70	114.90	834		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
	BD17-01168	BD17-01216	FM	89.70	89.70	48		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
	BD17-01099	BD17-01168	FM	89.70	89.70	69		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
	PS17	BD17-01099	FM	89.70	89.70	6		16	16.84		DI	1995	No	PS12	ACTIVE		0608223
RIMROCK INTERCEPTOR - 90																	
	MH03-111	MH03-110	GR	4.00	3.14	392	0.0022	12	12	1.08	RCP	1959	Yes	PS03	ACTIVE		0709364
	MH03-110	MH03-109	GR	3.14	2.26	400	0.0022	12	12	1.08	RCP	1959	Yes	PS03	ACTIVE		0709364
	MH03-109	MH03-108	GR	2.26	1.38	400	0.0022	12	12	1.08	RCP	1959	Yes	PS03	ACTIVE		0709364
	MH03-108	MH03-205	GR	1.38	0.50	400	0.0022	12	12	1.08	RCP	1959	Yes	PS03	ACTIVE		0709364
RIMROCK INTERCEPTOR RELIEF_REPLACEMENT - 91																	
	MH03-205	MH03-204	GR	0.38	-0.85	388	0.0032	15	15	2.79	PVC	2015	No	3	ACTIVE	2015	
	MH03-204	MH03-203	GR	-0.75	-2.42	399	0.0042	15	15	3.20	PVC	2015	No	3	ACTIVE	2015	
	MH03-203	MH03-202	GR	-2.52	-3.12	402	0.0015	15	15	1.91	PVC	2015	No	3	ACTIVE	2015	
	MH03-202	MH03-201	GR	-3.32	-4.07	498	0.0015	15	15	1.91	PVC	2015	No	3	ACTIVE	2015	
	MH03-201	PS03	GR	-7.27	-8.64	300	0.0046	15	15	3.34	PVC	2015	No	3	ACTIVE	2015	
SOUTH INTERCEPTOR/BAIRD STREET EXTENSION - 96																	
	MH04-408	MH04-407	GR	3.73	3.40	220	0.0015	15	14.54	1.76	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-407	MH04-406	GR	3.40	3.16	137	0.0015	15	14.54	1.76	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-406	MH04-405	GR	3.16	0.96	165	0.0133	15	14.54	5.23	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-405	MH04-404	GR	0.96	-0.16	231	0.0048	15	14.54	3.14	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-404	MH04-403	GR	-0.16	-1.28	231	0.0048	15	14.54	3.14	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-403	MH04-402	GR	-1.28	-1.65	240	0.0015	15	14.54	1.76	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-402	MH04-313	GR	-1.65	-1.94	190	0.0015	15	14.54	1.76	VP	1928	Yes	PS04	ACTIVE		0709264
	MH04-313	MH04-312	GR	-2.00	-3.00	14	0.0714	12	12	7.27	PVC	1995	Yes	PS04	ACTIVE		0709264
	MH04-312	MH04-311	SI	-4.00	-5.00	162		10 & 14	10	4.00	DI	1995	Yes	PS04	ACTIVE		0709264

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
SOUTH INTERCEPTOR/LAKESIDE EXTENSION - 97																	
	MH04-209	MH04-208	GR	-8.45	-8.67	195	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709252
	MH04-208	MH04-207	GR	-8.67	-8.86	287	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709252
	MH04-207	MH04-206	GR	-8.86	-9.08	99	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709252
	MH04-206	MH04-205	GR	-9.08	-9.26	254	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709252
	MH04-205	MH04-204	GR	-9.26	-9.63	400	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709253
	MH04-204	MH04-203	GR	-9.63	-10.18	518	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709253
	MH04-203	MH04-202	GR	-10.18	-10.28	95	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709253
	MH04-202	MH04-201	GR	-10.28	-9.92	366	0.001	24	24	4.62	AC	1967	No	PS04	ACTIVE		0709253
	MH04-201	PS04	GR	-10.67	-10.71	30	0.0013	24	24	5.27	AC	1967	No	PS04	ACTIVE		0709253
	MH04-103	MH04-102	GR			14	0.001		24	4.62	VP	1925	No	PS04	ACTIVE		0709252
	MH04-102	MH04-209	GR			13	0.001		24	4.62	RCP	1925	No	PS04	ACTIVE		0709252
SOUTH INTERCEPTOR RELIEF - 98																	
	MH04-315	MH04-314	GR	-1.00	-2.69	363	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-314	MH04-311	GR	-2.69	-5.00	280	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-311	MH04-310	GR	-5.00	-5.27	210	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-310	MH04-309	GR	-5.27	-5.52	298	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-309	MH04-308	GR	-5.52	-5.61	77	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-308	MH04-307	GR	-5.61	-6.10	473	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-307	MH04-306	GR	-6.10	-6.35	243	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-306	MH04-305	GR	-6.35	-6.85	494	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-305	MH04-304	GR	-6.85	-7.21	352	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709264
	MH04-304	MH04-303	GR	-7.21	-7.32	113	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709252
	MH04-303	MH04-302	GR	-7.32	-7.77	434	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709252
	MH04-302	MH04-301	GR	-7.77	-7.91	145	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709252
	MH04-301	MH04-209	GR	-7.91	-8.15	223	0.001	24	23.5	5.16	PVCPW	1995	No	PS04	ACTIVE		0709252
SOUTH INTERCEPTOR/LAKESIDE EXT-COLISEUM LEG - 99																	
	MH04-201B	MH04-201A	GR	-8.00	-9.15	398	0.0029	15	15	2.25	AC	1967	No	PS04	ACTIVE		0709253
	MH04-201A	MH04-201	GR	-9.15	-9.92	255	0.0029	15	15	2.25	AC	1967	No	PS04	ACTIVE		0709253
SOUTHEAST INTERCEPTOR - 110																	
	MH07-823	MH07-822	GR	44.60	43.01	400	0.004	12	12	1.46	AC	1961	No	PS07	ACTIVE		0710343
	MH07-822	MH07-821	GR	43.01	41.57	360	0.004	12	12	1.46	AC	1961	No	PS07	ACTIVE		0710343
	MH07-821	PB07-820X34	SI	41.57	26.00	76		8	8		DI	1992	No	PS07	ACTIVE		0710343
	PB07-820X34	MH07-820	SI			34		8	8		DI	1992	No	PS07	ACTIVE		0710343
	MH07-820	PB07-819X68	SI	26.00	38.44	6		8	8		DI	1992	No	PS07	ACTIVE		0710343
	PB07-819X68	MH07-819	SI	26.00	38.44	68		8	8		DI	1992	No	PS07	ACTIVE		0710343
	MH07-819	MH07-818	GR	38.44	37.02	357	0.004	12	12	1.46	AC	1961	No	PS07	ACTIVE		0710343
	MH07-818	MH07-817	GR	37.02	33.03	401	0.01	12	12	2.30	AC	1961	No	PS07	ACTIVE		0710341
	MH07-817	MH07-816	GR	33.03	26.99	400	0.015	12	12	2.82	AC	1961	No	PS07	ACTIVE		0710341
	MH07-816	MH07-815	GR	26.99	21.79	400	0.013	12	12	2.62	AC	1961	No	PS07	ACTIVE		0710341
	MH07-815	MH07-814	GR	21.79	16.58	400	0.013	12	12	2.62	AC	1961	No	PS07	ACTIVE		0710341
	MH07-814	MH07-813	GR	16.58	9.68	400	0.0172	12	12	3.02	AC	1961	No	PS07	ACTIVE		0710341
	MH07-813	MH07-812	GR	9.68	3.47	399	0.0156	12	12	2.87	AC	1961	No	PS07	ACTIVE		0710341

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-812	MH07-811	GR	3.47	2.32	400	0.003	12	12	1.26	AC	1961	No	PS07	ACTIVE		0710274
	MH07-811	MH07-810	GR	2.32	1.07	401	0.003	12	12	1.26	AC	1961	No	PS07	ACTIVE		0710274
	MH07-810	MH07-809	GR	0.82	0.19	399	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710274
	MH07-809	MH07-808	GR	0.19	-0.41	399	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710274
	MH07-808	MH07-807	GR	-0.41	-1.02	403	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710274
	MH07-807	MH07-806	GR	-1.02	-1.61	399	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710274
	MH07-806	MH07-805	GR	-1.61	-2.14	350	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710274
	MH07-805	MH07-804	GR	-2.14	-2.80	400	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710272
	MH07-804	MH07-803	GR	-2.80	-3.36	400	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710272
	MH07-803	MH07-802	GR	-3.36	-3.92	400	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710272
	MH07-802	MH07-801	GR	-3.92	-4.51	403	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710272
	MH07-801	MH07-218	GR	-4.51	-5.10	418	0.0015	15	15	1.62	AC	1961	No	PS07	ACTIVE		0710272
	MH07-218	MH07-217	GR	-6.81	-7.28	582	0.0007	36	36	11.40	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-217	MH07-216	GR	-7.28	-7.65	602	0.0007	36	36	11.40	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-216	MH07-215	GR	-7.65	-7.99	422	0.0007	36	36	11.40	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-215	MH07-214A	GR	-10.06	-10.11	416	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-214B	MH05-214	GR	-10.13	-10.20	467	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-214A	MH07-214B	GR	-10.11	-10.13	46	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-214	MH07-213	GR	-10.20	-10.63	505	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710281
	MH07-213	MH07-212	GR	-10.63	-10.68	553	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710282
	MH07-212	MH07-211	GR	-10.68	-10.84	489	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710282
	MH07-211	MH07-210	GR	-10.84	-11.19	498	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710282
	MH07-210	MH07-209	GR	-11.19	-11.57	541	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710282
	MH07-209	MH07-208	GR	-11.57	-11.88	577	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710282
	MH07-208	MH07-207A	GR	-11.88	-11.97	385	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-207A	MH07-207	GR	-11.97	-12.16	217	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-207	MH07-206B	GR	-12.16	-12.28	198	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-206B	MH07-206A	GR	-12.28	-12.40	202	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-206A	MH07-206	GR	-12.40	-12.52	200	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-206	MH07-205	GR	-12.52	-12.87	600	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-205	MH07-204	GR	-12.87	-13.10	457	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-204	MH07-202D	GR	-13.10	-13.47	528	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710291
	MH07-202D	MH07-202C	GR	-13.31	-13.38	237	0.0003	63	63		FRP	2017	No	PS07	ACTIVE	2017	
	MH07-202C	MH07-202B	GR	-13.46	-13.38	286	0.0003	63	63		FRP	2017	No	PS07	ACTIVE	2017	
	MH07-202B	MH07-202A	GR	-13.46	-13.52	195	0.0003	63	63		FRP	2017	No	PS07	ACTIVE	2017	
	MH07-202A	MH07-202	GR	-13.47	-13.49	227	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710203
	MH07-202	MH07-201	GR	-13.49	-13.69	171	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710203
	MH07-201	PS07	GR	-13.69	-13.70	81	0.0005	60	60	37.62	RCP	1961	No	PS07	ACTIVE		0710203
	MH09-108	MH09-107	GR	-9.40	-9.47	72	0.0008	24	24	4.13	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-107	MH09-106	GR	-9.47	-9.80	562	0.0008	24	24	4.13	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-106	MH09-105	GR	-9.80	-10.37	559	0.0008	24	24	4.13	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-105	MH09-104	GR	-10.37	-10.70	485	0.0008	24	24	4.13	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-104	MH09-103B	GR	-10.87	-10.88	22	0.0008	27	27	5.66	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-103B	MH09-103A	GR	-10.88	-10.98	177	0.0008	27	27	5.66	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-103A	MH09-103	GR	-10.98	-11.14	273	0.0008	27	27	5.66	RCP	1961	No	PS09	ACTIVE		0610032

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH09-103	MH09-102	GR	-11.14	-11.64	496	0.0008	27	27	5.66	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-102	MH09-101	GR	-11.64	-12.01	427	0.0008	27	27	5.66	RCP	1961	No	PS09	ACTIVE		0610032
	MH09-101	PS09	GR	-12.01	-12.31	285	0.001	24	24	4.62	RCP	1961	No	PS09	ACTIVE		0610032
SOUTHEAST INTERCEPTOR/BLOOMING GROVE EXT - 111																	
	MH07-249	MH07-248	GR	6.66	6.07	474	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-248	MH07-247	GR	6.07	5.73	337	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-247	MH07-246	GR	5.73	5.11	450	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-246	MH07-245	GR	5.11	4.63	450	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-245	MH07-244	GR	4.63	4.33	300	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-244	MH07-243	GR	4.33	3.83	445	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-243	MH07-242	GR	3.83	3.54	338	0.0011	18	18	2.25	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-242	MH07-241	GR	3.54	3.07	502	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-241	MH07-240	GR	3.07	2.80	497	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-240	MH07-239	GR	2.80	2.43	498	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-239	MH07-238	GR	2.43	2.09	479	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710261
	MH07-238	MH07-237	GR	2.09	1.79	505	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-237	MH07-236	GR	1.79	1.49	465	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-236	MH07-235	GR	1.49	1.04	428	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-235	MH07-234	GR	1.04	0.91	345	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-234	MH07-233	GR	0.91	0.53	459	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-233	MH07-232	GR	0.53	0.36	397	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-232	MH07-231	GR	0.36	0.10	399	0.0007	24	24	3.87	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-231	MH07-230	GR	0.10	-0.68	500	0.0012	24	24	5.06	RCP	1967	No	PS07	ACTIVE		0710262
	MH07-230	MH07-229	GR	-0.68	-1.19	400	0.0012	24	24	5.06	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-229	MH07-228	GR	-1.19	-1.74	447	0.0012	24	24	5.06	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-228	MH07-227	GR	-1.84	-2.45	505	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-227	MH07-226	GR	-2.45	-3.27	490	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-226	MH07-225	GR	-3.27	-4.07	503	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-225	MH07-224	GR	-4.07	-4.71	503	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710271
	MH07-224	MH07-223	GR	-4.71	-5.15	311	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710272
	MH07-223	MH07-222	GR	-5.15	-5.67	339	0.0015	30	30	10.26	RCP	1967	No	PS07	ACTIVE		0710272
SOUTHEAST INTERCEPTOR/MCFARLAND RELIEF - 112																	
	MH07-517	MH07-516	GR	12.75	12.20	55	0.0175	20	20.94	13.44	DI	1987	No	PS07	ACTIVE		0710341
	MH07-516	MH07-515	GR	12.20	5.50	337	0.0175	20	20.94	13.44	DI	1987	No	PS07	ACTIVE		0710341
	MH07-515	MH07-514	GR	5.50	4.90	404	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710343
	MH07-514	MH07-513	GR	4.90	4.45	426	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710341
	MH07-513	MH07-512	GR	4.45	4.02	433	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710341
	MH07-512	MH07-511	GR	4.02	3.50	387	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710341
	MH07-511	MH07-510	GR	3.50	3.12	358	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710341
	MH07-510	MH07-509	GR	3.12	2.68	425	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-509	MH07-508	GR	2.68	2.16	440	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-508	MH07-507A	GR	2.16	1.91	215	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-507A	MH07-507	GR	1.91	1.63	235	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-507	MH07-506	GR	1.63	1.21	449	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-506	MH07-505A	GR	1.21	1.07	159	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-505A	MH07-505	GR	1.07	0.92	178	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-505	MH07-504	GR	0.92	0.32	442	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-504	MH07-503	GR	0.32	0.02	381	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-503	MH07-502	GR	0.02	-0.36	483	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710274
	MH07-502	MH07-501	GR	-0.36	-0.82	397	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710271
	MH07-501	MH07-228	GR	-0.82	-1.74	463	0.0011	30	30	8.79	RCP	1987	No	PS07	ACTIVE		0710271
SOUTHEAST INTERCEPTOR/SIGGELKOW EXTENSION - 113																	
	MH07-618	MH07-617	GR	34.00	27.70	313	0.0201	12	12	3.86	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-617	MH07-616	GR	27.70	26.90	302	0.0026	12	12	1.39	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-616	MH07-615	GR	26.90	26.10	293	0.0027	12	12	1.41	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-615	MH07-614	GR	26.10	25.60	153	0.0033	12	12	1.56	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-614	MH07-613	GR	25.60	24.80	299	0.0027	12	12	1.41	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-613	MH07-612	GR	24.80	24.00	318	0.0025	12	12	1.36	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-612	MH07-611	GR	24.00	23.10	353	0.0025	12	12	1.36	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-611	MH07-610	GR	23.10	22.30	303	0.0026	12	12	1.39	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-610	MH07-609	GR	22.30	19.70	78	0.0333	8	8	1.68	PVC	1996	No	PS07	ACTIVE		0710353
	MH07-609	MH07-608A	GR	18.69	18.37	161	0.002	12	12	1.22	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-608A	MH07-607	GR	18.37	17.87	242	0.0021	12	12	1.25	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-608	MH07-607	GR	19.95	17.87	234	0.0089	12	12	2.57	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-607	MH07-606	GR	17.87	16.90	316	0.0031	12	12	1.51	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-606	MH07-605	GR	16.90	16.45	242	0.0019	12	12	1.19	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-605	MH07-604	GR	16.45	15.54	332	0.0027	12	12	1.41	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-604	MH07-603	GR	15.54	14.54	560	0.0018	12	12	1.15	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-603	MH07-602A	GR	14.54	14.26	128	0.0022	12	12	1.28	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-602A	MH07-602	GR	14.28	14.01	128	0.0021	12	12	1.25	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-602	MH07-601	GR	14.01	6.14	251	0.0314	12	12	4.82	PVC	1993	No	PS07	ACTIVE		0710352
	MH07-601	MH07-512	GR	6.14	5.34	306	0.0026	12	12	1.39	PVC	1993	No	PS07	ACTIVE		0710352
SOUTHWEST INTERCEPTOR - 125																	
	MH02-606	MH02-605	GR	-8.36	-8.50	245	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709262
	MH02-605	MH02-604	GR	-8.50	-8.50	95	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709262
	MH02-604	MH02-603	GR	-8.50	-8.98	468	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709262
	MH02-603	MH02-602	GR	-8.98	-9.44	408	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709262
	MH02-602	MH02-601	GR	-9.44	-9.74	516	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709233
	MH02-601	MH02-401	GR	-9.74	-9.75	38	0.0085	36	36	46.95	PVC-C905	2001	No	PS02	ACTIVE		0709233
	MH02-403	PS02	GR	-8.55	-10.75	40	0.0007	24	24	3.87	CI	1925	No	PS02	ACTIVE		0709233
	MH02-174	MH02-173A	GR	122.44	122.29	100	0.0015	20	20	3.48	AC	1955	No	PS08	ACTIVE	2011	0709322
	MH02-173A	MH02-173	GR	122.29	121.84	299	0.0015	20	20	3.48	AC	1955	No	PS08	ACTIVE		0709294
	MH02-173	MH02-172	GR	121.84	121.24	401	0.0015	20	20	3.48	AC	1955	No	PS08	ACTIVE		0709294
	MH02-172	MH02-171B	GR	121.24	117.05	307	0.0136	15	15	4.87	PVC	1994	No	PS08	ACTIVE		0709294
	MH02-171B	MH02-171A	GR	117.05	116.20	62	0.0136	15	15	4.87	PVC	1994	No	PS08	ACTIVE		0709294
	MH02-171A	MH02-171	GR	116.20	115.78	30	0.0136	15	15	4.87	PVC	1994	No	PS08	ACTIVE		0709294
	MH02-171	MH02-170	GR	115.78	115.19	396	0.0015	21	21	3.96	RCP	1955	No	PS08	ACTIVE		0709294
	MH02-170	MH02-169	GR	115.19	104.24	332	0.0381	12	12	4.49	PVC	1994	No	PS08	ACTIVE		0709294

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-169	MH02-168	GR	102.05	95.40	95	0.0381	12	12	4.49	AC	1955	No	PS08	ACTIVE		0709294
	MH02-168	MH02-167	GR	95.40	90.78	136	0.0381	12	12	4.49	PVC	1994	No	PS08	ACTIVE		0709294
	MH02-167	MH02-166	GR	90.78	77.62	387	0.0381	12	12	4.49	VP	1955	Yes	PS08	ACTIVE		0709294
	MH02-166	MH02-165	GR	77.62	64.50	345	0.0381	12	12	4.49	VP	1955	Yes	PS08	ACTIVE		0709294
	MH02-165	MH02-164	GR	64.50	53.30	295	0.0381	12	12	4.49	VP	1955	Yes	PS08	ACTIVE		0709294
	MH02-164	MH02-163	GR	53.30	41.78	360	0.0381	12	12	4.49	VP	1955	Yes	PS08	ACTIVE		0709294
	MH02-163	MH02-162	GR	40.20	38.86	192	0.0071	24	24	12.31	VP	1932	No	PS08	ACTIVE		0709294
	MH02-162	MH02-161	GR	38.86	37.46	186	0.0071	24	24	12.31	VP	1932	No	PS08	ACTIVE		0709283
	MH02-161	MH02-160	GR	37.46	36.32	164	0.0071	24	24	12.31	VP	1932	No	PS08	ACTIVE		0709283
	MH02-160	MH02-159	GR	36.32	35.26	153	0.0071	24	24	12.31	VP	1932	No	PS08	ACTIVE		0709283
	MH02-159	MH02-158	GR	35.26	27.40	173	0.0418	18	18	13.87	VP	1932	No	PS08	ACTIVE		0709283
	MH02-158	MH02-157	GR	27.40	22.62	129	0.0418	18	18	13.87	VP	1932	No	PS08	ACTIVE		0709283
	MH02-157	MH02-156	GR	22.45	20.52	177	0.01	20	20	8.99	VP	1932	No	PS08	ACTIVE		0709283
	MH02-156	MH02-155	GR	20.52	18.83	193	0.01	20	20	8.99	VP	1932	No	PS08	ACTIVE		0709283
	MH02-155	MH02-154	GR	18.83	18.71	10	0.01	20	20	8.99	VP	1932	No	PS08	ACTIVE		0709283
	MH02-154	MH02-153	GR	18.50	16.43	344	0.006	18	18	5.26	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-153	MH02-152	GR	16.43	14.33	350	0.006	18	18	5.26	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-152	MH02-151	GR	14.33	13.49	141	0.006	18	18	5.26	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-151	MH02-150	GR	13.49	12.38	186	0.006	18	18	5.26	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-150	MH02-149	GR	10.70	10.27	268	0.0016	24	24	5.85	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-149	MH02-148	GR	10.27	9.98	187	0.0016	24	24	5.85	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-148	MH02-147	GR	9.98	9.67	193	0.0016	24	24	5.85	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-147	MH02-146	GR	9.67	8.94	454	0.0016	24	24	5.85	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-146	MH02-145	GR	8.94	8.76	113	0.0016	24	24	5.85	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-145	MH02-144	GR	8.29	5.76	316	0.008	24	24	13.07	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-144	MH02-143	GR	5.76	4.12	205	0.008	24	24	13.07	RCP	1955	No	PS08	ACTIVE		0709283
	MH02-143	MH02-142	GR	4.12	2.40	220	0.008	24	24	13.07	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-142	MH02-141	GR	2.19	1.83	454	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-141	MH02-140	GR	1.83	1.56	330	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-140	MH02-139	GR	1.56	1.35	263	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-139	MH02-138	GR	1.35	1.20	191	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-138	MH02-137	GR	1.20	1.01	236	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-137	MH02-136	GR	1.01	0.86	195	0.0008	27	27	5.66	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-136	MH02-135	GR	0.86	0.66	250	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-135	MH02-134	GR	0.66	0.20	569	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-134	MH02-133	GR	0.20	-0.08	342	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-133	MH02-132	GR	-0.08	-0.33	309	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709281
	MH02-132	MH02-131	GR	-0.33	-0.65	400	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-131	MH02-130	GR	-0.65	-0.82	218	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-130	MH02-129	GR	-0.82	-1.14	394	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-129	MH02-128	GR	-1.14	-1.48	431	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-128	MH02-127A	GR	-1.48	-1.53	64	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-127A	MH02-127	GR	-1.53	-1.82	360	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-127	MH02-126	GR	-1.82	-2.44	776	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272
	MH02-126	MH02-125	GR	-2.44	-2.92	600	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709272

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-125	MH08-113	GR	-2.92	-3.25	407	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709271
	MH02-124	MH02-123	GR	-3.40	-3.76	292	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-123	MH02-122	GR	-3.76	-4.00	193	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-122	MH02-121A	GR	-4.00	-4.30	252	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-121A	MH02-121	GR	-4.30	-4.33	98	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-121	MH08-109	GR	-4.33	-4.45	117	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-120	MH02-119	GR	-4.70	-4.93	261	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-119	MH02-118	GR	-4.93	-5.25	338	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-118	MH02-117	GR	-5.25	-5.55	329	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-117	MH02-116	GR	-5.55	-5.66	56	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH02-116	MH08-106	GR	-5.66	-5.69	35	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709262
	MH02-115A	MH02-115	GR	-5.70	-5.72	24	0.0008	24	24	4.13	CI	1936	No	PS02	ACTIVE	2003	0709262
	MH02-115	MH02-114	GR	-5.72	-5.95	241	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-114	MH02-113	GR	-5.95	-6.62	321	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-113	MH02-112	GR	-6.62	-6.58	361	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-112	MH02-111	GR	-6.58	-6.70	146	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-111	MH02-110A	GR	-6.70	-6.76	70	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-110A	MH02-110	GR	-6.76	-6.78	20	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH02-110	MH02-606	GR	-6.78	-7.44	248	0.0012	24	24	5.06	CI	1936	No	PS02	ACTIVE		0709262
	MH08-113	MH02-124	GR	-3.25	-3.40	193	0.0008	30	30	7.49	RCP	1955	No	PS08	ACTIVE		0709271
	MH08-109	MH02-120	GR	-4.45	-4.70	269	0.0012	24	24	5.06	CI	1936	No	PS08	ACTIVE		0709271
	MH08-106	MH02-115A	GR	-5.69	-5.70	11	0.0009	24	24	4.38	CI	1936	No	PS02	ACTIVE	2003	0709262
WEST INTERCEPTOR - 140																	
	MH02-542	MH02-060	GR	51.04	50.00	305	0.0034	12	12	1.34	VP	1932	No	PS08	ACTIVE		0709173
	MH02-402	MH02-401	GR	-10.50	-10.70	284	0.0007	48	48	24.55	RCP	1963	No	PS02	ACTIVE		0709233
	MH02-401	PS02	GR	-10.70	-10.75	30	0.0016	48	48	37.12	RCP	1963	No	PS02	ACTIVE		0709233
	MH02-316	MH02-012B	GR	7.31	6.23	90	0.012	24	23.5	15.13	CI	1916	No	PS02	ACTIVE		0709221
	MH02-101	MH02-402	GR	-8.55	-8.55	10	0	36	36	8.88	RCP	1963	No	PS02	ACTIVE		0709233
	MH02-060	MH02-059C	GR	50.00	48.95	422	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709173
	MH02-059C	MH02-059B	GR	48.95	48.85	63	0.0015	18	18	2.63	VP	1961	No	PS08	ACTIVE		0709173
	MH02-059B	MH02-059A	GR	48.85	48.63	148	0.0015	18	18	2.63	VP	1961	Yes	PS08	ACTIVE		0709173
	MH02-059A	MH02-059	GR	48.63	48.49	97	0.0015	18	18	2.63	VP	1961	Yes	PS08	ACTIVE		0709173
	MH02-059	MH02-058F	GR	48.49	45.58	227	0.0128	12	12	2.60	VP(L)	1932	Yes	PS08	ACTIVE	1995	0709173
	MH02-058F	MH02-058E	GR	45.48	45.28	33	0.0061	14	13.84	3.11	PVC-C905	2016	No	PS08	ACTIVE	2016	
	MH02-058E	MH02-058D	GR	45.28	44.81	86	0.0055	14	13.84	2.95	PVC-C905	2016	No	PS08	ACTIVE	2016	
	MH02-058D	MH02-058C	GR	44.81	44.60	39	0.0054	14	13.84	2.92	PVC-C905	2016	No	PS08	ACTIVE	2016	
	MH02-058C	MH02-058B	GR	44.56	42.45	200	0.0144	12	12	2.76	VP	1932	No	PS08	ACTIVE		0709173
	MH02-058B	MH02-058	GR	42.45	41.89	51	0.011	12	12	2.41	VP	1932	No	PS08	ACTIVE		0709173
	MH02-058	MH02-057	GR	41.89	32.87	560	0.0134	12	12	2.66	VP	1932	No	PS08	ACTIVE		0709173
	MH02-057	MH02-056	GR	32.87	32.16	282	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-056	MH02-055A	GR	32.15	31.51	260	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	PB02-055X008	MH02-055	GR	31.51	31.46	8	0.0025	15	15	2.09	PVC	2010	No	PS08	ACTIVE		0709201
	MH02-055A	PB02-055X008	GR	31.46	31.44	21	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-055	PB02-054AX222	GR	31.44	31.42	8	0.0025	15	15	2.09	PVC	2010	No	PS08	ACTIVE		0709201

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	PB02-054AX222	MH02-054A	GR	31.42	30.89	222	0.0025	15	15	2.09	PVC	2010	No	PS08	ACTIVE		0709201
	MH02-054A	MH02-053B	SI	30.89	30.78	50	0.0025	16	16	2.12	CI	1958	No	PS08	ACTIVE		0709201
	MH02-053B	MH02-053A	GR	30.78	30.48	110	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-053A	MH02-053	GR	30.48	30.03	170	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-053	MH02-052	GR	30.03	29.21	327	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-052	MH02-051	GR	29.21	28.39	330	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-051	MH02-050	GR	28.39	27.56	331	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-050	MH02-049	GR	27.56	26.86	278	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-049	MH02-048	GR	26.86	25.88	394	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-048	MH02-047B	GR	25.88	25.26	245	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-047B	MH02-047A	SI	25.26	25.14	50	0.0025	15	15	2.12	RCP	1972	No	PS08	ACTIVE		0709201
	MH02-047A	MH02-047	GR	25.14	24.92	90	0.0025	15	15	2.09	VP	1932	No	PS08	ACTIVE		0709201
	MH02-047	PB02-046X288	GR	24.92	24.85	46	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709201
	PB02-046X288	PB02-046X263	GR	24.85	24.80	25	0.0016	18	18	2.71	PVC	2011	No	PS08	ACTIVE	2011	0709201
	PB02-046X263	MH02-046	GR	24.80	24.38	263	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709201
	MH02-046	MH02-045	GR	24.38	23.91	294	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-045	MH02-044	GR	23.91	23.44	296	0.0016	18	18	2.71	VP	1932	Yes	PS08	ACTIVE		0709212
	MH02-044	MH02-043	GR	23.44	22.70	461	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-043	MH02-042	GR	22.70	22.49	134	0.0016	18	18	2.71	CI	1932	No	PS08	ACTIVE		0709212
	MH02-042	MH02-041	GR	22.49	21.84	395	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-041	MH02-040	GR	21.84	21.30	347	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-040	MH02-039	GR	21.30	20.68	384	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-039	MH02-038	GR	20.68	20.16	332	0.0016	18	18	2.71	VP	1932	No	PS08	ACTIVE		0709212
	MH02-038	MH02-037	GR	20.16	19.70	676	0.0008	18	17.42	1.76	VP	1916	Yes	PS08	ACTIVE		0709212
	MH02-037	MH02-036	GR	19.70	19.38	392	0.0008	18	17.42	1.76	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-036	MH02-035	GR	19.38	18.56	363	0.0008	18	17.42	1.76	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-035	MH02-034	GR	18.56	18.70	29	0.0008	18	17.42	1.76	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-034	MH02-033	GR	18.70	18.23	406	0.001	20	19.44	2.63	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-033	MH02-032	GR	18.23	17.87	410	0.001	20	19.44	2.63	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-032	MH02-031A	GR	17.87	17.71	158	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-031A	MH02-031	GR	17.71	17.38	337	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-031	MH02-030	GR	17.38	16.91	604	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709211
	MH02-030	MH02-029	GR	16.91	16.59	325	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709222
	MH02-029	MH02-028	GR	16.59	16.09	265	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709222
	MH02-028	MH02-513	GR	16.09	16.07	15	0.001	22.5	21.66	3.52	VP	1916	Yes	PS08	ACTIVE		0709222
	MH02-021	MH02-020	GR	13.38	13.13	195	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-020	MH02-019A	GR	13.13	12.65	376	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-019A	MH02-019	GR	12.65	12.58	58	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-019	MH02-018	GR	12.58	12.65	143	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-018	MH02-017	GR	12.65	12.39	423	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-017	MH02-016A	GR	12.39	12.17	67	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-016A	MH08-206	GR	12.39	12.24	246	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-016	MH02-015A	GR	12.17	12.00	203	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-015A	MH02-015	GR	12.00	11.82	214	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221
	MH02-015	MH02-014A	GR	11.82	10.92	94	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-014A	MH02-014	GR	10.16	8.50	270	0.0066	24	23.5	11.22	CI	1916	No	PS02	ACTIVE		0709221
	MH02-014	MH02-013	GR	8.50	7.43	140	0.0066	24	23.5	11.22	CI	1916	No	PS02	ACTIVE		0709221
	MH02-013	MH02-316	GR	7.43	7.31	10	0.012	24	23.5	15.13	CI	1916	No	PS02	ACTIVE		0709221
	MH02-012B	PB02-012AX126	GR	6.23	0.63	349	0.012	24	23.5	15.13	CI	1916	No	PS02	ACTIVE		0709221
	PB02-012AX126	PB02-012AX120	GR	0.63	0.63	6	0.0008	24	17.42	1.76	PVC	2013	Yes	PS08	ACTIVE		0709211
	PB02-012AX120	MH02-012A	GR	0.63	0.53	120	0.0008	24	17.42	1.76	CI	1916	Yes	PS08	ACTIVE		0709211
	MH02-012A	MH02-012	GR	0.53	-0.71	100	0.012	24	23.5	15.13	CI	1916	No	PS02	ACTIVE		0709221
	MH02-012	MH02-011	GR	-0.71	-1.02	450	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-011	MH02-010A	GR	-1.02	-1.05	10	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-010A	MH02-010	GR	-1.05	-1.56	190	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-010	MH02-009	GR	-1.56	-2.21	240	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-009	MH02-008A	GR	-2.21	-2.11	420	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-008A	MH02-008	GR	-2.11	-2.09	40	0.001	24	23.5	4.37	CI	1916	No	PS02	ACTIVE		0709221
	MH02-008	MH02-007	GR	-2.09	-2.34	400	0.0013	24	23.5	4.98	CI	1916	No	PS02	ACTIVE		0709221
	MH02-007	MH02-006A	GR	-2.34	-2.61	400	0.0013	24	23.5	4.98	CI	1916	No	PS02	ACTIVE		0709221
	MH02-006A	MH02-006	GR	-2.61	-2.60	10	0.0013	24	23.5	4.98	CI	1916	No	PS02	ACTIVE		0709233
	MH02-006	MH02-005B	GR	-2.60	-2.64	15	0.0013	24	23.5	4.98	CI	1916	No	PS02	ACTIVE		0709233
	MH02-005B	MH02-005A	GR	-2.64	-3.70	435	0.0013	24	23.5	4.98	CI	1916	No	PS02	ACTIVE		0709233
	MH02-005A	MH02-005	GR	-3.70	-3.82	50	0.0013	24	24	5.27	CI	1968	No	PS02	ACTIVE		0709233
	MH02-005	MH02-004	GR	-3.82	-4.13	430	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH02-004	MH02-003	GR	-4.13	-5.06	250	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH02-003	MH02-002	GR	-6.89	-7.45	150	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH02-002	MH02-001A	GR	-7.45	-8.22	370	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH02-001A	MH02-001	GR	-8.22	-8.39	34	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH02-001	MH02-101	GR	-8.39	-8.55	34	0.0037	24	23.5	8.40	CI	1916	No	PS02	ACTIVE		0709233
	MH05-402	MH05-401	GR	-1.70	-1.90	92	0.0025	24	23.5	6.91	PVC	1995	No	PS05	ACTIVE		0709184
	MH05-401	PS05	GR	-1.90	-2.00	28	0.0025	24	23.5	6.91	PVC	1995	No	PS05	ACTIVE		0709184
	MH05-025A	MH05-025	GR	18.27	17.14	141	0.008	12	12	2.06	CI	1931	No	PS15	ACTIVE		0708124
	MH05-025	MH05-024A	GR	17.14	15.58	92	0.008	12	12	2.06	CI	1931	No	PS15	ACTIVE		0708124
	MH05-024A	MH05-024	GR	15.58	14.30	261	0.008	12	12	2.06	CI	1931	No	PS15	ACTIVE		0708124
	MH05-024	MH05-023	GR	14.30	11.46	353	0.008	12	12	2.06	CI	1931	No	PS15	ACTIVE		0708124
	MH05-023	MH05-103	GR	11.46	7.84	33	0.008	12	12	2.06	CI	1931	No	PS15	ACTIVE		0708124
	MH05-021	MH05-020	GR	7.47	6.70	238	0.0032	14	13.53	2.33	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-020	MH05-019	GR	6.70	5.85	204	0.0042	14	13.53	2.67	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-019	MH05-018	GR	5.85	5.52	239	0.0014	16	15.41	2.18	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-018	MH05-017	GR	5.52	5.20	239	0.0013	16	15.41	2.10	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-017	MH05-016	GR	5.20	4.59	405	0.0015	16	15.41	2.26	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-016	MH05-015	GR	4.59	4.03	350	0.0016	16	15.41	2.33	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-015	MH05-014	GR	4.03	3.77	164	0.0016	16	15.41	2.33	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-014	MH05-013	GR	3.77	3.08	431	0.0016	16	15.41	2.33	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-013	MH05-012	GR	3.08	2.49	365	0.0015	16	16.84	2.20	CI	1931	Yes	PS05	ACTIVE		0708124
	MH05-012	MH05-011	GR	2.49	2.22	157	0.0017	16	15.41	2.40	CI	1931	Yes	PS05	ACTIVE		0709182
	MH05-011	MH05-010	GR	2.22	1.75	433	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-010	MH05-009A	GR	1.75	1.52	203	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-009A	MH05-009	GR	1.53	1.36	159	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH05-009	MH05-008	GR	1.36	0.97	353	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-008	MH05-007	GR	0.97	0.67	276	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-007	MH05-006	GR	0.67	0.29	342	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-006	MH05-005	GR	0.29	-0.15	403	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-005	MH05-004	GR	-0.15	-0.54	353	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-004	MH05-003	GR	-0.54	-0.93	353	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-003	MH05-002	GR	-0.93	-1.13	181	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709182
	MH05-002	MH05-001	GR	-1.13	-1.55	385	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709184
	MH05-001	MH05-402	GR	-1.55		120	0.0011	18	18.84	2.54	CI	1931	No	PS05	ACTIVE		0709184
	MH05-000	MH05-402	GR			20		18	18.84		CI	1931	No	PS05	ACTIVE		709184
	MH08-206	MH02-016	GR	12.24	12.17	134	0.0011	24	23.5	4.58	CI	1916	No	PS08	ACTIVE		0709221

WEST INTERCEPTOR/SPRING STREET RELIEF - 141

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-316	MH02-315A	GR	5.04	4.99	23	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-315A	MH02-315	GR	4.99	4.49	255	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-315	MH02-314B	GR	4.49	4.35	90	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-314C	MH02-314	GR	4.11	3.71	200	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-314B	MH02-314A	GR	4.35	4.17	75	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-314A	MH02-314C	GR	4.17	4.11	15	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-314	MH02-313A	GR	3.71	3.24	235	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-313A	MH02-313	GR	3.24	3.16	42	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-313	MH02-312A	GR	3.16	3.12	370	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-312A	MH02-312	GR	3.12	2.38	20	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-312	MH02-311	GR	2.38	1.83	277	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-311	MH02-310	GR	1.83	1.02	402	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-310	MH02-309B	GR	1.02		130	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-309B	MH02-309A	SI			46		24	24	6.53	DI	1975	No	PS02	ACTIVE		0709221
	MH02-309A	MH02-309	GR		0.31	180	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709221
	MH02-309	MH02-308	SI	0.31	-0.13	91		24	24	6.53	CI	1940	No	PS02	ACTIVE		0709221
	MH02-308	MH02-307	GR	-0.13	-0.60	366	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-307	MH02-306A	SI	-0.60	-0.57	63	0.002	24	24	6.54	CI	1965	No	PS02	ACTIVE		0709233
	MH02-306A	MH02-305D	GR	-0.57	-0.59	12	0.002	24	24	6.54	CI	1965	No	PS02	ACTIVE		0709233
	MH02-305F	MH02-304A	GR	-1.44	-1.75	155	0.002	24	24	6.54	PVC	2006	No	PS02	ACTIVE		0709233
	MH02-305E	MH02-305F	GR			54	0.002	24	24	6.54	PVC	1996	No	PS02	ACTIVE		0709233
	MH02-305D	MH02-305C	GR	-0.59	-0.65	24	0.002	24	24		CI	1968	No	PS02	ACTIVE		0709233
	MH02-305C	MH02-305B	GR	-0.65	-0.94	142	0.002	24	24		CI	1968	No	PS02	ACTIVE		0709233
	MH02-305B	MH02-305A	GR	-0.94	-1.00	24	0.002	24	24		CI	1968	No	PS02	ACTIVE		0709233
	MH02-305A	MH02-305E	GR			86	0.002	24	24	6.54	PVC	1996	No	PS02	ACTIVE		0709233
	MH02-304A	MH02-304	GR	-1.60	-2.34	372	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-304	MH02-303	GR	-2.34	-3.10	377	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-303	MH02-302	GR	-3.10	-3.49	198	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-302	MH02-301	GR	-3.49	-3.83	170	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-301	MH02-300	GR	-3.83	-4.00	83	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233
	MH02-300	MH02-101	GR	-8.55	-8.55	3	0.002	24	24	6.54	CI	1940	No	PS02	ACTIVE		0709233

WEST INTERCEPTOR EXTENSION - 142

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH05-115	MH05-114	GR	19.79	15.37	499	0.0088	18	18	6.37	RCP	1957	No	PS15	ACTIVE		0708014
	MH05-114	MH05-113	GR	15.37	14.53	270	0.0031	18	18	3.78	RCP	1957	No	PS15	ACTIVE		0708014
	MH05-113	MH05-112A	GR	14.05	13.37	227	0.0016	24	24	5.85	RCP	1957	No	PS15	ACTIVE		0708121
	MH05-106	PB05-105X544	GR	9.52	9.49	16	0.0019	24	24	6.37	RCP	1957	No	PS15	ACTIVE		0708121
	PB05-105X544	MH15-101	GR	9.24	8.73	15	0.034	30	30	57.74	PVC	1999	No	PS15	ACTIVE		0708121
	PB05-105X006	MH05-105	GR	8.54	8.53	6	0.0017	24	24	6.03	RCP	1957	No	PS15	ACTIVE		0708121
	MH05-105	MH05-104	GR	8.53	8.10	399	0.0007	30	30	7.01	RCP	1957	No	PS15	ACTIVE		0708121
	MH05-104	MH05-103	GR	8.10	7.84	409	0.0007	30	30	7.01	RCP	1957	No	PS15	ACTIVE		0708124
	MH05-103	MH05-102A	GR	7.84	7.74	147	0.0007	30	30	7.01	RCP	1957	No	PS15	ACTIVE		0708124
	MH05-102A	MH05-102	GR	7.74	7.52	252	0.0007	30	30	7.01	RCP	1957	No	PS05	ACTIVE		0708124
	MH05-102A	PS15	GR	7.74	7.60	130	0.0011	30	30	8.79	RCP	1974	No	PS15	ACTIVE		0708124
	MH05-102	MH05-101	GR	7.52	7.47	293	0.0007	30	30	7.01	RCP	1957	No	PS05	ACTIVE		0708124
	MH05-101	MH05-021	GR	7.47	7.47	10	0.0007	30	30	7.01	RCP	1957	No	PS05	ACTIVE		0708124
	PB05-06607	TE05-06593	SI	1.40	0.26	14		14	14	4.40	RCP	1957	No	PS15	ACTIVE		0708014
	TE05-06593	MH05-115	SI	0.26	19.79	822		14	14	4.40	RCP	1957	No	PS15	ACTIVE		0708014
	MH15-101	PB05-105X006	GR	8.37	8.29	523	0.0002	30	30	4.43	PVC	1999	No	PS15	ACTIVE		0708121
WEST INTERCEPTOR RELIEF - 143																	
	MH02-547	MH02-546	GR	54.00	50.31	497	0.0074	24	24	12.57	RCP	1959	No	PS08	ACTIVE		0709184
	MH02-546	MH02-545	GR	50.31	49.93	192	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709184
	MH02-545	MH02-544A	GR	49.93	49.82	56	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709184
	MH02-544A	MH02-544	GR	49.82	48.98	420	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709184
	MH02-544	MH02-543	GR	48.98	47.89	542	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-543	MH02-542	GR	47.89	46.81	543	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-542	MH02-541	GR	46.81	46.43	191	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-541	MH02-540	GR	46.43	45.89	269	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-540	MH02-539	GR	45.89	44.89	500	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-539	MH02-538	GR	44.89	43.69	600	0.002	27	27	8.95	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-538	MH02-537	GR	43.11	41.07	600	0.0034	24	24	8.52	RCP	1959	No	PS08	ACTIVE		0709173
	MH02-537	MH02-536	GR	41.07	39.03	600	0.0034	24	24	8.52	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-536	MH02-535	GR	39.03	32.79	600	0.0104	21	21	10.44	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-535	MH02-534	GR	32.79	30.28	241	0.0104	21	21	10.44	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-534	MH02-533	GR	30.28	25.84	426	0.0104	21	21	10.44	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-533	MH02-532	GR	25.84	24.03	174	0.0104	21	21	10.44	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-532	MH02-531A	GR	23.05	22.90	65	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709201
	MH02-531A	MH02-531	GR	22.90	22.79	268	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-531	MH02-530	GR	22.79	22.55	301	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-530	MH02-529	GR	22.55	22.22	416	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-529	MH02-528	GR	22.22	21.94	344	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-528	MH02-527	GR	21.94	21.89	49	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-527	MH02-526	GR	21.89	21.41	600	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-526	MH02-525	GR	21.41	21.04	466	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-525	MH02-524	GR	21.04	20.76	357	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-524	MH02-523	GR	20.76	20.66	119	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212
	MH02-523	MH02-522	GR	20.66	20.20	360	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709212

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-522	MH02-521	GR	20.20	19.87	406	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-521	MH02-520	GR	19.87	19.63	309	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-520	MH02-519	GR	19.53	18.20	368	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-519	MH02-518B	GR	18.20	18.08	150	0.0036	36	36	25.85	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-518B	MH02-518A	GR	18.08	18.05	35	0.0036	36	36	25.85	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-518A	MH02-518	GR	18.05	17.83	280	0.0036	36	36	25.85	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-518	MH02-517	GR	17.83	17.75	99	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-517	MH02-516	SI	17.75	17.42	105	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-516	MH08-228	GR	17.42	17.21	10	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE	2005	
	MH02-515	MH02-514	GR	17.25	17.00	318	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709211
	MH02-514	MH02-513	GR	17.00	15.02	594	0.0033	36	36	24.75	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-513	MH02-512	GR	15.02	14.64	476	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-512	MH02-511	GR	14.64	14.26	471	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-511	MH02-510	GR	14.26	14.07	242	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-510	MH02-509	GR	14.07	13.90	212	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-509	MH02-508	GR	13.90	13.61	360	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-508	MH02-507	GR	13.61	13.56	65	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-507	MH08-209	GR	13.56	13.28	349	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709222
	MH02-506	MH02-505	GR	13.22	12.98	300	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH02-505	MH02-504	GR	12.98	12.84	169	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH02-504	MH08-207	GR	12.84	12.32	74	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH02-503	MH02-502	GR	11.68	11.40	142	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH02-502	MH02-501	GR	11.31	10.95	447	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH02-501	MH02-014A	GR	10.95	10.92	66	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE		0709221
	MH08-228	MH02-515	GR	17.21	17.25	200	0.0008	36	36	12.19	RCP	1959	No	PS08	ACTIVE	2005	0709211
	MH08-209	MH02-506	GR	12.28	13.22	82	0.0008	36	36	12.19	RCP	1959	No	PS02	ACTIVE		0709221
	MH08-207	MH02-503	GR	12.16	11.68	463	0.0011	36	36	14.29	RCP	1959	No	PS08	ACTIVE		0709221

WEST INTERCEPTOR/RANDALL RELIEF - 144

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH02-014A	MH08-201	GR	10.92	10.10	29	0.006	33	33	26.46	RCP	1964	No	PS08	ACTIVE		0709221
	MH08-201	MH08-123	GR	10.47	10.02	15	0.006	33	33	26.46	RCP	1964	No	PS08	ACTIVE		0709221
	MH08-123	MH08-122	GR	10.02	7.42	519	0.006	33	33	26.46	RCP	1964	No	PS08	ACTIVE		0709221
	MH08-122	MH08-121	GR	7.42	4.00	593	0.006	33	33	26.46	RCP	1964	No	PS08	ACTIVE		0709221
	MH08-122	MH02-012B	GR	7.42	6.23	15		24	24		RCP	1964	No	PS02	ACTIVE		0709221
	MH08-121	MH08-120	GR	0.00	-0.02	16	0.0013	30	39	19.23	CI	1964	No	PS08	ACTIVE		0709221
	MH08-120	MH08-119	GR	-0.02	-0.71	473	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-119	MH08-118	GR	-0.71	-1.66	592	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-118	MH08-117	GR	-1.66	-2.57	609	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-117	MH08-116	GR	-2.57	-2.99	357	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-116	MH08-115	GR	-3.07	-3.21	101	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-115	MH08-114	GR	-3.21	-4.13	606	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-114	MH08-113	GR	-4.21	-5.25	415	0.0015	42	42	25.17	RCP	1964	No	PS08	ACTIVE		0709224
	MH08-113	MH08-112	GR	-5.25	-5.35	170	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-112	MH08-111	GR	-5.35	-5.62	277	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-111	MH08-110	GR	-5.62	-5.77	203	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH08-110	MH08-109	GR	-5.77	-6.37	587	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-109	MH08-108	GR	-6.37	-6.65	240	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-108	MH08-107	GR	-6.65	-7.13	606	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-107	MH08-106	GR	-7.13	-7.53	433	0.0009	48	48	27.84	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-106	MH08-105	GR	-7.53	-8.16	417	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709271
	MH08-105	MH08-104	GR	-8.16	-8.69	549	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709262
	MH08-104	MH08-103	GR	-8.69	-9.37	595	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709262
	MH08-103	MH08-102	GR	-9.37	-10.09	638	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709263
	MH08-102	MH08-101	GR	-10.09	-10.49	345	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709263
	MH08-101	MH08-100	GR	-10.49	-10.76	390	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709263
	MH08-100	PS08	GR	-10.76	-11.02	245	0.0011	48	48	30.78	RCP	1964	No	PS08	ACTIVE		0709263
WEST INTERCEPTOR/GAMMON EXTENSION - 145																	
	MH05-240	MH05-239	GR	72.29	71.71	48	0.001	24	24	4.62	RCP	1966	No	PS16	ACTIVE		0708141
	MH05-239	MH05-238	GR	71.71	71.33	402	0.001	24	24	4.62	RCP	1966	No	PS16	ACTIVE		0708141
	MH05-238	MH05-237	GR	71.33	70.93	406	0.001	24	24	4.62	RCP	1966	No	PS16	ACTIVE		0708141
	MH05-237	MH05-236	GR	70.93	70.54	396	0.001	24	24	4.62	RCP	1966	No	PS16	ACTIVE		0708141
	MH05-236	MH16-211	GR	70.49	70.50	12	0.001	24	24	4.62	RCP	1966	No	PS16	ACTIVE		0708141
	MH05-230	MH16-202	GR	68.41	68.40	16	0.001	24	24	4.62	DI	1981	No	PS16	ACTIVE		0708141
	MH05-230	MH05-229	GR	68.56	68.04	387	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708141
	MH05-229	MH05-228	GR	68.04	67.73	259	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-228	MH05-227	GR	67.73	67.48	164	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-227	MH05-224	GR	67.48	67.06	204	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-224	MH05-223A	GR	67.06	67.00	30	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-223A	MH05-223	GR	67.00	66.38	365	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-223	MH05-222	GR	66.38	65.98	395	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-222	MH05-221	GR	65.98	65.28	394	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-221	MH05-220A	GR	65.28	64.90	248	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-220A	MH05-220	GR	64.90	64.68	148	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-220	MH05-219A	GR	64.68	64.46	150	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-219A	MH05-219	GR	64.46	64.10	244	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-219	MH05-218A	GR	64.10	63.74	237	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-218A	MH05-218	GR	63.74	63.51	155	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-218	MH05-217A	GR	63.51	63.11	135	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-217A	MH05-217	GR	63.11	62.76	109	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-217	MH05-216A	GR	62.76	62.55	130	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708132
	MH05-216A	MH05-216	GR	62.55	62.43	73	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708131
	MH05-216	MH05-215	GR	62.43	61.93	374	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708131
	MH05-215	MH05-214	GR	61.93	61.28	397	0.0016	14	14	1.39	AC	1966	No	PS05	ACTIVE		0708131
	MH05-214	MH05-213A	GR	61.28	58.45	170	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-213A	MH05-213	GR	58.45	54.63	229	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-213	MH05-212	GR	54.63	41.16	320	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-212	MH05-211	GR	41.16	35.22	332	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-211	MH05-210	GR	35.22	29.67	361	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-210	MH05-209	GR	29.67	24.18	372	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH05-209	MH05-208A	GR	24.18	23.42	62	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-208A	MH05-208	GR	23.42	19.30	338	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-208	MH05-207	GR	19.30	18.37	63	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-207	MH05-206	GR	18.37	14.80	287	0.018	10	10	1.90	AC	1966	No	PS05	ACTIVE		0708131
	MH05-206	MH05-205	GR	14.70	11.74	336	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-205	MH05-204	GR	11.74	9.88	302	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-204	MH05-203	GR	9.88	8.11	226	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-203	MH05-202A	GR	8.11	7.26	117	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-202A	MH05-202	GR	7.26	5.81	200	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-202	MH05-201	GR	5.81	3.16	336	0.0076	12	12	2.01	AC	1966	No	PS05	ACTIVE		0709182
	MH05-201	MH05-011	GR	2.85	2.22	168	0.0012	18	18	2.35	AC	1966	No	PS05	ACTIVE		0709182
	MH16-202	MH16-201	GR	67.30	67.11	144	0.0013	36	36	15.54	RCP	1981	No	PS16	ACTIVE		0708141
	MH16-201	PS16	GR	67.11	67.00	84	0.0013	36	36	15.54	DI	1981	No	PS16	ACTIVE		0708141
WEST INTERCEPTOR/WEST POINT EXTENSION - 146																	
	MH05-119	MH05-118	GR	41.18	40.44	315	0.0025	18	18	3.39	AC	1966	No	PS15	ACTIVE		0709063
	MH05-118	MH05-117	GR	40.44	39.73	269	0.0025	18	18	3.39	AC	1966	No	PS15	ACTIVE		0709063
	MH05-117	MH05-116	GR	39.73	38.40	108	0.0122	18	18	7.50	AC	1966	No	PS15	ACTIVE		0709063
	MH05-116	MH05-115B	SI	38.40	3.40	388		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	MH05-115B	BD05-00510	SI	38.40	3.40	360		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	MH05-115A	TE05-00238	SI	2.10	2.10	5		14	14.7	3.43	AC	1966	No	PS15	ACTIVE		0708014
	BD05-00510	BD05-00365	SI	3.40	4.40	145		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	BD05-00365	BD05-00313	SI	4.40	2.40	52		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	BD05-00313	TE05-00238	SI	2.40	2.10	75		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	TE05-00238	BD05-00189	SI	2.10	1.90	49		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
	BD05-00189	PB05-06607	SI	1.90	1.40	189		14	14.7	4.40	AC	1966	No	PS15	ACTIVE		0708014
WEST INTERCEPTOR/MIDVALE RELIEF - 147																	
	MH02-708	MH02-707A	GR	26.17	26.07	86	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-707A	MH02-707	GR	26.06	25.48	277	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-707	MH02-706A	GR	25.48	25.12	300	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-706A	MH02-706	GR	25.12	25.07	152	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-706	MH02-705	GR	25.07	24.58	476	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-705	MH02-704	GR	24.58	24.51	174	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-704	MH02-703A	GR	24.51	24.11	330	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE	1992	0709201
	MH02-703A	MH02-703	GR	24.11	24.07	45	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-703	MH02-702	GR	24.07	23.67	133	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-702	MH02-701	GR	23.67	23.17	541	0.0012	21	21	3.55	RCP	1971	No	PS08	ACTIVE		0709201
	MH02-701	MH02-531A	GR	23.17	22.90	136	0.002	21	21	4.58	RCP	1971	No	PS08	ACTIVE		0709201
WEST INTERCEPTOR/ESSER POND EXTENSION - 148																	
	MH05-317	MH05-316A	GR	96.15	96.03	40	0.003	21	21	5.61	RCP	1986	No	PS16	ACTIVE		0708142
	MH05-316A	MH05-316	GR	96.03	95.37	230	0.003	21	21	5.61	RCP	1986	No	PS16	ACTIVE		0708142
	MH05-316	MH05-315	GR	95.37	93.02	368	0.0064	21	21	8.19	RCP	1986	No	PS16	ACTIVE		0708142
	MH05-315	MH05-314	GR	92.88	91.23	206	0.0083	18	18	6.18	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-314	MH05-313	GR	91.23	89.74	182	0.0083	18	18	6.18	RCP	1978	No	PS16	ACTIVE		0708142

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH05-313	MH05-312	GR	89.74	88.21	193	0.0083	18	18	6.18	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-312	MH05-311	GR	88.21	86.74	169	0.0083	18	18	6.18	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-311	MH05-310	GR	86.74	84.66	252	0.0083	18	18	6.18	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-310	MH05-309	GR	84.66	81.88	209	0.013	18	18	7.74	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-309	MH05-308	GR	81.88	78.88	226	0.013	18	18	7.74	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-308	MH05-307	GR	78.88	76.74	163	0.013	18	18	7.74	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-307	MH05-306	GR	76.74	73.91	226	0.013	18	18	7.74	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-306	MH05-305	GR	73.65	73.20	271	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-305	MH05-304	GR	73.20	72.68	264	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-304	MH05-303	GR	72.68	72.12	290	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708142
	MH05-303	MH05-302	GR	72.12	71.58	328	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708141
	MH05-302	MH05-301	GR	71.58	71.06	320	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708141
	MH05-301	MH05-236	GR	71.06	70.49	298	0.0017	24	24	6.03	RCP	1978	No	PS16	ACTIVE		0708141
WEST INTERCEPTOR/WEST POINT EXTENSION FORCE MAIN - 149																	
	TEWP-04465	MHWP-04459	FM	4.40	4.40	6		14	14.7	5.50	DI	2016	No	PS15	ACTIVE		0709063
	MHWP-04459	PBWP-04454	FM	4.40	4.40	6		14	14.7	5.50	DI	2016	No	PS15	ACTIVE		0709063
	PBWP-04454	BDWP-04073	FM	4.40	10.40	381		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-04073	BDWP-04055	FM	10.40	11.40	74		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-04055	BDWP-03804	FM	11.40	19.50	251		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-03804	MHWP-03660	FM	19.50	25.40	144		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	MHWP-03660	BDWP-03654	FM	19.50	25.40	6		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-03654	BDWP-03541	FM	25.40	16.90	113		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-03541	BDWP-03365	FM	16.90	12.40	176		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-03365	BDWP-03089	FM	12.40	11.90	276		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-03089	BDWP-02981	FM	11.90	11.40	109		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02981	BDWP-02657	FM	11.40	23.70	323		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02657	BDWP-02257	FM	23.70	23.70	391		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02257	BDWP-02167	FM	23.70	27.30	90		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02167	BDWP-02077	FM	27.30	34.40	90		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02077	BDWP-02005	FM	34.40	41.90	72		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
	BDWP-02005	MH05-119	FM	41.90	41.90	55		14	14.7	5.50	AC	1966	No	PS15	ACTIVE		0709063
WEST INTERCEPTOR EXTENSION REPLACEMENT - 151																	
	MH05-112A	MH15-113	GR	13.47	13.48	10	0.0011	30	30	8.79	RCP	1997	No	PS15	ACTIVE		
	MH15-302	MH15-301	GR	15.10	14.23	105	0.0083	8	8	0.84	PVC	2007	No	PS15	ACTIVE		
	MH15-301	MH15-111	GR	14.23	14.07	39	0.004	8	8	0.58	PVC	2007	No	PS15	ACTIVE		
	MH15-203	MH15-202	GR	13.07	12.38	194	0.004	8	8	0.58	PVC	2007	No	PS15	ACTIVE		
	MH15-202	MH15-201	GR	12.28	11.70	175	0.004	8	8	0.58	PVC	2007	No	PS15	ACTIVE		
	MH15-201	MH15-105	GR	11.55	11.33	80	0.0028	10	10	0.89	PVC	2007	No	PS15	ACTIVE		
	MH15-113	MH15-112	GR	12.96	12.92	246	0.016	36	36	64.41	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-112	MH15-111	GR	12.92	12.50	190	0.016	36	36	64.41	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-111	MH15-110	GR	12.50	11.88	241	0.012	36	36	55.78	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-110	MH15-109	GR	11.88	11.22	628	0.01	36	36	50.92	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-109	MH15-108	GR	11.22	11.19	105	0.01	36	36	50.92	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-108	MH15-107	GR	11.19	10.84	85	0.01	36	36	50.92	PVC-C905	2007	No	PS15	ACTIVE		

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH15-107	MH15-106	GR	10.84	10.53	88	0.01	36	36	50.92	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-106	MH15-105	GR	10.53	10.26	99	0.01	36	36	50.92	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-105	MH15-104	GR	10.26	9.81	566	0.0068	36	36	41.99	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-104	MH15-103	GR	9.81	9.68	316	0.0044	42	42	50.95	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-103	MH15-102	GR	9.68	8.91	361	0.0044	42	42	50.95	PVC-C905	2007	No	PS15	ACTIVE		
	MH15-102	MH15-101	GR	8.91	8.73	314	0.0044	42	42	50.95	PVC-C905	2007	No	PS15	ACTIVE		
WEST INTERCEPTOR CAMPUS RELIEF - 155																	
	MH08-228	MH08-227	GR	17.21	16.56	640	0.001	36	37.36	15.04	DI	2005	No	PS08	ACTIVE		
	MH08-227	MH08-226	GR	16.56	15.93	642	0.001	36	37.36	15.04	DI	2005	No	PS08	ACTIVE		
	MH08-226	MH08-225	GR	15.93	15.76	84	0.0021	36	37.36	21.80	DI	2005	No	PS08	ACTIVE		
	MH08-225	MH08-224	GR	15.76	15.40	338	0.0011	36	37.36	15.78	DI	2005	No	PS08	ACTIVE		
	MH08-224	MH08-223	GR	15.40	15.09	232	0.0013	36	37.36	17.15	DI	2005	No	PS08	ACTIVE		
	MH08-223	MH08-222	GR	15.09	14.97	93	0.0013	36	37.36	17.15	DI	2005	No	PS08	ACTIVE		
	MH08-222	MH08-221	GR	14.97	14.90	68	0.0011	36	37.36	15.78	DI	2005	No	PS08	ACTIVE		
	MH08-221	MH08-220	GR	14.75	14.49	118	0.0022	24	31.2	13.80	DI	2005	No	PS08	ACTIVE		
	MH08-220	MH08-219	GR	14.49	14.30	158	0.0012	36	37.36	16.48	DI	2005	No	PS08	ACTIVE		
	MH08-219	MH08-218	GR	14.30	14.26	22	0.0018	36	37.36	20.18	DI	2005	No	PS08	ACTIVE		
	MH08-218	MH08-217	GR	14.26	14.15	132	0.0008	36	37.36	13.45	DI	2005	No	PS08	ACTIVE		
	MH08-217	MH08-216	GR	14.15	13.90	202	0.0012	36	37.36	16.48	DI	2005	No	PS08	ACTIVE		
	MH08-216	MH08-215	GR	13.90	13.74	55	0.0029	36	37.36	25.61	DI	2000	No	PS08	ACTIVE		0709222
	MH08-215	MH08-214	GR	13.74	13.68	161	0.0004	36	37.36	9.51	DI	2000	No	PS08	ACTIVE		0709222
	MH08-214	MH08-213	GR	13.68	13.15	392	0.0014	36	37.36	17.80	DI	2000	No	PS08	ACTIVE		0709222
	MH08-213	MH08-212	GR	13.48	13.44	47	0.0009	36	37.36	14.27	DI	2000	No	PS08	ACTIVE		0709222
	MH08-212	MH08-211	GR	13.44	13.04	244	0.0016	36	37.36	19.03	DI	2000	No	PS08	ACTIVE		0709222
	MH08-211	MH08-210	GR	13.04	12.85	152	0.0013	36	37.36	17.15	DI	2000	No	PS08	ACTIVE		0709222
	MH08-210	MH02-020	GR	12.85	13.13	39	0.012	24	25.06	17.96	DI	2000	No	PS02	ACTIVE	2000	0709221
	MH08-210	MH08-209	GR	12.85	12.79	64	0.0009	36	37.36	14.27	DI	2000	No	PS08	ACTIVE		0709221
	MH08-209	MH08-208	GR	12.80	12.19	629	0.001	48	48	34.68	FRP	2000	No	PS08	ACTIVE		0709221
	MH08-208	MH08-207	GR	12.19	12.16	12	0.0025	36	37.36	23.78	DI	2000	No	PS08	ACTIVE		0709221
	MH08-207	BD08-206X462	GR	12.19	12.00	12	0.0158	36	37.36	59.79	DI	1999	No	PS08	ACTIVE		0709221
	BD08-206X462	MH08-206	GR	12.17	11.57	462	0.0013	36	37.36	17.15	DI	1999	No	PS08	ACTIVE		0709221
	MH08-206	MH08-205	GR	11.57	11.52	16	0.0031	36	37.36	26.48	DI	1999	No	PS08	ACTIVE		0709221
	MH08-205	MH08-204	GR	11.55	11.10	328	0.0014	36	37.36	17.80	DI	1999	No	PS08	ACTIVE		0709221
	MH08-204	MH08-203	GR	11.13	10.96	109	0.0016	36	37.36	19.03	DI	1999	No	PS08	ACTIVE		0709221
	MH08-203	MH08-202	SI	10.99	10.87	129	0.0009	36	37.36	14.27	DI	1999	No	PS08	ACTIVE		0709221
	MH08-202	MH08-201	GR	10.90	10.47	78	0.0055	36	37.36	35.28	DI	1999	No	PS08	ACTIVE		0709221
EAST INTERCEPTOR/NORTH BASIN INTERCEPTOR - 156																	
	PB01-621X40	MH01-621	GR	-0.25	-0.29	47	0.001	18	18	2.54	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-621	MH01-620	GR	-0.29	-0.52	223	0.001	18	18	2.54	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-620	MH01-619	GR	-0.52	-0.97	361	0.001	18	18	2.54	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-619	MH01-618	GR	-0.97	-0.95	72	0.001	18	18	2.54	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-618	MH01-617	GR	-0.95	-1.35	375	0.001	18	18	2.54	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-617	MH01-616	GR	-1.33	-2.41	534	0.001	20	20	3.36	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-616	MH01-615	GR	-3.53	-3.18	46	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH01-615	MH01-614	GR	-3.18	-3.11	76	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-614	MH01-613	GR	-3.13	-3.60	526	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-613	MH01-612	GR	-3.60	-4.13	500	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-612	MH01-611	GR	-4.13	-4.81	681	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-611	MH01-610	GR	-4.81	-5.14	356	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-610	MH01-609	GR	-5.14	-5.53	360	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-609	MH01-608	GR	-5.53	-5.93	365	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-608	MH01-607	GR	-5.93	-6.26	409	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-607	MH01-606	GR	-6.26	-6.92	630	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-606	MH01-605	GR	-6.92	-7.18	253	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-605	MH01-604	GR	-7.18	-7.22	46	0.001	36	36	16.10	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-604	MH01-603	GR	-7.22	-7.34	59	0.001	42	42	24.29	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-603	BD01-602X520	GR	-7.34	-7.67	37	0.001	42	42	24.29	PVC-C905	2002	No	PS01	ACTIVE		0710063
	BD01-602X520	MH01-602	GR	-7.67	-7.15	520	0.001	42	42	24.29	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-602	MH01-601	GR	-7.67	-7.68	62	0.001	42	42	24.29	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-601	MH01-304	GR	-7.72	-7.80	109	0.001	42	42	24.29	PVC-C905	2002	No	PS01	ACTIVE		0710063
	MH01-120	PB01-621X40	GR	-0.24	-0.25	7	0.001	18	18	2.15	CI	1925	No	PS01	ACTIVE		0810313
WEST INTERCEPTOR/FORTUNE DRIVE REPLACEMENT - 157																	
	MH16-211	MH16-210	GR	70.05	69.58	282	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-210	MH16-209	GR	69.58	69.42	141	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-209	MH16-208	GR	69.42	69.15	252	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-208	MH16-207	GR	69.15	68.84	232	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-207	MH16-206	GR	68.84	68.41	395	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-206	MH16-205	GR	68.44	68.28	135	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-205	MH16-204	GR	68.28	67.97	175	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-204	MH16-203	GR	67.97	67.63	337	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
	MH16-203	MH16-202	GR	67.63	67.50	67	0.0012	36	35.5	16.99	PVC	2002	No	PS16	ACTIVE	2002	0708141
CROSS TOWN FORCE MAIN REPLACEMENT - 158																	
	TE02-01001	VAXTA-00000	FM	-1.87	-2.30	9		24	25.06		DI	2001	No	PS02	ACTIVE		0709233
	PS01	BDXT-00003	FM	-0.83	-1.50	3		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-16455	PS02	FM	-3.60	-5.05	89		30	31.16		DI	2002	No	PS02	ACTIVE		0709233
	MHXT-16400	BDXT-16455	FM	-2.80	-3.60	55		30	31.16		DI	2002	No	PS02	ACTIVE		0709233
	TEXT-16380	MHXT-16400	FM	-2.80	-2.80	20		30	31.16		DI	2002	No	PS02	ACTIVE		0709233
	MHXT-15683	TEXT-16380	FM	-5.66	-2.80	697		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709233
	MHXT-13108	MHXT-15683	FM	-5.66	-5.66	2575		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709234
	MHXT-12612	MHXT-13108	FM	-5.00	-5.66	496		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709234
	BDXT-12296	MHXT-12612	FM	-11.01	-5.00	316		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709234
	MHXT-11896	BDXT-12296	FM	-6.25	-11.01	400		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709231
	BDXT-11610	MHXT-11896	FM	-6.25	-6.25	286		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709231
	BDXT-11288	BDXT-11610	FM	-6.25	-6.25	322		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709231
	BDXT-11198	BDXT-11288	FM	-6.25	-6.25	91		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709242
	BDXT-10386	BDXT-11198	FM	-4.00	-6.25	812		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709242
	BDXT-10344	BDXT-10386	FM	-4.00	-4.00	42		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709242
	RDXT-10260	BDXT-10344	FM	-1.99	-4.00	84		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709242

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	PBXT-10254	RDXT-10260	FM	-1.57	-1.57	6		20	20.94		DI	2002	No	PS02	ACTIVE	2002	0709242
	PBXT-09256	PBXT-10254	FM	-0.48	-1.57	998		20	20.94		PVC	1995	No	PS02	ACTIVE	2002	0709242
	RDXT-09244	PBXT-09256	FM	-0.48	-0.48	12		20	20.94		DI	2002	No	PS02	ACTIVE	2002	0709242
	MHXT-08896	RDXT-09244	FM	-1.50	-0.48	348		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709133
	BDXT-08089	MHXT-08896	FM	-1.50	1.50	807		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709133
	BDXT-07930	BDXT-08089	FM	0.00	-1.50	159		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709133
	MHXT-07915	BDXT-07930	FM	0.00	0.00	15		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	BDXT-07624	MHXT-07915	FM	-1.00	0.00	291		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	MHXT-07553	BDXT-07624	FM	-0.50	-11.25	71		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	MHXT-07136	MHXT-07553	FM	-1.00	-0.50	417		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	BDXT-06944	MHXT-07136	FM	-14.32	-1.00	192		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	BDXT-06828	BDXT-06944	FM	-5.55	-14.32	116		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709133
	MHXT-06630	BDXT-06828	FM	-2.40	-5.55	198		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709134
	PBXT-06139	MHXT-06630	FM	-3.30	-2.40	491		30	31.16		PVC	2002	No	PS02	ACTIVE	2002	0709134
	MHXT-05771	PBXT-06139	FM	-2.75	-3.30	368		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709134
	MHXT-05384	MHXT-05771	FM	-2.50	-2.75	387		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709134
	MHXT-04667	MHXT-05384	FM	-2.20	-2.50	717		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0709134
	MHXT-03615	MHXT-04667	FM	-2.50	-2.20	1052		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	MHXT-01845	MHXT-03615	FM	-3.50	-2.50	1955		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	BDXT-01660	MHXT-01845	FM	-4.63	-3.50	185		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	BDXT-01371	BDXT-01660	FM	-0.26	-4.63	289		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	MHXT-01365	BDXT-01371	FM	-0.26	-0.26	6		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	BDXT-01344	MHXT-01365	FM	-0.26	-0.26	21		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	RDXT-01340	BDXT-01344	FM	-0.26	-0.26	4		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	PBXT-01337	RDXT-01340	FM	-0.26	-0.26	3		30	31.16		DI	2002	No	PS02	ACTIVE	2002	0710072
	BDXT-01300	PBXT-01337	FM	0.00	0.00	37		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-01273	BDXT-01300	FM	0.00	0.00	27		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-01193	BDXT-01273	FM	-8.33	0.00	80		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-01018	BDXT-01193	FM	-9.50	-8.30	175		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-00804	BDXT-01018	FM	-9.00	-9.50	214		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-00431	BDXT-00804	FM	-6.00	-9.00	373		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	PBXT-00067	BDXT-00431	FM	-1.70	-6.00	373		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	MHXT-00018	PBXT-00067	FM	-1.23	-1.70	49		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	BDXT-00003	MHXT-00018	FM	-1.50	-1.23	15		24	25.06		DI	2000	No	PS02	ACTIVE	2000	0710063
	VAXTA-00000	RDXTA-00019	FM	-2.30	-2.50	19		24	25.06		DI	2001	No	PS01	ACTIVE	2001	0709233
	VAXTA-00000	TEXT-16380	FM	-2.50	-2.80	24		30	31.16		DI	2001	No	PS01	ACTIVE	2002	0709233
NORTHEAST INTERCEPTOR/PFLAUM ROAD REPLACEMENT - 159																	
	MH07-955	MH07-954	GR	32.54	32.36	95	0.0019	48	48	40.45	DI	2001	No	PS07	ACTIVE		0710161
	MH07-954	PB07-953X106	GR	32.36	32.23	40	0.0029	48	48	49.97	DI	2001	No	PS07	ACTIVE	2005	0710152
	PB07-953X106	MH07-953	GR	32.23	31.93	106	0.0029	48	48	59.06	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-953	MH07-952	GR	31.93	30.61	519	0.0025	48	48	54.83	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-952	MH07-951	GR	30.61	29.10	301	0.005	48	48	77.54	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-951	MH07-950	GR	29.10	27.43	379	0.0044	48	48	72.74	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-950	MH07-949	GR	27.43	25.39	538	0.0038	48	48	67.60	FRP	2005	No	PS07	ACTIVE	2005	0710152

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-949	MH07-948	GR	25.39	23.55	398	0.0046	42	42	52.10	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-948	MH07-947	GR	23.55	22.44	309	0.0036	42	42	46.09	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-947	MH07-946	GR	22.44	22.03	114	0.0036	42	42	46.09	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-946	MH07-945	GR	22.03	20.74	262	0.0049	42	42	53.77	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-945	MH07-944	GR	20.74	17.17	260	0.0137	36	36	59.60	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-944	MH07-943	GR	17.17	12.80	313	0.0139	36	36	60.04	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-943	MH07-942	GR	12.80	8.74	277	0.0146	36	36	61.53	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-942	MH07-941	GR	8.74	7.21	310	0.0054	42	42	56.44	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-941	MH07-940	GR	7.21	2.90	464	0.0093	42	42	74.07	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-940	MH07-939	GR	2.90	2.52	16	0.0236	42	42	118.00	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-939	MH07-938	GR	2.52	2.26	150	0.0017	54	54	61.90	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-938	MH07-937	GR	2.26	1.75	342	0.0015	54	54	58.15	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-937	MH07-936	GR	1.75	1.28	347	0.0014	54	54	56.17	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-936	MH07-935	GR	1.28	1.07	140	0.0015	54	54	58.15	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-935	MH07-934	GR	1.07	0.51	431	0.0013	54	54	54.13	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-934	MH07-933	GR	0.51	-0.26	597	0.0013	54	54	54.13	FRP	2005	No	PS07	ACTIVE	2005	0710152
	MH07-933	MH07-932	GR	-0.26	-0.78	615	0.0008	54	54	42.46	FRP	2005	No	PS07	ACTIVE	2005	0710152
LOWER BADGER MILL CREEK INTERCEPTOR - 160																	
	MH17-157	MH17-156	GR	139.80	138.85	475	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-156	MH17-155	GR	138.75	137.80	475	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-155	MH17-154	GR	137.70	136.76	475	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-154	MH17-153	GR	136.66	135.55	553	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-153	MH17-152	GR	135.45	134.35	549	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-152	MH17-151	GR	134.25	133.03	600	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-151	MH17-150	GR	132.93	132.27	337	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-150	MH17-149	GR	132.17	131.35	403	0.002	30	29.4	13.27	PVCPW	2018	No	PS17	PROPOSED	2018	
	MH17-149	MH17-148	GR	131.25	131.06	196	0.001	30	29.5	9.47	FRP	2013	No	PS17	ACTIVE	2013	
	MH17-148	MH17-147	GR	131.06	130.37	292	0.0024	30	29.5	14.67	FRP	2013	No	PS17	ACTIVE	2013	
	MH17-147	MH17-146	GR	130.37	129.21	422	0.0026	30	29.5	15.27	FRP	2013	No	PS17	ACTIVE	2013	
	MH17-146	MH17-145	GR	129.02	127.84	412	0.0029	30	29.5	16.12	PVCPW	2008	No	PS17	ACTIVE		
	MH17-145	MH17-144	GR	127.84	127.13	362	0.002	30	29.5	13.39	PVCPW	2008	No	PS17	ACTIVE		
	MH17-144	MH17-143	GR	126.79	125.93	374	0.0023	36	37.1	22.39	DI	2006	No	PS17	ACTIVE		
	MH17-143	MH17-142	GR	125.89	125.84	51	0.001	30	29.5	9.47	PVCPW	2008	No	PS17	ACTIVE		
	MH17-142	MH17-141	GR	125.80	125.15	497	0.0013	30	29.5	10.80	PVCPW	2008	No	PS17	ACTIVE		
	MH17-141	MH17-140	GR	124.98	124.33	192	0.0034	30	29.5	17.46	PVCPW	2008	No	PS17	ACTIVE		
	MH17-140	MH17-139	GR	124.33	123.81	291	0.0018	30	29.5	12.70	PVCPW	2008	No	PS17	ACTIVE		
	MH17-139	MH17-138	GR	123.72	122.94	394	0.002	30	29.5	13.39	PVCPW	2008	No	PS17	ACTIVE		
	MH17-138	MH17-137	GR	122.86	122.10	395	0.0019	30	29.5	13.05	PVCPW	2008	No	PS17	ACTIVE		
	MH17-137	MH17-136	GR	122.10	120.71	342	0.0041	30	29.5	19.17	PVCPW	2008	No	PS17	ACTIVE		
	MH17-136	MH17-135	GR	120.56	119.48	153	0.0071	24	23.5	13.76	PVCPW	2008	No	PS17	ACTIVE		
	MH17-135	MH17-134	GR	119.35	115.62	564	0.0066	24	23.5	13.27	PVCPW	2008	No	PS17	ACTIVE		
	MH17-134	MH17-133	GR	115.57	113.03	353	0.0072	24	23.5	13.85	PVCPW	2008	No	PS17	ACTIVE		
	MH17-133	MH17-132	GR	112.93	110.64	333	0.0069	24	23.5	13.56	PVCPW	2008	No	PS17	ACTIVE		
	MH17-132	MH17-131	GR	110.62	109.63	142	0.007	24	23.5	13.66	PVCPW	2008	No	PS17	ACTIVE		

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH17-131	MH17-130	GR	109.58	108.60	229	0.0043	30	29.5	19.63	PVCPW	2008	No	PS17	ACTIVE		
	MH17-130	MH17-129	GR	108.50	107.74	172	0.0044	30	29.5	19.86	PVCPW	2008	No	PS17	ACTIVE		
	MH17-129	MH17-128	GR	107.74	107.27	200	0.0023	27	26.5	10.79	PVCPW	2008	No	PS17	ACTIVE		
	MH17-128	MH17-127	GR	106.37	105.72	130	0.005	27	26.5	15.91	PVCPW	2006	No	PS17	ACTIVE		
	MH17-127	MH17-126	GR	103.32	102.84	170	0.0028	30	29.5	15.84	PVCPW	2006	No	PS17	ACTIVE		
	MH17-126	MH17-125	GR	102.74	101.00	330	0.0053	30	29.5	21.80	PVCPW	2006	No	PS17	ACTIVE		
	MH17-125	MH17-124	GR	99.75	99.50	88	0.0028	30	29.5	15.84	PVCPW	2006	No	PS17	ACTIVE		
	MH17-124	MH17-123	GR	99.43	99.30	48	0.0027	30	29.5	15.56	PVCPW	2006	No	PS17	ACTIVE		
	MH17-123	MH17-122	GR	99.20	98.76	167	0.0026	30	29.5	15.27	PVCPW	2006	No	PS17	ACTIVE		
	MH17-122	MH17-121	GR	98.66	98.10	200	0.0028	30	29.5	15.84	PVCPW	2006	No	PS17	ACTIVE		
	MH17-121	MH17-120	GR	97.90	96.67	405	0.003	30	29.5	13.88	DI	2006	No	PS17	ACTIVE		
	MH17-120	MH17-119	GR	95.00	90.91	307	0.0133	30	29.5	34.53	PVCPW	2006	No	PS17	ACTIVE		
	MH17-119	MH17-118	GR	90.81	89.48	260	0.0051	30	29.5	21.38	PVCPW	2006	No	PS17	ACTIVE		
	MH17-118	MH17-117	GR	89.35	87.66	320	0.0053	30	29.5	21.80	PVCPW	2006	No	PS17	ACTIVE		
	MH17-117	MH17-116	GR	87.56	86.31	334	0.0037	30	29.5	18.21	PVCPW	2006	No	PS17	ACTIVE		
	MH17-116	MH17-115	GR	86.26	84.12	600	0.0036	30	29.5	17.97	PVCPW	2006	No	PS17	ACTIVE		
	MH17-115	MH17-114	GR	84.02	83.59	144	0.003	30	29.5	16.40	PVCPW	2006	No	PS17	ACTIVE		
	MH17-114	MH17-113	GR	83.49	82.18	347	0.0038	30	29.5	18.46	PVCPW	2006	No	PS17	ACTIVE		
	MH17-113	MH17-112	GR	82.13	81.55	184	0.0032	30	29.5	16.94	PVCPW	2006	No	PS17	ACTIVE		
	MH17-112	MH17-111	GR	81.15	80.33	549	0.0015	36	35.5	19.00	PVCPW	2006	No	PS17	ACTIVE		
	MH17-111	MH17-110	GR	80.22	79.92	271	0.0011	36	35.5	16.27	PVCPW	2006	No	PS17	ACTIVE		
	MH17-110	MH17-109	GR	79.87	79.05	600	0.0014	36	35.5	18.36	PVCPW	2006	No	PS17	ACTIVE		
	MH17-109	MH17-108	GR	78.95	78.26	516	0.0013	36	35.5	17.69	PVCPW	2006	No	PS17	ACTIVE		
	MH17-108	MH17-107	GR	78.21	78.07	125	0.0011	36	35.5	16.27	PVCPW	2006	No	PS17	ACTIVE		
	MH17-107	MH17-106	GR	78.02	77.44	426	0.0014	36	35.5	18.36	PVCPW	2006	No	PS17	ACTIVE		
	MH17-106	MH17-105	GR	77.34	76.83	361	0.0014	36	35.5	18.36	PVCPW	2006	No	PS17	ACTIVE		
	MH17-105	MH17-104	GR	76.78	76.27	393	0.0013	36	35.5	17.69	PVCPW	2006	No	PS17	ACTIVE		
	MH17-104	MH17-103	GR	76.19	75.89	198	0.0015	36	35.5	19.00	PVCPW	2006	No	PS17	ACTIVE		
	MH17-103	MH17-102	GR	75.84	75.62	162	0.0014	36	35.5	18.36	PVC-C905	2006	No	PS17	ACTIVE		
	MH17-102	MH17-101	GR	75.57	75.38	126	0.0015	36	35.5	19.00	PVCPW	2006	No	PS17	ACTIVE		
	MH17-101	PS17	GR	75.33	75.00	70	0.0047	36	35.5	28.46	DI	2006	No	PS17	ACTIVE		
GASTON ROAD EXTENSION to FAR EAST INTERCEPTOR - 161																	
	MH07-740	MH07-739	GR	42.47	41.39	350	0.003	18	18	4.39	PVC	2008	No	PS07	ACTIVE		
	MH07-739	MH07-738	GR	41.39	40.18	400	0.003	18	18	4.39	PVC	2008	No	PS07	ACTIVE		
	MH07-738	MH07-737	GR	38.85	37.66	450	0.003	18	18	4.39	PVC	2008	No	PS07	ACTIVE		
	MH07-737	MH07-736	GR	38.85	37.66	405	0.003	18	18	4.39	PVC	2008	No	PS07	ACTIVE		
	MH07-736	MH07-735	GR	37.66	37.36	88	0.003	18	18	4.39	PVC	2008	No	PS07	ACTIVE		
	MH07-735	PB07-734X467	GR	37.20	37.35	38	0.0013	21	20.7	4.20	PVC	2008	No	PS07	ACTIVE		
NINE SPRINGS VALLEY INTERCEPTOR/MENDOTA EXTENSION - 162																	
	MH16-105	MH16-104	GR	90.07	89.29	170	0.004	30	30	16.76	PCCP	1982	No	PS16	ACTIVE		0709132
	MH16-104	MH16-103	GR	89.28	83.08	225	0.0276	30	30	44.02	PCCP	1982	No	PS16	ACTIVE		0709132
	MH16-103	MH16-102A	GR	82.94	72.75	283	0.036	30	30	50.27	PCCP	1982	No	PS16	ACTIVE		0709132
	MH16-102A	MH16-102	GR	72.75	67.15	155	0.036	30	30	50.27	PCCP	1982	No	PS16	ACTIVE		0709132
	MH16-102	MH16-101	GR	67.12	67.10	15	0.0013	36	37.36	17.15	DI	1981	No	PS16	ACTIVE		0709132

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH16-101	PS16	GR	67.02	67.00	15	0.0013	36	37.36	17.15	DI	1981	No	PS16	ACTIVE		0709132

NORTHEAST INTERCEPTOR/PS10 TO LIEN ROAD RELIEF - 163

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD10-XX006	PS10	GR	-11.00	-11.00	5	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE	2010	
	MH10-426	MH10-425	GR	-2.93	-2.98	25	0.002	48	48	49.04	FRP	2010	No	PS10	ACTIVE		
	MH10-425	MH10-424	GR	-3.03	-3.13	65	0.0015	48	48	42.47	FRP	2010	No	PS10	ACTIVE		
	MH10-424	MH10-423	GR	-3.15	-3.56	258	0.0016	48	48	43.87	FRP	2010	No	PS10	ACTIVE		
	MH10-423	MH10-422	GR	-3.58	-4.12	318	0.0017	48	48	45.22	FRP	2010	No	PS10	ACTIVE		
	MH10-422	MH10-421	GR	-4.14	-4.96	500	0.0016	48	48	43.87	FRP	2010	No	PS10	ACTIVE		
	MH10-421	MH10-420	GR	-4.98	-6.03	652	0.0016	48	48	43.87	FRP	2010	No	PS10	ACTIVE		
	MH10-420	MH10-419	GR	-6.44	-7.00	637	0.0009	54	54	45.04	FRP	2010	No	PS10	ACTIVE		
	MH10-419	MH10-418	GR	-7.48	-7.74	547	0.0005	63	63	50.64	FRP	2010	No	PS10	ACTIVE		
	MH10-418	MH10-417	GR	-7.76	-7.89	268	0.0005	63	63	50.64	FRP	2010	No	PS10	ACTIVE		
	MH10-417	MH10-416	GR	-7.92	-8.11	394	0.0005	63	63	50.64	FRP	2010	No	PS10	ACTIVE		
	MH10-416	MH10-415	GR	-8.13	-8.30	348	0.0005	63	63	50.64	FRP	2010	No	PS10	ACTIVE		
	MH10-415	MH10-414	GR	-8.35	-8.54	476	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-415	MH10-112	GR	-8.36	-8.41	14	0.0036	36	36	30.55	FRP	2010	No	PS10	ACTIVE	2010	
	MH10-414	MH10-413	GR	-8.54	-8.73	472	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-413	MH10-412	GR	-8.75	-8.98	604	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-412	BD10-411XX006	GR	-9.06	-9.09	58	0.0005	54	54	33.57	FRP	2010	No	PS10	ACTIVE		
	BD10-411XX006	MH10-411	GR	-9.09	-9.09	6	0.0005	54	54	33.57	FRP	2010	No	PS10	ACTIVE	2010	
	MH10-411	MH10-410	GR	-9.11	-9.42	296	0.001	60	60	62.88	FRP	2010	No	PS10	ACTIVE		
	MH10-410	MH10-409	GR	-9.44	-9.55	297	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-409	MH10-408	GR	-9.57	-9.71	379	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-408	MH10-407	GR	-9.76	-10.00	369	0.0007	60	60	52.61	FRP	2010	No	PS10	ACTIVE		
	MH10-407	MH10-406	GR	-10.02	-10.14	299	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-406	MH10-405	GR	-10.16	-10.35	550	0.0003	54	54	26.00	FRP	2010	No	PS10	ACTIVE		
	MH10-405	MH10-404	GR	-10.37	-10.44	199	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-404	MH10-403	GR	-10.47	-10.55	232	0.0003	54	54	26.00	FRP	2010	No	PS10	ACTIVE		
	MH10-403	BD10-402XX010	GR	-10.57	-10.70	355	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	BD10-402XX010	MH10-402	GR	-10.70	-10.70	10	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE	2010	
	MH10-402	BD10-401XX544	GR	-10.72	-10.72	10	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE	2010	
	BD10-401XX544	MH10-401	GR	-10.72	-10.93	534	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE		
	MH10-401	BD10-XX006	GR	-10.95	-11.00	123	0.0004	54	54	30.03	FRP	2010	No	PS10	ACTIVE	2010	
	MH10-201A	MH10-419	GR	-6.50	-6.56	29	0.002	30	30	14.00	FRP	2010	No	PS10	ACTIVE	2010	

SOUTHEAST INTERCEPTOR/DUTCH MILL EXTENSION - 164

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-222	MH07-221	GR	-5.92	-6.27	495	0.0006	36	36	10.55	RCP	1963	No	PS07	ACTIVE		0710272
	MH07-221	MH07-220	GR	-6.27	-6.57	424	0.0006	36	36	10.55	RCP	1963	No	PS07	ACTIVE		0710272
	MH07-220	MH07-219	GR	-6.57	-6.86	508	0.0006	36	36	10.55	RCP	1963	No	PS07	ACTIVE		0710272
	MH07-219	MH07-218	GR	-6.86	-5.10	220	0.0006	36	36	10.55	RCP	1963	No	PS07	ACTIVE		0710272

NORTHEAST INTERCEPTOR/FEI TO SEI RELIEF/REPLACEMENT - 165

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-932	PB18-016XX017XX3	GR	-0.87	-1.12	5	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH07-214D	MH07-214C	GR	-9.49	-9.50	179	0.0001	60	60	19.88	FRP	2013	No	7	ACTIVE		
	BD07-214CXX076	MH07-214C	GR	-8.59	-9.50	76	0.012	60	60	217.81	FRP	2014	No	07	ACTIVE	2014	

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	MH07-214C	MH07-214B	GR	-9.55	-9.85	532	0.0006	60	60	48.70	FRP	2013	No	7	ACTIVE		
	PB18-016XX017XX3	BD18-016XX017	GR	-1.12	-1.54	352	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	BD18-016XX017	MH18-016	GR	-1.54	-1.55	5	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH18-016	MH18-015	GR	-1.63	-2.12	407	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH18-015	MH18-014	GR	-2.23	-2.64	345	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH18-014	MH18-013	GR	-2.74	-3.06	262	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-013	MH18-012	GR	-3.11	-3.59	399	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-012	MH18-011	GR	-3.64	-3.96	270	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-011	MH18-010	GR	-4.03	-4.74	594	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-010	MH18-009	GR	-4.90	-5.10	169	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-009	MH18-008	GR	-5.20	-5.80	504	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-008	MH18-007	GR	-5.85	-6.57	600	0.0012	48	48	37.99	FRP	2013	No	7	ACTIVE		
	MH18-007	MH18-006	GR	-6.97	-7.15	205	0.00088	54	54	44.54	FRP	2013	No	7	ACTIVE		
	MH18-006	BD18-005XX039	GR	-7.25	-7.26	5	0.00088	54	54	44.54	FRP	2013	No	7	ACTIVE		
	BD18-005XX039	MH18-005	GR	-7.26	-7.29	40	0.00088	54	54	44.54	FRP	2013	No	7	ACTIVE		
	MH18-005	MH18-004	GR	-7.39	-7.77	428	0.00088	54	54	44.54	FRP	2013	No	7	ACTIVE		
	MH18-004	MH18-003	GR	-8.17	-8.32	129	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH18-003	MH18-002	GR	-8.41	-8.71	253	0.0012	60	60	68.88	FRP	2013	No	7	ACTIVE		
	MH18-002	MH18-001	GR	-8.76	-9.10	418	0.00082	60	60	56.94	FRP	2013	No	7	ACTIVE		
	MH18-001	MH07-214D	GR	-9.16	-9.36	23	0.0087	60	60	185.46	FRP	2013	No	7	ACTIVE		
	MH18-001	PS18	GR	-9.32	-9.40	76		60	60		FRP	2014	No	18	ACTIVE	2014	
	PS18	BD07-214CXX076	GR	-9.40	-9.48	20	0.012	60	60	217.81	FRP	2014	No	7	ACTIVE	2014	

PUMPING STATION 18 FORCE MAIN - 166

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	RD18-15432	PB18-15410	FM	-14.35	-14.61	22		48	48		PCCP	2014	No		ACTIVE	2014	
	PB18-15410	BD18-15385	FM	-14.61	-14.35	25		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-15385	PB18-15010	FM	-14.35	-8.00	404		48	48		PCCP	2014	No		ACTIVE	2014	
	PB18-15010	BD18-14892	FM	-8.00	-7.90	118		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-14892	MH18-12555	FM	-7.90	3.40	2337		48	48		PCCP	2014	No		ACTIVE	2014	
	MH18-12555	MH18-11675	FM	3.40	2.00	880		48	48		PCCP	2014	No		ACTIVE	2014	
	MH18-11675	MH18-09207	FM	2.00	-3.00	2468		48	48		PCCP	2014	No		ACTIVE	2014	
	MH18-09207	BD18-09144	FM	-3.00	-3.37	63		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-09144	BD18-08847	FM	-3.37	-9.20	297		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-08847	BD18-08345	FM	-3.00	-9.20	502		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-08345	BD18-06798	FM	-3.00	-9.20	1547		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-06798	BD18-06246	FM	-3.00	-9.20	552		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-06246	MH18-06117	FM	-3.00	-9.20	129		48	48		PCCP	2014	No		ACTIVE	2014	
	MH18-06117	BD18-05869	FM	-9.20	-1.00	248		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-05869	BD18-05628	FM	-9.20	-1.00	241		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-05628	BD18-04625	FM	-9.20	-1.00	1003		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-04625	BD18-03555	FM	-9.20	-1.00	1070		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-03555	BD18-02476	FM	-9.20	-1.00	1079		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-02476	MH18-02005	FM	-9.20	-1.00	471		48	48		PCCP	2014	No		ACTIVE	2014	
	MH18-02005	BD18-01620	FM	-1.00	-4.10	385		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-01620	BD18-01496	FM	-4.00	-5.30	124		48	48		PCCP	2014	No		ACTIVE	2014	

Interceptor Name and No.	Upstream Structure No.	Downstream Structure No.	Flow Type	IE Up (feet)	IE Down (feet)	Length (feet)	Segment Slope	Size (inches)	Equiv Diameter	Segment Capacity(MGD)	Material	Year Installed	Is lined?	Flows to PS	Status	Status Year	Map Sheet ID
	BD18-01496	BD18-00639	FM	-4.00	-5.30	857		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-00639	BD18-00105	FM	11.00	19.25	534		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-00639	RD18-00623	FM	-4.00	-5.30	16		48	48		PCCP	2014	No		ACTIVE	2014	
	BD18-00105	NSWTP_HEADWO	FM	19.25	30.00	105		48	48		PCCP	2014	No		ACTIVE	2014	
	PS18	RD18-15432	FM	-20.35	-14.35	15		36	36		PCCP	2014	No		ACTIVE	2014	
PUMPING STATION 12 FORCE MAIN RELOCATION - 167																	
	BD12-02942	MH11-166A	FM	126.30	140.66	313		36	36			2017	No	PS11	ACTVE	2017	
NINE SPRINGS VALLEY INTERCEPTOR/MORSE POND EXTENSION - 168																	
	MH12-311	MH12-310	GR	988.36	988.32	36	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-310	MH12-309	GR	988.32	988.24	74	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-309	MH12-308	GR	988.24	987.89	316	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-308	MH12-307	GR	987.89	987.75	127	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-307	MH12-306	GR	987.75	987.44	277	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-306	MH12-305	GR	987.44	986.97	432	0.0011	20	19.2	3.16		2018	No	12	PROPOSED	2018	
	MH12-305	MH12-304	GR	986.97	986.42	500	0.0011	20	19.2	3.16			No		ACTIVE		
	MH12-304	MH12-303	GR	986.42	985.87	500	0.0011	20	19.2	3.16			No		ACTIVE		
	MH12-303	MH12-302	GR	985.87	985.32	500	0.0011	20	19.2	3.16			No		ACTIVE		
	MH12-302	MH12-301	GR	985.32	985.06	233	0.0011	20	19.2	3.16			No		ACTIVE		
	MH12-301	MH12-206	GR	985.06	984.80	238	0.0011	20	19.2	3.16			No		ACTIVE		

APPENDIX B – MMSD COLLECTION SYSTEM FACILITIES PLAN UPDATE (2011)

APPENDIX B – MMSD COLLECTION SYSTEM FACILITIES PLAN UPDATE (2011)

Madison Metropolitan Sewerage District Collection System Facilities Plan Update

Prepared by the Staff of the
Madison Metropolitan Sewerage District

December 2011

MADISON METROPOLITAN
SEWERAGE DISTRICT

COLLECTION SYSTEM FACILITIES PLAN UPDATE

Prepared by the Staff of the
Madison Metropolitan Sewerage District

December 2011

Table of Contents

The Mission of the Madison Metropolitan Sewerage District

To protect public health and the environment, the Madison Metropolitan Sewerage District provides exceptional wastewater collection, treatment, and related services to the metropolitan Madison area and surrounding areas in a wise and cost-effective manner.

PREFACE

Clean water is a precious resource, and the collection and treatment of wastewater hold prominent roles in preserving that resource.

Wastewater collection systems represent a crucial segment of public infrastructure. Collection systems are responsible for continuously conveying huge volumes of household, commercial, and industrial wastewater to treatment facilities where the water can be cleaned and safely returned to the environment. Extensive networks of gravity interceptors, pumping stations, and pressure sewers must operate 24 hours per day and 365 days per year to accomplish this important function.

A robust and reliable collection system is at the heart of the Madison Metropolitan Sewerage District's core services. The essence of the District's Collection System Facilities Plan is to ensure that a high level of reliability continues into the future, supporting MMSD's mission to protect public health and the environment.

This Facility Plan Amendment builds upon the original Collection System Facilities Plan (2002) and ensures that the District's collection system, a huge and dynamic asset of the Madison region, provides sustainable wastewater conveyance by managing, improving, and expanding the system in a wise and cost-effective manner.

Chapter 1
Introduction and Summary

Chapter Outline

This chapter is organized into the following sections:
- Purpose
- Recognition and Dedication
- Background Information
- A Valuable but Aging System
- Methodology & Results
- DNR Facility Planning
- Public Participation

Purpose

The purpose of this *Collection System Facilities Plan Update* is to update and revise the original Collection System Facility Plan conducted in 2002. That Plan reviewed and assessed the adequacy and condition of the Madison Metropolitan Sewerage District's (MMSD's) collection system at that time and identified a set of recommended future collection system projects and an approximate timeline for their completion. MMSD has completed many of the recommended projects over the past nine years since the original Plan was completed, and this update will review those projects remaining on the list while identifying additional projects that will need to be completed in the future to sustain and/or enhance the integrity of MMSD's collection system.

The recommended projects are intended to provide additional soundness to MMSD's overall collection system and to systematically improve or replace individual facilities as needed. In some cases, alternate future scenarios or paths exist and will be dependent on future decisions and study. This document therefore identifies an initial direction and scope of projects that will address MMSD's greatest priorities, while also retaining flexibility for future developments and changes. As with the past facilities plan, the assessments and timetables presented in this facilities plan should be regularly reviewed and updated as significant developments occur and as future information is obtained. In this way, the facilities plan will continue to serve as a functioning planning document well into the future.

This *Collection System Facilities Plan Update* is a reflection of MMSD's continued efforts to provide wastewater services in a wise and cost effective manner. Ensuring that MMSD's collection system remains robust and reliable is the ultimate goal of this planning work.

Recognition and Dedication

The MMSD collection system has been developed over the course of a century, and numerous studies, facility plans, maps, design reports, and evaluations have been prepared over the years. These previous works, many of which were prepared by MMSD staff members, represent a valuable collection of knowledge and insight. Much of this Collection System Facilities Plan has been built upon earlier work, and the writers wish to recognize the many MMSD staff members, consultants, contractors and agencies whose contributions have made this possible. Among the essential building blocks for this facilities plan is the flow and population projection work presented in the "MMSD Collection System Evaluation" (January 2009) prepared by the staff of the Capital Area Regional Planning Commission (CARPC) with significant input and review by MMSD staff. Excerpts from that report are in Appendix A1 and it is referenced throughout this document. Although a separate report, we will use and refer to the Collection System Evaluation as if it were a separate volume of this facilities plan.

The writers would also like to recognize the hard work and dedication of MMSD's staff over the past ten years in completing many of the numerous projects identified in the original Collection System Facilities Plan. A plan is only a plan without the follow-up action to make its recommendations a reality. The improvements to MMSD's system since the original plan have made MMSD's system, a good system at the time, even better and more robust than it was in 2002. We hope and believe that the recommendations within this update will accomplish as much or more than those contained in the original plan.

We would like to dedicate this *Collection System Facilities Plan Update* to MMSD's employees in recognition of and thankfulness for all of their hard work to accomplish the collection system improvements resulting from the first planning effort.

Background Information

The Madison Metropolitan Sewerage District (MMSD) was established in 1930 to consolidate wastewater service for areas surrounding Lake Monona and Lake Mendota. MMSD initially served a 50-square mile area that included Madison, Middleton, Monona, Maple Bluff, Shorewood Hills, and surrounding towns. By the end of 2010, the MMSD service area had grown to approximately 180 square miles.

The MMSD collection system currently conveys wastewater from the Cities of Fitchburg, Madison, Middleton, Monona, and Verona; the Villages of Cottage Grove, Dane, DeForest, Maple Bluff, McFarland, Shorewood Hills, and Waunakee; and from sanitary and utility districts and other areas in the Towns of Blooming Grove, Burke, Dunn, Madison, Middleton, Pleasant Springs, Verona, Vienna, Westport, and Windsor. Additional areas are regularly annexed to the District.

Figure 1.1 is a map of the present-day MMSD collection system. A more detailed map is also available in Figure 9.1 (see enclosed map pocket inside cover), referenced in later chapters of this facilities plan. The MMSD collection system includes approximately 96 miles of gravity interceptor sewers, 17 regional pumping stations, and 29 miles of force mains. These MMSD-owned facilities collect the wastewater from local community-owned collection systems and convey the flow to the Nine Springs Wastewater Treatment Plant. Presently, all wastewater generated in the MMSD service area is treated at this single plant.

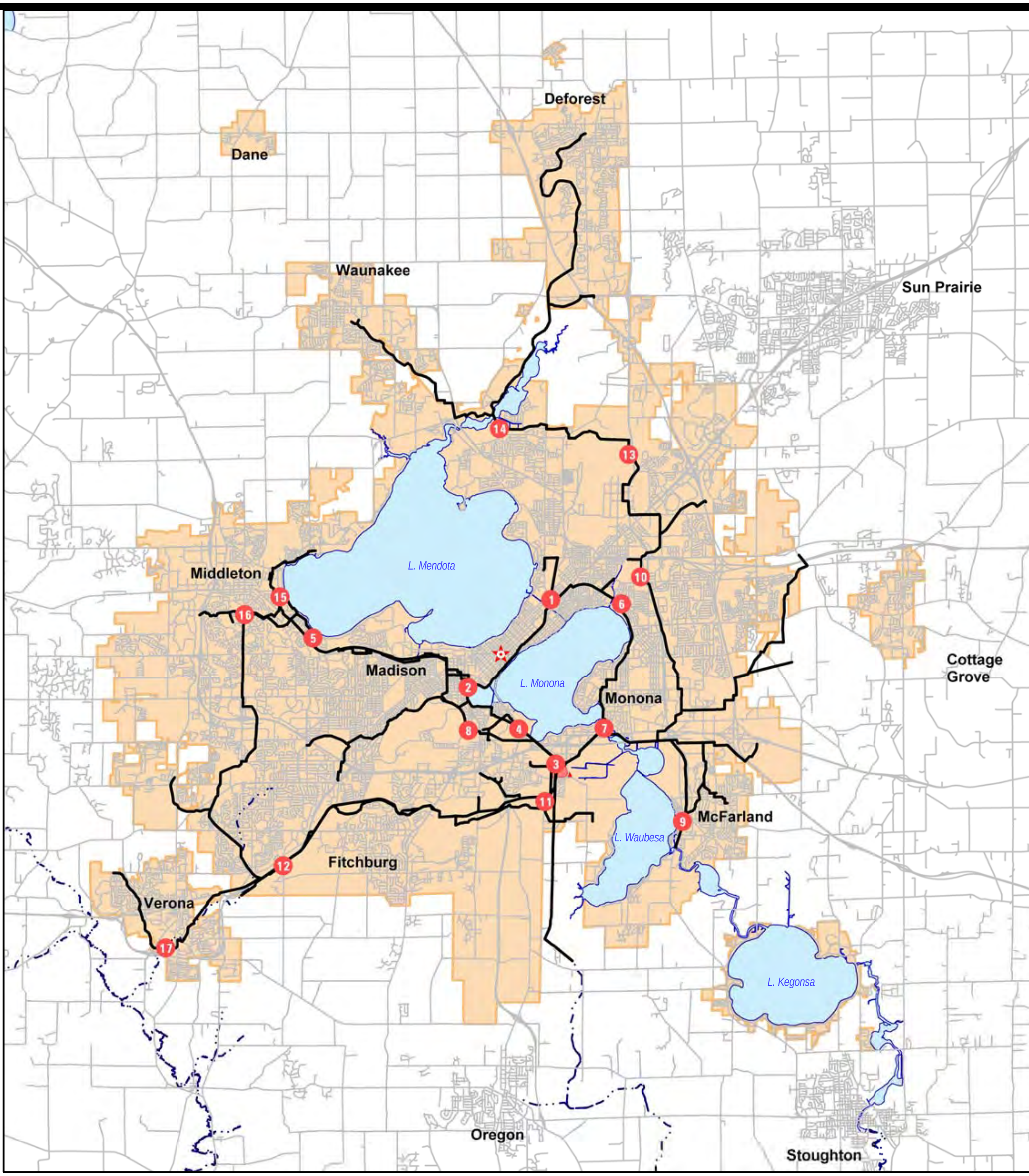
The MMSD system is somewhat unusual in that all flow is *pumped* into the Nine Springs Wastewater Treatment Plant through remote pumping stations and forcemains. The elevation of the treatment plant, constructed in 1926 on a hillside south of the city, is higher than various portions of the metropolitan service area. The geography of the Madison area, including multiple large lakes, a central isthmus, and hilly topography, also contributes to MMSD's special dependence on pumping stations and forcemains for flow conveyance. There are a total of 129 pumping stations (not including 429 small "grinder" pump installations) within MMSD's boundaries. Of these, 17 are owned and maintained by MMSD. The District also maintains 44 of the pumping stations owned by several of the communities it serves.

For the year 2010, MMSD received a total average wastewater flow volume of 43.0 mgd (million gallons per day). With increases in MMSD service area and population, this flow volume has significantly increased over the years and will continue to increase in the future. Figure 1.2 is a plot of MMSD's historical average flows and projected future average flows. As shown, the total average MMSD flow is expected to increase from 43.0 mgd in the Year 2010 to about 50 mgd by the Year 2030. This corresponds to an average increase of about 0.35 mgd per year, or a growth rate of about 0.8 % per year.

A Valuable but Aging System

Table 1.1 summarizes the construction history and replacement value for the MMSD collection system. A brief look at Table 1.1 reveals a long history of construction and indicates that many of MMSD's early collection system facilities are still in use. Although it is difficult to assign an exact useful life for such facilities, the average age of the MMSD collection system is clearly increasing. Figure 1.3 plots the average age and replacement value of the collection system assets. Much of the MMSD collection system was constructed prior to 1970, and Figure 1.3 shows a steady trend upward in average age since that time. The figure also shows that the MMSD collection system represents a very large investment. Based on original construction costs updated per the Engineering News Record Construction Cost Index, the estimated value of MMSD's collection system assets exceeds 250 million dollars.

MMSD actively monitors its collection system facilities and has replaced and rehabilitated numerous components over the years. Table 1.2 is a summary of significant replacement, rehabilitation, relief and major maintenance projects completed by MMSD



Legend

(1)	Pumping Station		MMSD Service Area		Road
	MMSD Main		Nine Springs WWTP		Receiving Stream

MMSD	**Madison Metropolitan Sewerage District**	Figure 1.1 Collection System	Prepared by: JP Date: 1/5/11

Figure 1.2
Total MMSD Average Annual Flows: Historical and Projected

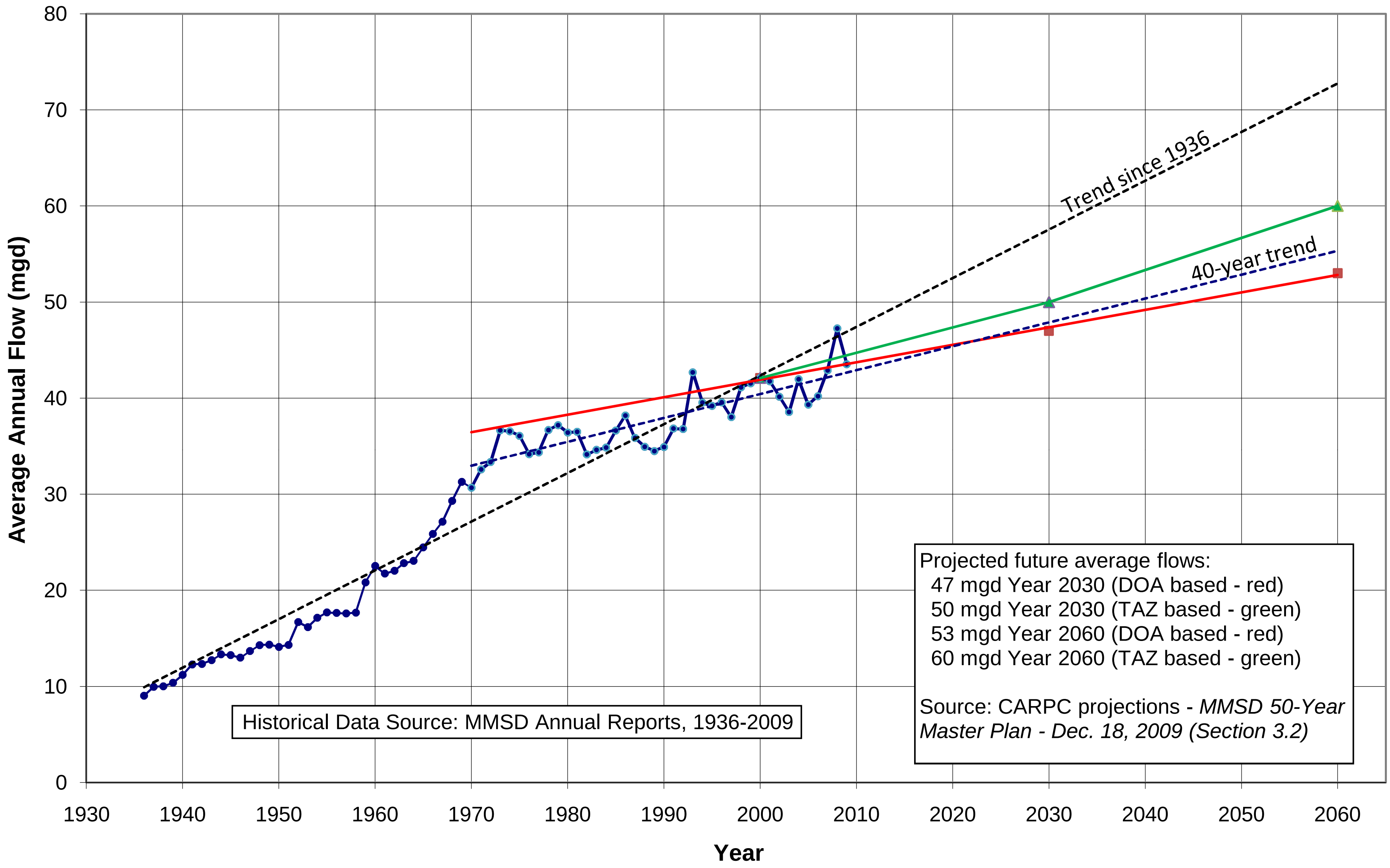


Table 1.1
Construction History of Major Collection System Assets

Collection System Asset / Other Historical Milestones	Placed in Service	Replacement Value Based on Original Cost and ENR Construction Cost Index (2010 $)	Comments
First City of Madison Treatment Plant	1899		Located near Yahara River at East Wash. Avenue Chemical precipitation plant that didn't work Only operated from June 1899 until January 1901
Second City of Madison Treatment Plant	1901		Built next to first - operated until 1914 Consisted of septic tanks with cinder filters
Burke Treatment Plant placed in service	1914		Operated by MMSD until 1936, U.S. Gov. 1942-1946, MMSD 1947-1950, rented by Oscar Meyer 1950-1979, Property sold to Reynolds Transfer & Storage in 1981
Main Pumping Station - (Old PS No. 1)	1916	$ 0	Abandoned in 1950 when new PS No. 1 went into service
Greenbush Pumping Station - (Old PS No. 2)	1916	$ 0	Abandoned in 1964 when new PS No. 2 went into service
Crosstown Force Main	1916	$ 0	Replaced in 2002
Burke Outfall Sewer and Main PS Force Main	1914 & 1916	$ 0	Replaced by North Basin Interceptor in 2002
"Old" Old West Interceptor	1916	$ 690,000	
Wingra Pumping Station - (Old PS No. 3)	1921	$ 0	Abandoned when SW Int. placed in service - 1956
Northend Int. - along Sherman Ave.	1925	$ 120,000	
Fair Oaks East Monona Interceptor	1926	$ 190,000	Replaced downstream of Starkweather Creek in 1997
Northend Int. - along Commercial to Pennsylvania	1927	$ 150,000	
Old Southwest Interceptor - W. Shore Drive	1927	$ 0	Replaced in 2001
(Nine Springs WWTP placed in service)	1928		Prior to this all flow went to the Burke Treatment Plant
Pumping Station No. 2 FM	1928	$ 0	Replaced in 2001
South Interceptor - Baird Street Ext.	1928	$ 120,000	
South Madison Pumping Station - (Old PS No. 4)	1928	$ 0	Abandoned when New PS No. 4 went online in 1967
Creation of the District	1930		By decree of Judge George Kroncke
Old West Interceptor	1931 - 1934	$ 6,090,000	
Old Southwest Int. - Cherokee Dr. to Nakoma Rd.	1932	$ 150,000	
Spring Harbor Pumping Station - (Old PS No. 5)	1932	$ 0	Superstructure and new pumps added in 1959 Abandoned when New PS No. 5 went online in 1996
Northeast Interceptor Relief	1937	$ 170,000	
"Old" Southwest Interceptor Extension	1938	$ 540,000	
Spring St. Relief from Randall Ave. to W. Wash. St.	1941	$ 1,400,000	Original construction paid by City of Madison in 1941.
Commercial Ave. Pumping Station - (Old PS No. 8)	1947	$ 0	Temporary - pumped to Burke Plant - dismantled in 1952
East Interceptor	1950	$ 18,720,000	Parts of East Int. replaced in phases (Phases I-V to date)
Pumping Station No. 1	1950	$ 5,580,000	Remaining value, rehabilitation in 2005
Pumping Station No. 6	1950	$ 6,430,000	
Pumping Station No. 7	1950	$ 4,460,000	Remaining value, rehabilitation in 1992
Southwest Interceptor	1956	$ 4,830,000	
West Interceptor Extension	1957	$ 1,320,000	
West Interceptor Relief	1958, 1960	$ 5,910,000	
Effluent Diverted to Badfish Creek	1958		
Pumping Station No. 3	1959	$ 400,000	Acquired from the village of Monona New pumping units 1980, electrical rehab. 1998
Rimrock Interceptor	1959	$ 370,000	
West Interceptor - Randall Relief	1962	$ 13,220,000	
Southeast Interceptor	1962	$ 7,370,000	
Southeast Interceptor Extension	1962	$ 2,650,000	
Pumping Station No. 9	1961	$ 840,000	Replacement value seems low.
Pumping Station No. 8	1963	$ 3,850,000	Improvements to electrical services by utility in 2000
Pumping Station No. 2	1963	$ 1,910,000	Remaining value, rehabilitation in 2005
Southeast Interceptor - Dutch Mill Extension	1964	$ 720,000	
West Interceptor - PS No. 2 Interceptor Work	1964	$ 390,000	
Second PS No. 7 Force Main	1963	$ 2,680,000	
Northeast Interceptor - SEI to FEI	1964	$ 3,390,000	SEI to FEI
Pumping Station No. 10	1964	$ 2,370,000	Remaining value, rehabilitation in 2005
Nine Springs Valley Interceptor - PS 11 to PS 12 FM	1965	$ 12,200,000	Nine Springs to McKee Rd
Pumping Station No. 11	1964	$ 4,280,000	Remaining value of original construction.
Northeast Interceptor - Burke Extension	1966	$ 0	Replaced by Hwy 30 Ext Replacement in 1996
West Interceptor - Gammon Extension	1966	$ 1,180,000	Replacement value of remaining sewer to Gammon Rd.
West Interceptor - West Point Extension	1966	$ 600,000	Includes Baskerville siphon.
Pumping Station No. 4	1966	$ 1,450,000	
South Interceptor - Lakeside Extension	1966	$ 1,440,000	
Southeast Interceptor - Blooming Grove Extension	1967	$ 2,260,000	
Northeast Interceptor - Truax Extension	1968	$ 7,000,000	Lien Rd to west side of N-S runway at airport
Nine Springs Valley Int. - Mineral Point Extension	1968	$ 7,080,000	McKee Rd to PS 12 to Mineral Point Rd, incluidng PS 12 force main
Pumping Station No. 12	1968	$ 2,110,000	Remaining value of original construction.
Far East Interceptor	1969	$ 3,090,000	NEI to east side of Interstate Highway
Pumping Station No. 13	1969	$ 2,290,000	Remaining value of original construction.
Northeast Int. - Waunakee & DeForest Extensions	1970	$ 24,420,000	Airport to Waunakee and DeForest, including PS 14 force main
Nine Springs Valley Int. - Waubesa Extension	1971	$ 1,430,000	
West Interceptor - Midvale Relief	1971	$ 650,000	

Table 1.1
Construction History of Major Collection System Assets

Collection System Asset / Other Historical Milestones	Placed in Service	Replacement Value Based on Original Cost and ENR Construction Cost Index (2010 $)	Comments
Northeast Int. - Highway 19 Extension	1971	$ 710,000	
Pumping Station No. 14	1972	$ 1,880,000	Remaining value of original construction.
Clean Water Act	1973		
West Interceptor - Spring Harbor Relief (Force Main)	1973	$ 1,420,000	
Pumping Station No. 15	1974	$ 1,500,000	Remaining value of original construction.
Nine Springs Valley Int. - Syene Extension	1974	$ 740,000	
Nine Springs Valley Int. - Hwy. 14 Extension	1977	$ 1,030,000	
West Interceptor - Esser Pond Extension	1978	$ 430,000	Middleton Street to Hwys 12-14, installed in open ground
East Interceptor - Johnson Street Relief	1979	$ 410,000	
Pumping Station No. 16 Force Main	1979	$ 2,100,000	
Pumping Station No. 15 FM Relocation	1981	$ 110,000	
Pumping Station No. 16	1981	$ 3,870,000	
Pumping Station No. 15 FM Diversion	1982	$ 910,000	
Far East Interceptor & Cottage Grove Extensions	1982	$ 970,000	
Pumping Station No. 16 Force Main - Air Vent	1983	$ 9,000	
West Interceptor - Esser Pond Extension	1986	$ 150,000	
Southeast Interceptor - McFarland Relief	1987	$ 940,000	
Pump Station 9 Second Force Main	1987	$ 510,000	
Northeast Int. - Starkweather Ext./Hwy 51 Crossing	1990	$ 30,000	Original casing installed in open-cut.
Pumping Station No. 7 Rehabilitation	1991	$ 3,860,000	
City of Verona annexed to the District	1993		District operates and maintains Verona WWTP
Southeast Interceptor - Siggelkow Extension	1994 & 1996	$ 520,000	
South Interceptor Replacement	1994	$ 910,000	MH 4109 on Lakeside Ext to Wingra Dr, including siphon replacement under Wingra Creek at Beld St
Northeast Interceptor - Lien Interstate Extension	1995	$ 780,000	
Northeast Interceptor - Hwy 30 Ext Replacement	1996	$ 160,000	Replace Burke Ext built in 1966.
Pumping Station No. 5	1995	$ 2,190,000	New pumping station built to replace old PS No. 5
Verona Pumping Station Force Main	1995	$ 1,540,000	
Verona Pumping Station (Pumping Station No. 17)	1995	$ 2,720,000	Verona WWTP abandoned
Effluent returned to Badger Mill Cr./Sugar River	1998		
Far East Interceptor - Door Creek Extension	1998	$ 2,260,000	
Nine Springs Valley Int. - Midtown Extension	1999	$ 1,060,000	
Crosstown Force Main Replacement - Yahara River	1999	$ 680,000	
West Interceptor - Campus Relief Phase 1	1999	$ 1,000,000	
West Interceptor - Campus Relief Phase 2	2000	$ 1,310,000	
P.S. #2 Forcemain Replacement	2000-2001	$ 5,600,000	
NSVI-Nicolet Replacement	2000	$ 210,000	
PS No. 1 North Basin Interceptor	2002	$ 3,410,000	
Crosstown Force Main Replacement	2002	$ 5,880,000	
WI - Gammon Ext - Fortune Drive Replacement Sewer	2002	$ 550,000	
Rehabilitation of Pump Stations 1 - 2 - 10	2003	$ 10,450,000	
West Interceptor - Campus Relief Phase 4	2004	$ 1,690,000	
Lower Badger Mill Creek Int - Cross Country Rd	2004	$ 120,000	
NEI Pflaum Rd Replacement Sewer	2005	$ 3,590,000	
Lower Badger Mill Creek Int - Ph 1	2006	$ 2,140,000	
SWI North and South Legs Relining	2006	$ 0	Sewers transferred to City of Madison in 2010.
PS 13 and 14 Firm Capacity Upgrades	2007	$ 670,000	
WI Ext Replacement	2007	$ 2,240,000	
Lower Badger Mill Creek Int - Ph 2	2008	$ 1,070,000	
NEI - Truax Extension Liner	2008	$ 1,950,000	
FEI - Gaston Road Extension	2008	$ 760,000	
SI - Baird Street Extension Liner	2009	$ 120,000	
FEI - Cottage Grove Extension Liner	2010	$ 340,000	
NEI - PS10 to Lien Road Relief & Replacement Sewer	2010	$ 8,710,000	
Rehabilitation of Pump Station 6 & 8	2010	$ 6,580,000	
Total Costs		$ 261,299,000	

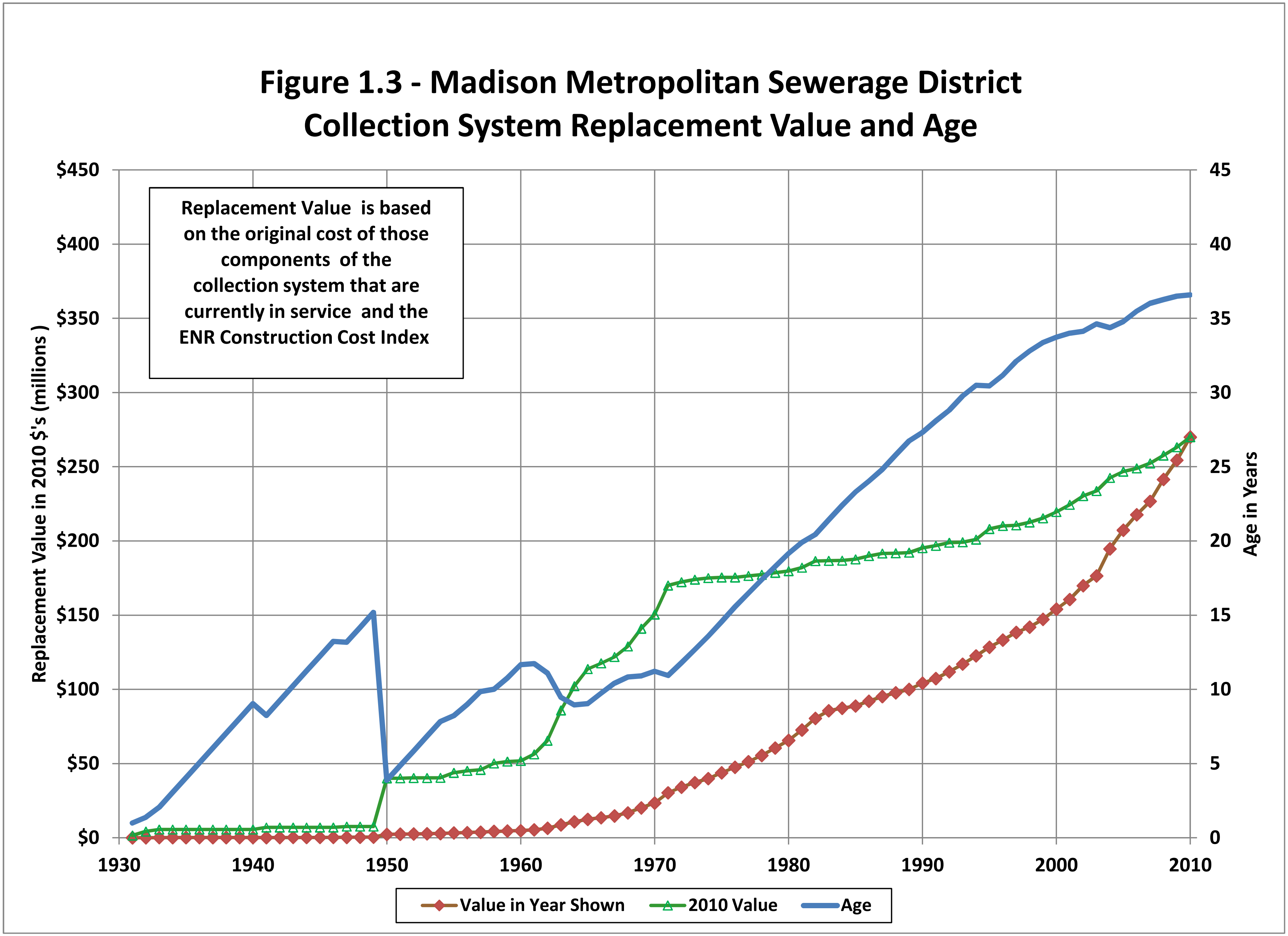


Figure 1.3 - Madison Metropolitan Sewerage District
Collection System Replacement Value and Age
Replacement Value is based on the original cost of those components of the collection system that are currently in service and the ENR Construction Cost Index
Replacement Value in 2010 $'s (millions)
Age in Years
$450
$400
$350
$300
$250
$200
$150
$100
$50
$0
45
40
35
30
25
20
15
10
5
0
1930
1940
1950
1960
1970
1980
1990
2000
2010
Value in Year Shown
2010 Value
Age

Table 1.2

Major Collection System Maintenance, Renewal, Replacement, and Relief Projects since 2000

Madison Metropolitan Sewerage District

Service Area / Project	Time Period	Approximate Costs (actual $)	Comments
System Wide Projects			
Annual televising projects	2000 - 2010	$ 1,030,000	Portions of MMSD's system are televised each year
Telemetry system improvements	2000	$ 118,000	Included new radios at plant and pumping stations
Pumping Station No. 1			
Rebuilt Pump A	2009	$ 19,000	
Pumping Station No. 1 Force Main Air Release MH	2006	$ 14,000	
Major rehab work on entire pumping station	2003 - 2006	$ 2,534,000	Included new and rebuilt pumps, electrical, and hvac
Crosstown FM Replacement - Phase 2	2002	$ 4,335,000	
Install new hoist and motorize bridge and trolley	2002	$ 20,000	
Burke Outfall Replacement	2002	$ 2,515,000	
Crosstown FM replacement at Yahara River	2000	$ 467,000	1,330 feet near PS No. 1
Pumping Station No. 2			
Rebuilt Pump A	2008	$ 22,000	
WI Repairs at Park Street	2007	$ 40,000	
Major rehab work on entire pumping station	2003 - 2006	$ 2,980,000	Included new and rebuilt pumps, electrical, and hvac
Repair FM leak	2003	$ 44,000	Along Olin Avenue
PS No. 2 FM Replacement	2000 - 2001	$ 3,966,000	17,000 feet of new 36" ductile iron
Southwest Int. Replacement on Shore Drive	2001	$ 437,000	1,700 feet of new 36" PVC interceptor
PS No. 2 Roof Replacement	2001	$ 18,000	
Pumping Station No. 3			
Install flowmeter	2005	$ 13,000	Part of PS 1, 2, & 10 Rehab Project
Pumping Station No. 4			
SI - Baird Street Extension Liner	2009	$ 113,000	
Second feed and transfer switch	2004	$ 60,000	Second power feed and transfer switch by MG&E
PS 4 painting	2003	$ 11,000	Contractor painted pumps, piping, motors, and railings.
Replace telmetry system and modify controls	2001 - 2002	$ 23,000	
Pumping Station No. 5			
PS 5 painting	2006	$ 13,000	
Replace Pump A Adjustable Frequency Drive	2005	$ 13,000	
Pumping Station No. 6			
Major rehab work on entire pumping station	2008 - 2010	$ 3,300,000	Work in progress - New pumps, electrical, hvac, etc.
Repair force main break after contractor damage	2009	$ 133,000	$125,000 was reimbursed as part of the settlement

Table 1.2

Major Collection System Maintenance, Renewal, Replacement, and Relief Projects since 2000

Madison Metropolitan Sewerage District

Service Area / Project	Time Period	Approximate Costs (actual $)	Comments
Pumping Station No. 6 continued			
Repair motor for Pump D	2006	$ 19,000	
Remove bar screen	2006	$ 7,000	In conjunction with new Plant headworks - 10th Addition
Install new hoist and motorize bridge and trolley	2002	$ 22,000	
Pumping Station No. 7			
FEI Cottage Grove Extension - Lining Project	2010	$ 343,000	Lined 5500 feet of 18-inch sewer
Replace bubbler system for level controls	2009 - 2010	$ 22,000	Work in progress - costs as of 12/3/2010
New sluice gate acutators	2009 - 2010	$ 96,000	Work done as part of PS 6 & PS 8 Rehab project
Roof replacement	2009	$ 22,000	
Third power feed to pumping station	2009	$ 87,000	MG&E installed 3rd power feed to pumping station site
Installed portable generator connection point	2009	$ 26,000	Connection for portable generator
Rebuilt Pump A	2009	$ 14,000	
Rebuilt Pump D	2009	$ 14,000	
Rebuilt Pump B	2009	$ 15,000	
FEI - Gaston Road Extension	2008	$ 714,000	
Rebuilt Pump B	2007	$ 12,000	
Remove bar screen	2006	$ 7,000	In conjunction with new Plant headworks - 10th Addition
Northeast Int. - Pflaum Road	2005 - 2006	$ 3,012,000	Relief for 5000 feet of sewer
Peak Capacity Modifications	2002	$ 26,000	
PS 7 FM	2001	$ 18,000	Added Air Release Manhole on FM near WPS
Pumping Station No. 8			
Major rehab work on entire pumping station	2008 - 2010	$ 3,300,000	Work in progress - New pumps, electrical, hvac, etc.
West Interceptor - Walnut Street Siphon Cleaning	2008	$ 102,000	
Southwest Interceptor - Line North & South Legs	2007	$ 519,000	Lined north and south legs of SW Interceptor
Replace suction valve on Pump D	2005	$ 17,000	
West Interceptor Campus Relief - Phase IV	2004	$ 1,354,000	Relief of WI to Walnut Street
Install actuator on Pump C discharge valve	2004	$ 17,000	
Replace suction valve with actuator on Pump A	2004	$ 44,000	
Southwest Interceptor - Chippewa Drive Rehab	2001	$ 49,000	
West Interceptor Campus Relief - Phase III	2000	$ 525,000	1,100 ft of 36" pipe behind stock pavilion
West Interceptor Campus Relief - Phase II	2000	$ 918,000	700 feet of new 48 inch pipe crossing Campus Drive
Power System Modifications	1999 - 2001	$ 60,000	Included new underground services from MG&E
Roof replacement	2000	$ 17,000	
Rebuilt Pump B	2000	$ 16,000	

Table 1.2

Major Collection System Maintenance, Renewal, Replacement, and Relief Projects since 2000

Madison Metropolitan Sewerage District

Service Area / Project	Time Period	Approximate Costs (actual $)	Comments
Pumping Station No. 8 continued			
Install channel grinder at PS 8	1999 - 2000	$ 98,000	Grinder removed from service in 2004.
Pumping Station No. 9			
New Pump B with motor	2007	$ 27,000	In-house pump installation
Install new electrical services and equipment	2004	$ 191,000	Included all new electrical and two power services
New Pump A with motor	2004	$ 21,000	In-house pump installation
New Pump C with motor	2002	$ 26,000	In-house pump installation
Pumping Station No. 10			
NEI - PS 10 to Lien Road	2009 - 2010	$ 8,710,000	Work in progress - provide relief for 9200 feet of sewer
Rebuilt Pump B	2009	$ 11,000	Sent to Cornell for warranty repair
Rebuilt Pump A	2008	$ 14,000	Sent to Cornell for warranty repair
Major rehab work on entire pumping station	2003 - 2006	$ 2,619,000	Included new and rebuilt pumps, electrical, and hvac
Rebuilt Pump C	2002	$ 11,000	
Pumping Station No. 11			
Rebuilt Pump B	2009	$ 16,000	
Rebuilt Pump B	2009	$ 18,000	
Rebuilt Pump B	2007	$ 14,000	
Install dehumidifier	2006	$ 17,000	
Remove bar screen	2006	$ 7,000	In conjunction with new Plant headworks - 10th Addition
PS 11 painting	2004	$ 27,000	
Control system improvements	2001 - 2002	$ 30,000	Replace relay panels with PLC controls
NSVI Nicolet Replacement	2000	$ 150,000	Replaced 1,170 feet of corroded pipe with new 30" PVC
Pumping Station No. 12			
Rebuilt Pump A	2010	$ 28,000	
Install dehumidifier	2005	$ 15,000	
PS 12 painting	2001	$ 23,000	
Control system improvements	2000 - 2001	$ 28,000	Replace relay panels with PLC controls
Pumping Station No. 13			
Replace well level controls	2009	$ 22,000	Adjust new float levels to new levels in SCC
NEI - Truax Area Liner	2008	$ 1,832,000	
Replace Pump B suction valve	2007	$ 25,000	
Upgrade pumping station firm capacity	2006 - 2007	$ 291,000	New and rehabbed pumps and control modifications

Table 1.2

Major Collection System Maintenance, Renewal, Replacement, and Relief Projects since 2000

Madison Metropolitan Sewerage District

Service Area / Project	Time Period	Approximate Costs (actual $)	Comments
Pumping Station No. 13 continued			
NEI - Airport Reconstruction	2005	-	Relocated with airport work - reimbursed by Dane Co.
Install dehumidifier	2004	$ 12,000	
Replace Pump A motor starter	2002 - 2003	$ 8,000	New soft starter and controls installed
PS 13 painting	2002	$ 23,000	
Control system improvements	2002	$ 31,000	Replace relay panels with PLC controls
Pumping Station No. 14			
Install monitoring manhole, MH14-156A	2008	$ 85,000	
Upgrade pumping station firm capacity	2006 - 2007	$ 314,000	New and rehabbed pumps and control modifications
Replace Pump A motor starter	2005	$ 8,000	New soft starter and controls installed
Install dehumidifier	2004	$ 12,000	
PS 14 painting	2003	$ 17,000	
Control system improvements	2003	$ 39,000	Replace relay panels with PLC controls
Pumping Station No. 15			
Rebuild Pump B	2008	$ 13,000	
West Int. Extension Replacement	2007	$ 2,014,000	
Installed new station control center (SCC)	2003	$ 39,000	Replace relay panels with PLC controls & HMI
PS 15 force main casting replacements - Allen Blvd	2000	$ 11,000	
Pumping Station No. 16			
Replace shingled roof	2008	$ 9,000	
Major control system renovations/replacement	2007 - 2010	$ 200,000	In-house design & installation of control system changes
Install dehumidifier	2005	$ 17,000	
PS 16 painting	2005	$ 17,000	
West Interceptor Fortune Drive Relief Sewer	2002	$ 406,000	
Odor Control System	2000	$ 26,000	
Pumping Station No. 17			
Rebuilt Pump A	2010	$ 21,000	
Rebuilt Pump C	2009	$ 15,000	
Rebuilt Pump B	2008	$ 23,000	
Lower Badger Mill Creek Int - Ph 2	2008	$ 1,000,000	
Control system modifications to allow dual pumping	2007	$ 6,000	Primarily staff time for re-programming & testing
New transformer installed - allows dual pumping	2007	$ -	New 300 kVA transformer installed by Alliant Energy
Lower Badger Mill Creek Int - Ph 1	2006	$ 1,869,000	

Table 1.2
Major Collection System Maintenance, Renewal, Replacement, and Relief Projects since 2000
Madison Metropolitan Sewerage District

Service Area / Project	Time Period	Approximate Costs (actual $)	Comments
Pumping Station No. 17 continued			
Rebuilt Pump B	2006	$ 19,000	
Lower Badger Mill Creek Int - Cross Country Rd	2004	$ 99,000	
Rebuilt Pump C	2004	$ 16,000	
PS 17 painting	2004	$ 13,000	
Rebuilt Pump B	2002	$ 18,000	
Replace main circuit breaker	2002	$ 16,000	

during the last decade. Although this list of projects is substantial, compromising over $54 million worth of improvements and repairs, it represents a relatively small portion of MMSD's extensive collection system. As the overall age of the system continues to increase, it is likely that the rate of such replacement and improvement projects will need to accelerate to ensure the continued high reliability that MMSD requires.

Methodology and Results

As detailed in the following chapters, this facilities plan recognizes the need for improvements based upon several factors. Each major component of the collection system is evaluated for hydraulic capacity and physical condition. The interaction between the major system components is also examined to help identify where and how specific projects can be combined and prioritized.

The result of this approach is a list of recommended projects and initiatives with an approximate timeline for completion. These results are presented in Chapter 9 and are intended to serve as a future guide for MMSD collection system planning, budgeting, and construction. Since the recommended timetable covers a long period (20-years), it is likely that the scope and priority of some projects may change as more detailed studies are performed and as future developments occur. It is recommended that the project timetable be annually reviewed and updated and that the results be incorporated into MMSD's capital budgeting process.

DNR Facility Planning

Collection system projects are funded by MMSD through two main sources: (1). Connection charges paid by new users that connect to existing infrastructure; and (2). Clean Water Fund (CWF) loans administered by the Wisconsin Department of Natural Resources (WDNR). The DNR requires that projects funded through CWF loans include a "facility planning" step. In general the facility plan report should include, at a minimum, the following elements:

- Description of proposed project and the need for the project.
- Preliminary cost estimate and expected user charge impacts to a typical customer.
- Environmental impacts of project, especially those related to floodplain, wetlands, or other environmentally sensitive areas.
- Letter from the Capital Area Regional Planning Commission stating conformance of the project with approved urban sewer service areas.

Pre-Design and Design Reports for each project are intended to be developed after facility planning in conjunction with the preparation of detailed plans and specifications and would address issues related to alternatives analysis and cost-effectiveness.

This Facilities Plan describes each proposed project and the driving forces for its construction. Preliminary cost estimates and a generalized user charge impact are provided in Chapter 9. However, detailed user charge impacts and environmental impacts are not developed in this document due to the unique nature of each project. MMSD believes that these issues are best addressed as part of Pre-Design or Design Reports that will be submitted to the WDNR for each project. As such, this Facilities Plan is not meant to satisfy all of the facility planning requirements set forth by the WDNR in order to secure CWF funding for a particular project.

Public Participation

The District held a public hearing on Wednesday, February 22, 2012, to present the methodology and recommendations of the facilities plan update and to solicit questions and comments from local officials and the general public. The public hearing was noticed in the local newspaper and notifications letters were also sent to each of the District's customers. A 12-day comment period was provided prior to the hearing for submission of written comments regarding the facilities plan update, which was made available for viewing at the District's administrative office and on its website.

Documents related to the public hearing are included in Appendix 11. No written comments were received from the public and no local officials or members of the general public attended the public hearing.

Approval letters for the update to the Collection System Facilities Plan were received from the Capital Area Regional Planning Commission and Wisconsin Department of Natural Resources on June 20, 2012 and July 20, 2012, respectively (see Appendix 12).

Chapter 2
Asset Management and CMOM

Chapter Outline

This chapter is organized into the following sections:

- Introduction
- Asset Management
- Capacity, Management, Operation and Maintenance (CMOM)

Introduction

This chapter will discuss the topics of asset management and CMOM (capacity, management, operation, and maintenance). The chapter is organized into three sections: this brief introduction, Asset Management, and CMOM. The sections on asset management and CMOM each contain specific conclusions and recommendations and are not reiterated here. However, a general summary of the conclusions and recommendations is provided.

The topics of asset management and CMOM have received a lot of attention at both the State and national levels. The definition of what constitutes a good asset management plan or CMOM program is fuzzy at best. However, general guidance is available as are many examples of best practices. It is up to each utility to determine what approaches and practices will be most beneficial in providing the best service to its customers.

The District's collection system facilities plan includes advanced asset management concepts and meets many of the criteria required in a CMOM program. Although the facilities plan may not include all aspects of either, it is certainly a part of the whole.

In this chapter, advanced asset management and CMOM concepts are reviewed and compared with the current practices used at the District. In general, the District takes a practical approach to managing its assets and in meeting regulations. Although the District's present approach appears to meet most of its needs, improvements and better approaches are always possible. Those improvements have been included within the recommendations and may be summed up as follows: (1). Provide better documentation, (2). Migrate towards the use of more advanced asset management and CMOM concepts, and (3). Develop and implement systems that are monitored and continually improved.

Asset Management

The District's *Collection System Facilities Plan* is an asset management plan. In conjunction with the District's maintenance programs, it is used to manage the District's collection system assets. The District has been progressively adopting additional asset management concepts (advanced asset management concepts) since its first collection system facilities plan was implemented in 2002. Eventually all of those advanced concepts that fit the District's approach will be incorporated into its asset management program. However, rather than a wholesale change, a migration toward using these more advanced asset management concepts is taking place.

The topic of asset management has received significant attention over the last five to ten years. As an engineering concept rather than an accounting concept, asset management considers how the assets of a utility can be optimized to provide the appropriate levels of service with an acceptable level of risk and at minimum life-cycle costs. Thus, asset management is defined as an integrated set of processes to minimize the life-cycle costs of infrastructure assets, at an acceptable level of risk, while continuously delivering established levels of service (definition from *Implementing Asset Management: A Practical Guide*). As stated in the EPA's advanced asset management training materials, Asset Management is the systematic integration of advanced and sustainable management techniques into a management paradigm or *way of thinking*, with primary focus on the *long-term life cycle* of the asset and its sustained performance, rather than on short-term, day-to-day aspects of the asset.

The District's *Collection System Facilities Plan* anticipates the timing of needs related to both condition and capacity. Each of the District's pumping station's physical condition is assessed by analyzing six categories on a scale of 1 to 5, with 1 being very good and 5 being very poor. The District's sewers are assessed for condition via its sewer maintenance televising program. Maintaining the District's sewers through cleaning, televising, and rehabilitation or replacement plays a major role in meeting expected levels of service. In addition, providing an appropriate level of maintenance is a part of minimizing life-cycle costs. The level of service is also established by determining the capacity adequate to meet peak events. The District has used a benchmark called the Madison Design Curve for many years to set the required capacity for its pumping and sewer systems. This benchmark sets a peaking factor of between 2.5 and 4.0 for all of the District's facilities based upon the average flow of the system's component. (This factor is described in more detail elsewhere in this facilities plan.)

The amount of information on advanced asset management concepts is significant although somewhat nebulous and non-standardized. This makes it difficult to compare what your organization is doing with a single standard or even with best practices. In the remainder of this section, comparisons have been made with what the EPA considers to be the Fundamentals of Asset Management and their ten step approach to developing an asset management plan. The District's *Collection System Facilities Plan* is fundamentally an asset management plan and as such provides a framework for improving the District's collection system and its assets (the system of pumps, pipes, manholes, structures, etc.). In addition, the *Collection System Facilities Plan* also provides a framework to continually improve the planning process itself, i.e., this "asset management" planning process and how it interfaces with the capital improvement plan.

The Five Core Questions

Per the US EPA's Fundamentals of Asset Management (retrievable from the EPA's website at http://www.epa.gov/OWM/assetmanage/assets_training.htm), there are five core questions to answer when developing an asset management framework. Those questions are as follows:

1. What is the current state of my assets?
    - What do I own?
    - Where is it?
    - What condition is it in?
    - What is its remaining useful life?
    - What is its remaining economic value?

2. What is my required level of service (LOS)?
    - What is the demand for my services by my stakeholders?
    - What do regulators require?
    - What is my actual performance?

3. Which assets are critical to sustained performance?
    - How does it fail? How can it fail?
    - What is the likelihood of failure?
    - What does it cost to repair?
    - What are the consequences of failure?

4. What are my best O&M and CIP investment strategies?
    - What alternative management options exist?
    - Which are the most feasible for my organization?

5. What is my best long-term funding strategy?

Answering most or all of these questions should lead to a well-developed and advanced asset management program.

The following comments should be made about several of the questions and more discussion will occur later. One of the questions under what is the state of my assets asks what the remaining useful life is. Age and better yet, the actual condition, can be good indicators of the remaining life of a piece of equipment from an operational standpoint, but may not be good indicators from the standpoint of capacity or the ability to meet actual system requirements or level of service. Therefore, from an asset management perspective, failures to meet capacity or other service level requirements are considered failure modes and can also limit the remaining useful life of an asset.

Note that another question asks about remaining economic value. This is sometimes difficult to assess. The original cost of a piece of equipment or system depreciated over time may be significantly different from its actual economic value. Perhaps a better indicator of economic value is replacement cost and the timing of the replacement. If a replacement can be delayed by repair or rehab, what is the value to the ratepayers of extending its life?

Another fundamental key of asset management is determining the desired level of service to provide and measuring actual performance. The desired level of service sets the bar for the utility's performance. Measuring actual performance determines where improvements need to be made.

Ten Steps to an Asset Management Program

One method of implementing the five core questions is a ten-step process also included in the EPA's Fundamentals of Asset Management and obtainable at the same website location as the five core questions. The ten steps are listed below:

1. Develop asset registry
2. Assess condition, failure modes
3. Determine residual life
4. Determine life cycle & replacement costs
5. Set target levels of service (LOS)
6. Determine business risk ("criticality")
7. Optimize O&M investment
8. Optimize capital investment
9. Determine funding strategy
10. Build asset management plan

Integrating the five core questions with the ten-step process answers the five core questions and helps develop a comprehensive asset management plan. Steps 1 to 4 relate to question 1. Step 5, and to some extent step 6, address question 2 regarding level of service. Step 6 relates primarily to question 3. Steps 7 and 8 address question 4. Step 9, and to some degree step 10, address question 5. Lastly, step 10 packages everything together. The list below adds a little more information related to each of the 10-steps without going into depth.

1. Develop asset registry
    - System layout
    - Data hierarchy, standards, and inventory

2. Assess condition, failure modes
    - Condition assessment protocol
    - Rating methodologies

3. Determine residual life
    - Expected life tables
    - Decay curves

4. Determine life cycle & replacement costs
   - Valuation
   - Life cycle costing

5. Set target levels of service (LOS)
   - Demand analysis
   - Balanced scorecard
   - Performance metrics

6. Determine business risk ("criticality")
   - FMECA (failure mode effects and criticality analysis)
   - Business risk (probability of failure times consequence of failure)
   - Delphi techniques

7. Optimize O&M investment
   - Root cause
   - RCM (reliability centered maintenance)
   - PdM (predictive maintenance)
   - ORDM (optimized renewal decision making)

8. Optimize capital investment
   - Confidence level rating
   - Strategic validation
   - ORDM

9. Determine funding strategy
   - Renewal
   - Annuity

10. Build asset management plan
   - Asset management plan
   - Policies and strategy
   - Annual budget

Existing Assessment of District Asset Management Practices

The District's Collection System Facility Plan addresses many of the above steps and other steps are addressed by the District's CMMS (computerized maintenance management system) and CIP (capital improvement plan). Without addressing all of the details of the District's approach, the following includes brief summaries of how the District meets or does not meet certain aspects of advanced asset management.

Step 1 – Asset Registry

Numerous drawings show the layout of the District's collection system and the assets and components that make up that system.

The District's computerized maintenance management system has a well-developed asset management registry with well-developed standards and a systematic parent-child hierarchy. The system is used for maintenance purposes, but is not used more globally for overall asset management. The District also has a financial asset management system (FAMS), which is used to track the book value of its assets. In general, this system is mainly used for accounting purposes, for not engineering or O&M purposes. Perhaps the future of asset management at the District will link these two systems together and the FAMS information will be based upon actual asset condition rather than the value of depreciated assets based solely on age, thus providing information that may be beneficial to engineering and O&M.

Step 2 – Assessing Condition and Failure Modes

A somewhat anecdotal and generalized system exists for assessing the condition of the District's pumping station assets. The adequacy of the firm and maximum capacity are determined by Capital Area Regional Planning Commission (CARPC) projections and the adequacy of the pumping station to meet capacity now and for the next twenty years. Power system redundancy (emergency measures), electrical system condition, mechanical system condition, and structural condition are less specific in their determination and there is therefore quite a bit more subjectivity built into the related assessments. Therefore, the assessments do not roll up from specific assessments of all equipment at the facility (e.g., assessments that would be made by maintenance staff during preventive or predictive maintenance work). However, assessments are based upon professional judgment by knowledgeable staff. Still, a more direct link between predictive maintenance findings and the condition ratings used in the facilities plan may be desirable and could enhance the results of future facilities (asset management) plans.

The adequacy of the capacity of the District's sewers is assessed using the same CARPC projections as were used to rate the pumping station capacities. The projections are used to determine the timeframe when the sewers will reach capacity and may need relief. Condition of the sewers is determined from findings of the sewer televising inspections that are completed on an annual basis. Deficiencies and problems are recorded in a database and this database is used to determine sewers that are most likely to require repair, rehab, or replacement. Although some problems exist with the present system, the system appears to be working reasonably well. With ongoing improvements to the system, it should be easily modifiable to meet the District's overall needs for asset management.

Step 3 – Determine Residual Life

The District assumes an asset's life based upon its age and type for purposes of depreciation in its Financial Asset Management System (FAMS). The actual useful life of equipment is determined by the asset's actual condition and anticipated remaining life. The two different approaches generally result in significantly different numbers. In addition, the life of an asset is often determined more by its ability to meet the conditions that are presently required and this can change over time, e.g., capacity requirements change or new regulations mean different equipment such as may occur with ventilation equipment.

Determining residual life and the use of decay curves does not presently receive much time or attention. In general, the condition of critical equipment is known and repair, rehab, or replacement of equipment and/or systems is anticipated and taken into account using the District's budget and planning processes. Repairs are generally treated as O&M expenses and addressed as maintenance while major rehab or replacement projects are treated as capital expenses.

Doing a more thorough job of determining and recording the residual life of equipment could potentially benefit overall planning and financial management by providing better information related to equipment needs and scheduling of repairs, rehabs, or replacements. However, the benefits of attempting to be more precise need to be balanced with the time commitment involved.

Step 4 – Determine Life Cycle and Replacement Costs

The District's present approach separates accounting requirements from actual long-term planning for needs. In addition, determining life cycle and replacement costs is only completed, if at all, at a very high level. Actual life, based upon asset condition, is oftentimes difficult to assess, and typically, capacity is the normal failure mode of the District's collection system assets. Replacement costs, for inclusion in the District's capital improvement plans, are also typically completed at a relatively high level until the design process begins and then, costs are refined as the project progresses.

Depreciated value says little about the actual value of a piece of equipment. In fact, even when equipment is depreciated using decay curve methods or by depreciating based upon the equipment's remaining life, the number tells little about the equipment's actual value. Depreciating based upon condition (the modified approach) may, however, help tell outside organizations more information than straight-line depreciation. If an organization is keeping its equipment well maintained and/or renewed, the modified approach will reflect some of the organization's good practices in its financial numbers.

Perhaps a better indicator of actual equipment value is its life cycle and replacement costs and the timing of those costs. This may be where the District could work at improving its present approach to long-term planning. Replacement costs should include an estimate of the life cycle costs for the best options. Even a modest approach to determining overall long-term replacement costs could prove helpful in identifying periods where the District might experience relatively high financial burdens due to renewal or replacement of existing infrastructure.

Step 5 – Set Target Levels of Service (LOS)

Regardless of whether or not an organization uses advanced asset management concepts or not, organizations have to determine appropriate levels of service. Knowing the appropriate level of service for each service provided is fundamental to any business. It provides the business with knowledge of the proper balance between service cost and the service performance.

The District has operated with, for the most part, an informal set of rules regarding how its collection system is operated and maintained. A stable, well-trained and well-managed workforce, known regulations from governing bodies, reasonable reserve capacity, certain guiding principles, and proper levels of automation have all contributed to a collection system that has worked well and provided good quality service to its customers.

One key target level of service is the District's capacity curve for sizing the capacity of its collection system assets. This curve, called the "Madison Design Curve" (MDC), is used to determine whether or not an existing sewer or pumping station is adequate as well as to help determine how large to size a new asset. The average flow is multiplied by a peaking factor from the Madison Design Curve to determine the peak flow capacity requirements for either the existing asset or a new one. Per EPA regulations, sanitary sewer overflows are strictly forbidden even in the event of a flood. Therefore, the MDC has received some attention regarding whether or not it is a conservative enough approach to designing facilities in the Madison area. This will be investigated further and is but one area where the target levels of service may need further review.

The District's informal set of rules has served it well; however, making these rules more formal and defining key performance indicators (KPIs) may be appropriate as workforce turnover increases with the departure of many long-term employees. Although an area in which the District's commission has not typically become involved, formalizing and communicating current levels of service to the District's governing body may provide helpful direction to the staff. Increased levels of service mean increased costs; there are trade-offs that need to be made and risks that need to be taken.

Step 6 – Determine Business Risk ("Criticality")

Risk and criticality are concepts that are used within asset management to help prioritize repair, renewal, or replacement of existing assets and/or installation of new assets. Not all projects can be constructed at the same time; there are financial, physical, and other resource constraints that hinder this. The level of risk or the critical nature of a specific asset can help determine how long the organization can wait to repair, renew, or replace it versus doing something with another asset in the same condition.

Although all of the District's collection system assets were built to serve the fundamental purpose of conveying wastewater to the District's Nine Springs Wastewater Treatment Plant, and all are therefore fundamentally important, some assets are more important than others and some involve higher levels of risk. A method to factor in criticality and risk for the pumping stations was included in the first collection system facilities planning effort and the same system was used for the second effort. Presently, a method to include risk or criticality for the District's sewers is also being developed.

Risk is defined as probability of failure times consequences of failure. The District's present approach to risk has barely scratched the surface of this concept. However, how much could be gained by going into much more detail in this area remains to be seen. Including risk level in decision-making has always been part of the District's approach and a general inclusion and understanding of risk while prioritizing maintenance and projects may provide the appropriate level of emphasis. As with many of the other advanced asset management concepts, this one may require further analysis to determine the appropriate level to meet the District's needs.

Step 7 – Optimize O&M Investment

Most collection system assets are long-lived assets. Therefore, most of them will need some form of maintenance, repair, and/or renewal, and ultimately, they will need replacement. How much maintenance and repair are required and when to renew or replace are not simple questions to answer. Neither is optimizing investments in maintenance, repair, and renewal to provide the lowest life cycle costs while meeting appropriate levels of service. However, that is one of the goals of a good asset management program.

The District's approach to maintenance has changed over the years and it has used a computer-based maintenance system for over ten years. The District continually modifies its approaches to maintenance based upon industry trends and specific pieces of equipment. Further analysis and improvements of the District's maintenance practices will and should continue to optimize the investment in its assets and in its maintenance resources and practices.

Step 8 – Optimize Capital Investment

All utilities should optimize their capital investments. To optimize its capital investments, a utility must make sure that its capital investment decisions include the right solutions at just the right time. Capital investments in the wastewater industry are generally significant long-term infrastructure investments with significant long-term consequences. Therefore, the decisions cannot be approached lightly. Much thought and evaluation need to go into the decision-making process to make wise and cost-effective decisions.

The District, like other utilities, must use all of its assets wisely and optimize its capital investments. Its collection system facilities plan is a prime example of how it approaches investments in its collection system capital wisely and with cost-effectiveness in mind. Projects are prioritized based upon need and follow-up planning and pre-design further investigate the need and best approach to meeting the intended purpose. The following techniques are best management practices for optimizing capital investment (taken from EPA's fundamentals of Asset Management):

1. Build a strategic CIP "Business Plan"
    - Includes project identification, validation, prioritization, and financing
    - Asks the following questions:
        i. What are we going to do and why?
        ii. What will it cost?
        iii. How will it be funded?
        iv. Life cycle impact on level of service, rates, and financial condition
    - Essentially – Are these the right projects at the right time and at the right cost?

2. Deliver the project on time and on budget
    - Includes execution and control
    - Addresses the following areas:
        i. Managing costs
        ii. Managing schedules
        iii. Managing contracts and changes

3. Integration into the portfolio of assets
    - Includes handover
    - Addresses the following areas:
        i. Registry
        ii. Start-up, shake-down, burn-in, commissioning
        iii. Manuals, spares, and service
        iv. Initiating the maintenance regimen

In general, the District's approach to capital investment covers all of these areas relatively well. That does not mean that the approach to any one technique could not be improved; however, all of the areas are covered and the District continually strives to improve how it performs them.

The District's collection system facilities plan begins the process of building the strategic business plan and initial justification for the project. The pre-design and design phases further analyze alternatives and evaluate whether or not the project is the right project at the right time. The bidding process sets the initial costs and provides a last go or no go decision. During the construction process, proper project management helps keep the project on time and on budget helping determine the final construction cost. Lastly, the turnover to the District's maintenance group integrates the new assets into the District's group of existing assets. Proper O&M throughout the life of the asset ensures that assets operate effectively to control life-cycle costs appropriately.

Step 9 – Determine Funding Strategy

Determining a funding strategy is step 9 in the process of building an asset management plan and the District has a well-developed funding strategy for funding its capital improvements plan. Rather than collect funds that are allocated for replacement, the District borrows money to pay for capital improvements including renewal projects. The District's philosophy behind this approach is that by borrowing, generally at below market rates, the District's customers who continue to use the District's system pay for the improvements while they are using them rather than having those who may or may not benefit from the improvements pay for them ahead of time.

In general, the District derives funds from three separate areas to help pay for capital improvements including borrowing, connection charges, and interest received on the capital account balance. The District takes advantage of State Revolving Fund loans to the extent possible to help fund rehabilitation projects. The District also funds new projects via connection charges for new connections to its collection system. Two separate connection charges are assessed, an interceptor connection charge and a treatment plant connection charge. In the past, connection charges have helped fund collection system expansion as well as fund a certain level of the renewal projects.

Additional funding also arrives in the way of interest derived from the balance in the capital fund accounts; the balance of these accounts should never go below a minimum of three million dollars. Recently, growth has slowed significantly as has the interest received on the capital account balance. Therefore, the District has had to borrow for a greater percentage of its overall capital expenditures. If this trend continues well into the future, the District might have to rethink some of its funding strategy.

Step 10 - Build Asset Management Plan

Step 10 integrates the previous nine steps into an asset management framework and continues to build upon and improve the plan going forward. As stated previously, the District does not have a formal advanced asset management plan; however, the District does use many of the concepts contained in the ten-step process to achieve an asset management plan and utilizes some steps more than others. The intended purpose of the District's collection system facilities plan is the same as an asset management plan: to meet expected levels of service within the District's collection system by managing those assets properly and/or by constructing new assets where necessary. The collection system facilities planning process, like any process, is subject to analysis and improvement. The components, and even the framework of this process, should be reviewed and improved periodically.

Conclusions and Recommendations

The District's Collection System Facilities Plan is an asset management plan. It utilizes some advanced asset management concepts, but has certainly only touched some of them on the surface. Further analysis of advanced asset management concepts may be warranted; however, ultimately, the usefulness of the original collection system facilities plan proves that even without major changes that would include more of these concepts, it provided a useful pathway for the District's engineering staff and capital improvement planning. Each new advanced asset management concept must add a reasonable level of additional value to the plan or it's not worth the additional effort to complete.

Although all advanced asset management concepts are not worth pursuing as part of the District's approach to asset management, the District should at least consider reviewing some of them to a greater extent. The following are recommendations based upon a cursory review of asset management concepts and the District's present practices. Further investigation and analysis is required in most instances.

- In general, become more knowledgeable in advanced asset management concepts and determine which, if any, to integrate into the District's present system of managing its assets.

- Continue to improve asset registry for the District's collection system and the condition assessment of those assets. A good systematic and consistent approach is preferred over one that is overly detailed and cannot be consistently followed.

- Improve methods to estimate remaining asset life, life cycle costs, and replacement costs.

- Review and/or establish written levels of service based upon stakeholder (customers, regulators, and other stakeholders) expectations. Consider presenting these to the District's governing body for review and approval.

- Continue to use methods that include risk and criticality in decision-making to help prioritize maintenance, repair, renewal, and/or replacement. Determine appropriate level of risk analysis to meet the District's needs.

- Optimize and continuously improve the District's maintenance program, repair and renewal methods, and capital improvement planning methods. Integrate these programs and methods to optimize overall asset and process costs.

- Continuously monitor funding strategies for the District's asset management program.

- Continue to monitor and improve the District's approach to managing its assets by building upon and improving existing practices and adding advanced asset management concepts as appropriate.

An asset management plan does not need to include all advanced asset management concepts to be a successful asset management approach. Those concepts that add value to the program should be incorporated into the District's asset management approach; those that do not should not be included. As with any change, it will take time to incorporate these practices into the District's present practices and these should occur over a reasonable timeframe. Advanced asset management and District practices are also likely to continue changing over time and therefore, review of both should continue. The ultimate goal is that the District fully optimizes how it uses its assets and continually searches for and incorporates methods to improve its practices.

Capacity, Management, Operation, and Maintenance (CMOM)

A CMOM program addresses the capacity, management, operation, and maintenance activities of a collection system. It contains many of the same elements that comprise an Asset Management Plan, with greater detail given to certain components. In general terms, a CMOM program consists of best management practices that have been developed by the wastewater industry with consideration given to the entire life cycle of the collection system components. The program helps the owner of a collection system provide a high level of service to its customers while at the same time working to improve regulatory compliance regarding sanitary sewer overflows.

Currently there are no formal requirements by state or federal governments for establishing or implementing CMOM programs. A guidance document for CMOM programs was published by EPA in 2005 to assist owners and operators in management of their collection systems (*Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems, EPA, 2005).* In August of 2007 the EPA released a document entitled "Model NPDES Permit Language for Sanitary Sewer Overflows" that essentially requires collection system owners and operators to develop and maintain a CMOM program as outlined in its guidance document.

While the proposed revisions to NPDES permits for SSO overflows have yet to be adopted, it is clear that development and adherence to such a program is likely to occur in the near future, and possibly within the planning horizon of this Facility Plan. As a result, this section is provided to: (1). Discuss the major requirements of a CMOM program (as defined by the EPA's guidance document); (2). Summarize how the District's facilities and operations are currently positioned to address each of these requirements; and (3). Provide recommendations for areas that may require further improvement.

Each major component of the EPA's proposed CMOM program will be discussed in turn in the remainder of this section as shown below:

1. Capacity Assurance
2. Management
3. Operation
4. Maintenance
5. Sewer Rehabilitation
6. Conclusions and Recommendations

1) Capacity Assurance

a) General

Capacity of the collection system should be evaluated periodically to evaluate the effects of both dry and wet weather flows on system conveyance. The first step in this evaluation involves an inventory of existing facilities and system features, including service population, total system size, and a characterization of pipe sizes, lengths, materials, and ages. The District's Collection System Database currently stores this information and integrates it with its Geographic Information System (GIS).

The second step in evaluating the capacity of the collection system is a general inspection of the system. This is discussed in more detail later in this subsection. The final step in the capacity evaluation involves identifying those areas of the collection system that are prone to capacity limitations in the form of wet weather related SSO's, surcharging, or basement backups. Those areas that are identified should be investigated more fully using techniques such as flow and rainfall monitoring and hydraulic modeling.

The District's *Collection System Evaluation (2009)*, as prepared by CARPC, will be a useful tool in identifying areas with capacity limitations by comparing system capacities against projected peak flowrates for each section of the collection system. The District has also used its recently acquired hydraulic model to further analyze areas of the collection system where capacity limitations have been identified by CARPC's analysis. The results of this investigation are discussed in more detail in Chapter 4 and Appendix 5.

b) Inspection Techniques

i) Flow Monitoring

Flow monitoring is used to collect fundamental information about the collection system, including dry weather flowrates and estimates of inflow and infiltration. The District employs a full-time crew to monitor flowrates from its satellite communities for billing purposes. Most in-line monitoring is done through weir measurements in manholes. This information is occasionally useful for establishing dry weather flowrates in District facilities, but it has limited applicability due to the short duration of the monitoring and due to the location in the system in which the monitoring is conducted. The District does not own any area-velocity or ultrasonic meters that are better suited for measuring flows in larger sewers. The District typically contracts with a consultant for flow monitoring in larger sewers for extended periods of time as part of flow and/or I/I studies. The District may want to consider investing in one or more meters if future I/I studies provide beneficial results and prove cost effective.

ii) Sewer System Testing

Leaks in the collection system are commonly identified through smoke testing or dyed water testing. Both of these techniques are used on a periodic basis when excessive I/I or a storm water cross connection is suspected in a portion of the collection system. Smoke testing is done by plugging each end of the test section, introducing smoke into the section via a blower, and recording those locations in the test section where smoke escapes. In a properly operating system the smoke should escape from the plumbing vents of adjacent buildings. In a leaky system the smoke will also escape from the ground at points along the sewer main or sewer laterals.

Dyed water testing is used to confirm the connection of a fixture or appurtenance to the sanitary sewer system. It is often used in conjunction with smoke testing to validate the results. The District has employed occasional use of both sewer system testing techniques, but would not likely have a routine need for either that would warrant additional investment.

iii) Sewer System Inspection

Visual inspection of manholes and pipelines is used to identify existing or potential problem areas that may limit capacity. Various defects in the pipeline can be identified and recorded such as root intrusion, corrosion, grease accumulation, and joint offsets. A variety of techniques for sewer inspection are available. They include lamping, camera inspection, sonar, sewer scanner, and closed circuit television (CCTV). The District aims to televise each segment of the collection system no less than once every ten years by contracting with a sewer cleaning and televising contractor. The use of CCTV by this process has served the District well in the past and should continue to do so in the future.

2) Management

Proper management of a collection system is crucial to the operation and management activities. The EPA's guidance document cites six important goals of a management program:

- Protection of public health and property
- Minimization of I/I and capacity assurance
- Prompt response to service interruptions
- Efficient use of funds
- Identification and correction of system deficiencies
- Safety

In order to achieve these six goals, a good management program should contain a strong focus on the following elements: organizational structure, training, internal communication, customer service, management information systems, a SSO notification program, and a clearly defined legal authority. Each of these areas will be discussed briefly in turn.

a) Organizational Structure

A well-defined organizational structure helps to delineate responsibilities and authority for each position in the collection system. This typically includes the use of an organizational chart, position descriptions for each employee, or both. The EPA recommends that vacant positions and work that is contracted out also be accounted for in the organizational chart. It is also recommended that one supervisor have overall responsibility for the collection system.

The District has a well-defined, overall organizational chart that is kept current and includes positions related to work in the collection system. Position descriptions for each employee have also been added to the organizational structure recently to help clarify job responsibilities and expectations. The District may want to consider developing an organizational chart specific to the collection system that shows contracted work responsibilities such as sewer cleaning and televising.

b) Training

While employee training is not explicitly required under current regulations, it is an important element of a collection system with regard to safety and regulatory compliance. The EPA recommends that training be provided in the following areas for collection system personnel:

- Routine line maintenance
- Confined space entry
- Traffic control
- Record keeping
- Pump Station O&M
- Electrical and instrumentation
- Public relations and customer service
- SSO/Emergency response

The District has a Training and Safety Manager on staff and a well-established safety program that addresses most of the areas identified above. Confined space entry policies are recorded in a written handbook and training is conducted for all affected personnel on an annual basis. A permit program for all entries is also in place. Operational and maintenance training for mechanics and electricians on all new or rehabilitated equipment at pump stations is routinely conducted by District staff or equipment suppliers.

While the District has prepared and periodically updates an emergency response manual that addresses SSO's, no formal training for employees is currently conducted. Written procedures for identification, clean-up, and notification of SSO's should be considered by the District in addition to employee training on these items. In addition, the District should consider offering formal training related to proper traffic control procedures for conformance to local road and state highway requirements.

c) Internal Communication

Effective communication requires the exchange of ideas and information amongst staff. The EPA's guidance document references the use of bulletin boards, regular staff meetings, e-mail, and employee incentive programs to promote effective communication. The District currently employs each of these communication tools as a way to exchange ideas between staff members.

d) Customer Service

Work in this area involves addressing all comments, questions, requests for information, and complaints from the public in a timely manner. This area also extends to the development of a public relations program that educates the general public, public officials and local utilities about the collection and treatment of wastewater.

The District provides wastewater conveyance and treatment to satellite communities of varying size. Thus, most of the District's customer service involves municipal officials at the town, village, or city level. In general the District's customer relations with these entities are very good. In the last year the District has worked to strengthen its public relations program. It recently contracted with a media relations company for radio advertisements promoting water conservation and I/I reduction efforts. In addition, the District recently completed a 50-year Master Planning effort and held extensive public meetings throughout the planning process to educate stakeholders about the Plan.

e) Management Information Systems

The collection, maintenance, and retrieval of data for collection system operations are important tools for system management. A good management information system improves preventive maintenance on equipment, allows work orders to be tracked more efficiently, and aids in preparing and justifying capital budget expenditures. The trend in the industry has been to use computer-based systems to manage data. For several years the District has used a computer-based Maintenance Management System (CMMS) to track the performance of assets in the collection system. Among other things, it is used to document problems and generate work orders, schedule routine maintenance activities, maintain equipment inventories, track costs, and create purchase orders.

The District has also developed a computerized database of its collection system for all pertinent physical characteristics. This database is used in conjunction with a Geographic Information System for locating and mapping of its facilities.

f) SSO Notification Program

A written procedure should be developed for all entities that could be affected in the event of an SSO. This includes the public, public health officials, and any regulatory authorities. The procedure should indicate the different agencies to be notified as well as contact information and responsibilities for all personnel involved.
The District currently notifies the Wisconsin Department of Natural Resources for each sewer bypass or sewer overflow event. It also works directly with public health officials to notify the public in the rare cases where overflows occur to surface waters. Contact information for these agencies is currently in the District's *Emergency Response Manual*, although specific written procedures are not included. The District should revise the manual to clarify the procedures to be used for SSO notification.

g) Legal Authority

This section deals with the regulation of flow that enters the collection system from residential, commercial, and industrial sources. The legal authority for this regulation can be in the form of a sewer use ordinance, contracts, service agreements, or some other legally binding document. Included in this authority is a pretreatment program to prevent the discharge of materials into the collection system that would interfere with the conveyance or treatment operations. This legal authority should also extend to include general prohibitions, grease control requirements, restrictions on stormwater inflow and infiltration from laterals, and new construction standards.

The District's Sewer Use Ordinance, along with its pretreatment program, provides the legal authority to regulate most of the items described above. Among other regulations, it provides standards for new connections, restricts clear water and storm water flows, and prohibits grease discharges. The District's pretreatment procedures are prepared in a written document and approved by WDNR on a periodic basis. These procedures specify sampling requirements and procedures and sets limits on constituents in wastewaters discharged from non-domestic sources.

With regard to the issue of excess flows from satellite communities, the District continually evaluates the effects of large rainfall events on the collection system and works with its customers to identify and correct problem areas. This approach has worked with success in the past. As such, the District currently does not employ the use of contracts, agreements, or allocations to regulate excess flows from its satellite communities. However, large storm events have increased in intensity and frequency over the last ten years and may cause the District to consider executing agreements for excess flow allocations in the future. Significant expense would be incurred by the District to enforce the monitoring requirements for such a program given the large number of customers served by the District as well as their geographic layout. The costs for this monitoring effort would need to be balanced against the costs needed to reinforce the District's conveyance facilities to accommodate larger wet weather flows. Non-economic factors should also be considered in this evaluation.

3) Operation

Collection systems have limited operability options relative to wastewater treatment plants as there usually is only one route for the wastewater to travel from the source to the plant. There are many factors to consider, though, with regard to operational activities of the collection system.

a) Budgeting

Budgeting is one of the most important components of a CMOM program. Inadequate funding makes achieving operational goals difficult. One way to avoid inadequate funding is to develop a consistent annual baseline for operating costs and to track expenditures closely. Costs of preventive and corrective maintenance and major repairs for the collection system are key components of the annual operating budget. An owner may develop a separate Capital Improvement Plan (CIP) to complete small projects (one to two year cycles) or larger projects (three to five year cycles).

The District prepares and adopts annual budgets for operational expenses and capital projects. The primary source of revenue to cover these expenses comes from service charges collected from the District's satellite communities. As mentioned previously, the District uses a CMMS system to track its annual operating expenses and also projects a 10-year Capital Improvement Plan. As a result, increases in service charge rates are generally consistent and average approximately 5% per year. No further changes in budgetary practices are anticipated to meet CMOM program requirements.

b) Monitoring

Monitoring of wastewater discharges in the collection system may be done by the owner for a variety of reasons. These include monitoring of industrial users for permit compliance, monitoring of satellite communities for billing purposes, monitoring receiving waters to assess SSO effects, and monitoring required for NPDES permit compliance. The EPA guidance document recommends that written procedures be developed to ensure that sampling is done in a safe, effective, and consistent manner. This document should include key items such as instructions for sampling and field monitoring and laboratory procedures for analysis.

The District employs one full-time crew for monitoring and sampling of wastewater throughout the collection system. The majority of the crew's time is devoted to quarterly sampling and monitoring of flows from satellite communities for determination of service charges. The crew also performs monitoring on a limited number of industrial users, although many of these users do their own monitoring. While the District's pretreatment program does contain some written procedures related to sampling and monitoring requirements (i.e. sample volumes and frequencies), the District may want to consider developing a more detailed procedure that contains all of the elements referenced in the EPA's guidance document.

c) Hydrogen Sulfide Monitoring and Control

Hydrogen sulfide gas can collect in various parts of collection systems and react with bacteria to form sulfuric acid, which can corrode metal and concrete surfaces. The EPA's guidance document recommends that a program be developed to monitor areas of the collection system which may be adversely affected by the presence of hydrogen sulfide.

The District performs routine manhole and sewer line inspections as part of its televising program. The condition of the manholes and sewers due to corrosion is recorded on inspection forms, although pH readings in the system are not generally taken. Acquiring pH readings in manholes in vulnerable parts of the collection system may be something the District wants to consider in its inspection program going forward.

The District has also addressed the issue of hydrogen sulfide control in specific parts of its collection system due to odor complaints or observations from operations staff. The addition of chemicals to reduce the level of sulfides has been studied but not implemented as a long-term solution. Other chemicals have been used to "mask" the odors caused by sulfides. The best operational strategy to eliminate problems due to hydrogen sulfides is to select materials of construction that are resistant to corrosion (i.e. PVC, fiberglass). The District has elected to use these pipe materials as its standard on new or rehabilitation projects over other materials such as concrete and steel.

d) Safety

Safety programs define the standards under which the work is to be accomplished and to make employees aware of safe working procedures and specific regulations. The safety program should be established in writing with respect to specific procedures and policies.

The EPA's guidance document recommends that safety programs be enacted for the following areas related to collection systems:

- Confined spaces
- Chemical handling
- Trenching and excavations
- Material Safety Data Sheets
- Biological hazards in wastewater
- Traffic control and work site safety

- Lockout/Tagout
- Electrical and mechanical safety
- Pneumatic or hydraulic systems safety

The District holds weekly safety meetings for all employees that deal with most of the items listed above. Material Safety Data Sheets are readily available to all employees for materials which are routinely used in District operations. While clearly defined procedures and policies have been developed for some of the items such as confined spaces, more written documentation could be provided for some of the other areas.

e) Emergency Preparedness and Response

Comprehensive plans should be in place for handling both routine and catastrophic emergencies. Examples of routine emergencies include overflowing manholes, sewer main breaks, localized electrical failures, and power outages at pumping stations. Catastrophic emergencies include extreme events such as floods, tornados, earthquakes, chemical spills, and widespread electrical outages.

The District has prepared, and updates on an annual basis, its *Emergency Response Manual* to address emergency situations. Among other information, it provides procedures to be followed during pump station outages, information related to repair of force mains, and contact information related to sewer overflows and other types of spills. This manual is made available to each employee in written form and on the District's internal website.

In addition, the District is in the preliminary stages of preparing a risk-based condition assessment for its collection system. This assessment will account for risk factors such as facility age, material, depth, location, and criticality in order to assess the risk of failure of each component and aid in prioritizing future rehabilitation projects.

f) Modeling

Sewer system modeling is done to help simulate non-uniform and unsteady flows throughout the collection system in response to different operating conditions and rainfall events. It can be a valuable tool in new designs and in evaluating different operating scenarios.

The District developed a hydraulic modeling tool for its collection system in 2005. It has been used primarily for evaluating capacity based on existing flows and future flow projections. The hydraulic model is described in more detail in Chapter 3 of this Plan.

g) Mapping

The creation and maintenance of good mapping records is crucial to the effectiveness of a collection system. The EPA's guidance document specifies that the following information should be included at a minimum: sewer mains, laterals, manholes, cleanouts, force mains, pump stations, service area boundaries, and other landmarks. The District maintains all the physical characteristics described above in its collection system database and maps these features using its Geographic Information System. Aerial photography is included in the mapping to aid in the location of facilities. Map books are updated on a regular basis to incorporate system modifications and mapping improvements.

h) New Construction

This section calls for the strict control and regulation of flows into the collection system from new construction. This includes both public and private sewers. The owner should adopt standards for new construction and procedures for the review of proposed extensions.

The District specifies standards for plan review, construction, inspection, and testing of new connections through its Sewer Use Ordinance. Proposed sewer extensions are reviewed by District staff, a county regulatory agency for conformance to area water quality plans, and the Wisconsin Department of Natural Resources. The District's review ensures that the collection system has adequate capacity to serve the proposed extension and that the proposed construction materials are adequate.

i) Pump Stations

Pump stations vary in their type, size, and complexity and require differing levels of specialized mechanical, electrical, and hydraulic knowledge. Failures can lead to equipment and environmental damage, or even endanger public health. The District owns and operates 17 regional pumping stations and employs its own electrical and mechanical maintenance staff to maintain and repair equipment.

4) Maintenance

Collection system owners should develop well-planned, systematic, and comprehensive maintenance programs which incorporate the following goals:

- Prevention of overflows
- Maximization of service and system reliability at minimum cost
- Assurance of infrastructure sustainability

Maintenance activities can be broadly classified as planned or unplanned. Planned maintenance includes both predictive and preventive measures, which aim to treat operational problems prior to equipment failure. Unplanned maintenance consists of corrective or emergency measures which are used to repair equipment once it has failed.

Proper maintenance programs should incorporate the various elements discussed further in this subsection.

a) Maintenance Budgeting

Maintenance costs can be a significant part of the annual operating budget. As such, these costs should be closely tracked throughout the year to ensure that future budgets have appropriate funding.

The District's maintenance costs are included in its annual operational budget. As mentioned earlier in the discussion of operational budgets, the District employs the use of a CMMS system to track operational and maintenance costs. This system has served the District well and no changes to this system are recommended at this time.

b) Planned and Unplanned Maintenance

i) Predictive Maintenance

Planned maintenance involves a systematic approach to maintenance activities such that equipment failure is avoided. As mentioned previously, this includes both predictive and preventive maintenance. Examples of predictive maintenance include equipment inspection and monitoring equipment for early warning signs of failure such as vibration, heat, dirty oil and leakage. Recording and storing the data obtained from inspection and monitoring activities is a key component of predictive maintenance.

The *2002 Collection System Facilities Plan* recommended development of a predictive maintenance program for pumping equipment in the collection system. The District has implemented this recommendation in its rehabilitation of Pump Stations 1, 2, 6, 8 and 10 through the installation of pump vibration sensors. In addition, the District recently purchased a thermal imaging scanner to detect unusual heat patterns or temperature changes in electrical equipment (i.e. motor control centers and control panels) as an indicator tool for impending electrical failure of the equipment. The goal is to scan each piece of equipment to develop a baseline for future comparison so that any problems can be corrected before equipment failure. One challenge of this thermal imaging program is to develop an efficient way to store all of the information that is obtained from the scans and link it to the District's asset management software. This is an area that will require further study and work.

ii) Preventive Maintenance

Preventive maintenance aims to reduce equipment breakdowns, improve system reliability by minimizing equipment outages, lengthen equipment life, and avoid potential noncompliance situations. An effective preventive maintenance program should contain the following elements:

- Trained personnel
- Scheduling based on system specific knowledge and manufacturer's recommendations
- Detailed instructions related to the maintenance of various pieces of equipment
- System for recordkeeping
- System knowledge in the form of maps, historical knowledge and records

A maintenance record for each piece of equipment should be maintained which contains information related to maintenance recommendations, schedule, instructions, and past maintenance history.

The District's CMMS is used to store and track information on all District assets at the treatment plant and at pumping stations in the collection system. This includes equipment specifications, bill of materials, maintenance schedules, and other related maintenance materials. The District typically requires and receives an Operating and Maintenance Manual from the manufacturer for each new or rehabilitated piece of equipment in the collection system. This information is used to generate schedules and instructions for preventive maintenance items. An asset identifier for each gravity sewer segment in the collection system has recently been added to the District's CMMS.

Other examples of predictive maintenance activities performed by the District include biweekly inspections of its 17 regional pumping stations, periodic inspection and cleaning of air release valves on force mains, and lubrication of equipment at pumping stations. Air release valves have historically been inspected and cleaned as necessary. Due to repeated problems with plugging of these valves, the District recently began a program to inspect and clean these valves no less than twice a year.

Pump station inspections include starting and stopping each pumping unit to check for vibration or plugged vent lines and documentation of other items that may require corrective maintenance. In addition, the District employs one full-time lubrication mechanic to ensure that all pumping equipment is greased according to the manufacturer's schedules.

On an annual basis inspections of all the District's pumping stations are made by the Director of Operations and Maintenance to identify and document large repair items that may be outside the scope of routine work orders. These items are prioritized and inserted into the Capital or Operational budgets as appropriate.

iii) Corrective Maintenance

Maintenance of this type can occur as a result of predictive or preventive maintenance activities which identify a problem. In these instances a work order is generally issued to the proper personnel for repair as soon as a problem is identified. Maintenance of this type usually results in the equipment being taken out of service for a period of time and reduces redundancy in the system.

The District's CMMS is used to generate, store, and track all work orders that pertain to corrective maintenance. Lengthy service disruptions are minimized through use of the CMMS by the ability to easily review open work orders.

iv) Emergency Maintenance

Emergency maintenance requires immediate attention and repair of a problem to avoid equipment failure or threats to public health or the environment. In large collection systems this may require emergency crews to be available at all times throughout the year, while smaller systems may utilize an "on-call" system. Written procedures should be in place to outline actions to be taken and the equipment needed for emergency situations.

The District has prepared, and updates on an annual basis, its *Emergency Response Manual* for responses to emergency events. This document deals with situations such as repairs to force mains, outages at pumping stations, emergency spills (including SSO's), and contact information for contractors, satellite communities, and regulators. For emergency events such as force main breaks, the District usually hires a contractor to excavate and make repairs.

c) Sewer Cleaning

Sewer cleaning removes accumulated material from the sewer and helps to prevent blockages and prepare the sewer line for televising. The key to an effective sewer cleaning program is recordkeeping. Not all areas of the collection system need to be cleaned at the same frequency. For example, those parts of the system with a high density of restaurants may need to be cleaned every six months, while a residential area with new pipe may not require cleaning for several years. An owner should be able to identify problem areas in the system and show how the preventive maintenance schedule addresses these areas. In addition, an owner should be able to document the number of stoppages experienced per mile of sewer.

The District does not clean sewers with its own forces. All sewer cleaning is contracted out on an annual basis under one contract. In general all sewers are cleaned no less than once every ten years, with any problem areas receiving more frequent attention. Due to the larger pipe sizes and magnitude of flows in the District's sewers compared to local sewers, this frequency of cleaning has found to be adequate based on past experience. The District links its sewer cleaning and televising operations and manages them through a computerized database. While the database has proved to be a useful tool, challenges have been noted with regards to development of a scoring and rating system for sewer condition and with the reporting of these scores for use in scheduling cleaning operations and repair or rehabilitation projects. The District should continue to develop the database to refine these areas.

d) Parts and Equipment Inventory

Spare parts, equipment, and supplies should be kept in inventory to keep equipment from being placed out of service for long periods of time after breakdown or malfunction. Inventory should be based on the equipment manufacturer's recommendations as well as the owner's past experience.

The District's Purchasing Manager is responsible for overall management of inventory for equipment used in the collection system, with assistance from the mechanical and electrical maintenance departments. Information regarding inventory is stored and tracked via the District's CMMS. Sign-out procedures for parts are in place for replenishing inventory. No changes to the District's inventory practices are recommended at this time.

5) Sewer Rehabilitation

The owner should develop a sewer rehabilitation program to incorporate the results of the capacity assurance, management, operation, and maintenance activities. Sewer rehabilitation helps to ensure that the collection system remains viable by: (1). Maintaining structural integrity; (2). Limiting the loss of conveyance; and (3). Controlling the rate of exfiltration from the pipe network to protect groundwater. The sewer rehabilitation program should clearly indicate how projects are prioritized and how rehabilitation methods are selected (i.e. open cut vs. trenchless construction).

The District currently does not have a formal sewer rehabilitation program. Projects are currently identified as a result of periodic capacity analyses or condition reports. The decision on the type of repair method to be used is generally made based on facility planning or pre-design reports. The District has completed a number of sewer lining projects in the last 3-4 years and has found them to be a cost-effective tool to prolong the service life of sewers in certain applications. As this technology evolves and improves and the District's collection system ages and grows, the District may want to consider a more formalized approach for identifying rehabilitation projects and construction methods.

As mentioned in the Emergency Preparedness and Response section for Operational activities, the District recently began development of a risk-based condition assessment tool to help identify and rank the most critical portions of the collection system. Continued development, refinement, and use of this tool with other data regarding the collection system are recommended to help prioritize future rehabilitation projects.

6) Conclusions and Recommendations

After reviewing the key elements and requirements for a CMOM program as found in the EPA's guidance document, it appears that the District is well positioned in the event that the program gets enacted. The District currently implements many facets of the program in its current operation of its collection system. Recommendations for improvements to the collection system have been discussed in the preceding sections. These recommendations are summarized by section below:

- Capacity Assurance
  - Consider purchase of flow metering equipment for I/I studies.

- Management
  - Develop an organizational chart specific to the collection system. Indentify all contracted work in the structure.
  - Develop a written procedure for SSO events. This should include procedures for identification and clean-up of overflows and notification requirements.
  - Offer or conduct training program for traffic control procedures.
  - Consider use of service agreements or contracts with satellite communities to regulate wet weather flows and I/I into District's collection system.

- Operation
  - Develop written rules and procedures for monitoring of wastewater.
  - Acquire pH readings in manholes as part of hydrogen sulfide monitoring program.
  - Develop and assemble a written safety program relating to collection system work areas.

- Maintenance
  - Develop a system to link thermal imaging scans for predictive maintenance to equipment asset information in CMMS.
  - Refine District televising database to improve scoring and ranking system. Incorporate the scheduling of cleaning and televising operations into database.

- Sewer Rehabilitation
  - Develop a risk-based condition assessment model to aid in prioritizing sewer rehabilitation and replacement projects.

The District will also need to consider the format of its CMOM document. At present the required information can be found in several separate locations (i.e. Geographic Information System, Collection System Facilities Plan, Emergency Response Plan, etc.). The District will need to consider the advantages and disadvantages of compiling all of this information in one central location and/or document.

Chapter 3
Progress since Original CSFP was Developed

Chapter Outline

This chapter is organized into the following sections:

- Status of recommended projects in *2002 Collection System Facilities Plan*
- Screenings and Solids Handling Update
- Hydraulic model

Status of recommended projects in *2002 Collection System Facilities Plan*

The *2002 Collection System Facilities Plan* has served as a useful guide for the District in identifying, prioritizing, and implementing improvements to the collection system over the past ten years. A list of recommended projects was included in Chapter 7 of the original facilities plan spanning four different periods of time (Table 7.1). A condensed listing of these projects is shown in Table 3.1 to show the current status of the recommendations up to the year 2010. Of the 52 projects recommended for completion between 2000 and 2010, 48 have been completed or the project was under construction as of 2010. Table 3.2 is a brief summary of the recommended projects that have yet to be completed and their current status.

Table 3.2 – Status of Uncompleted Projects from *2002 Collection System Facilities Plan*

Project	Status	Projected Completion
New PS 18	Facility planning starting in 2011	2015
PS 18 – New forcemain	Facility planning starting in 2011	2015
PS 10 – I/I study	Pending	-
PS 14 – I/I Study	Recommended per CSFP Update	2011-2012

Based on Tables 3.1 and 3.2, all collection system projects recommended in the 2002 Plan, with the exception of the inflow and infiltration study for the PS10 service area, will be completed by 2015. The need and scope for an I/I study in the PS10 service area requires further study and prioritization relative to other areas in the collection system.

Table 3.3 provides a summary of the major improvement projects that have been completed in the collection system from the year 2000 to 2010. At least one project was

Table 3.1 - MMSD Collection System Projects Completed From 2000 to 2010

Table 7.1 - MMSD Collection System Facilities Plan (2002)
MMSD Collection System Projects
Approximate Timetable and Costs

Project	Project Completed?	Cost Estimate (Year 2000 dollars) Period A 2000 - 2005	Period B 2006 - 2010	Primary Need: Hydraulic Capacity	Primary Need: Physical Condition	Comments
System Wide Projects						
Telemetry System Modifications	x	$ 100,000				Majority of work completed in 2000
Predictive maintenance program for pumps	x					To minimize risk of equipment outages
Collection System Dynamic Modeling	x	$ 250,000				A tool for analysis of high flows vs. time
Pumping Station No. 1 Service Area						
Crosstown FM Repl. at Monona Terrace	x	$ -			x	1,050-ft. project, completed in 1995.
Crosstown FM Replacement at Yahara River	x	$ 500,000		x	x	1,330-ft. project, completed in 2000.
Crosstown FM Replacement to PS2	x	$ 5,000,000		x	x	14,400-ft. E. Wash. Ave. to PS2, 2002.
Burke Outfall Replacement	x	$ 2,500,000			x	5,000-ft. Commercial Ave. to First St.
PS1 Major Rehab.	x	$ 3,000,000		x	x	PS1 (1950) will be approx. 55 years old
North End Interceptor Replacement	x	$ 300,000		x	x	1,700-ft. along Commercial Ave.
Pumping Station No. 2 Service Area						
PS2 Force Main Replacement-Phase I	x	$ 2,000,000		x	x	NSWTP to Van Duesen St., 2000
PS2 Force Main Replacement-Phase II	x	$ 2,500,000		x	x	Van Duesen St. to PS2, 2001
PS2 Major Rehab. incl. capacity revisions	x	$ 3,000,000		x	x	PS2 (1963) will be approx. 50 years old
SWI W. Shore Drive Replacement	x	$ 400,000		x	x	1,700-ft included with PS2FM Phase II
Pumping Station No. 3 Service Area						
Pumping Station No. 4 Service Area						
South Int. Baird Street Rehabilitation	x		$ 300,000		x	1,500-ft. VCP from 1928 (lined in 2009)
Install Second Power Feed	x	$ 100,000			x	
Pumping Station No. 5 Service Area						
Pumping Station No. 6 Service Area						
Short term electrical improvements	x	$ 50,000			x	
PS6 Major Rehab	x		$ 3,000,000		x	PS6 (1950) will be approx. 60 years old
Pumping Station No. 7 Service Area						
NEI Replacement at Buckeye Road	x	$ 150,000		x	x	FM, MH & 186-ft of 48", with City road project.
NEI Relief from PS10FM to FEI junction	x	$ 2,500,000		x	x	7,400-ft. of 30"-42" needs relief
New PS18			$ 5,000,000	x		For future growth and reliability
New PS18 Forcemain			$ 7,000,000	x	x	From new PS18 to NSWTP
Door Creek - Gaston Road Extension	x		$ 200,000			Extension to cross Interstate 94 at Gaston Road
Pumping Station No. 8 Service Area						
West Interceptor Campus Relief - Phase 1	x	$ 600,000		x	x	1,147-ft. Randall Ave to Matls.Science Bldg.
West Interceptor Campus Relief - Phase 2	x	$ 900,000		x		700-ft. University Ave. Tunnel
West Interceptor Campus Relief - Phase 3	x	$ 50,000		x	x	1,101-ft. behind Babcock Hall & Stock Pav.
West Interceptor Campus Relief - Phase 4	x	$ 1,300,000		x	x	2,600-ft. UW Ag. Campus to Walnut Street
SWI Relocation for Home Depot	x	$ -				Completed in 2000 for new buildings.
SWI South Leg Relief	x		$ 800,000	x		4,322-ft from Home Depot to SWI junction
SWI North Leg Relief	x		$ 1,100,000	x		5,639-ft of 15"-18" may need relief
SWI Rehab at Chippewa Drive	x	$ 100,000			x	1,387-ft of 12" VCP rehab for I/I
Power System Modifications	x	$ 50,000				For added power supply redundancy
PS8 Major Rehab	x		$ 3,000,000	x	x	PS8 (1964) will be approx. 45 years old
Pumping Station No. 9 Service Area						
I/I Study	x			x		Monitoring study completed 1998
Second power feed	x	$ 100,000				
Pumping Station No. 10 Service Area						
I/I Study		$ 50,000		x		
NEI Relief d/s of Lien Interceptor junction	x		$ 2,000,000	x		6,600-ft of 48" d/s of Lien Int. will need relief
NEI Relief u/s of Lien Interceptor junction	x		$ 800,000	x		2,600-ft. of 36"-42" u/s of Lien Int. may need relief
PS10 Major Rehab.	x	$ 3,000,000		x	x	PS10 (1964) will be 40 years old. Operating new peak capacity must wait for d/s NEI gravity relief.
Pumping Station No. 11 Service Area						
NSVI Nicolet Replacement	x	$ 300,000			x	Completed in 2000
PS11 Firm Capacity Improvements	x	$ 200,000		x		

Project	Project Completed?	Cost Estimate (Year 2000 dollars)		Primary Need		Comments
		Period A	Period B	Hydraulic Capacity	Physical Condition	
		2000 - 2005	2006 - 2010			
Pumping Station No. 12 Service Area						
I/I Study	**x**			x		Monitoring study completed 1998
Control system modifications	**x**	$ 50,000				
PS12 Firm Capacity Improvements	**x**	$ 200,000		x		
Pumping Station No. 13 Service Area						
I/I Study	**x**	$ -		x		Will be performed by City of Madison
NEI Rehab west of Airport	**x**		$ 300,000		x	1,500-ft. of 48" RCP rehab
PS13 Firm Capacity Improvements	**x**	$ 200,000		x		
Pumping Station No. 14 Service Area						
I/I Study		$ 50,000		x		
PS14 Firm Capacity Improvements	**x**	$ 200,000		x		
Pumping Station No. 15 Service Area						
West Int. Extension Replacement	**x**		$ 750,000	x	x	3715-ft. 24" & 18", Century Blvd. to Allen Blvd.
Pumping Station No. 16 Service Area						
West Int. Gammon Ext. Relief	**x**	$ 750,000		x		2,000-ft. on Voss Pkwy. and Fortune Dr. was built. ~1,200 ft on Middleton St. not built.
PS16 Control Improvements	**x**	$ 50,000			x	
Pumping Station No. 17 Service Area						
Lower Badger Mill Creek Interceptor to PS17	**x**		$ 3,000,000	x		Phases I & II built (PS17 to Cross Country Road). Remainder of route to Midtown Road not built.
Total Projects		$30,500,000	$27,250,000			

Table 3.1

Table 3.3
IMPROVEMENTS TO MMSD COLLECTION SYSTEM: 2000-2010

	PROJECT NAME	Project Description	Approx. Year Completed
System-wide Improvements			
	Telemetry system upgrade		2000
	Dynamic Model	Computer model of MMSD collection system for continuous flow simulation.	2005
Pump Station No. 1 Service Area			
	Crosstown FM: PS#1 to East Wash.	New 24" FM from PS#1 to East Wash Ave	2000
	Crosstown FM: PS#1 East Wash to PS#2	New 30" FM from East Wash Ave to PS#2	2002
	North Basin Interceptor	New 42" & 36" from 1st St. to Commercial; New 18" & 20" from Sherman to Commercial	2002
	PS#1 Rehab	X-Town pumps removed. A&B removed and new X-Town pumps installed. C&D remain. All VFD.	2005
Pump Station No. 2 Service Area			
	PS#2 FM Replacement	New 36" FM replaced existing 30"	2001
	PS#2 FM Changes at NSWTP	Extension of PS#2 FM to new Headworks Building during the 10th Addition	2005
	PS#2 Rehab	All 4 pumps replaced (all same size: 2 constant speed & 2 VFD)	2005
	SWI-Shore Drive Replacement	Approx 1,700 LF of 24" replaced with 36"	2001
	WI-Spring St. Relief Replacement @ Park St.	Approx. 155 LF of 24" replaced with 24" at Park Street crossing	2006
Pump Station No. 3 Service Area			
	Impeller Mods (due to PS#2 changes)	Larger impellers (both pumps) installed by the O&M Department	2005
Pump Station No. 4 Service Area			
	Impeller Mods (due to PS#2 changes)	Larger impellers (pumps B & C only, not A) installed by the O&M Department	2005
	South Interceptor - Baird Street Extension Lining	Cured-in-place liner installed in approximately 1,400 feet of 15" pipe	2009
	Power Feed Redundancy	Install second power feed.	2006
Pump Station No. 5 Service Area			
	None		
Pump Station No. 6 Service Area			
	Pump #6C Retired	Motor on pump 6C failed and not replaced. Impacts firm capacity	2006
	Pump Station Rehabilitation	Four new pumps, related electrical and control work, and new HVAC system.	2010
Pump Station No. 7 Service Area			
	NEI-Pflaum Road Replacement	Approx. 7,400 LF of new 36"-54" from Buckeye Road to FEI Junction	2005
	PS#7 FM Changes at NSWTP	Extension of PS#7 FM to new Headworks Building during the 10th Addition	2005
Pump Station No. 8 Service Area			
	WI Campus Relief-Phase 1	Approx. 1,150 LF of 36" Relief Sewer-Randall St. to Metallurgy Bldg.	2000
	WI Campus Relief-Phase 2	Approx. 700 LF of 36" Tunnel from Metallurgy Bldg. to Babcock Hall	2001
	WI Campus Relief-Phase 3	Approx. 1,100 LF of 36" Relief Sewer-Babcock Hall to Stock Pavilion	1999
	WI Campus Relief-Phase 4	Approx. 2,700 LF of 36" Relief Sewer-Stock Pavilion to Walnut Street	2004
	SWI-MH02-163 to MH02-167 Liner	Approx. 1,390 LF of 12" VP lined with CIPP	2001
	SWI-North & South Legs Liner	Entire length of North & South Legs lined (with CIPP)	2007
	PS#8 FM Changes at NSWTP	Extension of PS#8 FM to new Headworks Building during the 10th Addition	2005
	Pump Station Rehabilitation	Four rebuilt pumps, related electrical and control work, and new HVAC system.	2010

Table 3.3
IMPROVEMENTS TO MMSD COLLECTION SYSTEM: 2000-2010

	PROJECT NAME	Project Description	Approx. Year Completed
Pump Station No. 9 Service Area			
	Pump Replacements (by O&M Dept.)	All 3 pumps replaced (same size) by O&M Department	2006
	Electrical Improvements	Replaced electrical system and added second power feed.	2005
Pump Station No. 10 Service Area			
	PS#10 Rehab	All 4 Pumps replaced (3 new pumps; all same size; 1 constant speed & 2 VFD)	2005
Pump Station No. 11 Service Area			
	PS#11 FM Changes at NSWTP	Extension of PS#11 FM to new Headworks Building during the 10th Addition	2005
	NSVI-Nicolet Replacement	Approx. 1,150 LF of 24" replaced with 30" near Nicolet Instruments	2001
	PS#11 Firm Capacity Improvements	11B to pump in parallel with 11C or 11D to improve firm capacity	2008
Pump Station No. 12 Service Area			
	PS#12 Firm Capacity Improvements	12B to pump in parallel with 12C or 12D to improve firm capacity	2008
	Control System Modifications	Installed new system control center	2000
Pump Station No. 13 Service Area			
	PS#13 Firm Capacity Improvements	13A replaced. 13B re-built. 13A&13B pump in parallel for firm capacity. 13C unchanged.	2008
	NEI-Airport Relocation	Approx 1,990 LF of 48" FRP replaced 2,480 LF of RCP on west side of Airport	2007
Pump Station No. 14 Service Area			
	PS#14 Firm Capacity Improvements	14A replaced. 14B re-built. 14A&14B pump in parallel for firm capacity. 14C re-built.	2008
Pump Station No. 15 Service Area			
	WI Extension Replacement	Approx. 2,800 LF of 24" replaced with 3,200 LF 42"&36" from Mendota Ave to Mid. Sprgs Dr.	2007
Pump Station No. 16 Service Area			
	Fortune Drive Replacement	Approx. 2,000 LF of 24" replaced with 36" from Gammon Road to Middleton Street	2002
	Control System Upgrade	Replaced original control system with PLC-based controls	2009
Pump Station No. 17 Service Area			
	LBMC Interceptor-Phase 1	Approx 8,000 LF of new 27"-36" interceptor on west side of Verona	2006
	LBMC Interceptor - Phase 2	Approx 5,000 LF of new 27"-30" Interceptor on west side of Verona	2008
	Dual Pumping Modifications	Electrical/control modifications to allow parallel pumping	2007
Pump Station No. 18 Service Area			
	New Forcemain at NSWWTP	Installed ~650 feet of 42" forcemain piping at plant as part of Tenth Addition to NSWWTP project	2005

completed in each pump station area except for Pump Station 5, with a strong emphasis on improvements in the Pump Station 8 service area.

Screenings and Solids Handling Update

Chapter 5 of the *2002 Collection System Facilities Plan* provided a discussion of screening and solids handling at MMSD's pumping stations. The goals for screening and solids handling as presented in the facility plan are summarized as follows:

- Remove screening materials from the wastewater at some point in the treatment or conveyance process.
- Minimize the number of sites where screening materials are collected in order to mitigate operation and maintenance costs and odor complaints.
- Reduce the volume and weight of any screened material by washing, dewatering, and compacting.
- Contract with a local waste removal company to handle and dispose of screening materials.
- Protect pumps from harmful objects and materials that are present in the wastewater.

Fine screening equipment was installed in the new Headworks Facility that was constructed as part of the 10th Addition to NSWWTP improvements in 2005. The use of fine screens accomplished the District's primary goal of removing solids in one central location. Three alternatives were presented in the *2002 Collection System Facilities Plan* to address the remaining solids handling issues at District pumping stations:

1. Alternative 1: Remove all existing solids handling equipment at pumping stations.
2. Alternative 2: Install channel grinders in the incoming flow stream.
3. Alternative 3: Install and/or retrofit mechanical bar screening operations and provide an automated method for cleaning, dewatering, and compacting the screened materials.

Alternative 1 was chosen as the preferred alternative upon installation of fine screening equipment at the treatment plant in 2005. This alternative addressed all of the aforementioned goals except for the protection of pumping equipment. It allowed operation and maintenance efforts to be concentrated in one central location, thereby lowering costs. Screening, dewatering, and compaction of screenings would not have to be performed at each pumping station. This alternative also eliminated the need for District personnel to clean and maintain solids handling equipment and manually dispose of screenings at several pumping stations. As a result, working conditions for District employees would be improved by less exposure to confined spaces and less handling of wet, heavy, odorous material.

Solids handling equipment was present in eight of the District's 17 pumping stations at the time that the fine screens were installed at the treatment plant in 2005. The bar screens at PS1, PS2, PS6, PS7, PS10, and PS11 were removed upon start-up of the fine screening equipment. The bar screen at PS8 was decommissioned in 1999 when a channel grinder was installed. The grinder was subsequently removed as part of the station rehabilitation in 2008 due to its maintenance requirements and inability to pass certain materials. A channel grinder at PS17 is the only form of solids handling equipment that is still present in the District's collection system. A brief history of solids handling equipment employed at each station is shown in Table 3.4.

The only solids handling goal of the *2002 Collection System Facilities Plan* that was not addressed under Alternative 1 was protection of wastewater pumping equipment. Based on past experience, District staff felt that the pumping units in the collection system could adequately pass any large solids that might be present in the wastewater without endangering the performance of the equipment.

The result of removing bar screens at the larger pumping stations in 2005 and 2006 has generally been positive. Pumps at PS1, PS2, PS8, PS10, and PS11 have generally required more frequent attention due to plugging with rags and other solid material over the last five years, as would be expected, although the increase in required maintenance is not excessive. Table 3-5 provides an estimate of the time spent by District mechanics removing rags from pumps in 2010. Overall, it is estimated that District mechanics spend approximately 6.9% of their working time addressing the issue of rags at both District and non-District pumping stations. The amount of time spent at PS7 dealing with rags is significant (approximately 26% of total).

There does not appear to be a clear reason for the higher frequency of pump plugging at PS7 relative to the other pumping stations. Pumping stations immediately upstream of PS7 (PS6, PS9, and PS10) do not exhibit similar problems. District staff has analyzed various control strategies to address pump plugging problems at PS7. One strategy that has been employed thus far uses automated gates in the inlet channel to the wet well to isolate each half of the well to increase flushing velocities and eliminate possible dead zones in the wet well near pump inlet piping. The effect of this change and other possible changes will be evaluated on an ongoing basis.

Given the problems observed with pump plugging at PS7 since removal of the bar screens in 2006, it is expected that some form of screening will be implemented at PS18. The screened material will be cleaned, dewatered, and compacted to mitigate volume, weight, and odors, and will be collected for disposal by a private waste hauler. It is not expected that MMSD personnel will be involved in the collection and disposal of the screenings. Based on preliminary flow splitting alternatives for PS7 and PS18, it is estimated that approximately 75% of the flow that is currently conveyed to PS7 will be screened at future PS18.

Table 3.4 – History of Solids Handling Equipment at District Pumping Stations

Pump Station	Solids Handling Equipment	Year Installed	Year Removed	Status of Solids Handling Equipment (2010)
1	Bar screen	1975	2005	None
2	Bar screen	1964	2005	None
3	None	-	-	None
4	Comminutor	1967	1994	None
5	None	-	-	None
6	Bar screen	1975	2006	None
7	Bar screen	1992	2006	None
8	Bar screen	1963	1999	None
	Channel grinder	1999	2008	
9	None	-	-	None
10	Bar screen	1965	2005	None
11	Bar screen	1965	2006	None
12	Comminutor	1969	1994	None
13	Comminutor	1970	1993	None
14	Comminutor	1971	1994	None
15	Barminutor	1974	1989	None
16	Barminutor	1982	1985	None
17	Channel grinder	1996	N/A	In Service

Table 3.5 – Rag Removal at District Pumping Stations (2010)

Pump Station	Time Spent by District Mechanics Removing Rags from Pumps (hours)	Time Spent by District Mechanics Removing Rags from Pump Vents (hours)
Pump Station 7	228	-
Pump Station 11	142	6
Other District Pump Stations(1)	214	37
Non-District Pump Stations(2)	194	45
TOTAL	**778**	**88**

Notes/Calculations:

1) Includes all District owned pumping stations except for PS7 and PS11.

2) Includes pump stations maintained, but not owned, by MMSD.

3) Estimate of time spent by District mechanics in 2010 on rag removal at pumping stations:
   a) Seven District mechanics
   b) Total annual work hours (gross) = 7 x 2080 hr/year = 14,560 hours
   c) Each mechanic averages 282 hours away from work each year (paid leave, sick leave, etc.)
   d) Total annual work hours (net) = 14,560 – (282)(7) = 12,586 hours
   e) Percent time spent on rag removal = (778+88)/12,586 = 6.9%

Hydraulic Model

The development of a hydraulic modeling tool was recommended as a special project in Chapter 4 of the *2002 Collection System Facilities Plan*. Given the District's vast and interconnected collection system, a means of analyzing non-uniform and unsteady flows over time was desired. As mentioned in the 2002 Plan, the primary uses for such a model were twofold: (1). The model would provide a tool to test the effect of various assumed storms and recurrence intervals on trial designs, and (2). By incorporating previous study data and new calibration data, the model would characterize the estimated degree of infiltration and inflow susceptibility for each of the individual basins making up the model and would illustrate the potential effects on the system of reducing the I/I within any basin.

In 2003 the District hired a consultant to build and develop a hydraulic model of the collection system. All physical characteristics of the collection system were input into the model database. This included pipe characteristics such as size, diameter, and material type as well as all pump information for each station. Every pipe, manhole, and pumping station was modeled in the network as well as some of the larger City of Madison facilities.

Drainage catchments were added using the GIS features of the model and population estimates for each catchment were made using U.S. Census data. From these population estimates dry weather flows for each catchment were developed by comparison to historical average daily flow records at pumping stations.

One of the primary benefits of the chosen hydraulic model is its ability to generate and route wet weather flows throughout the collection system. Long-term rainfall records can be input into the model and routed into the collection system as overland flow or infiltration using a complex groundwater module.

One of the primary considerations given to the model development was the need for a rigorous and detailed calibration. A significant effort was undertaken to ensure that the model could simulate and route flows for both dry and wet weather periods. The model was calibrated for large wet weather events by comparing predicted flows to actual flows observed in the system for the large rain event in May of 2004. Validation of the model was subsequently performed for a previous large rain event in August of 2001. Ongoing maintenance and calibration of the model will be important considerations as the District's service area grows and improvements to the collection system are made.

The District received the final model in 2005 and has used it primarily as a tool for checking peak flow conveyance in certain parts of the collection system and for assessing the effects of station outages due to construction-related projects. In time it is hoped that the model can be further developed to take advantage of its groundwater modeling capabilities so that projects to identify and remove inflow and infiltration can be addressed. The issue of I/I is discussed in greater depth in Chapter 8.

Chapter 4
System Capacities and Projected Flows

Chapter Outline

This chapter is organized into the following sections:
- Introduction
- Projected Flowrates
- Benchmark Design Capacities
- Limitations of Flow Measurements
- Pumping Station Capacity Analysis
- Pumping Station No. 15 Flow Diversion
- Forcemain Capacity Analysis
- Gravity Interceptor Capacity Analysis
- Discussion

Introduction

This chapter will examine the available capacities and the projected flows for each major component of the MMSD collection system.

As shown schematically in Figure 4.1, the MMSD collection system includes a network of gravity interceptors feeding into 17 regional pumping stations. Each pumping station conveys its flow through a forcemain into the next gravity drainage basin or (for the downstream-most stations) to the Nine Springs Wastewater Treatment Plant. The entire system ultimately converges into six stations (PS No. 2, 3, 4, 7, 8, 11) that convey the flow directly into the treatment plant through four forcemains. A common forcemain conveys the combined flow from Pumping Stations No. 2, 3 and 4.

Figure 4.1 shows measured average daily flows in 2010 and projected average daily flows in 2030 for each pumping station. The 2010 average daily flows are based on analysis of MMSD's venturi meter and pump run-time records. Flows in 2010 were selected as the baseline year for analysis and comparison to pumping station capacities and projected flowrates in the collection system.

The 2030 average daily flows are as projected by the Capital Area Regional Planning Commission (CARPC) in their report entitled *MMSD Collection System Evaluation* (Appendix A1). According to this evaluation, over the 20-year study period (2010-2030) MMSD's total flow is expected to increase from 44.1 mgd to 49.7 mgd, a 13% overall increase or approximately 0.65% per year. Using estimates for both 2010 and 2030, flows in several pump station service areas are projected to increase very slightly or actually decrease over the 20-year period, including PS1, PS3, PS4, PS5, and PS8. Conversely, flows in the PS7 and PS17 service areas are projected to increase 37% and

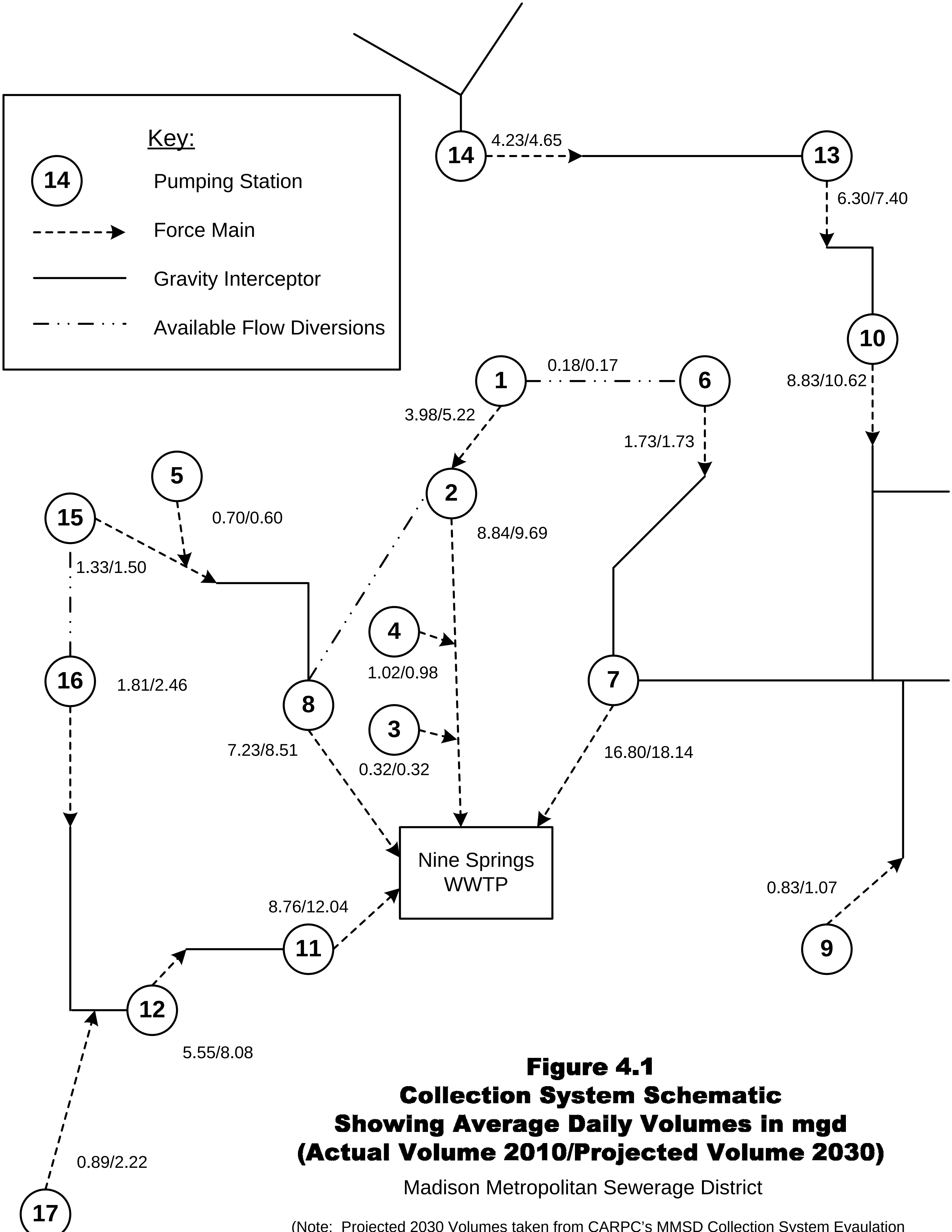


Figure 4.1
Collection System Schematic
Showing Average Daily Volumes in mgd
(Actual Volume 2010/Projected Volume 2030)

Madison Metropolitan Sewerage District

(Note: Projected 2030 Volumes taken from CARPC's MMSD Collection System Evaluation (2009). 2030 Volumes derived from Traffic Analysis Zone (TAZ) data).

87%, respectively, over this same time period due primarily to population growth. Most of these general trends are also observed when comparing actual 2010 flows to projected 2030 flows (Figure 4.1).

Projected Flowrates

Estimation of population, employment, and land use changes in the District's service area are important considerations for projecting future average daily and peak hourly flowrates. Accurate and reliable projections are needed so that the capacity of existing conveyance facilities can be analyzed properly and additional facilities can be planned for if needed. Table 4.1 summarizes the historic trends in population as well as forecasts for future years for the MMSD service area.

Table 4.1: Population Trends and Forecasts for the MMSD[(1)]

	1980	1990	2000	2030	*2060*
Central USA	218,344	245,390	268,850	339,222	*404,204*
Cottage Grove USA	901	1,131	4,059	9,372	*11,798*
Dane USA			799	1,351	*1,594*
Fox Bluff LSA			240	240	*240*
Kegonsa LSA			2,228	2,252	*2,252*
Morrisonville USA			352	428	*464*
Northern USA	5,393	7,160	9,901	16,883	*23,825*
Verona USA			7,306	15,685	*20,178*
Waubesa LSA			2,027	2,027	*2,027*
Waunakee USA	3,890	5,899	9,000	17,458	*23,367*
Windsor Prairie LSA			509	509	*509*
Westport LSA			377	377	*377*
MMSD	228,528	259,580	305,648	405,804	*490,835*

Note: (1). Data from *MMSD Collection System Evaluation, CARPC (January 2009).*

The population forecasts for the MMSD service area were developed by CARPC based on countywide projections prepared by the Wisconsin Department of Administration (DOA). The latest DOA projections were prepared in 2004 based on 2000 U.S. Census data. CARPC allocated these countywide forecasts to urban service areas within the MMSD service area.

Additionally, smaller planning units called traffic analysis zones (TAZ) were used to develop and refine population and employment projections. These zones were developed by the Madison Area Transportation Planning Board (MATPB) and contain socioeconomic data that includes population, number of households, and total employment for the year 2000 and forecasts for the year 2030. The MATPB developed the TAZ 2030 population and household data by allocating the forecasts prepared by DOA/CARPC to the various traffic analysis zones based on community development plans.

Since the TAZ data was prepared prior to the preparation of many municipal comprehensive and neighborhood development plans, there is some uncertainty with regards to the accuracy of these projections. To account for this uncertainty, CARPC developed an additional forecast method employing an uncertainty factor (UF). The UF method works with both the TAZ data and the most recent community development plans to allocate increases in population and employment based on available land area throughout the MMSD service area.

In general the UF forecasts project higher development rates, and thus higher wastewater flows, than the TAZ forecasts. Unless specifically noted, MMSD has elected to utilize the UF forecasts for purposes of analyzing capacity in its collection system as part of this Facilities Plan. It is understood that UF data will most often result in identifying a need to replace or reinforce a facility before it may actually be necessary. The TAZ data and other considerations such as pumping records and in-line flow measurement should be used to further define the need and timing for system improvements as each individual project is identified and moves forward.

Benchmark Design Capacities

Sanitary sewers in principle are intended to convey point source sanitary sewage, not stormwater. The actual design of sanitary sewer systems, however, is largely controlled by an estimate of the system's susceptibility to stormwater inflow. Average wastewater flow is sometimes used as a convenient base parameter that can be useful to help estimate the degree of susceptibility. Other parameters, such as the tributary land area, population, or miles of sanitary sewers, can also be used as base parameters.

MMSD has historically used the "Madison Design Curve" (MDC) as a benchmark tool for determining the peak design capacity needed for its wastewater conveyance facilities. This curve was prepared for MMSD by consultants Greeley and Hansen in their "Report on Sewerage and Sewage Treatment" (1961), and is also known to MMSD as the "Greeley and Hansen Formula".

The Madison Design Curve can be represented by the following formula:

$$\textit{Peaking Factor} = 4 \Big/ \left(Q_{avg}\right)^{0.158} \quad \text{, for Q in mgd}$$

$$\text{or} \quad Q_{peak} = 4 \left(Q_{avg}\right)^{0.842} \quad \text{, for Q in mgd.}$$

The MDC is similar in concept to other wastewater conveyance design curves that provide design capacity guidelines as a function of population or of average daily flow. As a general trend of such curves, the peak to average ratio (or "peaking factor") tends to decrease as the size and population of the service area increases. Significant variation of rainfall intensities and flow travel times within a large service area tend to decrease the peaking factors used for large areas.

Typical peaking factors for the Madison Design Curve range from 4.0 (for average flows less than 1 mgd) to 2.5 (for average flows greater than 20 mgd). This is a similar range as the default design capacities referenced in the Wisconsin Administrative Code's NR 110.13. The code calls for peak design capacities to be based on existing records. Where records are not available, the code references design capacities of 400% x average design flow for sub-main and branch sewers, and 250% x average design flow for interceptors, main (trunk) sewers, and sewage outfall pipes.

Peaking factor magnitudes can vary greatly from city to city and from region to region. They are largely dependent on the rainfall and climate of the particular region and the "leakiness" of the particular collection system. MMSD's collection system is relatively tight compared to many systems. Peaking factors experienced in some collection systems are many times higher than the values that would be derived using the Madison Design Curve.

It is important to recognize that peaking factor curves and design guides, including the MDC, cannot guarantee protection against all possible storm events or flood situations. The size and cost of constructing facilities large enough to handle any possible flood is generally not feasible. Actual peak flow rates in Madison during major storms have sometimes exceeded the MDC. Figure 4.2, for example, superimposes the MDC over peaking factor data for each District pumping station from a major rainstorm on June 7-8 of 2008. This rain event delivered 6.3 inches of rain in Madison over a two day period, with extremely high rainfall intensities in the northern portion of the collection system. As shown in Figure 4.2, roughly half of the peaking factors at District pumping stations for this major event exceeded the MDC, and roughly half were less than the MDC. Figure 4.3, which plots the service area peaking factor for each pumping station, shows similar results as Figure 4.2 relative to the MDC.

The MDC provides a useful overall benchmark or reference for comparison of design flows. In general, it is considered by MMSD to be a reasonable design curve for a reasonably tight collection system. For detailed design of individual projects, the analysis of actual flow measurements during major storm events and the consideration of known backup and bypass occurrences within the particular basin provide valuable additional information to help determine an appropriate design. For some projects, the MDC may provide a very conservative level of protection against even very large storm events. For others, the MDC may be less conservative. Further, even if sewer capacities *are* exceeded by an extreme wet weather event, individual drainage basins vary in their ability to withstand surcharged sewers. Due to the variation of topography and basement elevations, some basins may quickly experience bypasses or basement flooding after a sewer is surcharged, while other basins can accept significant surcharges with little adverse result. Further discussion of peaking factors and the handling of wet weather flows can be found in Chapter 8.

Figure 4.2
Peaking Factors vs Flow at MMSD Pump Stations (June 2008)

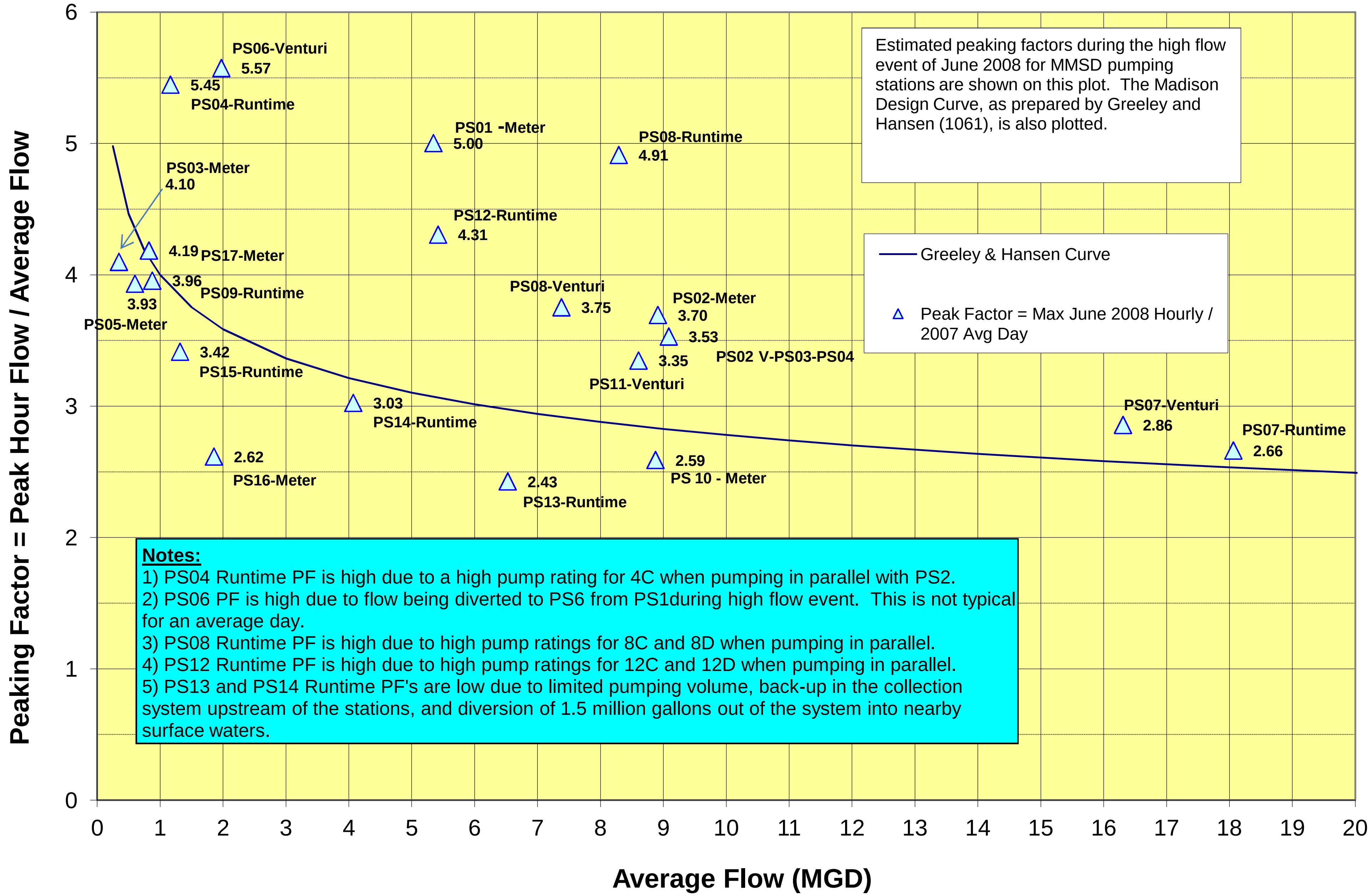
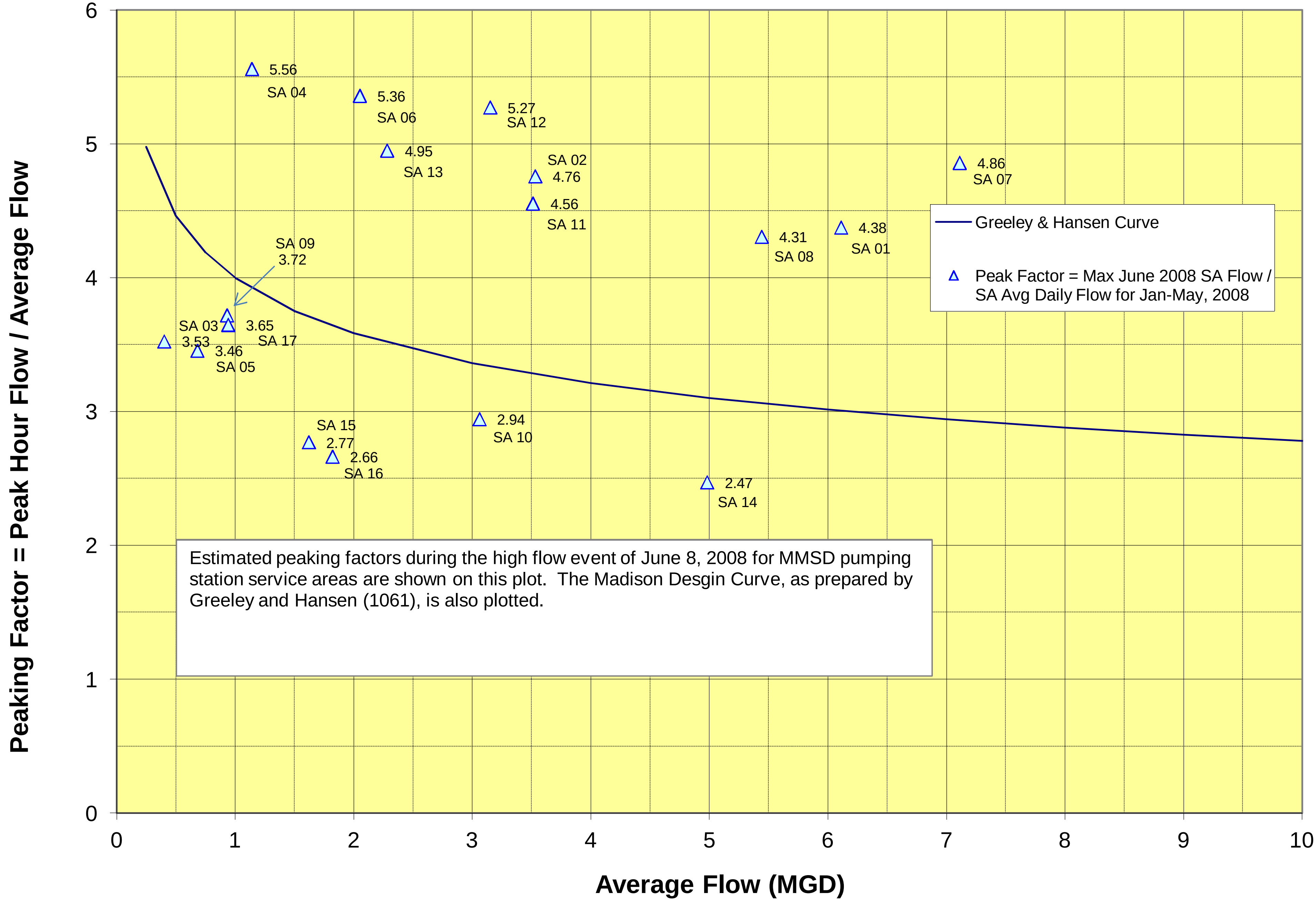


Figure 4.3
Peaking Factors vs Flow for MMSD Service Areas (June 8, 2008)



Limitations of Flow Measurements

Flow volumes and discharge rate data are used extensively in the preparation of wastewater designs and studies, including this facilities plan. It is important, however, to also recognize the limitations of most measured wastewater flow quantities.

A direct measurement of the elapsed time to fill a container of known volume is the most precise way to measure a flow rate. With large volumes of moving water, however, this method is seldom feasible. Venturi meters, magnetic flow meters, or flumes provide the next best source of information. Such meters exist at eleven of MMSD's 17 stations (PS1, 2, 3, 5, 6, 7, 8, 10, 11, 16, 17), but do not exist at the other six stations. Meters can be prone to errors or limits in accuracy, however. Sources of these errors include: (1). Calibration error; (2). Occasional malfunctions of transducers and piping assemblies; and (3). Non-submerged venturi meters during low flow periods.

Flow quantities based on pump run-time data are available at all 17 MMSD stations. However, these flows can be subject to significant errors, since they depend on assumed pump capacity ratings. The assumed pump capacity rating might be based on the original project specifications, the pump manufacturer's catalog, or factory test curves. This rating may be different from the actual in-station pump capacity due to differences in expected friction or wetwell levels, differences in actual motor rpm, or differences in actual impeller diameter. Even if the original pump rating was well documented in the station at the time of installation, pump wear over years of operation, particularly on the impeller and wearing rings, can significantly reduce the original pump discharge rate. Major repairs or impeller substitutions over the years could also impact the pump discharge.

In general, flow rates can be quoted with the most confidence when they can be verified by independent information. Given a significant increase in pump run time, for example, it would not be clear whether the change was caused by an actual incoming flow increase or by the deterioration of a pump. If a flow meter exists at the site, however, the true situation could be verified. In some cases, other information may be available to help provide a "reality check" on suspected faulty flow data. Balancing of flows to agree with trusted measurements from other stations, for example, is sometimes possible.

In many cases, a flow measurement will still depend on some significant assumptions. As a general rule of thumb, it is probably wise to assume that most measured wastewater flow rates are generally within ten percent of the "true" values, but should not be assumed to be much more certain than this. This should not be viewed as a catastrophic limitation, however. In many cases, the increasing or decreasing *trend* of a quantity is more important than the absolute value of the quantity itself.

Pumping Station Capacity Analysis

Table 4.2 summarizes key pump performance data for each of MMSD's 17 pumping stations. As shown, the number of pumps within a station varies from two to four. The maximum overall pumping capacity is also shown for each station. Some stations are designed to achieve their maximum pumping capacity with multiple units operating in parallel, while other stations achieve their maximum capacity with an individual large pump operating alone. The "firm" pumping capacity for a station (sometimes called the reliable capacity) is the overall capacity that can be achieved assuming the largest single pump is out of service.

It might be argued that the firm station capacity can afford to be somewhat less than the maximum station capacity, since the firm capacity becomes important only when a pump outage occurs at the very same time as an extreme flow event. However, it could also be argued that the likelihood of a pump failure increases somewhat during an extreme flow event. For the purpose of this analysis, the more conservative approach is used, and the MDC is used as the benchmark for both maximum and firm capacities.

Table 4.3 is a comparison of recent (2010) and future (2030) flows, the benchmark peak design flows based on the Madison Design Curve, and the present actual pumping capacities at each station. Table 4.3 uses the concept of an "adequacy ratio" for each station. This ratio relates the actual pumping capacity of a station to its benchmark capacity, or estimated influent peak flows. This provides a relative indicator of how well each station is presently equipped to handle present and future peak flows. For example, for PS13, the Year 2010 ratio of 1.06 for maximum capacity means that this station's present pumping capacity was able to provide 106% of its benchmark capacity for the Year 2010. The Year 2030 ratio of 0.78 means that this station's present pumping capacity, if not changed, would be able to provide only 78% of its projected benchmark peak flow in 2030.

Review of Table 4.3 shows that the maximum capacities at five stations (PS7, PS11, PS12, PS13, PS17) are anticipated to become more than 10% short of their benchmarks by 2030. No pumping stations were short of their benchmark maximum capacity in 2010. With regard to *firm* capacities, six stations are anticipated to become more than 10% short of their benchmarks by 2030, although only two of these stations (PS7, PS12) were short of benchmark capacity in 2010. In each case the shortage was less than 10%. The adequacy ratios of Table 4.3 are also presented in Figure 4.4 using a bar chart format. This information will be used in the following chapters to help prioritize future improvement projects.

Pumping Station No. 15 Flow Diversion

MMSD's Pumping Station No. 15 serves the far northwest side of the MMSD service area, including much of the City of Middleton. This station can pump its flow in two

Table 4.2

Pump Performance Data for MMSD Pumping Stations

Madison Metropolitan Sewerage District

Pumping Station No.	Station Location and Year Placed On-Line	Station Pumping Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
1	104 N. First St. Madison 1950	1A (or 1B) + 1D 26,600 gpm 38.3 mgd	1A (or 1B) + 1C 24,475 gpm 35.3 mgd	1A	14,100	134	890	600	2005	1A & 1B are the new Crosstown pumps and pump to PS#2. 1C & 1D are the old pumps (with re-wound motors) and pump to PS#6. 1A or 1B can pump with 1C or 1D. Pump 1D rating per 6/96 venturi analysis.
				1B	14,100	134	890	600	2005	
				1C	10,375	31	580	150	1950	
				1D	12,500	41	585	150	1950	
2	833 W. Washington Brittingham Park Madison 1964	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	2A	16,500	108	890	600	2005	All pumps were replaced during station rehab in 2005. All 4 pumps are equal size. 2A & 2B are VFD and 2C & 2D are constant speed. Data reflects new 36" FM online in 2001.
				2B	16,500	108	890	600	2005	
				2C	16,500	108	890	600	2005	
				2D	16,500	108	890	600	2005	
3	Nine Springs WWTP 1959	3A or 3B 1050 gpm 1.51 mgd	3A or 3B 1050 gpm 1.51 mgd	3A	1,050	60	1175	30	1980	New 36" FM (Aug. 2001) has no significant impact on capacities. New Headworks (Aug. 2005) adds ~4' static. New impellers (13.0" vs 12.2") installed in 2004.
				3B	1,050	60	1175	30	1980	
4	620 John Nolen Drive, Madison 1967	4B or 4C 2,900 gpm 4.2 mgd	4B or 4C 2,900 gpm 4.2 mgd	4A	2,000	47	860	40	1967	Peak capacities include new 36" FM (8/2001), new Headworks (8/2005), WSEL=32, wetwell @ -7, PS3 @1,000gpm, PS2 @ 28,500 gpm. New impellers (17.0" vs 16.25") in 4B&4C-2004.
				4B	2,900	95	1160	100	1967	
				4C	2,900	95	1160	100	1967	
5	Spring Harbor Park Madison 1996	Any two pumps 2,480 gpm 3.6 mgd	Any two pumps 2,480 gpm 3.6 mgd	5A	1,800	75	1256	50	1996	Variable speed units. Ratings per 1996 startup testing at 106% speed.
				5B	1,800	75	1256	50	1996	
				5C	1,800	75	1256	50	1996	
6	402 Walter Street Madison 1950	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	6A	7,700	45	890	125	2009	All ratings shown reflect station rehabilitation project in 2009. All 4 pumps are equal size. 6A is variable speed and 6B-6D are constant speed.
				6B	7,700	45	890	125	2009	
				6C	7,700	45	890	125	2009	
				6D	7,700	45	890	125	2009	
7	6300 Metropolitan Lane, Monona 1950	7C + 7D 31,250 gpm 45.0 mgd	7B + 7C 27,100gpm 39.0 mgd	7A	11,500	47	695	250	1950	Dual pump ratings per 1996 high flow data. No major pump changes since station was rehabbed in 1992.
				7B	15,200	53	705	250	1992	
				7C	19,400	59	705	350	1992	
				7D	19,400	59	705	350	1992	
8	901 Plaenart Dr. Madison 1964	8C+8D+8A(or 8B) 7,900 gpm (ea) 23,700 gpm total 34.1 mgd total	8A+8B+8C(or 8D) 7,850 gpm (ea) 23,600 gpm total 34.0 mgd total	8A	12,800	58	585	250	2009	All ratings shown are **after** station rehabilitation in 2009. 8A&8B (formerly 8C&8D)are variable speed and equal size. 8C&8D (formerly 6C&6D) are constant speed and equal size.
				8B	12,800	58	585	250	2009	
				8C	13,900	60	705	300	2009	
				8D	13,900	60	705	300	2009	

Pumping Station No.	Station Location and Year Placed On-Line	Station Pumping Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed (rpm)	Nominal Motor Size (HP)	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)				
9	4612 Larsen Beach Road, McFarland 1962	Any two pumps 3,150 gpm 4.5 mgd	Any two pumps 3,150 gpm 4.5 mgd	9A	2,300	51	1185	40	2003	All American Well Works pumps were replaced with Fairbanks Morse Built-Togethers (5434S) between 2002 & 2007. New pumps are same capacity as old.
				9B	2,300	51	1185	40	2007	
				9C	2,300	51	1185	40	2002	
10	192 Regas Road Madison 1965	Any 2 pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	Any 2 pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	10A	18,900	94	890	600	2005	All pumps were replaced during station rehab in 2005. All 3 pumps are equal size. 10A & 10B are VFD and 10C is constant speed. Pumps are currently not allowed to operate in parallel.
				10B	18,900	94	890	600	2005	
				10C	18,900	94	890	600	2005	
11	4760 E. Clayton Rd. Town of Dunn 1966	11C + 11D 21,700 gpm 31.2 mgd	11C or 11D + 11B 17,700gpm 25.5 mgd	11A	6,400	43	860	125	1950	11A relocated to PS11 from PS7. 11C & 11D individual capacities per testing in 2/2008. Firm capacity (11C or 11D in parallel with 11B) per testing in 2/2008.
				11B	9,100	49	880	150	1982	
				11C	13,300	57	705	250	1982	
				11D	13,300	57	705	250	1982	
12	2739 Fitchrona Rd. Town of Verona 1969	12C + 12D 16,300 gpm 23.5 mgd	12C or 12D + 12B 11,500 gpm 16.6 mgd	12A	3,400	44	700	50	1969	Firm capacity (12C or 12D in parallel with 12B) per estimate in 2/2008.
				12B	7,200	48	885	100	1969	
				12C	9,000	48	880	150	1982	
				12D	9,000	48	880	150	1982	
13	3634 Amelia Earhart Drive, Madison 1970	13C 14,000 gpm 20.2 mgd	13A + 13B 13,900 gpm 20.0 mgd	13A	8,200	16	585	50	2008	Pump 13A replaced in 2008. 13A matches 13B. Pump 13B re-built, including new impeller (same size). Pump 13C unchanged.
				13B	8,200	16	585	50	1970	
				13C	14,000	20	505	100	1970	
14	5000 School Rd. Madison 1971	14C 10,800 gpm 15.6 mgd	14A + 14B 10,400 gpm 15.0 mgd	14A	7,200	24	705	60	2008	Pump 14A replaced in 2008. 14A matches 14B. Pump 14B re-built, including larger impeller (17.375" vs. 16.5"). Pump 14C re-built with larger impeller (22.0" vs. 20.5").
				14B	7,200	24	695	60	1971	
				14C	10,800	29	585	100	1971	
15	2115 Allen Blvd. Madison 1975	15C 6,100 gpm 8.8 mgd	15A 4,000 gpm 5.8 mgd	15B	3,000	68	885	100	1975	Pump ratings shown are for pumping to the West Int. and PS8. See note (ii).
				15A	4,000	76	885	100	1975	
				15C	6,100	100	885	200	1982	
16	1303 Gammon Rd. Middleton 1982	Any two pumps 13,000 gpm 18.7 mgd	Any two pumps 13,000 gpm 18.7 mgd	16A	7,000	182	1185	500	1982	
				16B	7,000	182	1185	500	1982	
				16C	7,000	182	1185	500	1982	
17	405 Bruce Street Verona 1996	Any two pumps at 118% speed 3,250 gpm 4.6 mgd	Any two pumps at 118% speed 3,250 gpm 4.6 mgd	17A	2,300	115	1290	100	1996	Variable speed pumps. Nominal 100% speed=1190 rpm. Ratings shown are for 118% max speed=1404 rpm. Incorporated 118% dual pumping in 6/2008.
				17B	2,300	115	1290	100	1996	
				17C	2,300	115	1290	100	1996	

Notes:

i) Pump ratings are based on analysis of pump performance curves and system curves, and where available, flow meter data.

ii) For PS15 diversion to PS16, pump ratings are as follows: 15B) 1500 gpm @ 84' 15A) 3000 gpm @ 87' 15C) 6500 gpm @ 96'.

iii) Pump ratings are per pump turn-on level (high wetwell) and C=130.

Table 4.3
Pumping Station Capacities and Projected Flows
Madison Metropolitan Sewerage District

Pumping Station No.	Diversion Status	Station Maximum Pumping Capacity (mgd)	Station Firm Pumping Capacity (mgd)	Average Flows (mgd)			Benchmark Peak Flows (mgd) per Madison Design Curve[4]			Ratio Firm Capacity / Benchmark		Ratio Max. Capacity / Benchmark	
				2000	2010[1]	2030[3]	2000	2010	2030	2010	2030	2010	2030
1	Normal Scenario: PS15 pumps tp PS8.	38.3	35.3	6.87	4.16	5.54	20.27	13.28	16.91	2.66	2.09	2.88	2.27
2		41.0	41.0	4.48	8.84	10.74	21.34	25.06	29.52	1.64	1.39	1.64	1.39
3		1.5	1.5	0.30	0.32	0.35	1.20	1.28	1.40	1.18	1.08	1.18	1.08
4		4.2	4.2	0.91	1.02	1.03	3.69	4.07	4.10	1.03	1.02	1.03	1.02
5		3.6	3.6	0.70	0.70	0.63	2.80	2.80	2.52	1.29	1.43	1.29	1.43
6		24.2	24.2	7.75	1.73	1.74	15.23	6.35	6.38	3.81	3.80	3.81	3.80
7		45.0	39.0	20.15	16.80	23.94	42.95	43.03	59.85	**0.91**	**0.65**	1.05	**0.75**
8		34.1	34.0	8.77	7.23	9.31	24.89	21.16	26.18	1.61	1.30	1.61	1.30
9		4.5	4.5	0.81	0.83	1.28	3.24	3.32	4.92	1.36	**0.91**	1.36	**0.91**
10		42.2	42.2	8.79	8.83	13.26	24.94	25.04	35.26	1.69	1.20	1.69	1.20
11		31.2	25.5	7.50	8.76	15.03	21.82	24.87	39.18	1.03	**0.65**	1.25	**0.80**
12		23.5	16.6	4.32	5.55	10.48	13.71	16.93	28.92	**0.98**	**0.57**	1.39	**0.81**
13		20.2	20.0	5.60	6.30	9.14	17.06	18.84	25.77	1.06	**0.78**	1.07	**0.78**
14		15.6	15.0	3.34	4.23	5.26	11.04	13.47	16.19	1.11	**0.93**	1.16	**0.96**
15		8.8	5.8	1.30	1.33	1.83	4.99	5.09	6.65	1.14	**0.87**	1.73	1.32
16		18.7	18.7	1.37	1.81	3.05	5.48	6.59	10.23	2.84	1.83	2.84	1.83
17		4.6	4.6	0.67	0.89	3.41	2.68	3.56	11.24	1.29	**0.41**	1.29	**0.41**

Pumping Station No.	Diversion Status	Station Maximum Pumping Capacity (mgd)	Station Firm Pumping Capacity (mgd)	Average Flows (mgd)			Benchmark Peak Flows (mgd) per Madison Design Curve[(4)]			Ratio Firm Capacity / Benchmark		Ratio Max. Capacity / Benchmark	
				2000	2010[(1)]	2030[(3)]	2000	2010	2030	2010	2030	2010	2030
8	Alternate Scenario: PS15 pumps to PS16	34.1	34.0	7.47	5.90	7.48	21.75	17.83	21.77	1.91	1.56	1.91	1.57
11		31.2	25.5	8.80	10.09	16.86	24.96	28.01	43.16	**0.91**	**0.59**	1.11	**0.72**
12		23.5	16.6	5.62	6.88	12.31	17.11	20.29	33.12	**0.82**	**0.50**	1.16	**0.71**
15		9.4	4.3	1.30	1.33	1.83	4.99	5.09	6.65	**0.85**	**0.65**	1.85	1.41
16		18.7	18.7	2.67	3.14	4.88	9.14	10.48	15.20	1.78	1.23	1.78	1.23

Notes:

1). Year 2010 actual average flows are based on MMSD metered data for PS1, 2, 3, 5, 7, 8, 10, 11, 16 and 17. Pump run-time records are used at all other stations.

2). Year 2010 was selected as the baseline year for recent average annual flows. Year 2010 is believed to be a representative year for purposes of analysis and comparison.

3). Projected Year 2030 average flows are per CARPC's January 2009 report. These flows are generated from population forecasts utilizing traffic analysis zones and application of an uncertainity factor (UF).

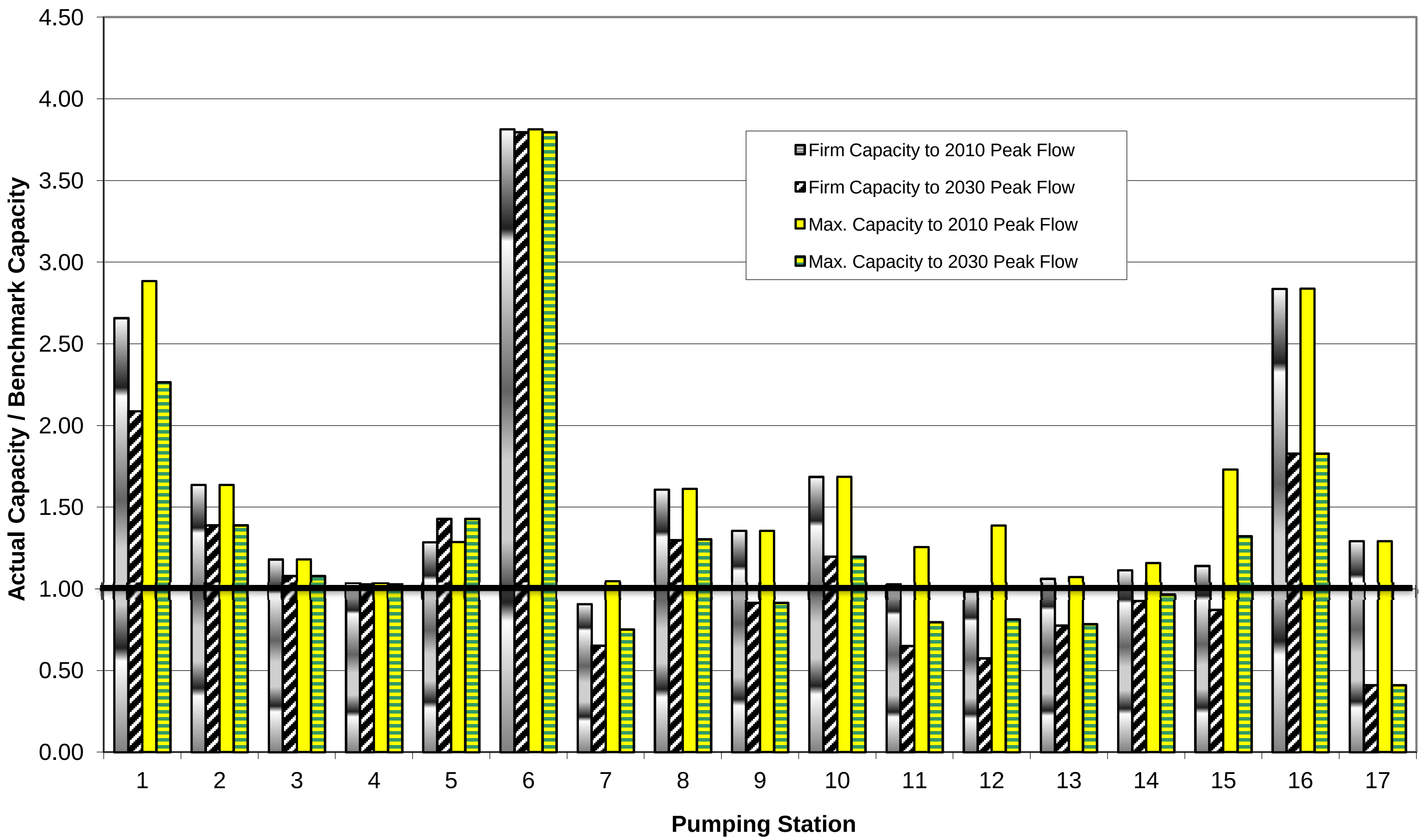
4). Benchmark peak flow requirements are computed per Madison Design Curve. Peaking factor of 4.0 applied for all average flowrates less than 1 MGD. Peaking factor of 2.5 applied for all average flowrates greater than 20 MGD. All other peaking factors equal to 4/(ADF)^0.158).

5). Year 2010 flows from PS 1 were apportioned to downstream pumping stations as follows: (a). 3.98 MGD to PS 2; and (b). 0.18 MGD to PS 6. Benchmark peak flows were based on these average flowrates.

6). All flows from PS 15 in Year 2010 were directed to PS 8. No flow was diverted to PS 16.

7). PS15 pump capacities pumping to PS16, as shown, are different than those pumping to PS8.

Figure 4.4
Pumping Station Capacity Adequacy Ratios
Madison Metropolitan Sewerage District



directions. When originally constructed in 1974, PS15 and its forcemain conveyed its flow to the West Interceptor system, which ultimately leads to PS8. In 1983, a diversion forcemain was constructed to allow the PS15 flow to be diverted to PS16, and then on to the Nine Springs Valley Interceptor system. This diversion was the main operating configuration from 1983 until 1996. Starting in September 1996, the PS15 flow was directed back to the West Interceptor and PS8. This operating change was made in an attempt to reduce odor complaints occurring in the PS16 area, and also to reduce energy costs. No change to the flow direction has been made since 1996, and none is anticipated for operational requirements.

The direction of the discharge from PS15 has significant implications as capacity needs exist in the PS8, PS11 and PS12 service areas in the near term. With PS15 discharging to the PS8 service area as it currently does, it is anticipated that approximately 10,100 feet of sewer in the West Interceptor Relief system will need relief by the year 2020. Approximately 32,000 feet of the Nine Springs Valley Interceptor (NSVI) in the PS11 and PS12 service areas is expected to reach benchmark capacity by 2030 *without* any discharge from PS15.

Diverting flow from PS15 to PS16 would alleviate the need to provide additional capacity for the West Interceptor Relief system prior to 2060, but would accelerate the required timing and scope of improvements needed for the NSVI system. A 50-year present worth analysis was conducted to compare the two alternatives for PS15 pumping. The results are shown in Table 4.4.

Table 4.4: Present Worth Analysis for Pumping Alternatives at PS15

Cost Items	Replacement Costs	Lining Costs	Total Costs
Alternative No. 1: PS15 to PS8			
NSVI	$23,265,000	$9,487,000	$32,752,000
West Interceptor Relief	$10,288,000	$1,602,000	$11,890,000
Pumping Energy	-	-	$5,656,000
TOTAL	$33,553,000	$11,089,000	**$50,298,000**
Alternative No. 2: PS15 to PS16			
NSVI	$33,424,000	$10,663,000	$44,087,000
West Interceptor Relief	$0	$1,258,000	$1,258,000
Pumping Energy	-	-	$15,155,000
TOTAL	$33,424,000	$11,921,000	**$60,500,000**

Note: All costs in 2010 dollars.

The present worth analysis considers new construction and rehabilitation of interceptors for both PS15 pumping alternatives. The analysis assumes that all sewers requiring capacity relief will have a new sewer of the same size built parallel to the existing sewer and that the existing sewer will be rehabilitated with a cured-in-place liner at that time. For those segments not in need of capacity relief prior to 2060, rehabilitation with a new liner was assumed to take place at the end of the sewer's useful service life. The worksheet at the end of this chapter (Appendix 4-1) contains other assumptions used in the analysis as well as detailed information for each individual sewer segment. It should be noted that unit costs for replacement of the West Interceptor are assumed to be twice those for the NSVI system owing to the difficult construction expected along the West Intercepting system route (traffic control, adjacent utilities, etc.).

Energy costs related to pumping were also considered in the present worth analysis (see Appendix 4-2). The overall costs to pump from PS15 to PS16 are approximately three times greater than the costs to pump from PS15 to PS8. This has a significant impact on the cost comparison. Another factor that needs to be considered in the analysis but is not included quantitatively is the issue of odor control. Significant odors were documented at PS16 from 1983-1996 when the PS15 flow was directed to PS16. Odor concerns still exist at PS16 at this time. While it may be possible to construct an odor treatment system to address this issue, the cost of implementing and maintaining such a system would be costly and would likely be prohibitive.

Given the present worth costs outlined in Table 4.4 and the issue of odors at PS16, it is recommended that the District continue its current practice of pumping both average daily and peak flows from PS15 to PS8. As a result, all capacity evaluations in this Facility Plan for all pumping stations, force mains, and interceptors assume that PS15 flow will continue to be directed toward PS8 instead of PS16 and the Nine Springs Valley Interceptor (NSVI) System.

Forcemain Capacity Analysis

The capacity of any pumping station is influenced by the characteristics of its pumping equipment together with the characteristics of its forcemain system. The diameter, length and roughness of the forcemain, and the elevation difference between station wetwell and forcemain discharge, will significantly affect the performance of the pumping unit. All pumping capacities reported in the previous sections of this chapter therefore reflect the characteristics of the station's pumping equipment together with the characteristics of its particular forcemain system.

It is also important, however, to consider the limiting capacity of the forcemain facility itself. Table 4.5 summarizes the characteristics and nominal capacities for each of MMSD's raw wastewater forcemains, without regard to pumping equipment. The nominal capacities shown are based on a common industry practice to limit forcemain velocities to a maximum of 8 feet/second. Using the 8 fps criterion, Table 4.5 shows that the nominal limiting capacity of the forcemain is less than the Year 2030 benchmark

Table 4.5
Forcemain Capacities and Characteristics
Madison Metropolitan Sewerage District

Pumping Station Forcemain No.	Forcemain Characteristics					Nominal FM Capacity (mgd) based on 8 fps velocity	2030 Benchmark Peak Flows (mgd)	
	Segment Length (feet)	Dia. (inches)	Mat'l	Year Installed	Comments		If PS15 pumps to PS8	If PS15 pumps to PS16
1 (to PS 6)	2,638	30	RCCP	1948		25.4	0.00	
1 (to PS 2)	1,340	24	DI	2000	Segment from PS1 to E. Washington Ave.	16.2	16.91	
	998	20	PVC	1995	Segment under Monona Terrace	11.3		
	14,205	30	DI	2002	Balance of FM from E. Wash. Ave. to PS2	25.4		
2	17,064	36	DI	2001	From PS2 to near old meter vault @ NSWTP	36.5	29.52	
	364	36	DI	2005	Installed during the 10th Addition			
3	5	8	CI	1959	Original forcemain remaining	1.8	1.40	
	21	8	DI	2000	Installed dring PS2FM replacement			
4	100	16	CI	1959	Original forcemain remaining	7.2	4.10	
	60	16	DI	2000	Installed dring PS2FM replacement			
5	28	16	DI	1996	Segment from new PS5 to 1959 junction	7.2	2.52	
	504	16	RCCP	1959	Segment to PS15 FM junction	7.2		
	1,746	24	RCCP	1959	Segment from PS5/15 junction to Whitney	16.2		
6	7,208	36	RCCP	1948		36.5	6.38	
7	13,992	2 x 36	RCCP	1948, 63	Dual forcemains from PS7 to plant grounds	65 (based on 8 fps) 55-60 (based on transients) see note 3 below	59.85	
	1,332	48	RCCP	1963	Through plant grounds to 10th Add connection			
	323	48	DI	2005	Installed during the 10th Addition			
8	13,174	42	RCCP	1964	78' of 42" abandoned during 10th Addition	49.7	26.18	21.77
	194	36	RCCP	1964	Located outside of PS#8	36.5		
	334	42	DI	2005	Installed during the 10th Addition	49.7		
9	4,812	20	DI	1987		11.3	4.92	
	2,197	10	AC	1961		2.8	0.00	

Pumping Station Forcemain No.	Forcemain Characteristics					Nominal FM Capacity (mgd) based on 8 fps velocity	2030 Benchmark Peak Flows (mgd)	
	Segment Length (feet)	Dia. (inches)	Mat'l	Year Installed	Comments		If PS15 pumps to PS8	If PS15 pumps to PS16
10	11,112	36	RCCP	1964		36.5	35.26	
11	3,945	36	RCCP	1965	230' of 36" abandoned during 10th Addition	36.5	39.18	43.16
	91	36	DI	2005	Installed during the 10th Addition			
	0	30	RCCP	1964	All 30" was abandoned during 10th Addition			
12	4,795	36	RCCP	1968		36.5	28.92	33.12
13	2,588	36	RCCP	1969		36.5	25.77	
14	4,354	30	RCCP	1971		25.4	16.19	
15 (to PS 8)	2,467	24	DI	1974	Segment from PS15 to Thorstrand air release	16.2	6.65	
	4,811	20	DI	1974	Segment from Thorstrand to PS5 FM junction	11.3		
	1,746	24	RCCP	1959	Segment from PS5 FM juction to Whitney Way	16.2		
15 (to PS16)	1,378	24	DI	1974	Segment from PS15 to junction near Univ. Ave.	16.2	6.65	
	4,893	30	RCCP	1982	Segment from FM junction to near PS16	25.4		
16	7,214	36	DI	1979	Segment from PS16 to Gammon high point	36.5	10.23	15.20
	2,965	30	DI	1980	Segment from high point to near Min. Pt. Rd.	25.4		
17	13,357	16	DI	1995	Segment from PS17 to Hwy. 18/151 high pt.	7.2	11.24	
	3,071	20	DI	1995	Forced gravity segment from high pt. to NSVI	11.3		

Notes:
1 Benchmark flows per Table 4.3
2 Nominal FM Capacities shown are based on 8 feet/sec velocity in principal FM segments
3 Limiting capacity for the PS7 FM is 55-60 MGD due to maximum allowable transient pressures in 36"-1948 FM.

value at three pumping stations (PS1 Crosstown Forcemain, PS11, PS17). In the case of the PS1 Crosstown Forcemain, the limiting segment under Monona Terrace is approximately 1,000 feet in length. A detailed analysis of the forcemain system should be undertaken to determine if this small stretch of forcemain warrants replacement due to its limited capacity.

The effective capacities of some forcemains may be further limited by the age, condition or pressure rating of the pipe. The original 36" segment of the PS7 forcemain (1948) is rated for a pressure head of approximately 100 feet. Since transient pressures under some scenarios can approach this rating, and since this forcemain did experience a major rupture in 1963, MMSD has considered its limiting capacity to be approximately 50 - 60 mgd.

Gravity Interceptor Capacity Analysis

Tables 4.6 and 4.7 show the pipe capacities and the projected flows for the MMSD network of gravity interceptors. Table 4.7 is a detailed compilation of the entire gravity system broken down into significant segments with similar hydraulic properties. These segments reflect the sub-basin service areas used in CARPC's *Collection System Evaluation*, but with further breakdown to include each major change in pipe capacity, diameter, or materials of construction. Table 4.6 is a summary of Table 4.7. Both tables organize the gravity interceptors into the 17 pumping station drainage basins. Similar to the pumping station analysis earlier in this chapter, the benchmark peak design flows for the gravity interceptors are computed according to the Madison Design Curve.

Table 4.6 shows that 13% of MMSD's total gravity interceptor mileage will reach or exceed its benchmark capacity based on predicted flows by 2020, and that 26% is projected to reach or exceed its benchmark capacity by 2030. The most significant areas of capacity shortfalls include the Nine Springs Valley Interceptor in the PS11 service area and the Southeast Interceptor and Far East Interceptor in the PS7 service area. It should be noted that the capacity limitations for the Southeast Interceptor will be relieved with the addition of Pumping Station 18 in 2015. This will be discussed in subsequent chapters.

Table 4.7 shows that some individual interceptor segments are expected to see significant flow increases over 20 years, while others are expected to see little or no growth. To reasonably prioritize capacity improvement projects, both the timing and the relative degree of the predicted hydraulic need should be considered. Consider, for example, a particular segment that has already exceeded its computed benchmark capacity, but just marginally. If it is in a low-growth or zero-growth area, and has not actually experienced chronic backup problems, it might be argued that this segment should not be ranked as a high priority need for capacity relief, even though its capacity in theory has already been exceeded. On the other hand, a high growth interceptor that is within its capacity benchmarks today, but is projected to surpass its capacity within 5 years, may be a project deserving of a fairly high priority. Figure 9.1 (in map pocket) highlights the

Table 4.6
Gravity Interceptor & Force Main Capacity Evaluation
Madison Metropolitan Sewerage District

Pumping Station Service Area	Total Gravity Interceptor Mileage in Service Area (miles)	Total Force Main Mileage in Service Area (miles)	Mileage Predicted to Reach Benchmark Capacity By 2020				Mileage Predicted to Reach Benchmark Capacity By 2030			
			Gravity Interceptors		Force Mains		Gravity Interceptors		Force Mains	
			(miles)	(%)	(miles)	(%)	(miles)	(%)	(miles)	(%)
PS1	1.71	3.67	0.00	0%	0.45	12%	0.00	0%	0.45	12%
PS2	2.73	3.29	0.41	15%	0.00	0%	0.41	15%	0.00	0%
PS3	0.72	0.005	0.72	100%	0.00	0%	0.72	100%	0.00	0%
PS4	1.55	0.03	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS5	3.00	0.42	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS6	1.91	1.37	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS7	19.76	2.96	4.44	22%	0.00	0%	8.39	42%	1.33	45%
PS8	14.64	2.60	2.39	16%	0.00	0%	3.22	22%	0.00	0%
PS9	0.63	1.24	0.00	0%	0.01	1%	0.05	9%	0.01	1%
PS10	6.59	2.10	2.07	31%	0.00	0%	2.07	31%	0.00	0%
PS11	10.04	0.79	1.21	12%	0.00	0%	5.29	53%	0.79	100%
PS12	7.86	0.91	0.67	8%	0.00	0%	0.67	8%	0.00	0%
PS13	2.96	0.49	0.00	0%	0.00	0%	0.36	12%	0.00	0%
PS14	15.84	0.85	0.88	6%	0.00	0%	3.49	22%	0.00	0%
PS15	1.97	2.80	0.00	0%	0.00	0%	0.04	2%	0.00	0%
PS16	1.63	1.93	0.00	0%	0.00	0%	0.53	32%	0.00	0%
PS17	2.52	3.11	0.00	0%	2.53	81%	0.00	0%	2.53	81%
Totals	96.06	28.57	12.80	13%	2.98	10%	25.25	26%	5.10	18%

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Pipe Characteristics: Year Installed	Pipe Characteristics: Pipe Material	Nominal Capacity (mgd)	Peak Flows (mgd) 2000	% Nominal Capacity 2000	Peak Flows (mgd) 2010 UF	% Nominal Capacity 2010 UF	Peak Flows (mgd) 2030 UF	% Nominal Capacity 2030 UF	Capacity Reached	Capacity Needs	
Pump Station No. 1 Service Area																	
GR	North End Interceptor along Sherman Avenue	MH01-126	MH01-123	650	10	1927	VP	0.45	0.20	44%	0.20	44%	0.20	44%	> 2060		
GR	North End Interceptor along Sherman Avenue	MH01-123	MH01-120	832	12	1927	VP	0.73	0.20	27%	0.20	27%	0.20	27%	> 2060		
GR	North End Interceptor along Commercial Avenue	MH01-120	MH01-617	1,085	18	2002	PVC	2.54	4.13	163%	1.67	66%	1.64	65%	> 2060		
GR	North End Interceptor along Commercial Avenue	MH01-617	MH01-616	534	20	2002	PVC	3.36	4.13	123%	1.67	50%	1.64	49%	> 2060		
GR	North End Interceptor along Pennsylvania Avenue	MH01-616	MH01-604	4,248	36	2002	PVC	16.10	12.27	76%	8.38	52%	8.51	53%	> 2060		
GR	North End Interceptor along E. Johnson Street	MH01-604	MH01-304	787	42	2002	PVC	24.29	12.27	51%	8.38	34%	8.51	35%	> 2060		
GR	Northeast Interceptor Relief	MH01-003	MH01-001	189	30	1937	CI	8.38	1.37	16%	1.37	16%	1.36	16%	> 2060		
GR	East Johnson Street Relief Sewer	MH01-001	MH01-303	38	36	1979	RCP	23.60	1.37	6%	1.37	6%	1.36	6%	> 2060		
GR	East Johnson Street Relief Sewer	MH01-304	PS1	658	36	1979	RCP	23.60	13.19	56%	9.37	40%	9.50	40%	> 2060		
GR	City of Madison Interceptor - Blount Street to PS 1	-	-	-	-	-	-	-	7.95		8.42		9.35				
FM	PS 1 Force Main - PS 1 to PS 6	PS 1	PS 6	2,638	30	1948	RCP	25.40	N/A		N/A		N/A		>2060		
FM	Cross Town Force Main	PS1	PBXT-01337	1,346	24	2000	DI	16.20	19.06	118%	15.95	98%	16.90	104%	2010-2020	X	Y
FM	Cross Town Force Main	PBXT-01337	PBXT-06139	4,987	30	2002	DI	25.40	19.06	75%	15.95	63%	16.90	67%	> 2060		
FM	Cross Town Force Main	PBXT-06139	BDXT-07930	1,791	30	2002	PVC	25.40	19.06	75%	15.95	63%	16.90	67%	> 2060		
FM	Cross Town Force Main	BDXT-07930	RDXT-09244	1,314	30	2002	DI	25.40	19.06	75%	15.95	63%	16.90	67%	> 2060		
FM	Cross Town Force Main	RDXT-09244	PBXT-09256	12	20	2002	DI	11.30	19.06	169%	15.95	141%	16.90	150%	2000	X	Y
FM	Cross Town Force Main	PBXT-09256	PBXT-10254	998	20	1995	PVC	11.30	19.06	169%	15.95	141%	16.90	150%	2000	X	Y
FM	Cross Town Force Main	PBXT-10254	RDXT-10260	6	20	2002	DI	11.30	19.06	169%	15.95	141%	16.90	150%	2000	X	Y
FM	Cross Town Force Main	RDXT-10260	PS2	6,285	30	2002	DI	25.40	19.06	75%	15.95	63%	16.90	67%	> 2060		

Total Length of Gravity Sewers (mi) 1.71
Total Length of Force Mains (mi) 3.67

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 0.00
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.45
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.45

Flow Type	Segment Description	From	To	Length (ft)	Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	2000	%	2010 UF	%	2030 UF	%	Capacity Reached	Capacity Needs	
Pump Station No. 2 Service Area																	
GR	Original West Interceptor on Randall Avenue - Dayton Street to Spring Street	MH02-014A	MH02-316	420	24	1916	CI	7.73	2.23	29%	2.22	29%	2.19	28%	> 2060		
GR	West Interceptor - Spring Street Relief	MH02-316	MH02-300	4,577	24	1940	CI	6.54	2.23	34%	2.22	34%	2.19	33%	> 2060		
GR	West Interceptor - Spring Street Relief at West Washington Avenue	MH02-300	MH02-101	3	24	1940	CI	6.54	7.20	110%	7.76	119%	8.86	135%	2000	X	Y
Junction with Original West Interceptor																	
GR	Original West Interceptor at Regent Street/Randall Avenue	MH02-316	MH02-011	1,115	24	1916	CI	4.62	0.00	0%	1.36	29%	1.68	36%	> 2060		
GR	Original West Interceptor on Regent Street	MH02-011	MH02-008	900	24	1916	CI	4.62	5.65	122%	6.95	150%	7.69	166%	2000	X	Y
GR	Original West Interceptor on Regent Street	MH02-008	MH02-005A	1,260	24	1916	CI	5.27	5.65	107%	6.95	132%	7.69	146%	2000	X	Y
GR	City of Madison Frances Street Interceptor	MH02-005A	MH02-402	1,296	30	1968	RCP	12.43	5.65	45%	6.95	56%	7.69	62%	> 2060		
GR	Original West Interceptor	MH02-005	MH02-101	1,319	24	1916	CI	8.89	0.23	3%	0.22	2%	0.21	2%	> 2060		
Junction with Spring Street Relief																	
GR	West Interceptor to PS 2 along West Washington Avenue	MH02-101	MH02-402	10	36	1963	RCP	26.21	7.38	28%	7.93	30%	9.01	34%	> 2060		
GR	West Interceptor to PS 2 along West Washington Avenue	MH02-402	MH02-401	284	48	1963	RCP	24.55	11.97	49%	13.61	55%	15.25	62%	> 2060		
Junction with Southwest Interceptor																	
GR	SWI on Haywood Street	MH08-106	MH02-606	1,438	24	1936	CI	5.06	0.15	3%	0.16	3%	0.18	4%	> 2060		
GR	SWI on West Shore Drive	MH02-606	MH02-401	1,770	36	2001	PVC	46.95	1.27	3%	1.25	3%	1.22	3%	> 2060		
Junction with Original West Interceptor																	
GR	Interceptor to PS 2	MH02-401	PS2	30	48	1963	RCP	37.12	12.83	35%	14.45	39%	16.04	43%	> 2060		
FM		PS2	TE02-10933	9,890	36	2001	DI	36.50	28.69	79%	27.25	75%	29.53	81%	> 2060		
Junction with PS4 force main																	
FM	From PS4 junction to PS3 junction	TE02-10933	TE02-17328	6,395	36	2001	DI	36.50	30.93	85%	29.56	81%	31.88	87%	> 2060		
Junction with PS3 force main																	
FM	At Nine Springs WWTP	TE02-17328	BD02-18136	757	36	2000-2001	DI	36.50	31.64	87%	30.31	83%	32.68	90%	2030-2060		
FM	At Nine Springs WWTP	BD02-18136	Headworks	354	36	2006	DI	36.50	31.64	87%	30.31	83%	32.68	90%	2030-2060		

Total Length of Gravity Sewers (mi) 2.73
Total Length of Force Mains (mi) 3.29

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 0.41
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 0.41
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.00

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	Peak Flows (mgd) / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
Pump Station No. 3 Service Area																
GR	Rimrock Interceptor	MH03-311	MH03-102	3,492	12	1959	RCP	1.08	*1.24*	115%	*1.29*	119%	*1.40*	130%	2000	X Y
GR	Rimrock Interceptor at PS 3	MH03-102	PS3	308	10	1958	CI	1.00	*1.24*	124%	*1.29*	129%	*1.40*	140%	2000	X Y
FM	At Nine Springs WWTP	PS3	TE03-00009	9	8	1958	CI	1.80	*1.24*	69%	*1.29*	72%	*1.40*	78%	> 2060	
FM	At Nine Springs WWTP	TE03-00009	TE02-17328	17	8	2001	DI	1.80	*1.24*	69%	*1.29*	72%	*1.40*	78%	> 2060	
Junction with PS2 / PS4 force main																

Total Length of Gravity Sewers (mi) 0.72
Total Length of Force Mains (mi) 0.005

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 0.72
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 0.72
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.00

Flow Type	Segment Description	From	To	Length (ft)	Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
Pump Station No. 4 Service Area																
GR	South Interceptor - Baird Street Extension	MH04-408	MH04-313	1,414	15	1928	VP(L)	2.87	*1.52*	53%	*1.55*	54%	*1.62*	56%	> 2060	
GR	South Interceptor - Baird Street Extension	MH04-313	MH04-312	14	12	1995	PVC	7.27	*1.52*	21%	*1.55*	21%	*1.62*	22%	> 2060	
SI	South Interceptor - Wingra Creek Siphon	MH04-312	MH04-311	156	10&14	1995	DI	4.00	*2.90*	73%	*2.96*	74%	*3.08*	77%	> 2060	
GR	South Interceptor - Beld Street to Wingra Creek Siphon	MH04-315	MH04-311	643	24	1995	PVCPW	5.46	*0.18*	3%	*0.19*	3%	*0.21*	4%	> 2060	
GR	South Interceptor - Wingra Creek Siphon to Sayle Street	MH04-311	MH04-209	3,048	24	1995	PVCPW	5.46	*3.49*	64%	*3.56*	65%	*3.69*	68%	> 2060	
GR	South Interceptor - Sayle Street to PS 4	MH04-209	MH04-201	2,214	24	1967	AC	4.62	*3.49*	76%	*3.56*	77%	*3.69*	80%	> 2060	
GR	South Interceptor - Fairgrounds Branch	MH04-201B	MH04-201	653	15	1967	AC	2.25	*0.40*	18%	*0.41*	18%	*0.41*	18%	> 2060	
GR	South Interceptor to PS 4	MH04-201	PS4	30	24	1967	AC	5.27	*3.89*	74%	*3.96*	75%	*4.09*	78%	> 2060	
FM		PS04	TE04-00098	98	16	1967	CI	7.20	*3.89*	54%	*3.96*	55%	*4.09*	57%	> 2060	
FM		TE04-00098	TE02-10933	55	16	2000	DI	7.20	*3.89*	54%	*3.96*	55%	*4.09*	57%	> 2060	
Junction with PS2 force main																

Total Length of Gravity Sewers (mi) 1.55
Total Length of Force Mains (mi) 0.03

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 0.00
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.00

Flow Type	Segment Description	From	To	Length (ft)	Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
Pump Station No. 5 Service Area																
GR	West Interceptor Diversion at PS 15 - Marshall Park	MH05-102A	MH05-021	555	30	1957	RCP	7.01	*0.19*	3%	*0.00*	0%	*0.00*	0%	> 2060	
GR	West Interceptor Diversion at PS 15 - Marshall Park	MH05-021	MH05-020	238	14	1931	CI	2.11	*0.19*	9%	*0.00*	0%	*0.00*	0%	> 2060	
GR	West Interceptor Diversion - Marshall Park to Lake Mendota Dr.	MH05-020	MH05-011	2,554	16	1931	CI	1.92	*0.19*	10%	*0.00*	0%	*0.00*	0%	> 2060	
Junction with West Interceptor - Gammon Extension																
GR	West Interceptor - Gammon Extension	MH05-230	MH05-214	4,598	14	1966	AC	1.39	*1.16*	83%	*1.18*	85%	*1.21*	87%	> 2060	
GR	West Interceptor - Gammon Extension	MH05-214	MH05-206	2,534	10	1966	AC	1.90	*1.16*	61%	*1.18*	62%	*1.21*	64%	> 2060	
GR	West Interceptor - Gammon Extension	MH05-206	MH05-201	1,517	12	1966	AC	2.01	*1.33*	66%	*1.34*	67%	*1.38*	69%	> 2060	
GR	West Interceptor - Gammon Extension	MH05-201	MH05-011	168	18	1966	AC	2.35	*1.33*	57%	*1.34*	57%	*1.38*	59%	> 2060	
Junction with Original West Interceptor																
GR	Original West Interceptor - Gammon Ext. to PS 5	MH05-011	MH05-402	3,561	18	1931	CI	2.25	*1.98*	88%	*1.81*	80%	*1.86*	83%	> 2060	
GR	West Interceptor to PS 5	MH05-402	MH05-401	92	24	1995	PVC	7.31	*1.98*	27%	*1.81*	25%	*1.86*	25%	> 2060	
GR	West Interceptor to PS 5	MH05-401	PS5	28	24	1995	PVC	7.31	*2.59*	35%	*2.44*	33%	*2.52*	34%	> 2060	
FM	PS5 FM replaced with new station (1994)	PS5	TE05-22834	27	16	1994	DI	7.20	*2.59*	36%	*2.44*	34%	*2.52*	35%	> 2060	
FM	PS5 original FM	TE05-22834	TE05-22376	458	16	1959	PCCP	7.20	*2.59*	36%	*2.44*	34%	*2.52*	35%	> 2060	
Junction with PS 15 force main																
FM		TE05-22376	MH02-547	1,742	24	1959	PCCP	16.2	*7.42*	46%	*7.75*	48%	*8.54*	53%	> 2060	
Junction with West Interceptor Relief																

Total Length of Gravity Sewers (mi) 3.00
Total Length of Force Mains (mi) 0.42

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 0.00
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.00

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	Peak Flows (mgd) / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs	
Pump Station No. 6 Service Area																	
GR	East Interceptor - PS 1 FM to Fair Oaks Avenue	MH06-122	MH06-108A	4,813	36	1995	PVCPW	23.88	*0.54*	2%	*0.63*	3%	*0.81*	3%	> 2060		
Junction with Fair Oaks / East Monona Interceptor																	
GR	Fair Oaks/East Monona Interceptor - U/S of Starkweather Creek	MH06-209	MH06-206	1,236	15	1926	VP	1.02	*0.73*	72%	*0.72*	71%	*0.71*	70%	> 2060		
SI	Fair Oaks/East Monona Interceptor - Starkweather Creek crossing	MH06-206	MH06-205	85	14	1925	CI	1.04	*0.73*	70%	*0.72*	69%	*0.71*	68%	> 2060		
GR	Fair Oaks/East Monona Interceptor - D/S of Starkweather Creek	MH06-205	MH06-204	90	14	1925	CI	0.85	*0.73*	86%	*0.72*	85%	*0.71*	84%	> 2060		
GR	Fair Oaks/East Monona Interceptor - D/S of Starkweather Creek	MH06-204	MH06-108A	847	15	1997	PVC	1.64	*0.73*	45%	*0.72*	44%	*0.71*	43%	> 2060		
Junction with East Interceptor																	
GR	East Interceptor - Fair Oaks Avenue to Olbrich Gardens	MH06-108A	MH06-103	1,526	36	1995	PVCPW	23.88	*1.41*	6%	*1.49*	6%	*1.66*	7%	> 2060		
GR	East Interceptor - Olbrich Gardens to PS 6	MH06-103	PS6	1,483	42	1948	RCP	30.48	*1.41*	5%	*1.49*	5%	*1.66*	5%	> 2060		
FM		PS6	MH07-129	7,214	36	1948	RCP	36.5	*5.77*	16%	*5.97*	16%	*6.37*	17%	> 2060		
		Total Length of Gravity Sewers (mi)		1.91									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		0.00		
		Total Length of Force Mains (mi)		1.37									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		0.00		
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		0.00		
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		0.00		
Pump Station No. 7 Service Area																	
GR	FEI Gaston Road Extension	MH07-740	MH07-735	1,693	18	2008	PVC	4.39	*0.00*	0%	*0.00*	0%	*2.38*	54%	>2060		
GR	FEI Gaston Road Extension	MH07-735	PB07-734	38	21	2008	PVC	4.20	*0.00*	0%	*0.00*	0%	*2.38*	57%	>2060		
Junction with Door Creek Extension																	
GR	FEI Door Creek Extension	PB07-734	MH07-728	3,384	21	1998	PVCPW	4.36	*0.18*	4%	*2.77*	64%	*7.14*	164%	2010-2020	X	Y
GR	FEI Door Creek Extension	MH07-728	MH07-723	2,496	21	1998	PVCPW	5.41	*0.18*	3%	*2.77*	51%	*7.14*	132%	2020-2030		Y
GR	FEI Door Creek Extension	MH07-723	MH07-707	7,899	24	1998	PVCPW	5.98	*0.18*	3%	*2.77*	46%	*7.14*	119%	2020-2030		Y
GR	FEI Door Creek Extension	MH07-707	MH07-426	3,474	24	1998	PVCPW	7.12	*0.18*	3%	*2.77*	39%	*8.20*	115%	2020-2030		Y
Junction with Cottage Grove Extension																	
GR	FEI Cottage Grove Extension	MH07-437	MH07-426	5,510	18	1981	RCP(L)	2.71	*1.27*	47%	*2.20*	81%	*3.00*	111%	>2030		Y
Junction with Far East Extension																	
GR	FEI - Far East Extension	MH07-426	MH07-425	153	36	1981	RCP	12.19	*1.68*	14%	*5.31*	44%	*11.11*	91%	2030-2060		
GR	FEI - Far East Extension (Cottage Grove Ext. to I90 east R/W)	MH07-425	MH07-416	3,861	30	1981	RCP	7.49	*1.68*	22%	*5.31*	71%	*11.11*	148%	2010-2020	X	Y
GR	FEI - Far East Extension (I90 crossing)	MH07-416	MH07-415	355	42	1970	RCP	15.92	*1.68*	11%	*5.31*	33%	*11.11*	70%	2030-2060		
Junction with Far East Interceptor																	
GR	FEI - I90 west R/W to junction with NEI	MH07-415	MH07-932	8,067	42	1970	RCP	15.92	*1.96*	12%	*5.59*	35%	*11.44*	72%	2030-2060		
Junction with Northeast Interceptor																	
GR	NEI - D/S of NEI junction	MH07-932	MH07-313	14	42	1970	RCP	15.92	*26.75*	168%	*33.21*	209%	*45.50*	286%	2000	X	Y
GR	NEI - MH07-313 to SEI junction	MH07-313	MH07-215	5,591	48	1964	RCP	32.14	*26.75*	83%	*33.21*	103%	*45.50*	142%	2000-2010	X	Y
Junction with Southeast Interceptor																	
GR	Southeast Interceptor - PS 9 Force Main to Siggelkow Road	MH07-823	MH07-821	760	12	1961	AC	1.46	*0.36*	25%	*0.38*	26%	*0.42*	29%	> 2060		
SI	Southeast Interceptor - Siggelkow Road crossing	MH07-821	MH07-819	184	8	1992	DI	1.46	*0.36*	25%	*0.38*	26%	*0.42*	29%	> 2060		
GR	Southeast Interceptor - North of Siggelkow Road	MH07-819	MH07-818	357	12	1961	AC	1.46	*0.36*	25%	*0.38*	26%	*0.42*	29%	> 2060		
GR	Southeast Interceptor - North of Siggelkow Road to McFarland Court	MH07-818	MH07-810	3,201	12	1961	AC	2.36	*0.36*	15%	*0.38*	16%	*0.42*	18%	> 2060		
GR	Southeast Interceptor - McFarland Ct. to Blooming Grove Ext. junction	MH07-810	MH07-218	3,971	15	1961	AC	1.62	*0.36*	22%	*0.38*	23%	*0.42*	26%	> 2060		
Junction with SEI Blooming Grove Extension																	
GR	Southeast Interceptor - Blooming Grove Ext. junction to NEI junction	MH07-218	MH07-215	1,606	36	1961	RCP	11.4	*4.51*	40%	*6.69*	59%	*10.71*	94%	2030-2060		
Junction with Northeast Interceptor																	
GR	Southeast Interceptor - NEI junction to east of Monona Drive	MH07-215	MH07-211	2,468	60	1961	RCP	37.62	*29.44*	78%	*37.33*	99%	*52.28*	139%	2010-2020	X	Y
GR	Southeast Interceptor - East of Monona Drive to PS 7	MH07-211	PS7	5,342	60	1961	RCP	37.62	*30.09*	80%	*38.01*	101%	*53.01*	141%	2000-2010	X	Y
Junction with East Interceptor																	
GR	NEI - Between Buckeye Road and Helgesen Drive	MH07-955	MH07-954	95	48	2001	DI	40.45	*25.09*	62%	*29.32*	72%	*37.44*	93%	2030-2060		
GR	NEI - Between Buckeye Road and Helgesen Drive	MH07-954	PB07-953	40	48	2001	DI	57.2	*25.09*	44%	*29.32*	51%	*37.44*	65%	> 2060		
GR	NEI - Between Buckeye Road and Helgesen Drive	PB07-953	MH07-949	1,843	48	2005	FRP	67.6	*25.09*	37%	*29.32*	43%	*37.44*	55%	> 2060		
GR	NEI - North and south of Helgesen Drive	MH07-949	MH07-945	1,083	42	2005	FRP	50.37	*25.09*	50%	*29.32*	58%	*37.44*	74%	> 2060		
GR	NEI - Between Helgesen Drive and Pflaum Road	MH07-945	MH07-942	850	36	2005	FRP	60.47	*25.09*	41%	*29.32*	48%	*37.44*	62%	> 2060		
GR	NEI at Pflaum Road	MH07-942	MH07-939	790	42	2005	FRP	68.27	*25.09*	37%	*29.32*	43%	*37.44*	55%	> 2060		
GR	NEI - Pflaum Road to junction with FEI	MH07-939	MH07-932	2,622	54	2005	FRP	52.01	*25.09*	48%	*29.32*	56%	*37.44*	72%	> 2060		
Junction with Far East Interceptor																	

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	Peak Flows (mgd) / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
GR	SEI Blooming Grove Ext. - Millpond Road to I90 west R/W	MH07-249	MH07-242	2,794	18	1967	RCP	2.25	*0.37*	16%	*2.07*	92%	*5.21*	232%	2010-2020	X Y
GR	SEI Blooming Grove Ext. - I90 west R/W to Marsh Road	MH07-242	MH07-231	4,974	24	1967	RCP	3.87	*0.37*	10%	*2.07*	53%	*5.21*	135%	2020-2030	Y
GR	SEI Blooming Grove Ext. - Marsh Rd. to SEI McFarland Relief junction	MH07-231	MH07-228	1,347	24	1967	RCP	5.06	*0.37*	7%	*2.07*	41%	*5.21*	103%	2020-2030	Y
Junction with McFarland Relief																
GR	SEI Blooming Grove Ext. - McFarland Relief junction to Galleon Run	MH07-228	MH07-224	2,001	30	1967	RCP	10.26	*3.84*	37%	*6.02*	59%	*9.98*	97%	2030-2060	
GR	SEI Blooming Grove Ext. - Between Galleon Run and S. Dutch Mill Road	MH07-224	MH07-222	650	30	1967	RCP	10.26	*4.21*	41%	*6.40*	62%	*10.42*	102%	2020-2030	Y
GR	SEI Blooming Grove Ext. - East of S. Dutch Mill Road to SEI junction	MH07-222	MH07-218	1,647	36	1963	RCP	10.55	*4.21*	40%	*6.40*	61%	*10.42*	99%	2030-2060	
Junction with Southeast Interceptor																
GR	SEI McFarland Relief - Brandenburg Way to Star Spangled Trail	MH07-517	MH07-515	392	20	1987	RCP	11.89	*3.23*	27%	*3.90*	33%	*5.02*	42%	> 2060	
GR	SEI McFarland Relief - Star Spangled Trail to Siggelkow Ext. junction	MH07-515	MH07-512	1,263	30	1987	RCP	8.79	*3.23*	37%	*3.90*	44%	*5.02*	57%	> 2060	
Junction with Siggelkow Extension																
GR	SEI McFarland Relief - Siggelkow Ext. to Blooming Grove Ext.	MH07-512	MH07-228	5,012	30	1987	RCP	8.79	*3.46*	39%	*4.36*	50%	*5.92*	67%	> 2060	
Junction with Blooming Grove Extension																
GR	SEI Siggelkow Extension - Red Oak Trail to Siggelkow Road	MH07-618	MH07-610	2,334	12	1996	PVC	2.12	*0.18*	8%	*0.31*	15%	*0.57*	27%	> 2060	
GR	SEI Siggelkow Extension - Siggelkow Road crossing	MH07-610	MH07-609	78	8	1996	PVC	0.72	*0.18*	25%	*0.31*	43%	*0.57*	79%	> 2060	
GR	SEI Siggelkow Ext. - Siggelkow Rd. to FEI McFarland Relief junction	MH07-609	MH07-512	2,666	12	1993	PVC	2.12	*0.18*	8%	*0.31*	15%	*0.57*	27%	> 2060	
Junction with McFarland Relief																
GR	East Interceptor Replacement - Phase II	MH07-129	MH07-121A	3,126	36	1986	RCPWT	41.05	*7.82*	19%	*8.02*	20%	*8.42*	21%	> 2060	
GR	East Interceptor Replacement - Phase IV	MH07-121A	MH07-111J	2,851	42	1990	RCPWT	36.03	*7.82*	22%	*8.02*	22%	*8.42*	23%	> 2060	
GR	East Interceptor Replacement - Phase I	MH07-111J	MH07-111A	1,844	36	1985	RCPWT	36.01	*7.82*	22%	*8.02*	22%	*8.42*	23%	> 2060	
GR	East Interceptor Replacement - Phase III	MH07-111A	MH07-103	2,610	42	1990	DI	30.48	*7.82*	26%	*8.02*	26%	*8.42*	28%	> 2060	
GR	East Interceptor - MH07-103 to PS 7	MH07-103	PS7	989	42	1948	RCP	30	*7.82*	26%	*8.02*	27%	*8.42*	28%	>2060	
FM	PS7 to Junction at Nine Springs WWTP	PS 7	TE07A-01520	6,996	36	1948	RCP	55.00	*35.13*	64%	*42.99*	78%	*59.86*	109%	2020-2030	Y
FM	PS7 to Junction at Nine Springs WWTP	PS 7	TE07A-01520	6,996	36	1963	PCCP	65.00	*35.13*	54%	*42.99*	66%	*59.86*	92%	2030-2060	
FM	At Nine Springs WWTP	TE07A-01520	PB07A-00186	1,338	48	1963	PCCP	65.00	*35.13*	54%	*42.99*	66%	*59.86*	92%	2030-2060	
FM	At Nine Springs WWTP	PB07A-00186	Headworks	323	48	2005	DI	65.00	*35.13*	54%	*42.99*	66%	*59.86*	92%	2030-2060	
			Total Length of Gravity Sewers (mi)	19.76										Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)	4.44	
			Total Length of Force Mains (mi)	2.96										Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)	8.39	
														Total Length of Force Mains Reaching Capacity by 2020 (mi)	0.00	
														Total Length of Force Mains Reaching Capacity by 2030 (mi)	1.33	
Pump Station No. 8 Service Area																
GR	WI Relief - Between Whitney Way and Merill Springs Road	MH02-547	MH02-546	497	24	1959	RCP	12.57	*7.42*	59%	*7.75*	62%	*8.54*	68%	> 2060	
GR	WI Relief - Between Whitney Way and Merill Springs Road	MH02-546	MH02-545	192	27	1959	RCP	8.95	*7.42*	83%	*7.75*	87%	*8.54*	95%	> 2060	
GR	WI Relief - Merill Springs Road to Maple Terrace	MH02-545	MH02-538	3,121	27	1959	RCP	8.95	*9.79*	109%	*10.22*	114%	*11.21*	125%	2000	X Y
GR	WI Relief - Maple Terrace to Highbury Road	MH02-538	MH02-536	1,200	24	1959	RCP	8.52	*9.79*	115%	*10.22*	120%	*11.21*	132%	2000	X Y
GR	WI Relief - Highbury Road to Joyce Erdman Place	MH02-536	MH02-535	600	21	1959	RCP	10.44	*9.79*	94%	*10.22*	98%	*11.21*	107%	2010-2020	X Y
GR	WI Relief - Joyce Erdman Place to Shorewood Boulevard	MH02-535	MH02-532	841	21	1959	RCP	10.44	*9.79*	94%	*10.22*	98%	*11.21*	107%	2010-2020	X Y
GR	WI Relief at Shorewood Boulevard	MH02-532	MH02-531A	65	36	1959	RCP	12.19	*9.98*	82%	*10.42*	85%	*11.40*	94%	2030-2060	
Junction with WI - Midvale Relief																
GR	WI Relief - Midvale Relief junction to east of Highland Avenue	MH02-531A	MH02-519	4,363	36	1959	RCP	12.19	*12.58*	103%	*13.07*	107%	*14.17*	116%	2000	X Y
GR	WI Relief - Between Highland Avenue and Walnut Street	MH02-519	MH02-518	465	36	1959	RCP	25.85	*12.58*	49%	*13.07*	51%	*14.17*	55%	> 2060	
SI	WI Relief - Walnut Street crossing	MH02-518	MH02-516	204	36	1959	RCP	12.19	*12.58*	103%	*13.07*	107%	*14.17*	116%	2000	X Y
GR	WI Relief - Walnut Street to Campus Relief (Ph IV) junction	MH02-516	MH08-228	10	36	1959	RCP	12.19	*14.21*	117%	*14.66*	120%	*15.67*	129%	2000	X Y
Junction with Campus Relief (Ph IV)																
GR	WI Relief - Campus Relief (Ph IV) junction to Original West Int. junction	MH08-228	MH02-513	1,112	36	1959	RCP	12.19	*6.68*	55%	*6.89*	57%	*7.36*	60%	> 2060	
Junction with Old West Interceptor																
GR	WI Relief - Original West Int. junction to Campus Relief (Ph II) junction	MH02-513	MH08-209	2,175	36	1959	RCP	12.19	*9.29*	76%	*9.77*	80%	*10.78*	88%	> 2060	
Junction with Campus Relief (Ph II)																
GR	WI Relief - Between Babcock Drive and Henry Mall	MH08-209	MH08-207	625	36	1959	RCP	12.19	*7.74*	63%	*8.01*	66%	*8.59*	70%	> 2060	
Junction with Campus Relief (Ph II)																
GR	WI Relief - Henry Mall to Randall Avenue	MH08-207	MH02-503	463	36	1959	RCP	12.19	*3.63*	30%	*3.76*	31%	*4.03*	33%	> 2060	
GR	WI Relief on Randall Avenue - Campus Drive to Engineering Drive	MH02-503	MH02-502	142	36	1959	RCP	12.19	*3.63*	30%	*3.76*	31%	*4.03*	33%	> 2060	
GR	WI Relief on Randall Avenue - Engineering Drive to Randall Relief junction	MH02-502	MH02-014A	513	36	1959	RCP	12.19	*5.34*	44%	*5.48*	45%	*5.78*	47%	> 2060	
Junction with Old West Interceptor & West Interceptor Randall Relief																
GR	WI Midvale Relief - Midvale Boulevard to WI Relief junction	MH02-708	MH02-531A	2,653	21	1971	RCP	3.55	*3.19*	90%	*3.32*	94%	*3.57*	101%	2020-2030	Y
Junction with West Interceptor Relief																

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
GR	WI Campus Relief (Ph IV) - Walnut Street to UW Dairy Barn	MH08-228	MH08-223	1,933	36	2005	DI	15.04	*7.53*	50%	*7.77*	52%	*8.30*	55%	> 2060	
GR	WI Campus Relief (Ph IV) - North of UW Dairy Barn	MH08-223	MH08-221	161	36	2005	DI	15.04	*9.69*	64%	*9.90*	66%	*10.39*	69%	> 2060	
GR	WI Campus Relief (Ph IV) - North of UW Dairy Barn	MH08-221	MH08-220	118	2 @ 24	2005	DI	15.64	*9.69*	62%	*9.90*	63%	*10.39*	66%	> 2060	
GR	WI Campus Relief (Ph IV) - UW Dairy Barn to Campus Relief (Ph III) junction	MH08-220	MH08-216	514	36	2005	DI	15.04	*9.69*	64%	*9.90*	66%	*10.39*	69%	> 2060	
GR	WI Campus Relief (Ph III) - South of Stock Pavilion & Babcock Hall	MH08-216	MH08-210	1,078	36	2000	DI	16.40	*9.69*	59%	*9.90*	60%	*10.39*	63%	> 2060	
GR	WI Campus Relief (Ph II) - South of Babcock Hall	MH08-210	MH08-209	64	36	2000	DI	15.04	*9.69*	64%	*9.90*	66%	*10.39*	69%	> 2060	
Junction with West Interceptor Relief																
GR	WI Campus Relief (Ph II) - South of Babcock Hall to Material Science Bldg.	MH08-209	MH08-208	629	48	2000	FRP	34.68	*9.52*	27%	*9.87*	28%	*10.63*	31%	> 2060	
GR	WI Campus Relief (Ph II) - Campus Drive at Material Science Building	MH08-208	MH08-207	12	36	2000	DI	15.04	*9.52*	63%	*9.87*	66%	*10.63*	71%	> 2060	
Junction with West Interceptor Relief																
GR	WI Campus Relief (Ph I) - Material Science Bldg. to Randall Relief junction	MH08-207	MH08-201	1,134	36	1999	DI	17.80	*13.64*	77%	*14.13*	79%	*15.18*	85%	> 2060	
Junction with West Interceptor - Randall Relief																
GR	Old West Interceptor - State Crime Lab to Shorewood Boulevard	MH02-060	MH02-047	5,066	12-18	1932	VP	2.09	*0.71*	34%	*0.89*	43%	*1.25*	60%	> 2060	
GR	Old West Interceptor - Shorewood Boulevard to west of Franklin Avenue	MH02-047	MH02-041	1,914	18	1932	VP	2.71	*0.71*	26%	*0.89*	33%	*1.25*	46%	> 2060	
GR	Old West Interceptor - West of Franklin Avenue to Farley Avenue	MH02-041	MH02-038	1,063	18	1932	VP	2.71	*1.40*	52%	*1.67*	62%	*2.20*	81%	2030-2060	
GR	Old West Interceptor - Farley Avenue to Highland Avenue	MH02-038	MH02-034	1,460	18	1916	VP	1.92	*1.40*	73%	*1.67*	87%	*2.20*	115%	2010-2020	X Y
GR	Old West Interceptor - Highland Avenue to Walnut Street	MH02-034	MH02-032	816	20	1916	VP	2.84	*2.41*	85%	*2.76*	97%	*3.47*	122%	2010-2020	X Y
GR	Old West Interceptor - Walnut Street to West Relief junction	MH02-032	MH02-513	1,704	21	1916	VP	3.24	*2.41*	74%	*2.76*	85%	*3.47*	107%	2020-2030	Y
Junction with West Interceptor Relief																
GR	Old West Interceptor - Babcock Hall to West Relief junction	MH02-021	MH02-014A	2,153	24	1916	CI	4.85	*3.44*	71%	*3.33*	69%	*3.11*	64%	> 2060	
Junction with West Interceptor Relief & West Interceptor Randall Relief																
GR	WI Randall Relief - Junction with Old West Int. to jxn with Campus Relief	MH02-014A	MH08-201	29	33	1964	RCP	25.10	*7.97*	32%	*8.02*	32%	*8.15*	32%	> 2060	
Junction with West Interceptor - Campus Relief (Table 4-21)																
GR	WI Randall Relief - South of Dayton Street to Regent Street	MH08-201	MH08-121	1,127	33	1964	RCP	25.10	*19.93*	79%	*20.45*	81%	*21.58*	86%	> 2060	
GR	WI Randall Relief - At Randall Avenue and Regent Street	MH08-121	MH08-120	16	2@30	1964	CI	21.13	*19.93*	94%	*20.45*	97%	*21.58*	102%	2020-2030	Y
GR	WI Randall Relief - Regent Street to Milton Street	MH08-120	MH08-119	473	42	1964	RCP	25.17	*19.93*	79%	*20.45*	81%	*21.58*	86%	> 2060	
GR	WI Randall Relief - Milton Street to Vilas Avenue	MH08-119	MH08-117	1,201	42	1964	RCP	25.17	*20.67*	82%	*20.45*	81%	*21.58*	86%	> 2060	
GR	WI Randall Relief - Vilas Avenue to SWI junction at Vilas Zoo	MH08-117	MH08-113	1,479	42	1964	RCP	25.17	*20.93*	83%	*20.70*	82%	*21.83*	87%	> 2060	
Junction with Southwest Interceptor																
GR	WI Randall Relief - Through Vilas Zoo to Vilas Park Drive	MH08-113	MH08-109	1,237	48	1964	RCP	27.84	*20.75*	75%	*20.61*	74%	*21.63*	78%	> 2060	
Junction with Southwest Interceptor																
GR	WI Randall Relief - Vilas Park Drive to Haywood Drive	MH08-109	MH08-106	1,279	48	1964	RCP	27.84	*21.07*	76%	*20.94*	75%	*21.96*	79%	> 2060	
Junction with Southwest Interceptor																
GR	WI Randall Relief - Along Wingra Drive from Haywood Drive to PS 8	MH08-106	PS 8	3,179	48	1964	RCP	30.78	*24.90*	81%	*24.74*	80%	*25.94*	84%	> 2060	
GR	SWI North Leg - Whitney Way to Beltline Highway	MH02-189	MH02-186	846	15	1955	RCP(L)	1.89	*1.44*	76%	*1.44*	76%	*1.44*	76%	> 2060	
GR	SWI North Leg - Beltline Highway to east edge of Odana Hills GC	MH02-186	MH02-174	4,693	18	1955	RCP/AC(L)	2.46	*1.44*	59%	*1.44*	59%	*1.44*	59%	> 2060	
GR	SWI North Leg - East edge of Odana Hills GC to junction with SWI South Leg	MH02-174	MH02-173A	100	20	1955	AC	3.48	*1.44*	41%	*1.44*	41%	*1.44*	41%	> 2060	
Junction with Southwest Interceptor - South Leg																
GR	SWI South Leg - USH 18/151 Frontage Road to Home Depot	MH02-218	MH02-215	1,134	16	2000	PVC	2.62	*0.90*	34%	*0.90*	34%	*0.89*	34%	> 2060	
GR	SWI South Leg - Home Depot to Hammersley Road	MH02-215	MH02-208	1,893	12	1955	RCP(L)	1.13	*0.90*	80%	*0.90*	80%	*0.89*	79%	> 2060	
GR	SWI South Leg - Along Pontiac Trail, Hammersley Road to Boston Court	MH02-208	MH02-203	1,606	14	1955	AC(L)	1.67	*0.90*	54%	*0.90*	54%	*0.89*	53%	> 2060	
GR	SWI South Leg - Along Pontiac Trail, Boston Court to Nokomis Court	MH02-203	MH02-202	348	12	1955	AC/VP/PVC(L)	2.45	*0.90*	37%	*0.90*	37%	*0.89*	36%	> 2060	
GR	SWI South Leg - Nokomis Court, between Pontiac trail and Odana Hills GC	MH02-202	MH02-201	315	12	1955	VP(L)	2.35	*0.90*	38%	*0.90*	38%	*0.89*	38%	> 2060	
GR	SWI South Leg - Nokomis Court extended to SWI North Leg junction	MH02-201	MH02-173A	160	12	1994	PVC	2.35	*0.90*	38%	*0.90*	38%	*0.89*	38%	> 2060	
Junction with Southwest Interceptor - North Leg																
GR	SWI - North & South Leg junction to 1994 Replacement	MH02-173A	MH02-172	700	20	1955	AC	3.48	*2.34*	67%	*2.34*	67%	*2.33*	67%	> 2060	
GR	SWI - 1994 Replacement to Midvale Boulevard	MH02-172	MH02-171B	307	15	1994	PVC	4.87	*2.34*	48%	*2.34*	48%	*2.33*	48%	> 2060	
GR	SWI - At Midvale Boulevard	MH02-171B	MH02-171	92	15	1994	PVC	4.87	*2.64*	54%	*2.64*	54%	*2.63*	54%	> 2060	
GR	SWI - Midvale Boulevard to east along SW Bike Path	MH02-171	MH02-170	396	21	1955	RCP	3.96	*2.64*	67%	*2.64*	67%	*2.63*	66%	> 2060	
GR	SWI - East of Midvale Boulevard to Cherokee Drive & Chippewa Drive	MH02-170	MH02-163	1,950	12	1955/1994	VP/PVC	4.49	*2.64*	59%	*2.64*	59%	*2.63*	59%	> 2060	
GR	SWI - Along Cherokee Drive, Chippewa Drive to Oneida Place	MH02-163	MH02-159	695	24	1932	VP	12.31	*3.58*	29%	*3.57*	29%	*3.55*	29%	> 2060	
GR	SWI - Cherokee Drive between Oneida Place and Nakoma Road	MH02-159	MH02-157	302	18	1932	VP	13.87	*3.58*	26%	*3.57*	26%	*3.55*	26%	> 2060	
GR	SWI - Cherokee Drive between Oneida Place and Nakoma Road	MH02-157	MH02-154	380	20	1932	VP	8.99	*3.58*	40%	*3.57*	40%	*3.55*	39%	> 2060	
GR	SWI - Nakoma Road between Cherokee Drive and Spring Trail	MH02-154	MH02-150	1,021	18	1955	RCP	5.26	*3.58*	68%	*3.57*	68%	*3.55*	67%	> 2060	
GR	SWI - Nakoma Road & Spring Trail to Glenway Street	MH02-150	MH02-145	1,215	24	1955	RCP	5.84	*5.32*	91%	*5.39*	92%	*5.55*	95%	2030-2060	
GR	SWI - Along UW Arboretum from Glenway Street to Western Avenue	MH02-145	MH02-142	741	24	1955	RCP	13.00	*5.32*	41%	*5.39*	41%	*5.55*	43%	> 2060	
GR	SWI - UW Arboretum from Western Ave. to Arbor Drive & Knickerbocker St.	MH02-142	MH02-136	1,669	27	1955	RCP	5.66	*5.32*	94%	*5.39*	95%	*5.55*	98%	2030-2060	
GR	SWI - Wingra Park from Knickerbocker Street to Woodrow Street	MH02-136	MH02-133	1,161	30	1955	RCP	7.49	*5.32*	71%	*5.39*	72%	*5.55*	74%	> 2060	
GR	SWI - Along Lake Wingra, Woodrow Street to WI Randall Relief junction	MH02-133	MH08-113	3,959	30	1955	RCP	7.49	*5.40*	72%	*5.48*	73%	*5.63*	75%	> 2060	
Junction with West Interceptor Randall Relief																
GR	SWI - At Vilas Zoo	MH08-113	MH02-124	193	30	1955	RCP	7.49	*4.05*	54%	*4.02*	54%	*4.20*	56%	> 2060	
GR	SWI - Through Vilas Zoo to Vilas Park Drive	MH02-124	MH08-109	1,060	24	1936	CI	5.06	*4.05*	80%	*4.02*	79%	*4.20*	83%	> 2060	

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs	
Junction with West Interceptor Randall Relief																	
GR	SWI - Vilas Park Drive to Haywood Drive	MH08-109	MH08-106	1,288	24	1936	CI	5.06	*3.72*	74%	*3.69*	73%	*3.88*	77%	> 2060		
Junction with West Interceptor Randall Relief																	
FM	PS8 to 200 feet east	PS 8	RD08-13205	194	36	1964	PCCP	36.50	*25.13*	69%	*24.97*	68%	*26.17*	72%	> 2060		
FM	200 feet east of PS8 to Nine Springs WWTP	RD08-13205	PB08-00192	13,210	42	1964	PCCP	49.70	*25.13*	51%	*24.97*	50%	*26.17*	53%	> 2060		
FM	At Nine Springs WWTP	PB08-00192	Headworks	334	42	2005	DI	49.70	*25.13*	51%	*24.97*	50%	*26.17*	53%	> 2060		
		Total Length of Gravity Sewers (mi)		14.64									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		2.39		
		Total Length of Force Mains (mi)		2.60									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		3.22		
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		0.00		
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		0.00		
Pump Station No. 9 Service Area																	
GR	SEI - USH 51 from Yahara Drive to Farwell Street	MH09-108	MH09-104	1,678	24	1961	RCP	4.13	*2.05*	50%	*2.59*	63%	*3.67*	89%	2030-2060		
GR	SEI - USH 51 from Farwell Street to Larson Beach Road	MH09-104	MH09-101	1,373	27	1961	RCP	5.66	*3.22*	57%	*3.86*	68%	*4.93*	87%	2030-2060		
GR	SEI - Larson Beach Road to PS 9	MH09-101	PS9	285	24	1961	RCP	4.62	*3.22*	70%	*3.86*	84%	*4.93*	107%	2020-2030		Y
FM	PS9 to 40 feet east	PS9	TE09-20598	40	14	1961	CI	2.8	*3.22*	115%	*3.86*	138%	*4.93*	176%	2000	X	Y
FM	PS9 to SEI McFarland Relief at Brandenburg Way	TE09-20598	MH07-517	4,334	20	1987	DI	11.3	*3.22*	28%	*3.86*	34%	*4.93*	44%	> 2060		
FM	PS9 to Southeast Interceptor	TE09-20598	MH09-20594	4	10	1961	CI	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
FM	PS9 to Southeast Interceptor	MH09-20594	PB09-20296	298	10	1961	AC	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
FM	PS9 to Southeast Interceptor	PB09-20296	PB09-20118	178	10	1961	CI	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
FM	PS9 to Southeast Interceptor	PB09-20118	PB09-19463	655	10	1961	AC	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
FM	PS9 to Southeast Interceptor	PB09-19463	PB09-19199	264	10	1961	CI	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
FM	PS9 to Southeast Interceptor	PB09-19199	MH07-823	798	10	1961	AC	2.8	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060		
		Total Length of Gravity Sewers (mi)		0.63									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		0.00		
		Total Length of Force Mains (mi)		1.24									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		0.05		
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		0.01		
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		0.01		
Pump Station No. 10 Service Area																	
GR	NEI - Near Rieder Road & Old Gate Road to Lien Road at Thierer Road	MH10-145	MH10-426	10,948	48	1969	RCP	24.55	*19.09*	78%	*22.30*	91%	*28.47*	116%	2010-2020	X	Y
GR	NEI Replacement - Between Lien Road & Sycamore Avenue	MH10-426	MH10-420	1,804	48	2010	FRP	45.78	*20.06*	44%	*23.30*	51%	*29.54*	65%	>2060		
GR	NEI Replacement - North of Sycamore Avenue to NEI Lien Extension	MH10-420	MH10-419	640	54	2010	FRP	44.58	*20.06*	45%	*23.30*	52%	*29.54*	66%	>2060		
Junction with NEI Lien Extension																	
GR	NEI Replacement - Sycamore Avenue crossing	MH10-419	MH10-418	546	63	2010	FRP	49.95	*20.85*	42%	*23.30*	47%	*29.54*	59%	>2060		
GR	NEI Replacement - Sycamore Avenue to NEI Junction at Wal-Mart	MH10-418	MH10-415	1,011	63	2010	FRP	49.95	*21.26*	43%	*25.44*	51%	*33.44*	67%	>2060		
Junction with Northeast Interceptor																	
GR	NEI Replacement - NEI Junction at Wal-Mart to MH10-412	MH10-415	MH10-412	1,509	54	2010	FRP	29.46	*12.76*	43%	*15.26*	52%	20.06	68%	>2060		
Junction with Northeast Interceptor																	
GR	NEI Replacement - MH10-412 to MH10-403	MH10-412	MH10-403	2,680	54	2010	FRP	29.46	*12.76*	43%	*15.26*	52%	20.06	68%	>2060		
GR	NEI Replacement - MH10-403 to MH10-402	MH10-403	MH10-402	360	54	2010	FRP	29.46	*12.78*	43%	*15.28*	52%	20.1	68%	>2060		
Junction with Northeast Interceptor																	
GR	NEI Replacement - NEI Junction to PS 10	MH10-402	PS 10	672	54	2010	FRP	29.46	*13.04*	44%	*15.55*	53%	20.35	69%	>2060		
GR	NEI - NEI Replacement Junction at Wal-Mart to east of USH 51	MH10-112	MH10-412	1,528	48	1964	RCP	20.75	*8.50*	41%	*10.18*	49%	*13.38*	64%	>2060		
Junction with Northeast Interceptor Replacement																	
GR	NEI - USH 51 & STH 30 crossing	MH10-412	MH10-104A	1,476	48	1964	RCP	20.75	*8.50*	41%	*10.18*	49%	13.38	64%	>2060		
Junction with NEI Highway 30 Extension																	
GR	NEI - South of STH 30 to MH10-402	MH10-104A	MH10-402	1,463	48	1964	RCP	20.75	*8.96*	43%	*10.63*	51%	13.81	67%	>2060		
Junction with Northeast Interceptor Replacement																	
GR	NEI - MH10-402 to MH10 to PS 10	MH10-402	PS 10	714	48	1964	RCP	20.75	*10.09*	49%	*11.73*	57%	*14.91*	72%	>2060		
GR	NEI Lien Interstate Extension	MH10-220	MH10-214	2,075	24	1995	PVC	12.33	*0.03*	0%	*1.30*	11%	*3.86*	31%	> 2060		
GR	NEI Lien Extension - Lien Interstate Extension to east of Zeier Road	MH10-214	MH10-212	804	24	1973	RCP	8.00	*1.27*	16%	*2.87*	36%	*5.69*	71%	> 2060		
GR	NEI Lien Extension - East of Zeier Road to NEI Replacement junction	MH10-212	MH10-419	4,831	27	1970 & 1973	RCP	7.75	*1.27*	16%	*2.87*	37%	*5.69*	73%	> 2060		
Junction with Northeast Replacement Interceptor																	

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Pipe Characteristics: Year Installed	Pipe Characteristics: Pipe Material	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
GR	NEI Highway 30 Ext. - Railroad crossing at Commercial Ave. (extended)	MH10-305	BD10-303X227	307	12	1966	AC	0.86	*0.75*	87%	*0.75*	87%	*0.76*	88%	> 2060	
GR	NEI Highway 30 Ext. - Bend in interceptor west of Starkweather Creek	BD10-303X227	BD10-303X202	50	12	1996	DI	0.86	*0.75*	87%	*0.75*	87%	*0.76*	88%	> 2060	
GR	NEI Highway 30 Ext. - Starkweather Creek to NEI junction	BD10-303X202	MH10-104A	1,371	16	1996	DI	1.85	*0.75*	41%	*0.75*	41%	*0.76*	41%	> 2060	
Junction with Northeast Interceptor																
FM	PS10 to Buckeye Road	PS10	BD10-17400	11,039	36	1964	PCCP	36.5	*23.13*	63%	*27.28*	75%	*35.26*	97%	2030-2060	
FM	Buckeye Road crossing	BD10-17400	MH07-955	70	36	2001	DI	36.5	*23.13*	63%	*27.28*	75%	*35.26*	97%	2030-2060	

Total Length of Gravity Sewers (mi) 6.59
Total Length of Force Mains (mi) 2.10

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 2.07
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 2.07
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.00

Pump Station No. 11 Service Area

Flow Type	Segment Description	From	To	Length (ft)	Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
GR	NSVI MP Ext. - Along US 18/151 from Cottonwood Drive to CTH PD	MH11-171	MH11-169	812	42	1968	RCP	24.32	*14.12*	58%	*19.29*	79%	*28.93*	119%	2020-2030	Y
GR	NSVI MP Ext. - CTH PD from US 18/151/ to east	MH11-169	MH11-167	465	42	1965 & 1968	RCP	24.32	*14.99*	62%	*20.13*	83%	*29.76*	122%	2010-2020	X Y
GR	NSVI - CTH PD to 2001 Relocation behind Certco	MH11-167	MH11-161E	1,436	42	1965	RCP	25.17	*14.99*	60%	*20.13*	80%	*29.76*	118%	2020-2030	Y
GR	NSVI - 2001 Relocation behind Certco	MH11-161E	MH11-161A	1,146	30	2001	PVC	42.59	*14.99*	35%	*20.13*	47%	*29.76*	70%	> 2060	
GR	NSVI - South of Chalet Gardens	MH11-161A	MH11-159	1,321	36	1965	RCP	27.25	*14.99*	55%	*20.13*	74%	*29.76*	109%	2020-2030	Y
GR	NSVI - Chalet Gardens to Allied Drive	MH11-159	MH11-158	340	36	1965	RCP	27.25	*15.91*	58%	*20.99*	77%	*30.53*	112%	2020-2030	Y
GR	NSVI - South of Crescent Road between Allied Drive & Red Arrow Trail	MH11-158	MH11-156	1,103	30	1965	RCP	36.04	*15.91*	44%	*20.99*	58%	*30.53*	85%	> 2060	
GR	NSVI - Through Dunn's Marsh to east of Seminole Highway	MH11-156	MH11-151A	2,220	42	1965	RCP	29.07	*15.91*	55%	*20.99*	72%	*30.53*	105%	2020-2030	Y
GR	NSVI - East of Seminole Highway to Ashbourne Lane	MH11-151A	MH11-145	3,784	42	1965	RCP	29.07	*16.23*	56%	*21.39*	74%	*31.09*	107%	2020-2030	Y
GR	NSVI - Ashbourne Lane to Longford Terrace	MH11-145	MH11-141	1,558	36	1965	RCP	37.81	*19.82*	52%	*25.03*	66%	*34.91*	92%	2030-2060	
GR	NSVI - Longford Terrace to west of High Ridge Trail (extended)	MH11-141	MH11-137	1,648	30	1965	RCP	35.75	*19.82*	55%	*25.03*	70%	*34.91*	98%	2030-2060	
GR	NSVI - High Ridge Trail (extended) to east of Fish Hatchery Road	MH11-137	MH11-129	3,995	33	1965	RCP	31.31	*19.82*	63%	*25.03*	80%	*34.91*	111%	2020-2030	Y
GR	NSVI - N/S segment through marsh 1000 feet east of Fish Hatchery Road	MH11-129	MH11-127	733	36	1965	RCP	35.00	*19.82*	57%	*25.03*	72%	*34.91*	100%	2030-2060	
GR	NSVI - E/W segment through marsh to NSVI Syene Ext. junction	MH11-127	MH11-116A	4,855	54	1965	RCP	31.12	*19.82*	64%	*25.03*	80%	*34.91*	112%	2020-2030	Y
Junction with NSVI - Syene Extension																
GR	NSVI - Syene Road to west of Highway 14	MH11-116A	MH11-111A	2,788	54	1965	RCP	31.12	*20.53*	66%	*25.74*	83%	*35.63*	114%	2020-2030	Y
GR	NSVI - Highway 14 crossing to Highway 14 Ext. junction	MH11-111A	MH11-106A	2,716	54	1965	RCP	31.12	*20.58*	66%	*26.40*	85%	*37.39*	120%	2010-2020	X Y
Junction with NSVI - Highway 14 Extension																
GR	NSVI - Highway 14 Ext. junction to east to MH11-104	MH11-106A	MH11-104	1,689	54	1965	RCP	31.12	*21.29*	68%	*27.08*	87%	*38.03*	122%	2010-2020	X Y
GR	NSVI - MH11-104 to NSVI Waubesa Ext. junction at PS 11	MH11-104	PS11	1,525	54	1965	RCP	31.12	*21.70*	70%	*27.65*	89%	*38.90*	125%	2010-2020	X Y
Junction with NSVI - Waubesa Extension																
GR	NSVI Syene Ext. - Along Syene Road from Post Road to south to MH11-304	MH11-306	MH11-304	223	12	1975	RCP	2.12	*1.15*	54%	*1.20*	57%	*1.30*	61%	> 2060	
GR	NSVI Syene Ext. - Along Syene Road from MH11-304 to NSVI junction	MH11-304	MH11-116A	1,599	16	1975	RCP	2.8	*1.15*	41%	*1.20*	43%	*1.30*	46%	> 2060	
Junction with Nine Springs Valley Interceptor																
GR	NSVI Hwy 14 Ext. - Beltline Highway to Ski Court	MH11-423	MH11-416	1,929	10	1977	PVC	1.17	*0.83*	71%	*0.84*	72%	*0.86*	74%	> 2060	
GR	NSVI Hwy 14 Ext. - Ski Court to Ski Lane & USH 14	MH11-416	MH11-414	719	12	1977	PVC	1.33	*0.83*	62%	*0.84*	63%	*0.86*	65%	> 2060	
GR	NSVI Hwy 14 Ext. - Pheasant Ridge Trail to Ski Lane	MH11-414C	MH11-414	834	10	1977	PVC	1.31	*0.01*	1%	*0.01*	1%	*0.01*	1%	> 2060	
GR	NSVI Hwy 14 Ext. - Ski Lane & USH 14 to Clausen Street	MH11-414	MH11-410	1,190	15	1977	PVC	1.97	*0.83*	42%	*0.84*	43%	*0.86*	44%	> 2060	
GR	NSVI Hwy 14 Ext. - Clausen Street to MH11-402, 1800 feet east of USH 14	MH11-410	MH11-402	2,385	15	1977	PVC	2.56	*1.15*	45%	*1.15*	45%	*1.16*	45%	> 2060	
GR	NSVI Hwy 14 Ext. - MH11-402 to NSVI junction	MH11-402	MH11-106A	491	15	1977	PVC	3.04	*1.15*	38%	*1.15*	38%	*1.16*	38%	> 2060	
Junction with Nine Springs Valley Interceptor																
GR	NSVI Waubesa Ext. - Meadowview Road (extended) to north	MH11-226	MH11-223	992	15	1971	RCP	1.67	*0.46*	28%	*0.47*	28%	*0.50*	30%	> 2060	
GR	NSVI Waubesa Ext. - 700 feet east of Lake Farm Road to Lake Farm Road	MH11-223	MH11-221	696	18	1971	RCP	2.8	*0.46*	16%	*0.47*	17%	*0.50*	18%	> 2060	
GR	NSVI Waubesa Ext. - Lake Farm Road to Meadowview Road	MH11-221	MH11-212	3,506	21	1971	RCP	3.24	*0.46*	14%	*0.47*	15%	*0.50*	15%	> 2060	
GR	NSVI Waubesa Ext. - Meadowview Road to NSVI junction at PS 11	MH11-212	PS11	4,317	27	1971	RCP	6.33	*0.46*	7%	*0.47*	7%	*0.50*	8%	> 2060	
Junction with Nine Springs Valley Interceptor																
FM	PS11 to Nine Springs WWTP	PS11	PB11-XXXX	4,081	36	1965	PCCP	36.5	*21.98*	60%	*27.92*	76%	*39.17*	107%	2020-2030	Y
FM	At Nine Springs WWTP	PB11-XXXX	Headworks	92	36	2006	DI	36.5	*21.98*	60%	*27.92*	76%	*39.17*	107%	2020-2030	Y

Total Length of Gravity Sewers (mi) 10.04
Total Length of Force Mains (mi) 0.79

Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi) 1.21
Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi) 5.29
Total Length of Force Mains Reaching Capacity by 2020 (mi) 0.00
Total Length of Force Mains Reaching Capacity by 2030 (mi) 0.79

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics			Nominal	*Peak Flows (mgd)* / Percent Nominal Capacity						Capacity Reached	Capacity Needs
					Pipe Dia. (in)	Year Installed	Pipe Material	Capacity (mgd)	2000		2010 UF		2030 UF			
Pump Station No. 12 Service Area																
GR	NSVI MP Ext. - PS 16 FM discharge to Gammon Rd. & Mineral Point Rd.	MH12-177	MH12-176	400	33	1968	RCP	17.42	*5.67*	33%	*8.30*	48%	*10.24*	59%	> 2060	
GR	NSVI MP Ext. - Gammon & Mineral Point Roads to Beltline Highway	MH12-176	MH12-166	3,920	33	1968	RCP	17.42	*7.42*	43%	*9.97*	57%	*11.90*	68%	> 2060	
GR	NSVI MP Ext. - Beltline Highway crossing to Seybold Road	MH12-166	MH12-164	732	30	1968	RCP	17.77	*7.42*	42%	*9.97*	56%	*11.90*	67%	> 2060	
GR	NSVI MP Ext. - Seybold Road to Greentree Landfill	MH12-164	MH12-157	2,942	30	1968	RCP	17.77	*8.15*	46%	*10.66*	60%	*12.58*	71%	> 2060	
GR	NSVI MP Ext. - Greentree Landfill	MH12-157	MH12-156	544	30	1968	RCP	17.77	*9.18*	52%	*11.76*	66%	*13.86*	78%	> 2060	
GR	NSVI MP Ext. - Through Greentree Landfill & Elver Park to Midtown Ext. junction	MH12-156	MH12-133	10,101	36	1968	RCP	21.11	*9.18*	43%	*11.76*	56%	*13.86*	66%	> 2060	
Junction with Midtown Extension																
GR	NSVI MP Ext. - Midtown Ext. junction to East Pass	MH12-133	MH12-121	5,740	36	1968	RCP	21.11	*9.49*	45%	*13.76*	65%	*17.06*	81%	> 2060	
GR	NSVI MP Ext. - East Pass to Maple Grove Road & Nesbitt Road	MH12-121	MH12-112	4,284	36	1968	RCP	21.11	*12.16*	58%	*16.61*	79%	*20.46*	97%	> 2060	
GR	NSVI MP Ext. - Maple Grove & Nesbitt Rd. to PS 17 FM junction at USH 18/151	MH12-112	MH12-110	970	48	1968	RCP	22.73	*12.16*	53%	*16.61*	73%	*20.46*	90%	> 2060	
Junction with PS 17 Force Main																
GR	NSVI MP Ext. - PS 17 FM junction to MH12-101 at PS 12	MH12-110	MH12-101	3,484	48	1968	RCP	22.73	*13.97*	61%	*19.09*	84%	*28.64*	126%	2010-2020	X Y
GR	NSVI MP Ext. - MH12-101 to PS 12	MH12-101	PS12	38	48	1968	RCP	22.73	*14.12*	62%	*19.29*	85%	*28.93*	127%	2010-2020	X Y
GR	NSVI Midtown Ext. - Hawks Landing to CTH M crossing	MH12-220	MH12-210	3,771	24	1999	PVC	12.21	*0.04*	0%	*1.81*	15%	*2.24*	18%	> 2060	
GR	NSVI Midtown Ext. - CTH M crossing to MH12-207	MH12-210	MH12-207	1,505	24	1999	PVC	13.38	*0.04*	0%	*2.35*	18%	*3.86*	29%	> 2060	
GR	NSVI Midtown Ext. - MH12-207 to NSVI junction	MH12-207	MH12-133	3,050	30	1999	PVC	14.69	*0.04*	0%	*2.35*	16%	*3.86*	26%	> 2060	
Junction with Nine Springs Valley Interceptor																
FM	PS12 to USH 18/151 at Cottonwood Drive	PS12	MH11-171	4,786	36	1968	PCCP	36.50	*14.12*	39%	*19.29*	53%	*28.93*	79%	> 2060	
			Total Length of Gravity Sewers (mi)	7.86										Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)	0.67	
			Total Length of Force Mains (mi)	0.91										Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)	0.67	
														Total Length of Force Mains Reaching Capacity by 2020 (mi)	0.00	
														Total Length of Force Mains Reaching Capacity by 2030 (mi)	0.00	
Pump Station No. 13 Service Area																
GR	NEI WD Ext. - MH13-137 on Golf Parkway to Sherman Avenue	MH13-137	MH13-132	2,059	48	1971	RCP	20.75	*11.72*	56%	*13.49*	65%	*16.90*	81%	> 2060	
GR	NEI WD Ext. - Sherman Avenue to railroad, south of CTH CV	MH13-132	MH13-122A	4,397	48	1971	RCP	20.75	*12.01*	58%	*13.82*	67%	*17.31*	83%	2030-2060	
GR	NEI WD Ext. - West of railroad, south of CTH CV	MH13-122A	MH13-116H	153	48	1971	RCP	20.75	*16.94*	82%	*18.83*	91%	*22.52*	109%	2020-2030	Y
GR	NEI - Airport Relocation	MH13-116H	MH13-116A	1,989	48	2006 & 2007	FRP	34.68	*16.94*	49%	*18.83*	54%	*22.52*	65%	> 2060	
GR	NEI Truax Ext. - To east across Airport lands to easterly perimeter road	MH13-116A	MH13-105A	5,168	48	1969	RCP(L)	26.66	*16.94*	64%	*18.83*	71%	*22.52*	84%	> 2060	
GR	NEI Truax Ext. - Across easterly Airport perimeter road	MH13-105A	MH13-105	125	48	1969	RCP(L)	26.66	*17.00*	64%	*20.00*	75%	*25.77*	97%	2030-2060	
GR	NEI Truax Ext. - Across Airport lands from Starkweather Creek to PS 13	MH13-105	PS13	1,758	48	1969	RCP	24.55	*17.00*	69%	*20.00*	81%	*25.77*	105%	2020-2030	Y
FM	PS 13 to near Rieder Road & Old Gate Road	PS13	MH10-145	2,588	36	1969	PCCP	36.50	*17.00*	47%	*20.00*	55%	*25.77*	71%	> 2060	
			Total Length of Gravity Sewers (mi)	2.96										Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)	0.00	
			Total Length of Force Mains (mi)	0.49										Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)	0.36	
														Total Length of Force Mains Reaching Capacity by 2020 (mi)	0.00	
														Total Length of Force Mains Reaching Capacity by 2030 (mi)	0.00	
Pump Station No. 14 Service Area																
GR	NEI DeForest Ext. - N. Main Street to Mayapple Circle	MH14-209	MH14-196	4,386	21	1971	RCP	3.39	*1.81*	53%	*2.00*	59%	*2.36*	70%	> 2060	
GR	NEI DeForest Ext. - Mayapple Circle to Riverview Court	MH14-196	MH14-193	1,203	21	1971	RCP	3.39	*2.69*	79%	*2.99*	88%	*3.61*	106%	2020-2030	Y
GR	NEI DeForest Ext. - Riverview Court to west of River Road	MH14-193	MH14-182	4,062	21	1971	RCP	5.51	*2.86*	52%	*3.24*	59%	*4.00*	73%	> 2060	
GR	NEI DeForest Ext. - West of River Road to MH14-171	MH14-182	MH14-171	5,724	21	1971	RCP	5.51	*2.97*	54%	*3.44*	62%	*4.32*	78%	2030-2060	
GR	NEI DeForest Ext. - MH14-171 to MH14-166 near Paradise Circle	MH14-171	MH14-166	2,351	21	1971	RCP	5.51	*3.13*	57%	*3.60*	65%	*4.45*	81%	2030-2060	
GR	NEI DeForest Ext. - MH14-166 near Paradise Circle to MH14-165	MH14-166	MH14-165	488	21	1971	RCP	5.51	*3.76*	68%	*4.33*	79%	*5.35*	97%	2030-2060	
GR	NEI DeForest Ext. - MH14-165 to MH14-162 near Diamond Drive	MH14-165	MH14-162	1,401	24	1971	RCP	7.01	*3.76*	54%	*4.33*	62%	*5.35*	76%	2030-2060	
GR	NEI DeForest Ext. - MH14-162 near Diamond Drive to Windsor Road	MH14-162	MH14-156	2,687	24	1971	RCP	7.01	*3.81*	54%	*4.48*	64%	*5.72*	82%	2030-2060	
GR	NEI DeForest Ext. - Windsor Road to Lake Windsor GC	MH14-156	MH14-145	4,625	27	1971	RCP	9.17	*4.62*	50%	*5.27*	57%	*6.52*	71%	> 2060	
GR	NEI DeForest Ext. - Lake Windsor GC to I90/94	MH14-145	MH14-143	964	30	1971	RCP	9.18	*4.62*	50%	*5.27*	57%	*6.52*	71%	> 2060	
GR	NEI DeForest Ext. - I90/94 to Highway 19 Extension junction	MH14-143	MH14-134	4,895	36	1971	RCP	9.63	*4.77*	50%	*5.47*	57%	*6.83*	71%	> 2060	
Junction with Highway 19 Extension																
GR	NEI DeForest Ext. - NEI Hwy 19 Ext. junction to NEI Waunakee Ext. junction	MH14-134	MH14-102	16,679	36	1971	RCP	9.63	*5.57*	58%	*6.60*	69%	*8.58*	89%	2030-2060	
Junction with Waunakee Extension																

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Pipe Characteristics: Year Installed	Pipe Characteristics: Pipe Material	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
GR	NEI Highway 19 Ext. - North across Highway 19, east of CTH CV	MH14-416	MH14-415	193	12	1971	RCP	1.15	*0.17*	15%	*0.26*	22%	*0.44*	38%	> 2060	
GR	NEI Highway 19 Ext. - Along Hwy 19 across I90/94	MH14-415	MH14-411	1,619	15	1971	RCP	2.21	*0.81*	37%	*1.23*	56%	*2.08*	94%	2030-2060	
GR	NEI Highway 19 Ext. - South across Highway 19	MH14-411	MH14-409	622	15	1971	RCP	3.23	*0.81*	25%	*1.23*	38%	*2.08*	64%	> 2060	
GR	NEI Highway 19 Ext. - South of Highway 19 between IH90/94 & DeForest Ext.	MH14-409	MH14-407	771	18	1971	RCP	3.32	*0.81*	24%	*1.23*	37%	*2.08*	63%	> 2060	
GR	NEI Highway 19 Ext. - South of Highway 19 between IH90/94 & DeForest Ext.	MH14-407	MH14-134	3,059	18	1971	RCP	2.35	*0.81*	34%	*1.23*	52%	*2.08*	89%	2030-2060	
Junction with DeForest Extension																
GR	NEI Waunakee Ext. - MH14-359 to MH14-358	MH14-359	MH14-358	494	24	1971	RCP	5.47	*2.10*	38%	*2.49*	46%	*3.25*	59%	> 2060	
GR	NEI Waunakee Ext. - MH14-362 to MH14-358	MH14-362	MH14-358	775	10	1971	RCP	1.54	*1.34*	87%	*1.42*	92%	*1.58*	103%	2020-2030	Y
GR	NEI Waunakee Ext. - MH14-358 to Division Street	MH14-358	MH14-356	674	24	1971	RCP	5.47	*3.45*	63%	*3.91*	71%	*4.69*	86%	2030-2060	
GR	NEI Waunakee Ext. - Division Street to near Woodland & Manchester	MH14-356	MH14-345	4,659	24	1971	RCP	5.85	*4.45*	76%	*5.33*	91%	*7.03*	120%	2010-2020	X Y
GR	NEI Waunakee Ext. - Near Woodland & Manchester to MH14-338	MH14-345	MH14-338	2,859	21	1971	RCP	6.31	*4.45*	71%	*5.33*	84%	*7.03*	111%	2020-2030	Y
GR	NEI Waunakee Ext. - MH14-338 to MH14-333 near Eldorado Court	MH14-338	MH14-333	2,110	21	1971	RCP	7.99	*4.45*	56%	*5.33*	67%	*7.03*	88%	2030-2060	
GR	NEI Waunakee Ext. - MH14-133 near Eldorado Ct. to MH14-323 near Kennedy Rd.	MH14-333	MH14-323	4,889	30	1971	RCP	7.01	*4.45*	63%	*5.33*	76%	*7.03*	100%	2020-2030	Y
GR	NEI Waunakee Ext. - MH14-323 near Kennedy Road to CTH M & Hwy 113	MH14-323	MH14-315	4,055	30	1971	RCP	7.01	*4.86*	69%	*5.82*	83%	*7.65*	109%	2020-2030	Y
GR	NEI Waunakee Ext. - CTH M & Hwy 113 to near DeForest junction	MH14-315	MH14-301	5,251	30	1971	RCP	9.18	*5.46*	59%	*6.42*	70%	*8.28*	90%	2030-2060	
GR	NEI Waunakee Ext. - MH14-301 to DeForest junction	MH14-301	MH14-102	248	30	1971	RCP	26.23	*5.46*	21%	*6.42*	24%	*8.28*	32%	> 2060	
Junction with DeForest Extension																
GR	NEI WD Ext. - Yahara River crossing to near PS 14	MH14-102	MH14-101	1,873	42	1971	RCP	20.55	*9.88*	48%	*11.68*	57%	*15.12*	74%	> 2060	
GR	NEI WD Ext. - MH14-101 to PS 14	MH14-101	PS14	34	42	1971	RCP	20.55	*11.00*	54%	*12.77*	62%	*16.18*	79%	> 2060	
FM	PS14 to Comanche Way	PS14	TE14-11057	3,108	30	1971	PCCP	25.40	*11.00*	43%	*12.77*	50%	*16.18*	64%	> 2060	
FM	Comanche Way to MH13-137 on Golf Parkway	TE14-11057	MH13-137	1,358	30	1971	PCCP	25.40	*11.72*	46%	*13.49*	53%	*16.90*	67%	> 2060	
			Total Length of Gravity Sewers (mi)	15.84										Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)	0.88	
			Total Length of Force Mains (mi)	0.85										Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)	3.49	
														Total Length of Force Mains Reaching Capacity by 2020 (mi)	0.00	
														Total Length of Force Mains Reaching Capacity by 2030 (mi)	0.00	
Pump Station No. 15 Service Area																
FM	At Westport No. 2 Lift Station in Mendota County Park	MHWP-00005	TEWP-04470	5	6	1966	CI	1.01	*0.59*	58%	*1.02*	101%	*1.87*	185%	> 2060	
FM	Force main from Westport LS in Mendota County Park to near Waconia Lane	MHWP-04488	MH05-119	2,585	14	1966	AC	5.50	*0.59*	11%	*1.02*	19%	*1.87*	34%	> 2060	
GR	WI West Point Ext. - Near Waconia Lane to Roosevelt St., east of Baskerville Ave.	MH05-119	MH05-117	584	18	1966	AC	3.39	*0.59*	17%	*1.02*	30%	*1.87*	55%	> 2060	
GR	WI West Point Ext. - Along Rossevelt Street towards Baskerville Avenue	MH05-117	MH05-116	108	18	1966	AC	7.50	*0.59*	8%	*1.02*	14%	*1.87*	25%	> 2060	
SI	WI West Point Ext. - Siphon underneath Pheasant Branch Creek	MH05-116	MH05-115	2,099	14	1957 & 1966	RCP/AC	3.43	*1.50*	44%	*2.10*	61%	*3.30*	96%	2030-2060	
GR	West Int. Ext. - Across Allen Boulevard on Century Avenue	MH05-115	MH05-113	769	18	1957	RCP	5.12	*1.50*	29%	*2.10*	41%	*3.30*	64%	> 2060	
GR	West Int. Ext. - Century Avenue to north of Middleton Springs Drive	MH05-113	MH05-112A	227	24	1957	RCP	5.85	*4.74*	81%	*5.14*	88%	*5.93*	101%	2020-2030	Y
GR	West Int. Ext. - Near Middleton Springs Drive	MH05-112A	MH15-113	10	30	1997	RCP	8.79	*4.74*	54%	*5.14*	58%	*5.93*	67%	> 2060	
GR	West Int. Ext. - Near Middleton Springs Drive to Lakeview Park	MH15-113	MH15-104	2,248	36	2007	PVC	19.05	*4.74*	25%	*5.14*	27%	*5.93*	31%	> 2060	
GR	West Int. Ext. - Lakeview Park to Mendota Avenue	MH15-104	MH15-101	991	42	2007	PVC	25.50	*4.74*	19%	*5.14*	20%	*5.93*	23%	> 2060	
GR	West Int. Ext. - Along Mendota Avenue between Gateway St. & Allen Blvd.	MH05-106	MH15-101	31	30	1999	PVC	10.60	*5.40*	51%	*5.79*	55%	*6.56*	62%	> 2060	
GR	West Int. Ext. - Along Mendota Avenue between Gateway St. & Allen Blvd.	MH15-101	MH05-105	529	30	1999	PVC	10.60	*5.40*	51%	*5.79*	55%	*6.56*	62%	> 2060	
GR	West Int. Ext. - Along Allen Boulevard from Mendota Avenue to near PS 15	MH05-105	MH05-103	808	30	1957	RCP	7.01	*5.40*	77%	*5.79*	83%	*6.56*	94%	> 2060	
GR	West Int. Ext. - Gateway Street to near PS 15	MH05-025A	MH05-103	880	12	1931	CI	2.06	*0.02*	1%	*0.02*	1%	*0.02*	1%	> 2060	
GR	West Int. Ext. - Allen Boulevard crossing near PS 15	MH05-103	MH05-102A	147	30	1957	RCP	7.01	*5.42*	77%	*5.81*	83%	*6.58*	94%	> 2060	
GR	West Int. Ext. - MH05-102A in Marshall Park to PS 15	MH05-102A	PS15	130	30	1974	RCP	8.79	*5.42*	62%	*5.89*	67%	*6.65*	76%	> 2060	
FM	PS15 to west	PS15	BD15-00000	10	24	1972	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	
FM	PS15 to south along Allen Boulevard	BD15-00000	BD15-00489	546	24	1981	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	
FM	PS15 to near intersection of Allen Boulevard & University Avenue	BD15-00489	TE15-01350	804	24	1972	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	
FM	PS15 FM diversion to PS16	TE15-01350	RD15D-05583	17	24	1982	DI	25.40	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060	
FM	PS15 FM diversion to PS16	RD15D-05583	MH16-105	4,871	30	1982	PCCP	25.40	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060	
GR	PS 15 FM diversion - Across Stonefield Park and Elm Lawn School to MH16-102	MH16-105	MH16-102	833	30	1982	PCCP	44.02	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060	
GR	PS 15 FM diversion - MH16-102 to PS 16	MH16-102	PS 16	30	36	1981	DI	27.25	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060	
FM	Near Allen Blvd. & University Ave. to Thorstrand Rd. & University Ave.	TE15-01350	BD15-02421	1,071	24	1972	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

Table 4.7
Gravity Interceptors - Capacities and Predicted Flows

Flow Type	Segment Description	From	To	Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Year Installed	Pipe Material	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity: 2000		2010 UF		2030 UF		Capacity Reached	Capacity Needs
FM	Thorstrand Rd. & University Ave. to Spring Harbor Park	BD15-02421	RD15-07254	4,837	20	1972	DI	11.30	*5.42*	48%	*5.89*	52%	*6.65*	59%	> 2060	
FM	Spring Harbor Park	RD15-07254	MH15-07264	10	24	1972	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	
FM	Spring Harbor Park	MH15-07264	TE05-22376	8	24	1959	DI	16.20	*5.42*	33%	*5.89*	36%	*6.65*	41%	> 2060	
Junction with PS 5 force main																
			Total Length of Gravity Sewers (mi)	1.97									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		0.00	
			Total Length of Force Mains (mi)	2.80									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		0.04	
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		0.00	
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		0.00	
Pump Station No. 16 Service Area																
GR	WI Esser Pond Ext. - West Beltline crossing	MH05-317	MH05-315	638	21	1986	RCP	7.24	*2.85*	39%	*4.32*	60%	*6.74*	93%	> 2060	
GR	WI Esser Pond Ext. - West Beltline to High Point Road & Parmenter Street	MH05-315	MH05-310	1,002	18	1978	RCP	6.18	*2.85*	46%	*4.32*	70%	*6.74*	109%	2020-2030	Y
GR	WI Esser Pond Ext. - High Point Rd. & Parmenter St. to Westfield Rd. & Voss Pkwy.	MH05-310	MH05-306	824	18	1978	RCP	7.74	*2.85*	37%	*4.32*	56%	*6.74*	87%	> 2060	
GR	WI Esser Pond Ext. - Along Voss Pkwy. from Westfield Rd. to Middleton St.	MH05-306	MH05-236	1,771	24	1978	RCP	6.03	*2.85*	47%	*4.32*	72%	*6.74*	112%	2020-2030	Y
Junction with WI Gammon Extension																
GR	WI Gammon Ext. - Middleton Street from Middleton city limit to Voss Parkway	MH05-240	MH05-236	1,252	24	1966	RCP	4.62	*2.78*	60%	*4.60*	100%	*4.32*	94%	> 2060	
GR	WI Gammon Ext. - Voss Parkway & Middleton Street	MH05-236	MH16-211	12	24	1966	RCP	4.62	*5.43*	118%	*8.08*	175%	*10.03*	217%	2000	X Y
GR	WI Gammon Ext. - Voss Parkway between Middleton Street & Shirley Street	MH16-211	MH16-210	282	36	2002	PVC	17.64	*5.43*	31%	*8.08*	46%	*10.03*	57%	> 2060	
GR	WI Gammon Ext. - Voss Pkwy. & Shirley St. to Fortune Dr. & Gammon Rd.	MH16-210	MH16-202	1,734	36	2002	PVC	17.64	*5.61*	32%	*8.24*	47%	*10.19*	58%	> 2060	
GR	WI Gammon Ext. - Fortune Drive & Gammon Road to PS 16	MH16-202	PS16	228	36	1981	DI	15.54	*5.61*	36%	*8.24*	53%	*10.19*	66%	> 2060	
GR	PS 15 FM - Across Stonefield Park and Elm Lawn School to MH16-102	MH16-105	MH16-102	833	30	1982	PCCP	44.02	*0.00*	0%	*0.00*	0%	*0.00*	0%	> 2060	
GR	PS 16 - MH16-102 to PS 16	MH16-102	PS 16	30	36	1981	DI	27.25	*0.08*	0%	*0.08*	0%	*0.08*	0%	> 2060	
FM	PS 16 to Gammon Road	PS16	BD16-00162	162	36	1981	DI	36.50	*5.67*	16%	*8.30*	23%	*10.24*	28%	> 2060	
FM	Gammon Road - PS16 to Old Sauk Road	BD16-00162	PB16-05500	4,561	36	1979	DI	36.50	*5.67*	16%	*8.30*	23%	*10.24*	28%	> 2060	
FM	Gammon Road - Old Sauk Road to 600' north of Colony Drive	PB16-05500	MH16-03385	2,491	36	1980	DI	36.50	*5.67*	16%	*8.30*	23%	*10.24*	28%	> 2060	
FM	Gammon Road - 600' north of Colony Drive to NSVI Mineral Point Extension	MH16-03385	MH12-177	2,965	30	1980	DI	25.40	*5.67*	22%	*8.30*	33%	*10.24*	40%	> 2060	
Junction with Nine Springs Valley Interceptor																
			Total Length of Gravity Sewers (mi)	1.63									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		0.00	
			Total Length of Force Mains (mi)	1.93									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		0.53	
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		0.00	
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		0.00	
Pump Station No. 17 Service Area																
GR	LBMC Int. (Ph II) - Northern Lights Road & Nine Mound Road to Basswood Ave.	MH17-146	MH17-137	2,968	30	2008	PVC	15.15	*1.00*	7%	*1.73*	11%	*9.04*	60%	> 2060	
GR	LBMC Int. (Ph II) - Basswood Avenue to Edward Street	MH17-137	MH17-129	2,288	30	2008	PVC	24.93	*1.00*	4%	*1.73*	7%	*9.04*	36%	> 2060	
GR	LBMC Int. (Ph I/II) - Edward Street to south	MH17-129	MH17-127	330	27	2006/2008	PVCPW	16.21	*1.00*	6%	*1.73*	11%	*9.04*	56%	> 2060	
GR	LBMC Int. (Ph I) - South of Edward Street to W. Verona Avenue	MH17-127	MH17-121	1,003	30	2006	PVCPW	21.47	*1.00*	5%	*1.73*	8%	*9.04*	42%	> 2060	
GR	LBMC Int. (Ph I) - W. Verona Avenue crossing	MH17-121	MH17-120	405	30	2006	DI	18.17	*1.00*	6%	*1.73*	10%	*9.04*	50%	> 2060	
GR	LBMC Int. (Ph I) - W. Verona Avenue to Cleary Building Systems	MH17-120	MH17-112	2,496	30	2006	PVCPW	23.01	*1.00*	4%	*1.73*	8%	*9.04*	39%	> 2060	
GR	LBMC Int. (Ph I) - Cleary Building Systems to south of Paoli Street & Bruce Street	MH17-112	MH17-105	2,848	36	2006	PVCPW	20.37	*1.00*	5%	*1.73*	8%	*9.04*	44%	> 2060	
GR	LBMC Int. (Ph I) - South of Paoli St. & Bruce St. to Bruce St. at Badger Mill Creek	MH17-105	MH17-103	591	36	2006	DI	17.23	*1.00*	6%	*1.73*	10%	*9.04*	52%	> 2060	
GR	LBMC Int. (Ph I) - Badger Mill Creek crossing along Bruce Street	MH17-103	MH17-102	162	36	2006	PVC	20.37	*1.00*	5%	*1.73*	8%	*9.04*	44%	> 2060	
GR	LBMC Int. (Ph I) - Along Bruce Street between Badger Mill Creek & PS 17	MH17-102	MH17-101	126	36	2006	DI	17.23	*1.00*	6%	*1.73*	10%	*9.04*	52%	> 2060	
GR	LBMC Int. (Ph I) - MH17-101 to PS 17	MH17-101	PS17	70	36	2006	DI	29.53	*1.00*	3%	*1.73*	6%	*9.04*	31%	> 2060	
FM	PS 17 to Nesbitt Rd. between E. Verona Ave. & Cross Country Road	PS17	MH17-14450	13,357	16	1995	DI	7.20	*2.69*	37%	*3.90*	54%	*11.25*	156%	2010-2020	X Y
FM	Nesbitt Road between E. Verona Ave. & Cross Country Road to NSVI junction	MH17-14450	MH12-110	3,071	20	1995	DI	11.30	*2.69*	24%	*3.90*	35%	*11.25*	100%	2030-2060	
Junction with Nine Springs Valley Interceptor (Table 4-5)																
			Total Length of Gravity Sewers (mi)	2.52									Total Length of Gravity Interceptors Reaching Capacity by 2020 (mi)		0.00	
			Total Length of Force Mains (mi)	3.11									Total Length of Gravity Interceptors Reaching Capacity by 2030 (mi)		0.00	
													Total Length of Force Mains Reaching Capacity by 2020 (mi)		2.53	
													Total Length of Force Mains Reaching Capacity by 2030 (mi)		2.53	

Capacity Needs: **X** = Capacity reached by 2020 **Y** = Capacity reached by 2030

location of these capacity needs as well as the location of other projects discussed in later chapters.

Discussion

Significant growth has occurred in the MMSD system, and substantial additional growth is projected. As shown in Table 4.6, 26% of MMSD's gravity interceptor footage is expected to reach or exceed benchmark capacity by 2030. In general, about 1% of MMSD's interceptor mileage per year (or approximately 1.3 miles per year) may need hydraulic relief during the next 20-year period if they are to meet their benchmark capacities. These projections consider hydraulic capacity needs only. As detailed in following chapters, additional mileage will also likely need replacement or repair due to old age, pipe corrosion, and structural condition.

Seven of MMSD's 17 pumping stations are expected to be short of their benchmark maximum pumping capacities by 2030. In terms of *firm* capacities (i.e. capacities assuming the largest pump is out of service), eight of MMSD's 17 stations are expected to be short of their benchmark values by 2030.

The above capacity assessments should not be considered as a definitive or final conclusion about each component of the collection system. As discussed earlier, it is important to remember the general nature of benchmark design guides, the common limitations of wastewater flow measurements, and the variability between drainage basins. It is likely that some individual segments of the MMSD collection system may be better than projected and that some may be worse. The analyses in this chapter, however, are intended to provide a basis for identifying the most apparent strengths and challenges for the MMSD collection system in 2010, and to discuss how best to meet the challenges over the next 20 years. As individual replacement and relief projects are planned and designed in more detail, basin-specific high flow data and backup events should be studied to determine an appropriate design capacity for any particular project.

Given the challenges referenced in the preceding paragraph and in an effort to identify and prioritize the most critical projects with regard to hydraulic capacity, further analysis was conducted on those facilities that are predicted to reach capacity prior to 2030. The analysis that is summarized in Table 4.7 compares anticipated peak flows in the facility, as developed in CARPC's *MMSD Collection System Evaluation,* to the hydraulic capacity of the facility. While this type of analysis is useful for providing a general overview of interceptor capacity, it has several limitations. Peak flowrates are calculated by Manning's equation, which was developed for conditions of uniform flow in which the hydraulic grade line is parallel to the pipe slope. Given the physical characteristics and complexity of the collection system, this assumption during peak flow events is not valid in some instances due to backwater effects. Further, energy losses in the system are not accounted for in this type of analysis. Energy losses at manholes associated with expansion and contraction of flow are usually minor for average flow conditions but can be significant at peak conditions. Thus, analysis of capacity for each individual segment of the system can be misleading due to the water surface profile.

Another limitation of the analysis used to produce Table 4.7 involves the input location of dry weather and wet weather flows. In order to keep the number of facility segments and subbasins manageable, peak flowrates in portions of the collection system are misrepresented in some instances. Inputting peak flowrates from subbasins too far upstream generally leads to the overestimation of flows in downstream parts of the system.

The District's hydraulic model was used as an additional resource to analyze those facilities identified as having inadequate capacity to overcome the limitations mentioned previously. The hydraulic model can more readily and easily assess the impact of surcharged conditions in any particular interceptor segment and relate this impact to conditions both upstream and downstream. Development of a hydraulic grade line, or water surface profile, for interceptor segments can provide useful information in addition to the capacity analysis used to generate Table 4.7. The ability to model both dry weather and wet weather flows over various time increments is an additional feature to aid in the analysis.

Tables 4.8 and 4.9. were prepared to summarize MMSD facilities reaching capacity in ten year increments, starting in 2000 and ending in 2020. For each of these facilities the hydraulic model was used to assess the capacity needs identified in Table 4.7. In most instances the conclusions reached were confirmed. For other facilities the use of the hydraulic model determined that the capacity limitations were minor due to factors such as the size or length of the facility, or it demonstrated that the capacity exceedance would not cause any adverse effects in the collection system. A summary of the hydraulic modeling results for each of the facilities can be found in Tables 4.8 and 4.9 along with a recommendation for future action. In addition to the summary tables, copies of the hydraulic model results and other supporting documentation are provided in Appendix 5.

Table 4.8

MMSD Facilities Reaching Capacity 2000-2010

Madison Metropolitan Sewerage District

Identifier	Facility Name	From	To	Pipe Diameter (in)	Length (ft)	Summary of Hydraulic Modeling Results and/or Additional Comments	Recommended Action
2010A	Pump Station 1 Force Main	RDXT-09244	PBXT-10254	20	998	Exceedance of maximum velocity permissible for short length of force main.	No improvements recommended
2010B	Pump Station 7	-	-	-	-		
2010C	Pump Station 9 Force Main	PS 9	TE09-20598	14	40	Exceedance of maximum velocity permissible for short length of force main.	No improvements recommended
2010D	Pump Station 11	-	-	-	-	Not modeled.	N/A
2010E	Pump Station 12	-	-	-	-	Not modeled.	N/A
2010F	West Interceptor/Gammon Extension	MH05-236	MH05-211	24	12	Minimal surcharging. See Appendix A5 for results.	No improvements recommended
2010G	West Interceptor Relief	MH02-545	MH02-536	24 & 27	4,321	Moderate to significant surcharging from MH02-545 to MH08-228. See Appendix A8 for analysis of West Side conveyance system and HGL profile.	Program relief project into Capital Budget
2010G	West Interceptor Relief	MH02-531A	MH02-519	36	4,363		
2010G	West Interceptor Relief	MH02-518	MH08-228	36	214		
2010H	West Interceptor/Spring Street Relief	MH02-300	MH02-101	24	3	Minimal surcharging for short length of sewer. Negligible backwater effects. See Appendix A8 for results.	No improvements recommended
2010I	West Interceptor	MH02-011	MH02-005A	24	2,160	Redistribution of flows along length of interceptor shows that capacity is not exceeded in section. See Appendix A8 for revised analysis.	No improvements recommended. Additional analysis was performed to assess impact of heavy iron deposits on 24" cast iron sewer. Surcharging of less than one foot was modeled assuming buildup of 1" deposits and Manning's n= 0.018. It is recommended that this sewer be televised in the near future to assess condition and capacity.
2010J	Rimrock Interceptor	MH03-311	PS 3	10 & 12	3,800	Recommended peaking factor not achieved for existing (2009) flows. Infiltration is significant in this basin. See capacity analysis in Appendix A5.	Conduct infiltration study. Construct replacement sewer with adequate capacity or line existing sewer if I/I source can be found.
2010K	Northeast Interceptor	MH10-121	PS 10	36, 42 & 48	9,200	Relief sewer under construction in 2010	N/A
2010L	Northeast Interceptor	MH07-932	MH07-215	42 & 48	5,605	Significant surcharging confirmed via hydraulic modeling and flow monitoring in wet weather. See Appendix A5 for results.	Coordinate interceptor relief project with PS 18 construction.
2010M	Southeast Interceptor	MH07-211	PS 7	60	5,342	Significant surcharging confirmed via hydraulic modeling. See Appendix A5 for results.	Relief sewer not needed with new PS 18.

Table 4.9

MMSD Facilities Reaching Capacity 2010-2020

Madison Metropolitan Sewerage District

Identifier	Facility Name	From	To	Pipe Diameter (in)	Length (ft)	Summary of Hydraulic Modeling Results and/or Additional Comments	Recommended Action
2020A	Pump Station 13	-	-	-	-	Not modeled.	
2020B	Pump Station 15	-	-	-	-	Not modeled.	
2020C	Pump Station 17	-	-	-	-	Not modeled.	
2020D	Pump Station 1 Force Main	PS 1	PBXT-01337	24	1,346	Not modeled.	Capacity shown in Table 4.7 is exceeded assuming nominal diameter of 24". Using the actual diameter of 25.06" for this segment, capacity is not exceeded for 2030 UF flows.
2020E	Pump Station 17 Force Main	PS 17	MH17-14450	16	13,357	Not modeled.	
2020F	Nine Springs Valley Interceptor	MH12-110	PS 12	48	3,522	Surcharging of approximately 4-5 feet at 2020 UF flows from PS 12 to MH 12-121. See Appendix A5 for results.	Continue to monitor flows in PS 12 basin. CARPC's 2010 UF average flow at PS 12 is 6.5 mgd. Existing average daily flow at PS 12 for January 2010 was only 5.5 mgd, however. PS 12 capacity improvements should help to mitigate surcharging.
2020G	Nine Springs Valley Interceptor	MH11-169	MH11-167	42	465	Surcharging of approximately 1-2 feet at 2020 UF flows from MH 11-161D to MH 11-171. See Appendix A5 for results.	Continue to monitor flows in PS 12 basin. CARPC's 2010 UF average flow at PS 12 is 6.5 mgd. Existing average daily flow at PS 12 for January 2010 was only 5.5 mgd, however.
2020H	Nine Springs Valley Interceptor	MH11-111A	PS 11	54	5,930	Surcharging of approximately 1-2 feet at 2020 UF flows from MH11-111A to PS 11. See Appendix A5 for results.	Continue to monitor flows at PS 11. CARPC's 2010 UF average flow at PS 11 is 10.1 mgd. Existing average daily flow at PS 11 for January 2010 was only 9.2 mgd, however.
2020I	West Interceptor Relief	MH02-536	MH02-532	21	1,441	See Appendix A8 for analysis of West Side conveyance system.	
2020J	West Interceptor	MH02-038	MH02-032	18 & 20	2,276	Surcharging of up to 2-3 feet observed from MH02-032 to MH02-042 at 2020 UF CARPC flows. See Appendix A8 for further analysis.	Rehabilitate aging pipe with cured-in-place pipe as part of City of Madison road reconstruction project. Divert portion of West Interceptor upstream of MH02-043 to West Interceptor Relief system.

Table 4.9

MMSD Facilities Reaching Capacity 2010-2020

Madison Metropolitan Sewerage District

Identifier	Facility Name	From	To	Pipe Diameter (in)	Length (ft)	Summary of Hydraulic Modeling Results and/or Additional Comments	Recommended Action
2020K	Northeast Interceptor/Waunakee Extension	MH14-356	MH14-345	24	4,659	Significant surcharging modeled in upper reach of section (MH14-352 to MH14-356). See Appendix A5 for results. MMSD's average daily flow at downstream monitoring manhole MH14-325 in 2009 was 1.74 mgd. CARPC's flow estimate at MH14-325 for 2010 UF conditions is 1.41 mgd. Thus, existing flows seem to be at or slightly above CARPC projections.	Further study is recommended to better determine the average daily flow in the section in question. Additional subbasins should be developed to aid in this effort. If projected flows are confirmed, consideration should be given to capacity relief prior to 2020.
2020L	Northeast Interceptor/Truax Extension	MH10-145	MH10-121	48	10,973	Significant surcharging (~4.5 feet) at discharge of PS 13 force main. Modeling done with capacity improvements from Lien Road to PS 10. See Appendix A5 for results.	Modeling performed using 2030 UF peak flow of 25.77 mgd. 2030 TAZ peak flow of 21.56 mgd is significantly less. See Appendix A3 ('Station 13 Flow Diversion to Station 1') for further analysis and recommendations.
2020M	Far East Interceptor/Door Creek Extension	MH07-734	MH07-728	21	2,917	Significant surcharging modeled in FEI/Gaston Road Extension and upper reaches of Door Creek Extension. See Appendix A5 for results.	Modeled surcharging is due to rapid development in lands north of I-94. As of 2010 no development has taken place on these lands and planning is ongoing. No action necessary at this time.
2020N	Far East Interceptor/Cottage Grove Extension	MH07-437	MH07-426	18	5,510	Not modeled. Additional capacity constructed in 2009 to serve Village of Cottage Grove.	N/A
2020O	Far East Interceptor	MH07-425	MH07-416	30	3,861	Surcharging less than two feet at upstream end of section for 2020 UF CARPC flows. See Appendix A5 for results.	Surcharging is relatively minor for indicated flows and no local connections are present in surcharged area.
2020P	Southeast Interceptor	MH07-215	MH07-211	60	2,468	Significant surcharging confirmed via hydraulic modeling. See Appendix A5 for results.	Relief sewer not needed with new PS 18.
2020Q	Southeast Interceptor/Blooming Grove Extension	MH07-249	MH07-242	18	2,794	Significant surcharging at upstream end for 2020 UF CARPC flows (up to 8 feet). See Appendix A5 for results.	CARPC's projections for 2020 UF flows include rapid development of lands in the Door Creek valley. To date there has been little to no development in this sewershed and nothing appears imminent in the near-term. Significant capacity is available for flows based on 2030 TAZ numbers.
2020R	West Interceptor/Gammon Extension	MH05-240	MH05-236	24	1,252	Surcharging of one foot or less for 2020UF CARPC flows. See Appendix A5 for results.	This analysis assumes that flows from City of Madison's South Point Road Lift Station continue to PS 16 until 2020. If flows are diverted, surcharging is not expected to be a problem.

APPENDIX 4-1

ALTERNATIVE 1 - PS 15 TO PS 8

Capital Costs for Nine Springs Valley Interceptor (2010-2060)

Assumptions:

Base Interest Rate	*3.00%*
Base Year	*2010*
End of Analysis Period	*2060*
Construction Cost Escalation Rate	*3.20%*
Interceptor Service Life (yrs)	*75*
Lining Service Life (yrs)	*50*

Notes:

1. *Estimates for Relief Year are based on CARPC's Collection System Capacity Evaluation (2009) with regard only to capacity. Condition not considered in this analysis.*
2. *A Relief Year of 2060 infers that capacity is adequate until the Year 2060 or beyond.*
3. *Construction of sewer segments infers that a relief sewer will be built roughly parallel to the existing sewer at the same size. In these instances the old sewer will be lined upon completion of the replacement sewer*
4. *For sewer segments not replaced within the analysis period based on capacity considerations, the segment was rehabilitated (lined) upon reaching its useful life*

							Construction of NSVI Segments					Lining of NSVI Segments					
							Capital Costs		Salvage Value			Capital Costs		Salvage Value			
From	To	Length	Size	Year of Original Construction	Relief Year	Lining Year	2010 Present Worth	Cost in Year Constructed	Year 2060 Value	2010 Present Worth	Construction Present Worth	2010 Present Worth	Cost in Year Lined	Year 2060 Value	2010 Present Worth	Lining Present Worth	Total Present Worth
PS 16 to MH12-177																	
PS 16	MH16-03385	7,214	36	1980	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
MH16-03385	MH12-177	2,965	30	1980	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NSVI - Mineral Point Extension																	
12-177	12-176	400	33	1968	2060	2043	$0	$0	$0	$0	$0	$60,000	$169,661	$111,976	$25,543	$34,457	$34,457
12-176	12-166	3,920	33	1968	2060	2043	$0	$0	$0	$0	$0	$588,000	$1,662,675	$1,097,365	$250,317	$337,683	$337,683
12-166	12-164	732	30	1968	2060	2043	$0	$0	$0	$0	$0	$91,500	$258,733	$170,763	$38,952	$52,548	$52,548
12-164	12-157	2,942	30	1968	2060	2043	$0	$0	$0	$0	$0	$367,750	$1,039,879	$686,320	$156,554	$211,196	$211,196
12-157	12-156	544	30	1968	2060	2043	$0	$0	$0	$0	$0	$68,000	$192,282	$126,906	$28,948	$39,052	$39,052
12-156	12-133	10,101	36	1968	2060	2043	$0	$0	$0	$0	$0	$1,767,675	$4,998,416	$3,298,955	$752,515	$1,015,160	$1,015,160
12-133	12-121	5,740	36	1968	2060	2043	$0	$0	$0	$0	$0	$1,004,500	$2,840,403	$1,874,666	$427,625	$576,875	$576,875
12-121	12-112	4,284	36	1968	2060	2043	$0	$0	$0	$0	$0	$749,700	$2,119,910	$1,399,141	$319,154	$430,546	$430,546
12-112	12-110	970	48	1968	2060	2043	$0	$0	$0	$0	$0	$218,250	$617,141	$407,313	$92,911	$125,339	$125,339
12-110	12-101	3,484	48	1968	2017	2017	$2,787,200	$3,474,770	$1,482,568	$338,184	$2,449,016	$783,900	$977,279	$136,819	$31,209	$752,691	$3,201,706
12-101	PS 12	38	48	1968	2017	2017	$30,400	$37,899	$16,170	$3,689	$26,711	$8,550	$10,659	$1,492	$340	$8,210	$34,921
PS 12 to MH11-171																	
PS 12	MH11-171	4,786	36	1968	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NSVI (PS 12 to PS 11)																	
11-171	11-169	812	42	1968	2022	2022	$568,400	$829,489	$409,214	$93,345	$475,055	$162,400	$236,997	$56,879	$12,975	$149,425	$624,481
11-169	11-167	465	42	1965	2020	2020	$325,500	$446,013	$208,140	$47,478	$278,022	$93,000	$127,432	$25,486	$5,814	$87,186	$365,208
11-167	11-161E	1,436	42	1965	2020	2020	$1,005,200	$1,377,366	$642,771	$146,621	$858,579	$287,200	$393,533	$78,707	$17,954	$269,246	$1,127,826
11-161E	11-161A	1,146	30	2001	2060	2076	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11-161A	11-159	1,321	36	1965	2025	2025	$792,600	$1,271,304	$678,029	$154,663	$637,937	$231,175	$370,797	$111,239	$25,374	$205,801	$843,737
11-159	11-158	340	36	1965	2023	2023	$204,000	$307,232	$155,664	$35,508	$168,492	$59,500	$89,609	$23,298	$5,315	$54,185	$222,677
11-158	11-156	1,103	30	1965	2060	2040	$0	$0	$0	$0	$0	$137,875	$354,712	$212,827	$48,547	$89,328	$89,328
11-156	11-151A	2,220	42	1965	2028	2028	$1,554,000	$2,739,590	$1,570,698	$358,287	$1,195,713	$444,000	$782,740	$281,786	$64,277	$379,723	$1,575,435
11-151A	11-145	3,784	42	1965	2026	2026	$2,648,800	$4,384,543	$2,396,883	$546,746	$2,102,054	$756,800	$1,252,727	$400,872	$91,442	$665,358	$2,767,412
11-145	11-141	1,558	36	1965	2056	2056	$934,800	$3,980,932	$3,768,616	$859,648	$75,152	$272,650	$1,161,105	$1,068,217	$243,668	$28,982	$104,134
11-141	11-137	1,648	30	1965	2037	2037	$824,000	$1,928,764	$1,337,276	$305,042	$518,958	$206,000	$482,191	$260,383	$59,395	$146,605	$665,563
11-137	11-129	3,995	33	1965	2023	2023	$2,197,250	$3,309,143	$1,676,632	$382,452	$1,814,798	$599,250	$902,494	$234,648	$53,525	$545,725	$2,360,523
11-129	11-127	733	36	1965	2031	2031	$439,800	$852,175	$522,667	$119,224	$320,576	$128,275	$248,551	$104,391	$23,812	$104,463	$425,038
11-127	11-116A	4,855	54	1965	2022	2022	$4,612,250	$6,730,839	$3,320,547	$757,440	$3,854,810	$1,213,750	$1,771,273	$425,106	$96,970	$1,116,780	$4,971,590
11-116A	11-111A	2,788	54	1965	2021	2021	$2,648,600	$3,745,355	$1,797,771	$410,084	$2,238,516	$697,000	$985,620	$216,836	$49,462	$647,538	$2,886,054
11-111A	11-106A	2,716	54	1965	2019	2019	$2,580,200	$3,425,868	$1,553,060	$354,264	$2,225,936	$679,000	$901,544	$162,278	$37,017	$641,983	$2,867,919
11-106A	11-104	1,689	54	1965	2018	2018	$1,604,550	$2,064,386	$908,330	$207,196	$1,397,354	$422,250	$543,259	$86,922	$19,827	$402,423	$1,799,776
11-104	PS11	1,525	54	1965	2016	2016	$1,448,750	$1,750,135	$723,389	$165,010	$1,283,740	$381,250	$460,562	$55,267	$12,607	$368,643	$1,652,383
PS 11 to NSWWTP																	
PS11	NSWWTP	4,173	36	1965	2025	N/A	$1,669,200	$2,677,342	$1,427,916	$325,718	$1,343,482	$0	$0	$0	$0	$0	$1,343,482
TOTALS											**$23,264,900**					**$9,487,151**	**$32,752,051**

APPENDIX 4-1

ALTERNATIVE 1 - PS 15 TO PS 8

Capital Costs for West Interceptor Relief (2010-2060)

Assumptions:	
Base Interest Rate	*3.00%*
Base Year	*2010*
End of Analysis Period	*2060*
Construction Cost Escalation Rate	*3.20%*
Interceptor Service Life (yrs)	*75*
Lining Service Life (yrs)	*50*

Notes:

1. *Estimates for Relief Year are based on CARPC's Collection System Capacity Evaluation (2009) with regard only to capacity. Condition not considered in this analysis.*
2. *A Relief Year of 2060 infers that capacity is adequate until the Year 2060 or beyond.*
3. *Construction of sewer segments infers that a relief sewer will be built roughly parallel to the existing sewer at the same size. In these instances the old sewer will be lined upon completion of the replacement sewer*
4. *For sewer segments not replaced within the analysis period based on capacity considerations, the segment was rehabilitated (lined) upon reaching its useful life*

							Construction of WI Segments					Lining of WI Segments					
							Capital Costs		Salvage Value			Capital Costs		Salvage Value			
From	To	Length	Size	Year of Original Construction	Relief Year	Lining Year	2010 Present Worth	Cost in Year Constructed	Year 2060 Value	2010 Present Worth	Construction Present Worth	2010 Present Worth	Cost in Year Lined	Year 2060 Value	2010 Present Worth	Lining Present Worth	Total Present Worth
PS 15 to MH02-547																	
PS 15	TE15-01350	1,360	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TE15-01350	BD15-02421	1,071	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
BD15-02421	RD15-07254	4,837	20	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
RD15-07254	TE05-22376	18	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TE05-22376	MH02-547	1,742	24	1959	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
West Interceptor Relief																	
02-547	02-546	497	24	1959	2060	2034	$0	$0	$0	$0	$0	$74,550	$158,767	$76,208	$17,384	$57,166	$57,166
02-546	02-545	192	27	1959	2060	2034	$0	$0	$0	$0	$0	$28,800	$61,335	$29,441	$6,716	$22,084	$22,084
02-545	02-538	3,121	27	1959	2010	2010	$3,121,000	$3,121,000	$1,040,333	$237,307	$2,883,693	$390,125	$390,125	$0	$0	$390,125	$3,273,818
02-538	02-536	1,200	24	1959	2010	2010	$1,200,000	$1,200,000	$400,000	$91,243	$1,108,757	$150,000	$150,000	$0	$0	$150,000	$1,258,757
02-536	02-535	600	21	1959	2014	2014	$600,000	$680,566	$263,152	$60,027	$539,973	$75,000	$85,071	$6,806	$1,552	$73,448	$613,421
02-535	02-532	841	21	1959	2014	2014	$1,009,200	$1,144,711	$442,622	$100,965	$908,235	$147,175	$166,937	$13,355	$3,046	$144,129	$1,052,363
02-532	02-531A	65	36	1959	2055	2055	$78,000	$321,870	$300,412	$68,526	$9,474	$11,375	$46,939	$42,245	$9,636	$1,739	$11,212
02-531A	02-519	4,363	36	1959	2010	2010	$5,235,600	$5,235,600	$1,745,200	$398,092	$4,837,508	$763,525	$763,525	$0	$0	$763,525	$5,601,033
TOTALS											**$10,287,639**					**$1,602,215**	**$11,889,855**

APPENDIX 4-1

ALTERNATIVE 2 - PS 15 TO PS 16

Capital Costs for Nine Springs Valley Interceptor (2010-2060)

Assumptions:	
Base Interest Rate	*3.00%*
Base Year	*2010*
End of Analysis Period	*2060*
Construction Cost Escalation Rate	*3.20%*
Interceptor Service Life (yrs)	*75*
Lining Service Life (yrs)	*50*

Notes:

1. *Estimates for Relief Year are based on CARPC's Collection System Capacity Evaluation (2009) with regard only to capacity. Condition not considered in this analysis.*
2. *A Relief Year of 2060 infers that capacity is adequate until the Year 2060 or beyond.*
3. *Construction of sewer segments infers that a relief sewer will be built roughly parallel to the existing sewer at the same size. In these instances the old sewer will be lined upon completion of the replacement sewer*
4. *For sewer segments not replaced within the analysis period based on capacity considerations, the segment was rehabilitated (lined) upon reaching its useful life*

							Construction of NSVI Segments					Lining of NSVI Segments					
							Capital Costs		Salvage Value			Capital Costs		Salvage Value			
From	To	Length	Size	Year of Original Construction	Relief Year	Lining Year	2010 Present Worth	Cost in Year Constructed	Year 2060 Value	2010 Present Worth	Construction Present Worth	2010 Present Worth	Cost in Year Lined	Year 2060 Value	2010 Present Worth	Lining Present Worth	Total Present Worth
PS 16 to MH12-177																	
PS 16	MH16-03385	7,214	36	1980	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
MH16-03385	MH12-177	2,965	30	1980	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NSVI - Mineral Point Extension																	
12-177	12-176	400	33	1968	2060	2043	$0	$0	$0	$0	$0	$60,000	$169,661	$111,976	$25,543	$34,457	$34,457
12-176	12-166	3,920	33	1968	2049	2049	$2,156,000	$7,364,732	$6,284,571	$1,433,555	$722,445	$588,000	$2,008,563	$1,566,679	$357,371	$230,629	$953,074
12-166	12-164	732	30	1968	2059	2059	$366,000	$1,713,114	$1,690,272	$385,563	-$19,563	$91,500	$428,278	$419,713	$95,739	-$4,239	-$23,803
12-164	12-157	2,942	30	1968	2041	2041	$1,471,000	$3,905,560	$2,916,151	$665,195	$805,805	$367,750	$976,390	$605,362	$138,087	$229,663	$1,035,468
12-157	12-156	544	30	1968	2025	2025	$272,000	$436,279	$232,682	$53,076	$218,924	$68,000	$109,070	$32,721	$7,464	$60,536	$279,460
12-156	12-133	10,101	36	1968	2060	2043	$0	$0	$0	$0	$0	$1,767,675	$4,998,416	$3,298,955	$752,515	$1,015,160	$1,015,160
12-133	12-121	5,740	36	1968	2028	2028	$3,444,000	$6,071,524	$3,481,007	$794,042	$2,649,958	$1,004,500	$1,770,861	$637,510	$145,421	$859,079	$3,509,037
12-121	12-112	4,284	36	1968	2014	2014	$2,570,400	$2,915,543	$1,127,343	$257,155	$2,313,245	$749,700	$850,367	$68,029	$15,518	$734,182	$3,047,427
12-112	12-110	970	48	1968	2022	2022	$776,000	$1,132,448	$558,674	$127,438	$648,562	$218,250	$318,501	$76,440	$17,437	$200,813	$849,376
12-110	12-101	3,484	48	1968	2010	2010	$2,787,200	$2,787,200	$929,067	$211,927	$2,575,273	$783,900	$783,900	$0	$0	$783,900	$3,359,173
12-101	PS 12	38	48	1968	2010	2010	$30,400	$30,400	$10,133	$2,311	$28,089	$8,550	$8,550	$0	$0	$8,550	$36,639
PS 12 to MH11-171																	
PS 12	MH11-171	4,786	36	1968	2056	2056	$1,914,400	$8,152,649	$7,717,841	$1,760,494	$153,906	$0	$0	$0	$0	$0	$153,906
NSVI (PS 12 to PS 11)																	
11-171	11-169	812	42	1968	2012	2012	$568,400	$605,360	$217,929	$49,711	$518,689	$162,400	$172,960	$6,918	$1,578	$160,822	$679,511
11-169	11-167	465	42	1965	2011	2011	$325,500	$335,916	$116,451	$26,563	$298,937	$93,000	$95,976	$1,920	$438	$92,562	$391,499
11-167	11-161E	1,436	42	1965	2013	2013	$1,005,200	$1,104,820	$412,466	$94,086	$911,114	$287,200	$315,663	$18,940	$4,320	$282,880	$1,193,993
11-161E	11-161A	1,146	30	2001	2060	2076	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11-161A	11-159	1,321	36	1965	2018	2018	$792,600	$1,019,745	$448,688	$102,349	$690,251	$231,175	$297,426	$47,588	$10,855	$220,320	$910,571
11-159	11-158	340	36	1965	2015	2015	$204,000	$238,797	$95,519	$21,789	$182,211	$59,500	$69,649	$6,965	$1,589	$57,911	$240,123
11-158	11-156	1,103	30	1965	2040	2040	$551,500	$1,418,850	$1,040,490	$237,343	$314,157	$137,875	$354,712	$212,827	$48,547	$89,328	$403,484
11-156	11-151A	2,220	42	1965	2018	2018	$1,554,000	$1,999,349	$879,714	$200,669	$1,353,331	$444,000	$571,243	$91,399	$20,849	$423,151	$1,776,482
11-151A	11-145	3,784	42	1965	2018	2018	$2,648,800	$3,407,899	$1,499,476	$342,041	$2,306,759	$756,800	$973,685	$155,790	$35,537	$721,263	$3,028,022
11-145	11-141	1,558	36	1965	2028	2028	$934,800	$1,647,985	$944,845	$215,526	$719,274	$272,650	$480,662	$173,038	$39,471	$233,179	$952,453
11-141	11-137	1,648	30	1965	2024	2024	$824,000	$1,280,687	$665,957	$151,910	$672,090	$206,000	$320,172	$89,648	$20,449	$185,551	$857,641
11-137	11-129	3,995	33	1965	2015	2015	$2,197,250	$2,572,041	$1,028,817	$234,680	$1,962,570	$599,250	$701,466	$70,147	$16,001	$583,249	$2,545,819
11-129	11-127	733	36	1965	2022	2022	$439,800	$641,818	$316,630	$72,226	$367,574	$128,275	$187,197	$44,927	$10,248	$118,027	$485,601
11-127	11-116A	4,855	54	1965	2015	2015	$4,612,250	$5,398,975	$2,159,590	$492,618	$4,119,632	$1,213,750	$1,420,783	$142,078	$32,409	$1,181,341	$5,300,973
11-116A	11-111A	2,788	54	1965	2013	2013	$2,648,600	$2,911,089	$1,086,807	$247,908	$2,400,692	$697,000	$766,076	$45,965	$10,485	$686,515	$3,087,207
11-111A	11-106A	2,716	54	1965	2012	2012	$2,580,200	$2,747,975	$989,271	$225,660	$2,354,540	$679,000	$723,151	$28,926	$6,598	$672,402	$3,026,942
11-106A	11-104	1,689	54	1965	2011	2011	$1,604,550	$1,655,896	$574,044	$130,943	$1,473,607	$422,250	$435,762	$8,715	$1,988	$420,262	$1,893,869
11-104	PS11	1,525	54	1965	2010	2010	$1,448,750	$1,448,750	$482,917	$110,157	$1,338,593	$381,250	$381,250	$0	$0	$381,250	$1,719,843
PS 11 to NSWWTP																	
PS11	NSWWTP	4,173	36	1965	2025	N/A	$1,669,200	$2,677,342	$1,427,916	$325,718	$1,343,482	$0	$0	$0	$0	$0	$1,343,482
TOTALS											**$33,424,147**					**$10,662,743**	**$44,086,890**

APPENDIX 4-1

ALTERNATIVE 2 - PS 15 TO PS 16

Capital Costs for West Interceptor (2010-2060)

Assumptions:

Base Interest Rate	*3.00%*
Base Year	*2010*
End of Analysis Period	*2060*
Construction Cost Escalation Rate	*3.20%*
Interceptor Service Life (yrs)	*75*
Lining Service Life (yrs)	*50*

Notes:

1. Estimates for Relief Year are based on CARPC's Collection System Capacity Evaluation (2009) with regard only to capacity. Condition not considered in this analysis.

2. A Relief Year of 2060 infers that capacity is adequate until the Year 2060 or beyond.

3. Construction of sewer segments infers that a relief sewer will be built roughly parallel to the existing sewer at the same size. In these instances the old sewer will be lined upon completion of the replacement sewer

4. For sewer segments not replaced within the analysis period based on capacity considerations, the segment was rehabilitated (lined) upon reaching its useful life

							Construction of WI Segments					Lining of WI Segments					
							Capital Costs		Salvage Value			Capital Costs		Salvage Value			
From	To	Length	Size	Year of Original Construction	Relief Year	Lining Year	2010 Present Worth	Cost in Year Constructed	Year 2060 Value	2010 Present Worth	Construction Present Worth	2010 Present Worth	Cost in Year Lined	Year 2060 Value	2010 Present Worth	Lining Present Worth	Total Present Worth
PS 15 to MH02-547																	
PS 15	TE15-01350	1,360	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TE15-01350	BD15-02421	1,071	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
BD15-02421	RD15-07254	4,837	20	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
RD15-07254	TE05-22376	18	24	1972	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TE05-22376	MH02-547	1,742	24	1959	2060	N/A	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
West Interceptor Relief																	
02-547	02-546	497	24	1959	2060	2034	$0	$0	$0	$0	$0	$74,550	$158,767	$76,208	$17,384	$57,166	$57,166
02-546	02-545	192	27	1959	2060	2034	$0	$0	$0	$0	$0	$28,800	$61,335	$29,441	$6,716	$22,084	$22,084
02-545	02-538	3,121	27	1959	2060	2034	$0	$0	$0	$0	$0	$390,125	$830,838	$398,802	$90,970	$299,155	$299,155
02-538	02-536	1,200	24	1959	2060	2034	$0	$0	$0	$0	$0	$150,000	$319,451	$153,336	$34,977	$115,023	$115,023
02-536	02-535	600	21	1959	2060	2034	$0	$0	$0	$0	$0	$75,000	$159,725	$76,668	$17,489	$57,511	$57,511
02-535	02-532	841	21	1959	2060	2034	$0	$0	$0	$0	$0	$147,175	$313,434	$150,449	$34,318	$112,857	$112,857
02-532	02-531A	65	36	1959	2060	2034	$0	$0	$0	$0	$0	$11,375	$24,225	$11,628	$2,652	$8,723	$8,723
02-531A	02-519	4,363	36	1959	2060	2034	$0	$0	$0	$0	$0	$763,525	$1,626,058	$780,508	$178,039	$585,486	$585,486
TOTALS											**$0**					**$1,258,005**	**$1,258,005**

APPENDIX 4-1

UNIT COSTS FOR INTERCEPOR REPLACEMENT AND REHABILITATION

Pipe Diameter (in)	NSVI Interceptor Replacement Cost per L.F.[1]	WI Interceptor Replacement Cost per L.F.[2]	Force Main Replacement Cost per L.F.[1]	Lining Cost per L.F.
18	$275	$550	$175	
21	$300	$600	$200	
24	$450	$900	$250	
27	$475	$950		
30	$500	$1,000	$325	$125
33	$550	$1,100		$150
36	$600	$1,200	$400	$175
42	$700	$1,400	$500	$200
48	$800	$1,600		$225
54	$950	$1,900		$250
60	$1,100	$2,200		

Notes:

(1). Unit costs taken from Technical Memo 3 of MMSD's *50-Year Master Plan Report* (December 2009).

(2). Unit costs for West Interceptor Replacement are assumed to be twice the unit costs for NSVI Interceptor Replacement due to factors such as traffic congestion, utility conflicts, etc.

Appendix 4-2
Life Cycle Pumping Costs for MMSD Pumping Station 15

Madison Metropolitan Sewerage District

PS15 Pumping Alternative	2009 Unit Pumping Rates for Pump Station Service Areas ($/Mgal Pumped)					Year 2009					2010 Annual Pumping Costs ($)	2010 Present Worth Pumping Costs ($)
	PS8	PS11	PS12	PS15[1]	PS16	Total Pumping Station Costs ($/Mgal)	Effluent Pumping Costs[5] ($/Mgal)	Total Pumping Costs ($/Mgal)	PS 15 Pumped Volume (Mgal)	Annual Pumping Costs ($)		
15 to 8	$26.50	-	-	$38.18	-	$64.69	$37.08	$101.77	496.1484	$50,000	$53,000	$5,656,000
15 to 16	-	$26.51	$23.86	$52.35	$129.32	$232.04	$37.08	$269.12	496.1484	$134,000	$142,000	$15,155,000

Notes/Assumptions:

(1). 2009 unit rate for pumping from PS15 to PS16 is estimated from actual power costs and flow volumes from September 1995 to August 1996. This corresponds to the last time period that PS15 pumpe to PS16 on a routine basis. Energy escalation rate of 4.9% per annum applied to unit pumping rate from PS15 to PS16 to convert to 2009 dollars, corresponding to the increase seen in the unit pumping rate between PS15 and PS8 from 1997 to 2009.

(2). Base interest rate = 3.00%

(3). Energy escalation rate = 6.00%

(4). Analysis Period (yrs) = 50

(5). Effluent pumping costs represent costs associated with discharge of final effluent to Badfish Creek and Lower Badger Mill Creek.

Chapter 5
Condition and Needs Assessment

Chapter Outline

This chapter is organized into the following sections:

- Introduction
- Pumping Station Priority Rankings
- Pumping Station Rating Criteria
- Pumping Station Summary Observations
- Forcemains
- Gravity Interceptors

Introduction

This chapter will examine the overall improvement needs for MMSD's existing pumping stations, forcemains, and gravity interceptors. The physical condition of each major facility will be evaluated in this chapter and will be considered together with the flow and capacity needs developed in previous chapters.

Pumping Station Priority Rankings

Table 5.1 presents a rating system developed to prioritize the need for improvements at MMSD's seventeen pumping stations. This system was introduced for the 2002 Collection System Facilities Plan and successfully achieved its intended purpose of ranking pumping stations by criticality, condition, and capacity needs. The rating system evaluates each pumping station for adequacy in six mission-critical categories:

- Maximum Capacity – Can the station meet its benchmark peak flow requirements? To what extent?
- Firm Capacity – Can the station meet its benchmark peak flow requirements without the largest pumping unit in service? To what extent?
- Power Supply Redundancy – Is the power supply system redundant and to what extent?
- Mechanical System Condition – What is the physical condition and reliability of the mechanical equipment, especially the largest pumping units?
- Building and Structural Condition – What is the condition of the wetwell structure, drywell structure, and control room?
- Electrical System Condition – What is the condition of the electrical equipment and control equipment? Of most critical importance is providing proper power and control to the pumping units.

Table 5.1
Pumping Station Rating Sheet
Assessment of Adequacy and Criticality

Facility	Adequacy/Condition of Mission Critical Category Likert Scale (1-5) - Category dependent (see text for explanatic						Total		Mean Weighting Factor (Sliding scale of 1 to 2)		Overall Rating	Ordinal Ranking (1 - 17)
	Peak Flow Capacity Qp (5 points)	Firm Flow Capacity Qf (5 points)	Power System Redundancy (5 points)	Mechanical Condition/ (5 points)	Structural Integrity (5 points)	Electrical Condition (5 points)						
PS NO. 1	1	1	1.5	1	1	1	6.5		1.75		11.38	**13**
PS NO. 2	1	1	1.5	1	1	1	6.5		1.95		12.68	**11**
PS NO. 3	2.5	1.5	3	1.5	4	1	13.5		1.00		13.50	**9**
PS NO. 4	3	2	3	1.5	2	3	14.5		1.15		16.68	**7**
PS NO. 5	1	1	1	1	1	1	6		1.20		7.20	**17**
PS NO. 6	1	1	1.5	1	1	1	6.5		1.30		8.45	**16**
PS NO. 7	3.5	3.5	2	2.5	1	2	14.5		2.00		29.00	**2**
PS NO. 8	1	1	1.5	1	1	1	6.5		1.85		12.03	**12**
PS NO. 9	2	2	1	1	2	1	9		1.10		9.90	**15**
PS NO. 10	1.5	1	1.5	1.5	1	1	7.5		1.70		12.75	**10**
PS NO. 11	3	3	3	3	2	4	18		1.70		30.60	**1**
PS NO. 12	2.5	4	4	2	2	3.5	18		1.50		27.00	**3**
PS NO. 13	3.5	3	4	1	3	3.5	18		1.30		23.40	**4**
PS NO. 14	2.5	2.5	4	1	3	3.5	16.5		1.15		18.98	**6**
PS NO. 15	1	2.5	4	2.5	4	3	17		1.25		21.25	**5**
PS NO. 16	1	1	2	2.5	2	1.5	10		1.10		11.00	**14**
PS NO. 17	3.5	3	1	4	1	1	13.5		1.15		15.53	**8**

Assumptions:

1). Recently completed projects include updated capacity and equipment condition assessments (e.g., PS 13 & PS 14 Firm Capacity Improvements and PS 6 & 8 Rehabilitation).
2). All flow in the Lower Badger Mill Creek valley is assumed to be flowing to Pumping Station 17 in Year 2030. For Year 2010 all flows in the LBMC valley south of Valley View Roa assumed to flow to PS 17. Station upgrades at PS 17 are not anticipated until the LBMC Interceptor is fully constructed (~2015-2020).
3). No satellite treatment facilities are considered (e.g., Sugar River Treatment Plant).

Prepared by Michael E. Simon 1/7/2010
(updated by TWG 4/2711)

As shown in Table 5.1, the six categories are each rated on a generalized Likert scale of 1 to 5 points (1–Excellent, 2–Good, 3–Adequate, 4–Poor, 5–Very Poor). The sum of the ratings is multiplied by a station weighting factor to arrive at an overall score. Thus the higher the overall score, the greater the need for improvements.

The weighting factor reflects an MMSD staff evaluation of the relative importance or criticality of each station within the MMSD system. A sliding scale from 1.0 to 2.0 is used for the weighting factor. Considerations in weighting the stations include the relative amount of flow through the station, how many other stations pump to the station, the availability of alternative flow diversion routes, and the amount of time the station can be down without basement backups or bypassing. The stations were weighted independently by several experienced members of the MMSD staff, and the mean values are used in Table 5.1.

Table 5.1 is the result of this rating process. The ordinal ranking column shows the relative priority for improvements at the pumping stations. These ratings were conducted in mid 2008 as part of the District's Master Planning effort and reviewed in 2010 to confirm the proper ratings prior to completing the update of the facilities plan. Several assumptions were made, including the following: 1) Recently completed projects include updated capacity and equipment condition assessments (e.g., PS 13 & 14 Firm Capacity Improvements, PS 6 & 8 Rehabilitation), 2) All flow in the Lower Badger Mill Creek valley is assumed to be flowing to Pumping Station 17 in Year 2030. For Year 2010 all flows in the LBMC valley south of Valley View Road are assumed to flow to PS 17; and 3) No satellite treatment plant facilities were considered. Based on this approach, the three stations with the greatest overall need for improvements are Pumping Station 11, Pumping Station 7, and Pumping Station 12, followed by Pumping Station 13, Pumping Station 15, and Pumping Station 14. The firm and maximum pumping capacity at Pumping Station 17 will have to be increased when the Lower Badger Mill Creek Interceptor is completed from Northern Lights Road to Midtown Road. This section of the LBMC Interceptor is scheduled for completion between 2015 and 2020. The results and implications of the Table 5.1 pumping station ratings are discussed in the Summary Observations section later in this chapter.

The flows, physical condition and operating experiences at the individual MMSD stations will continue to evolve with time and as future improvement projects are undertaken. It is therefore recommended that the station rating exercise continue to be updated regularly, maintaining a current assessment of the MMSD pumping stations.

Pumping Station Rating Criteria

This section explains how each station was rated within each of the mission-critical categories. Although no rating system is without some subjectivity, the ratings are intended to reflect each category and pumping station as objectively as possible

Maximum and Firm Station Capacities

The maximum and firm capacity scores shown in Table 5.1 are based on the adequacy ratio analysis presented in Chapter 4. The adequacy ratio is the ratio of a station's actual installed capacity divided by its desired benchmark capacity. The Year 2010 and Year 2030 adequacy ratios from Table 4.3 were averaged for each station, thus taking into consideration both the present and future needs. It should be noted that the Year 2010 adequacy ratios are based on actual rather than projected flowrates. Actual flowrates are measured via flowmetering equipment or computed based on pump run times and ratings for each pumping station. Scores were then assigned to each station using the following scoring scheme.

Score Assigned	Adequacy Ratio for Maximum Capacity	Adequacy Ratio for Firm Capacity
1. Excellent	> 1.25	> 1.15
2. Good	1.10 – 1.25	1.00 – 1.15
3. Adequate	0.90 – 1.10	0.80 – 1.00
4. Poor	0.75 – 0.90	0.65 – 0.80
5. Very Poor	< 0.75	< 0.65

Power System Redundancy

A number of considerations went into rating MMSD's pumping stations for power system redundancy and electrical condition. The intent of this summary is to give a general overview of why the stations were rated as they were. The rating system is qualitative, but the results should give a reasonable picture of where the greatest improvement needs exist.

Power supply redundancy at the pumping stations is an important practical criterion and is also required by applicable codes. In many cases, basement flooding or sewer overflows can occur within a short period of time after a pumping facility loses power. Therefore, redundant power in the form of an alternate feed from the utility or backup generation must be provided.

Although these four stations have redundant power sources, the worst-case situations (4 points) for MMSD at this time include Pumping Stations Nos. 12, 13, 14, and 15. These four pumping stations are each rated at 4 points because their particular design includes several weak links in the power system. The power to each station is fed through a single transfer switch, bank of transformers, and low voltage feed to the station. As a result, longer than desirable outages can occur if any of these parts of the system fail. To mitigate the problems that can occur during such failures, provisions to connect portable generation could be made. Future changes should include improvements to the power system design.

Although Pumping Station No. 4 is similar to the four pumping stations above, it is rated at 3 points, rather than 4, since it also contains a generator transfer switch, is near the Plant, and can be powered relatively easily using a portable generator set. MMSD has a limited number of portable generators, however, and a major power outage may require more generators than are available. If necessary, the flow to Pumping Station 4 could also be trucked to the Plant in the event of a catastrophic failure at the station. It should be noted that a second feed was added to this site based upon the outcome of the 2002 Facilities Plan. The second feed feeds an MG&E transfer switch, which then feeds the transformers that serve the station. Should the service feeding the pumping station fail, the transfer switch transfers power to the other feed. Pumping Station 4 should be in relatively good condition with this arrangement until other revisions are conducted at the pumping station. At that time, a more robust system with two service feeds in a main-tie-main arrangement similar to Pumping Station 9 should be considered. Another possibility would be to consider an on-site generator as an alternative to a second feed. Further use of portable generation is still another option; however, the District may need to consider additional portable generators if this path is taken. Another disadvantage of this option is that more portable generators require more manpower to operate and this could potentially overstretch the District's human resources during a major power outage.

Pumping Station 11 is also rated at 3 points. Its electrical system includes two 4.16 kV feeds from the utility. In general, this type of system provides reasonably adequate (not the best) redundancy. They have a common bus, which provides power to the entire station. This common bus is the weak link for everything powered from it and downstream of it. In addition, Pumping Station 11's electrical services are not entirely redundant and this is also a matter of concern that should be addressed when improvements at the pumping station are considered in the near future.

Pumping Station No. 3 is a small station at the plant. It currently does not have a redundant power service. It is rated at 3 points, rather than 4 or 5 points, because provisions are available for backup power via a portable generator connection and the small flow could also be hauled by truck if necessary. Again, the problem with this situation is that MMSD manages numerous facilities which require either backup generation or hauling in the event of a major outage. A long-term plan to minimize the number of these special-need facilities may be beneficial. It is possible that the power for Pumping Station 3 could be fed from the plant in the future.

Pumping Station No. 7 is rated at 2 points. Although it has dual feeds from Madison Gas and Electric, it was discovered that the feeds were not as "redundant" as initially thought. The feeds were on the same pole line and even though they were routed from different directions, an automobile striking a pole caused an outage of over 4 hours. Since that time, changes have been made to the way Pumping Station 7 is fed. These changes routed a new feed in from the southeast up Metropolitan Lane improving the situation significantly. The station can be fed from three separate MG&E circuits with the normal two entering the station area from different directions. Unfortunately, at this time, a single pole on Bridge Road is still the common point for all three of these circuits. MG&E has placed pole barriers along side of this pole to help protect it from potential damage by traffic and in the future they will be upgrading their Femrite Substation to provide a totally redundant feed to the pumping station. MGE estimates that the Femrite Substation improvements could happen as early as 2011. At the site itself, the services are kept as separated as possible, but they are still enclosed in a single substation enclosure. Even with redundant electrical systems, there is still always an electrical connection between the two systems at least somewhat susceptible to storm events that could take out both feeds. This, in addition to construction of a new Pumping Station 18, will help to make the pumping station as well as the collection system more reliable.

Pumping Station 16 is also rated at 2 points. It also has dual feeds from MG&E, but, similar to Pumping Station 7, there are areas that could be improved. Its main-tie-main arrangement within the pumping station provides a relatively reliable approach to providing backup power to the pumping station. However, the greater question is the reliability of the power system ahead of the pumping station. As with many of the District's pumping stations, the power system redundancy ahead of the pumping station should be investigated further to determine the level of reliability.

A number of pumping stations were rated 1.5 points. Pumping Station Nos. 1, 2, 6, 8, and 10 were recently rehabilitated. The numbers given assume the construction is completed for purposes of this facility planning effort. All five of these pumping stations have redundant power sources from the utility (MG&E) and care was taken to ensure the systems are relatively redundant; however, in all five cases, a major outage on MG&E's system can result in an outage to the pumping station and these five stations may be difficult to power from one of the District's portable generators. It may be possible to power pumps at PS 1, PS 6, and possibly PS 8 with portable generation (using PS 17's generator); however, it is unlikely that this could be done during peak flows. Portable generators sized to operate PS 2 and PS 10 are large, not easily obtained within a short time frame, and would take significant effort to connect to the pumping station's power system. As with all of the District's pumping stations, each power system should be reviewed with MG&E to determine the full level of redundancy available to serve the pumping station. Although the District's staff prefers redundant power feeds over onsite generators, generators are generally considered a more reliable option and should be considered as a good potential option during any design effort. It should be noted that either option meets the requirements found in NR 110 related to emergency operation.

Pumping Stations Nos. 5, 9, and 17 are rated at 1 point for having excellent redundancy. The two services from the electric utility to Pumping Station Nos. 5 and 9 should provide excellent redundancy. In addition, both PS 5 and PS 9 have provisions for connection of a portable generator. PS 17 has an on-site backup generator set. This provides excellent redundancy provided the unit and transfer controls are well maintained and should, in theory, be more reliable than two utility feeds.

Electrical Condition

The condition of the electrical equipment at the pumping stations is another important criterion. In some cases, the line-up of multiple parallel pumping units and corresponding parallel electrical equipment within a station makes this issue somewhat less important than the power supply system redundancy issue. However, it remains a critical aspect of a reliable pumping facility. Some of the factors mentioned in the power system redundancy analysis will overlap with electrical condition factors.

Pumping Station 11 is rated at 4 points. The pumping station is over 40 years old and physically its electrical system is not in good condition and in need of replacement or a major overhaul. A few major electrical improvements were made to the pumping station in the 1980s; however, these improvements are now approaching 30 years old and are not physically in much better condition than the original equipment. The pumping station's electrical system exhibits a relatively significant amount of corrosion and some of the equipment has been problematic.

Pumping Stations No. 12, 13, and 14 were rated at 3.5 points. These stations are all approaching 40 years old and they all exhibit a significant degree of corrosion to their electrical equipment. The stations electrical systems should be inspected for replacement or refurbishment. Some changes and improvements have been made to these stations over the years, but it is time that a much closer look is taken at all of them.

Pumping Stations No. 4 and 15 were rated at 3 points. These two stations are not quite as old as the stations which were rated at 3.5 and 4 points. The two stations both exhibit electrical system problems similar to those rated at 4 points (e.g., corrosion, obsolete equipment and parts, aging wiring and fixtures, etc.). Some of the equipment in these two pumping stations has been replaced. For example at Pumping Station 4, the main breaker was replaced when the original circuit breaker failed. At Pumping Station 15, some of the equipment was replaced during the Pumping Stations 11, 12, and 15 Project in the early 1980s.

Pumping Station 7's electrical condition is rated at 2 points. Its electrical system was replaced as part of a major rehabilitation of the pumping station in the early 1990s. Although the pumping station has operated and continues to operate well, the control system includes some early programmable controllers that the District should consider replacing; the programmable controllers are now obsolete and the functionality of the controllers is somewhat limited. In addition, other components within the electrical system should also be reviewed to determine if suitable and simple replacements can be found in the event of failure. The system is approaching twenty years of age and many of the components are no longer manufactured in the same form as the original equipment.

Pumping Station No. 16 is rated at 1.5 points. It went on-line in 1982. The motor starting equipment, power distribution equipment, and most of the electrical equipment is in excellent working condition. District electrical staff replaced the control system in the 2008 to 2009 timeframe. This replaced the original obsolete electronic control equipment with programmable controllers and operator interface terminals (Allen-Bradley PanelViews). These changes have significantly improved the reliability and operation of the pumping station. Although the pumping station is in excellent condition, the 30-year old age of the electrical equipment is the primary reason the pumping station scored 1.5 points versus 1 point.

Pumping Stations No. 1, 2, 3, 5, 6, 8, 9, 10, and 17 are each rated at 1 point. They all have relatively new electrical systems and the electrical equipment and controls are in excellent working condition. There may be some electrical changes to these pumping stations during the planning period; however, any changes will most likely be driven by mechanical or other system changes. In addition, since changes in the electrical and control industry occur quite frequently, the District anticipates some related changes will occur at these pumping stations throughout the planning period.

Mechanical Condition

The ratings for mechanical condition in Table 5.1 were based primarily on a pump condition assessment conducted by MMSD in 2000 and updated in November, 2010. The assessment examines the condition of MMSD's 57 sewage pumping units and is detailed in Appendix A2 of the Facilities Plan. Since the largest units at each station are the most critical for overall station reliability, the Table 5.1 station mechanical ratings place special emphasis on the largest units within each station.

Key issues that were noted in preparing the pump condition assessment include the various methods that are available and used to evaluate pump performance and the determination of a pump's service life. A primary goal for each of the District's pumping units in the collection system should be to provide 20 or more years of reliable service without accumulating excessive maintenance costs. Several key thoughts from the assessment are summarized in this section.

Sewage pumps are robust units that can have very long service lives if they are well maintained. Age alone is not a good criterion for a pump's condition. MMSD has numerous pumps in service that are 60 or more years old and still providing adequate service, and five pumps with more than 100,000 operating hours. Many parts on a pump are replaceable as they wear, including bearings, shafts, impellers, wear rings, and mechanical seals. Replacement parts can be obtained relatively easily for any MMSD pump, in some cases from the original manufacturer and in other cases from companies that manufacture specialty parts. Significant wear on a pump's volute or casing could make the pump unreliable or perhaps so inefficient that it should be replaced. Motors are generally long lived, have few problems, and are repairable or replaceable when problems occur.

MMSD's Mechanical Maintenance Department rated the condition of MMSD's 57 raw sewage pumps into categories of Good, Fair or Poor. The vast majority of the pumps (47 of the 57 pumps) were rated Good. Six pumps were rated Fair (Pumps 12A, 15A, 15B, 16A, 16B, and 16C). Four pumps were rated Poor, including Pump 11B and all three pumps at PS17.

The following specific recommendations were made in the November, 2010 condition assessment memo in Appendix A2:

1) Plans should be made to address the ten pumps that received a rating of less than Good.

    a) Rehabilitation projects at PS11, PS12, PS15, and PS17 are currently included in the District's ten-year Capital Projects Budget. All projects are scheduled to begin construction in or about the year 2015. These rehabilitation projects will provide an opportunity to address deficiencies with seven of the ten problematic pumps identified in the pump condition assessment.

b) The remaining three pumps receiving a rating of less than Good are located at PS16. All of these pumps are scheduled to be rebuilt in 2011 and their performance will be monitored to determine if further improvements are needed.

2) MMSD should continue to implement predictive maintenance procedures and/or strategies in pumping stations as they are rehabilitated or as the need arises. These procedures and strategies include the following:

   a) Installation of sensors on pump bearing housings to monitor unusual vibrations.

   b) Installation of limit switches on check valves to ensure that pumps do not run dry.

   c) Installation of flowmeters downstream of individual pumping units to provide early indication of declining pump capacity.

   d) Installation of bearing temperature sensors on the pump and motor.

   e) Use of motor soft starters.

3) Continue to monitor and evaluate the effect of pump plugging at the four major pumping stations (PS2, PS7, PS8, and PS11).

   a) Investigate the coarse screening of all flow from the Northeast Interceptor system as part of the PS18 improvements to mitigate pump plugging at PS7.

   b) Continue to track labor and material costs associated with pump plugging to ensure that staff time is spent as efficiently as possible and that other mechanical maintenance activities are not being neglected.

   c) Develop a risk-based assessment model for the District's collection system to identify the most critical areas of the system and to use as an aid in prioritizing improvement projects. This risk-based model should include the effect of pump plugging on pump station reliability.

   d) Perform a detailed economic analysis for re-installation of bar screens at the four major pumping stations, including life cycle costs. The analysis should include several alternatives for screening and removal of debris.

4) As a long-range goal, develop a formal program for the periodic internal inspection of all pumps to check for wear of critical components.

5) In general, avoid the use of extended vertical drive shafts for pumps in future designs. Vertical shafts tend to be labor intensive and more prone to causing pump vibration.

Building and Structural Condition

This criterion was included to assess the overall adequacy of a station's building, structure, and appurtenances. In general, MMSD's pumping stations are considered to be structurally sound. However, the age of the facility, its physical characteristics, layout, and any other operational deficiencies were considered in determining the rating for this category. As shown in Table 5.1, eight stations (PS1, PS2, PS5, PS6, PS7, PS8, PS10, and PS17) received excellent ratings. PS5 and PS17, both placed in service in 1996, are MMSD's newest stations. PS7, constructed in 1949, was extensively rehabilitated in 1992 as were PS1 (1948), PS2 (1963), and PS10 (1963) in 2006. PS6 (1948) and PS8 (1962) were rehabilitated in 2010. Five stations (PS4, PS9, PS11, PS12, and PS16) received good ratings. Except for PS16 (1982), these medium-aged stations were all placed on-line during the period 1962-1969. Two stations (PS13 and PS14) received adequate ratings. Although PS 13 (1970) and PS14 (1971) are somewhat newer stations, they were rated only as adequate, rather than good, due to heating and ventilating problems. Two stations, PS3 (1959) and PS15 (1974) were rated as poor. PS3 is a small two-pump station with a cramped pump room accessible only by ladder. PS15 has no superstructure, and its electrical control room is located below ground.

Pumping Station Summary Observations

Generally, the stations that ranked poorest in Table 5.1 have significant needs in several of the mission-critical categories. These stations are likely to have the greatest need for an overall station rehabilitation project. Various systems within a station are influenced by one another, and multiple needs often lead to an overall station rehabilitation rather than just an individual system upgrade. For example, a need for larger pumping capacity may drive a need for new pumps that, in turn, will require larger valves and larger motors. The larger motors may call for new electrical equipment and possibly a larger control room to house it. Such major electrical and mechanical and building work may present a logical opportunity or need to also improve heating and ventilating systems, lighting and other appurtenances. The purpose of the Table 5.1 rating exercise is not to finalize the details of a given rehabilitation project, but to point out the apparent leading candidates with the greatest needs. In all cases, a detailed design study would be needed to determine the precise scope of each project.

From Table 5.1, the MMSD pumping stations ranking highest in their need for improvements are PS11, PS7, PS12, PS13, PS15 and PS14. The stations are discussed individually in turn.

PS11, located at 4670 E. Clayton Road in the Town of Dunn, was constructed and placed into service in 1966. A major rehabilitation was performed in 1983 which added three new pumps to the station. No major rehabilitations have been performed since this time. PS11 is in need of major upgrades across all six of the scoring criteria listed in Table 5.1. The adequacy ratios for firm and maximum capacity for existing conditions are 1.03 and 1.25, respectively. Development in upstream basins such as the Lower Badger Mill Creek valley have the potential to reduce the ratios for firm and maximum capacity to 0.65 and 0.80, respectively, by 2030. Pump 11A is one of the oldest pumps in the District's collection system and has over 150,000 hours of recorded run-time. Pump 11B has the highest recorded maintenance costs in the previous ten years. The greatest need at this station, however, is with regard to the condition of the electrical equipment. Much of the original equipment from the 1966 construction is still in place and needs replacement to ensure reliable operation for this critical station.

PS7, at 6300 Metropolitan Lane in the City of Monona, was placed in service in 1950. Major station rehabilitations occurred in 1963 and 1992. PS7 is currently the largest of the District's stations in terms of average daily flow and pumping capacity and as a result it is deemed the most critical station in the collection system. Approximately 40% of the average daily flow to the Nine Springs Treatment Plant passes through this facility. As indicated in Table 4.3 in Chapter 4, the adequacy ratio for firm capacity at this station is below 1.00 for existing flows. The adequacy ratio for maximum capacity for existing flows is only 1.05. There is a strong potential for new and accelerated development in this service area between the City of Madison and the Village of Cottage Grove and a significant increase in average daily flowrates could be seen over the next twenty years (up to 40% of 2010 flowrates). As discussed in more detail in Chapter 6, it is not practical or prudent to provide the required capacity at PS7 due to site limitations and for reasons of system reliability. A new Pumping Station 18, working in tandem with PS7, will act to alleviate the firm and maximum capacity concerns at PS7. Some additional electrical and control work is required at PS7 in the near-term and will be completed in conjunction with or shortly after placing PS18 in service. Some of the electrical equipment at PS7 has outlived its useful service life and it is expected that some additional control and telemetry work will be required at PS7 so that it can operate in tandem with PS18.

PS12, located at 2739 Fitchrona Road in the Town of Verona, was constructed and placed into service in 1969. It is located upstream of PS11 and thus it is susceptible to the same increase in flowrates from the Lower Badger Mill Creek Valley as PS11. The adequacy ratio for firm capacity is 0.98 for existing conditions and is projected to decrease to 0.57 by 2030 for high-growth scenarios. The adequacy ratios for maximum capacity for 2010 and 2030 are 1.39 and 0.81, respectively. Pumps 12A and 12B have service lives in excess of 40 years, while Pumps 12C and 12D are approaching 30 years of service. Pump 12A is nearing 150,000 hours of run-time and is rated in fair condition by the District's Mechanical Maintenance Department. Significant deficiencies are also present in the power and electrical systems. The power to the station is fed through a single low voltage feed and significant outages can occur if any components related to this feed were to fail. Similar to PS11, the electrical equipment in this station has exceeded its service life and requires a major upgrade.

PS13, located at 3634 Amelia Earhart Drive in the City of Madison, was constructed and placed into service in 1971. Firm capacity improvements involving all three pumps were completed in 2008, but no other major rehabilitation work has been done since 1971. As a result, the electrical equipment is in poor condition and in need of replacement. Improvements to the design of the power system need to be implemented as well, similar to PS12. PS13 has no substantive heating systems for the interior spaces and minimal ventilation. These systems will need to be upgraded to meet current code requirements as part of any major rehabilitation work. Even with the firm capacity improvement project that was completed in 2008, the 2010 and 2030 adequacy ratios for firm capacity are 1.06 and 0.78, respectively. The scope of the 2008 project was constrained by downstream capacity and thus further firm capacity improvements will be needed at PS13 upon upgrades to interceptor capacity. It is likely that the PS13 firm and maximum capacity improvements will be needed prior to 2020. However, it may be possible to divert a portion of flows in the PS13 service area to PS1. This diversion could postpone the need for capacity improvements at PS13 by up to ten years or more. More information on this diversion can be found in Appendix A3.

PS15, located at 2115 Allen Boulevard in the City of Middleton, was constructed and placed into service in 1974 and serves primarily lands in the City of Middleton and Town of Westport. The primary needs for this station include those relating to power system redundancy and structural integrity. Similar to PS12 and PS13, the power to this station is fed through a single transfer switch, transformer bank, and low voltage feed. Damage to any of these components can result in significant interruptions of power to the station. The lack of a superstructure at this station presents challenges for access to equipment and shortens the expected life of electrical and control equipment. Capacity at this station is not an immediate concern, although the adequacy ratio for firm capacity could decrease to 0.87 by 2030 under high-growth scenarios. District staff should continue to monitor and assess the flow requirements for the proposed Bishops Bay Development in the City of Middleton and Town of Westport. This development includes 650 acres of land and has the potential to add approximately 7,300 people to the PS15 service area over the next twenty years.

PS14, located at 5000 School Road in the City of Madison, was constructed and placed into service in 1972. PS14 is similar to PS13 in age, service area, and capacity and thus has many of the same rehabilitation needs as PS13. Electrical equipment, the power system, and the HVAC system are all antiquated and need to be upgraded. The firm capacity at this station was also upgraded in 2008 at the same time as PS13, but the existing adequacy ratio is still only 1.11. Unlike PS13, diverting flow from the PS13 service area will do nothing to alleviate the firm capacity requirements at this station. Improvements to firm and maximum capacity will likely be needed prior to 2020.

The remaining eleven pumping stations generally received ratings of adequate, good or excellent in most of the scoring categories. Major rehabilitation work has been completed at PS1, PS2, PS6, PS8 and PS10 since 2005 to address condition and capacity deficiencies. Each rehabilitated station currently has a rating of either excellent or good across all of the categories and no major upgrade projects are contemplated at these stations in the near term.

Of the remaining six stations, the priority ranking for improvements is as follows: PS4, PS17, PS3, PS16, PS9, and PS5. Work that should be considered prior to 2020 includes improvements to the power system and electrical equipment at PS4, modifications and/or expansion of the pump house at PS3, and capacity upgrades at PS9. Rehabilitation work at PS17 depends in large part on the pace of development in the Lower Badger Mill Creek valley and the completion of the Lower Badger Mill Creek Interceptor between

Northern Lights Trail in the City of Verona and Midtown Road in the City of Madison. It is likely that these improvements will be needed sometime between 2015 and 2020. PS5 and PS16 score strongly across all of the categories and no major work is currently planned for these two stations.

Forcemains

The characteristics and capacities of MMSD's seventeen wastewater forcemains were examined in Chapter 4 and are summarized in Table 4.5.

Forcemains have the potential for very long service lives, sometimes approaching or exceeding 100 years. Wastewater forcemains are generally in service and under live pressure 24 hours per day, 365 days per year. They cannot easily be taken out of service, and are generally not accessible for internal inspection or televising. Within the past five years MMSD staff has had the opportunity to inspect the exterior and interior surfaces of very small segments of the PS6, PS7, and PS8 forcemains as part of short station outages or pipe abandonment projects. In general the concrete surfaces that were inspected looked very good and showed no evidence of corrosion or deterioration. From these very limited observations it appears that the concrete in fully submerged forcemains is in good to excellent condition, even after fifty years in service.

Measurements of flow and operating pressures can provide an indicator for some types of forcemain problems, such as major solids deposition or major air binding. In general, though, the most common and direct tool for assessing the condition of a given forcemain is its particular history of leaks and breaks and emergency repairs.

As might be expected, MMSD's oldest forcemains have exhibited the most problems. The old 30" cast iron PS2 Forcemain (1926) suffered a number of leaks and failures in its later years and was replaced by MMSD with a new facility in 2001. The old 20" cast iron Crosstown Forcemain (1914) also suffered numerous joint leaks and failures and was replaced by a new facility in 2002. Old cast iron forcemains are more susceptible to leaks and breaks than other common forcemain pipe materials such as ductile iron and prestressed concrete cylinder pipe. Old cast iron pipe is more brittle than ductile iron pipe. Cast iron pipe was also typically assembled with lead joints. These lead joints took considerable skill to construct and had a higher probability of failure if not constructed properly.

With the completion of the PS2 Forcemain Replacement and the Crosstown Forcemain Replacement projects, MMSD significantly reduced the age of its forcemain piping network. As can be seen in Figure 5.1, almost one-third of the network was installed during the 1960's, while installation of the remainder of the network is fairly evenly distributed from 1940 through 2010. Approximately 88% of the District's forcemains have service lives of 50 years or less at this time.

Figure 5.1 - Forcemain Age

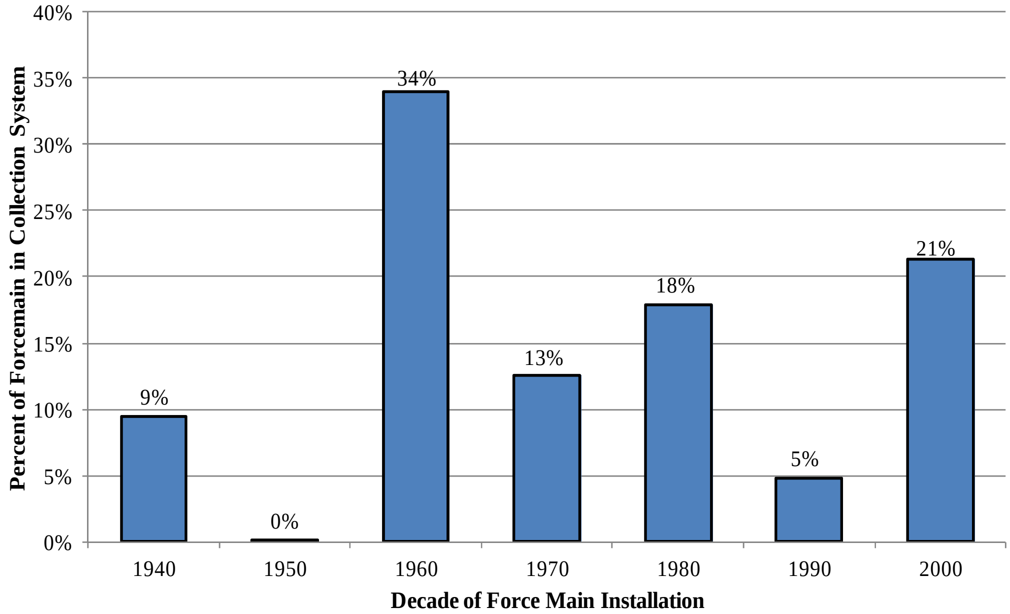
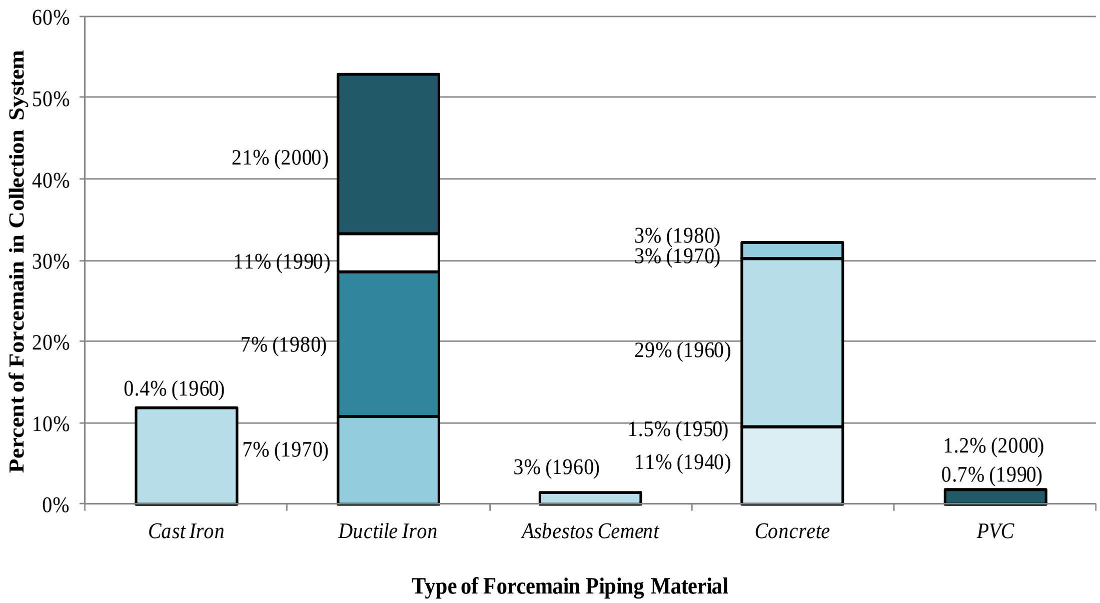


Figure 5.2 shows the relative age of the forcemain system in terms of piping material. The predominant materials in the system are ductile iron (46%) and concrete (48%). Concrete includes both reinforced concrete pipe and prestressed concrete cylinder pipe. As discussed previously, cast iron pipe is the pipe material most prone to failure and there is very little of it that remains in the District's system (0.4%).

Figure 5.2 - Classification of Forcemains by Material and Age



Given the age of the forcemains in service, the fact that ductile iron and concrete comprise the vast majority of piping materials, and the lack of recent forcemain leaks or breaks throughout the system, there are no present needs to replace forcemains in the system from a condition perspective.

Gravity Interceptors

As part of MMSD's interceptor maintenance program, approximately 10% of the 96-mile MMSD gravity system is televised each year. Table 5.2, located at the end of this chapter, tracks the history of MMSD's televised interceptor inspections and summarizes any major defects discovered. Condition scores for each interceptor segment are also shown and are used to develop ordinal rankings of sewer condition by pump station service area. These rankings are used as a guide in prioritizing future televising efforts and identifying possible rehabilitation projects. Interceptor segments in particular need of rehabilitation or replacement work are discussed in more detail in this subsection.

The following summary of needs is based on the physical condition of the interceptors as televised and the capacity status as developed in Chapter 4. Specific repair or replacement projects are recommended for certain interceptors. Locations of the interceptor projects are highlighted in Figure 9.1 (see enclosed map pocket). Interceptors that are functional but may be developing problems are recommended to be placed on a "watch list" and closely examined again at their next televising. Major interceptor repair and replacement projects already completed by MMSD are also summarized in this section.

PS1 Basin Interceptors

Significant improvements have been made to the PS1 basin since the 2002 Collection System Plan was developed. In 2002 the District's 54" x 24" Burke Outfall (1911) and 30" Burke Pressure Sewer (1912) on Pennsylvania Avenue were replaced with a new 36" PVC interceptor sewer. An 18" cast iron sewer on Commercial Avenue has also been replaced. These old facilities had experienced severe corrosion and were structurally unsound.

Some old facilities in the PS1 basin remain, however. The North End Interceptor on Sherman Avenue was constructed in 1927. This clay sewer was last televised in 1999 and was found to be in good condition, although it should be televised within the next 2-3 years to reassess its condition. In addition, the Northeast Interceptor Relief sewer was built in 1937. This is a cast iron sewer that does not convey very much flow due to the new sewers constructed in 2002 on Pennsylvania Avenue. As a result it has significant silt deposition and should be cleaned and televised within the next 2-3 years.

PS2 Basin Interceptors

There are several old cast iron interceptor sewers within the PS2 drainage basin that are displaying signs of hard iron deposits and tuberculation. The Southwest Interceptor on Haywood Street (1936) was last televised in 2000 and showed tuberculation at that time. The West Interceptor on Regent Street from Randall Avenue to PS2 has not been televised in the last ten years, although a piece of the sewer was removed during this period for a service connection and the pipe wall was found to be in excellent condition. Both of these sewers should be televised in the next 1-2 years to assess the deterioration due to tuberculation. Consideration should also be given to replacing the 24" sewer on Haywood Street with a new 36" sewer to serve as an inter-connection for PS2 and PS8 (see Chapter 6 for more details).

The Spring Street Relief (1940) is another cast iron sewer in the PS2 basin that was last televised in 2006. No significant defects were found during this inspection. The Southwest Interceptor on Shore Drive (2001) was televised in 2007 and was found to be in excellent condition.

PS3 Basin Interceptors

The Rimrock Interceptor was televised in 2009 and showed a variety of deficiencies including areas with root intrusion, sags, and infiltration. This sewer section should be evaluated further for rehabilitation. It should also be noted that the Rimrock Interceptor has capacity needs, as discussed in more detail in Chapter 4 and Appendix 5. It is recommended that an independent study of this interceptor be conducted to further evaluate its condition and capacity.

PS4 Basin Interceptors

The *2002 Collection System Facilities Plan* identified the South Interceptor - Baird Street Extension (1928) as a sewer that should be watched due to its age and structural stability. In 2009 the District rehabilitated this sewer with a cured-in-place liner. All other gravity sewers in this drainage basin have been televised in the last five years and are in good condition.

PS5 Basin Interceptors

The West Interceptor (1931) between PS15 and PS5 is an aging cast iron sewer that has significant iron deposits and tuberculation. It was placed on the watch list in the *2002 Collection System Facilities Plan*. Televising of this sewer in 2009 verified that the iron deposits continue to grow. The District intends to rehabilitate a portion of this sewer in 2011 via a cured-in-place liner, from MH05-021 to MH05-011.

PS6 Basin Interceptors

The East Interceptor/East Monona Interceptor has one of the worst scores in the District's rating database. This section of sewer is located on Fair Oaks Avenue north of Starkweather Creek. The sewer was constructed in 1925 and 1926 and includes sections of vitrified clay and cast iron. Televising of this sewer in 2006 showed several segments with deficiencies, including root intrusion and cracked pipe. The District intends to re-televise this sewer in 2010 and rehabilitate it with a cured-in-place liner in 2011.

The East Monona Interceptor downstream of Starkweather Creek was replaced in 1997 and is in good condition, as is the East Interceptor, which was sliplined in 1995 with PVC.

PS7 Basin Interceptors

The gravity interceptors in the PS7 drainage basin consist primarily of reinforced concrete pipe. Most of the interceptor segments in the basin have been televised in the last ten years to check for evidence of corrosion and other defects, although two notable sections have not been televised: (1). Southeast Interceptor (60") from PS 7 to the Northeast Interceptor, and (2). Northeast Interceptor (48") from the Southeast Interceptor to the Far East Interceptor. The District intends to televise both sections in either 2010 or 2011. The Northeast Interceptor segment is projected to reach its benchmark capacity by 2010 and is scheduled for replacement in 2013. The Southeast Interceptor is also projected to reach its benchmark capacity by 2010, although the construction of a new PS 18 will decrease flows through this interceptor such that benchmark capacity will not be exceeded.

In 2005 the District completed replacement of the Northeast Interceptor from the end of the PS10 force main to its junction with the Far East Interceptor (1.39 miles). The old concrete sewer had suffered from severe corrosion and was also in need of capacity relief. In 2010 the District will be rehabilitating the Far East Interceptor – Cottage Grove Extension (1.0 miles) with a new cured-in-place liner. This will address corrosion deficiencies noted in this section.

The East Interceptor and Far East Interceptor sections were televised in 2006 and found to be in reasonably good condition. Similarly, the Blooming Grove and McFarland Relief extensions to the Southeast Interceptor were televised in 2004 and no significant deficiencies were found.

PS8 Basin Interceptors

As noted in the *2002 Collection System Facilities Plan*, the pipe compromising the West Interceptor (1916 and 1932) in the PS8 basin is old and in mediocre condition on average. Numerous spot repairs have been made along its length. Approximately one mile was replaced in 2005 as part of the West Interceptor – Campus Relief (Phase IV) improvements.

No televising of the West Interceptor within the PS8 drainage basin has been done in the last ten years. It is recommended that televising of the entire length be performed in 2010 or 2011. A small portion of the West Interceptor on University Avenue between Midvale Boulevard and Shorewood Boulevard was televised in 2009 and found to be in good condition, however.

The West Interceptor Relief and West Interceptor – Randall Relief systems were televised in 2007 and found to be in generally good condition. Some areas of minor infiltration and mineral deposits at joints were found.

Extensive rehabilitation of the North and South legs of the Southwest Interceptor was done in 2007. Both legs were rehabilitated with a cured-in-place liner along their entire lengths. The Southwest Interceptor downstream of the confluence of the north and south legs was televised in 2007 with very few deficiencies found. A spot repair was made in 2009 to a short section of sewer near Thoreau Elementary School using a cured-in-place liner. The District intends to convey ownership of portions of the Southwest Interceptor sewer system to the City of Madison in 2010 or 2011.

PS9 Basin Interceptors

No significant gravity interceptor needs within the PS9 basin have been identified.

PS10 Basin Interceptors

Approximately 3,900 feet of the Northeast Interceptor will be replaced in 2010 between Nakoosa Trail and Lien Road. The existing 36”-48” concrete sewer is suffering from corrosion and requires capacity relief as well. The portion of the existing Northeast Interceptor from Nakoosa Trail to PS 10 will remain and serve as a relief for the new sewer to be installed. This section was televised in 2005 and found to be in good condition, with only minor corrosion noted.

The Truax Extension to the Northeast Interceptor was also televised in 2005 and found to be in good condition, although it is projected to reach its benchmark capacity within the next ten years and may require relief. The Lien Extension to the Northeast Interceptor was televised in 2007 and appears to be in good condition, with areas of moderate infiltration present in the concrete portions.

PS11 Basin Interceptors

The majority of the Nine Springs Valley Interceptor sewer system was televised in 2003. Much of this system is reinforced concrete pipe. In general, the ratings for this system were very good, with only small sections noted for minor root intrusion and infiltration.

Portions of this system may need capacity relief prior to 2030, depending on the fate of the Sugar River Wastewater Treatment Plant in the City of Verona.

PS12 Basin Interceptors

The Mineral Point (1968) and Midtown (1999) Extensions to the Nine Springs Valley Interceptor system were televised in 2004. No significant deficiencies were reported in either of these sections.

PS13 Basin Interceptors

Television inspection of the Northeast Interceptor in 2006 showed evidence of corrosion at the junction with the City of Madison's 36" Truax Interceptor (MH13-122A). The District is investigating the rehabilitation of the affected manhole with a lining system. There is also evidence of significant corrosion in the 48" interceptor sewer upstream of the Truax Interceptor junction. It is recommended that the section from MH13-116H to MH13-137 be monitored for further corrosion within the next five years and that the section from MH13-116H to MH13-125 be scheduled for rehabilitation prior to 2020.

Further downstream, the District relocated approximately 2,000 feet of the Northeast Interceptor at the northwest corner of the Dane County Regional Airport as part of improvements to the airport in 2006-07. In addition, the 48" Northeast Interceptor (1971) across the Dane County Regional Airport was rehabilitated in 2006-07 with installation of a cured-in-place liner. This concrete sewer had also experienced moderate corrosion in numerous segments.

PS14 Basin Interceptors

The DeForest Extension (1971) to the Northeast Interceptor was televised in 2004. Moderate infiltration was documented along the 9.4 miles that were televised, although no major deficiencies were found. The Waunakee Extension (1971) to the Northeast Interceptor was televised in 2007. In addition to moderate infiltration, areas of corrosion were also noted in certain areas. This section of sewer should be put on a watch list for future televising. Approximately 4,600 feet of this sewer is expected to reach its benchmark capacity within the next ten years (MH14-345 to MH14-356).

PS15 Basin Interceptors

The District replaced approximately 3,800 feet of the West Interceptor Extension in 2007 from Mendota Avenue to the north. The old concrete sewer had experienced problems related to joints, dips, and grease due to poor soil conditions. Further upstream, the District's West Point Extension to the West Interceptor has one of the worst condition scores. This rating is primarily due to the presence of corrosion in the asbestos cement pipe that was documented in 1999. This section of sewer should be re-televised within the next 1-2 years to reassess the corrosion.

The West Interceptor (1931) within the PS 15 drainage basin is another interceptor with a relatively poor rating. This cast iron sewer was last televised in 1999 and was noted in mediocre condition, with evidence of heavy mineral deposits and joint buildup. This section should be televised in the next 1-2 years.

PS16 Basin Interceptors

All gravity interceptors within the PS16 drainage basin have been televised since 2003 and are in excellent condition. This is due most likely to the age of the sewers in this basin. A 0.38-mile segment of the West Interceptor – Gammon Extension on Voss Parkway and Fortune Drive was replaced in 2002.

PS17 Basin Interceptors

The District's only interceptor in the PS17 drainage basin is the Lower Badger Mill Creek Interceptor, which was constructed in phases in 2006 and 2008. No deficiencies have been noted in this interceptor.

Table 5.2
Televising History for Gravity Interceptors

Segment Description	From	To	Segment Length (ft)	Pipe Characteristics			Year Last Televised	Condition Score		Ordinal Ranking	Significant Defects?	Comments and/or Defects
				Pipe Dia. (in)	Year Installed	Pipe Material		Average Score per Segment	Worst Score per Segment			
Pump Station No. 1 Service Area												
East Interceptor - North End Interceptor (Sherman Avenue)	MH01-126	MH01-120	1,482	10, 12	1927	VP	1999	NR	NR			
East Interceptor - North Basin Interceptor	MH01-120	MH01-304	6,670	18-20 & 36-42	2002	PVC	2007	25.00	25			Sewer replaced in 2002.
East Interceptor - Northeast Interceptor Relief	MH01-003	MH01-001	189	30	1937	CI	1999	NR	NR		W	
East Interceptor - East Johnson Street Relief Sewer	MH01-304	PS1	696	36	1979	RCP	NR	NR	NR			
East Interceptor - Burr Jones Park Leg	City sewer	PS1	10	42	1950	RCP	NR	NR	NR			
WEIGHTED COMPOSITE SCORE									25.0	15		
Pump Station No. 2 Service Area												
West Interceptor - Spring Street Relief	MH02-316A	MH02-101	4,580	24	1916 & 1940	CI	2006	25.27	31			
West Interceptor - Regent/Randall to PS2	MH02-014	MH02-101	5,164	24	1916	CI	NR	NR	NR		W	
Southwest Interceptor (Haywood St)	MH08-106	MH02-606	1,438	24	1936	CI	2000	NR	NR		W	Build-up of iron deposits and tuberculation.
Southwest Interceptor (West Shore Dr)	MH02-606	MH02-401	1,770	36	2001	PVC	2007	25.00	25			
Interceptor to PS 2 along West Washington Avenue	MH02-101	PS2	324	36-48	1963	RCP	NR	NR	NR			
WEIGHTED COMPOSITE SCORE									29.3	10		
Pump Station No. 3 Service Area												
Rimrock Interceptor	MH03-311	PS3	3,800	10 & 12	1958-59	RCP, CI	2009	30.40	37		X	Roots, sags, and infiltration noted throughout section.
WEIGHTED COMPOSITE SCORE									37.0	1		
Pump Station No. 4 Service Area												
South Interceptor - Baird Street Extension	MH04-408	MH04-311	1,584	10-15	1928 & 1955	VP(L), PVC, DI	2009	25.00	25			Vitrified clay section re-lined in 2009.
South Interceptor Relief	MH04-315	MH04-209	3,691	24	1995	PVCPW	2005	25.00	25			
South Interceptor - Lakeside Extension	MH04-209	PS4	2,271	24	1967	AC, VP & RCP	2005	26.00	33			
South Interceptor - Lakeside Extension (Coliseum Leg)	MH04-201B	MH04-201	653	15	1967	AC	2005	25.00	25			
WEIGHTED COMPOSITE SCORE									27.2	14		
Pump Station No. 5 Service Area												
West Interceptor Extension	MH05-102A	MH05-021	555	30	1957	RCP	1999	33.00	37			Grease.
West Interceptor (Marshall Park to PS5)	MH05-021	MH05-402	6,373	14-18	1931	CI	2009	26.70	33		X	Significant mineral deposition along entire length.
West Interceptor - Gammon Extension	MH05-230	MH05-011	8,833	10-18	1966	AC	2003	25.68	33			
Interceptor at PS 5	MH05-402	PS5	120	24	1995	PVC	2009	25.00	25			Line sag.
WEIGHTED COMPOSITE SCORE									33.1	4		

Scoring : 25 (best) to 100 (worst)
Ranking: 1 (worst) to 17 (best)

Defect Codes: X -= Segment in poor condition
W = Segment in mediocre condition

NR = No record for sewer inspection available from 1999-2010

Table 5.2
Televising History for Gravity Interceptors

Segment Description	From	To	Segment Length (ft)	Pipe Characteristics			Year Last Televised	Condition Score		Ordinal Ranking	Significant Defects?	Comments and/or Defects
				Pipe Dia. (in)	Year Installed	Pipe Material		Average Score per Segment	Worst Score per Segment			
Pump Station No. 6 Service Area												
East Interceptor (PS 1 Force Main to Olbrich Gardens)	MH06-122	MH06-103	6,339	36	1995	PVCPW	2006	25.30	29			
East Interceptor (Olbrich Gardens to PS 6)	MH06-103	PS6	1,483	42	1948	RCP	2006	27.67	31			Heavy grease in line to PS 6 wet well.
East Interceptor - East Monona Interceptor	MH06-209	MH06-204	1,411	14 & 15	1925-26 & 1997	CI, VP & PVC	2006	35.50	41		X	Cracked pipe and roots. Section scheduled for relining in 2007.
East Interceptor - East Monona Interceptor	MH06-204	MH06-108A	847	15	1997	PVC	2006	26.00	27			
WEIGHTED COMPOSITE SCORE									36.1	2		
Pump Station No. 7 Service Area												
Far East Interceptor - Gaston Road Extension	MH07-740	PB07-734	1,731	18 & 21	2008	PVC			NR			
Far East Interceptor - Door Creek Extension	PB07-734	MH07-426	17,253	21 & 24	1998	PVCPW	2005	25.09	27			
Far East Interceptor - Cottage Grove Extension	MH07-437	MH07-426	5,510	18	1981	RCP(L) & DI(L)	2006	32.36	34		X	Moderate corrosion throughout section. Lined in 2010.
Far East Interceptor - Far East Extension	MH07-426	MH07-416	4,014	30 & 36	1981	RCP & DI	2006	26.20	29			Minor infiltration noted throughout section.
Far East Interceptor	MH07-416	MH07-313	8,436	42	1970	RCP	2006	25.21	29			
Northeast Interceptor (FEI to SEI)	MH07-313	MH07-215	5,591	48	1964	RCP	2000	28.19	34			Some infiltration noted.
Southeast Interceptor (PS9 to SEI - Blooming Grove Ext)	MH07-823	MH07-218	8,473	8-15	1961 & 1992	AC & DI	2003	25.00	25			
Southeast Interceptor (SEI - Blooming Grove Ext to NEI)	MH07-218	MH07-215	1,606	36	1961	RCP	2001	33.00	33			Numerous cracks and mineral deposits.
Southeast Interceptor (NEI to PS7)	MH07-215	PS7	7,810	60	1961	RCP	2001	28.05	33			Many leaking joints.
Northeast Interceptor - Pflaum Road Replacement	MH07-955	MH07-932	7,323	36-54	2001 & 2005	DI, FRP	2005	25.00	25			Section replaced in 2005.
Southeast Interceptor - Blooming Grove Extension	MH07-249	MH07-218	13,413	18-36	1963 & 1967	RCP	2004	25.64	27			
Southeast Interceptor - McFarland Relief	MH07-517	MH07-228	6,667	20 & 30	1987	RCP & DI	2004	25.79	29			
Southeast Interceptor - Siggelkow Extension	MH07-618	MH07-512	5,078	8 & 12	1993 & 1996	PVC	2004	25.00	25			
East Interceptor	MH07-129	PS7	11,420	36 & 42	1948, 1985, 1986 & 1990	RCPWT, DI, RCP	2006	25.20	33			
WEIGHTED COMPOSITE SCORE									28.9	11		
Pump Station No. 8 Service Area												
West Interceptor Relief	MH02-547	MH02-014A	16,588	21-36	1959	RCP	2007	26.26	39			Hanging gaskets, mineral deposits, and roots from Shorewood Blvd. to west.
West Interceptor - Midvale Relief	MH02-708	MH02-531A	2,653	21	1971	RCP	2006	25.25	27			
West Interceptor - Campus Relief	MH08-228	MH08-201	5,682	36 & 48	1999, 2000, & 2005	DI & FRP	2007	25.00	25			
West Interceptor (State Crime Lab to Paunack Place)	MH02-542	MH02-513	12,023	12-21	1916, 1932 & 1961	VP	1999/2009	28.21	35			Some minor chips and cracks noted in 1999 televising. MH02-055 to MH02-049 televised in 2009 and found to be in good condition.
West Interceptor (Babcock Drive to Dayton Street)	MH02-021	MH02-014A	2,153	24	1916	CI	1999	33.00	33			Moderate iron buildup throughout section.
West Interceptor - Randall Relief	MH02-014A	PS8	10,020	30-48	1964	CI & RCP	2007	25.76	29			Some infiltration and mineral deposits noted.

Scoring : 25 (best) to 100 (worst)
Ranking: 1 (worst) to 17 (best)

Defect Codes: X -= Segment in poor condition
W = Segment in mediocre condition

NR = No record for sewer inspection available from 1999-2010

Table 5.2
Televising History for Gravity Interceptors

Segment Description	From	To	Segment Length (ft)	Pipe Characteristics: Pipe Dia. (in)	Pipe Characteristics: Year Installed	Pipe Characteristics: Pipe Material	Year Last Televised	Condition Score: Average Score per Segment	Condition Score: Worst Score per Segment	Ordinal Ranking	Significant Defects?	Comments and/or Defects
Southwest Interceptor - North Leg	MH02-189	MH02-174	5,539	15 & 18	1955	RCP(L) & AC(L)	2007	25.00	25			Ownership of SWI to be transferred to City of Madison in 2010.
Southwest Interceptor - South Leg	MH02-218	MH02-173A	5,456	12-16	1955, 1994 & 2000	PVC, RCP(L) & AC(L)	2007	25.00	25			Ownership of SWI to be transferred to City of Madison in 2010.
Southwest Interceptor	MH02-173A	MH08-106	17,229	15-30	1932, 1936, 1955, & 1994	AC, RCP, CI, VP & PVC	2007	27.27	27			Ownership of SWI to be transferred to City of Madison in 2010.
WEIGHTED COMPOSITE SCORE									30.9	9		
Pump Station No. 9 Service Area												
Southeast Interceptor	MH09-108	PS9	3,336	24 & 27	1961	RCP	2003	26.60	33			Moderate mineral deposits noted.
WEIGHTED COMPOSITE SCORE									33.0	5		
Pump Station No. 10 Service Area												
Northeast Interceptor - Truax Extension	MH10-145	MH10-426	10,948	48	1969	RCP	2005	27.50	35			
Northeast Interceptor Replacement	MH10-426	PS 10	9,222	48-63	2010	FRP	NR	NR	NR			Under construction in 2010.
Northeast Interceptor (Nakoosa Trail to PS 10)	MH10-112	PS 10	5,181	48	1964	RCP	2005	27.06	28			Insignificant to moderate corrosion.
Northeast Interceptor - Lien Extension	MH10-220	MH10-419	7,710	24 & 27	1970, 1973 & 1995	RCP & PVC	2009	26.00	29			Infiltration and minor mineral deposition noted.
Northeast Interceptor - Highway 30 Extension	MH10-305	MH10-104A	1,728	12 & 16	1966	AC & DI	2005	25.00	25			
WEIGHTED COMPOSITE SCORE									31.1	7		
Pump Station No. 11 Service Area												
NSVI - Mineral Point Extension	MH11-171	MH11-168	1,184	42	1968	RCP	2003	25.00	25			
Nine Springs Valley Interceptor (CTH PD to Certco)	MH11-168	MH11-161E	1,529	42	1965	RCP	2003	26.60	33			
NSVI - 2001 Relocation behind Certco	MH11-161E	MH11-161A	1,156	18 & 30	2001	PVC	2003	25.00	25			
Nine Springs Valley Interceptor (Certco to PS 11)	MH11-161A	PS11	30,275	30-54	1965	RCP	2003	27.31	33			Minor root and infiltration defects.
NSVI - Syene Extension	MH11-306	MH11-116A	1,822	12 & 16	1975	RCP	2003	26.00	29			
NSVI - Highway 14 Extension	MH11-423	MH11-106A	6,714	10-15	1977	PVC	2003	25.00	25			
NSVI - Highway 14 Extension (Granda Way Leg)	MH11-414C	MH11-414	834	10	1977	PVC	NR	NR	NR			
NSVI - Highway 14 Extension (Ski Lane Leg)	MH11-416A	MH11-416	236	8	1977	PVC	NR	NR	NR			
NSVI - Waubesa Extension	MH11-226	PS11	9,511	15-27	1971	RCP	2003	25.76	31			
WEIGHTED COMPOSITE SCORE									31.1	7		
Pump Station No. 12 Service Area												
NSVI - Mineral Point Extension	MH12-177	PS12	33,155	30-48	1968	RCP	2004	25.35	29			
NSVI - Midtown Extension	MH12-220	MH12-133	8,326	24 & 30	1999	PVC	2004	25.00	25			
WEIGHTED COMPOSITE SCORE									28.2	13		

Scoring : 25 (best) to 100 (worst)
Ranking: 1 (worst) to 17 (best)

Defect Codes: X -= Segment in poor condition
W = Segment in mediocre condition

NR = No record for sewer inspection available from 1999-2010

Table 5.2
Televising History for Gravity Interceptors

Segment Description	From	To	Segment Length (ft)	Pipe Characteristics			Year Last Televised	Condition Score		Ordinal Ranking	Significant Defects?	Comments and/or Defects
				Pipe Dia. (in)	Year Installed	Pipe Material		Average Score per Segment	Worst Score per Segment			
Pump Station No. 13 Service Area												
NEI - Waunakee/DeForest Extension (PS 14 FM to Airport)	MH13-137	MH13-116H	6,609	48	1971	RCP	2006	28.71	34			Corrosion in pipe and manhole at City of Madison's Truax Interceptor junction.
NEI - Waunakee/DeForest Extension (Aiport to NEI/Truax Ext)	MH13-116H	MH13-116A	1,989	48	2006 & 2007	FRP	2007	25.00	25			New sewer relocated in 2007.
Northeast Interceptor - Truax Extension	MH13-116A	PS13	7,051	48	1969	RCP(L) & RCP	2008	25.00	25			RCP from MH13-116A to MH13-105 re-lined in 2008.
WEIGHTED COMPOSITE SCORE									28.8	12		
Pump Station No. 14 Service Area												
NEI - Waunakee/DeForest Extension (DeForest Leg)	MH14-209	MH14-102	49,465	21 - 36	1971	RCP	2004	25.64	37			Moderate infiltration noted.
Northeast Interceptor - Highway 19 Extension	MH14-417	MH14-134	6,334	12, 15 & 18	1971	RCP	2004	25.56	31			
NEI - Waunakee/DeForest Extension (Waunakee Union HS Leg)	MH14-362	MH14-358	775	10	1971	VP	2007	25.67	27			Moderate infiltration noted.
NEI - Waunakee/DeForest Extension (Waunakee Leg)	MH14-359	MH14-102	25,239	21-30	1971	RCP	2007	27.84	30		W	Moderate corrosion noted along entire length.
NEI - Waunakee/DeForeset Extension	MH14-102	PS14	1,907	42	1971	RCP	NR	NR	NR			
WEIGHTED COMPOSITE SCORE									34.3	3		
Pump Station No. 15 Service Area												
West Interceptor - West Point Extension	MH05-119	PB05-06607	1,955	14 & 18	1966	AC	1999	39.00	43			Moderate corrosion noted in AC pipe. Siphon under Pheasant Branch Creek not included in score.
West Interceptor Extension	PB05-06607	MH05-112A	1,832	14-30	1957	RCP	1999	29.50	30			Siphon under Pheasant Branch Creek not televised.
West Interceptor Extension Replacement	MH05-112A	MH15-101	3,842	8-10 & 30-42	2007	PVC	2007	25.00	25			
West Interceptor Extension	MH05-106	PS 15	1,645	30	1957 & 1999	PVC, RCP	1999	28.00	31			
West Interceptor	MH05-025A	MH05-103	880	12	1931	CI	1999	35.00	35			Mineral deposits and joint buildup.
WEIGHTED COMPOSITE SCORE									31.2	6		
Pump Station No. 16 Service Area												
West Interceptor - Esser Pond Extension	MH05-317	MH05-236	4,235	18-24	1978 & 1986	RCP	2003	25.00	25			
West Interceptor - Gammon Extension (Middleton Street)	MH05-240	MH16-211	1,264	24	1966	RCP	2003	25.00	25			
West Interceptor - Fortune Drive Replacement	MH16-211	MH16-202	2,016	36	2002	PVC	2007	25.00	25			
West Interceptor - Gammon Extension (Fortune Dr to PS 16)	MH16-202	PS16	228	36	1981	DI	2003	25.00	25			
Interceptor to PS 16 (via PS 15 force main)	MH16-105	PS 16	863	30 & 36	1981-82	PCCP & DI	2003	25.00	25			
WEIGHTED COMPOSITE SCORE									25.0	15		
Pump Station No. 17 Service Area												
Lower Badger Mill Creek Interceptor - Phase II	MH17-146	MH17-128	5,456	27 & 30	2008	PVCPW	NR	NR	NR			
Lower Badger Mill Creek Interceptor - Phase I	MH17-128	PS17	7,831	27-36	2006	PVCPW, PVC & DI	2007	25.00	25			New sewer constructed in 2006.
WEIGHTED COMPOSITE SCORE									25.0	15		

Scoring : 25 (best) to 100 (worst)
Ranking: 1 (worst) to 17 (best)

Defect Codes: X -= Segment in poor condition
W = Segment in mediocre condition

NR = No record for sewer inspection available from 1999-2010

Chapter 6
Special Projects and Diversions

Chapter Outline

This chapter is organized into the following sections:

- Introduction
- The Future of PS7 and a New PS18
- PS15 Diversion to PS8 or PS16
- Future MMSD Satellite Treatment Plants
- Inter-Station Diversions
- Lower Badger Mill Creek Interceptor
- East Verona Interceptor
- Headworks Equilization

Introduction

The operation of MMSD's pumping stations, forcemains and interceptors can significantly impact one another. This chapter will examine a number of key projects and diversion concepts that may impact multiple stations or interceptors.

The Future of PS7 and a New PS18

PS7, located at Bridge Road in Monona, is MMSD's largest and most critical station. The flows conveyed through three MMSD pumping stations (PS6, PS10 and PS9) and four interceptor systems (East, Southeast, Northeast, Far East) ultimately converge at PS7. With an average daily flowrate of 16.8 mgd in 2010, PS7 conveyed nearly 40% of MMSD's total flow. The average wastewater volume at PS7 is projected to increase about 43% in the next 20 years according to CARPC's 2030 UF estimates (from 16.8 mgd in 2010 to about 24 mgd in 2030).

The maximum PS7 pumping capacity is currently about 45 mgd. According to CARPC's *Collection System Evaluation* (2009), a design capacity of 72 mgd will be needed for PS7 to handle peak flows from MMSD's east side by 2060. These large future flows appear to be beyond the practical ability for PS7 to handle alone. A major capacity upgrade would require a new 42" or 48" forcemain to replace the old 36" line (1948) and would likely require a new set of 24" pumps. The PS7 pump room is already crowded with four horizontal 20" pumping units and associated 20" to 36" piping and valves. The larger equipment and the new forcemain connection would not be efficiently accommodated within the existing pump room and header geometry. Further, PS7 is already by far MMSD's highest flow and most critical station (although not the largest station physically), and no diversion provisions exist. It is not prudent for MMSD to place such large future flow increases through this single station.

In view of the above, the concept of a future PS18 and PS18 forcemain, to work in tandem with PS7, was identified in MMSD's *Crosstown Forcemain Diversion Study* (November 2001). The driving force for the new PS18 and forcemain would be providing the needed capacity for MMSD's east side. A significant benefit, as a byproduct, would be the added protection and reliability provided by dual stations, each of which could serve as an emergency diversion for the other. A feasibility study for PS18 is included as Appendix A9 of this Facilities Plan.

PS15 Diversion to PS8 or PS16

MMSD's PS15 is located at Marshall Park on Allen Boulevard on the west side of the Madison metropolitan area. PS15 serves the far northwest side of the MMSD service area, including much of the City of Middleton.

PS15 is equipped to pump its flow either to PS16 (and ultimately down the Nine Springs Valley Interceptor system to PS12 and PS11) or to the West Interceptor system and PS8. When originally constructed in 1974, PS15 and its forcemain conveyed its flow to the West Interceptor. In 1983, a diversion forcemain was constructed to allow the PS15 flow to be diverted to the newly constructed PS16 and then on to the Nine Springs Valley Interceptor system. This diversion to PS16 remained the main operating scenario from 1983 until 1996. Starting in September 1996, the PS15 flow was directed back to the West Interceptor and PS8. This operating change was made in an attempt to reduce odor complaints occurring in the PS16 area, and also to reduce energy costs.

As discussed in Chapter 4, the direction of the PS15 discharge has significant implications for the downstream MMSD collection system. Average daily flows in 2010 were 1.34 mgd and peak flows were 5.12 mgd, as calculated by the Madison Design Curve. In 2030, the PS15 average daily and peak hourly flows are projected to be approximately 1.83 mgd and 6.65 mgd, respectively.

Upstream of Walnut Street, the need for capacity relief for the West Interceptor system depends significantly on PS15. If PS15 continues to be discharged to the West Interceptor system, approximately 10,100 feet of the West Interceptor Relief sewer from Whitney Way to Walnut Street will require relief by the year 2020. This is particularly significant since the PS15 service area has considerable potential for growth and the timing of this growth is uncertain. If flows from PS15 are redirected back to PS16 and the NSVI, the 2-mile gravity system from Whitney Way to Walnut Street would be better positioned with regards to anticipated flows and capacity relief would not be needed over the next fifty years. Without flows from PS15, the West Interceptor service area is projected to have little future growth. The physical condition of the interceptors, however, may still be of concern, particularly the segments of the original West Interceptor dating from 1916 and 1932.

The hydraulic adequacy of the Nine Springs Valley Interceptor system is also affected by the direction of PS15. If PS15 continues to be discharged to the West Interceptor system, approximately 32,000 feet of sewer in the NSVI gravity system will require capacity relief prior to the year 2030 (see Chapter 4). If PS15 is redirected back to PS16, the scope of capacity relief projects for the NSVI system will increase and all projects will be required much sooner, on the order of five to ten years (see Appendix 4-1 in Chapter 4 for details). Approximately 47,000 feet of sewer in the NSVI gravity sewer will require relief prior to 2030 under this scenario (i.e. with PS15 flows diverted to PS16 and the NSVI system).

Increases to maximum pumping capacity at PS12 and PS11 would also be needed in 2010 if flow were to be diverted from PS15 to PS16. A Sugar River Treatment Plant (discussed later in this Chapter) could significantly change the future needs at PS12 and PS11 and could reduce or eliminate the need for capacity relief in the NSVI system. However, the costs and regulatory constraints associated with a satellite treatment plant in the Sugar River basin are prohibitive at this time and do not support its construction.

The present worth analysis performed in Chapter 4 demonstrates that the preferred alternative for operation of PS15 is to continue the practice of routing flows from PS15 to PS8. While construction costs are similar between the two alternatives, energy costs associated with pumping from PS15 to PS16 are excessive relative to PS8. In addition, pumping to PS16 would exacerbate the odor problems that are currently observed at PS16. While it may be possible to mitigate the odor problems with more sophisticated equipment and intensive maintenance, the costs for doing so would not be practical or cost efficient. It is recommended that flows from PS15 continue to be directed to PS8 and that capacity relief projects for the West Interceptor system are scheduled accordingly.

Future MMSD Satellite Treatment Plants

The 2002 *Collection System Facilities Plan* discussed the concept of constructing satellite treatment plants in the collection system. The primary purpose of these plants would be to return treated effluent to the watersheds in which the water was originally withdrawn. A secondary benefit of these plants would be to reduce average daily and peak flowrates in downstream conveyance facilities, thus postponing the need for capacity relief projects.

In December of 2009, work was completed on MMSD's *50-Year Master Plan Report.* This report included a comprehensive analysis of all District operations and facilities at the treatment plant and within the collection system in order to identify capacity and condition related projects over the next fifty years. The report also investigated a number of master planning alternatives in the near term (2010 to 2030) and long term (2030 to 2060) involving satellite treatment plants.

Near-Term Alternatives

Wastewater flows in the Sugar River watershed are currently pumped to the Nine Springs Treatment Plant (NSWTP) via Pumping Stations 17, 12 and 11 and approximately 3.6 mgd of treated effluent is returned to this watershed. In order to continue this mode of operation significant improvements will need to be made in the collection system prior to 2020, including capacity relief for portions of the Nine Springs Valley intercepting system and firm capacity improvements at all three of the aforementioned pumping stations. Constructing a satellite treatment plant in the Sugar River watershed would postpone the need for all of these projects, while at the same time helping to promote the concept of watershed balance.

The Master Planning Report identified a number of alternatives for conveying and treating flows in the Sugar River watershed and advanced the following two alternatives for further analysis:

1. Alternative 1: Westside Conveyance System Expansion. This alternative included capacity improvement projects in the NSVI and at Pumping Stations 11, 12 and 17 to continue centralized treatment at NSWTP. Four options under this alternative were included to allow for increased flowrates of highly treated effluent back to the Lower Badger Mill Creek (LBMC)/Sugar River watershed.

2. Alternative 2: Sugar River WWTP. Under this alternative a new high quality effluent treatment plant would be built in the Sugar River watershed to treat wastewater generated in the PS17 and PS12 service areas, with the effluent discharged to the Sugar River.

A life cycle cost analysis for each alternative was performed and each alternative was scored based on a set of ranking criteria that included factors such as cost, regulatory constraints, and environmental impacts. From this analysis it was determined that the District's current mode of operation of centralized treatment and return of 3.6 mgd of treated effluent to the LBMC was the most cost effective option of serving the Sugar River basin and produced the highest total score. However, the report also noted that this option does not allow for future increases in inter-basin water transfers in order to achieve watershed balance.

Despite the higher life cycle costs and lower score associated with Alternative 2, the report recommended further evaluation of this alternative in an effort to obtain a more detailed cost estimate for construction of a new plant relative to the cost of NSVI facility improvements. Prior to performing this evaluation the District contacted the Wisconsin Department of Natural Resources (WDNR) and requested that the Department calculate effluent limits for both the LBMC and the Sugar River. This was done in an effort to verify the cost estimate of the new treatment plant, which assumes that a high quality effluent will be produced.

In their response, the WDNR classified a portion of the LBMC and the Sugar River as cold water fisheries that will have stringent effluent limits. The limits proposed by the Department for chloride, and possibly phosphorus, cannot be met with conventional processes at a new Sugar River WWTP. Thus, the cost estimates for a new plant, as detailed in the Master Plan, appear to be accurate and there is no need to study this option further at this time. The District will continue to convey wastewater flows from the Sugar River basin through the NSVI system to the NSWTP, while preserving the option for increasing the return flow of treated effluent to the LBMC and the Sugar River basin from 3.6 mgd up to a maximum of 8.0 mgd.

Long-Term Alternatives

Long-term alternatives are described as those which will provide relief in the conveyance system and will aid in mitigating inter-basin water transfers, but cannot be implemented prior to the year 2030. The *50-Year Master Plan* evaluated costs for the following two alternatives in providing long-term effluent reuse options:

1. Alternative 1: Centralized High Quality Effluent Treatment and Distribution. Under this alternative facilities at the NSWTP would be constructed to produce a high quality effluent that would be suitable for reuse such as augmenting stream flow, infiltration, industrial reuse, or irrigation.

2. Alternative 2: Decentralized High Quality Effluent Treatment Facilities. This alternative would include the construction of a satellite treatment plant near Pumping Station 13 that would receive flows tributary to PS13 or both PS13 and PS14 and provide reuse options similar to those listed in Alternative 1.

Life cycle costs were evaluated for both alternatives for effluent return flows of 4 mgd and 10 mgd. Alternative 1 scored higher than Alternative 2 for both flowrate scenarios due primarily to lower life cycle costs, greater public acceptance, and more flexibility in effluent reuse options. From this analysis it would appear that construction of a satellite treatment plant near PS 13 is not a cost effective or viable option at this point in time.

Conclusions

The District's *50-Year Master Plan* investigated the construction of satellite treatment plants in the southwest and northeast areas of the collection system. Life cycle costs and other ranking criteria such as regulatory constraints and public acceptance do not support the construction of these satellite plants at this time. In general, the most cost effective means of conveying, treating, and returning wastewater to its original basin is through centralized treatment at NSWTP.

Satellite treatment plants may become more viable as groundwater supplies become scarce, advanced treatment processes improve, and as the demand for a high quality effluent increases. While the District will continue to support and promote projects that mitigate inter-basin transfers of water and use treated effluent as a resource, where appropriate, the construction of satellite treatment plants will not be considered a viable alternative during the planning horizon for this facilities plan.

Inter-Station Diversions

In addition to the PS15 forcemain diversion, discussed earlier in this chapter, MMSD's collection system includes several inter-station connections that can allow a limited amount of flow diversion between specific stations. These diversions were not typically designed as such, but were generally by-products inherited from ongoing growth and expansion of the collection system into new station basins. Still, the availability of these diversions has been very beneficial for MMSD, and has been crucial in allowing MMSD the flexibility to take some major stations or forcemains out of service during emergency repairs or for major planned maintenance events.

Existing and potential MMSD inter-station diversion capabilities include the following:

Existing Diversions

- CTFM Diversion between PS1 and PS2
- PS15 forcemain diversion to PS16 or to PS8
- Gravity diversion of PS2 to PS8 via Southwest Interceptor
- Gravity diversion of PS8 to PS2 via Southwest Interceptor
- Gravity diversion of PS15 to PS5 via original West Interceptor
- Gravity diversion of PS16 to PS5 via West Interceptor Gammon Extension

Potential Diversion Projects

- Potential forcemain link between PS4 and PS8
- Potential for gravity diversion of PS13 to PS 1 via City of Madison Sanitorium Sewer and MMSD North Basin Interceptor.
- Potential for a gravity (or pressurized) link between PS6 and PS10
- Potential for a gravity link between PS7 and PS18

The inter-station diversions are detailed in Appendix A3, *Connector Lines Between Stations*, June 1999 (updated April 2010). In reviewing the list of inter-station diversions, it becomes apparent that all of the existing diversions are located in the western or central portions of the collection system. Other than the diversion capabilities of the Crosstown Forcemain, there is little to no redundancy or flexibility in the east side collection system. Three potential projects to improve this situation have been proposed in the memorandum in Appendix A3 and are briefly summarized in this chapter.

Diversion from PS13 to PS1

Prior to the construction of PS13 in 1970, flows in the PS13 service area were conveyed to PS1. With the extension of MMSD's Northeast interceptor to the Villages of DeForest and Waunakee in the early 1970's and capacity concerns in the PS1 service area, the City of Madison constructed the Truax Interceptor in 1971 to divert flows to PS13. With the rehabilitation of PS1 and PS2 in 2005, there is now ample capacity at these stations to convey a portion of the flow from the PS13 service area and much of the interceptor infrastructure in Packers Avenue and Pennsylvania Avenue exists to convey it. Approximately 2,700 feet of new sewer along the Packers Avenue frontage road and Commercial Avenue would need to be built to complete the diversion route to PS1. It is estimated that 1.2 mgd of average daily flow and 3.1 mgd of peak hourly flow could be diverted away from PS13 for 2030 TAZ flows.

Besides providing redundancy in the collection system, the PS13 diversion offers additional benefits by postponing the need for firm capacity improvements at the pumping station and for capacity relief in the Northeast Interceptor (Truax Extension) downstream of PS13. It is likely that a rehabilitation of PS13 will occur prior to 2030 to replace outdated equipment. Thus, the diversion of flow from PS13 will not, by itself, alleviate the need for significant work at PS13. This diversion should be considered, however, as an alternative to providing capacity relief of the Northeast Interceptor (Truax Extension) in the near term.

Diversion between PS6 and PS10

Pumping Station 10 handled the third largest average daily flow of the District's 17 pumping stations in 2010, yet there are few, if any, reasonable options for diverting this flow if PS10 or its forcemain becomes disabled. An overflow structure upstream of PS10 that discharged to Starkweather Creek was removed in 2009 as part of the replacement of the Northeast Interceptor. Due to the similarity of the wet well elevations of PS6 and PS10, it is possible to construct a gravity connector line between these stations. This gravity sewer line would be approximately 6,300 feet in length and could divert flows between the stations in the event of an emergency at either station.

It is estimated that approximately 5.6 mgd could be diverted in a 48" connector from PS6 to PS10 in an emergency, which is slightly less than the 2030 peak hourly flow for PS6 of 6.37 mgd. The estimated diversion capacity from PS10 to PS 6 is 25.9 mgd, which is less than the 2030 peak hourly flow for PS10 of 35.26 mgd, but well above the 2030 average daily flow of 13.3 mgd. Thus, while this connector line would not be able to fully convey peak flows from either station, it would have ample capacity to divert average daily flows from either station as well as a substantial portion of the peak flows.

Diversion between PS7 and PS18

Similar to PS10, PS7 is a high flow station with no available redundancy at this time. The average daily flow at PS7 in 2010 was 16.8 mgd, or approximately 39% of the total flow received at the Nine Springs Wastewater Treatment Plant. As such, it is deemed critical that the District reduce its reliance on this critical station to convey flows from the east side of the collection system. The District will begin preliminary planning in 2011 to construct a new PS18 approximately 6,300 feet to the southeast of PS7. Additional details regarding this diversion can be found in Appendix A9.

Lower Badger Mill Creek Interceptor

The Lower Badger Mill Creek (LBMC) watershed is located on the far westerly edge of the District's service area and extends roughly from PS17 in the City of Verona northerly to Old Sauk Road. Each of the four municipal entities comprising this watershed (Town of Middleton, Town of Verona, City of Madison, and City of Verona) have different development plans and thus needs for public sanitary sewerage service. In response to these needs, a sewer service report was prepared by the District in December 2004 that outlined various development scenarios and service options for this rapidly developing watershed. A copy of this report can be found in Appendix A6.

One of the recommendations presented in this report was that the District should work cooperatively with the City of Verona and City of Madison to design a new interceptor such that capacity exists to serve all lands within the watershed. To that end, the District entered into a Memorandum of Understanding with the City of Verona in 2006 for the first phase of the interceptor's construction from PS17 to Edwards Street (see Appendix A6 for copy of MOU). This interceptor segment was completed in 2006, at which time the District assumed ownership responsibilities.

The District also entered into an agreement with the City of Madison in 2008 for service to lands in the LBMC watershed that are located north of Midtown Road (see Appendix A6 for copy of agreement). This portion of the LBMC interceptor is to be owned and maintained by the City of Madison, with the provision that the District shall assume ownership responsibilities if lands in the Town of Middleton require future service. In 2010 the City constructed a pumping station at Midtown Road, approximately 1,000 feet to the west of the Hawks Landing development, to convey flows from this future interceptor to the District's NSVI-Midtown Extension sewer. A portion of this interceptor is scheduled for construction in 2011.

In 2008 the District extended the LBMC interceptor from Edwards Street in the City of Verona to Cross Country Road. The District is planning to construct the remaining portion of the LBMC interceptor from Cross County Road to Midtown Road as required by development needs in the basin. It is expected that this stretch of interceptor will be installed between 2015 and 2020. Upon completion of the LBMC Interceptor to Midtown Road, the City of Madison's Midtown Road Pumping Station will no longer be required.

East Verona Interceptor

The City of Verona has a need to reinforce a portion of its East Side Interceptor in the near term. This interceptor runs generally parallel to the Lower Badger Mill Creek

(LBMC) from PS17 to the Military Ridge Recreational Trail. The City intends to perform flow monitoring in this interceptor in 2010 or 2011. The schedule for capacity relief will depend on the results of this flow monitoring as well as the pace of new development in the sewer basin.

The District's PS17 forcemain travels through the same corridor as the City's East Side Interceptor. This forcemain is expected to reach capacity prior to 2020. Since a new Sugar River Treatment Plant will not be built in this watershed in the foreseeable future, capacity relief for the forcemain will need to be provided within the next ten years. This project should be coordinated with the City's interceptor project to the extent possible.

It is also possible that an extension of the District's LBMC Effluent Return pipeline could be located in this corridor in the future. Currently the District discharges approximately 3.6 mgd of treated effluent into the LBMC at the current outfall located south of USH 151 and east of CTH PB. It is likely that effluent return flowrates in excess of 3.6 mgd will need to bypass the LBMC and be returned further downstream to the Sugar River. A pipeline to convey this excess flow would likely follow the same general alignment as the City of Verona's East Side Interceptor and the District's PS17 relief forcemain.

Headworks Flow Equalization

The District's Headworks Facility at the Nine Springs Wastewater Treatment Plant currently receives raw wastewater flow from PS2, PS3, PS4, PS7, PS8, and PS11. If each of these stations were pumping at maximum capacity, the resulting peak flow would be approximately 150 mgd. Flows of this magnitude are at the upper limits of the plant's hydraulic capacity. The forcemain from PS18 will introduce another direct flow source to the Headworks Facility which may cause the plant's hydraulic capacity to be exceeded during large storm events if all of the stations are pumping at maximum capacity for extended periods of time.

For this reason the District should consider the construction of an equalization basin to temporarily store excess incoming flows during these large events. In order to properly analyze the need for such a system and to size it properly, it is recommended that the design of this project begin shortly after the design for the PS18 improvements are completed. An updated analysis of the plant's hydraulic capacity should be included as part of the Headworks Flow Equalization project.

Chapter 7
Collection System Maintenance

Chapter Outline

This chapter is organized into the following sections:

- Introduction
- General Discussion
- Pumping Station Maintenance
- Maintenance of Sewers and Force Mains
- Summary

Introduction

This chapter summarizes the practices used by MMSD to maintain its collection system of pumping stations, intercepting sewers, and force mains. The 17 regional pumping stations, 96 miles of intercepting sewers, and 29 miles of raw wastewater force-main sewers represent a significant investment by MMSD. The collection system is also an important part of the public-works infrastructure for the metropolitan area and is vital to protecting public health and the environment. To maintain such assets in good operating condition over a relatively long life requires a strong maintenance program and good maintenance practices.

General Discussion

MMSD has a long history of reliably maintaining its pumping stations and sewer systems. Although past maintenance practices kept MMSD's systems reasonably reliable, improvements in technology, better (modernized) maintenance methods, and better construction materials have allowed MMSD to improve on its maintenance practices over the years. MMSD's current maintenance practices are becoming more program-driven than in the past. Program driven maintenance (PDM) focuses labor resources on planned, preventive, and predictive activities to help reduce reactive maintenance to a small fraction of the maintenance performed. In addition, program driven maintenance relies on reliability centered maintenance practices to focus attention on those areas that are the highest priorities for sustaining a reliable system. A computer maintenance management system helps synchronize maintenance planning with inventory and tracks maintenance costs. Modern test equipment allows impending failures to be predicted with greater accuracy. Predictive testing permits repair or replacement of the failing parts to be proactively scheduled versus reacting when equipment fails. The proper balance of proactive and reactive work minimizes costs.

Pumping Station Maintenance

Overview

The purpose of MMSD's seventeen pumping stations is to receive incoming raw wastewater and pump it to another pumping station or to the Nine Springs Wastewater Treatment Plant. The stations operate continuously, 24 hours a day, seven days a week. The pumping units within the stations run as necessary to prevent sewer backups or overflows. To operate efficiently and effectively, the mechanical and electrical equipment must remain in good working condition, and the building structure must be kept sound and leak-proof. Additionally, the building and grounds should remain well maintained and aesthetically pleasing.

Mechanical Systems

The mechanical equipment in MMSD's pumping stations includes raw wastewater pumps, sump pumps, heating-ventilating and air-conditioning equipment, air compressors, valves, piping, gates, surge mitigating equipment, and solids handling equipment. This equipment is maintained by the Mechanical Maintenance Section. Each station is routinely visited at least once per week and inspected for proper operation. Additionally, each station is monitored via a radio telemetry system that provides information to computer screens on the process control system at the Nine Springs Wastewater Treatment Plant. Data displayed include pumping patterns, an indication of the pumps in service, the status of the electrical services, and in some cases, flow data. The telemetry system also signals the operator at the Nine Springs Wastewater Treatment Plant of any alarm conditions that occur. The operator will forward any alarm conditions to either the Mechanical or Electrical Maintenance Sections based upon the type of alarm received. If necessary a mechanic or electrician will be dispatched to the site.

During the routine site visit by the mechanic, the mechanic will look for any problems that need correction. If a problem cannot be corrected immediately, the mechanic will note the problem for follow-up work. A work order will be generated at the plant and planned and assigned for a later date. Other work orders are automatically generated for preventive and predictive maintenance of pumping station equipment. Lubrication of bearings and checking a pumping system for vibration or proper alignment are examples of preventive and predictive maintenance.

The most critical mechanical equipment at a pumping station is the raw wastewater pumping system. Therefore, it is very important that the pumps and ancillary equipment (valves, piping, surge arrestors, etc.) be well maintained to insure proper operation when needed. As part of the routine site visit, the mechanics visually inspect the pumps, listen for unusual sounds that may indicate wear or misalignment, feel the pumps to sense excess vibration or high temperature, check for plugged vent lines, and ensure that sump pumps are working properly. At recently rehabbed pumping stations, the raw wastewater pumping systems have been equipped with vibration sensors, and bearing and motor winding temperature sensors to continually monitor the pumps and the corresponding motors. During site visits, mechanics will also tighten packing on those pumps not using mechanical seals and will read any suction or discharge pressure gages as these could help identify problems with a pump.

Predictive and preventive pump maintenance that takes more time than is allowed during a routine site visit will be scheduled via periodic work orders. This maintenance includes checking pump/motor alignment, vibration testing of some of the larger pumps, exercising gates and valves, cleaning float tubes, testing backflow preventers, checking the HVAC systems, inspecting cranes, and preparing the stations for winter and summer operation. When major corrective action is necessary, the mechanics will remove a pump from service and transport it to MMSD's maintenance facilities. MMSD's maintenance facilities are equipped with full rebuild capabilities for pump repair.

Valves and gates play an integral role in keeping the pumping station operational. Pumping stations typical contain numerous types of valves and gates intended to divert and control the wastewater within the pumping station. Check valves allow water flow in only one direction, preventing an operating pump from pumping backwards though idle pumps and preventing the force main from draining back into the wetwell. Isolation valves on both the pump suction and discharge allow maintenance to be performed on a pump while other pumps remain in-service. If equipped, force main valves isolate the entire pumping station from the force-main, allowing work on any part of the piping system within the station.. Ball valves and sometimes gate valves are used for surge mitigation on start up and primarily on shut down of pumps. Gates are generally used to control the flow from the collection system into the pumping station wetwells or to isolate half of the wetwell. This is typically done for maintenance purposes, wetwell cleaning, and in some cases, for operational purposes.

The last paragraph discussed the importance of valves and gates within the pumping system and logically it follows that these are good reasons why valves and gates should be kept in good working condition. The best way to keep valves and gates maintained is to exercise them periodically. Oftentimes, valves and gates that are relied upon for isolation or operational procedures do not work when called upon, simply because they have not been operated for a significant amount of time. That being said, it is often difficult to operate some valves or gates without disrupting normal operation of the pumping station and/or because the valves or gates are difficult to close or open. Some valves or gates may require manual operation and take hundreds of turns to open. Therefore, the District has begun to include motorized operators on its valves and gates whenever possible, and where motorized operators are not installed, has attempted to come up with easier ways to operate them, e.g., using an electric drill with a socket to drive the operator rather than manually driving it. Eventually, it is hoped that all of the valves and gates will become part of a routine exercise program that periodically verifies proper operation.

Since the 2002 facilities plan, the District has made systematic changes in its' approach to solids handling at the pumping stations. With the Tenth Addition to the Plant, all screenings are now dealt with at the Nine Springs Wastewater Treatment Plant versus the pumping stations. The impacts of this change in operation are discussed in more detail in Chapter 3. In general, the change has shifted labor at the pumping stations from manual removal of screenings and maintenance of screening equipment to monitoring of pump performance and cleaning of pumps. Both of these maintenance activities are the result of a higher frequency of pump plugging. The only remaining piece of solids handling equipment within the District's collection system is a grinder at Pumping Station 17. This grinder remains in place because of concerns related to the large solids that Pumping Station 17 can potentially receive from the county mental hospital located within its service area. Typical mechanical problems with grinders include occasional jamming and periodic overhaul of the grinder mechanisms due to the maintenance intensive process of grinding non-organic (rocks, sand, etc.) solids.

Air compressors are installed in some of the pumping stations to provide air for level sensing instrumentation or for surge mitigation systems. For the level sensing systems, a small amount of air is bled into the wetwell via a pipe or plastic tube. The backpressure is measured and calibrated to correspond to the wastewater level in the wetwell. These air compressors use very little air, but because they are critical to sensing the proper level, it is very important to keep them well maintained. The surge mitigating systems use a great deal more air. These systems inject air into a storage vessel connected to the outgoing force main. The air stored in this vessel acts as a cushion or buffer for when the pumping units start or shut off. The air in the vessel compresses or expands, helping dissipate surge energy in the force main. It is also very important to keep the air compressors attached to these systems well maintained. At the present time, only Pumping Station 7 has a surge mitigating system of this type.

Other surge mitigating equipment includes surge arrestors that are a type of pressure release valve. Typically, these valves will open on high pressure (e.g., a pressure wave from a water hammer transient wave) releasing some wastewater, and consequently dissipating the high pressure, back into the wetwell. The amount of wastewater released in such an event is generally minimal. Since these surge mitigating devices protect the force main and the pumping station header, it is important that they remain in good working condition. In addition, another reason to keep them well maintained is that they could potentially stick in the open position and continue to release wastewater into the wetwell, causing excessive pump operation and possibly flooding the wetwell. Some of the force mains also include air release/vacuum intake valves, which provide another method of surge mitigation. Although not located within the pumping station, they can protect the pumping station's piping from excessive positive or negative pressures by releasing extreme pressures to the atmosphere, generally at the force main's high points. These are discussed in greater detail later in this chapter.

Ventilation and the air handling systems also provide an important function at MMSD pumping stations. Many of the older stations have little or no forced ventilation. This can lead to poor air quality within the stations, including foul and corrosive air in the dry well area. This, in turn, can lead to corrosion of sensitive electrical equipment, an unhealthy air quality, and rusting of the piping and equipment within the drywell.

To combat this, new regulations require air-handling systems that provide adequate amounts of fresh air to prevent the buildup of corrosive and/or toxic gases. All new or rehabilitated MMSD pumping stations are equipped with heating, ventilating and air conditioning (HVAC) equipment to meet these requirements. This provides a better environment for the pumping station equipment and a safer environment for personnel during site visits.

HVAC systems are maintained by the Mechanical and Electrical Maintenance Sections of the District, each taking care of their respective areas of the systems and equipment. Older controls are often manual while newer controls are typically integrated into the station's control system and may be monitored or operated from the system's station control center, e.g., a graphic display (operator interface terminal).

Electrical, Controls, and Instrumentation

The electrical equipment in MMSD's pumping stations includes power entrance, transfer, and distribution equipment, motors and motor controls, pump and auxiliary control systems, instrumentation (including telemetry equipment), and lighting systems. MMSD's electrical systems are maintained by the Electrical Maintenance Section with significant support from the Electrical Engineering Group. The District's electrical staff responds to problems in a manner similar to the mechanical staff. When an alarm signals the operator of a problem at one of the pumping stations, it is determined who will respond and either an electrician or mechanic will be dispatched to the site. However, the vast majority of electrical work at the pumping stations is either planned maintenance, preemptive replacement of equipment, or new equipment installation.

The electrical staff does extensive preventive and predictive maintenance of the electrical equipment at the pumping stations. This work includes cleaning of electrical cabinets, inspection of electrical contacts, tightening of electrical terminations, thermal sensing of electrical equipment while in operation, cycling of equipment to determine proper operation (for example – power system auto transfer schemes), verification of proper signaling for alarms and other instrumentation, and verification of proper control operation for all control systems. In addition, roughly every three years an electrical testing firm is hired to test power system relays, circuit breakers, and oil testing of oil filled switches and transformers. The Electrical Engineering Group prepares specifications and provides project management services for the electrical maintenance testing process with field support provided by the Electrical Maintenance Section. Proper operation of the power systems, motors, motor controls, and pumping system controls at the pumping stations is critical.

MMSD's pumping stations typically have two redundant utility power services. The two exceptions include Pumping Stations 3 and 17. However, Pumping Station 17 does have a backup generator on-site to provide redundant power. Each redundant service or the backup generator, as in the case of PS 17, will automatically connect to provide power in the event of a normal power outage. Since the pumping stations operate continuously, it is important that these automatic transfer systems are well maintained and function properly when required. To insure this, the transfer schemes are inspected and tested at least semi-annually and the generator at Pumping Station 17 is tested monthly by the mechanics. The mechanics start the generator manually and verify that it is providing power to the station. The generator runs for two hours and then automatically shuts off and the station is switched back to utility power. The Metrogro mechanics perform an annual inspection of the generator, which includes an oil change. If the generator would run more than normal, another oil change would be scheduled at other times during the year as needed. The Metrogro mechanics are familiar with large diesel engines and therefore, familiar with the engine that drives the generator at Pumping Station 17 as well as the portable generators that the District owns.

The motor control systems, starters, and or adjustable frequency drives (AFDs), especially for the wastewater pumps, are routinely inspected for bad components, loose connections, and worn contacts. Components in poor condition are repaired or replaced prior to failure. Although it is sometimes difficult to assess the condition of solid-state equipment such as solid-state starters and adjustable speed drives, these enclosures are also cleaned and the equipment inspected for signs of overheating or other damage. The equipment is checked for proper operation prior to returning it to service.

Most of the control systems, such as the pump control system, are now controlled via programmable logic controllers or another programmable device. Since these generally either work or they do not work, it is important to have a backup control system or backup plan in the event of equipment failure. It is generally difficult to predict when this type of equipment will fail. Although older control systems have more individual components, it is generally not any easier to predict failures. After proper operation of the control and alarm systems is initially verified, keeping the instrumentation components calibrated and working well, and testing alarm functionality periodically is probably as much as can be done. The periodic testing of alarms should include testing of the telemetry system to verify that all alarms show up properly on the operator's screen at the plant.

The lighting systems, although important from the standpoint of allowing maintenance personnel to see what they are working on, probably receive less attention than most of the other systems, simply because they require little maintenance and they play a supporting role versus a critical role to the mission of the pumping station. Burnt out lamps are generally replaced by the Building and Grounds Crew. If there is something wrong with the fixture, e.g., bad ballast, a work order is generated for the electricians to take corrective action.

Buildings and Grounds

The pumping station structure, building exterior, roof, and site maintenance are taken care of by MMSD's Building and Grounds Crew.

The Building and Grounds Crew annually inspects each pumping station's roof and exterior for structural damage and leaks. Any leaks or damages that are reparable by the crew are fixed, while those that are not are either contracted for repair or budgeted for repair during the next year. Leaks or damage that require immediate attention are repaired while those that can wait are budgeted for.

The interiors of wetwells and drywells typically require little maintenance. However, occasional repairs to damaged concrete are required. If these are not too extensive, the Buildings and Grounds Crew may make these small structural repairs. If extensive rehabilitation is required, it is generally dealt with as a contracted service managed by the Engineering Department. Painting of piping, equipment, and sometimes walls, is done as necessary, usually on a rotating basis, and may be done internally or contracted out depending upon the size of the project and the pending workload. A good fresh coat of paint adds significantly to the neat and tidy appearance of the pumping station.

The Building and Grounds Crew keeps the pumping stations aesthetically pleasing externally and internally. Trash within the building is removed and floors swept and cleaned periodically. The lawn and landscaping are well cared for. MMSD's pumping station sites are often located near neighborhoods or parks, and it is important that the site be kept clean, well landscaped, and well groomed. A good appearance is less likely to bring negative attention to the pumping station. A good internal appearance also provides for a better working environment for the mechanics and electricians.

To minimize the build up of grease and solids in Pumping Station wetwells, some stations have an automatic well cleaning sequence programmed into the station control system. This sequence runs during the nighttime hours and results in the station pumps lowering the well level to a lower than normal level. The pumping station's pumps then pump most of the floating and settled material from the well under these conditions. Unfortunately, some wetwells are more susceptible to solids and grease build-up than others and therefore need more cleaning than can be provided using the pumping systems. To deal with this issue, the Buildings and Grounds Crew periodically hires the City of Madison to provide a vactor truck to assist in cleaning these wetwells. Typical solids include grease, rags, and other non-organic materials. The method of removal is to high-pressure spray the wells while pumping the wash water into the vactor truck.

Maintenance of Intercepting Sewers and Force Mains

MMSD's wastewater collection system currently includes 96 miles of gravity intercepting sewers, 29 miles of raw wastewater force mains, and 1,551 manholes. These pipelines and manholes are responsible for collecting and transmitting the wastewater from the various communities to and between MMSD's 17 pumping stations, and ultimately to the Nine Springs Wastewater Treatment Plant. MMSD staff follows a written interceptor maintenance guideline that has been used and revised since 1992. This section presents a summary of MMSD's *Interceptor Maintenance Program Guidelines* (latest (3rd) revision – Nov. 2009), which is included as Appendix A4. The interceptor maintenance program defines seven areas that are each addressed with a separate plan. The seven areas and their separate plans are summarized in turn:

Interceptor Evaluations

MMSD has developed a formalized interceptor evaluation program that keeps staff members informed about the physical condition and hydraulic adequacy of its individual gravity interceptors, and allows informed decisions regarding the need for rehabilitation or replacement projects. The program includes televising, cleaning, manhole inspection, flow documentation, and various other work. Interceptor evaluations are performed on roughly 10% of MMSD's gravity sewers each year. The program includes systematic recordkeeping and organization of the work. The program has been successful in identifying system needs prior to their becoming emergencies, and has allowed MMSD to more efficiently plan, budget and carry out the necessary repairs and rehabilitation projects

As noted above, approximately 10%, or nine miles, of MMSD interceptors are evaluated each year. During this process, the interceptors are cleaned (e.g., grit and roots are removed) and televised. Following televising of the interceptors, MMSD receives video documentation of the televising. MMSD personnel then view the results in detail and enter any defects noted into a database. The database assigns a score to the interceptor based on the condition observed during the televising results. The scores are used to rank the overall condition of the interceptor and prioritize the need for any repairs. As interceptors are re-inspected every 10 years or so, new scores will be assigned and condition of the interceptor can be compared to the previous inspection.

Force Main Isolation Valve Exercising

Eighteen exterior isolation valves presently exist on MMSD's force main sewers (an up-to-date listing of the actual number and status of these valves is maintained in MMSD's *Interceptor Maintenance Program Guidelines* – the most recent version is included in Appendix A4). Some of these valves are located immediately outside of pumping stations and were designed to limit possible pumproom flooding in the event of a burst header inside the pumping station. Several others were added at specific forcemain junction points to allow diversion of flow as part of a construction project. Most of MMSD's older isolation valves are double-disc gate valves. Newer valves are resilient-wedge gate valves or plug valves. Since the seating area can become filled with grit and solids that can prevent full seating of any type of valve, each valve is regularly exercised and inspected by MMSD twice per year. Valve exercising verifies that the valve is operational and in working order, but does not automatically verify that the valve is fully sealing off the flow. Some valves may leak even though their valve stem exercises freely to closure, and may require additional rehab work when needed. The valve exercising program is intended to maintain the valves in good working condition and to help insure, but not guarantee, that the valves will work and seal properly when they are needed.

Air Valve Inspection and Maintenance

There are twenty-eight air release valve installations on MMSD's raw wastewater forcemains (an up-to-date listing of the actual number and status of these valves is maintained in MMSD's *Interceptor Maintenance Program Guidelines* – the most recent version is included in Appendix A4). Most of MMSD's air valves are "combination" valves, i.e. they perform both a vacuum breaking function and an air release function. The vacuum breaking function admits air into the forcemain during low pressure conditions (such as during pump shutdowns), thus preventing possible vapor cavity formation & water column separations which could lead to waterhammer failures. The air release function prevents air pockets from accumulating and potentially restricting the flow at forcemain high points. To ensure that each valve remains in working order, each air valve is inspected and cleaned twice each year, or more frequently when the valves are prone to plugging. If possible the valves are cleaned and repaired in the field. In most cases, the valve must be removed and returned to the shop where it can be inspected and cleaned prior to reinstallation at the site.

Siphon Cleaning

Eleven active inverted siphons currently exist in MMSD's collection system (an up-to-date listing of the actual number and status of the siphons is maintained in MMSD's *Interceptor Maintenance Program Guidelines* – the most recent version is included in Appendix A4). The purpose of a siphon is to carry the wastewater flow beneath an obstacle (such as a streambed or a major utility line) that would otherwise block the interceptor's gravity profile. Unfortunately, a siphon typically carries a lower velocity (since it always flows full) and thus creates greater potential for solids deposition. Newer siphons with multiple barrels are designed to minimize the potential for solids deposition. MMSD began contracting out the regular annual cleaning of its siphons in 1998. Prior to 1998, siphons were cleaned only if specific problems occurred. Annual contracted siphon cleaning helps to catch any problems before they become serious. The contractor's cleaning operations are closely observed, and the adjacent siphon manholes are visually inspected at the time of cleaning to determine if any additional work is needed.

Stoplog & Gate Structures

There are eight stoplog and gate structures on MMSD interceptors (an up-to-date listing of the actual number and status of these structures is maintained in MMSD's *Interceptor Maintenance Program Guidelines* – the most recent version is included in Appendix A4). Some of these structures were constructed at junction points between adjacent interceptor projects. Others were originally constructed as flushing manholes (no longer used) for the purpose of periodic flushing of the interceptor with adjacent surface water. To ensure that the stoplog and flapgate structures remain in good repair, MMSD inspects each structure annually and provides any stoplog or gate replacements or repairs that are needed.

Special Projects, Events, and Repairs

In addition to the regular planned maintenance activities, there are numerous specific projects, repairs and events that occur every year in the operation and maintenance of interceptors and force mains. Examples include high flow events, emergency repairs, connection inspections, odor complaints, backup events, I/I work, specific manhole repairs, surface route inspections, and other events. These specific events are an important aspect of the interceptor maintenance program. Therefore, specific records of these events are kept for future decisions and management of the MMSD program.

Program Coordination and Management

Coordination and management of the interceptor maintenance program includes numerous functions needed to make the program successful. Examples include the following:

- Preparing annual program budget and tracking it during the year
- Tracking of work performed and work outstanding
- Updating interceptor GIS database and maps
- Managing inventory
- Managing contractors
- Managing Diggers' Hotline membership and locating services
- Organization of emergency preparedness
- Screening outside projects via UTILITY log.
- Organizing cross-training activities
- Recommending periodic improvements to the program

The interceptor and forcemain maintenance program is carried out as a joint effort of MMSD's Operations and Maintenance Department, MMSD's Engineering Department, and outside contractors. MMSD's Collection System Supervisor currently handles oversight of the entire program. MMSD's Monitoring Services/Sewer Maintenance Crew carries out most of the field activities, including inspection and maintenance of valves and stop logs, manhole repairs, and response to odor or backup complaints. Locates and field marking are handled as a contracted service, presently provided by United States Infrastructure Corporation (USIC). Televising and cleaning work is annually bid and contracted. MMSD's Engineering Department provides engineering and assistance for major projects and special events, and maintains system maps and the Geographical Information System (GIS). Major repairs, excavation, heavy construction and specialty services are contracted out to private construction firms.

Summary

MMSD's collection system represents a significant investment and an important asset for the protection of public health and the environment. To preserve that investment requires a diligent and thorough maintenance program. MMSD uses a program driven approach to maintenance intended to reduce the number of emergency maintenance events. All components of MMSD's collection system are inspected and maintained to insure that proper operation of MMSD's system continues. Components that are found in poor condition are repaired or replaced prior to failure. Detailed records of maintenance, high flow events, and failures are kept for future reference and decision-making. MMSD's program will not prevent all failures; however, a sound maintenance program has and will continue to maximize the life and usefulness of MMSD's collection system components.

Chapter 8
Addressing I/I Issues and High Flows

Chapter Outline

This chapter is organized into the following sections:

- Introduction
- Background
- Estimation of Infiltration Volume
- Conveyance Costs
- Effect of Climate Change
- Peaking Factors
- I/I Mitigation Strategies

Introduction

The inflow and infiltration (I/I) of clear water into the sanitary sewer collection system is a concern for several reasons. It can result in environmental damage through sanitary sewer overflows, damage the property of system users, and lead to increased costs for conveyance and treatment. This chapter will evaluate the impact of I/I on the District's collection system, examine how the collection system is designed to accommodate these flows, what factors contribute to increased levels of I/I, and what measures can be undertaken to mitigate the impact of I/I.

Background

All sanitary sewer collection systems infiltrate clear water to some degree. Properly designed sewers employ the use of a peaking factor to account for these extraneous flows. Since 1961 MMSD has used the "Madison Design Curve" as a guide in determining the appropriate peaking factor for its wastewater conveyance facilities (see Chapter 4). In general the District's use of this peaking factor in design has proven adequate for conveying wet weather flows over the past 50 years.

MMSD's collection system has experienced a number of high flow events in the last twenty years. Several of these events have resulted in peak flows greater than those predicted by the Madison Design Curve. As such, it is reasonable to question if the Madison Design Curve is an adequate design standard for future conveyance projects.

Estimation of I/I Volume

Attempting to quantify the amount of I/I in a collection system is challenging. The term infiltration is generally used to account for clear water that enters the collection system directly from groundwater through cracks and joints in the piping network. Since this type of flow is relatively constant over time, it is easier to estimate than inflow through flow metering and pump records. Inflow generally describes storm water that directly flows into the sewer system through defects in manhole covers and cross-connections with storm water conveyance facilities (i.e. residential roof drains, sump pumps, municipal storm sewers, etc.). Inflow volumes and rates are responsive to a number of rainfall characteristics such as amount, intensity and duration and thus are difficult to quantify.

Table 8.1 includes an estimate of total daily infiltration volumes for Year 2010 in the District's collection system by pump station service area. These volumes were derived by CARPC in their C*ollection System Evaluation (2009)* by subtracting estimated dry weather wastewater flows from MMSD's metered flow data and pumping records.

Table 8.1 also includes an estimate of infiltration volumes directly into MMSD's interceptor sewers based on television inspection results. MMSD maintains a database that estimates infiltration rates in each segment of MMSD sewer based on closed circuit television inspection and/or industry standards. Infiltration of clear water into District sewers accounts for approximately 29% of the total infiltration that is conveyed to the treatment plant. The remaining 71% of the total infiltration is attributable to the conveyance systems of the District's satellite communities. A schematic of the total daily infiltration rates throughout the District's collection system is presented in Figure 8.1.

Infiltration per unit length of MMSD's interceptor sewers are also calculated for 2010 for each pump station service area in Table 8.1. The results show that the service areas for PS1, PS15, PS16, and PS17 are relatively tight systems. In the cases of PS15, PS16, and PS17 this is most easily explained by the fact that these service areas have been developed more recently and employ the use of better construction materials. PS1 had historically been a very problematic area with regard to infiltration and inflow. However, the 2002 replacement of the North Basin Interceptor has reduced infiltration dramatically in this basin.

Infiltration into MMSD's Rimrock Interceptor upstream of PS3 is estimated to be moderate, although the overall infiltration rate in the PS3 basin is significant. More investigation of I/I in this basin is recommended (see Appendix 5 for further details).

Service areas that exhibited high infiltration rates per unit length of interceptor in 2010 include those for PS6, PS9, PS12, PS13, and PS14. The PS6 basin is unique in that the length of MMSD interceptors is small relative to the overall service area since a significant portion of the flow is conveyed to PS6 through City of Madison interceptors. The City of Madison plans to perform a study of its conveyance facilities in a portion of the PS6 service area in 2011.

Table 8.1
MMSD Infiltration by Pumping Station Basin (2010)
Madison Metropolitan Sewerage District

Pump Station Basin	Estimate of Total Infiltration by Pump Station Basin[1] (gpd)	MMSD Infiltration by Pump Station Basin[2] (gpd)	MMSD Infiltration as Percentage of Total Infiltration (%)	Total MMSD Interceptor Mileage in Service Area (miles)	MMSD Infiltration per Unit Length of Interceptor (gpd/mile)
1[3]	480,000	505	0%	1.71	296
2	270,048	44,255	16%	2.73	16,202
3	84,000	5,309	6%	0.72	7,377
4	81,000	12,055	15%	1.55	7,789
5	204,450	44,655	22%	3.00	14,880
6	140,000	67,414	48%	1.91	35,312
7	360,000	218,130	61%	19.76	11,040
8	640,000	322,715	50%	14.64	22,042
9	136,000	16,735	12%	0.63	26,487
10	206,000	75,645	37%	6.59	11,481
11	525,000	225,956	43%	10.04	22,504
12[4]	535,000	238,075	45%	7.86	30,304
13	990,000	76,040	8%	2.96	25,656
14	1,170,000	411,255	35%	15.84	25,958
15	130,000	6,804	5%	1.97	3,447
16	177,000	6,617	4%	1.63	4,060
17	31,000	0	0%	2.52	0
TOTAL	6,159,498	1,772,165	29%	96.06	18,448

(1). Source: CARPC's *MMSD Collection System Evaluation (January 2009).* Includes all infiltration into sewers owned by MMSD and satellite communities in Year 2000.

(2). Includes only infiltration into MMSD sewers. MMSD infiltration derived from inspection records and/or industry standards. Values reflect Year 2010 conditions.

(3). PS1 infiltration based on CARPC's Year 2030 estimate to reflect MMSD's North Basin Interceptor Replacement in 2005.

(4). CARPC's estimate for infiltration in PS 12 basin is 208,000 gallons. Estimated infiltration in this basin was revised upwards based on 2009-2010 flow metering data and MMSD infiltration calculations for this basin.

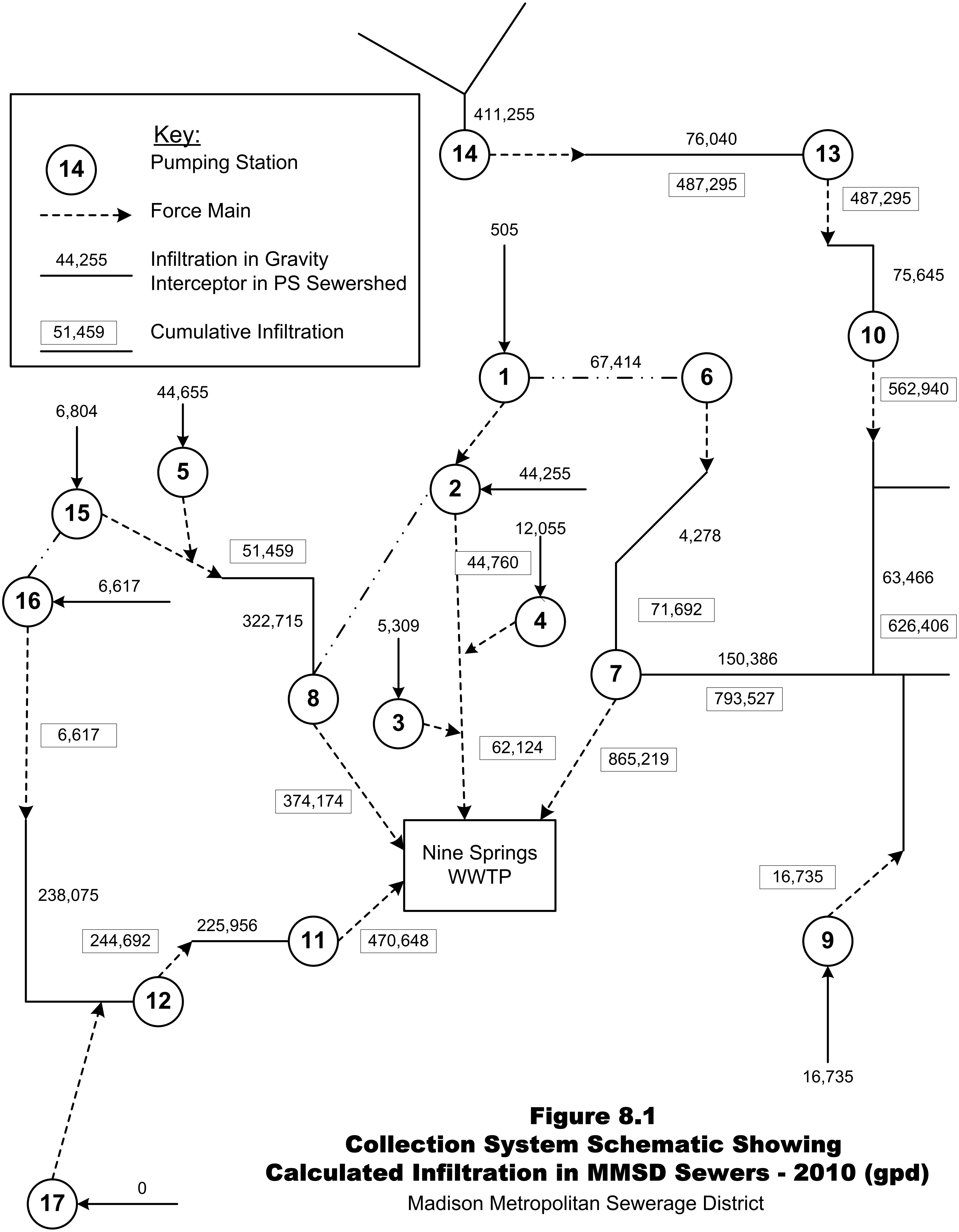


Figure 8.1
Collection System Schematic Showing Calculated Infiltration in MMSD Sewers - 2010 (gpd)
Madison Metropolitan Sewerage District

CARPC's estimated 2010 wastewater flows for each pump station service area are compared to actual pumping records in Table 8.2. The infiltration rates computed from this data in the PS1, PS2, PS8, and PS15 basins result in negative values, indicating either inaccurate flow data or overestimates of wastewater flows. Whatever the cause, the negative values suggest that these basins are relatively tight with regard to the infiltration of clear water. More importantly, Table 8.2 shows that infiltration is significant in the PS3, PS5, PS7, PS13, and PS14 basins (i.e. infiltration rate >25% of average daily flow).

I/I studies were recommended for the PS9, PS12, PS13 and PS14 service areas in the District's *2002 Collection System Facilities Plan.* Flow monitoring and I/I investigations in the PS9 and PS12 basins were performed by Strand Associates in 1999. While flow monitoring did confirm high peaking factors in some of the PS12 subbasins, no definitive sources of inflow or infiltration were discovered.

The City of Madison completed an I/I investigation in a portion of the PS13 basin in 2005. The City relined approximately 3,000 feet of its 24" Anderson Street Interceptor in 2008 in response to a recommendation from this study. The City also relined approximately 8,000 feet of smaller diameter sewer and 40 manholes as part of this project from 2008 to 2010.

Additional rehabilitation work in basins with significant infiltration was completed by MMSD in 2011. Approximately 2,800 feet of MMSD's West Interceptor in the PS5 basin was rehabilitated with a cured-in-place liner (MH05-011 to MH05-021).

It is recommended that additional studies be performed in the PS3, PS7, and PS14 basins, with PS14 receiving the highest priority. No formal I/I study of the PS14 service area has been performed and it is recommended that one be conducted in the next one to two years based on the recommendation of the *2002 Collection System Facilities Plan*, the sewer system overflows observed in this basin during the June 8, 2008 rain event, and the data presented in Tables 8.1 and 8.2.

Conveyance Costs

As mentioned at the beginning of this chapter, one of the primary reasons to identify and remove I/I in a collection system is to reduce conveyance costs. The District has a large number of pumping stations relative to its service area and the pumping of clear water can result in correspondingly large and unnecessary pumping costs. Given the layout of the District's collection system, some clear water flows are pumped as many as five times. Figure 8.2 shows the unit costs to pump clear water flows from each of the District's 17 pump station service areas in 2010.

In looking at Figure 8.2, it can be seen that PS16 has the highest unit pumping rate at $0.22/1000 gallons. This rate is attributed primarily to the high system head of 182 feet for PS16. Another reason for the elevated rate for PS16 is that flows from this station

Table 8.2
Total Infiltration by Pumping Station Basin (2010)
Madison Metropolitan Sewerage District

Pump Station Basin	Actual Average Daily Flow by Pump Station Basin[1] (mgd)	CARPC Estimated Wastewater Flows[2] (mgd)	Estimated Total Infiltration by Pump Station Basin (gpd)	Infiltration Rate as Percentage of Average Daily Flow (%)
1	4.16	4.59	-425,000	N/A
2	3.52	4.08	-559,000	N/A
3	0.32	0.23	90,000	28%
4	1.02	0.90	125,000	12%
5	0.70	0.42	280,000	40%
6	1.55	1.47	82,000	5%
7	5.41	3.09	2,323,000	43%
8	5.20	5.84	-642,000	N/A
9	0.83	0.76	72,000	9%
10	2.53	2.51	19,000	1%
11	3.21	2.85	356,000	11%
12	2.85	2.53	320,000	11%
13	2.07	1.43	643,000	31%
14	4.23	2.60	1,635,000	39%
15	1.33	1.34	-11,000	N/A
16	1.81	1.65	159,000	9%
17	0.89	0.82	72,000	8%
TOTAL	41.63	37.09	4,538,738	11%

(1). Year 2010 actual average daily flows are based on metered data for PS1, 2, 3, 5, 7, 8, 10, 11, 16 and 17. Pump run-time records are used at all other stations.

(2). Source: CARPC's *MMSD Collection System Evaluation (January 2009).* Estimate includes only projected wastewater flows for 2010. Infiltration not included.

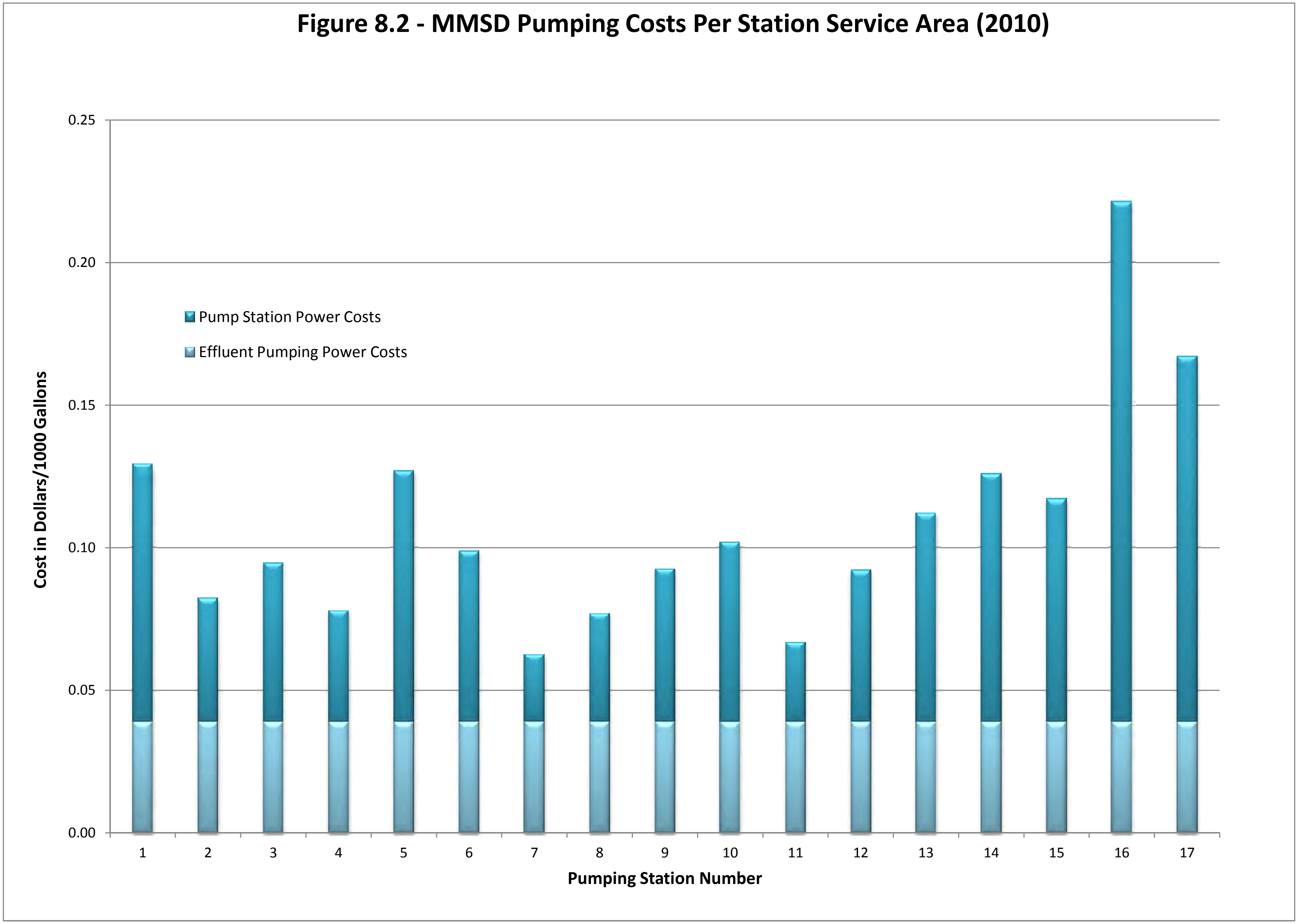


Figure 8.2 - MMSD Pumping Costs Per Station Service Area (2010)
Cost in Dollars/1000 Gallons
0.25
0.20
0.15
0.10
0.05
0.00
Pump Station Power Costs
Effluent Pumping Power Costs
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Pumping Station Number

also pass through PS12 and PS11. A similar situation occurs for PS13 and PS14. Even though both of these pump stations have relatively low system heads, their unit pumping rates are higher than average since their flows also pass through PS10 and PS7. Thus, it makes sense that a gallon of clear water removed in upstream service areas such as PS13, PS14, or PS16 would result in greater energy savings than a gallon of clear water which is removed in the PS7 service area.

Table 8.3 contains a summary of the costs to pump all infiltration to the treatment plant and from the treatment plant through the effluent force mains in 2010. The estimated cost to pump infiltration in this year was approximately $235,000, with approximately $87,000 of that total representing effluent pumping. The average annual cost to pump infiltration at each station in 2010 was $8,700. PS7 and PS10 had infiltration pumping costs over three times the average value, which is partially a result of these stations conveying infiltration from the PS13 and PS14 service areas.

Table 8.4 shows the costs to pump various rates of infiltration in each pump station service area in 2010. It also calculates the 50-year present worth costs of pumping these same infiltration rates. The present worth analysis takes into consideration that energy rates increase on an annual basis and must be accounted for in determining pumping costs as they are a significant factor. In looking at Table 8.4, the costs to pump infiltration in a "leaky" basin such as PS14 can be significant. Infiltration rates in this service area are estimated to be 750 gpm (1.08 mgd) or more, resulting in a 50-year present worth pumping cost of $5.3 million.

Given these costs, it is reasonable to question whether it is more cost efficient to continue to pump these extraneous flows or provide methods of sewer rehabilitation which mitigate the infiltration. A rudimentary analysis is presented in Table 8.5 to assess the cost effectiveness of rehabilitation relative to infiltration conveyance. In this analysis the pumping costs associated with infiltration into MMSD interceptors is calculated over a 50-year period. This present worth cost is then used to calculate the length of MMSD's sewers that could be rehabilitated through a cured-in-place liner to mitigate infiltration. It is important to note that only the pumping costs associated with infiltration into MMSD sewers are accounted for in this analysis. As discussed earlier, approximately 70% of the total infiltration amount in the District's collection system comes from the District's satellite communities.

As shown in Table 8.5, the money saved from reductions in pumping of infiltration does not provide for much sewer rehabilitation in each service area. On average only 9% of the District's interceptors could be rehabilitated with a cured-in-place liner with the money saved from reduced pumping costs. There are several problems with approaching sewer rehabilitation in this fashion. Most importantly, it is extremely difficult to identify definitive infiltration sources. Further, it is very unlikely that all or even a majority of the infiltration is occurring in only 9% of the interceptor length. A meaningful reduction in infiltration for any service area may require that 25%-50% of the interceptors be rehabilitated. Finally, as mentioned previously, even if the District's entire sewer

Table 8.3

Infiltration Pumping Costs by MMSD Pumping Station (2010)

Madison Metropolitan Sewerage District

	Cumulative Infiltration at MMSD Pump Station[1] (gpd)	2010 Unit Pumping Cost ($/MGal)	2010 Annual Cost to Pump Infiltration ($/yr)
1	480,000	$47.27	$8,283
2	750,048	$43.26	$11,844
3	84,000	$55.70	$1,708
4	81,000	$39.17	$1,158
5	204,450	$49.97	$3,729
6	140,000	$36.09	$1,844
7	3,002,000	$23.71	$25,975
8	974,450	$38.04	$13,531
9	136,000	$29.93	$1,486
10	2,366,000	$39.37	$33,999
11	1,268,000	$27.85	$12,887
12[3]	743,000	$25.26	$6,850
13	2,160,000	$10.14	$7,991
14	1,170,000	$13.87	$5,924
15	130,000	$40.10	$1,903
16	177,000	$129.28	$8,352
17	31,000	$75.13	$850
		Average PS Cost	$8,724
Infiltration to WWTP[2]	6,159,498	-	-
Effluent Pumping	6,159,498	$38.91	$87,477
TOTAL PUMPING COSTS (2010)			**$235,000**

Notes:

(1). Source: CARPC's *MMSD Collection System Evaluation (January 2009).* Includes MMSD's collection system and satellite community systems.

(2). Includes cumulative infiltration from PS 2, 3, 4, 7, 8, & 11.

(3). CARPC's estimate for infiltration in PS 12 basin is 208,000 gallons. Estimated infiltration in this basin was revised upwards based on 2009-2010 flow metering data and MMSD infiltration calculations for this basin.

Table 8.4
Pumping Costs for MMSD Pumping Stations for Various Rates of Infiltration (2010)
Madison Metropolitan Sewerage District

Pumping Station Service Area	Pumping Station Costs ($/1000 gal)	Effluent Pumping Costs ($/1000 gal)	Total Pumping Costs (Fig. 8-2) ($/1000 gal)	Annual Cost to Pump Various Infiltration Rates (2010 $/yr) (Infiltration rates in gpm)									
				1	5	10	25	50	100	250	500	750	1,000
1	0.0905	0.0389	0.1294	68	340	680	1,701	3,402	6,804	17,010	34,019	51,029	68,038
2	0.0433	0.0389	0.0822	43	216	432	1,080	2,160	4,319	10,798	21,595	32,393	43,191
3	0.0557	0.0389	0.0946	50	249	497	1,243	2,486	4,973	12,432	24,864	37,296	49,729
4	0.0392	0.0389	0.0781	41	205	410	1,026	2,052	4,104	10,259	20,519	30,778	41,038
5	0.0880	0.0389	0.1269	67	334	667	1,668	3,335	6,671	16,677	33,354	50,031	66,709
6	0.0598	0.0389	0.0987	52	259	519	1,297	2,594	5,188	12,969	25,938	38,908	51,877
7	0.0237	0.0389	0.0626	33	165	329	823	1,646	3,291	8,228	16,455	24,683	32,910
8	0.0380	0.0389	0.0770	40	202	404	1,011	2,022	4,045	10,112	20,223	30,335	40,447
9	0.0536	0.0389	0.0925	49	243	486	1,216	2,432	4,864	12,160	24,321	36,481	48,642
10	0.0631	0.0389	0.1020	54	268	536	1,340	2,680	5,360	13,401	26,802	40,202	53,603
11	0.0278	0.0389	0.0668	35	175	351	877	1,754	3,509	8,772	17,543	26,315	35,086
12	0.0531	0.0389	0.0920	48	242	484	1,209	2,418	4,836	12,090	24,181	36,271	48,362
13	0.0732	0.0389	0.1121	59	295	589	1,473	2,947	5,893	14,733	29,465	44,198	58,931
14	0.0871	0.0389	0.1260	66	331	662	1,656	3,311	6,622	16,556	33,111	49,667	66,222
15	0.0781	0.0389	0.1171	62	308	615	1,538	3,076	6,152	15,381	30,761	46,142	61,523
16	0.1824	0.0389	0.2213	116	582	1,163	2,908	5,816	11,631	29,078	58,155	87,233	116,310
17	0.1282	0.0389	0.1671	88	439	878	2,196	4,392	8,785	21,962	43,925	65,887	87,850

Pumping Station Service Area	Pumping Station Costs ($/1000 gal)	Effluent Pumping Costs ($/$1000 gal)	Total Pumping Costs (Fig. 8-2) ($/1000 gal)	50-Year Present Worth Costs to Pump Various Infiltration Rates (2010 $) (Leakage rates in gpm)									
				1	5	10	25	50	100	250	500	750	1,000
1	0.0905	0.0389	0.1294	7,261	36,307	72,614	181,535	363,071	726,141	1,815,353	3,630,707	5,446,060	7,261,414
2	0.0433	0.0389	0.0822	4,610	23,048	46,095	115,239	230,477	460,954	1,152,386	2,304,771	3,457,157	4,609,542
3	0.0557	0.0389	0.0946	5,307	26,537	53,073	132,683	265,366	530,731	1,326,828	2,653,655	3,980,483	5,307,311
4	0.0392	0.0389	0.0781	4,380	21,899	43,798	109,495	218,989	437,979	1,094,947	2,189,895	3,284,842	4,379,789
5	0.0880	0.0389	0.1269	7,120	35,598	71,195	177,988	355,976	711,952	1,779,879	3,559,758	5,339,637	7,119,516
6	0.0598	0.0389	0.0987	5,537	27,683	55,366	138,415	276,830	553,660	1,384,149	2,768,299	4,152,448	5,536,598
7	0.0237	0.0389	0.0626	3,512	17,562	35,124	87,810	175,619	351,238	878,096	1,756,191	2,634,287	3,512,383
8	0.0380	0.0389	0.0770	4,317	21,583	43,167	107,917	215,835	431,670	1,079,174	2,158,349	3,237,523	4,316,697
9	0.0536	0.0389	0.0925	5,191	25,957	51,913	129,783	259,565	519,131	1,297,826	2,595,653	3,893,479	5,191,306
10	0.0631	0.0389	0.1020	5,721	28,604	57,208	143,021	286,041	572,083	1,430,207	2,860,413	4,290,620	5,720,826
11	0.0278	0.0389	0.0668	3,745	18,723	37,446	93,616	187,231	374,463	936,157	1,872,313	2,808,470	3,744,627
12	0.0531	0.0389	0.0920	5,161	25,807	51,614	129,036	258,071	516,143	1,290,357	2,580,715	3,871,072	5,161,430
13	0.0732	0.0389	0.1121	6,289	31,447	62,894	157,236	314,471	628,942	1,572,355	3,144,711	4,717,066	6,289,422
14	0.0871	0.0389	0.1260	7,068	35,338	70,676	176,691	353,381	706,762	1,766,905	3,533,811	5,300,716	7,067,622
15	0.0781	0.0389	0.1171	6,566	32,830	65,660	164,151	328,302	656,603	1,641,508	3,283,016	4,924,524	6,566,032
16	0.1824	0.0389	0.2213	12,413	62,066	124,133	310,332	620,663	1,241,326	3,103,315	6,206,630	9,309,945	12,413,260
17	0.1282	0.0389	0.1671	9,376	46,879	93,758	234,396	468,792	937,584	2,343,959	4,687,919	7,031,878	9,375,838

Assumptions
Interest rate = 3.00%
Energy escalation rate = 6.00%
Term (yrs) = 50

Table 8.5
Life Cycle Costs for Pumping of Infiltration (2010)
Madison Metropolitan Sewerage District

Goal of Analysis: Determine the length of MMSD interceptor sewers that could be rehabilitated in each service area for the 50-year present worth cost to pump infiltration from that service area.

	INFILTRATION PUMPING COSTS (2010 $)					PIPE REHABILITATION (SEWER LINING)				
Pumping Station Service Area	Pumping Station Costs ($/1000 gal)	Effluent Pumping Costs ($/1000 gal)	Total Pumping Costs ($/1000 gal)	MMSD Infiltration by PS Service Area (gpd)	50-year PW Cost to Pump MMSD Infiltration ($)	Average Pipe Diameter in Service Area (in)	Sewer Lining Unit Cost ($/ft)	Length of MMSD Interceptor to be Lined(5) (ft)	Total MMSD Interceptor Length in Service Area (ft)	Fraction of MMSD Interceptors to be Rehabilitated (%)
1	0.0905	0.0389	0.1294	505	$2,547	30	125	20	9,029	0%
2	0.0433	0.0389	0.0822	44,255	$141,663	27	115	1,232	13,464	9%
3	0.0557	0.0389	0.0946	5,309	$19,567	12	60	326	3,802	9%
4	0.0392	0.0389	0.0781	12,055	$36,666	21	90	407	8,184	5%
5	0.0880	0.0389	0.1269	44,655	$220,779	15	70	3,154	15,840	20%
6	0.0598	0.0389	0.0987	67,414	$259,197	33	150	1,728	10,085	17%
7	0.0237	0.0389	0.0626	218,130	$532,053	33	150	3,547	104,333	3%
8	0.0380	0.0389	0.0770	322,715	$967,405	27	115	8,412	77,299	11%
9	0.0536	0.0389	0.0925	16,735	$60,331	24	100	603	3,326	18%
10	0.0631	0.0389	0.1020	75,645	$300,522	48	225	1,336	34,795	4%
11	0.0278	0.0389	0.0668	225,956	$587,584	36	175	3,358	53,011	6%
12	0.0531	0.0389	0.0920	238,075	$853,338	33	150	5,689	41,501	14%
13	0.0732	0.0389	0.1121	76,040	$332,116	48	225	1,476	15,629	9%
14	0.0871	0.0389	0.1260	411,255	$2,018,469	27	115	17,552	83,635	21%
15	0.0781	0.0389	0.1171	6,804	$31,026	27	115	270	10,402	3%
16	0.1824	0.0389	0.2213	6,617	$57,041	27	115	496	8,606	6%
17	0.1282	0.0389	0.1671	0	$0	33	150	0	13,306	0%
Average				1,772,165						9%

Notes/Assumptions
(1). Interest rate = 3.00%
(2). Energy escalation rate = 6.00%
(3). Analysis Term (yrs) = 50
(4). Service life of rehabilitated (lined) sewer = 50 years.
(5). Length of MMSD interceptors to be lined is calculated using the 50-year present worth value for pumping of infiltration.

network were rehabilitated to eliminate infiltration sources, only 30% of the problem would be addressed.

In summary, it is apparent that it is more cost efficient for the District to convey infiltration to and from the treatment plant rather than to adopt an aggressive, regional sewer rehabilitation program across each service area to eliminate infiltration sources. It is also clear, however, that infiltration into the sanitary sewer network reduces overall conveyance capacities and can lead to premature replacement or reinforcement of certain sections. Excessive infiltration into the sewer network also depletes the groundwater supply and can disrupt watershed balances, if excessive. With these considerations in mind, a more systematic approach for dealing with the issue of infiltration is needed, as discussed in following sections of this chapter.

<u>Effect of Climate Change</u>

The Madison area has experienced a number of severe storms in the last twenty years. Both the volume and intensity of these storms has overwhelmed the collection system of the District and its satellite communities on occasion. Historical rainfall data over the past 50-60 years for the Madison area shows a noticeable rise in volume. From 1950 to 2006 the annual average precipitation in Dane County has increased approximately 5.5 inches (*Center for Climatic Research & Center for Sustainability and the Global Environment, Nelson Institute, UW-Madison).* Figure 8.3 shows the general rise in annual precipitation measured at various cities in the state of Wisconsin during this time period. These trends would seem to indicate that a significant change in climatic patterns in the Madison area is taking place with regard to rainfall.

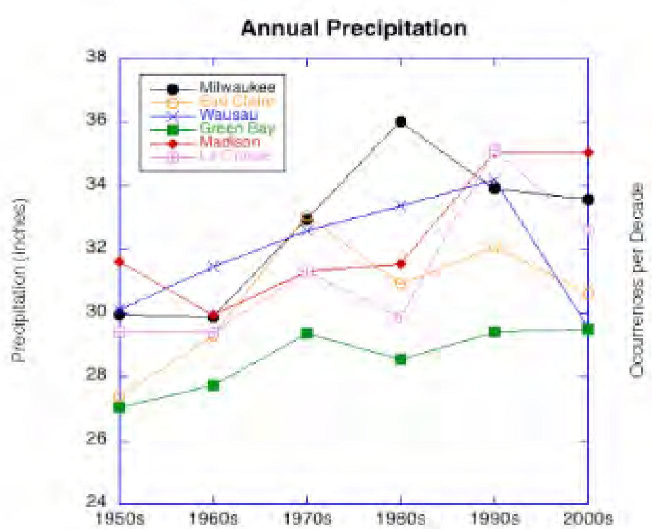


Figure 8.3 – Historical Annual Precipitation for Wisconsin Cities
Source: Kucharik, C.J. S.P. Serbin, E.J. Hopkins, S. Vavrus, and M.M. Motew, 2010: Patterns of climate change across Wisconsin from 1950 to 2006

A more in-depth analysis of the data suggests that these trends are not so clearly definable. In looking at a longer historical rainfall record for the Madison area, members of the *Wisconsin Initiative on Climate Change Impacts* (WICCI) determined that there does not appear to be a statistically significant increasing trend in annual precipitation from 1869 to 2008 (Figure 8.4).

Similarly, an analysis was performed to see if the magnitude and frequency of intense rainfall events has increased over this same time period. From this analysis it was determined that while an increase in the magnitude of storm events in the Madison area does not appear to be statistically significant, the occurrence of five 3" daily storm events from 2004-2008 does suggest an increase in intensity (Figure 8.5). For the purposes of this analysis an "event" was defined as any one-day precipitation total, while "an intense event" is defined as a daily precipitation total that exceeds a threshold of three inches.

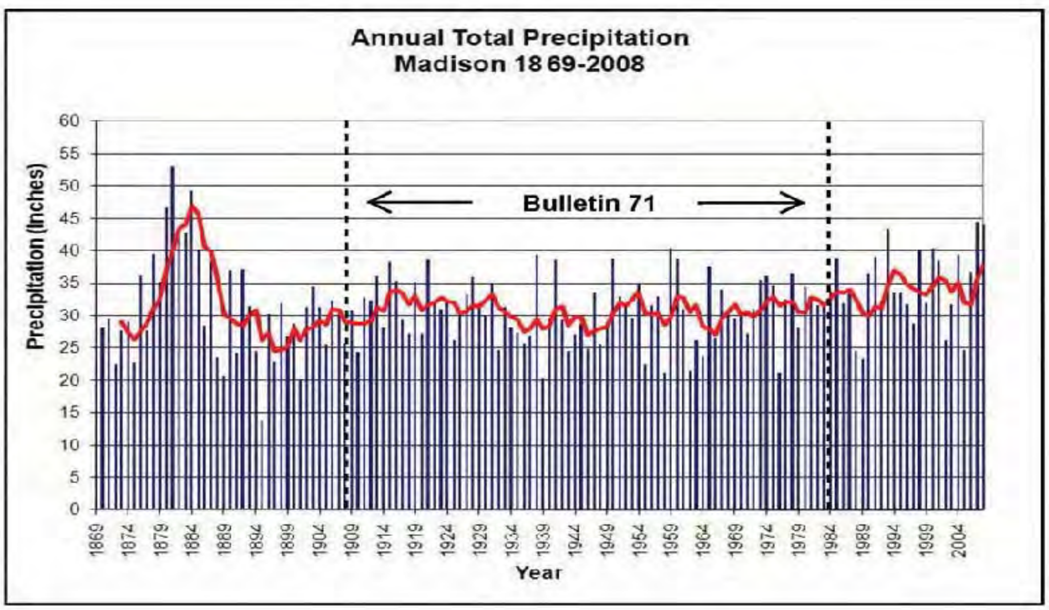


Figure 8.4 – Annual Total Precipitation in Madison (1869-2008)

Source: Stormwater Management in a Changing Climate: Managing High Flow and High Water Levels in Wisconsin, WICCI Stormwater Working Group, June 2010

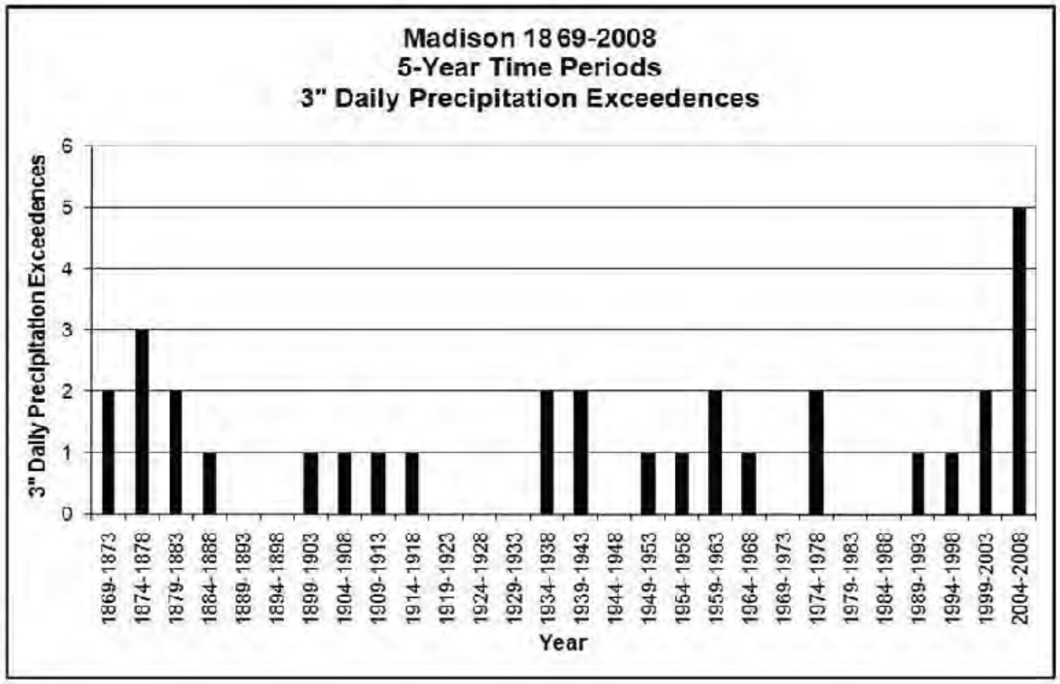


Figure 8.5 – 3" Daily Precipitation Exceedences in Madison (1869-2008)
Source: Stormwater Management in a Changing Climate: Managing High Flow and High Water Levels in Wisconsin, WICCI Stormwater Working Group, June 2010

WICCI has also attempted to project future rainfall amounts and frequencies from a number of Global Circulation Models (GCM). GCM's consider the increased emission of greenhouse gases in the atmosphere over time and their effect on global climatic patterns. The output from 15 of these models was used by WICCI to assess the effect of climate change on various hydrologic parameters in three distinct time periods: (1). 1961-2000; (2). 2046-2065; and (3). 2081-2100. The results of this analysis can be generally summarized as follows:

1. A modest increase in the magnitude of intense precipitation events can be expected during the next 90 years. The magnitude of the 100-year, 24-hour storm event is expected to increase by about 11% by the 2046-2065 time period.

2. Total precipitation and intense precipitation events are projected to increase significantly during the winter and spring months (December to April).

3. The amount of precipitation that occurs as rain from the months of December to March is projected to significantly increase.

Climate change is an emerging and constantly evolving topic. While its effects are not widely understood at this point and are not universally accepted by all members of the scientific community, local rainfall data does suggest that it has had an impact on rainfall volume and intensity during the last ten years. Even though an increase in rainfall volume and intensity may not be statistically significant for a long period of record in the Madison area, it would seem prudent to acknowledge these increases in the short term record when assessing the required capacity for both new and existing collection system facilities.

Peaking Factors

The required capacity of all intercepting sewers, force mains and pumping units in the collection system is determined by peak flowrates. As mentioned previously, the District uses the Madison Design Curve as a guide for calculating appropriate peaking factors for its facilities. This curve was developed by Greeley & Hansen Engineers in their "*Report on Sewerage & Sewage Treatment*" (1961) for the District and is represented by the following formulas:

$$\text{Peaking Factor} = 4/(Q_{avg})^{0.158} \qquad \text{(Q in mgd)}$$

or,

$$Q_{peak} = 4*(Q_{avg})^{0.842} \qquad \text{(Q in mgd)}$$

Note: 1. Peaking factor = 4.0 for $Q_{avg} \leq 1.0$ mgd
2. Peaking factor = 2.5 for $Q_{avg} \geq 20.0$ mgd

As discussed in the previous section, the Madison area has experienced a number of extreme rainfall events in the last twenty years, some of which have stressed portions of MMSD's collection system. District staff have analyzed data for several of the larger rainfalls and prepared reports for the following events:

- June 17, 1996
- August 18-19, 2007 (Two day rainfall total of 5.52 inches)
- June 7-8, 2008 (Two day rainfall total of 6.34 inches)

In response to the 2008 flow event the District prepared a memorandum to outline specific actions that the District would undertake to address the issue of high flows in its collection system. This memorandum and its updates can be found in Appendix 10. One of the action items from the memorandum was to review the District's use of the Madison Design Curve in sizing future conveyance facilities and in assessing capacity of the existing collection system. A file memo dated June 3, 2009 suggested that more conservative peaking factors may be needed in some areas of the collection system, such as increasing the peaking factor by 1.0 in wetter service areas.

In order to identify the most vulnerable service areas in the collection system, actual peaking factors for each of the aforementioned large rainfall events were calculated and compared to those predicted by the Madison Design Curve. As one might expect, some of the peaking factors for local pump station service areas fell below the value predicted by the Madison Design Curve and some were above the predicted value. Much of this variation can be attributed to the spatial variability and intensity that is associated with large rainfall events. For instance, the June 2008 event was particularly intense in the northwest portion of the District's collection system, leading to sewer overflows in the PS13 and PS14 service areas while other portions of the collection system were much less affected. After review of the data for each of the three large storm events, however, the following pump station service areas were identified as having peaking factors greater than those predicted by the Madison Design Curve for each event: PS2, PS6, PS7, PS8, PS11, PS12, PS13, and PS14. Most of these service areas also ranked high in estimation of infiltration volume as discussed in a preceding section of this chapter.

The peak flow in these wet service areas was increased by adding 1.0 to the Greeley & Hansen peak factor calculation to determine the additional length of gravity interceptors that would reach benchmark capacity by 2030. Table 8.6 compares the 2030 benchmark capacities for each service area with the conventional peaking factor developed by Greeley & Hansen and the revised peaking factor proposed in this section. As can be seen in Table 8.6, 25.3 miles of gravity interceptors will reach or exceed benchmark capacity by 2030 with utilization of the conventional peaking factor.

Applying the more conservative peaking factor to the wet service areas results in 41.0 miles of gravity interceptors reaching benchmark capacity by 2030, an increase of approximately 62%. Using an approximate unit replacement cost of $600 per foot for the additional 15.8 miles of sewer to be replaced, the cost to provide additional capacity in all of the wet service areas is estimated at $50 million over a 20-year period, or $2.5 million per year. This level of incremental funding for capital projects is not sustainable over the long term. Thus, revising the peaking factor to all wet service areas may not be the most efficient use of available funds for identifying and prioritizing capacity-related projects. A more systematic and detailed analysis of each "wet" service area identified in this facilities plan would likely generate the best results for the funds available.

It is interesting to note that a substantial portion (42%) of the additional interceptor length that would reach benchmark capacity with a revised peaking factor is in the PS14 service area. A more concentrated and thorough analysis of this service area, in particular, is recommended to verify existing rates of daily flow, to identify areas of suspected inflow and infiltration, and to determine excess capacity.

I/I Mitigation Strategies

The District outlined the following five steps to be taken following the June of 2008 storm to address the issue of high flows caused by excessive infiltration and inflow into the collection system (see Appendix 10):

Table 8.6
Gravity Interceptor Capacity Evaluation
Madison Metropolitan Sewerage District

Pumping Station Service Area	Total Gravity Intercveptor Mileage in Service Area (miles)	Mileage Predicted to Reach Benchmark Capacity By 2030				Additional Mileage Requiring Capacity Relief
		Greeley & Hansen Peaking Factor		*Revised Peaking Factor* [(1)]		
		Gravity Interceptors		Gravity Interceptors		
		(miles)	(%)	(miles)	(%)	(miles)
PS1	1.71	0.00	0%	0.00	0%	0.00
PS2	2.73	0.41	15%	0.41	15%	0.00
PS3	0.72	0.72	100%	0.72	100%	0.00
PS4	1.55	0.00	0%	0.00	0%	0.00
PS5	3.00	0.00	0%	0.00	0%	0.00
PS6	1.91	0.00	0%	0.02	1%	0.02
PS7	19.76	8.39	42%	10.68	54%	2.29
PS8	14.64	3.22	22%	6.94	47%	3.72
PS9	0.63	0.05	9%	0.06	10%	0.01
PS10	6.59	2.07	31%	2.07	31%	0.00
PS11	10.04	5.29	53%	6.25	62%	0.95
PS12	7.86	0.67	8%	2.85	36%	2.19
PS13	2.96	0.36	12%	0.36	12%	0.00
PS14	15.84	3.49	22%	10.11	64%	6.62
PS15	1.97	0.04	2%	0.04	2%	0.00
PS16	1.63	0.53	32%	0.53	32%	0.00
PS17	2.52	0.00	0%	0.00	0%	0.00
Totals	96.06	25.25	26%	41.04	43%	15.80

Notes:

(1). Revised peaking factor = Greeley & Hansen peaking factor + 1.0

(2). Revised peaking factor calculated only for service areas identified as "wet" basins (highlighted in grey).

1. Review design standards for sizing interceptor sewers and pump stations and adopt the use of higher peaking factors if deemed necessary and cost effective.

2. Review design standards for the materials used in the collection system to ensure that rainfall is less likely to leak into the system during heavy rains and floods.

3. Review flow data and inspect existing interceptor sewers to identify defects that allow excessive rainfall into the District's collection system.

4. Review flow data from the District's satellite communities that is collected during high flow events.

5. Increase public education efforts in the area of water conservation.

The remainder of this chapter summarizes the actions that the District has undertaken with regard to these steps since July of 2008.

Review of Peaking Factors

A previous section of this chapter discussed the District's current standards for sizing its conveyance facilities. This section also assessed the impact of adopting a higher peaking factor for facilities in low-lying or flood prone areas. In general it is cost prohibitive to adopt higher peaking factors for each existing facility in a "wet" area. The cost to rehabilitate or replace sewers in each of these areas would not be sustainable and may not be necessary in certain portions of the collection system. A more cost-effective approach would be to identify and prioritize those service areas with the highest susceptibility to I/I and perform detailed studies of each basin that include activities such as flow monitoring, television inspection, and smoke testing to locate specific I/I sources.

For new facilities it may be wise to consider more conservative peaking factors in the design, especially in areas of known I/I problems. An example where this approach might be applicable would be the design of PS18, which will receive flow from wet areas in the PS13 and PS14 basins.

Review of Design Standards for Construction Materials

Other than cross-connections with stormwater conveyance facilities or illicit discharges, the majority of I/I enters a collection system through manhole and pipe joints and manhole access covers. As demonstrated in Table 8.1, the pump station service areas with the greatest rates of I/I are those in which the pipes and manholes were installed prior to 1970. The majority of the pipes installed by the District prior to 1970 were of concrete and iron construction with poor sealing characteristics at joints and more joints per unit length than today's commonly used sewer materials.

The development and use of PVC and other flexible piping for sanitary sewers began in the 1970's and has led to significant improvements in the sealing of joints between pipes. Similar improvements have been made in the sealing of joints between manhole sections and in manhole access covers. The District installs chimney seals on all new manholes and on existing manholes prone to flooding to reduce the possibility of stormwater inflow through the access cover and adjusting rings. The District has also been proactive in replacing center-pull covers with sealed lids in areas prone to infiltration.

The use of improved materials of construction are reflected in the lower rates of I/I that are seen in the pump station service areas where these materials have been used in the last 30-40 years as part of new construction or rehabilitation projects (i.e. PS 1, PS15, PS16, and PS17). Going forward the District will continue to be proactive in replacing older access covers and installing chimney seals on existing manholes in flood prone areas and as part of road reconstruction projects.

Review of Flow Data and Television Inspection

The review of flow data by District staff for three of the largest storm events in the last fifteen years has been discussed in previous sections of this chapter. The analysis of this data has led to the identification of the following pump station service areas with peaking factors higher than predicted: PS2, PS6, PS7, PS8, PS11, PS12, PS13, and PS14. Some significant sources of inflow were identified by the District's Sewer Maintenance crew following the June 2008 high flow event. Several manholes in the PS12 service area were raised and flood-proofed upon inspection of the system after the storm event. The Sewer Maintenance crew will continue to inspect and rehabilitate those facilities that are susceptible to I/I as part of their routine inspection program.

Inspection of interceptor segments by closed-circuit television should be used as an additional tool to identify and prioritize I/I projects in suspected wet service areas. Table 5.2 in Chapter 5 should be used as a guide in this effort. Of the wet service areas previously identified, the District's television database has noted moderate infiltration in interceptors in the PS7, PS11, and PS14 basins.

Review of Flow Data from District Satellite Communities

The District maintains 61 pumping stations throughout its service area (44 are owned by satellite communities). As such, the District has access to flow data from these stations during high flow events and routinely analyzes the data to alert communities of areas of excessive I/I. The City of Madison, in particular, has used this information to identify and implement a number of I/I rehabilitation projects.

In recent years the District has been more proactive in communicating I/I problems to its satellite communities. After the June 2008 storm the District sent a memo to each community documenting the high flow conditions in the District's collection system and at the Nine Springs Wastewater Treatment Plant and the actions that the District would undertake to help mitigate the situation.

In August of 2009 the District took the additional step of analyzing flows from each of its satellite communities based on user charge (or flow monitoring) data and identifying those communities with higher than normal volumes of wastewater discharges. A letter was sent to each of the 17 communities that were identified as having high discharges, requesting that each community allocate funds to perform I/I studies and remediation efforts in their collection systems. Several communities have responded favorably to this request with documentation of their recent I/I investigations or future plans. The District will continue to monitor both average daily and peak flows from its satellite communities on a routine basis to identify problem areas and encourage rehabilitation programs. At this time the District has not directed any of its customers to take specific actions with regard to high flows.

Increase Public Education Efforts

The most effective strategy in reducing I/I in a collection system is to remove it at the source. To that end, in 2009 the District developed a series of radio advertisements which directed homeowners on efforts that could be undertaken to prevent rain water from entering their homes and ultimately the sanitary sewer system. The response to these advertisements has been favorable and more work in this area appears warranted and needed to help reduce I/I at the source level.

One specific area in which public education initiatives could be undertaken is with regard to rehabilitation of private sanitary sewer laterals. These private laterals contribute significant amounts of I/I into the sanitary sewer collection system and their condition is rarely inspected by the property owner. Lateral rehabilitation or replacement is usually only initiated by the owner due to root intrusion or damaged pipe that cause line blockages. With advances in sewer lining technology, the opportunity exists for the District to work with satellite communities on developing programs that encourage and offer incentives to property owners to inspect, maintain, and repair their sewer laterals.

Chapter 9
Recommended Projects & Initiatives

Based on the results and considerations presented in the preceding chapters, Table 9.1 is a summary of projects recommended for the MMSD collection system. The projects are organized by pumping station drainage basin. The driving needs for the individual projects (hydraulic capacity, physical condition, or both) are noted in the table and are discussed in the preceding chapters. The locations of the projects are highlighted in Figure 9.1 (see large map enclosed in the attached pocket).

Individual project costs shown in Table 9.1 are preliminary and may be subject to significant change as individual projects are examined in detail and refined in scope. All preliminary estimates shown in Table 9.1 are in terms of Year 2010 dollars.

The projects in Table 9.1 are organized into four time periods based on consideration of priority and needs (Period A: 2010-2015, Period B: 2016-2020, Period C: 2021-2030, and Period D: beyond 2030). An additional category, entitled 'Uncertain', has been included as a separate category for complex projects that do not fit into a specific time period based on capacity or condition but may be required as conditions and needs within the collection system evolve over time. Due to the long-range timeframe of Table 9.1, it is likely that the scope and priority of various projects will change as detailed studies are performed and as future developments occur. Table 9.1 and Figure 9.1 should be reviewed and updated annually to maintain a current picture of MMSD's collection system needs and to track the completion of major projects.

Funding for the projects will be provided from reserves and through general obligation debt placements. It is estimated that MMSD will borrow an average of $7 million each year over the next twenty years to fund these projects. Debt service on these borrowed funds will be recovered through MMSD's service charges. It is assumed that all borrowing will be made from the Wisconsin Clean Water Fund Program administered by the Wisconsin Department of Natural Resources. Terms of the loans are assumed to include interest at 4% and a twenty-year repayment period. The average household in MMSD could expect their annual service charge to increase by $4 each year for the next twenty years to fund these projects. This increase will be in addition to increases associated with inflation in wages, materials, energy, and services that will impact MMSD's operating budget from year to year.

In addition to the projects listed in Table 9.1, a number of other initiatives and recommended improvements have been discussed in this facilities plan to enhance the management, maintenance and operation of the District's collection system. These initiatives relate primarily to asset management and CMOM principles. A list of these major initiatives is shown in Table 9.2.

Table 9.1
MMSD Collection System Projects
Approximate Timetable and Costs

Project	Project Completed?	Cost Estimate (Year 2010 dollars) Period A 2010-2015	Period B 2016 - 2020	Period C 2021-2030	Period D Beyond 2030	Uncertain	Primary Need: Hydraulic Capacity	Primary Need: Physical Condition	Comments
System Wide Projects									
Telemetry System - Third Updgrade			$ 150,000						Upgrade with Process Control System.
Influent Storage and Equalization			$ 9,000,000				x		Influent storage required after PS 18 is built.
Update and Maintain CSFP									Ongoing process.
Interceptor Rehabilitation (Lining)			$ 2,500,000	$ 5,000,000				x	Allowance for annual lining of interceptors.
Pumping Station No. 1 Service Area									
Northend Interceptor Lining		$ 100,000						x	1,482' - 10" & 12" VP ~85 years old.
Pumping Station No. 2 Service Area									
Southwest Int - Haywood Replacement				$ 1,200,000			x	x	1,500' - 36" provides additional capacity for PS2-PS8 diversion.
Old West Int Lining (MH02-014A to MH02-101)		$ 660,000						x	5,000' - 24". 1916 cast iron sewer with mineral deposits.
WI - Spring Street Relief Lining		$ 600,000						x	4,580' - 24". 1940 cast iron sewer with mineral deposits.
Pumping Station No. 3 Service Area									
Rimrock Interceptor Replacement			$ 550,000				x	x	3,800' - 12" RCP (1959).
PS No. 3 Rehabilitation			$ 600,000					x	PS 3 ~50 years old (1958).
Pumping Station No. 4 Service Area									
South Interceptor - Baird Street Lining	x	$ 100,000						x	1,500' - VCP (1928). Lined with CIPP in 2010.
PS No. 4 Rehabilitation			$ 1,300,000					x	PS 4 ~45 years old (1967).
Pumping Station No. 5 Service Area									
West Int. Rehabilitation U/S of PS5		$ 300,000						x	3,600' - CIP (1931). PS5 to Gammon Ext. junction.
Pumping Station No. 6 Service Area									
East Monona Interceptor Lining		$ 120,000						x	Cracked pipe sections.
PS No. 6 Rehabilitation	x	$ 3,300,000						x	Four new pumps and related electrical and control work.
Gravity Tie from PS 6 to PS 10						$ 4,500,000	x		Intertie for diversion flexibility and system redundancy.

Project	Project Completed?	Cost Estimate (Year 2010 dollars) Period A 2010-2015	Period B 2016 - 2020	Period C 2021-2030	Period D Beyond 2030	Uncertain	Primary Need: Hydraulic Capacity	Primary Need: Physical Condition	Comments
Pumping Station No. 7 Service Area									
NEI Relief from FEI junction to PS18		$ 7,400,000					x		5,600' - 48" needs relief. To be completed with PS18 project.
NEI Lining from FEI junction to SEI junction			$ 1,300,000					x	Rehabilitate existing 48" NEI after relief sewer is constructed.
FEI - Cottage Grove Extension Lining	x	$ 190,000						x	5,500' - 18" rehabilitated with CIPP liner.
Far East Interceptor				$ 2,200,000	$ 6,900,000		x		3,900' - 30" may require relief in Period C.
PS 18 (to provide relief for PS 7)		$ 10,500,000					x		For future growth and reliability.
PS 18 Force Main		$ 11,600,000					x		From new PS 18 to NSWWTP.
Pumping Station 7 Improvements			$ 1,800,000					x	Construct after PS18 is operational.
FEI - Door Creek Extension					$ 8,800,000		x		High growth may require relief in Period C.
SEI - Blooming Grove Extension				$ 4,500,000	$ 1,200,000		x		High growth may require relief in Period B for segments east of I-90.
SEI - Dutch Mill Extension					$ 1,100,000		x		
Southeast Int (MH07-215 to MH07-218)					$ 1,100,000		x		
Pumping Station No. 8 Service Area									
West Int Lining on Old University Ave	x	$ 300,000						x	3,400-ft of 18"-21" from Farley to Forest (1916).
PS No. 8 Rehabilitation	x	$ 3,300,000						x	Four rebuilt pumps and related electrical work.
West Int Relief - Additional Capacity			$ 12,000,000				x		~12,000 ft of relief sewer from Whitney Way to Walnut St.
West Int/Midvale Relief - Additional Capacity				$ 900,000			x		2,600' - 21" may need relief. Could be provided with WI Relief project.
West Int/Randall Relief					$ 60,000		x		
Southwest Interceptor					$ 1,500,000		x		
Pumping Station No. 9 Service Area									
PS No. 9 Rehabilitation			$ 600,000					x	PS 9 ~50 years old (1961).
Southeast Interceptor					$ 1,800,000		x		
Pumping Station No. 10 Service Area									
NEI - Relief Upstream of PS No. 10	x	$ 8,700,000					x	x	9,200' of relief sewer from Lien Road to PS 10.
NEI - Truax Extension Replacement/Relief				$ 9,800,000			x		11,000-ft. of relief sewer from PS 13 FM to Lien Rd.
I/I Study						$ 150,000	x		Recommendation from 2002 CSFP.
PS10 Forcemain Relief					$ 6,400,000		x		PS6-PS10 gravity connection for system redundancy.
Pumping Station No. 11 Service Area									
PS No. 11 Rehabilitation		$ 3,700,000					x	x	PS 11 ~50 years old. Major electrical upgrades required.
NSVI Relief Projects			$ -	$ 11,700,000	$ 16,100,000		x		Assumes relief sewer of similar size to existing.
PS 11 Forcemain Relief				$ 1,900,000			x		4,200'-36" relief FM from PS 11 to NSWWTP.

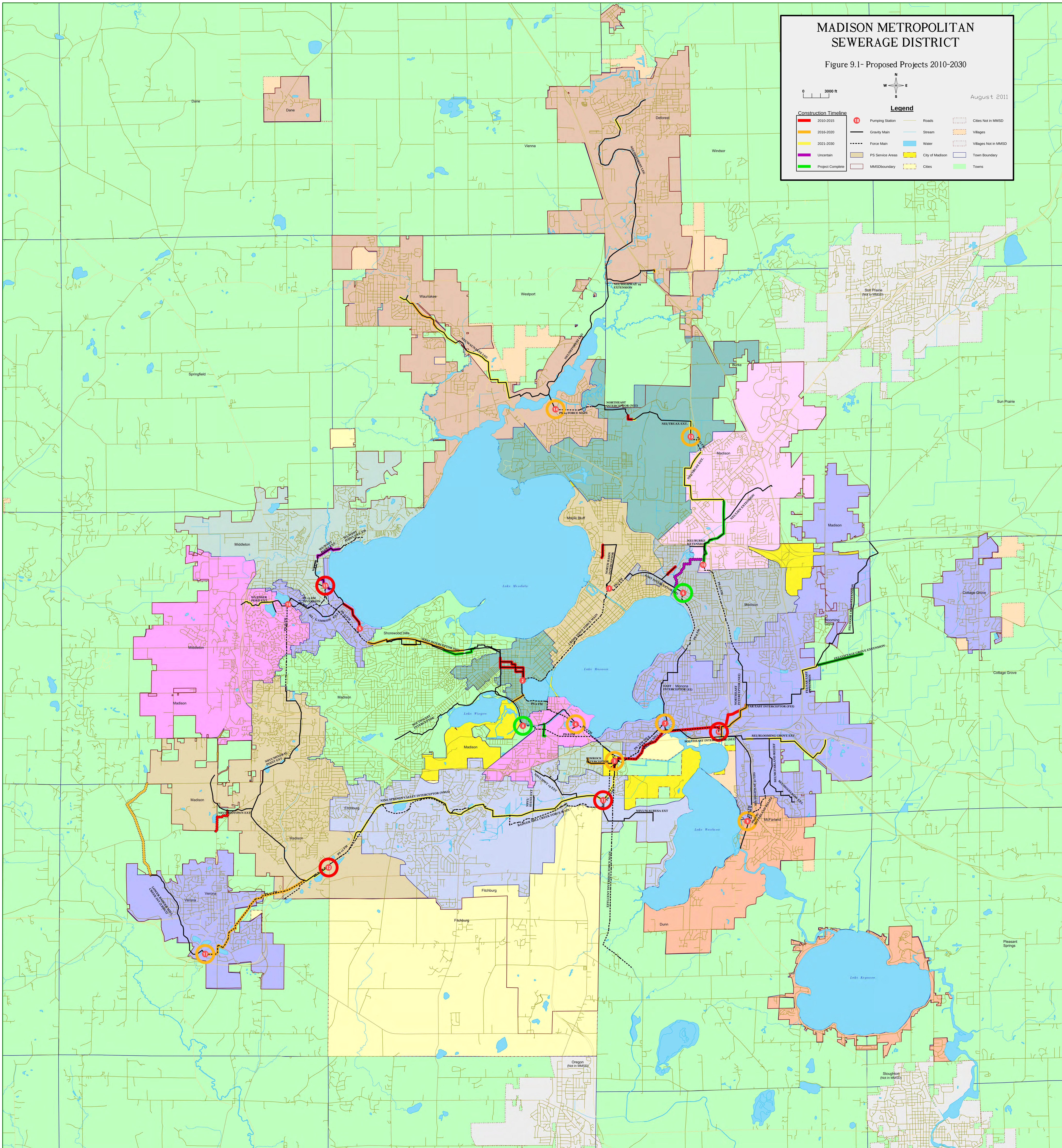
Project	Project Completed?	Cost Estimate (Year 2010 dollars) Period A 2010-2015	Period B 2016 - 2020	Period C 2021-2030	Period D Beyond 2030	Uncertain	Primary Need: Hydraulic Capacity	Primary Need: Physical Condition	Comments
Pumping Station No. 12 Service Area									
NSVI - Morse Pond Extension		$ 740,000					x		3,500-ft of new sewer to serve future development.
PS No. 12 Rehabilitation		$ 3,700,000						x	PS 12 ~40 years old. Major electrical upgrades required.
NSVI Relief Projects			$ -	$ 3,200,000	$ -		x		~3,500'-48" sewer U/S of PS 12 needs relief.
Pumping Station No. 13 Service Area									
PS No. 13 Rehabilitation			$ 3,400,000					x	PS13 ~40 years old and requires electrical upgrades.
NEI - Rehabilitation West of Airport		$ 600,000						x	Corrosion from MH13-116H to MH13-125 (~1,250').
NEI - PS 14 to PS 13				$ 1,800,000	$ 4,200,000		x		
Sanitarium Sewer						$ 1,890,000			Divert flows from PS13 service area to PS1.
Pumping Station No. 14 Service Area									
PS No. 14 Rehabilitation			$ 3,400,000					x	PS14 ~40 years old and requires electrical upgrades.
NEI - Waunakee Extension Relief			$ 2,500,000	$ 6,300,000	$ 4,100,000		x		
NEI - DeForest Extension Relief				$ 400,000	$ 16,600,000		x		
I/I Study		$ 150,000					x		Recommendation from 2002 CSFP.
Pumping Station No. 15 Service Area									
PS No. 15 Rehabilitation		$ 2,400,000	$ 1,300,000					x	PS 15 ~35 years old and needs firm capacity relief.
West Int Extension - Siphon Replacement						$ 500,000	x		Improve maintenance for siphon at Pheasant Branch.
West Int Extension					$ 100,000				
Pumping Station No. 16 Service Area									
West Interceptor - Gammon Extension Relief				$ 700,000			x		2,800' of 18" & 24" on Voss Parkway needs relief.
Pumping Station No. 17 Service Area									
Lower Badger Mill Creek Interceptor - Phase III			$ 2,800,000	$ 1,500,000					New sewer from Cross Country Rd to Midtown Rd.
PS No. 17 Rehabilitation			$ 1,900,000				x	x	To be completed with LBMC Interceptor (Phase III).
PS No. 17 Force Main			$ 2,600,000				x		To be completed with LBMC Interceptor (Phase III).
Total Projects		$ 58,460,000	$ 47,700,000	$ 51,100,000	$ 69,960,000	$ 7,040,000			
Total Projects (less completed projects as of 7/11)		$ 42,570,000	-	-	-	-			

Table 9.2 – MMSD Collection System Initiatives

Collection System Area	Initiative	Related Information
Capacity evaluation	Consider purchase of flow metering equipment for I/I studies.	Chapter 2
Design	Consider development and adoption of revised peaking factors for service areas subject to excessive inflow and infiltration.	Chapter 8
	Continue to evaluate alternate designs for air release valves on forcemains and eliminate these valves where possible to avoid SSO's due to valve plugging.	Chapter 7
Management	Continue improvements in asset registry and system of assessing condition of assets. Develop systematic procedures to capture all information relating to collection system assets and improved methods of storing and tracking this data.	Chapter 2
	Improve methods to estimate remaining asset life, life cycle costs, and replacement costs. Particular emphasis should be placed on methods for pipes rehabilitated with new technologies such as cured-in-place liners.	Chapter 2
	Assess and determine expected level of service to be provided based upon customers and regulators expectations.	Chapter 2
	Develop a risk-based condition assessment tool to aid in prioritizing maintenance, repair, renewal, and replacement projects.	Chapter 2
	Optimize and improve upon the District's maintenance program, repair and renewal methods, and capital improvement planning methods. Develop and formalize written methods for project justification as part of budgeting process.	Chapter 2
	Monitor funding strategies for District's asset management program.	Chapter 2
	Develop written procedures for sanitary sewer overflow events, including procedures for identification and clean-up of overflows and notification requirements.	Chapter 2
Operation	Develop written rules and procedures for wastewater monitoring program.	Chapter 2
	Develop a systematic program to assess hydrogen sulfide concentrations in susceptible areas of the collection system.	Chapter 2
	Develop a written safety program relating specifically to collection system work areas.	Chapter 2

Maintenance	Provide enhancements to District's televising program. Enhancements to include staff training for pipeline inspection, improvements to the scoring and ranking system, and improved tracking of cleaning and televising frequency throughout the collection system.	Chapter 5

Overall, the District believes that its collection system is operated in a cost-efficient manner and provides a high level of service to its customers. The initiatives described in Table 9.2 are steps that have been identified to: (1). Optimize the use of available funds in operation and maintenance of its collection system; (2). Assist the District in meeting future regulations regarding sanitary sewer overflows; and (3). Adopt advanced asset management principles to help manage and operate the District's expanding collection system assets.


MADISON METROPOLITAN
SEWERAGE DISTRICT
Figure 9.1- Proposed Projects 2010-2030
N
W
E
S
0
3000 ft
August 2011
Legend
Construction Timeline
2010-2015
2016-2020
2021-2030
Uncertain
Project Complete
Pumping Station
Gravity Main
Force Main
PS Service Areas
MMSDboundary
Roads
Stream
Water
City of Madison
Cities
Cities Not in MMSD
Villages
Villages Not in MMSD
Town Boundary
Towns
Dane
Vienna
Windsor
Deforest
Waunakee
Westport
Springfield
Sun Prairie
Burke
Madison
Maple Bluff
Middleton
Shorewood Hills
Lake Mendota
Lake Monona
Lake Wingra
Lake Waubesa
Lake Kegonsa
Monona
Blooming Grove
Cottage Grove
McFarland
Fitchburg
Verona
Dunn
Pleasant Springs
Oregon
(Not in MMSD)
Stoughton
(Not in MMSD)

Appendix A1
MMSD Collection System Evaluation (January 2009)

Appendix A1 contains excerpts from the *Madison Metropolitan Sewerage District Collection System Evaluation (January 2009)*, prepared by the Capital Area Regional Planning Commission (CARPC) in collaboration with MMSD. These excerpts serve as background for the methodologies employed to generate the population and wastewater flow forecasts that are used throughout this update to *MMSD's Collection System Facilities Plan*. CARPC's complete document is on file at MMSD's Administrative offices.

MMSD Collection System Evaluation

January 2009

Madison Metropolitan Sewerage District Collection System Evaluation 2008

Prepared by the staff of the Capital Area Regional Planning Commision in collaboration with the staff of the Madison Metropolitan Sewerage District

Table of Contents

Chapters

Appendices

List of Tables

List of Figures

Chapter 1 Introduction and Background

Background and Overview

The Madison Metropolitan Sewerage District (MMSD) was formed in 1930 to provide area-wide wastewater collection and treatment for the communities around Lakes Mendota and Monona. The District initially served a 50 square mile area including Madison, Monona, Maple Bluff, Shorewood Hills, and surrounding towns. By 2007, the District's service area had grown to 178 square miles, including all of the communities that formerly discharged treated wastewater to the Yahara River lakes. A map of MMSD's service area is shown in Figure 1-1.

All of the wastewater generated in the MMSD service area is collected and transmitted to the Nine Springs Wastewater Treatment Plant. Most of the treated effluent is discharged to Badfish Creek to divert treated wastewater around the Yahara River lakes. Some treated effluent is returned to Badger Mill Creek to offset the effects of inter-basin transfer on the base flow of Badger Mill Creek. The Badger Mill Creek outfall has a design capacity of 3.6 million gallons per day (mgd).

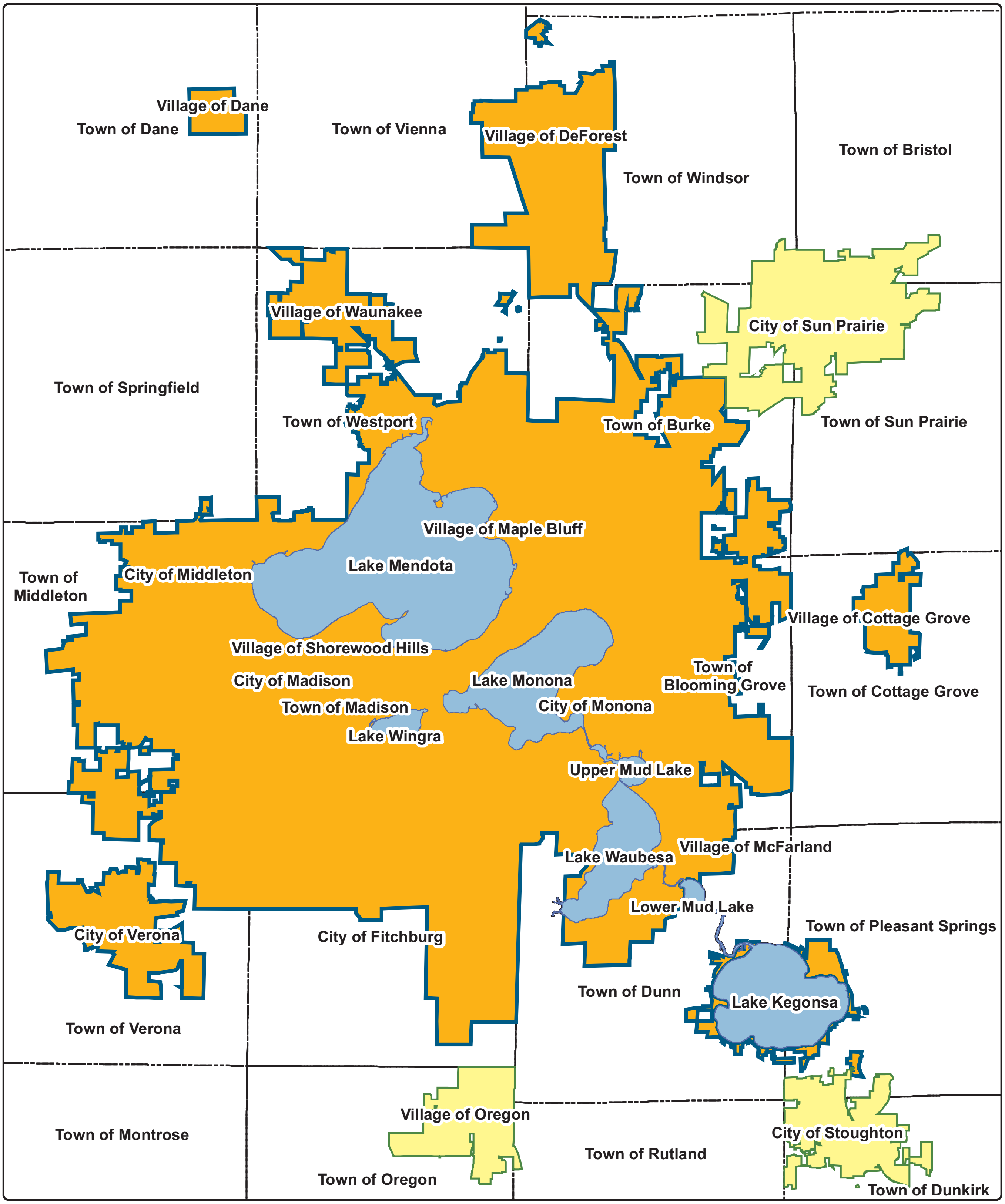
In 2007, the District's collection system included approximately 94.5 miles of gravity sewer, 29.3 miles of force main, and 17 major pumping stations. This collection system receives wastewater from the community sanitary sewer systems, and transmits the wastewater to the Nine Springs plant for treatment.

Previous Studies

Parts of the MMSD collection system date back to before 1900, and there have been numerous design studies of various sections or elements of the system over the years. The most significant system design studies and plans since 1960 are listed and described in Appendix A. These include:

- "Report on Sewerage and Sewage Treatment", 1961, Greeley and Hanson Engineers
- "Review of Project VII; West Side Collecting System", 1967, Mead & Hunt
- "Review of Project IV; Northeast Collecting System", 1969, Mead & Hunt
- "Report on Northeast Interceptor, Token Creek Extension", 1971, Mead & Hunt
- "Report on Sewage Treatment; Additions to the Nine Springs Sewage Treatment Works, 1971, Greeley and Hanson Engineers
- "Planning Report on the Fifth Addition to the Nine Springs Sewage Treatment Works", 1973, Dane County Regional Planning Commission (DCRPC)

1/06/2008



LEGEND

Outside District

Inside District

MMSD SERVICE AREA

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

FIGURE 1-1

In 1976, MMSD completed a major, comprehensive, facilities plan for the overall wastewater management needs for the entire district. As part of that facilities planning effort, the DCRPC and MMSD developed flow forecasts, evaluated the collection system, and considered regionalization or interconnection possibilities.

Several facilities plans, design studies, and reports concerning specific improvements and interceptor extensions were conducted between 1976 and 1986. These studies are summarized in Appendix A. They include design studies for:

- The Esser Pond Interceptor (1978)
- The Cottage Grove Extension of the Far East Interceptor (1978)
- The Mendota Extension of the Nine Springs Valley Interceptor (1979)
- The City of Middleton Sewer Plan (1982)
- The Facilities Plan for the Dunn-Kegonsa Sanitary District (1985)
- The Facilities Plan for the Town of Pleasant Springs portion of the Kegonsa service area (1986)
- The Design Study for the McFarland Relief Sewer (1986)

A comprehensive four-year study of the MMSD collection system was completed in 1993 with the publication of a report titled "MMSD Collection System Evaluation". The study, a collaboration between the DCRPC and MMSD, utilized socioeconomic data generated by the DCRPC for transportation planning, to forecast flows for small geographic areas (sub-basins).

Several additional design studies and reports concerning specific improvements and interceptor extensions were conducted between 1993 and 1998. These studies are also summarized in Appendix A. They include design studies for:

- The City of Verona connection to MMSD (1993)
- The Badger Mill Creek effluent return project (1993)
- The Morrisonville Urban Service Area connection to MMSD (1995)
- The Lien Interceptor Extension (1995)
- The Village of Dane connection to MMSD (1997)
- The Far East Interceptor – Door Creek Extension (1997)

In 1999, the DCRPC and MMSD collaborated on an update to the 1993 collection system evaluation. The update also utilized socioeconomic data generated by the DCRPC for transportation planning, to forecast flows for small geographic areas (sub-basins).

Since 1999, there have been additional design studies and reports addressing specific improvements. These studies are summarized in Appendix A. They include:

- Summary Design Memo West Interceptor Replacement at UW Campus (1999)
- Collection System Facilities Plan (2002)
- The Lower Badger Mill Creek Sewer Service Report (2005)
- Predesign Memo for West Interceptor Extension (2006)
- Design Memo for Southwest Interceptor North & South Legs Rehabilitation (2006)
- Design Report for Rehabilitation of Pumping Stations No. 6 and 8 (2007)
- Final Design Report Pump Station 13 and 14 Firm Capacity Improvements (2007)

- Northeast Interceptor – PS10 to Lien Road Relief / Replacement Planning Report (2008)
- Northeast Interceptor Truax Liner Engineering Design Report (2008)

Purpose and Approach to the Evaluation

The basic purpose of this collection system evaluation is to update the 1999 collection system evaluation, in order to anticipate future capacity problems and identify needs for the expansion or improvement of sections of the MMSD collection system. This evaluation follows a similar approach to the 1999 evaluation. The approach to the evaluation includes the following steps:

1. Pumping station service areas and sub-basin boundaries are updated based on additions and changes to the community sanitary sewer systems.
2. Historic wastewater flows and flow distributions throughout the system are analyzed.
3. Characteristics and capacities of elements of the collection system (pumping stations, force mains, and interceptor sewers) are determined.
4. Future wastewater flows are forecast, and estimated for specific sections and elements of the collection system. These forecasts are developed from, and are consistent with, population, land use, and socioeconomic forecasts in adopted plans, as required by state statutes and administrative rules governing MMSD operations and facilities planning. Baseline and future flows are allocated to sub-areas (pumping station service areas and sub-basins) served by individual pumping stations or interceptor sewer sections.
5. The capacities of specific facilities are compared with baseline and future estimated wastewater flows to determine where there could be future capacity problems, and to assess the need for expansion or improvements to the collection system.
6. The evaluation includes the determination of long-term (2060) growth and development potential and flow forecasts, in order to provide guidance in selecting design flows and capacities for facility improvements.

The function of this report is to allow MMSD to adequately plan its collection system improvements to ensure pollution control into the future. This necessitates a conservative, yet reasonable, approach to estimating future development levels and wastewater generation rates. The identification of any area as a potential future growth area in this report is not intended to predict or promote growth in these areas, nor is it intended to be an indication of the likelihood that any specific area will be approved as an expansion of the urban service area in the future.

This collection system evaluation reflects the input and contribution from the staffs of both the Madison Metropolitan Sewerage District and the Capital Area Regional Planning Commission (CARPC). MMSD staff was primarily responsible for providing technical data and information regarding historic flows and distribution, characteristics and capacities of collection system components and evaluation of the results and implications of the evaluation. CARPC staff was primarily responsible for socioeconomic data and forecasts, development of future flow forecasts, allocation of flows into pumping station service areas and sub-basins, and developing long-range forecasts of flows and service areas.

Chapter 2 Plans and Socioeconomic Forecasts

Plan Consistency Requirements

The collection system evaluation is based on and consistent with adopted local and regional plans in order to satisfy the requirements in state statutes and administrative rules for plan consistency. The purpose of the plan consistency requirement is to ensure that decisions regarding sewerage are coordinated and consistent with other related planning decisions made by other agencies or units of government. The intent is to avoid conflict between plans and decisions of different agencies and units of government, and to coordinate the pursuit of common regional land use and development objectives. These consistency requirements are particularly important in the case of sanitary sewer systems, since the location and extension of sanitary sewers is often a major factor in the location of urban development. Coordinated and consistent planning allows the provision and extension of sanitary sewer service in a cost effective and efficient manner. Conversely, planned control over the timing and extension of sanitary sewer service is an important technique in guiding urban development.

State administrative rules governing water quality planning and wastewater facilities planning generally require that facilities planning, funding, and regulatory decisions be consistent with approved area-wide water quality management plans. The state also requires that all sanitary sewer extensions be consistent with the sewer service areas delineated in area-wide water quality management plans in designated areas, including Dane County. In addition to state water quality planning consistency requirements, state statutes governing metropolitan sewerage districts (Chapter 200, Wisconsin Statutes) require that plans of metropolitan sewerage districts be consistent with adopted regional plans.

Land Use Plans

The *Vision 2020 Dane County Land Use and Transportation Plan* is the overall comprehensive land use and development policy framework and guide for Dane County. Dane County and the Dane County Regional Planning Commission adopted this plan in 1997. The *Dane County Water Quality Plan*, the official area-wide water quality management plan for Dane County, is based on and incorporates the land use and transportation plan as the basic regional land use framework for the water quality plan. The water quality plan outlines the planned sewer service areas throughout Dane County, which reflect the urban service areas and limited service areas outlined in the land use and transportation plan. These plans also reflect the delineation of environmental corridors or environmentally sensitive areas that are to be protected from the impacts of urban development. Sections of the water quality plan are revised and updated on a periodic basis.

In 1999, the Wisconsin Legislature passed comprehensive planning legislation (§66.1001, Wisconsin Statutes) often referred to as the "Smart Growth" law. The law requires all Wisconsin communities that exercise land use authority to adopt a comprehensive plan by ordinance by 2010, and for land use decisions to be consistent with the adopted plan. Comprehensive plans are to serve as a guide for the future development and redevelopment of the local governmental unit over a 20-year planning period. Local comprehensive plans, as well as neighborhood development plans, provided information on the amount and location of future development in a community. The comprehensive plans of the following communities were reviewed as part of this study:

- City of Fitchburg (draft, October 2008)
- City of Madison (adopted, January 2006)
- City of Middleton (adopted, November 2006)
- City of Monona (adopted, April 2004)
- City of Verona (draft, April 2008)
- Village of Maple Bluff (draft, November 2002)
- Village of Cottage Grove (amended, July 2008)
- Village of DeForest (amended, April 2008)
- Village of McFarland (adopted, March 2006)
- Village of Waunakee (adopted, June 2003)
- Town of Vienna (adopted, June 2006)
- Town of Westport (adopted, March 2004)
- Town of Windsor (adopted, September 2006)

Socioeconomic Forecasts

Urban Service Area Data

Forecasts of future population and basic socioeconomic data are used to anticipate future growth and infrastructure needs. There are currently seven urban service areas (USA) and five limited service areas (LSA) within the MMSD service area. Urban service areas are those areas in and around existing communities that are most suitable for urban development and capable of being provided with a full range of urban services. Urban services are the public services normally provided or needed in urban areas, including public water supply and distribution systems, sanitary sewerage systems, higher levels of police and fire protection, solid waste collection, urban storm drainage systems, streets with curbs and gutters, street lighting, neighborhood facilities such as parks and schools, and urban transportation facilities such as sidewalks, taxi service and mass transit. Limited service areas are areas where only a few urban services, such as sanitary sewer service, are intended to be provided to special or unique areas (remote correctional facilities, sanitary landfills, etc.) or to areas of existing development experiencing sewage disposal problems. These areas are not intended to receive a full range of urban services or additional urban development.

Table 2-1 illustrates historic and forecasted population for the MMSD service area. Population forecasts for urban and limited service areas in 2030 are developed by the CARPC by allocating countywide population forecasts, developed by the Demographic Services Center of the Wisconsin Department of Administration (DOA), to smaller areas. These official population forecasts are required for use for facilities planning purposes. The CARPC population forecasts are based on the DOA countywide population forecasts prepared in January 2004 from 2000 US Census data. The DOA population forecasts project population 30 years into the future at the county level, and 25 years into the future at the municipal level. Population forecasts for Dane County and for each of the urban service areas are expected to be updated in 2014 from 2010 US Census data. The 2060 forecasts were developed from a least squares linear regression and are not official forecasts. The official 2060 population forecasts will not be developed until 2030.

Table 2-1: Population Trends and Forecasts for the MMSD

	1980	1990	2000	2030	*2060*
Central USA	218,344	245,390	268,850	339,222	*404,204*
Cottage Grove USA	901	1,131	4,059	9,372	*11,798*
Dane USA			799	1,351	*1,594*
Fox Bluff LSA			240	240	*240*
Kegonsa LSA			2,228	2,252	*2,252*
Morrisonville USA			352	428	*464*
Northern USA	5,393	7,160	9,901	16,883	*23,825*
Verona USA			7,306	15,685	*20,178*
Waubesa LSA			2,027	2,027	*2,027*
Waunakee USA	3,890	5,899	9,000	17,458	*23,367*
Windsor Prairie LSA			509	509	*509*
Westport LSA			377	377	*377*
MMSD	228,528	259,580	305,648	405,804	*490,835*

Historic and forecasted population figures for three urban service areas that are outside, but nearby, the current MMSD service area are shown in Table 2-2.

Table 2-2: Population Trends and Forecasts for Other USAs

	1980	1990	2000	2030	*2060*
Oregon USA	3,927	4,528	7,514	13,106	*17,275*
Stoughton USA	8,256	9,265	12,671	18,609	*23,064*
Sun Prairie USA	13,306	15,481	20,533	36,211	*45,188*

Traffic Analysis Zone Data

In addition to population forecasts at the urban service area level, socioeconomic data is available in smaller analysis units called traffic analysis zones (TAZ). The Madison Area Transportation Planning Board (MATPB) developed the most recent TAZ data in 2000 for transportation planning. This data divides Dane County into over 1,000 analysis zones, which range in size from 3.7 acres in the central urban area, to over 6,000 acres in rural areas. The socioeconomic data associated with each zone includes population, number of households, and total employment for the year 2000 as well as forecasts for the year 2030.

TAZ Data Sources

The TAZ allocation of year 2000 population and household data is based on US Census data and Census block boundaries. The MATPB developed the TAZ 2030 population and household data by allocating the DOA/CARPC population forecasts to TAZ regions based on community comprehensive plans and neighborhood development plans. They noted in their *Regional Transportation Plan 2030*, that the allocation of forecasted 2030 growth is far less than a build-out scenario of the planned growth identified in local plans.

The year 2000 employment data is generated from CLARITAS, which did a phone book survey of places of business in Dane County in 1999. The MATPB adjusted the CLARITAS data, in some cases, to be consistent with Census employment data. The data was geocoded to allocate it to the TAZ regions. The DCRPC developed a 2030 employment forecast based upon a labor supply forecast using the DOA 2030 population forecast by age group. The MATPB allocated the 2030 employment forecast to TAZ regions using the 2000 ratio of population to employment, the location of planned employment centers, and the change in the population/employment ratio for each urban service area from 1990 to 2000.

TAZ Data Adjustments

The geographic area associated with the TAZ data does not always coincide with the pumping station sub-basin areas. In these cases, the TAZ region was divided to correspond with the pumping station sub-basin areas and the TAZ data was allocated between the resulting areas.

Allocation of the year 2000 TAZ data is based on a review and analysis of other available data sources including the 2000 Census data, 2000 land use inventory, geocoding of the 1999 CLARITAS data, 2000 aerial photography, and municipal property information. TAZ household data includes households on septic systems. The 2000 TAZ household count are adjusted, where necessary, to remove households on septic systems.

Allocation of the 2030 household and employment forecasts is based on a review and analysis of 2005 aerial photography and current parcel data to identify areas that have been developed since 2000. Areas available for development were also identified. After accounting for development that has already occurred, 2030 household and employment forecasts were generally allocated based on the proportion of developable area remaining.

Comprehensive Plan Data

The TAZ data was developed in 2000. Most communities have completed their comprehensive plans since 2000, or are currently working on them. Thus, the TAZ data does not always reflect current development plans, which results in uncertainty with the accuracy of the data. Comprehensive plans and neighborhood development plans usually contain data on the amount of household and sometimes employment growth associated with new development. Municipal development plans were reviewed and summarized to develop another forecast of 2030 household and employment. In addition to reviewing the comprehensive plans, meetings were held with each community to discuss their comprehensive plan projections and to get their forecasts for long term growth through 2060.

Table 2-3: Comprehensive Plan Growth Projections

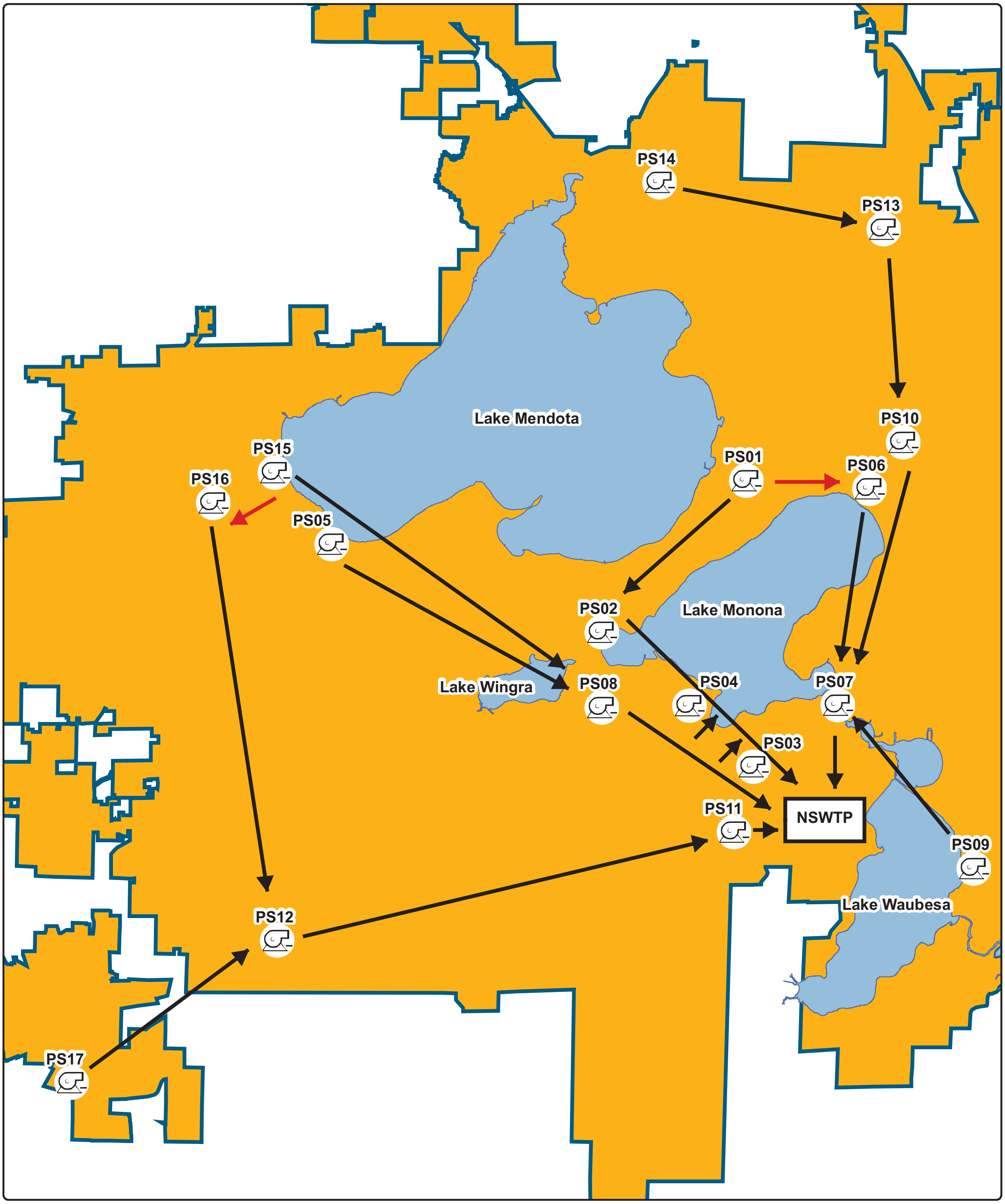
	2000		Comprehensive Plan Projection		
Municipality	**Households**	**Population**	**Year**	**Households**	**Population**
City of Fitchburg	8,262	20,501	2030	14,843	35,386
City of Madison	89,019	208,054	2030	117,900	264,850
City of Middleton	7,095	15,770	2025	9,173	19,608
City of Monona	3,768	8,018	2010		7,553
City of Verona	2,664	7,052	2030	12,798	31,099
Village of Cottage Grove	1,405	4,059	2025	3,476	9,560
Village of Dane				No plan available	
Village of DeForest	2,675	7,368	2025	4,479	11,865
Village of Maple Bluff	557	1,358			No information in plan
Village of McFarland	2,434	6,416	2025	3,910	9,776
Village of Shorewood Hills				No plan available	
Village of Waunakee	3,295	9,000	2025	5,513	14,855
Town of Vienna	461	1,294	2020	581	1,987
Town of Westport				No information in plan	
Town of Windsor	1,880	5,286	2025	2,412	7,101

Chapter 3 Wastewater Flows

Collection System Description

The MMSD collections system includes approximately 123.8 miles of interceptor sewer and force main, and 17 major pumping stations that transmit wastewater from municipal sewer systems in the MMSD service area to the Nine Springs Wastewater Treatment Plant. There are two points in the collection system where the wastewater can be routed in different directions. The flow from Pumping Station 15 can be routed to Pumping Station 8 or to Pumping Station 16. The flow from Pumping Station 1 can be routed to Pumping Station 2 or to Pumping Station 6. Figure 3-1 is a general flow diagram of the collection system. This schematic illustrates the current, normal operating mode of the system, in which the flow from Pumping Station 15 is routed to Pumping Station 8 and the flow from Pumping Station 1 is routed to Pumping Station 2. However, MMSD typically pumps an average of 150,000 gpd from Pumping Station 1 to Pumping Station 6 to flush the force main for maintenance.

10/23/2008



LEGEND

PumpStation

Flow Direction

Normal

Alternate

GENERAL FLOW DIAGRAM

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

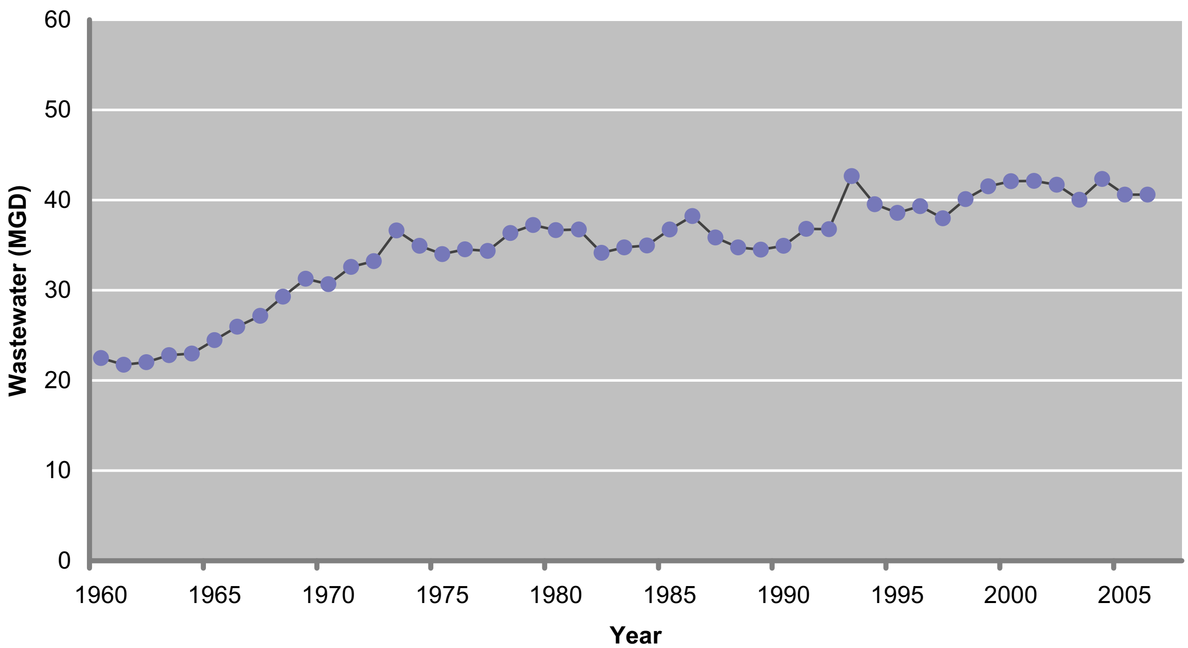
FIGURE 3-1

Historic Water Use and Wastewater Flows

MMSD Metering

Figure 3-2 illustrates the total average daily wastewater flow at the Nine Springs Wastewater Treatment Plant for the period from 1960 to 2007. The 50 mgd average daily flow design capacity currently used for the plant is based on the Seventh Addition design, completed in the early 1980's. A more specific measure of the design capacity of the treatment plant is determined by the design loading of each unit process used at the plant.

Figure 3-2: Average Daily Wastewater Flow at the Nine Springs Treatment Plant



MMSD measures the average daily flow of wastewater in the collection system with five venturi flow meters. They are located at the treatment plant, pumping stations 7, 8, 11, and downstream of the combined flow from pumping stations 2, 3, and 4. In addition, there are flow meters at pumping stations 1, 2, 3, 5, 6, 10, 16, and 17. MMSD calculates average daily flow at the remaining pumping stations from pump run time meters and pump capacities. These pumping station flow records are used as baseline flow data for each pumping station.

Water Utility Records

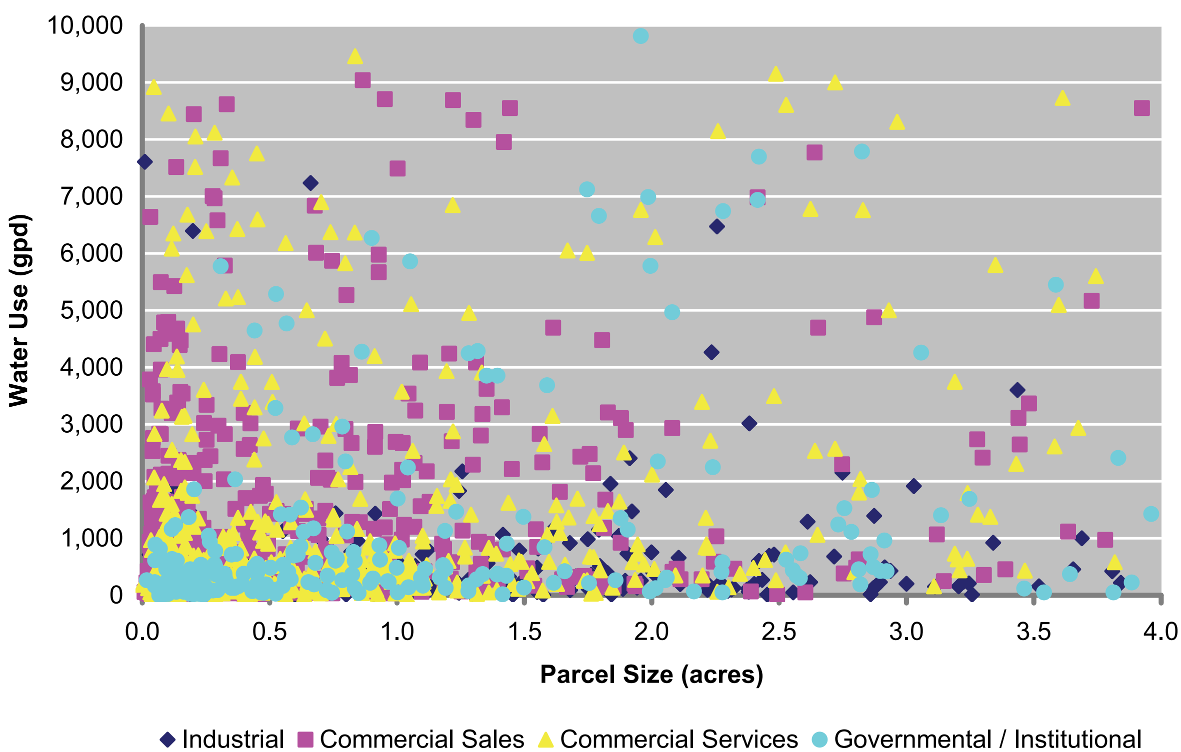
Annual water sales for every water utility are available from Public Service Commission reports. This data is used for estimating wastewater generation in municipalities served by the MMSD. The reports break down annual water sales data into the following categories:

- Residential (which includes single family and two family customers)
- Commercial (which includes commercial customers, multifamily apartments, and the UW)
- Industrial

- Public Authority Customers (which includes, local, state, and federal government customers)
- Sales for Resale (which includes sales to other water utilities)

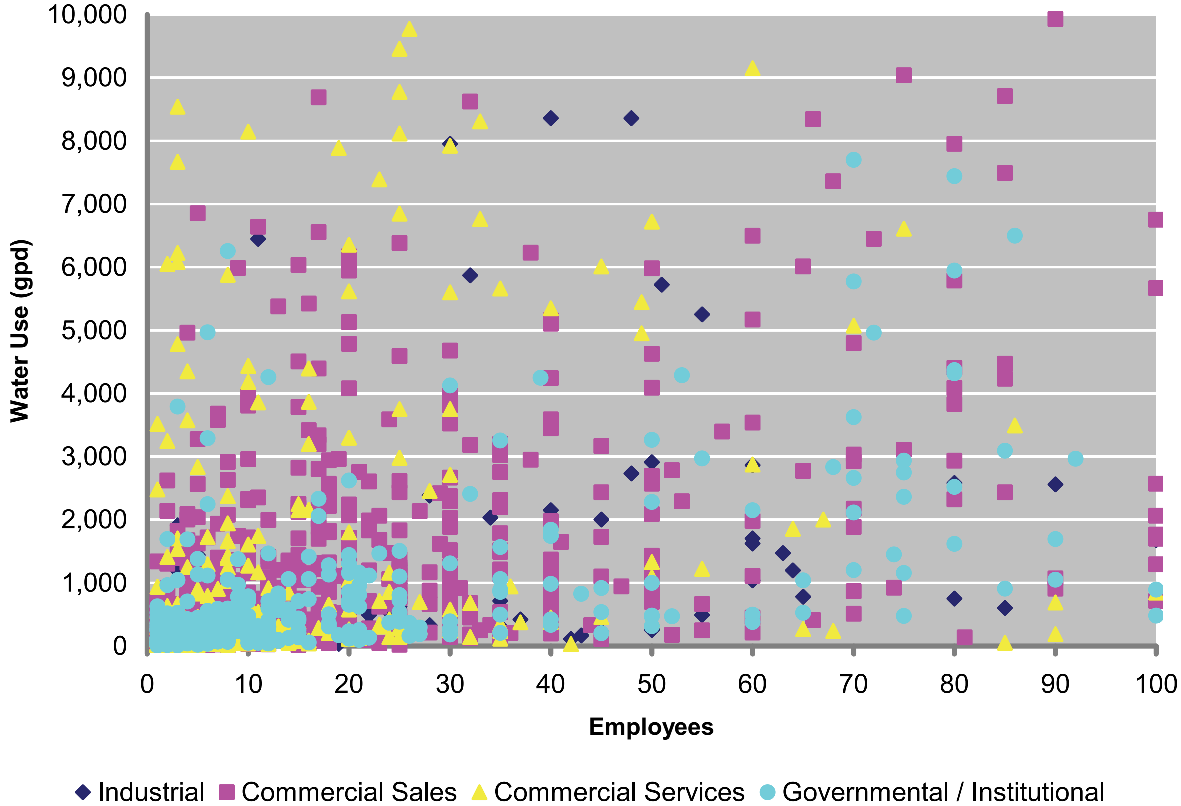
Year 2000 water use records were obtained for over 6,200 commercial, industrial, governmental, and multi-family accounts in the City of Madison. Over 2,000 non-residential accounts were matched to their parcel size and land use. The scatter plot in Figure 3-3 shows the generally weak correlation between water use and parcel size when grouped into industrial, commercial sales, commercial services, and governmental / institutional the land use categories. A linear regression of the data results in R^2 values ranging from 0.04 for governmental / institutional to 0.53 for industrial. A R^2 value near 1 indicates a strong correlation.

Figure 3-3: Water Use vs Parcel Size



The water use records of over 1,800 non-residential locations in the City of Madison were also matched to their number of employees and standard industrial classification in the CLARITAS data. The scatter plot in Figure 3-4 shows the correlation between water use and number of employees when grouped into industrial, commercial sales, commercial services, and governmental / institutional employment categories. A linear regression of the data results in R^2 values ranging from 0.18 for commercial sales to 0.81 for industrial. While this is a better correlation than water use per acre, it is still a weak correlation statistically.

Figure 3-4: Water Use vs Employees



Due to the weak correlation between wastewater generation and parcel size, as well as wastewater generation and number of employees, it was determined that the best methodology for estimating the non-residential component of wastewater generation is to estimate an average wastewater generation rate per employee for each pumping station service area based on actual water meter readings to the extent possible. GIS was used to identify industrial, commercial sales, commercial services, governmental, and institutional parcels based on their 2000 land use codes. Wastewater generation was determined from actual water meter readings for most parcels in the City of Madison. For other parcels, wastewater generation was estimated from CLARITAS employment data and median wastewater generation rates per employee by employment type. Water utility data on commercial, industrial, and public authority water sales were used as control totals for each community. Water meter data from golf courses, greenhouses, heating plants, and similar places were not used. These land uses consume large volumes of water that does not generate wastewater.

Some University of Wisconsin campus buildings have individual water meters. However most of the campus is provided water via the campus distribution system that is only metered in bulk at ten metering pits. The University of Wisconsin Facilities Planning and Management Department provided data from 1997 on the percentage distributed to each building. While this information is out-of-date, it is the best information available.

Pumping Station Service Area Baseline Wastewater Flows

The year 2000 is used as the baseline for the wastewater flow estimates, because actual Census and land use data are available for that year. The baseline wastewater flow estimates are composed of three main components: large sources (> 10,000 gpd), other (non-large) sources, and infiltration / inflow.

Pumping Station Sub-Basins

The collection system is divided into evaluation sections based on MMSD's July 2002 Gravity Interceptor Spreadsheet. Pumping station sub-basins boundaries are defined by which parcels contribute to each collection system section based on available municipal sewer data. There may be some inaccuracies in the pumping station sub-basin boundaries due to out of date or inconclusive municipal sewer data.

Large Wastewater Generators

Large wastewater generators are defined as those contributing greater than 10,000 gpd, based on metered water data. A list of water customers using 10,000 gpd or more in 2000 or 2005 was obtained from each water utility in the MMSD service area. Appendix B summarizes the large wastewater generators in 2000 by pumping station service area.

Other Wastewater Generators

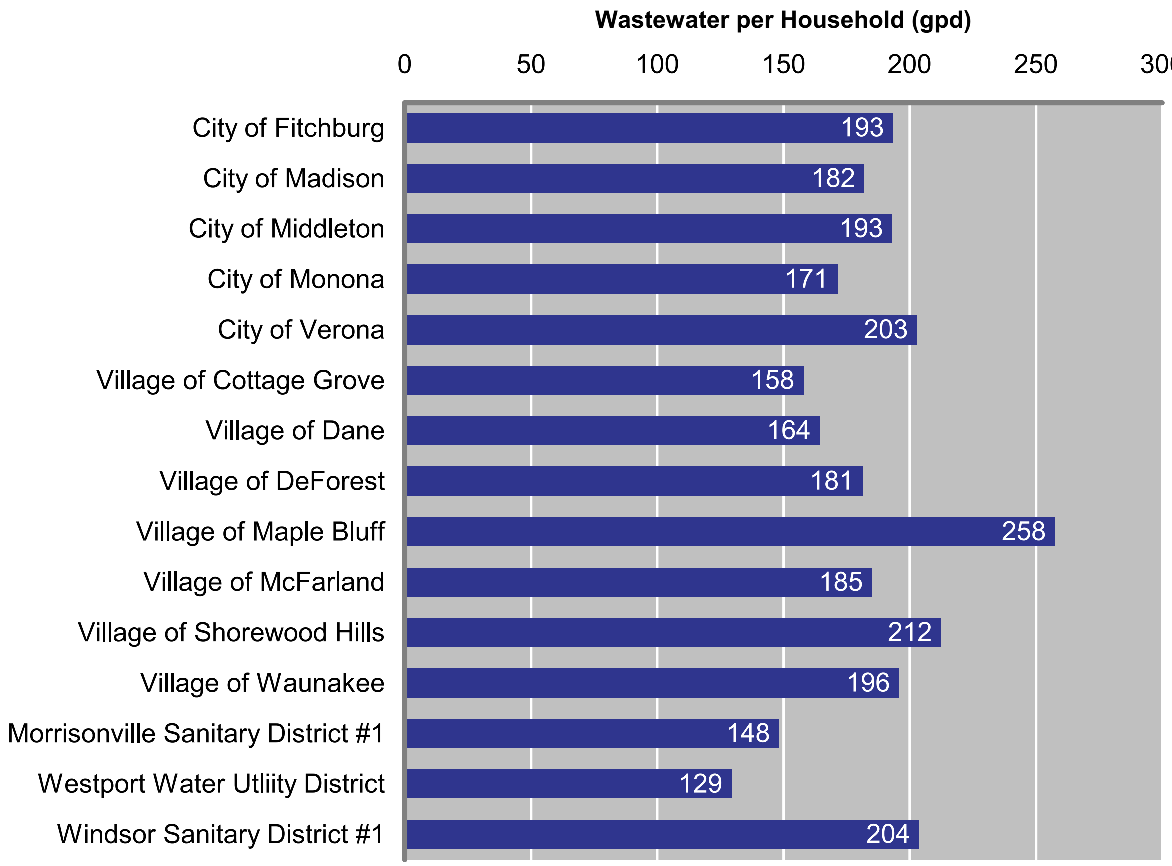
The non-large wastewater generation component is made up of household (single family, two-family, and multifamily) wastewater generation and employment wastewater generation.

Wastewater Generation per Household

Total annual residential (single family and two-family) water use, average number of residential customers, and monthly water pumping records were obtained from water utility reports for each municipality from 1997 to 2006. This data was used to estimate the water use per household per day for each month. To estimate the monthly wastewater generation per household it is necessary to estimate the amount of water used for lawn and garden watering.

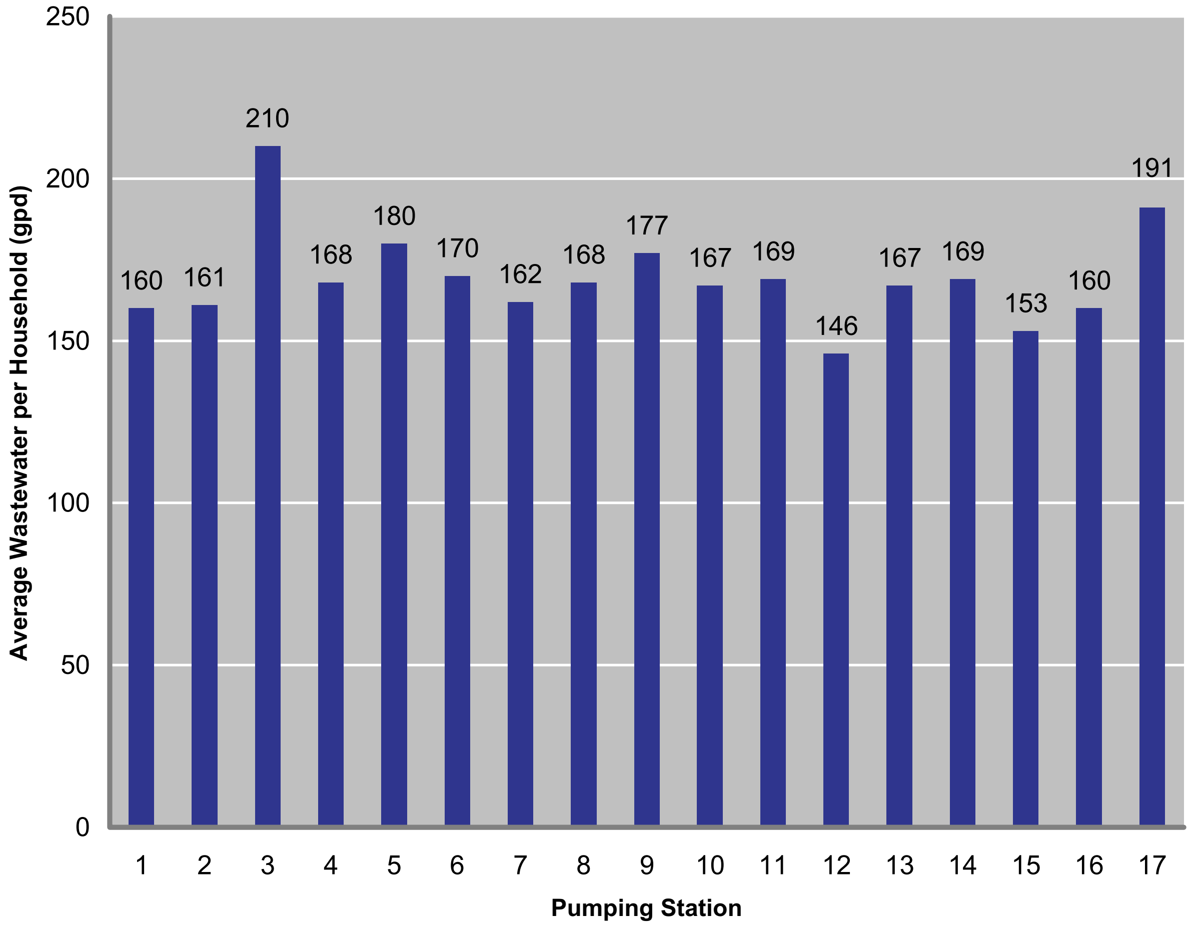
Appendix C contains the graphs of monthly residential water use plotted with monthly rainfall data and the Palmer Z drought index for each community. The assumption is that during periods of wet weather, there is little to no lawn or garden watering, thus residential wastewater generation can be approximated by water use during these wet periods. An average wastewater generation rate per household for 2000 was estimated for each municipality and water utility district as shown in Figure 3-5. The variation in the average household wastewater generation rate by municipality is likely due to differences in average household size, house size, and household water conservation (larger houses have larger housekeeping water use).

Figure 3-5: Residential Wastewater Generation



The amount of wastewater attributable to multifamily households is determined separately, since water utility reports classify multifamily customers as commercial rather than residential. A Geographic Information System (GIS) was used to identify single family, two-family, and multifamily parcels based on their 2000 land use codes. Single family and two family parcels are assigned the wastewater generation rate in Figure 3-5, based on their location. Multifamily wastewater generation was based on actual water meter readings for most parcels in the City of Madison. For other parcels, an average rate per multifamily unit was estimated from parcels with actual water meter readings. The number of multifamily units for each parcel was obtained from municipal property records, where available, or estimated from aerial photographs and census data where better information was not available. In general, the multifamily wastewater generation rates are lower than the single family / two-family wastewater generation rates, due to smaller units and the average household size being smaller. An average wastewater generation rate for all households (single family, two-family, and multifamily) was calculated for each pumping station service area by adding the wastewater allocation for the residential parcels and dividing by the number of households on those parcels. The results are shown in Figure 3-6.

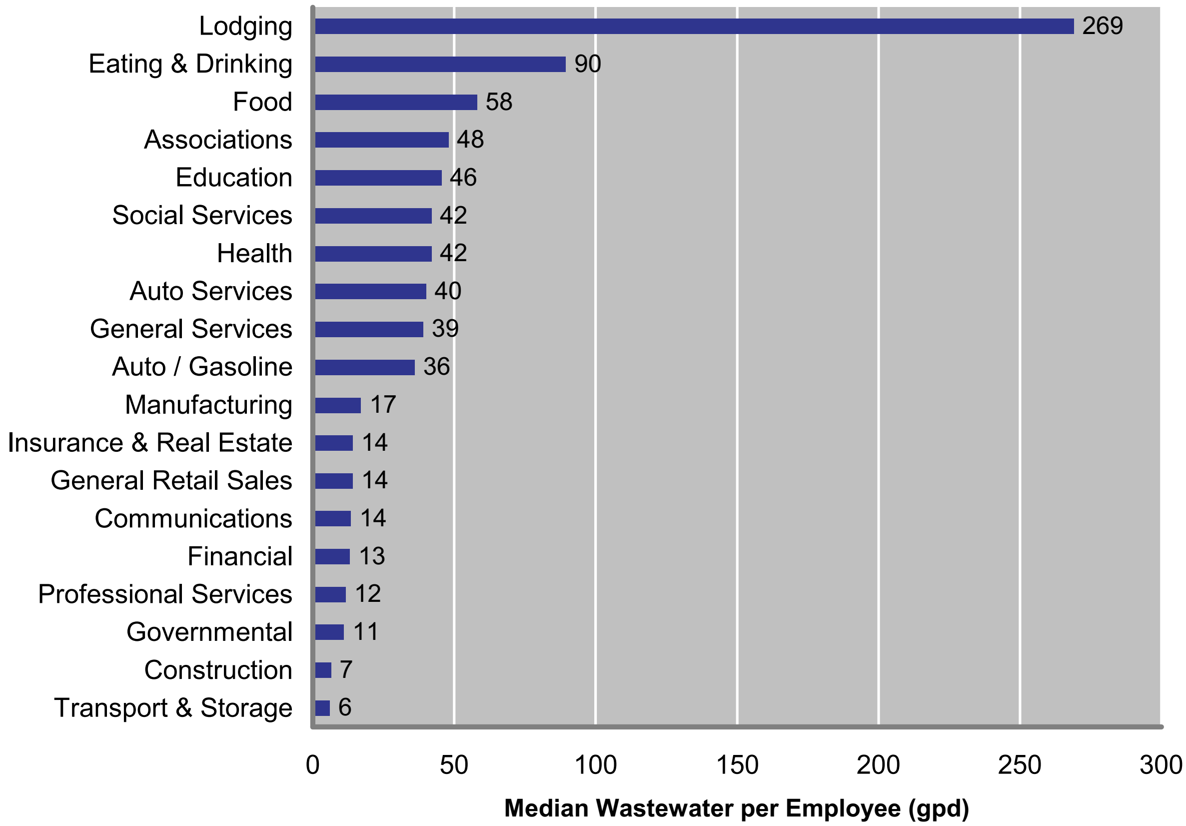
Figure 3-6: Household Wastewater Generation by Pumping Station



Wastewater Generation per Employee

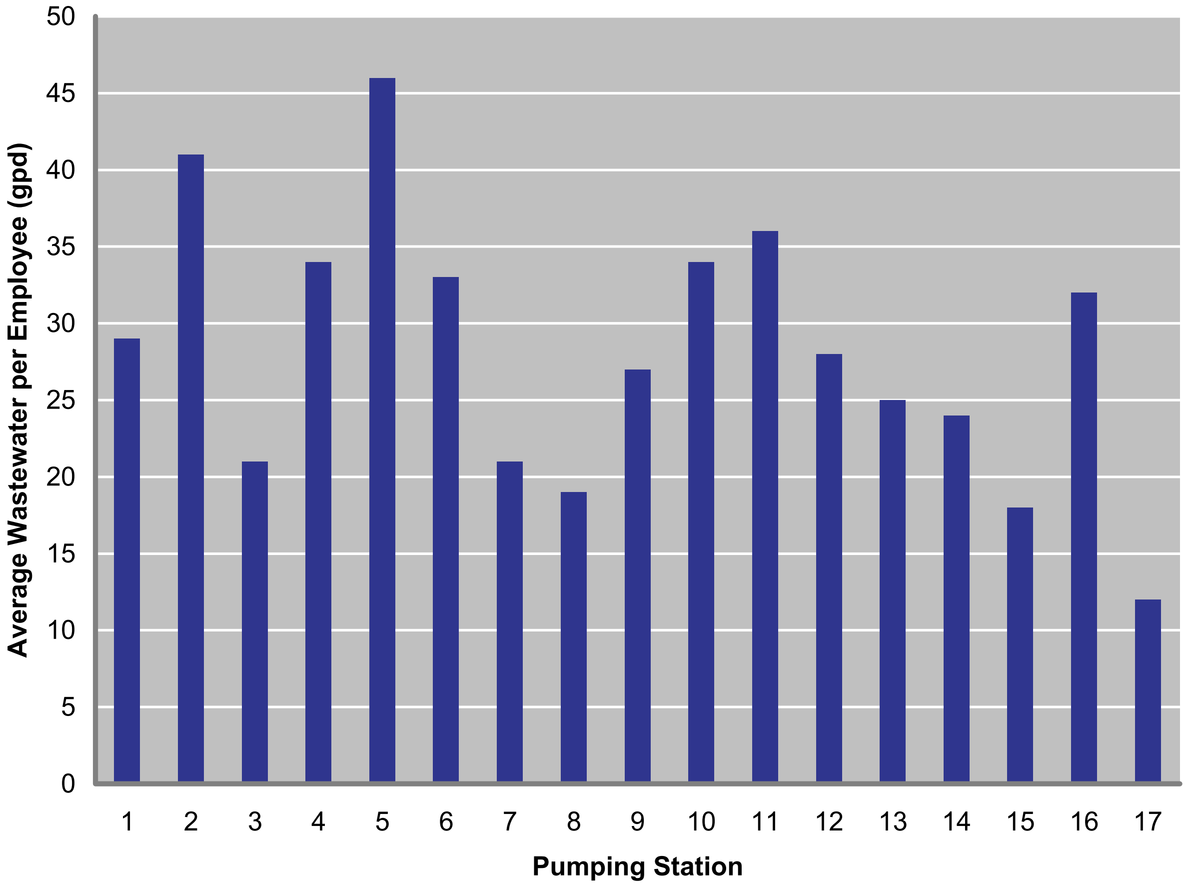
The median wastewater generation rates per employee were calculated for over 1,800 non-residential locations in the City of Madison by comparing their year 2000 water use records to their number of employees in the CLARITAS data. The results were grouped into 19 employment categories, based on their Standard Industrial Classification (SIC) codes. The median wastewater generation rate for each employment category is shown in Figure 3-7. There is a stronger correlation between wastewater generation and employment category, however there is still considerable variation within each category.

Figure 3-7: Median Wastewater Generation Rate by Employment Type



The total estimates of employment wastewater and employment were used to calculate an average wastewater generation rate per employee by pumping station as shown in Figure 3-8. These rates do not include large generators.

Figure 3-8: Average Wastewater Generation per Employee by Pumping Station



Infiltration / Inflow

The amount of infiltration and inflow (I/I) in each pumping station service area in 2000 is estimated by subtracting the estimate of the total wastewater flow for the pumping station service area from MMSD's pumping station flow records. In some cases, where the year 2000 meter data was suspect, the 2005 meter data was used or I/I was assumed to be 10%, which MMSD staff determined to be a reasonable average value. These instances are noted in the discussion of wastewater forecasts for each pumping station. I/I is distributed among the sub-basins proportional to sub-basin areas.

Pumping Station Service Area Wastewater Flow Forecasts

2030 Forecast Methodology

The basic approach to forecasting year 2030 wastewater flows is to use the estimated average household and employee wastewater generation rates in each pumping station for the baseline year and to multiply those rates by household and employment forecasts for each pumping station sub-basin. Two different 2030 forecast are generated, a TAZ forecast and an Uncertainty Factor (UF) forecast. This approach is based on several assumptions:

1. Future residential growth will have water use characteristics that are similar to current residential units (no dramatic housing type changes or substantial conservation measures). Because collection system studies are updated every 10 years, this assumption is expected to be valid in the context of other factors of safety used in operating and maintaining the collection system.
2. Future employment growth will be for businesses with characteristics that are similar to current businesses in each pumping station area. This assumption is expected to be valid in light of the fact that new wet industries and employment centers are screened by MMSD and CARPC (through the sewer extension review process) to ensure the availability of collection system capacity.

The use of uncertainty factors in flow forecasts (further discussed below) also accounts for some potential variability in future growth characteristics, so long as the variability is not dramatic.

TAZ Forecasts

In the TAZ forecasts, the TAZ regions are subdivided to coincide with pumping station sub-basins. The TAZ data within each sub-basin was added together to determine the household and employment forecast for the sub-basin.

Uncertainty Factor Forecasts

There is uncertainty about the accuracy of the TAZ data since it was developed before most of the current municipal comprehensive plans and neighborhood plans. The uncertainty factor (UF) forecast for households and employment looks at the development identified in these plans in addition to the TAZ data. Development plans were allocated to sub-basin areas based on the information contained in the plans and most current land use and aerial photography. In most cases future development was allocated proportionally to sub-basins based on available land area. Estimates of redevelopment are based on housing trends in each pumping station service area. To provide a conservative, upper end estimate, the higher projected value of households and employment between the TAZ data and the development plan data was used for the uncertainty factor forecasts.

Pumping Station Sub-Basins

The potential 2030 sub-basin boundaries are based on municipal development plans, meetings with municipal planners, and future municipal sewer location information where available. Contour data is used to estimate future sub-basin boundaries where more detailed information is not available. The pumping station sub-basin figures include the Wisconsin Department of Natural Resources data layer for wetlands larger than two acres. This information is included to illustrate areas where I/I may be a concern as well as areas that may not be developable. They cannot be used to delineate wetland boundaries.

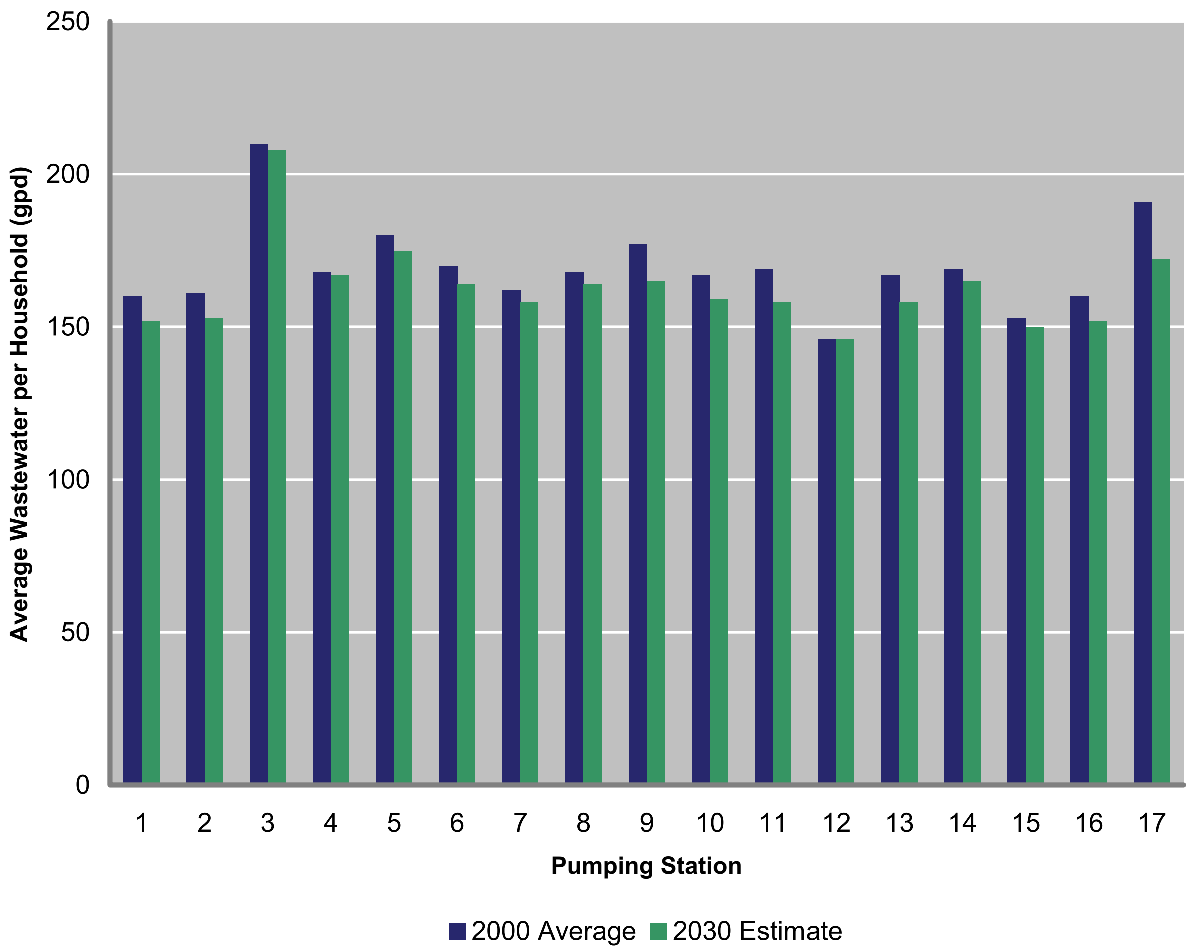
Large Wastewater Generators

The 2030 wastewater flow forecasts from large generators are assumed to remain at 2000 levels, except in those few cases where there was a significant decrease in water use from 2000 to 2005. These instances are noted in the discussion of wastewater forecasts for each pumping station.

Wastewater Generation per Household

The 2030 wastewater generation rate per household was assumed to decrease in most pump station service areas due to increased water conservation. The amount of the decrease was based on the trend of water use for each municipal water utility as shown in the graphs in Appendix C. The 2000 baseline and 2030 forecast of average household wastewater generation by pumping station is shown in Figure 3-9.

Figure 3-9: Household Wastewater Generation by Pumping Station



Wastewater Generation per Employee

The 2030 average wastewater generation rates per employee for each pumping station service area are assumed to remain at 2000 levels in the 2030 TAZ projections. There is some uncertainty that the average rates will not increase in the future for those pumping station service areas that are expected to have a large increase in employment by 2030. In the 2030 Uncertainty Factor (UF) projections the future wastewater generation rate per employee was increased in those areas where there will be a large increase in employment. A maximum rate of 46 gpd per employee was used, since this was the maximum average rate for any pumping station in 2000.

Infiltration and Inflow

Infiltration and inflow (I/I) is assumed to be the same in 2030 as it was in 2000, except where noted in the narrative for each pumping station.

2060 Forecast Methodology

The only purpose for deriving a 2060 flow forecast is to assist MMSD in sizing collection system pipes. While the treatment components of the wastewater system are designed with a 20-year planning horizon, pipes have an expected life of 50-70 years and need to be sized accordingly. There are no TAZ forecasts for households or employment in 2060. Therefore, a different methodology is used for the long-term, 2060 wastewater flow forecasts. The basic approach to forecasting year 2060 wastewater flows is to use an estimated average per capita wastewater generation rate for each pumping station (excluding large generators), and to multiply the rate by the 2060 population forecasts for each pumping station sub-basin. Wastewater from large generators is assumed to be the same in 2060 as it was in 2030. I/I is assumed to be the same in 2060 as it was in 2030. These components are added together to estimate the total 2060 wastewater forecast for each sub-basin.

Pumping Station Sub-Basins

The potential 2060 sub-basin boundaries are based on municipal development plans, meetings with municipal planners, and future municipal sewer location information where available. Contour data is used to estimate future sub-basin boundaries where more detailed information is unavailable.

2060 Population Forecast

The 2030 Uncertainty Factor forecast is used as the baseline number of households for the 2060 forecast. The increase in households for each sub-basin from 2030 to 2060 is estimated from the long-range development plans in each community. These are added together to estimate the number of households in each sub-basin in 2060. The 2060 population forecast for each sub-basin is then calculated. It assumes that the average household size (the number of persons per household) in each sub-basin forecast in the 2030 TAZ data will remain the same through 2060.

Wastewater Generation per Capita

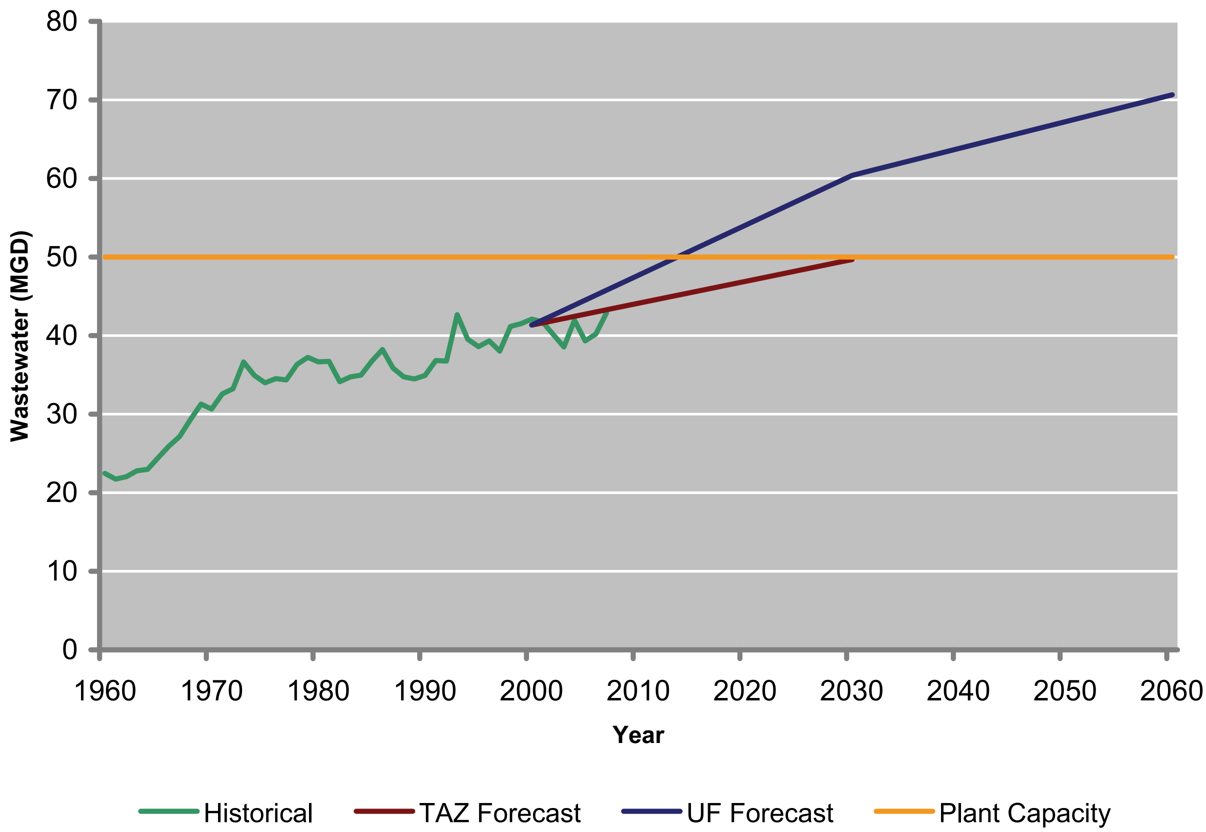
The wastewater generation rate per capita for other (non-large) sources in each sub-basin is calculated from the 2030 UF forecasts. The 2030 UF wastewater forecast for each sub-basin from non-large sources is divided by the sub-basin population to determine the per capita rate. The 2060 wastewater generation rate per capita is assumed to be the same as the 2030 UF wastewater generation rate per capita.

Cumulative Forecasts

The cumulative 2030 TAZ forecast projects the 2030 MMSD service area to contain 187,382 households and a population of 431,110. This is reasonably consistent with (within 7% of) the 2030 population estimate of 405,804 from Table 2-1, based on the CARPC / DOA population forecasts for the area. The cumulative average daily wastewater flow for the 2030 TAZ forecast is 49.68 mgd, near the current rated design capacity of the Nine Springs Treatment Plant of 50 mgd average daily flow.

The cumulative 2030 UF forecast projects the 2030 MMSD service area to contain 242,551 households and a population of 554,654. This is considerably higher (approximately 37% more) than the CARPC / DOA official population forecasts for the area. It is unlikely that all of the development projected by the 2030 UF forecast will occur by 2030. However it is probable that some of the sub-basin areas will develop to the levels projected in the 2030 UF forecast by 2030.

Figure 3-45: WWTP Meter Data vs Wastewater Forecasts



Page intentionally blank

Chapter 4 Collection System Capacity Evaluation

Overall Analysis Approach

The collection system is divided into evaluation sections based on MMSD's 2002 Collection System Facilities Plan. A section is defined as a distinct part of portion of the system that has similar hydraulic components, a generally larger division related by system capacity. The average wastewater flow for each pumping station sub-basin is added cumulatively as the flow from each sub basin enters the collection system. Peak flows were determined by applying the standard MMSD peaking factor formula, shown in Equation 1, to the cumulative average flows. A minimum peak factor of 2.5 and a maximum peak factor of 4.0 are used.

Equation 1: Peaking Factor

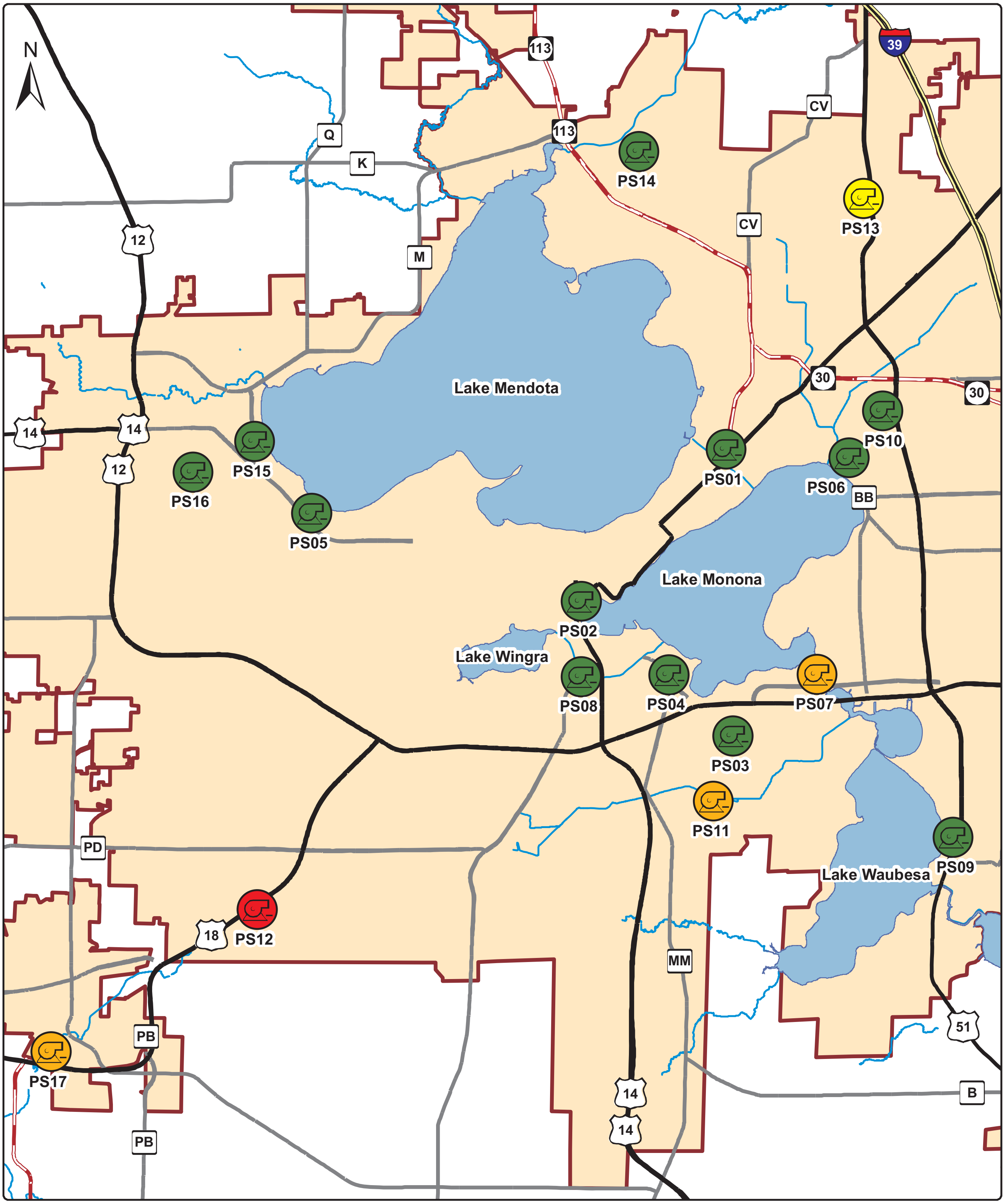
$$PeakFactor = \frac{4}{AverageFlow^{0.158}}$$

The peaking factors used for each sub-basin and the resulting cumulative peak flows are included in Appendix E. Detailed information on the hydraulic and pipe characteristics (i.e. invert elevation, size, slope, pipe material, friction factor and capacity) of each manhole segment from MMSD's collection system database is in Appendix G. A segment is defined as one run of sewer, the smallest part of the system, beginning at one manhole and ending at the next. Pumping station characteristics are described in Table 4-3. The capacities given for Pumping Station 6 and Pumping Station 8 are the planned capacities of these two stations after they are rehabbed in 2009 / 2010. Nominal force main capacities are based on a velocity of 8 feet per second, except for the force main from Pumping Station 7. The Pumping Station 7 force main capacity is 55 mgd based on transients.

Peak wastewater flows for 2010 and 2020 are interpolated from 2000 and 2030 UF wastewater flow projections. The 2030 UF projections are used for the capacity analysis rather than the 2030 TAZ projections because they are higher, and therefore more conservative. In cases where sub-basins were added or removed from the pumping station service area between 2000 and 2030, the peak wastewater flows for 2010 and 2020 are interpolated from 2000 to the wastewater flow projection in the year of the sub-basin change and from the year of the sub-basin change to the 2030 UF wastewater flow projection. Peak wastewater flows for 2060 are calculated from the 2060 UF wastewater flow projections as shown in Appendix E.

Figures 4-1 through 4-24 show various sections of the MMSD collection system. Each section of the collection system is color-coded based on the date range when that section is projected to reach capacity. Summary tables including the collection system sections, nominal capacity, and peak flow projections follow each figure.

12/22/2008



Capacity Reached

- 2000 - 2010
- 2010 - 2020
- 2020 - 2030
- > 2030

PUMPING STATION FIRM CAPACITY USING TAZ FLOWS

MADISON METROPOLITAN SEWERAGE DISTRICT COLLECTION SYSTEM EVALUATION

2008

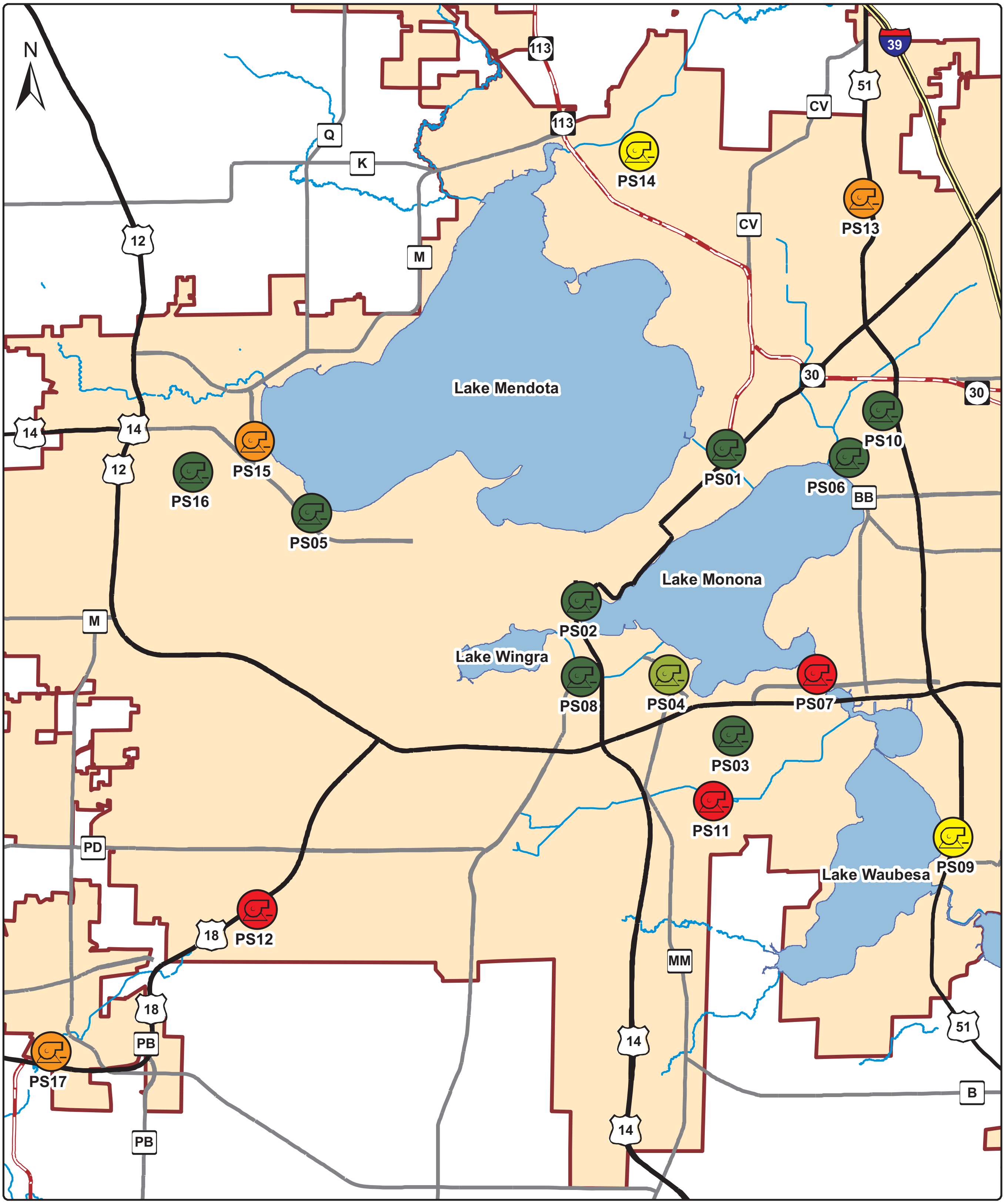
0 1.25 2.5 5 Miles

FIGURE 4-1

Table 4-1: Pumping Station Capacity Evaluation – TAZ Flows

Pumping Station	Station Capacity		*Peak Flows (mgd)* / Percent Firm Capacity								Firm Capacity Reached
	Maximum	Firm	2000		2010 TAZ		2020 TAZ		2030 TAZ		
1	38.3	35.3	*19.1*	54%	*15.7*	44%	*15.9*	45%	*16.1*	46%	> 2030
2	41.0	41.0	*28.7*	70%	*26.4*	64%	*26.7*	65%	*27.1*	66%	> 2030
3	1.5	1.5	*1.2*	83%	*1.2*	83%	*1.3*	85%	*1.3*	86%	> 2030
4	4.2	4.2	*3.9*	93%	*3.9*	92%	*3.9*	93%	*3.9*	94%	> 2030
5	3.6	3.6	*2.6*	72%	*2.6*	71%	*2.4*	66%	*2.4*	67%	> 2030
6	24.2	24.2	*5.8*	24%	*6.0*	25%	*6.2*	25%	*6.4*	26%	> 2030
7	45.0	39.0	*35.1*	90%	*39.0*	100%	*42.5*	109%	*45.9*	118%	2010-2020
8	34.1	34.0	*25.1*	74%	*24.0*	71%	*24.1*	71%	*24.3*	71%	> 2030
9	4.5	4.5	*3.2*	72%	*3.6*	79%	*3.9*	87%	*4.2*	94%	> 2030
10	42.2	42.2	*23.1*	55%	*25.2*	60%	*27.2*	64%	*29.3*	69%	> 2030
11	31.2	25.5	*22.0*	86%	*25.6*	100%	*29.1*	114%	*32.5*	127%	2010-2020
12	23.5	16.6	*14.1*	85%	*17.3*	104%	*20.3*	122%	*23.2*	140%	2000-2010
13	20.2	20.0	*17.0*	85%	*18.5*	93%	*20.0*	100%	*21.6*	108%	2020-2030
14	15.6	15.0	*11.0*	73%	*12.2*	82%	*13.4*	89%	*14.6*	97%	> 2030
15	8.8	5.8	*5.4*	93%	*5.0*	86%	*5.3*	92%	*5.6*	97%	> 2030
16	18.7	18.7	*5.7*	30%	*7.4*	40%	*7.6*	41%	*8.5*	46%	> 2030
17	4.6	4.6	*2.7*	58%	*3.4*	74%	*6.3*	136%	*7.8*	170%	2010-2020

1/08/2009



Capacity Reached

- > 2060
- 2030 - 2060
- 2020 - 2030
- 2010 - 2020
- 2000 - 2010

PUMPING STATION FIRM CAPACITY USING UNCERTAINTY FACTOR FLOWS

MADISON METROPOLITAN SEWERAGE DISTRICT COLLECTION SYSTEM EVALUATION

2008

0 1.25 2.5 5 Miles

FIGURE 4-2

Table 4-2-: Pumping Station Capacity Evaluation – Uncertainty Factor Flows

Pumping Station	Station Capacity		*Peak Flows (mgd)* / Percent Firm Capacity										Firm Capacity Reached
	Maximum	Firm	2000		2010 UF		2020 UF		2030 UF		2060 UF		
1	38.3	35.3	*19.1*	54%	*16.0*	45%	*16.4*	47%	*16.9*	48%	*18.5*	52%	> 2060
2	41.0	41.0	*28.7*	70%	*27.3*	66%	*28.4*	69%	*29.5*	72%	*33.7*	82%	> 2060
3	1.5	1.5	*1.2*	83%	*1.3*	86%	*1.3*	89%	*1.4*	93%	*1.4*	93%	> 2060
4	4.2	4.2	*3.9*	93%	*4.0*	94%	*4.0*	96%	*4.1*	97%	*4.3*	102%	2030-2060
5	3.6	3.6	*2.6*	72%	*2.4*	68%	*2.5*	69%	*2.5*	70%	*2.7*	74%	> 2060
6	24.2	24.2	*5.8*	24%	*6.0*	25%	*6.2*	25%	*6.4*	26%	*7.1*	30%	> 2060
7	45.0	39.0	*35.1*	90%	*43.0*	110%	*50.6*	130%	*59.9*	153%	*72.3*	185%	2000-2010
8	34.1	34.0	*25.1*	74%	*25.0*	73%	*25.6*	75%	*26.2*	77%	*28.0*	82%	> 2060
9	4.5	4.5	*3.2*	72%	*3.9*	86%	*4.4*	98%	*4.9*	110%	*6.4*	142%	2020-2030
10	42.2	42.2	*23.1*	55%	*27.3*	65%	*31.3*	74%	*35.3*	84%	*38.7*	92%	> 2060
11	31.2	25.5	*22.0*	86%	*27.9*	109%	*33.6*	132%	*39.2*	154%	*44.8*	176%	2000-2010
12	23.5	16.6	*14.1*	85%	*19.3*	116%	*24.2*	146%	*28.9*	174%	*32.3*	195%	2000-2010
13	20.2	20.0	*17.0*	85%	*20.0*	100%	*22.9*	115%	*25.8*	129%	*29.4*	147%	2010-2020
14	15.6	15.0	*11.0*	73%	*12.8*	85%	*14.5*	97%	*16.2*	108%	*20.2*	134%	2020-2030
15	8.8	5.8	*5.4*	93%	*5.9*	102%	*6.3*	108%	*6.7*	115%	*7.6*	131%	2010-2020
16	18.7	18.7	*5.7*	30%	*8.3*	44%	*8.8*	47%	*10.2*	55%	*10.6*	56%	> 2060
17	4.6	4.6	*2.7*	58%	*3.9*	85%	*8.7*	188%	*11.3*	245%	*13.6*	295%	2010-2020

Table 4-3: Pumping Station Characteristics

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
1	104 N. First St. Madison 1950	1A (or 1B) + 1D 26,600 gpm 38.3 mgd	1A (or 1B) + 1C 24,475 gpm 35.3 mgd	1A	14,100	134	890	600	2005	1A & 1B are the new Crosstown pumps and pump to PS#2. 1C & 1D are the old pumps (with re-wound motors) and pump to PS#6. 1A or 1B can pump with 1C or 1D. Pump 1D rating per 6/96 venturi analysis.
				1B	14,100	134	890	600	2005	
				1C	10,375	31	580	150	1950	
				1D	12,500	41	585	150	1950	
2	833 W. Washington Brittingham Park Madison 1964	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	Any 3 pumps 9,500 gpm (ea) 28,500 gpm total 41.0 mgd total	2A	16,500	108	890	600	2005	All pumps were replaced during station rehab in 2005. All 4 pumps are equal size. 2A & 2B are VFD and 2C & 2D are constant speed. Data reflects new 36" FM online in 2001.
				2B	16,500	108	890	600	2005	
				2C	16,500	108	890	600	2005	
				2D	16,500	108	890	600	2005	
3	Nine Springs WWTP 1959	3A or 3B 1050 gpm 1.51 mgd	3A or 3B 1050 gpm 1.51 mgd	3A	1,050	60	1175	30	1980	New 36" FM (Aug. 2001) has no significant impact on capacities. New Headworks (Aug. 2005) adds ~4' static. New impellers (13.0" vs 12.2") installed in 2004.
				3B	1,050	60	1175	30	1980	
4	620 John Nolen Drive, Madison 1967	4B or 4C 2,900 gpm 4.2 mgd	4B or 4C 2,900 gpm 4.2 mgd	4A	2,000	47	860	40	1967	Peak capacities include new 36" FM (8/2001), new Headworks (8/2005), WSEL=32, wetwell @ -7, PS3 @1,000gpm, PS2 @ 28,500 gpm. New impellers (17.0" vs 16.25") in 4B&4C-2004.
				4B	2,900	95	1160	100	1967	
				4C	2,900	95	1160	100	1967	
5	Spring Harbor Park Madison 1996	Any two pumps 2,480 gpm 3.6 mgd	Any two pumps 2,480 gpm 3.6 mgd	5A	1,800	75	1256	50	1996	Variable speed units. Ratings per 1996 startup testing at 106% speed.
				5B	1,800	75	1256	50	1996	
				5C	1,800	75	1256	50	1996	

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
6	402 Walter Street Madison 1950	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	Any 3 pumps 5,600 gpm (ea) 16,800 gpm total 24.2 mgd total	6A	7,700	45	890	125	2009	All ratings shown are **after** station rehabilitation in 2009. All 4 pumps are equal size. 6A is variable speed and 6B-6D are constant speed.
				6B	7,700	45	890	125	2009	
				6C	7,700	45	890	125	2009	
				6D	7,700	45	890	125	2009	
7	6300 Metropolitan Lane, Monona 1950	7C + 7D 31,250 gpm 45.0 mgd	7B + 7C 27,100gpm 39.0 mgd	7A	11,500	47	695	60	1950	Dual pump ratings per 1996 high flow data. No major pump changes since station was rehabbed in 1992.
				7B	15,200	53	705	250	1992	
				7C	19,400	59	705	350	1992	
				7D	19,400	59	705	350	1992	
8	901 Plaenart Dr. Madison 1964	8C+8D+8A(or 8B) 7,900 gpm (ea) 23,700 gpm total 34.1 mgd total	8A+8B+8C(or 8D) 7,850 gpm (ea) 23,600 gpm total 34.0 mgd total	8A	12,800	58	585	250	2009	All ratings shown are **after** station rehabilitation in 2009. 8A&8B (formerly 8C&8D)are variable speed and equal size. 8C&8D (formerly 6C&6D) are constant speed and equal size.
				8B	12,800	58	585	250	2009	
				8C	13,900	60	705	300	2009	
				8D	13,900	60	705	300	2009	
9	4612 Larsen Beach Road, McFarland 1962	Any two pumps 3,150 gpm 4.5 mgd	Any two pumps 3,150 gpm 4.5 mgd	9A	2,300	51	1185	40	2003	All American Well Works pumps were replaced with Fairbanks Morse Built-Togethers (5434S) between 2002 & 2007. New pumps are same capacity as old.
				9B	2,300	51	1185	40	2007	
				9C	2,300	51	1185	40	2002	
10	192 Regas Road Madison 1965	Any 2 pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	Any 2 pumps 14,700 gpm (ea) 29,400 gpm total 42.2 mgd total	10A	18,900	94	890	600	2005	All pumps were replaced during station rehab in 2005. All 3 pumps are equal size. 10A & 10B are VFD and 10C is constant speed. Pumps are currently not allowed to operate in parallel.
				10B	18,900	94	890	600	2005	
				10C	18,900	94	890	600	2005	
11	4760 E. Clayton Rd. Town of Dunn 1966	11C + 11D 21,700 gpm 31.2 mgd	11C or 11D + 11B 17,700gpm 25.5 mgd	11A	6,400	43	860	125	1950	11A relocated to PS11 from PS7. 11C & 11D individual capacities per testing in 2/2008. Firm capacity (11C or 11D in parallel with 11B) per testing in 2/2008.
				11B	9,100	49	880	150	1982	
				11C	13,300	57	705	250	1982	
				11D	13,300	57	705	250	1982	

Pumping Station No.	Station Location and Year Placed On-Line	Pumping Station Capacity		Individual Pump No.	Estimated Pump Performance at Turn-On Elevation		Nominal speed	Nominal Motor Size	Year Pump On-line	Comments
		Maximum	Firm		Q (gpm)	H (ft.)	(rpm)	(HP)		
12	2739 Fitchrona Rd. Town of Verona 1969	12C + 12D 16,300 gpm 23.5 mgd	12C or 12D + 12B 11,500 gpm 16.6 mgd	12A	3,400	44	700	50	1969	Firm capacity (12C or 12D in parallel with 12B) per estimate in 2/2008.
				12B	7,200	48	885	100	1969	
				12C	9,000	48	880	150	1982	
				12D	9,000	48	880	150	1982	
13	3634 Amelia Earhart Drive, Madison 1970	13C 14,000 gpm 20.2 mgd	13A + 13B 13,900 gpm 20.0 mgd	13A	8,200	16	585	50	2008	Pump 13A replaced in 2008. 13A matches 13B. Pump 13B re-built, including new impeller (same size). Pump 13C unchanged.
				13B	8,200	16	585	50	1970	
				13C	14,000	20	505	100	1970	
14	5000 School Rd. Madison 1971	14C 10,800 gpm 15.6 mgd	14A + 14B 10,400 gpm 15.0 mgd	14A	7,200	24	705	60	2008	Pump 14A replaced in 2008. 14A matches 14B. Pump 14B re-built, including larger impeller (17.375" vs. 16.5"). Pump 14C re-built with larger impeller (22.0" vs. 20.5").
				14B	7,200	24	695	60	1971	
				14C	10,800	29	585	100	1971	
15	2115 Allen Blvd. Madison 1975	15C 6,100 gpm 8.8 mgd	15A 4,000 gpm 5.8 mgd	15B	3,000	68	885	100	1975	Pump ratings shown are for pumping to the West Int. and PS8. See note (ii).
				15A	4,000	76	885	100	1975	
				15C	6,100	100	885	200	1982	
16	1303 Gammon Rd. Middleton 1982	Any two pumps 13,000 gpm 18.7 mgd	Any two pumps 13,000 gpm 18.7 mgd	16A	7,000	182	1185	500	1982	
				16B	7,000	182	1185	500	1982	
				16C	7,000	182	1185	500	1982	
17	405 Bruce Street Verona 1996	Any two pumps at 118% speed 3,200 gpm 4.6 mgd	Any two pumps at 118% speed 3,200 gpm 4.6 mgd	17A	2,300	115	1290	100	1996	Variable speed pumps. Nominal 100% speed=1190 rpm. Ratings shown are for 118% max speed. Incorporated dual pumping in 2007. Capacity based on 2008 testing
				17B	2,300	115	1290	100	1996	
				17C	2,300	115	1290	100	1996	

Notes:

i) Pump ratings are based on analysis of pump performance curves and system curves, and where available, flow meter data.

ii) For PS15 diversion to PS16, pump ratings are as follows: 15B) 1500 gpm @ 84' 15A) 3000 gpm @ 87' 15C) 6500 gpm @ 96'.

iii) Pump ratings are per pump turn-on level (high wetwell) and C=130.

iv) Due to limited downstream interceptor capacity, PS10 is currently limited to one pump operation (dual pumping is not allowed).

Chapter 5 Issues and Alternatives

There is the potential to postpone or avoid the projected need for capacity improvements if the projected flow increases can be offset by reducing infiltration and inflow, reducing per capita wastewater generation, or directing development to areas with excess capacity.

Infiltration and Inflow

Average daily infiltration and inflow in 2000 was estimated to be 7.2 mgd or approximately 17% of the total estimated wastewater flow.

Table 5-1 compares the municipal and sanitary district wastewater generation from MMSD records to their water sales from water utility reports to the Public Service Commission. It is expected that the ratio of wastewater to water sales would be less than 1, because some water uses do not contribute to wastewater, these include; lawn and garden watering, swimming pools, cooling towers, etc. A wastewater to water sales ratio of more than 1 indicates a problem with infiltration and inflow in that community, unless there are a large number of households with private water wells, but public sanitary sewer.

Table 5-1: Comparison of Wastewater Generation to Water Sales

Municipality / Sanitary District	2005 Wastewater (gpd)	2005 Water Sales (gpd)	Ratio Wastewater / Water Sales
City of Fitchburg	1,682,000	2,036,219	0.83
City of Madison	26,447,000	28,064,800	0.94
City of Middleton	1,694,000	2,203,589	0.77
City of Monona	898,000	925,299	0.97
City of Verona	727,000	988,315	0.74
Village of Cottage Grove	583,000	423,512	1.38
Village of Dane	55,000	57,485	0.96
Village of DeForest	623,000	640,414	0.97
Village of Maple Bluff	161,000	232,512	0.69
Village of McFarland	553,000	568,345	0.97
Village of Shorewood Hills	179,000	176,625	1.01
Village of Waunakee	1,243,000	1,240,414	1.00
Morrisonville Sanitary District	48,000	23,562	2.04
Token Creek Sanitary District	54,000	39,310	1.37
Windsor Sanitary District #1	192,000	221,690	0.87

The Village of Cottage Grove, Village of Shorewood Hills, Village of Waunakee, Morrisonville Sanitary District, and Token Creek Sanitary District have a wastewater to water sales ratio of 1 or greater. In the case of the Village of Cottage Grove, the difference is attributed to the Hydrite groundwater barrier project has pumped approximately 150,000 gpd of contaminated groundwater into the MMSD collection system since the fall of 2003. MMSD may wish to follow up with these communities regarding their municipal collection system televising and inspection programs to verify if infiltration is a problem and to encourage corrective measures to reduce clear water inputs into the collection system.

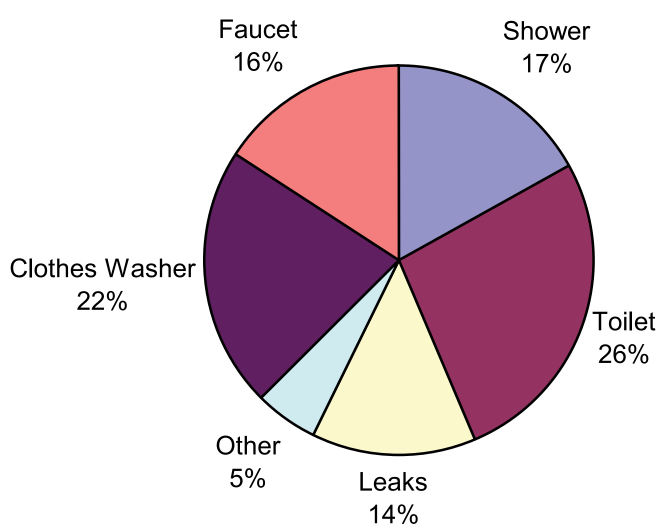
Demand-Side Management

A comprehensive evaluation and discussion of a demand side management program to reduce wastewater generation at the source could be the subject of an entire report alone. The information presented here is intended only to provide an introduction to the potential reductions in wastewater generation from a demand side management program.

Many power and water utilities have a demand-side management program to encourage conservation as a mechanism to help postpone or avoid the need for additional capacity. MMSD may wish to consider implementing a similar program. Implementation of a demand side management program could be either alone or in conjunction with local water utilities.

A breakdown of typical residential indoor water use in the United States is shown in Figure 5-1. The two largest water uses are for flushing toilets and washing clothes.

Figure 5-1: Breakdown of US Residential Indoor Water Use



Source: American Water Works Association Research Foundation, "Residential End Uses of Water", 1999

A study by the University of Arizona Water Resources Research Center documented the history of toilet water use. During the 20th century, the toilet was engineered to use progressively less water. Flush volumes declined over time in the U.S. from more than 7 gallons in early models, to five gallons per flush for much of the mid-20th century. By the 1980's, the standard in the U.S. was 3.5 gallons per flush. By 1992, 1.6 gallons per flush was the standard nationally. The study also reported that the life span of a toilet its typically 20 years. Based on this 20-year life span, it is likely that the majority of toilets within the MMSD service area that use 3.5 gallons per flush or more have already been replaced with 1.6 gallon per flush models, or are likely to be replace within the next 4 years.

Currently, dual flush toilets are not widely used in the MMSD area, but they are becoming more available. These toilets typically use only 0.8 gallons per flush for liquid waste. The potential wastewater reduction that can be achieved by installing a dual flush toilet is estimated to be 4.8 to 7.2 gallons per day per household.[6]

A study by the Oak Ridge National Laboratory determined that a front load washer reduces average water consumption by 15 gallons per load. The potential wastewater reduction that can be achieved by installing a front load washer is estimated to be 8.5 gallons per day per household[7].

The installation of dual flush toilets and front load washers together has the potential to reduce average daily household wastewater generation by 1.8 to 2.1 mgd, based on the number of households in the MMSD service area in 2000.

Targeting large wastewater generators or areas where the collection system is marginally close to capacity may further increase the cost to benefit ratio of a demand side management program.

Excess Capacity Areas

The portions of the collection system and corresponding sub-basins that are projected to have at least 25% of their capacity remaining by 2060 are classified as excess capacity areas. This does not include areas that have excess capacity upstream, but are capacity restricted further downstream. Therefore capacity in the collection system is ultimately restricted by the capacity of the force mains entering the wastewater treatment plant as shown in Table 5-2.

Table 5-2: Projected Capacity of Force Mains to NSWTP

Force Main	Projected Capacity
Pumping Station 11 Force Main	Capacity reached 2020 – 2030
Pumping Station 8 Force Main	75% of capacity in 2060
Pumping Station 2/3/4 Force Main	90-100% of capacity in 2060
Pumping Station 7 Force Main	Capacity reached 2020 – 2030

The only force main entering the wastewater treatment plant that is projected to have excess capacity in 2060 is from Pumping Station 8. The only sub-basin within the Pumping Station 8 service area that has excess capacity in 2060 and is not restricted further down stream is sub-basin 8-W.

If higher velocities and pressures were acceptable, resulting in a higher capacity rating for the Pumping Station 2/3/4 force main, then sub-basins 1-C, 1-D, 1-E, 2-D, 2-E, 2-F, and 2-H would also have excess capacity in 2060.

---

[6] Based on 3 people per household, 3-4 flushes per person per day, 1 flush per person per day @ 1.6 gallons and 2-3 flushes per person per day @ 0.8 gallons.
[7] Based on an average of 4 loads per week.

Appendix A2
Condition Assessment for Sewage Pumps at MMSD Stations

Appendix A2
Condition Assessment for Sewage Pumps at MMSD Stations
Madison Metropolitan Sewerage District
November, 2010

Outline

This document is organized into the following sections:

- Introduction
- Pump Information
    - Pump Data
- Condition Assessment
    - Evaluation Criteria
    - Observations
    - Availability of Spare Parts
    - Inspections of Pumps
- Pump Ratings
    - Qualitative Analysis
    - Maintenance Costs
- Conclusions and Recommendations
- Attachments

Introduction

The 2002 *Collection System Facilities Plan* contained an assessment of the condition of the sewage pumps at the District's 17 pumping stations. Since 2002 the District has replaced and rehabilitated a number of its pumping units through two major construction projects and through maintenance projects completed by District staff. This appendix serves to update the changes that have taken place since 2002, evaluate current maintenance practices for the pumping units, and provide recommendations for future operation and maintenance of pumps.

Pump Information

Pump Data

The District has 57 sewage pumps currently in service throughout its 17 pumping stations. A listing of the pumps and their attributes are shown in Table 1 (Pumps at District Stations) as an attachment to this document.

The District has seven brands of pumps at its stations as shown in Table 2. Of the 57 raw sewage pumps in the collection system, slightly less than half are Fairbanks Morse units (47%). The second most common brand is Allis Chalmers with 11 units (19%). The Fairbanks Morse and Allis Chalmers brands make up 67% of all District pumps. Since 2002 the District has added pumps manufactured by Cornell and Flygt to its collection system and removed pumps manufactured by American Well (PS9) and Dayton Dowd (PS1).

Table 2 - District Pumping Units by Manufacturer

Manufacturer	Number of Pumps	Locations of Pumps
Allis Chalmers	11	PS's 4, 11, 12, 14, 15
Cornell	9	PS1, PS2, PS10
Fairbanks Morse	27	PS's 1, 3, 6, 7, 8, 9, 11, 12, 13, 15
Flygt	1	PS14
Goulds	3	PS17
Patterson	3	PS 5
Worthington	3	PS16
Total	**57**	

Due to major pump replacement projects at Pumping Stations 1, 2, 6, 8, and 10 in the last five years the average age of the District's pumping units has decreased significantly. This can be seen in Table 3 and in Figures 1 and 2 (see attachments).

Table 3 - Pump Ages

	In Year 2000	In Year 2010
Average age (yrs)	29	21
Median age (yrs)	30	18
Minimum age (yrs)	4	0
Maximum age (yrs)	63	60

Pumps with 60 years of service at this time include Pumps 1C, 1D, 7A, and 11A. Pumps 1C and 1D are now used to transfer flow from PS1 to PS6 on a periodic basis and have limited run hours during normal operation. The motors for these pumps were rewound in 2005 as part of the PS1 rehabilitation project. Pumps 7A and 11A handle average daily flows and as a result have very high run hours. They are good examples of Fairbanks Morse pumps that provide excellent reliability and endurance despite their age. Pump 7A was rehabilitated in 2009.

Run times on pumps vary widely across the collection system. Table 4 provides a listing of age, runtime, and condition for all sewage pumps at District stations (see attachments). The higher capacity pumps at many of the stations have low run time hours as expected.

In addition, the new pumps at PS6 and PS8 have low run times due to their replacement in 2009 and 2010. Table 5 provides a summary of pump run times in year 2010 compared to year 2000. Figures 3 and 4 in the Appendix provide additional information on the distribution of pump run times.

Table 5 - Pump Run Times

	As of January 2000	As of October 2010
Average run time (hrs)	39,273	24,420
Median run time (hrs)	10,388	12,634
Minimum run time (hrs)	65 (Pump 15C)	118 (Pump 6B)
Maximum run time (hrs)	234,695 (Pump 1A)	192,931 (Pump 4A)

Like the average pump age, the average pump run time has decreased over the last ten years due to the major pump replacement projects at PS 1, 2, 6, 8, and 10.

Condition Assessment

Evaluation Criteria

Key components in developing and maintaining a pump condition assessment program include the evaluation of a pump's performance and subsequent determination of its service life. A number of criteria need to be considered in this evaluation, including (1). Age of the pump; (2). Pump run hours; (3). Availability of parts; (4). Evidence of volute/casing wear; and, (5). Maintenance history.

It should be noted that capacity is not an appropriate criterion for evaluation as the focus is on the integrity of the pumping units themselves and not on system concerns such as required capacity. Capacity is an overriding consideration and if it is inadequate and can't be increased sufficiently by installing a larger impeller, the pump will have to be replaced even if it is in excellent condition. Pump station capacity considerations are dealt with elsewhere in the collection systems facilities planning effort.

Observations

The criteria cited in the preceding section were discussed with the District's Mechanical Maintenance Department and the following points reflect the collective thoughts of the mechanical maintenance group:

- Sewage pumps are robust units and can have a very long service life if they are well maintained and if there are no particular problems with a pump.
- Age alone is not a good criterion of a pump's performance. The District has pumps that are 60 years old that are still performing satisfactorily. Parts are readily available for the District's Fairbanks Morse pumps, despite the fact that some of these pumps are 60 years old.

- Many parts on a pump are replaceable as they wear (bearings, shafts, impellers, wear rings, seals, etc.). Excluding the impeller, all these parts can be made or obtained without going through the manufacturer. Thus, even if the manufacturer goes out of business new parts can be obtained. Impellers deserve special consideration since there are fewer sources for these parts. If the pump and impeller are still being manufactured then there is a source for replacement impellers. If the original manufacturer has gone out of business there may still be replacement impellers available through another source. In the event that there is no source for the impeller, the pump would have to be replaced when a new impeller is needed.

- Wear on a volute or casing could make a pump unreliable or perhaps so inefficient that it should be replaced. The best method to check this wear is to inspect pumps for excessive wear and to check the pump capacities after determining that the impellers, wear rings, wear ring clearances, and other efficiency related components are in good order.

- Motors are long-lived, have few problems, and are repairable or replaceable when problems occur. Consequently, a motor in poor condition would not generally be a reason to replace an entire pumping unit. Efficiency and voltage issues may lead to a decision to change motors even if the motor is in good condition.

- Pumps driven by vertical, extended drive shafts require more maintenance than pumps with shorter drive shafts. In general the use of extended vertical drive shafts should be avoided in future designs.

- Pump plugging with rags and other stringy material has been a chronic problem since 2006 when the bar screens were removed at the four large stations pumping to the treatment plant. The problem has been particularly noteworthy at PS7 and PS11. This issue is discussed in more detail in Chapter 3 of this Facilities Plan.

- Technological improvements in pump control systems have led to greater operational flexibility and have extended the life of associated electrical equipment. These improvements include adjustable frequency drives, programmable logic controllers, motor soft starters, bearing temperature sensors, and vibration sensors. While these improvements are a net benefit to the overall performance of the pumping system, their complexity can make it more difficult to troubleshoot and correct problems with a pump or the operation of the overall pumping system.

Two points are worthy of further consideration and discussion: (1). Availability of spare parts, and (2). Internal inspections of pumps.

Availability of spare parts

Spare parts are readily available for most of the District's pumps since most of the pumps are still being manufactured. All of the Fairbanks Morse, Flygt, Cornell, Allis Chalmers, Goulds, Patterson, and Worthington pumps fall under this category. The full line of parts including impellers, bearing frames, casings and other cast parts are still available. This includes the Fairbanks Morse pumps installed in the 1950's. While some parts manufactured today may be slightly different than the original parts, the new parts generally still fit and work as replacement parts.

Table 6 is a summary of the primary vendors used by the District for replacement parts for each of the different pump manufacturers.

Table 6 - Suppliers of Spare Parts

Pump Manufacturer	Vendor(s)	Location
Allis Chalmers	ITT Flygt Corporation	Pewaukee, WI
	RDM Municipal Supply & Service, Inc.	Oak Creek, WI
Cornell	Cornell Pump Company	Clackamas, OR
	USEMCO	Tomah, WI
	Crane Engineering Sales, Inc.	Kimberly, WI
Fairbanks Morse	L.W. Allen, Inc.	Madison, WI
	ABBA Parts & Service	Burlington, ON (Canada)
Flygt	ITT Flygt Corporation	Pewaukee, WI
Goulds	Energenecs	Cedarburg, WI
	First Supply	Madison, WI
	Crane Engineering Sales, Inc.	Kimberly, WI
Patterson	Thomas Pump Company	Aurora, IL
Worthington	Furey Filter & Pump, Inc.	Germantown, WI

As can be seen in Table 6, most of the vendors supplying pump parts are located in southern Wisconsin. As a result, there are not significant shipping delays in most instances. Some problems have been experienced with the acquisition of parts for the Cornell pumps, whose parent company is located in the state of Oregon.

Another complicating factor in obtaining spare parts in some cases is the dissolution or consolidation of suppliers and/or manufacturers. ITT Industries purchased the Goulds and Allis Chalmers companies some time ago and replaced the brand name “Allis Chalmers” with the brand name “A-C Pump.” ITT subsequently sold the former Goulds (PS 17 pumps) dry pit sewage pump line to the Yeomans Chicago Corporation. Yeomans Chicago Corporation now markets the former Goulds sewage pump line as part of its Morris Pumps division. The local representative for Morris Pumps is Energenecs in Cedarburg, Wisconsin. As the Goulds brand has been sold on several occasions, it has been difficult to obtain timely and valuable technical support for the problematic pumps at PS17.

Parts for the District’s two most common pumps, Fairbanks Morse and Allis Chalmers, can be obtained through local suppliers in most instances. An alternative source of parts for these pumps is ABBA Pump Parts and Service headquartered in Ontario, Canada.

ABBA can make virtually any part needed for pumps including bearing frames, impellers, casings and other cast parts if an old sample part can be provided as a model.

For impellers, ABBA takes dimensions off an old worn one, and, if a performance curve is available for the original impeller, a computer program can be used to design a replacement impeller to match the performance of the original impeller. Maximum delivery time for almost any part is four months (much less than that for items they already have patterns for). These "special" parts will, of course, be costly, but the ability to have parts made is an alternative to installing an entirely new pump if capacity is not an issue.

In short, parts can be obtained for any of the pumps the District owns, even for those pumps that are no longer manufactured.

Inspections of Pumps

The District does not have a formal program for routine inspection of internal surfaces and components. Thus, it is difficult to predict how much wear or corrosion there may be on impellers, wear rings, and casings. Internal inspections have typically been done only when there is evidence of a problem or as part of other required maintenance such as bearing replacement or unplugging of pumps. In general, inspections are not scheduled due to staffing and workload issues.

As the District has implemented improved maintenance practices over the years such as the use of mechanical seals and better alignment of pumps, overhauls of pumps to replace worn shaft sleeves and worn bearings have become less frequent. Conversely, the removal of bar screens at the major pumping stations has resulted in increased pump plugging at these stations since 2006. Removal of rags from pumps has provided an opportunity to inspect pump internals, although not all pumps are inspected at the same frequency. In reviewing work orders for 2010, it was found that approximately 7% of the mechanical maintenance staff's time was spent unplugging pumps at District and non-District stations. Due to staffing constraints, the percentage of daily staff time spent unplugging pumps needs to decrease before a scheduled program for internal inspection of pumps can be implemented.

Even without the aid of formalized inspections, several technological advances in the last ten years have allowed District staff to better predict declining performance in pumps and/or mitigate pump wear. Vibration sensors have been installed on pumps at PS 1, 2, 6, 8, and 10 since 2005. These sensors have proved useful in developing trends to detect unusual vibrations.

Limit switches are being installed on check valves in conjunction with the rehabilitation or replacement of pumps. These switches monitor check valve status during pump start-up and run cycles. If the check valve doesn't open within a period of time or fails to stay open during the run cycle, the pump will fail, shut off, and alarm. This prevents unnecessary wear on the pump in cases that it is running but might not be pumping any liquid.

Finally, the installation of magnetic or venturi flowmeters on the discharge of new or rebuilt pumps has provided additional information on the performance of these units.

Recorded reductions in flow can be used to investigate pump problems before they may otherwise be noticed.

Pump Ratings

Qualitative Analysis

Pump condition ratings, as provided by the Mechanical Maintenance Department in 2010, are shown in Table 7. A three level rating system was used to qualitatively assess pump performance (Good, Fair, and Poor). A rating of “Good” implies that the pump, in general, performs as anticipated and does not require any unusual or unexpected maintenance. A rating of “Fair” suggests that the pump requires more maintenance than anticipated, although not extensive. A rating of “Poor” is used to describe those pumps that are not reliable and require frequent attention and/or rehabilitation.

Table 7 - Ratings of District Pumps

Rating	Number of Pumps	Pumps
Good	47	
Fair	6	12A, 15A, 15B, 16A, 16B, 16C
Poor	4	11B, 17A, 17B, 17C
Total	**57**	

It is important to note that the ratings provided in Table 7 reflect the current operating performance of the pumping units. Where some pumps may have been problematic in the past, rebuilding of their internal components has caused them to operate satisfactorily at this time and achieve a “Good” rating. Historical maintenance costs for each pump are discussed in the next section.

Eighty-two percent (47 of 57) of the pumps were rated in good condition overall. Six pumps were rated in fair condition. Pump 12A has nearly 150,000 operating hours and, not surprisingly, requires more maintenance than other pumping units. It was recently rebuilt in 2009 and is operating satisfactorily at this time. Pumps 15A and 15B are Fairbanks Morse pumps that have provided 35 years of service to date. Even though Fairbanks Morse pumps are generally very reliable, the model type for Pumps 15A and 15B is different from other Fairbanks Morse pumps at the District’s stations. The pumps at PS16 have performed below expectations in recent years. All three pumps are scheduled to be rebuilt in 2011.

Pump 11B received a poor rating due to recurring problems with the pump shaft. Shafts on this pump were repaired in 2009 and 2010. The most problematic pumps in the District’s collection system, however, are those at PS17. These pumps are manufactured by Goulds (Model # NCD 8x8-17). The pumps are driven by vertical shafts and vibrate excessively, causing premature wear and failure of several components. Bearing housings need to be machined frequently and impellers and shafts need to be refitted.

Mechanical seals, shaft sleeves, and wear rings also need frequent replacement due to the excessive wear on these pumps. The aforementioned components are replaced or rebuilt once every three years at present time.

A comparison of pump ratings between 2000 and 2010 is shown in Table 8. The District has been successful in addressing problematic pumps since the last pump condition assessment was performed in 2000. Of the seven pumps rated in fair or poor condition in 2000, all have been replaced as of 2010.

The three pumps at PS16 which are rated in fair condition are to be rebuilt in 2011. Pump station rehabilitation projects are scheduled at PS11, PS12, PS15, and PS17 from 2014 to 2015. These projects will provide an opportunity to replace or rebuild the remaining pumps that are rated in fair or poor condition at this time.

Table 8 - Comparison of Pump Ratings

Rating	In Year 2000		In Year 2010	
	Number	%	Number	%
Good	52	88	47	82
Fair	6	10	6	11
Poor	1	2	4	7
Total	59	100	57	100

Maintenance Costs

In addition to the qualitative rankings provided by the mechanics, the District's asset management program was used to track maintenance costs for each of the 57 pumps now in service in the collection system. Table 9 provides a summary of the labor, material, and service costs associated with each pump during the ten year period from 2001-2010 (see attachments). The total costs during this period are displayed graphically in Figure 5.

The pump with the most extensive maintenance costs over the last ten years is Pump 11B, at over $68,000. This pump was rebuilt in 2007 and 2009 and the shaft was repaired in 2010. The pumps at PS7 also have significant maintenance costs, although this is not surprising given that this station conveys slightly less than one-half of the District's average daily flow. A large portion of the maintenance costs for this station can be attributed to pump plugging, as discussed elsewhere in this appendix.

The pumps at PS17 are the most problematic with regard to cost from an overall pump station perspective. During the last ten years the total cost to service these pumps has been over $115,000. As mentioned previously, each pump requires a full rebuild once approximately every three years due to excessive vibration and premature wear of pump components. The District is currently working on a vibration analysis of these pumps with the pump representative. Given the high annual costs to maintain these pumps, replacement of one or more of the units may be required if a satisfactory solution to the vibration problems cannot be found.

As expected, the maintenance costs for many of the new pumps are minimal as they have been installed within the last five years. An exception to this is the Cornell pumps at PS 1, 2, and 10. Maintenance costs for these pumps are relatively high as problems with bearing failures, vibration, and other difficulties have been experienced during the early years of operation. Some of the maintenance costs shown for these pumps are for the District's labor to remove and reinstall the pumps for warranty work by the manufacturer.

Conclusions and Recommendations

Sewage pumps are robust machines and if well maintained can provide many years of service. The District has numerous pumps in service that are 60 years old and five pumps with more than 100,000 operating hours. The great majority of the pumps are considered to be in good condition and capable of providing many more years of service. As the pump population ages and wastewater flows increase it is expected that pump maintenance needs will also increase. The following observations and recommendations are made with regard to the current and future operation and maintenance of raw wastewater pumps in the District's collection system:

1. The District has implemented various predictive maintenance procedures and/or strategies in the last ten years that have provided valuable information and improved maintenance in general. These procedures and strategies include the following:

    a) Installation of sensors on pump bearing housings to monitor unusual vibrations.

    b) Installation of limit switches on check valves to ensure that pumps do not run dry.

    c) Installation of flowmeters downstream of individual pumping units to provide early indication of declining pump capacity.

    d) Installation of bearing temperature sensors on the pump and motor.

    These measures have been primarily implemented at pumping stations where major rehabilitation work has taken place. It is recommended that these procedures continue to be phased in throughout the collection system as part of future rehabilitation work or scheduled maintenance projects.

2. The plugging of pumps with rags and other stringy material has been a major operational concern at PS7 and PS11 since the bar screens were removed beginning in 2006. A significant amount of time is spent by mechanics in unplugging pumps and repairing pump components. Further, the plugging of pumps hinders overall station reliability, especially during high flow events. This issue should continue to be evaluated in future years, and the re-installation of bar screens should be considered if necessary.

3. In general, spare parts for all of the pumps in operation are readily available from local suppliers and/or manufacturers.

4. The most problematic pumps in the collection system, as determined by the Mechanical Maintenance Department, are found at PS11, PS12, PS15, PS16, and PS17. Rehabilitation projects are scheduled to begin at PS11, PS12, PS15, and PS17 in approximately 2015. Replacement or rehabilitation of the problematic pumping units at these stations should be included in the scope of work for these projects.

5. The pumps at PS17 are especially problematic and have high annual maintenance costs. District staff is currently working with the manufacturer's representative on a vibration analysis for these pumps. If a satisfactory solution to the vibration problems experienced by these pumps cannot be found soon, it may be cost effective to replace these units prior to the scheduled station rehabilitation in 2015.

Attachments

1. Table 1: Pumps at District Pump Stations
2. Table 4: Age, Runtime, and Condition of Sewage Pumps at District Pumping Stations (November 2010)
3. Figure 1: Pump Age in Year 2010
4. Figure 2: Distribution of Pump Ages in Year 2010
5. Figure 3: Pump Run Hours
6. Figure 4: Distribution of Pump Run Hours
7. Table 9: Maintenance Costs for MMSD Pumps (Jan. 2001 to Nov. 2010)
8. Figure 5: Maintenance Costs for MMSD Pumps (Jan. 2001 to Nov. 2010)

Table 1 - Pumps at District Stations

	Asset ID & Manufacturer	Description & Model Number	Drive Type	Flow (gpm)	Head (ft)	Serial Number	Outlet Size (in)	Impeller	Impeller Diameter (in)	Operating Speed (rpm)	Horsepower
PS01											
	PMP0108 Cornell	PS01: Pump A 18NHG34A-F30	VFD	14,100	134	131778	18	18NHG34	28.56	890	600
	PMP0109 Cornell	PS01: Pump B 18NHG34A-F30	VFD	14,100	134	131777	18	18NHG34	28.56	890	600
	PMP0103 Fairbanks Morse	PS01: Pump C 5720	VFD	10,375	31	727677	20	L20A1S	21.75	580	150
	PMP0104 Fairbanks Morse	PS01: Pump D 5720	VFD	12,500	41	727676	20	L20A1S	24.00	585	150
PS02											
	PMP0206 Cornell	PS02: Pump A 18NHG34A-F30	VFD	16,500	108	131770	18	18NHG34	28.56	890	600
	PMP0207 Cornell	PS02: Pump B 18NHG34A-F30	VFD	16,500	108	131775	18	18NHG34	28.56	890	600
	PMP0208 Cornell	PS02: Pump C 18NHG34A-F30	Constant	16,500	108	131773	18	18NHG34	28.56	890	600
	PMP0209 Cornell	PS02: Pump D 18NHG34A-F30	Constant	16,500	108	131774	18	18NHG34	28.56	890	600
PS03											
	PMP0301 Fairbanks Morse	PS03: Pump A B5414	Constant	1,050	60	K3D1-050173-1	5	T5D1CU	13.00	1,175	30
	PMP0302 Fairbanks Morse	PS03: Pump B B5414	Constant	1,050	60	K3D1-050173-2	5	T5D1CU	13.00	1,175	30
PS04											
	PMP0401 Allis Chalmers	PS04: Pump A Model 150, 10 x 8 x 17 Type NSW	Constant	2,000	47	1-5279-80811-2-1	8	52-216-465	16.25	860	40
	PMP0402 Allis Chalmers	PS04: Pump B Model 150, 10 x 8 x 17 Type NSW	Constant	2,900	95	1-5279-80811-1-2	8	52-216-465	17.00	1,160	100
	PMP0403 Allis Chalmers	PS04: Pump C Model 150, 10 x 8 x 17 Type NSW	Constant	2,900	95	1-5279-80811-1-1	8	52-216-465	17.00	1,160	100
PS05											
	PMP0501 Patterson	PS05: Pump A NCSVF-4, 6 x 6 x 14.5	Constant	1,800	75	NC-C000889-03	6	D-5873	14.50	1,256	50
	PMP0502 Patterson	PS05: Pump B NCSVF-4, 6 x 6 x 14.5	Constant	1,800	75	NC-C000889-2	6	D-5873	14.50	1,256	50
	PMP0503 Patterson	PS05: Pump C NCSVF-4, 6 x 6 x 14.5	Constant	1,800	75	NC-C000889-1	6	D-5873	14.50	1,256	50

Table 1 - Pumps at District Stations

	Asset ID & Manufacturer	Description & Model Number	Drive Type	Flow (gpm)	Head (ft)	Serial Number	Outlet Size (in)	Impeller	Impeller Diameter (in)	Operating Speed (rpm)	Horsepower
PS06											
	PMP0606 Fairbanks Morse	PS06: Pump A B5721	VFD	7,700	45	176063-1-0	14	L14A1A	14.00	890	125
	PMP0607 Fairbanks Morse	PS06: Pump B B5721	Constant	7,700	45	1760631-1	14	L14A1A	14.00	890	125
	PMP0608 Fairbanks Morse	PS06: Pump C B5721	Constant	7,700	45	1760631-2	14	L14A1A	14.00	890	125
	PMP0609 Fairbanks Morris	PS06: Pump D B5721	Constant	7,700	45	1760631-3	14	L14A1A	14.00	890	125
PS07											
	PMP0701 Fairbanks Morse	PS07: Pump A 5720	Constant	11,500	47	729155	20	L20C1D	24.00	695	250
	PMP0702 Fairbanks Morse	PS07: Pump B C 5721, Size 20	Constant	15,200	53	K3X1-071561	20	L20A1CT	22.50	705	250
	PMP0703 Fairbanks Morse	PS07: Pump C C 5721, Size 20	Constant	19,400	59	K3X1-071560-0	20	L20A1CT	24.00	705	350
	PMP0704 Fairbanks Morse	PS07: Pump D C 5721, Size 20	Constant	19,400	59	K3X1-071560-1	20	L20A1CT	24.00	705	350
PS08											
	PMP0806 P-8A (Formerly Fairbanks Morris	PS08: Pump A 5722	VFD	12,800	58	505931	20	L20C1A	30.00	585	250
	PMP0808 (Formerly 8D) Fairbanks Morris	PS08: Pump B 5722	VFD	12,800	58	505932	20	L20C1A	30.00	585	250
	PMP0809 (Formerly 6C) Fairbanks Morse	PS08: Pump C 5721S	Constant	13,900	60	505933	20	L20A1AV	24.00	705	300
	PMP0810 (Formerly 6D) Fairbanks Morse	PS08: Pump D 5721S	Constant	13,900	60	505934	20	L20A1AV	24.00	705	300
PS09											
	PMP0905 Fairbanks Morse	PS09: Pump A 5434S-T40	Constant	2,300	51	1001739	8	T8D1A	8.00	1,185	40
	PMP0906 Fairbanks Morse	PS09: Pump B 5434S-T40	Constant	2,300	51	1507392	8	T8D1A	8.00	1,185	40
	PMP0904 Fairbanks Morse	PS09: Pump C 5430	Constant	2,300	51	481873	8	T8D1A	8.00	1,185	40

Table 1 - Pumps at District Stations

	Asset ID & Manufacturer	Description & Model Number	Drive Type	Flow (gpm)	Head (ft)	Serial Number	Outlet Size (in)	Impeller	Impeller Diameter (in)	Operating Speed (rpm)	Horsepower
PS10											
	PMP1008 Cornell	PS10: Pump A 18NHG34A-F30	VFD	18,900	94	131771	18	18NHG34	28.56	890	600
	PMP1009 Cornell	PS10: Pump B 18NHG34A-F30	VFD	18,900	94	131772	18	18NHG34	28.56	890	600
	PMP1010 Cornell	PS10: Pump C 18NHG34A-F30	Constant	18,900	94	131776	18	18NHG34	28.56	890	600
PS11											
	PMP1101 Fairbanks Morse	PS11: Pump A 5720	Constant	6,400	43	729252	16	L16A1K	17.00	860	125
	PMP1102 Allis Chalmers	PS11: Pump B Model 150, 16 x 16 x 20 Type NSY	Constant	9,100	49	821-37489-1-3	16	---	18.50	880	150
	PMP1103 Allis Chalmers	PS11: Pump C Model 150, 20 x 20 x 25 Type NSY	Constant	13,300	57	821-37489-3-1	20	---	23.25	705	250
	PMP1104 Allis Chalmers	PS11: Pump D Model 150, 20 x 20 x 25 Type NSY	Constant	13,300	57	821-37489-3-2	20	---	23.25	705	250
PS12											
	PMP1201 Fairbanks Morse	PS12: Pump A 5425 - 10"	Constant	3,400	44	K2N1 053104	10	TALE5AK	20.63	700	50
	PMP1202 Fairbanks Morse	PS12: Pump B 5720 - 16"	Constant	7,200	48	K2N1 053105	16	L16A1G1	17.63	885	100
	PMP1203 Allis Chalmers	PS12: Pump C Model 150, 16 x 16 x 20 Type NSY	Constant	9,000	48	821-37489-1-1	16	---	18.50	880	150
	PMP1204 Allis Chalmers	PS12: Pump D Model 150, 16 x16 x20 Type NSY	Constant	9,000	48	821-37498-1-2	16	---	18.50	880	150
PS13											
	PMP1307 Fairbanks Morse	PS13: Pump A B5721	Constant	8,200	16	1550432	16	L16A1G	18.70	585	50
	PMP1302 Fairbanks Morse	PS13: Pump B 5720 - 16"	Constant	8,200	16	K2P1-055130	16	L16A1G	19.04	585	50
	PMP1303 Fairbanks Morse	PS13: Pump C 5720 -20"	Constant	14,000	20	K2P1-055131	20	L20A1AV	23.38	505	100
PS14											
	PMP1407 Flygt	PS14: Pump A Model 150 16 X 16 X 20 NSY	Constant	7,200	24	1086076204	16	P2689-2	17.38	705	60
	PMP1402 Allis Chalmers	PS14: Pump B Model 150, 16 x 16 x 20 Type NSY	Constant	7,200	24	1-97191-2-1	16	P2689-2	17.38	695	60
	PMP1403 Allis Chalmers	PS14: Pump C Model 150, 18 x 18 x 23 Type NSY	Constant	10,800	29	1-97191-3-1	18	---	22.00	585	100

Table 1 - Pumps at District Stations

	Asset ID & Manufacturer	Description & Model Number	Drive Type	Flow (gpm)	Head (ft)	Serial Number	Outlet Size (in)	Impeller	Impeller Diameter (in)	Operating Speed (rpm)	Horsepower
PS15											
	PMP1501 Fairbanks Morse	PS15: Pump A 5425C - 10"	Constant	4,000	76	K2V1-073520-1	10	TALE5BB	21.00	885	100
	PMP1502 Fairbanks Morse	PS15: Pump B 5425C - 10"	Constant	3,000	68	K2V1-073520-0	10	TALE5A	19.06	885	100
	PMP1503 Allis Chalmers	PS15: Pump C Model 150, 14 x 12 x 20 Type NSM	Constant	6,100	100	821-37489-5-1	12	---	23.00	885	200
PS16											
	PMP1601 Worthington	PS16: Pump A 12 MN 24	Constant	7,000	182	81ZUS8254-2	12	----	22.05	1,185	500
	PMP1602 Worthington	PS16: Pump B 12 MN 24	Constant	7,000	182	81ZUS8254-3	12	----	22.05	1,185	500
	PMP1603 Worthington	PS16: Pump C 12 MN 24	Constant	7,000	182	81ZUS8254-1	12	----	22.05	1,185	500
PS17											
	PMP1701 Goulds	PS17: Pump A NCD 8 x 8 - 17	VFD	2,300	115	M95065A0-01	8	52262	16.50	1,290	100
	PMP1702 Goulds	PS17: Pump B NCD 8 x 8 - 17	VFD	2,300	115	M95065A01-02	8	52262	16.50	1,290	100
	PMP1703 Goulds	PS17: Pump C NCD 8 x 8 - 17	VFD	2,300	115	M95065A01-03	8	52262	16.50	1,290	100

Table 4 - Age, Runtime, and Condition of Sewage Pumps at District Stations

Pump	Manufacturer	Flow (gpm)	Head (ft)	Outlet Size (in	Year Installed	Age in Year 2010 (yrs)	Runtime in Year 2000 (hrs)	Runtime from 2000 to 2010 (hrs)	Total Runtime to Date (hrs)	Condition	Comments
1A	Cornell	14,100	134	18	2005	5	0	22,174	22,174	Good	
1B	Cornell	14,100	134	18	2005	5	0	18,001	18,001	Good	
1C	Fairbanks Morse	10,375	31	20	1950	60	21,353	1,378	22,731	Good	Motor rewound in 2005.
1D	Fairbanks Morse	12,500	41	20	1950	60	3,231	677	3,908	Good	Motor rewound in 2005.
2A	Cornell	16,500	108	18	2005	5	0	28,885	28,885	Good	
2B	Cornell	16,500	108	18	2005	5	0	15,722	15,722	Good	
2C	Cornell	16,500	108	18	2005	5	0	348	348	Good	
2D	Cornell	16,500	108	18	2005	5	0	483	483	Good	
3A	Fairbanks Morse	1,050	60	5	1980	30	24,152	11,913	36,065	Good	
3B	Fairbanks Morse	1,050	60	5	1980	30	21,247	11,054	32,301	Good	
4A	Allis Chalmers	2,000	47	8	1967	43	131,906	61,025	192,931	Good	
4B	Allis Chalmers	2,900	95	8	1967	43	2,564	124	2,688	Good	Impeller diameter increased from 16.25" to 17.00" in 2005.
4C	Allis Chalmers	2,900	95	8	1967	43	1,176	65	1,241	Good	Impeller diameter increased from 16.25" to 17.00" in 2005.
5A	Patterson	1,800	75	6	1996	14	4,535	9,978	14,513	Good	
5B	Patterson	1,800	75	6	1996	14	5,501	17,216	22,717	Good	
5C	Patterson	1,800	75	6	1996	14	11,324	9,885	21,209	Good	
6A	Fairbanks Morse	7,700	45	14	2009	1	0	544	544	Good	
6B	Fairbanks Morse	7,700	45	14	2009	1	0	118	118	Good	
6C	Fairbanks Morse	7,700	45	14	2009	1	0	355	355	Good	
6D	Fairbanks Morse	7,700	45	14	2009	1	0	274	274	Good	
7A	Fairbanks Morse	11,500	47	20	1950	60	103,408	31,789	135,197	Good	
7B	Fairbanks Morse	15,200	53	20	1992	18	32,924	27,232	60,156	Good	
7C	Fairbanks Morse	19,400	59	20	1992	18	5,378	7,256	12,634	Good	
7D	Fairbanks Morse	19,400	59	20	1992	18	3,475	6,149	9,624	Good	
8A	Fairbanks Morse	12,800	58	20	2010	0	0	2,190	2,190	Good	Formerly Pump 8C. Completely rebuilt, including new motor, in 2010. 250 HP; 600 rpm; 30" impeller; VFD.
8B	Fairbanks Morse	12,800	58	20	2010	0	0	2,523	2,523	Good	Formely Pump 8D. Completely rebuilt, including new motor, in 2010. 250 HP, 600 rpm; 30" impeller; VFD.
8C	Fairbanks Morse	13,900	60	20	2010	0	0	1,061	1,061	Good	Formerly Pump 6C (Model 5720). Pump rebuilt and moved to PS8 in 2010 (now Model 5721S). Note that runtime hours reset to zero after rebuild. 300 HP; 710 rpm; 24" impeller; constant speed.

Table 4 - Age, Runtime, and Condition of Sewage Pumps at District Stations

Pump	Manufacturer	Flow (gpm)	Head (ft)	Outlet Size (in	Year Installed	Age in Year 2010 (yrs)	Runtime in Year 2000 (hrs)	Runtime from 2000 to 2010 (hrs)	Total Runtime to Date (hrs)	Condition	Comments
8D	Fairbanks Morse	13,900	60	20	2010	0	0	181	181	Good	Formerly Pump 6D (Model 5720). Pump rebuilt and moved to PS8 in 2010 (now Model 5721S). Note that runtime hours reset to zero after rebuild. 300 HP; 710 rpm; 24" impeller; constant speed.
9A	Fairbanks Morris	2,300	51	8	2003	7	0	4,166	4,166	Good	Pump replaced in 2003 with F-M Vertical Biltogether pump.
9B	Fairbanks Morris	2,300	51	8	2007	3	0	1,766	1,766	Good	Pump replaced in 2007 with F-M Vertical Biltogether pump.
9C	Fairbanks Morris	2,300	51	8	2002	8	0	7,718	7,718	Good	Pump replaced in 2002 with F-M Vertical Biltogether pump.
10A	Cornell	18,900	94	18	2005	5	0	21,177	21,177	Good	
10B	Cornell	18,900	94	18	2005	5	0	25,197	25,197	Good	
10C	Cornell	18,900	94	18	2005	5	0	640	640	Good	
11A	Fairbanks Morse	6,400	43	16	1950	60	98,747	57,993	156,740	Good	
11B	Allis Chalmers	9,100	49	16	1982	28	9,825	12,513	22,338	Poor	Overhauled but has a poor history of snapping shafts.
11C	Allis Chalmers	13,300	57	20	1982	28	152	1,796	1,948	Good	
11D	Allis Chalmers	13,300	57	20	1982	28	79	1,212	1,291	Good	
12A	Fairbanks Morse	3,400	44	10	1969	41	106,828	42,328	149,156	Fair	Pump rebuilt in 2010 by District mechanics.
12B	Fairbanks Morse	7,200	48	16	1969	41	17,398	38,501	55,899	Good	
12C	Allis Chalmers	9,000	48	16	1982	28	396	273	669	Good	
12D	Allis Chalmers	9,000	48	16	1982	28	132	352	484	Good	
13A	Fairbanks Morse	8,200	16	16	2008	2	0	7,266	7,266	Good	Pump replaced in 2008 by Contract.
13B	Fairbanks Morse	8,200	16	16	1970	40	3,658	6,844	10,502	Good	Pump rebuilt in 2008 by Contract. Includes new impeller, impeller wear ring, bearings, mechanical seal and coupling.
13C	Fairbanks Morse	14,000	20	16	1970	40	259	463	722	Good	
14A	Flygt	7,200	24	16	2008	2	0	6,248	6,248	Good	Pump replaced in 2008 by Contract.
14B	Allis Chalmers	7,200	24	16	1971	39	2,281	18,350	20,631	Good	Pump rebuilt in 2008 by Contract. Includes new impeller, impeller wear ring, bearings, mechanical seal and coupling.
14C	Allis Chalmers	10,800	29	18	1971	39	408	269	677	Good	Pump rebuilt in 2008 by Contract. Includes new impeller, impeller wear ring, bearings, mechanical seal and coupling. Impeller diameter increased from 20.50" to 22.00".
15A	Fairbanks Morse	4,000	76	10	1975	35	12,648	1,090	13,738	Fair	
15B	Fairbanks Morse	3,000	68	10	1975	35	82,375	46,962	129,337	Fair	
15C	Allis Chalmers	6,100	100	12	1982	28	65	204	269	Good	
16A	Worthington	7,000	182	12	1982	28	9,639	4,477	14,116	Fair	
16B	Worthington	7,000	182	12	1982	28	8,906	4,492	13,398	Fair	
16C	Worthington	7,000	182	12	1982	28	8,773	4,388	13,161	Fair	

Table 4 - Age, Runtime, and Condition of Sewage Pumps at District Stations

Pump	Manufacturer	Flow (gpm)	Head (ft)	Outlet Size (in	Year Installed	Age in Year 2010 (yrs)	Runtime in Year 2000 (hrs)	Runtime from 2000 to 2010 (hrs)	Total Runtime to Date (hrs)	Condition	Comments
17A	Goulds	2,300	115	8	1996	14	3,250	11,578	14,828	Poor	Vertical arrangement. Numerous vibration/wear issues.
17B	Goulds	2,300	115	8	1996	14	3,250	19,753	23,003	Poor	Vertical arrangement. Numerous vibration/wear issues.
17C	Goulds--Morris	2,300	115	8	1996	14	3,250	10,854	14,104	Poor	Vertical arrangement. Numerous vibration/wear issues.

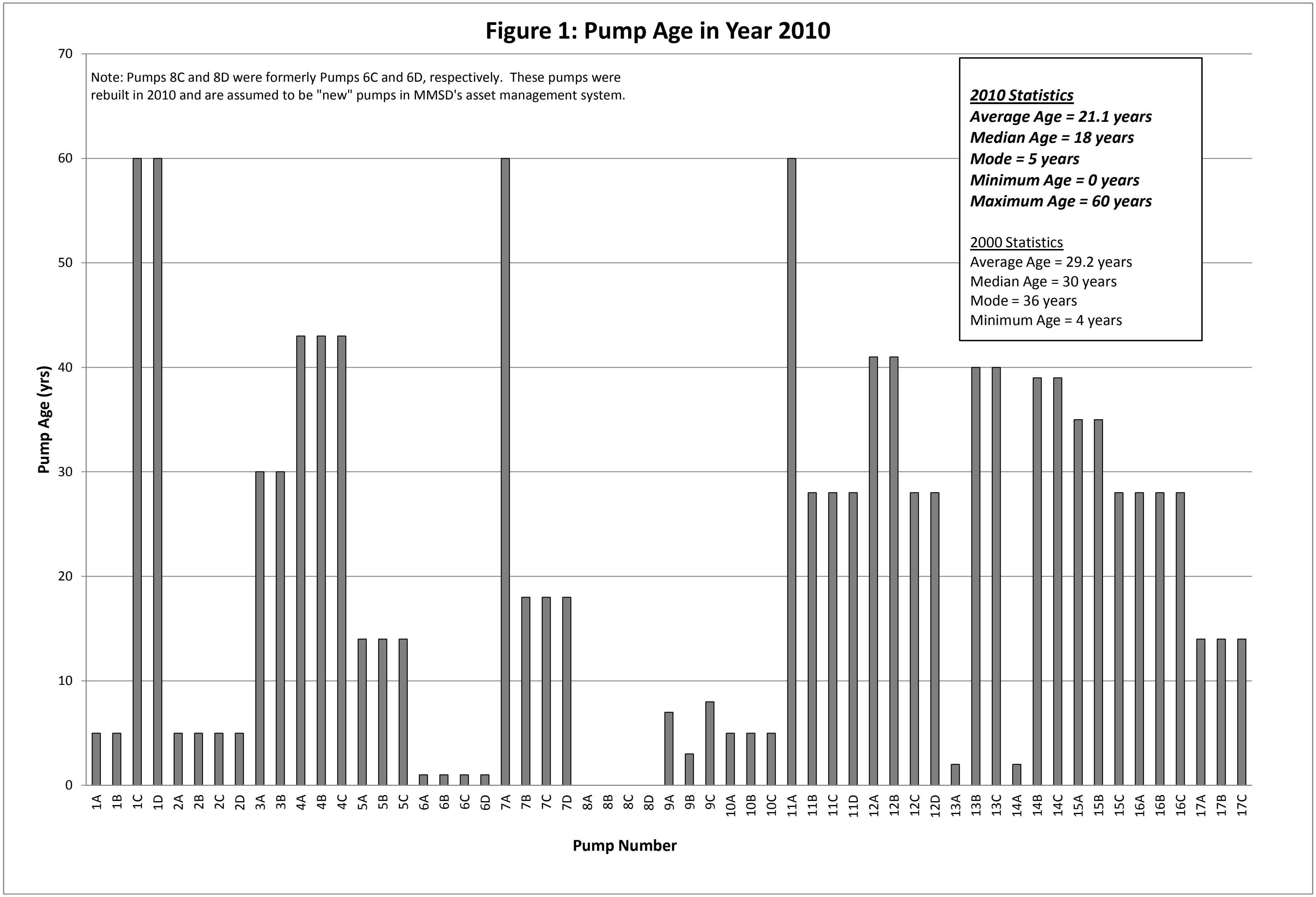


Figure 1: Pump Age in Year 2010
Note: Pumps 8C and 8D were formerly Pumps 6C and 6D, respectively. These pumps were rebuilt in 2010 and are assumed to be "new" pumps in MMSD's asset management system.
2010 Statistics
Average Age = 21.1 years
Median Age = 18 years
Mode = 5 years
Minimum Age = 0 years
Maximum Age = 60 years
2000 Statistics
Average Age = 29.2 years
Median Age = 30 years
Mode = 36 years
Minimum Age = 4 years
Pump Age (yrs)
Pump Number
0
10
20
30
40
50
60
70
1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 4A 4B 4C 5A 5B 5C 6A 6B 6C 6D 7A 7B 7C 7D 8A 8B 8C 8D 9A 9B 9C 10A 10B 10C 11A 11B 11C 11D 12A 12B 12C 12D 13A 13B 13C 14A 14B 14C 15A 15B 15C 16A 16B 16C 17A 17B 17C

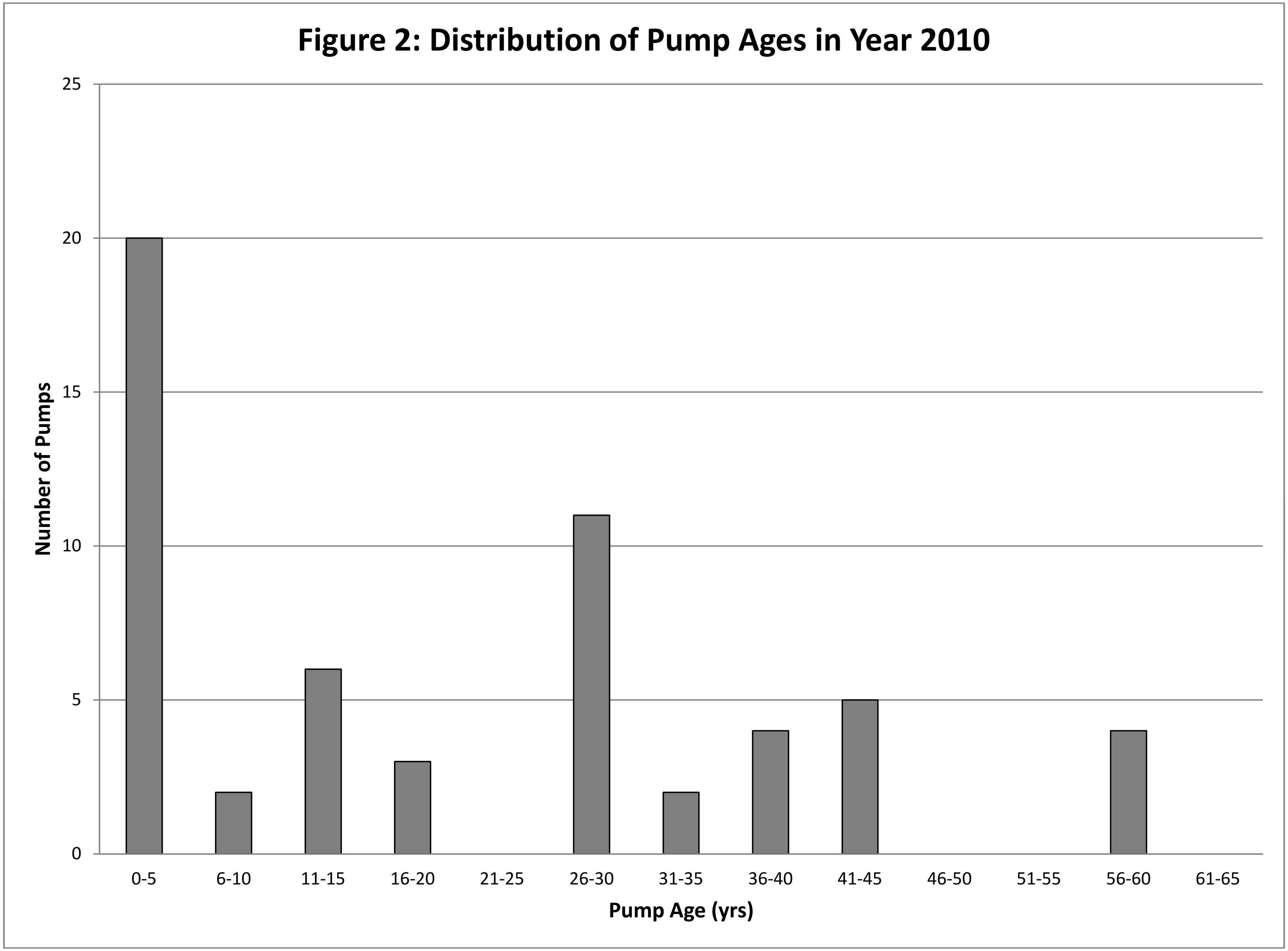


Figure 2: Distribution of Pump Ages in Year 2010
Number of Pumps
25
20
15
10
5
0
0-5
6-10
11-15
16-20
21-25
26-30
31-35
36-40
41-45
46-50
51-55
56-60
61-65
Pump Age (yrs)

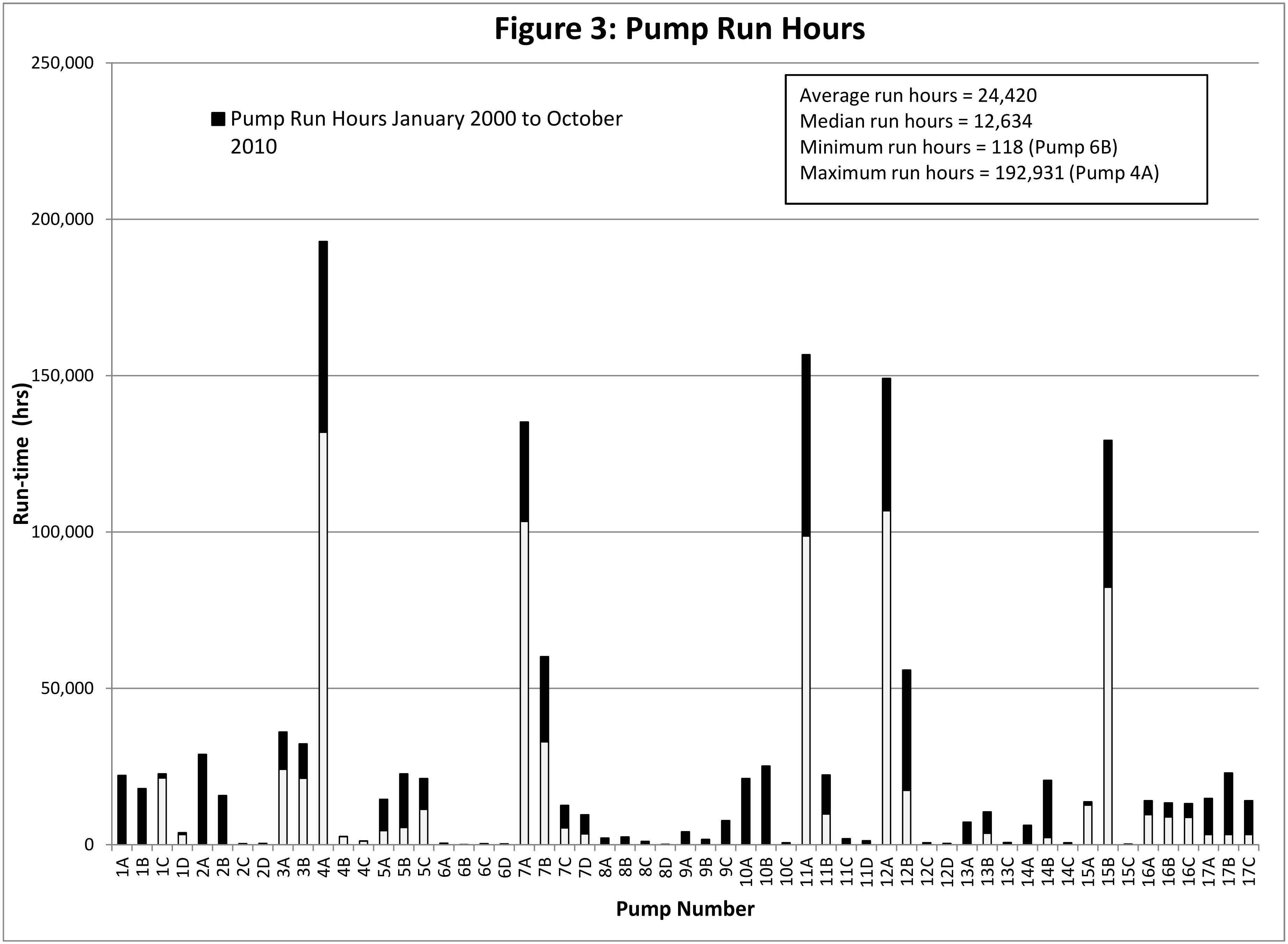


Figure 3: Pump Run Hours
Pump Run Hours January 2000 to October 2010
Average run hours = 24,420
Median run hours = 12,634
Minimum run hours = 118 (Pump 6B)
Maximum run hours = 192,931 (Pump 4A)
Run-time (hrs)
250,000
200,000
150,000
100,000
50,000
0
1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 4A 4B 4C 5A 5B 5C 6A 6B 6C 6D 7A 7B 7C 7D 8A 8B 8C 8D 9A 9B 9C 10A 10B 10C 11A 11B 11C 11D 12A 12B 12C 12D 13A 13B 13C 14A 14B 14C 15A 15B 15C 16A 16B 16C 17A 17B 17C
Pump Number

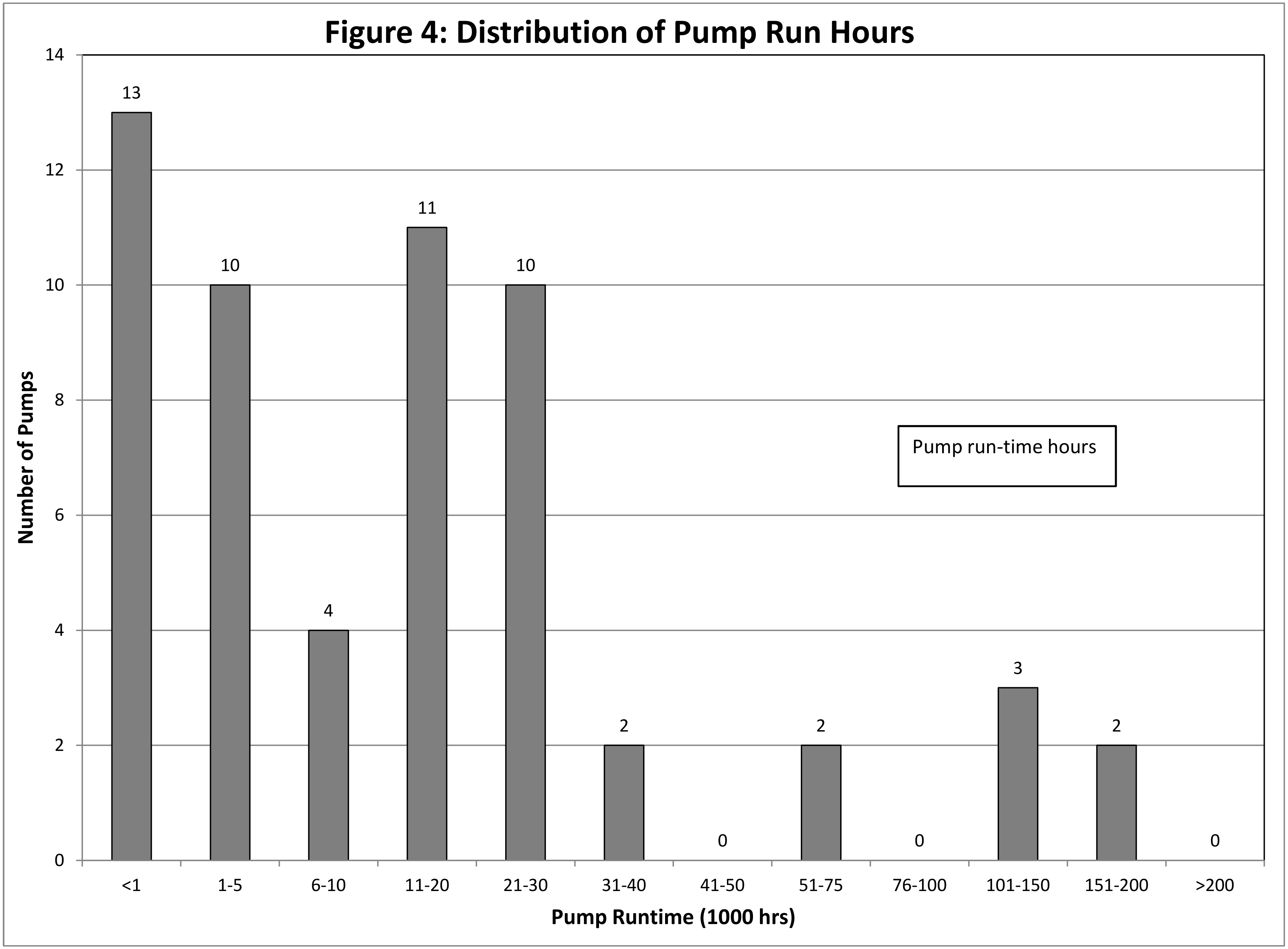


Figure 4: Distribution of Pump Run Hours
Number of Pumps
0
2
4
6
8
10
12
14
13
10
4
11
10
2
0
2
0
3
2
0
<1
1-5
6-10
11-20
21-30
31-40
41-50
51-75
76-100
101-150
151-200
>200
Pump Runtime (1000 hrs)
Pump run-time hours

Table 9 - Maintenance Costs for MMSD Pumps (January 2001 to November 2010)

Pump Station	Pump	Labor, Material & Service Costs by Year 2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total Costs ($)	Comments
1	1A							$301.26	$66.35	$16,775.67	$136.23	$17,279.51	Rebuilt pump with new bearings and mechanical seal in 2009.
	1B									$121.15	$403.13	$524.28	
	1C			$50.21		$293.45			$6,854.98	$2,846.73	$391.59	$10,436.96	Replaced wear rings on impeller and volute in 2008.
	1D	$219.25			$505.37	$314.36	$183.40			$27.68		$1,250.06	
2	2A								$8,125.14	$929.21	$217.70	$9,272.05	Removed and reinstalled pump for warranty repairs in 2008.
	2B					$121.94	$34.77		$98.19	$101.76		$356.66	
	2C						$362.06				$3,385.43	$3,747.49	Replaced mechanical seal and sleeve in 2010.
	2D								$2,157.61	$1,024.06	$2,745.24	$5,926.91	Replaced mechancial seal in 2010.
3	3A		$211.09		$4,984.90							$5,195.99	Rebuilt pump with new bearings, mechanical seal, sleeve and impeller in 2004.
	3B		$60.21		$4,692.15							$4,752.36	Rebuilt pump with new bearings, mechanical seal, sleeve and impeller in 2004.
4	4A	$138.72				$266.90	$526.48				$87.57	$1,019.67	
	4B	$82.58		$60.17	$4,294.01	$24.17	$76.58					$4,537.51	Replaced impeller in 2004.
	4C			$60.17	$4,121.83							$4,182.00	Replaced impeller in 2004.
5	5A							$192.26		$504.29	$671.38	$1,367.93	
	5B				$567.25		$40.11	$468.46	$3,318.35		$355.81	$4,749.98	Repaired leaking volute in 2008.
	5C	$50.13					$34.77	$115.16	$6,196.89			$6,396.95	Repaired adjustable frequency drive and added motor soft starts in 2008.
6	6A										$211.16	$211.16	
	6B											$0.00	
	6C										$618.55	$618.55	
	6D										$30.93	$30.93	
7	7A					$26.03	$256.00	$134.78	$146.41	$12,544.67		$13,107.89	Rebuilt pump with new bearings, shaft, mechanical seal, and impeller in 2009.
	7B			$93.39			$2,216.43	$12,070.13	$754.97	$18,138.09	$2,026.19	$35,299.20	Replaced wear ring and repaired impeller in 2007. Replaced bearings, sleeve, mechanical seal, and wear rings in 2009. Replaced impeller twice in 2009.
	7C				$146.80		$418.62	$492.94	$2,292.44	$1,334.15	$1,003.50	$5,688.45	
	7D						$1,222.55	$573.32	$617.04	$15,671.64	$6,321.99	$24,406.54	Replaced impeller in 2009.
8	8A										$7.80	$7.80	
	8B											$0.00	
	8C											$0.00	
	8D											$0.00	
9	9A					$155.04	$100.57	$142.55				$398.16	New pump installed in 2004.
	9B									$95.51		$95.51	New pump installed in 2007.
	9C			$38.34			$103.96				$56.46	$198.76	New pump installed in 2002.

Table 9 - Maintenance Costs for MMSD Pumps (January 2001 to November 2010)

Pump Station	Pump	Labor, Material & Service Costs by Year: 2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total Costs ($)	Comments
10	10A							$220.62	$11,817.19	$6,821.33	$424.95	$19,284.09	Repaired noisy bearing and leaky seal in 2008.
	10B					$259.21		$80.36	$2,914.23	$10,399.12	$6,218.87	$19,871.79	Removed and reinstalled pump for warranty repairs in 2009. Replaced wear rings in 2010.
	10C									$255.45	$662.76	$918.21	
11	11A			$2,691.63			$8,641.19	$230.20	$1,608.00	$259.58	$96.04	$13,526.64	
	11B			$51.08	$8,643.80	$36.05	$620.69	$12,729.53	$9,052.60	$26,913.30	$10,324.66	$68,371.71	Replaced mechanical seal, suction plate, wear rings, and coated impeller in 2007. Rebuilt pump with new shaft, impeller, sleeve, bearings, and seal in 2009. Repaired broken shaft in 2010.
	11C				$85.56	$48.21		$378.35	$3,083.02	$527.46	$1,237.03	$5,359.63	
	11D			$44.13	$382.03	$294.00	$159.10	$139.41	$73.64	$667.03	$1,137.14	$2,896.48	
12	12A				$38.32	$84.33				$543.79	$24,124.66	$24,791.10	Rebuilt pump with new impeller, bearings, and mechanical seal in 2010.
	12B		$3,490.58			$20.54				$644.72		$4,155.84	
	12C	$626.11		$51.90	$34.68	$146.05		$1,158.87	$50.69	$911.01	$2,186.15	$5,165.46	
	12D	$646.14	$191.55	$31.47	$68.62	$24.04	$158.43		$135.32	$81.26	$1,005.07	$2,341.90	
13	13A									$327.93	$483.65	$811.58	New pump installed in 2008.
	13B	$108.61	$76.33	$118.08	$354.57	$331.64	$210.30		$411.33	$1,380.27	$237.85	$3,228.98	Removed and reinstalled pump for warranty work in 2009.
	13C				$68.96	$7,231.02	$1,155.24	$51.43			$76.45	$8,583.10	Rebuilt pump with new bearings, seals, casing ring, and impeller ring in 2005.
14	14A											$0.00	New pump installed in 2008.
	14B			$108.30	$182.97	$377.28	$47.59	$132.81	$186.22			$1,035.17	
	14C			$4,864.89	$275.94	$96.16		$76.93	$53.27		$104.84	$5,472.03	Repaired check valve in 2003.
15	15A			$121.91				$146.57	$8,315.43			$8,583.91	Replaced impeller wear ring in 2008.
	15B					$181.23		$667.47	$11,470.11			$12,318.81	Replaced bearings, mechanical seal, wear rings and rebuilt impeller in 2008.
	15C				$74.71			$13.52	$50.69			$138.92	
16	16A	$4,160.88	$1,533.42	$170.45	$341.05	$20.54	$105.45	$94.86	$416.80	$56.19	$419.52	$7,319.16	Repaired coupling in 2001.
	16B	$32.97	$350.97	$150.22	$102.94	$106.37	$77.67	$57.44	$186.18	$56.19	$25.26	$1,146.21	
	16C	$32.97	$135.54	$235.44	$39.88	$20.54	$45.18	$217.41	$114.25	$196.12	$215.88	$1,253.21	
17	17A					$64.99	$10,842.75	$555.13	$126.64	$3,810.04	$15,444.89	$30,844.44	Rebuilt pump with new bearings and mechanical seal in 2006. Rebuilt pump housing, repaired impeller and shaft, and replaced bearings, seal, and wear rings in 2010.
	17B		$12,513.31	$5,139.42			$18,222.93	$128.58	$19,055.24	$2,456.69	$1,328.96	$58,845.13	Rebuilt pump with new bearings, mechanical seal, impeller and sleeve in 2002. Rebuilt bearing housing and replaced bearings, seal, shaft and impeller wear ring in 2006. Rebuilt pump with new shaft and impeller in 2008.
	17C					$9,904.11	$4,807.10	$128.59	$53.09	$9,952.32	$3,105.30	$27,950.51	Rebuilt pump with new bearings, mechanical seal, grease seals, and sleeve in 2005-2006. Repaired electrical box for heater and motor thermal protection circuits in 2009.

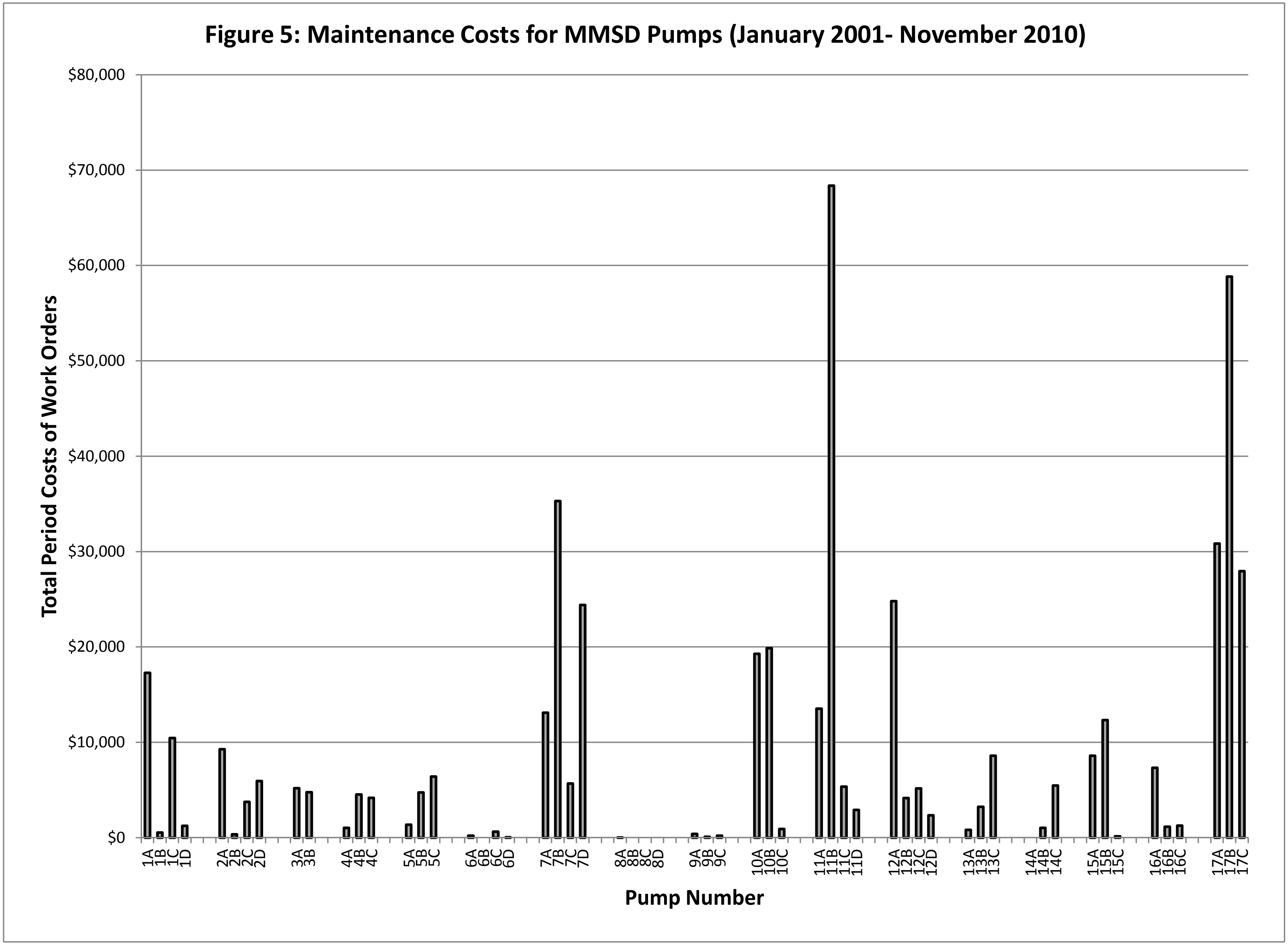


Figure 5: Maintenance Costs for MMSD Pumps (January 2001- November 2010)
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Total Period Costs of Work Orders
1A 1B 1C 1D 2A 2B 2C 2D 3A 3B 4A 4B 4C 5A 5B 5C 6A 6B 6C 6D 7A 7B 7C 7D 8A 8B 8C 8D 9A 9B 9C 10A 10B 10C 11A 11B 11C 11D 12A 12B 12C 12D 13A 13B 13C 14A 14B 14C 15A 15B 15C 16A 16B 16C 17A 17B 17C
Pump Number

Appendix A3
Connector Lines Between Stations
June 1999 (Updated April 2010)

MADISON METROPOLITAN SEWERAGE DISTRICT

COLLECTION SYSTEM TECHNICAL GUIDELINES

APPENDIX 3

CONNECTOR LINES BETWEEN STATIONS

Stations 1-2, 2-8, 6-10, 4-8, 15-5, 15-16, 16-5, and 13-1

Author: Dick Klaas, June 1999

Updated: Todd Gebert, April 2010

Table of Contents

List of Tables

Introduction

District personnel have discussed and briefly investigated the possibility of constructing connector lines between several pumping stations. The main advantage of connector lines is to improve reliability during emergency situations. Connector lines can be very valuable if the force main or the pumping station develop major problems causing a loss of flow handling capabilities for a long period of time. Major problems are defined here as problems that would take a day or more to repair. Some stations can be out of service longer than others, but all stations would be a real concern if an outage lasted a day or more. Without connector lines there probably would be no other way to handle the flows during this outage time. Connector lines could also be used to shave peak flows, if needed.

The purpose of this memo is to identify existing and possible new connector lines, to comment on their usefulness, and to estimate the costs of constructing additional connector lines.

Background Information

Madison Metropolitan Sewerage District pumping stations were not designed with connector lines between them. System expansion over the years has provided opportunities to allow some transfer of flow from one station to another. All of these changes (interconnection of facilities) were done with very little cost to the District. Most often an existing facility with slight modification could be used in conjunction with the new facility being constructed.

Crosstown Force Main

The Crosstown force main now serves as the primary pumping option between Station 1 and Station 2, but it was not designed for that reason. It was originally constructed in 1914 to pump from old Booster Station 2 (near Brittingham Park) to old Booster Station 1 (near First Street), which then pumped to the Burke Treatment Plant. The Crosstown force main was replaced from 2000-2002 and is currently used to convey daily flows from Station 1 to Station 2. This reduces the flow that was previously pumped from PS1 to PS6 and subsequently PS7. In emergency situations flow can be reversed so that flow is from Station 2 to Station 1. These stations have similar firm and maximum pumping capacities after rehabilitation work was completed in 2005 (see Table 4.2 in Chapter 4).

Station 2-8 or 8-2

A portion of the Southwest Interceptor from Station 2 to the intersection of Haywood Drive and Mills Street serves as a connector line between Station 2 and Station 8. This section of sewer was not constructed as a connector line, but serves as one when either station is out of service long enough to back up the flow into this section of sewer. At present this section of sewer does not have adequate capacity to convey average daily flows that are diverted from either Station 2 or Station 8.

Station 15-5 and 15-16

Incoming gravity flow to Station 15 can be diverted to Station 5 through MH05-102A located near Station 15. The West Interceptor flow to Station 15 was originally handled by Station 5. The flow upstream of MH05-102A was diverted to Station 15 when the station was put in service in 1974. This manhole has a slide gate with a small hole in the middle of the gate to allow flow to continue down the West Interceptor. The hole is now above the normal water elevation so that flow through the hole occurs only during high flow situations.

Station 15 force main can be diverted to Station 16, if necessary. This diversion relieves the West Interceptor and Station 8.

Station 16-5

Incoming gravity flow to Station 16 can be diverted to Station 5 through the Gammon Extension by overflowing the dam in MH05-230 which is located across Gammon Road from Station 16. This would reduce flows to Stations 12 and 11.

Station 13-1

Prior to 1971, a portion of the Station 13 service area flowed to Station 1. This area includes approximately 2,150 acres adjacent to Warner Park in the City of Madison. Due to capacity constraints at Station 1 and the extension of the District's Northeast Interceptor to Waunakee and DeForest in the early 1970's, the City of Madison constructed a new interceptor in 1971 that diverted flow from the Warner Park area to Station 13. The infrastructure to convey flows to Station 1 is still largely in place, although modest system improvements would be needed to provide the required capacity.

Connectors and Potential Improvements

The following is a brief description of when and how the existing connector lines work. Other possible options were investigated to determine if other connectors are needed.

Station 2-8 Connector

The Southwest Interceptor (SWI) from Station 2 to MH08-106 at the intersection of Haywood Drive and Mills Street can be used to divert flow from Station 2 to Station 8. This diversion was used several times during repairs to the Station 2 force main prior to its replacement in 2001. Most repairs were needed to fix leaky joints, but there were also several pipe breaks. Leaky joints might not require force main shut down for more than a few hours. Pipe breaks have taken the force main out of service for days. The 1970 break of an elbow at Sayle Street and Van Duessen Street took the force main out of service for a week (see Appendix 5 for details).

Flow from Station 2 to Station 8 through the diversion section of the SWI at several different wet well elevations has been calculated. The maximum reliable diversion capacity is 3.9 MGD at a PS2 wetwell elevation of -2.00 (see Appendix 1). The invert elevation of the SWI at MH08-106 (Haywood and Mills) is -5.85 and at MH02-401 (near Station 2) the invert elevation is –9.75. The diversion length is approximately 3,200 feet, with a pipe slope of 0.12 % towards Station 2. Assuming a wet well elevation of -2.00 at Station 2, the calculated capacity is 3.9 MGD with a calculated water surface slope of 0.058%. Based on past station outages, the wet well should not be maintained any higher than -2.00 to minimize the risk of flooding. A survey of basement elevations around Station 2 found that most basements have elevations in the general range of -0.5 to 0.5. One backup was reported in 1999 when the wet well rose to Elevation -0.8.

Station 2 and Station 8 average daily and peak hourly flows are shown in Table 1 for 2009 flows and projected 2030 flows:

Table 1 - Stations 2 and 8 Flows

	Year 2009		Year 2030	
Pumping Station No.	Average Daily Flow (mgd)	Peak Hourly Flow (mgd)	Average Daily Flow (mgd)	Peak Hourly Flow (mgd)
2	10.15	28.15	10.74	29.52
2 (less 1)	5.93	17.90	5.21	16.04
8	7.60	22.07	9.31	26.18
8 (less 15)	6.24	18.69	7.38	21.53

Note: Average flows for 2009 are taken from MMSD pumping records. Average flows for 2030 are projected per CARPC's "MMSD Collection System Evaluation". All peak flows are derived from Madison Design Curve.

As mentioned previously, routine daily operation is for flows from Station 1 to be conveyed to Station 2 through the Crosstown force main. In the event that a problem develops at Station 2 or in the Station 2 force main, flows from Station 1 could be temporarily diverted to Station 6. For this reason, flows at Station 2 are shown in Table 1 with and without flow contribution from Station 1. Similarly, if operational problems were encountered at Station 8 or the Station 8 force main, flows could be diverted from Station 15 to Station 16.

All existing and 2030 average daily flows (~5.2 mgd) at Station 2 exceed the capacity of the existing 24" SWI diversion line (3.9 mgd), even with diversion of Station 1 flows away from Station 2.

Station 8-2 Connector

The SWI from MH08-106 to Station 2 can be used to divert flow from Station 8 during an outage of the station or during force main repairs. Based on past experience, basement flooding in the Station 8 service area starts at a wet well level of approximately +1.00 (see Appendix 6 for details). Assuming a wet well elevation one foot below this (0.00) at Station 8, the calculated slope of the water surface is 0.12% and the calculated capacity is 6.8 MGD (Appendix 3). This capacity is calculated using a Manning's n=0.015 and a slight decrease in pipe diameter since the iron build-up in the Haywood Drive diversion line is severe. This diversion is not fully capable of handling the existing average daily flow of 7.60 MGD to Station 8 but could potentially handle lower diurnal flows at night.

Diverting Station 15 flow to Station 16 would not relieve Station 8 quickly enough to divert remaining Station 8 flow through the existing SWI. The average flow time from Station 15 to Station 8 is 8.8 hours. This means the flow reduction at Station 8 would not be seen for 8.8 hours after switching the valves. Basements flooded within 3 hours during the Station 8 outage of June 24, 1998.

The 2002 *Collection System Facilities Plan* recommended investigating the possibility of reconfiguring sewers in the Randall Avenue area as another way to divert flow from Station 8 to Station 2. This would involve diverting flow from the West Interceptor/Randall Relief sewer to either the Spring Street Relief sewer or the West Interceptor on Regent Street. In 2003 the City of Madison completed a construction project at the intersection of Randall Avenue and Regent Street that redirected approximately 0.30 mgd of average daily flow from the Randall Relief to the West Interceptor. Given this diversion of flow and the possibility of heavy iron deposits in the 24" cast iron West Interceptor that may reduce capacity, it is not recommended to divert additional flow into this sewer. Conversely, opportunities may exist to divert flows from the Randall Relief Sewer to the Spring Street Relief sewer. CARPC's capacity evaluation projects that peak flows in the Spring Street Relief will be approximately 30%-35% of capacity by 2030. Appendix A8 of the update to the 2002 *Collection System Facilities Plan* includes further discussion on capacity needs in the West Side Conveyance System.

Haywood Drive Replacement Sewer

Due to the age, condition, and capacity of the 24” cast iron sewer on Haywood Drive, consideration should be given to replacing this sewer. A replacement line would provide much more reliability during outages, including all of the following:

- Station 2 outage
- Station 8 outage
- Station 2 force main problem
- Station 8 force main problem

Installation of a larger sewer is not needed to convey average daily flows, but the additional capacity provided would be very useful for flow diversion between Stations 2 and 8. Approximate diversion capacities between the stations are shown in Table 2 for both the existing 24” sewer and a 36” replacement sewer.

Table 2 - Connector Capacities for Stations 2 and 8

	Year 2030			
Pumping Station No.	Average Daily Flow (mgd)	Peak Hourly Flow (mgd)	Existing Diversion Capacity in 24” Haywood sewer (mgd)	Proposed Diversion Capacity in 36” Haywood sewer (mgd)
Diversion from PS 2 to PS 8				
2	10.74	29.52	3.90	10.40
2 (less 1)	5.21	16.04	3.90	10.40
Diversion from PS 8 to PS 2				
8	9.31	26.18	6.80	21.70
8 (less 15)	7.38	21.53	6.80	21.70

Assuming a unit cost of $700 per foot for a new 36” sewer, the cost to replace the Haywood Drive sewer and provide additional diversion capacity between Stations 2 and 8 is estimated to be approximately $1,000,000.

With the replacement sewer in place, 2030 average daily flows to Station 2 could very nearly be fully diverted to Station 8. 2030 peak hourly flows could not be fully diverted from Station 2 to Station 8, even with flow diversion to Station 6. Average daily flows to Station 8 could be safely diverted to Station 2, although peak flows could not be fully diverted.

In summary, the existing 24" sewer on Haywood Street does not have adequate capacity to safely divert average daily flows between Station 2 and Station 8. A 36" replacement sewer is needed to divert the anticipated 2030 average daily flows from each station. A 36" sewer would also allow for the diversion of a significant portion of peak hourly flows between the stations, although it could not be expected to convey all peak flows.

Station 1-2 Connector (Crosstown FM)

The Crosstown force main was replaced between 2000 and 2002 with new 24" and 30" diameter pipe. Previously this force main had been used during heavy rainfalls to divert flows from Station 1 to Station 2 and provide relief for Station 6. Since 2002 the Crosstown force main has been used to convey average daily and peak flows from Station 1 to Station 2. This change in operation has provided capacity relief for Stations 6 and 7. A small amount of flow is directed towards Station 6 on a daily basis to flush out the force main in an effort to reduce odors.

The Crosstown force main system has sufficient flexibility to permit pumping from Station 2 to Station 1. This mode of operation would typically only be used in the event of an outage at Station 2 or with the Station 2 force main. Reconfiguring the system to allow pumping to Station 2 requires manual intervention, including opening/closing several valves, and should be tested periodically to ensure proper operation.

Station 6-10 Connector

Background & Purpose

There are no connector lines between Station 6 and Station 10 at this time. The purpose of a connector would be to allow diversion of flow between Station 6 and Station 10. One of the primary reasons for investigating this connector is that the stations have wet wells at similar elevations. This unusual condition would make it much easier to transfer flows between stations than in other instances. A connector between Stations 6 and 10 would increase the reliability of District facilities if any of the following occurred:

- Station 6 outage
- Station 10 outage
- Station 6 force main problem
- Station 10 force main problem

In January of 2009 a contractor performing soil borings on Monona Drive drilled a hole into the Station 6 force main, disabling it for several hours. During the outage wastewater had to be hauled by truck from Station 6 to other points in the collection system. A connector line from Station 6 to Station 10 would have likely reduced or eliminated the need for hauling wastewater while the force main was out of service.

Another benefit of building a connector line between Station 6 and Station 10 is to reduce the chance of flooding basements in the Johns Street area in the Station 6 basin. When the wet well level at Station 6 reaches elevation –5.0, the City of Madison is called to isolate the Johns Street sewer from the rest of the Station 6 service area. There is not much time to react during high flows since the Station 6 wet well level rises very rapidly. At one time the City had plans to build a pumping station adjacent to Station 6. The proposed pumping station would act to isolate the local sewers along Johns Street from the Station 6 wet well. The City elected not to build this local pumping station, in part due to the District's change in operation in 2002 when flows from Station 1 were rerouted from Station 6 to Station 2. The proposed connector line would act to greatly mitigate flooding in the Johns Street area.

Exceeding the capacity at Station 6 will eventually cause an overflow into Starkweather Creek and/or Lake Monona. There is an overflow flap gate at MH06-102 that would overflow to the creek. Before the overflow elevation is reached many basements would flood in the Johns Street area, as previously mentioned. Station 10 previously had an overflow for the incoming interceptor sewer at MH10-114, near Sycamore Road. This overflow was abandoned in 2010 as part of the new relief and replacement sewers that were installed from Station 10 to Lien Road.

Route Alternatives and Cost

A connector line could flow by gravity from Station 6 to Station 10 or via force main between the two stations. Two alternate routes for a gravity connector are shown in Appendix 7. The connector line for Alternate 1 would connect to MH06-102 and travel along the east side of Starkweather Creek to O.B. Sherry Park. The sewer would extend northeasterly across the park to Milwaukee Street, at which point it would head to the north across lands owned by the Voit Concrete Company. The sewer would travel to the south and east of the existing sand pit on the Voit site and finally extend east to MH10-102 across lands owned by the City of Madison. The total length of the route is approximately 6,300 feet, with one railroad crossing and significant dewatering expected across the wetlands owned by the City of Madison. Excavation for a gravity main in the vicinity of Milwaukee Street would be on the order of 25-30 feet (see Appendix 10 for proposed invert elevations and manhole depths for both route options). Easements would be needed for much of the route for lands owned by the Voit Concrete Company and the City of Madison.

The connector line for Alternate 2 would be a more direct route to Station 10 along City of Madison streets. It would connect to the wet well at Station 6 and then head to the northeast to Station 10 along Harding Street, Richard Street, and Schenk Street. The total length of this option is approximately 5,600 feet, so it is significantly shorter than Alternate 1. The depths of the sewer are generally 20-25 feet along the entire length. Due to excavation on City streets the unit price of construction is expected to be considerably more than that for Alternate 1 due to additional factors such as traffic, other utilities, and pavement removal and replacement. Land acquisition for this option should be minimal.

It is likely that Alternate 1 would be the preferred route based on costs. Although certain segments involve deep construction and would require dewatering, there is little impact to City streets and interferences with other utilities should be minimal. Using a rough estimation of $800 per lineal foot for installation of a 48" gravity sewer, the connector line is estimated to cost $5.0 million.

Flowrates

Average daily and peak hourly flowrates at both stations for existing and future conditions are shown in Table 3. The carrying capacity of the connector line should be able to convey, at a minimum, the average daily flow through the year 2030.

Table 3 - Stations 6 and 10 Flows

	Year 2009		Year 2030	
Pumping Station No.	Average Daily Flow (mgd)	Peak Hourly Flow (mgd)	Average Daily Flow (mgd)	Peak Hourly Flow (mgd)
6	2.99	9.89	1.74	6.37
10	8.77	23.52	13.26	35.26

Note: Average flows for 2009 are taken from MMSD pumping records. Average flows for 2030 are projected per CARPC's "MMSD Collection System Evaluation". All peak flows are derived from Madison Design Curve.

The design of a connector line should also consider the operating parameters outlined in Table 4 for each station.

Table 4 - Stations 6 and 10 Design Parameters

Conditions	PS 6	PS 10
High Water Alarm	-5.5	-5.0
Overflow Elev.	+1.0	N/A
Flooding Elev.	-6.0	+2.0
Manhole Inverts	-8.9 at 6-102	-10.0 (10-104) & -10.89 (10-102A)
Large Pump Start	-6.2	-5.5

Flooding elevations listed above are critical for the connector line design. The maximum head allowed on the connector line would be at an elevation of –6.0 at Station 6 and +2.0 at Station 10. It would be advantageous for the connector line to have enough capacity to convey both average daily and peak hourly flowrates for future conditions, although the conveyance of peak flowrates may not be attainable. A 48" connector line could convey the majority of CARPC's projected peak flows in 2030 between the stations (see Appendices 8 and 9). The capacity of this diversion line and the average daily and peak hourly flowrates for 2030 are shown in Table 5.

Table 5 - Connector Capacities for Stations 6 and 10

Pumping Station No.	Year 2030 Average Daily Flow (mgd)	Year 2030 Peak Hourly Flow (mgd)	Capacity in Proposed 48" Diversion Section (mgd)
Diversion from PS 6 to PS 10			
6	1.74	6.37	5.6
Diversion from PS 10 to PS 6			
10	13.26	35.26	25.9

Note: Average flows for 2030 are projected per CARPC's "MMSD Collection System Evaluation". All peak flows are derived from Madison Design Curve.

There is little difference in elevation between flooding in the PS6 service areas (Elev = -6.0) and the elevation at which the pumps at PS 10 typically turn on (Elev = -7.50). As a result, there is minimal capacity in the diversion line from PS6 to PS10 under normal operating conditions. Approximately 5.6 mgd of flow could be transferred from Station 6 to Station 10 in an emergency. This amount of flow is greater than the average daily flow to PS6, but slightly less than the peak hourly flowrate at PS6 for 2030 projections.

With regard to the PS10 to PS6 diversion, it should be noted that the firm and maximum pumping capacity of PS6 is 24.2 MGD. Thus, Station 6 would not be able to handle the estimated diversion capacity of 25.9 MGD as shown in Table 5. Either additional capacity would need to be added at Station 6 or a smaller diversion line (42") could be installed.

Station 4-8 Connector

The 2002 *Collection System Facilities Plan* discussed the construction of a connector line from Station 8 forcemain to Station 4. Due to the relatively high costs involved to construct this line, another means of providing reliability for Station 4 was desired. A less expensive project involving the installation of valves to the force mains from Stations 2 and 4 was identified and completed in 2000.

The Station 4 force main connects to the Station 2 force main just to the east of Station 4. Prior to the PS2 Forcemain Replacement project, a break in the PS2 forcemain in either direction from PS4 would disable both force mains. By adding a valve just north of the Station 4 connection, Station 2 can be isolated if a Station 2 force main break occurs between Station 4 and Station 2. In this case Station 4 flow can continue to be pumped to the plant during the repair of a break between these stations. Another valve just south of the Station 4 connection allows Station 4 flow to pump to Station 2 if a force main break occurs between this valve and the meter vault at the treatment plant's headworks facility.

Connecting the Stations 2 and 4 force main lines has added reliability for force main breaks but not for station problems. Hauling Station 4 flow to the plant with Metrogro semi trucks or using a generator are the current contingency plans for any Station 4 outage.

Given the additional flexibility provided by the valve installation project in 2000, no additional connector lines are proposed for Station 4 at this time.

Station 15-5 and 15-16 Connectors

Incoming gravity flow to Station 15 can be diverted to Station 5 through MH05-102A located near Station 15. The West Interceptor flow was originally conveyed by Station 5. This flow upstream of MH05-102A was diverted to Station 15 in 1974 when the station was put in service. This manhole has a slide gate with a small hole in the middle of the gate to allow flow to continue down the West Interceptor. The hole is now above the normal water elevation so that flow through the hole occurs only during high flow situations.

Due to corrosion problems in the West Interceptor downstream of Station 15, consideration was given to abandoning a stretch of this system along Lake Mendota between Marshall Park and Baker Avenue. However, abandonment of this portion of the system would require the construction of new local sewers to maintain service to properties currently served directly by the West Interceptor. In addition, abandonment of the West Interceptor in this area would eliminate a valuable relief option for Station 15. The District intends to rehabilitate the corroded portions of the West Interceptor with a cured-in-place lining in 2011.

Station 15 was out of service on June 18, 1998 for almost 3 hours. Flow ran over the slide gate in MH05-102A without causing any known backup problems. Capacity of the 14" and 16" West Interceptor segments downstream of this manhole are 2.1 MGD and 2.9 MGD, respectively. These segment capacities are estimates based upon lining of the 1931 cast iron pipe. Station 15 average daily flow in 2009 was 1.36 MGD, with the 2030 estimated average daily flow increasing to 1.83 MGD. Thus, this portion of the West Interceptor can be relied upon for diverting Station 15's average daily flows until 2030, but the line capacity is likely exceeded for peak flows.

Other options available during Station 15 outages or force main problems include using a generator to run the station or pumping flow to Station 16 through a diversion force main. The diversion force main relieves the West Interceptor system and Station 8 and could be used during specific force main repairs. Force main problems downstream of MH15-01360 (near Allen Boulevard and University Avenue) could be repaired while diverting flow to Station 16.

Station 16-5 Connector

Incoming gravity flow to Station 16 can be diverted to Station 5 by overflowing the dam in MH05-230, located across Gammon Road from Station 16. This would also reduce flows to Stations 12 and 11. Station 16 average daily flow in 2009 (without Station 15 flow included) is 1.71 MGD, with an estimated increase to 3.05 MGD by 2030. Minimum capacity in the West

Interceptor downstream of MH05-230 is 1.39 MGD. Therefore, there is insufficient capacity in the West Interceptor diversion to handle all of the existing Station 16 flow.

Station 16 and its force main are 30 years old. The likelihood of failures for these facilities is less than in other portions of the collection system. Station controls have been a concern but were recently upgraded. Additional diversion capabilities for this station are not required at this time.

Station 13 Flow Diversion to Station 1

Background and Purpose

Currently there is little redundancy in the District's Eastside collection system. Other than Station 1, no pumping station in this part of the system has the ability to back up or relieve another station in the event of a station or force main outage. In an effort to provide more redundancy, connector lines between Stations 6 and 10 and between Stations 7 and 18 have been proposed and discussed in the Collection System Facilities Plan. Another location where redundancy could be implemented in the Eastside collection system is between Stations 13 and 1.

Prior to 1971, flows from the Warner Park area in the City of Madison were routed to Station 1 on N. First Street. Flow was conveyed along Packers Avenue to Oscar Mayer through City of Madison sewers that were originally constructed in the 1940's to serve the Dane County sanitarium on Northport Drive. A relief sewer was constructed along this route in the 1960's to provide additional capacity. MMSD sewers conveyed the flow from the end of the City's sewers at Oscar Mayer to Station 1.

In the late 1960's and early 1970's the District constructed Stations 13 and 14 and extended the Northeast Interceptor to the villages of DeForest and Waunakee. Due to capacity constraints in the Station 1 service area and with the Warner Park area continuing to grow, the City elected to build a new diversion sewer (Truax Interceptor) to connect the Warner Park lands to the Northeast Interceptor and Station 13. This diversion sewer begins at the intersection of Packers Avenue and International Lane and currently directs all flow from the Warner Park area to Station 13 via slide gates.

Flowrates at Pumping Stations

The District has made significant improvements to conveyance and pumping capacity in the Station 1 service area since the 1960's and 1970's. Adequate capacity is now available such that flows from the City of Madison's Fremont Pumping Station and the County sanitarium sewershed could be redirected to Station 1, if desired. The lands generating the flows to be diverted comprise approximately 2,150 acres and are shown as subbasins 13-A, 13-D, and 13-E on CARPC's subbasin delineation map in Appendix 11 (Figure 3-34). Using CARPC's 2030 TAZ flow estimates, an average daily flow of 1.23 MGD and a peak hourly flow of 3.06 MGD could be diverted by gravity from Station 13 to Station 1.

Benefits of Flow Diversion

There are several benefits to diverting a portion of the Station 13 flow to Station 1. Most importantly, the diversion would allow for redundancy and flexibility in this portion of the collection system. This is an important consideration in that the Station 13 service area is generally a low-lying area with a history of infiltration and inflow concerns.

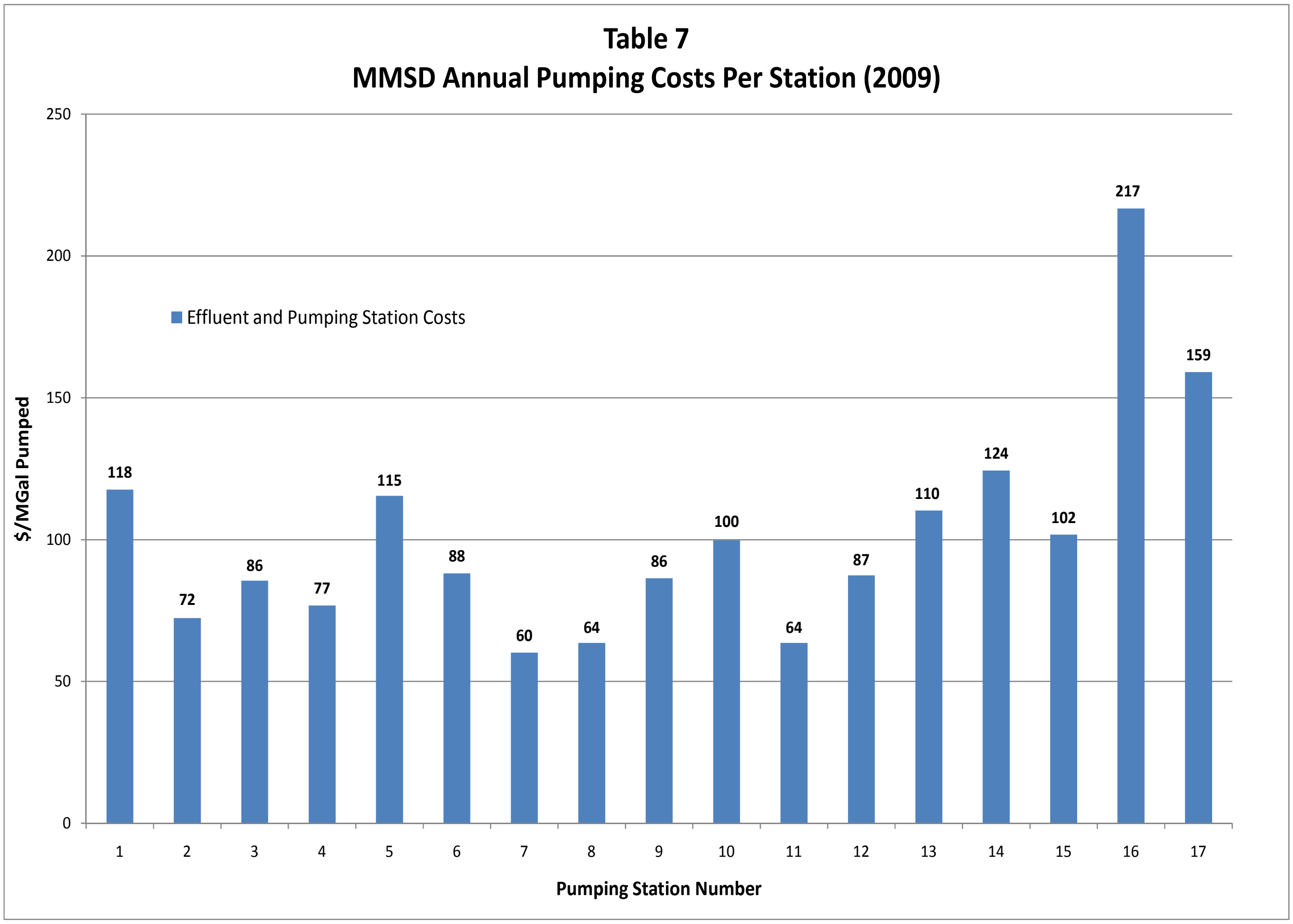
The flow diversion would also postpone the need for firm pumping capacity improvements at Station 13 and in the interceptor downstream of PS13 by at least ten years. Table 6 shows the major facility improvements affected by the PS13 flow diversion and the required timing of these improvements. CARPC's flow projections using both Traffic Analysis Zone (TAZ) data and Uncertainty Factor (UF) data were used in determining the timing of the improvements.

Table 6 - Summary of Improvements for PS 13 Flow Diversion

	Year Improvement is Required			
	No Diversion		With Diversion	
Improvement	TAZ Flows	UF Flows	TAZ Flows	UF Flows
Increase PS 13 Firm Capacity	2020	2010	2036	2021
Relief for NEI – Truax Extension (MH10-145 to MH10-121)	2032	2017	2043	2027
Construct interceptor to connect PS 13 service area to PS 1	Not needed	Not needed	Prior to flow diversion	Prior to flow diversion

It is not anticipated that any capacity improvements would be needed at downstream Stations 1 and 2 if flow were diverted from the Station 13 service area. Both of these stations were recently rehabilitated and have sufficient firm capacity to accept the diverted flow. The effect of the diversion on flowrates at all of the downstream pumping stations is shown in Appendix 12 for various development scenarios.

Diverting flow from the PS13 service area would result in a small increase in overall pumping costs. Currently flow from the PS13 subbasins is pumped at three stations (13, 10, and 7). With the diversion the flow would be pumped at two stations (1 and 2). As can be seen in Table 7, the total unit cost to pump flow through Stations 13, 10 and 7 and the treatment plant's effluent force main is approximately $110/MGal. The costs for pumping through Stations 1 and 2 and the effluent force main are approximately $118/MGal. Thus, there is a small increase in pumping costs associated with diverting the flow to Station 1.



Infrastructure and Costs

Much of the infrastructure to convey the diverted flow is already in place and has available capacity. In 2002 the District completed its upgrade of the North Basin Interceptor from Station 1 to the intersection of Pennsylvania Avenue and Commercial Avenue. This new 36" sewer has adequate capacity to accommodate the diverted flow. Sufficient capacity should also be available in the City's sewer system along Packers Avenue from International Lane to a point approximately 650 feet south of Aberg Avenue. At this point the City's sewers decrease in size and additional capacity would have to provided to the terminus of the North Basin Interceptor at Pennsylvania Avenue and Commercial Avenue.

The District has abandoned facilities along the Packers Avenue and Commercial Avenue corridor. At one time the Burke Outfall and a 30" cast iron sewer connected to the City's sewers south of Aberg Avenue and conveyed flow all the way to Station 1. These facilities were originally constructed in 1911 and 1912 to convey flow to and from the Burke Treatment Plant east of STH 113 and were eventually converted to gravity sewers. Due primarily to structural considerations, portions of these facilities were abandoned in the 1990's, with the entire length abandoned fully by 2002.

The length of new sewer along Packers Avenue and Commercial Avenue that would be required is approximately 2,700 feet in length (see Appendix 13 for map). Assuming installation of a new 30” sewer at a unit cost of $700 per foot, the approximate project cost would be $1.9 million. A present worth analysis was conducted to compare the life cycle costs over a 40-year period for operation under the existing conditions as opposed to diverting flow as previously discussed (see Appendix 14). The present worth cost to operate under existing conditions is approximately $8.6 million, while the present worth costs to divert the flow is approximately $8.1 million. Thus, it should be economically feasible to construct this project and operate as outlined above. A more thorough cost analysis should be conducted to evaluate this project as capacity needs at PS13 and in the NEI (Truax Extension) become more imminent.

It is assumed that installation of a replacement sewer could proceed along the Packers Avenue Service Road and Commercial Avenue adjacent to the abandoned Burke Outfall. This assumption requires further investigation as a portion of the Burke Outfall was abandoned in 1995 at the City’s request to allow installation of a new storm sewer for Oscar Mayer. Conflicts with this storm sewer and other utilities may pose a problem for installation of a new replacement sewer in this corridor.

Conclusions

Little flexibility and redundancy is currently available in the District’s Eastside collection system, especially in the upper reaches of the system (Stations 13 and 14). The ability to divert flow from a portion of the Station 13 service area to Station 1 would provide options during high-flow events or extended station or force main outages downstream. While this diversion would address only a fraction of the total flow to Station 13, it may prove especially useful in very intense and localized storms, such as the storms that caused Stations 13 and 14 to be bypassed for a short time in June of 2008.

At present there is not a pressing need to implement this diversion. The project is expected to postpone the need to provide capacity relief in the NEI (Truax Extension) and additional firm pumping capacity at Station 13 by an additional ten years, although PS13 will likely require a major rehabilitation for equipment prior to 2030. The effect on other system improvements due to this diversion is negligible. Nevertheless, the cost to implement this project is relatively affordable and should be considered a long-term goal. The City’s sewers along the Packers Avenue Service Road are 70-80 years old and are approaching the end of their service lives. When the City elects to replace or rehabilitate these sewers the District should consult with the City and investigate cost-sharing alternatives to provide additional capacity in this corridor.

Summary and Recommendations

This memo reviewed the status of existing station connector lines and identified potential improvement projects and potential new projects. It is recommended that the following projects be evaluated during the overall facility plan project prioritizing procedure.

1. Replace the Southwest Interceptor from MH08-106 (Haywood Drive and Mills Street) to MH 2-606 (Haywood Drive and West Shore Drive) with a 36” line to serve as a gravity connector between Stations 2 and 8. Approximate cost is estimated at $1 million.

2. Investigate a possible new 48” connector between Stations 6 and 10 at an approximate cost of $5.0 million.

3. As a long-term consideration, explore opportunities to divert flow on a daily or event basis from the Station 13 service area to Station 1. District staff should consult with the City of Madison on cost-sharing alternatives to upgrade sewer capacity along the Packers Avenue Service Road and Commercial Avenue between Packers Avenue and Pennsylvania Avenue.

Appendix

1. Emergency diversion from PS 2 to PS 8 – Existing conditions
2. Emergency diversion from PS 2 to PS 8 – Proposed conditions
3. Emergency diversion from PS 8 to PS 2 – Existing conditions
4. Emergency diversion from PS 8 to PS 2 – Proposed conditions
5. 1970 PS 2 FM broke elbow near Sayle Street
6. 1998 PS 8 power outage
7. Alternate route map for Stations 6-10 connector line
8. Emergency diversion from PS 6 to PS 10
9. Emergency diversion from PS 10 to PS 6
10. PS 6-10 Connector Characteristics
11. Map of Pump Station 13 service area
12. Pump Station 13 flow diversion – Effects on downstream pump stations
13. Pump Station 13 Diversion Sewer
14. 40-Year Present Worth Cost Analysis for Pump Station 13 Diversion

APPENDIX 1 - EMERGENCY DIVERSION FROM PS 2 TO PS 8
Existing Conditions

FIND: Wet well elevations at Pump Station No. 2 for various rates of "backflow" from PS 2 to PS 8.

I. PHYSICAL CHARACTERISICS OF DIVERSION (EXISTING)

Haywood Drive Section		**Shore Drive Section**	
Length, L, of 24" overflow (ft) =	1,438	Length, L, of 36" overflow (ft) =	1,770
Pipe diameter, D (ft) =	1.92	Pipe diameter, D (ft) =	3.00
Pipe area, A (ft^2) =	2.8853	Pipe area, A (ft^2) =	7.0686
Hydraulic radius, R (ft) =	0.48	Hydraulic radius, R (ft) =	0.75
Manning's n =	0.015	Manning's n =	0.013

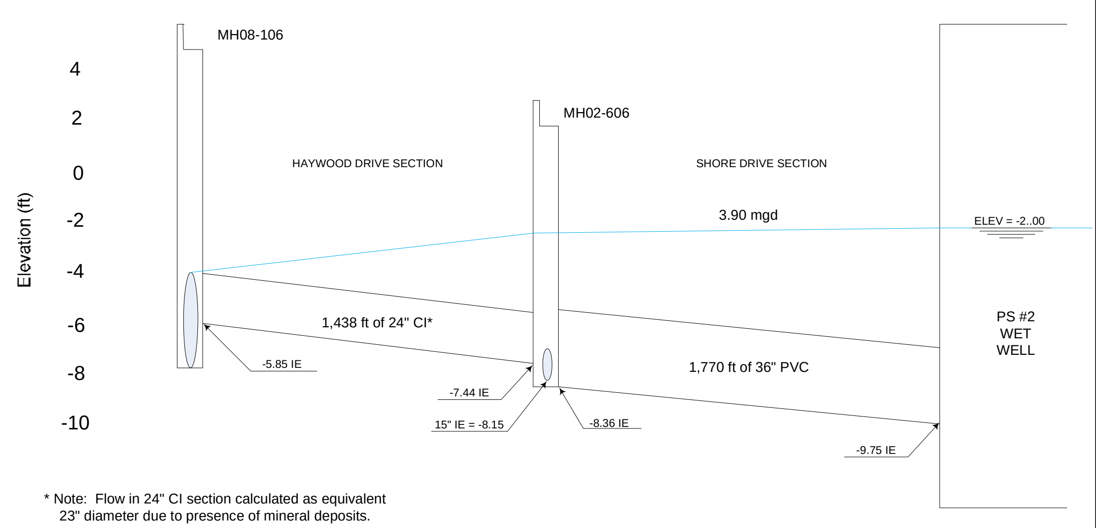
Water surface elevation at discharge (MH08-106) = -3.85 (assumes 48" Randall Relief flowing full)

II. CALCULATE FLOW BY MANNING'S EQUATION (EXISTING)

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in Haywood Drive Section (ft)	Water Surface Elevation at MH02-606 (ft)	Head Loss, ΔH, in Shore Drive Section (ft)	Water Surface Elevation at PS 2 (ft)
8.00	12.38	7.19	3.34	0.61	3.94
7.00	10.83	5.50	1.65	0.46	2.12
6.00	9.28	4.04	0.19	0.34	0.53
5.00	7.74	2.81	-1.04	0.24	-0.81
4.00	6.19	1.80	-2.05	0.15	-1.90
3.90	**6.03**	**1.71**	**-2.14**	**0.14**	**-2.00**
3.00	4.64	1.01	-2.84	0.09	-2.75
2.00	3.09	0.45	-3.40	0.04	-3.36
1.00	1.55	0.11	-3.74	0.01	-3.73
0.00	0.00	0.00	-3.85	0.00	-3.85



EMERGENCY DIVERSION – PS 2 TO PS 8

Existing Conditions

APPENDIX 2 - EMERGENCY DIVERSION FROM PS 2 TO PS 8
Proposed Conditions

FIND: Wet well elevations at Pump Station No. 2 for various rates of "backflow" from PS 2 to PS 8.

I. PHYSICAL CHARACTERISICS OF DIVERSION

Haywood Drive Section		**Shore Drive Section**	
Length, L, of 24" overflow (ft) =	1,438	Length, L, of 36" overflow (ft) =	1,770
Pipe diameter, D (ft) =	3.00	Pipe diameter, D (ft) =	3.00
Pipe area, A (ft^2) =	7.0686	Pipe area, A (ft^2) =	7.0686
Hydraulic radius, R (ft) =	0.75	Hydraulic radius, R (ft) =	0.75
Manning's n =	0.013	Manning's n =	0.013

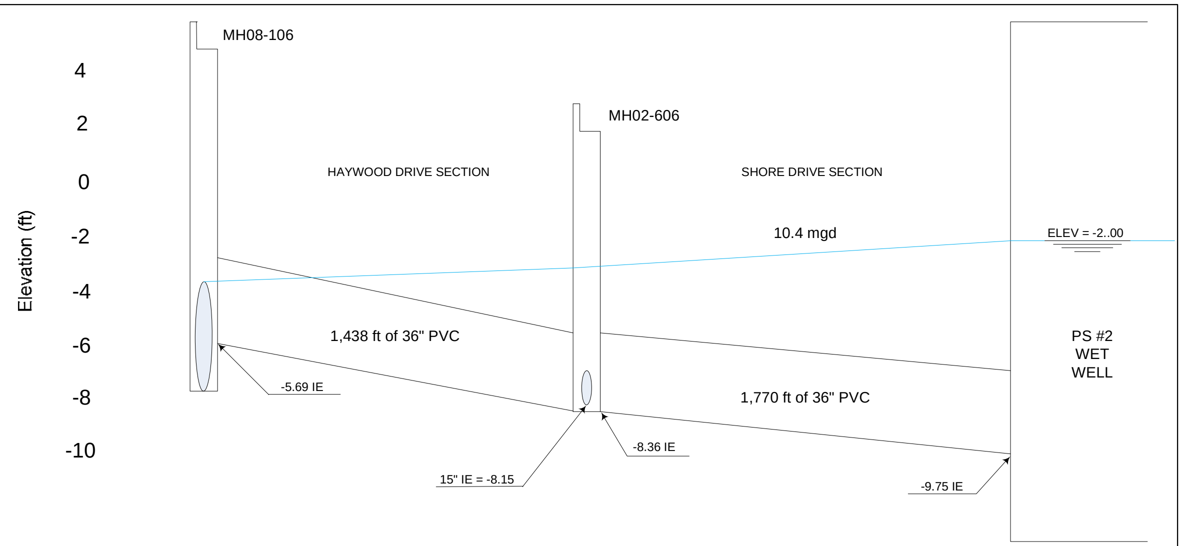
Water surface elevation at discharge (MH08-106) = -3.85 (assumes 48" Randall Relief flowing full)

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in Haywood Drive Section (ft)	Water Surface Elevation at MH02-606 (ft)	Head Loss, ΔH, in Shore Drive Section (ft)	Water Surface Elevation at PS 2 (ft)
16.00	24.75	1.97	-1.88	2.43	0.55
15.00	23.21	1.73	-2.12	2.14	0.02
14.97	23.16	1.73	-2.12	2.13	0.00
14.00	21.66	1.51	-2.34	1.86	-0.48
13.00	20.11	1.30	-2.55	1.60	-0.94
12.00	18.56	1.11	-2.74	1.37	-1.37
11.00	17.02	0.93	-2.92	1.15	-1.77
10.37	**16.04**	**0.83**	**-3.02**	**1.02**	**-2.00**
10.00	15.47	0.77	-3.08	0.95	-2.13
9.00	13.92	0.62	-3.23	0.77	-2.46
8.00	12.38	0.49	-3.36	0.61	-2.75
7.87	12.17	0.48	-3.37	0.59	-2.78
7.00	10.83	0.38	-3.47	0.46	-3.01
6.00	9.28	0.28	-3.57	0.34	-3.23



EMERGENCY DIVERSION – PS 2 TO PS 8

Proposed Conditions – Haywood Drive Replacement Sewer

APPENDIX 3 - EMERGENCY DIVERSION FROM PS 8 TO PS 2
Existing Conditions

FIND: Wet well elevations at Pump Station No. 8 for various rates of "backflow" from PS 8 to PS 2

I. PHYSICAL CHARACTERISICS OF DIVERSION

Haywood Drive Section		**Wingra Drive Section**	
Length, L, of 24" overflow (ft) =	1,438	Length, L, of 48" overflow (ft) =	3,179
Pipe diameter, D (ft) =	1.92	Pipe diameter, D (ft) =	4.00
Pipe area, A (ft^2) =	2.885254167	Pipe area, A (ft^2) =	12.5664
Hydraulic radius, R (ft) =	0.48	Hydraulic radius, R (ft) =	1.00
Manning's n =	0.015	Manning's n =	0.013

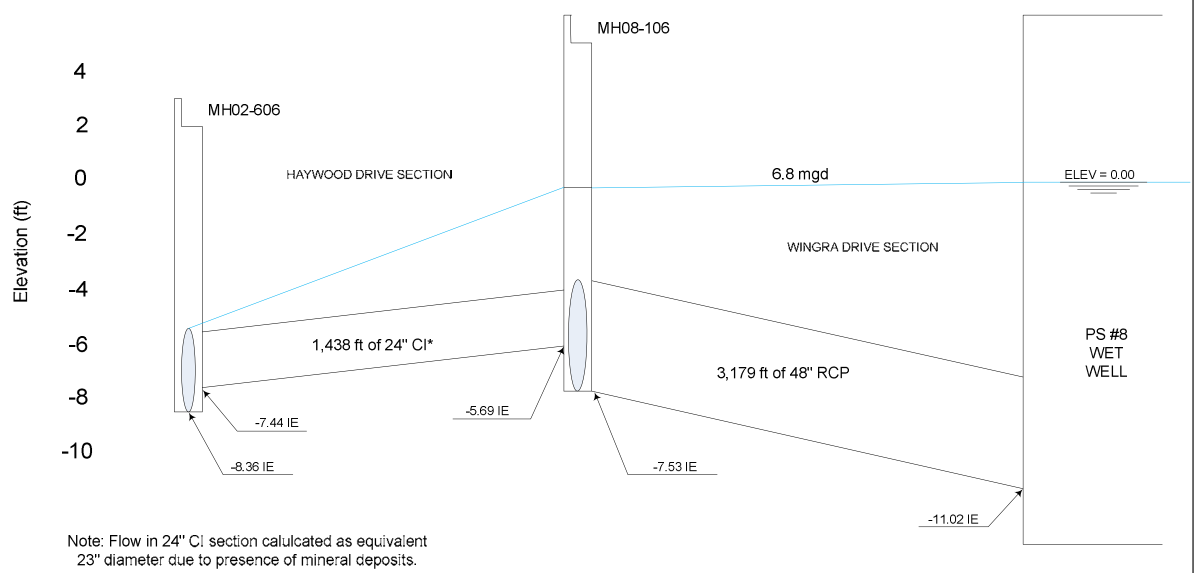
Water surface elevation at discharge (MH02-606) = -5.36 (assume 36" on Shore Drive is flowing full)

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^{2} * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in Haywood Drive Section (ft)	Water Surface Elevation at MH08-106 (ft)	Head Loss, ΔH, in Wingra Drive Section (ft)	Water Surface Elevation at PS 8 (ft)
8.00	12.38	7.19	1.83	0.23	2.06
7.00	10.83	5.50	0.14	0.18	0.32
6.80	**10.52**	**5.19**	**-0.17**	**0.17**	**0.00**
6.00	9.28	4.04	-1.32	0.13	-1.19
5.23	**8.09**	**3.07**	**-2.29**	**0.10**	**-2.19**
5.00	7.74	2.81	-2.55	0.09	-2.46
4.00	6.19	1.80	-3.56	0.06	-3.50
3.00	4.64	1.01	-4.35	0.03	-4.32
2.00	3.09	0.45	-4.91	0.01	-4.90
1.00	1.55	0.11	-5.25	0.00	-5.24
0.00	0.00	0.00	-5.36	0.00	-5.36



EMERGENCY DIVERSION – PS 8 TO PS 2

Existing Conditions

APPENDIX 4 - EMERGENCY DIVERSION FROM PS 8 TO PS 2
Proposed Conditions

FIND: Wet well elevations at Pump Station No. 8 for various rates of "backflow" from PS 8 to PS 2

I. PHYSICAL CHARACTERISICS OF DIVERSION

Haywood Drive Section		Wingra Drive Section	
Length, L, of 24" overflow (ft) =	1,438	Length, L, of 48" overflow (ft) =	3,179
Pipe diameter, D (ft) =	3.00	Pipe diameter, D (ft) =	4.00
Pipe area, A (ft^2) =	7.0686	Pipe area, A (ft^2) =	12.5664
Hydraulic radius, R (ft) =	0.75	Hydraulic radius, R (ft) =	1.00
Manning's n =	0.013	Manning's n =	0.013

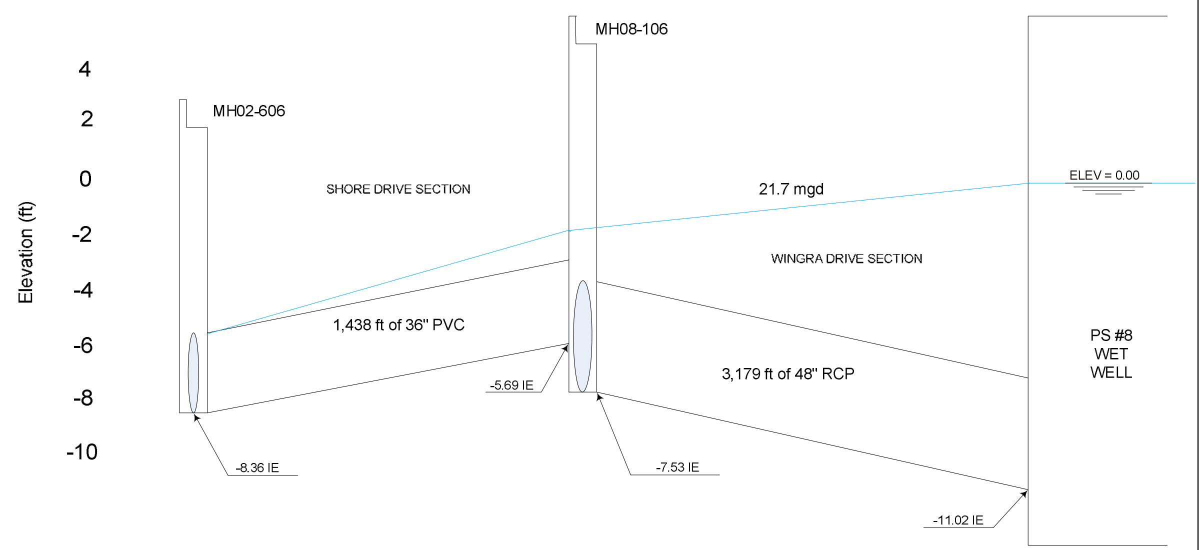
Water surface elevation at discharge (MH02-606) = -5.36 (assume 36" on Shore Drive is flowing full)

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in Haywood Drive Section (ft)	Water Surface Elevation at MH08-106 (ft)	Head Loss, ΔH, in Wingra Drive Section (ft)	Water Surface Elevation at PS 8 (ft)
28.00	43.32	6.04	0.68	2.88	3.56
27.00	41.77	5.62	0.26	2.67	2.93
26.00	40.22	5.21	-0.15	2.48	2.33
25.00	38.68	4.82	-0.54	2.29	1.75
24.00	37.13	4.44	-0.92	2.11	1.19
23.00	35.58	4.08	-1.28	1.94	0.66
22.00	34.03	3.73	-1.63	1.78	0.15
21.70	**33.57**	**3.63**	**-1.73**	**1.73**	**0.00**
21.00	32.49	3.40	-1.96	1.62	-0.34
20.00	30.94	3.08	-2.28	1.47	-0.81
19.00	29.39	2.78	-2.58	1.32	-1.25
18.00	27.85	2.50	-2.86	1.19	-1.67



EMERGENCY DIVERSION – PS 8 TO PS 2

Proposed Conditions – Haywood Drive Replacement Sewer

APPENDIX 5

January 21, 1970

PRESSURE LINE BREAK
SAYLE & VAN DUESEN
STREETS

On Wednesday, January 14, 1970, at about 9:00 A.M. the operator at Nine Springs reported unusually low effluent flow and high raw sewage flow to the plant. Checks were made of all tanks and overflows without locating the trouble. At about 1:30 P.M. a call was received from the City Engineering Department that there was a geyser at Sayle and Van Duesen Streets east of our old #4 Pumping Station. This was right over a bend in the 30" cast iron pressure line from #2 Pumping Station to Nine Springs. Procedures were instituted to shut off the flow in the broken main by diverting the flow from #2 across town to #1 Station, to bypass #4 Station into Murphys Creek and bypass #3 Station to the marsh. Since sewage was flowing from the meter vault mixing chamber back to the break, stop logs were ordered into the #2 incoming line. Calls were made to local contractors to get men and digging equipment. Flow at the break continued very heavy until 8:00 P.M. when it was discovered that the stop logs were in #11 line. They were moved to #2 line which reduced but did not stop all the flow immediately.

n Thursday, January 15, 1970, Icke Const. Co. arrived but flow at the break prevented any work. The stop logs at Nine Springs were tightened and sand bagged until leaking appeared negliable. The shut off valve at Pumping Station No. 2 into the pressure line was tightened down another 29 turns and the flow at the break stopped. Pumping was started and by about 10:00 P.M. we could see that a piece of the 30" elbow had blown out. Pumping was continued through the night to drain the line.

On Friday, January 16, 1970, Icke Co. dug out the break. The blown 45° elbow was broken out and replaced with an elbow from our stock. The bell next to the elbow was cut off to get installation room and re-leaded. A stainless steel, 6 part, Adams repair sleeve was obtained from the City Water Utility and installed. When sewage was turned into the line, the sleeve leaked.

On Saturday, January 17, 1970, a 6" piece of 30" pipe was cut and inserted in the line and the sleeve was tried again. Efforts to find a different type of clamp sleeve in stock of other utilities and manufacturers were in vain.

On Sunday, January 18, 1970, a 15" cast iron lead joint repair sleeve was brought from our stock. The old bell piece and spacer were removed nd new ones were cut to reduce the clearance space in the line. A 2" ent in the cover of the inspection tee across the creek from the break was opened to keep the line dry for pouring the lead joints. Valves were closed at #4 Station to isolate it from the line when it was found to be siphoning into the pressure line. The cast iron sleeve was installed and

Jan. 21, 1970

PRESSURE LINE BREAK
SAYLE & VAN DUESEN
STREETS - continued

leaded and gravel bedding was placed under the exposed pipe.

On Monday, January 19, 1970, the elbow was braced and #4 Station was turned into the line at 11:00 A.M. About noon #3 Station was turned in and all bypassing was stopped. The entire pressure line was full and overflowing at the meter vault mixing chamber by about 3:00 P.M.. A concrete thrust block was poured, covered with hay and allowed to set.

On Wednesday, January 21, 1970, valves were operated putting #2 Station on the line to Nine Springs at about 3:00 P.M. thus returning the system to normal pumping.

From 4:00 P.M. on January 14 to 3:00 P.M. on January 21, the sewage flow to Pumping Station #2 was pumped to Pumping Station #1 and flowed by gravity to Pumping Station No. 8.

The bypassing consisted of the flow from the break while the pipe was being taken out of service, the sewage to drain the line and the flow to Pumping Station #4 and Pumping Station #3.

JOHN T. WRIGHT

APPENDIX 6

MEMORANDUM

To: Pump Station 8 File

From: Paul Nehm

Subject: June 24, 1998 Power Outage at Pump Station 8

Date: June 24, 1998

At 4:50 am on June 24, 1998 the preferred power lines at both Pump Station 2 and Pump Station 8 were lost during a storm. Both stations immediately switched to emergency power. At Pump Station 2 the well level was high enough for Pump A to turn on. The well had just been pumped down at Pump Station 8 so none of the pumps came on.

At 5:30 am both stations switched back to their preferred power lines. At this time the well level at Pump Station 8 was about 0.2 ft higher than the level that Pump A is set to turn on. By 5:40 am the well level had risen to -7.7 ft which was about 0.8 ft above the start level for Pump A but still 0.5 ft below the start level for Pump B. Jeff Woerpel placed the station in computer control and tried to turn on Pump A. Even though the TLM screen showed that preferred power was available, the pump would not turn on. Jeff returned the station to local control. Since his review of our emergency response manual showed that Pump Station 8 could be without power for two hours and it was only an hour from our normal starting time, we did not call out any maintenance personnel.

When Roy Swanke arrived at the plant he was told of the situation and he immediately sent Dave Helgesen to the station. Dave arrived at Pump Station 8 shortly before 7:00 am. He found that the lights at the station worked, but he could not start any of the pumps using either power source. Dave relayed this information to Roy who contacted Dave Lundey. Dave Lundey sent Jerry DuBois and Dave Smith to the station.

At about 7:20 am Dave Helgesen called the plant to say that the electricians could not get any of the pumps to run either. Dave Lundey immediately went to the station. At about 7:50 am Dave Lundey called the control room to request that the operator report to MG&E that there was a power problem at the station and to ask that someone bring our portable generator to the station. Rick Neath made the call to MG&E. It appeared that they were not aware of the problem. Dick Hockett took the generator to Pump Station 8.

Because Pump Station 8 has two power feeds, it is not set up with a plug in connection for the generator. The electricians had to hard wire the generator to the station. At about 8:50 am Roy Swanke called to say that the generator was running Pump B. This pump pumped at about 14.8 MGD. TLM communications with the station had been lost shortly before this. It is estimated that the wet well level was slightly above +2.0 at this time.

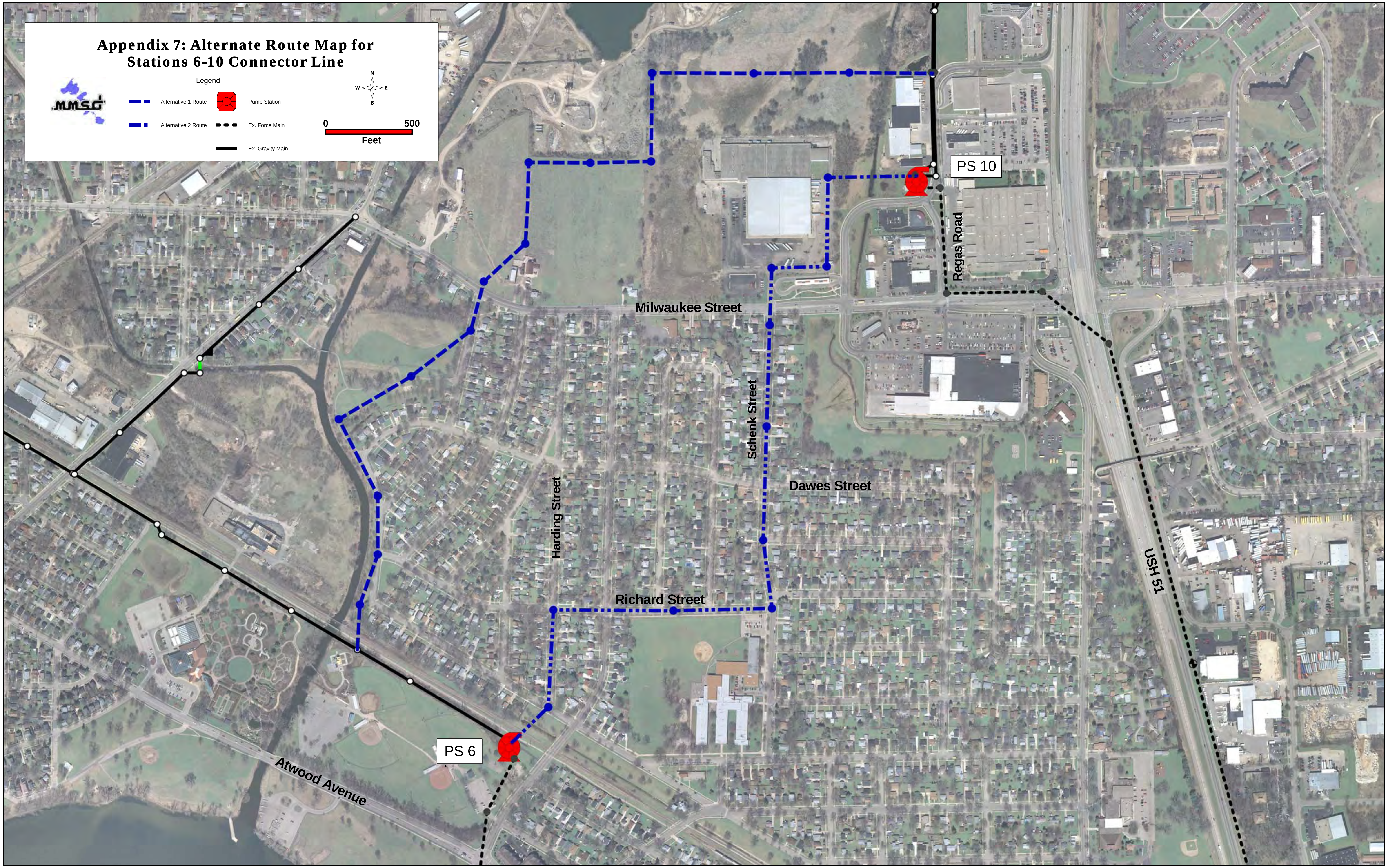
Shortly after this Duane Sippola called the plant to ask if we had any pump station problems. He had received two calls of basement flooding in the Wingra Drive area. While we were talking his dispatcher told him of two additional flooded basements and also reported that the zoo was experiencing backups. I told Duane that the well level was dropping since Pump B was now operating at the station and the sewer system was overflowing to Pump Station 2. Later it was determined that the City received the first notice of basement flooding at 8:30 am. At that time the wet well elevation was about +0.9 feet.

At 9:30 am MG&E had made a temporary repair to allow the emergency line to be used. Pump D was turned on. TLM communications with the station were again off at this time, but it is estimated that the well elevation was about -3.5 ft. This pump continued to drop the well level until it shut off at 11:08am.

The collection system has a cross connection which allows wastewater to flow between Pump Stations 2 and 8 if the well level at either station rises high enough. At about 7:45 am Larry Marquardt was asked to check this connection and to check the level of the water in the overflow manhole to Wingra Creek. Larry reported that the level in the cross connection manhole was about five feet from the top of the manhole and water was flowing to Pump Station 2. He also found the level of the water in the overflow manhole to Wingra Creek to be about three feet from the top of the stoplogs in the manhole. We believe that the wet well depth rose about another 1.5 feet from the time that Larry made these observations. This would mean that the high water elevation in the overflow manhole was about 1.5 feet below the top of the stoplogs.

I should be noted that there seems to be some discrepancy between the wet well elevations as displayed on the TLM screens and as read in the stations. Early in the morning Rick Neath was reading an elevation which was about one foot lower than what Dave Helgesen was reading at the station. This needs to be checked.

Another item of interest is that in the forty minutes from 4:50 am to 5:30 am, the wet well level at Pump Station rose about six feet. For the next three hours it rose 1.2 to 1.8 feet every 30 minutes.


Appendix 7: Alternate Route Map for
Stations 6-10 Connector Line
Legend
Alternative 1 Route
Alternative 2 Route
Pump Station
Ex. Force Main
Ex. Gravity Main
0
500
Feet
N
S
E
W
PS 10
PS 6
Milwaukee Street
Regas Road
Schenk Street
Dawes Street
Harding Street
Richard Street
USH 51
Atwood Avenue

APPENDIX 8 - EMERGENCY DIVERSION FROM PS 6 TO PS 10

Proposed Conditions

FIND: Wet well elevations at Pump Station No. 6 for various rates of "backflow" from PS 6 to PS 10.

I. PHYSICAL CHARACTERISICS OF DIVERSION

Length, L, of 42" overflow (ft) =	1,043	Length, L, of 48" overflow (ft) =	6,300
Pipe diameter, D (ft) =	3.50	Pipe diameter, D (ft) =	4.00
Pipe area, A (ft^2) =	9.62115	Pipe area, A (ft^2) =	12.5664
Hydraulic radius, R (ft) =	0.88	Hydraulic radius, R (ft) =	1.00
Manning's n =	0.013	Manning's n =	0.013

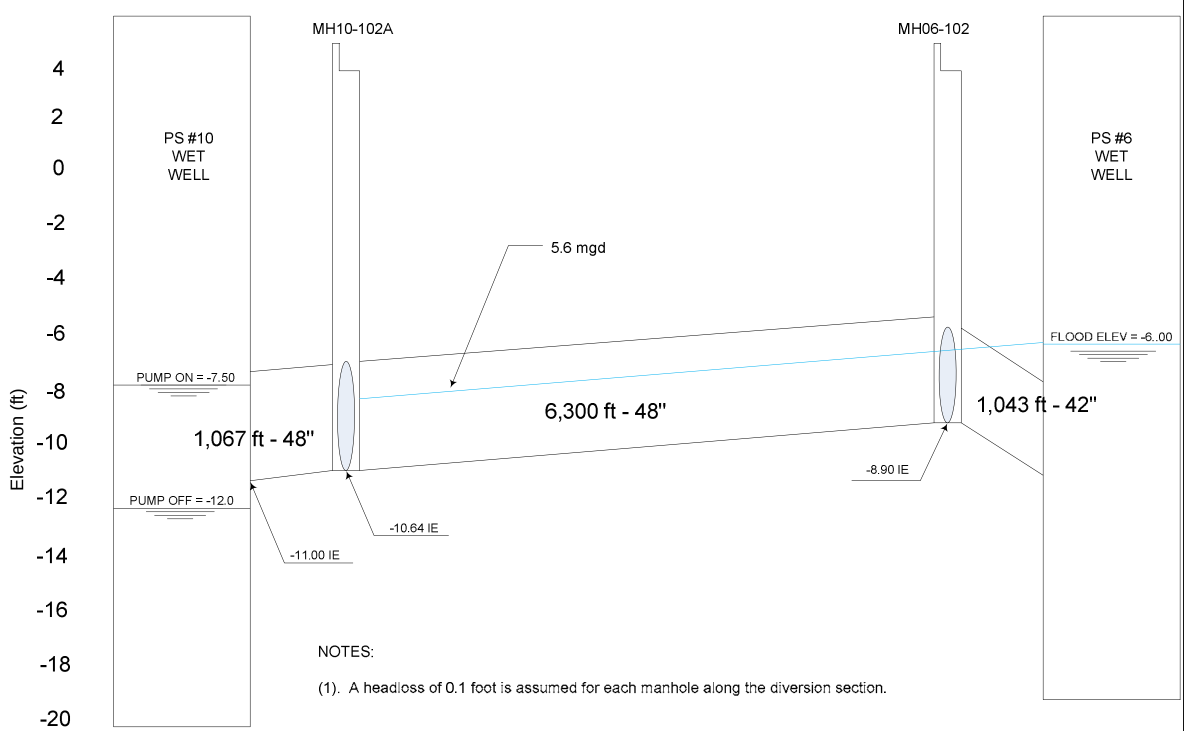
Assumed water surface elevation at discharge (MH10-102A) = -8.00

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in 42" Diversion Section (ft)	Head Loss, ΔH, in 48" Diversion Section (ft)	Water Surface Elevation at PS 6 (ft)
12.00	18.56	0.55	2.55	-4.90
10.00	15.47	0.45	2.23	-5.33
9.00	13.92	0.40	2.09	-5.51
8.00	12.38	0.36	1.97	-5.68
6.00	9.28	0.29	1.76	-5.95
5.55	8.59	0.28	1.72	-6.00
4.00	6.19	0.24	1.62	-6.14
2.00	3.09	0.21	1.53	-6.26
0.00	0.00	0.20	1.50	-6.30



EMERGENCY DIVERSION – PS 6 TO PS 10

APPENDIX 9 - EMERGENCY DIVERSION FROM PS 10 TO PS 6

Proposed Conditions

FIND: Wet well elevations at Pump Station No. 10 for various rates of "backflow" from PS 10 to PS 6.

I. PHYSICAL CHARACTERISICS OF DIVERSION

Length, L, of 48" overflow (ft) =	1,067	Length, L, of 48" overflow (ft) =	6,300
Pipe diameter, D (ft) =	4.00	Pipe diameter, D (ft) =	4.00
Pipe area, A (ft^2) =	12.5664	Pipe area, A (ft^2) =	12.5664
Hydraulic radius, R (ft) =	1.00	Hydraulic radius, R (ft) =	1.00
Manning's n =	0.013	Manning's n =	0.013

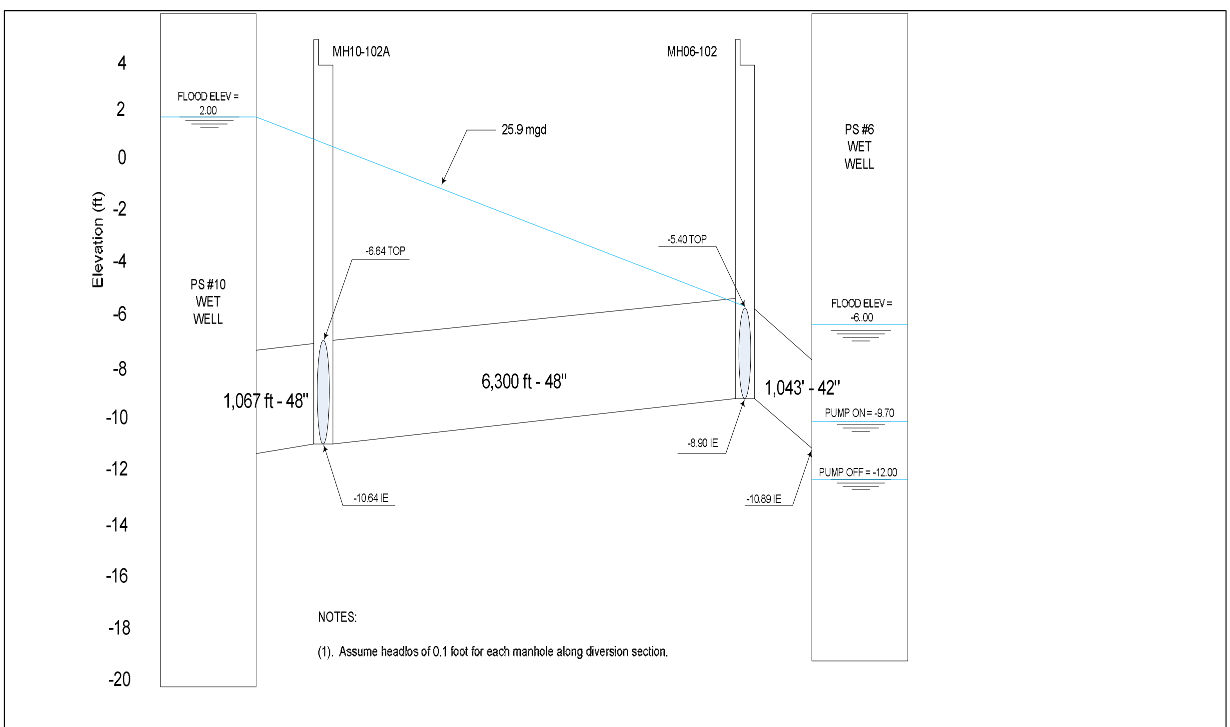
Assumed water surface elevation at discharge (MH06-102) = -5.40

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in 48" Diversion Section (ft)	Head Loss, ΔH, in 48" Diversion Section (ft)	Water Surface Elevation at PS 10 (ft)
30.00	46.41	1.31	8.04	3.95
28.00	43.32	1.17	7.20	2.96
27.00	41.77	1.10	6.80	2.50
25.90	40.07	1.03	6.38	2.00
24.00	37.13	0.91	5.69	1.20
22.00	34.03	0.80	5.02	0.41
20.00	30.94	0.69	4.41	-0.30
18.00	27.85	0.60	3.85	-0.95
16.00	24.75	0.52	3.36	-1.52



EMERGENCY DIVERSION – PS 10 TO PS 6

APPENDIX 10 - PS 6-10 CONNECTOR CHARACTERISTICS

Proposed Conditions -Alternate 1

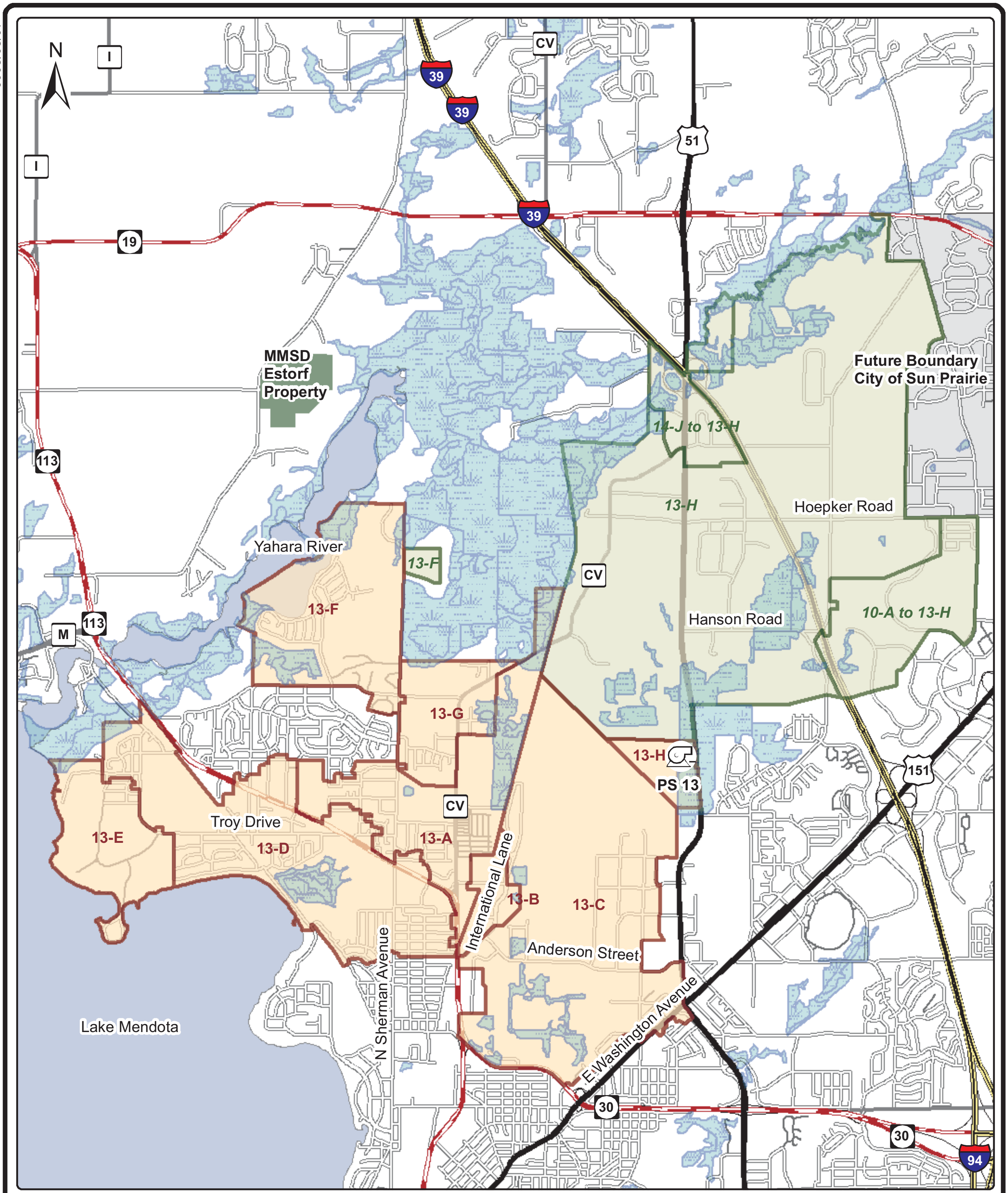
From Manhole	To Manhole	Upstream El	Downstream El	Pipe Length (ft)	Manhole Rim (ft)	Manhole Depth (ft)
MH06-102	Div1	-8.90	-8.98	261	3.0	12.0
Div1	Div2	-8.98	-9.07	308	5.0	14.1
Div2	Div3	-9.07	-9.17	340	4.5	13.7
Div3	Div4	-9.17	-9.32	498	4.0	13.3
Div4	Div5	-9.32	-9.46	488	5.0	14.5
Div5	Div6	-9.46	-9.59	434	9.0	18.6
Div6	Div7	-9.59	-9.67	294	17.2	26.9
Div7	Div8	-9.67	-9.77	325	19.2	29.0
Div8	Div9	-9.77	-9.91	470	20.0	29.9
Div9	Div10	-9.91	-10.01	358	22.5	32.5
Div10	Div11	-10.01	-10.12	352	13.0	23.1
Div11	Div12	-10.12	-10.27	513	16.0	26.3
Div12	Div13	-10.27	-10.44	590	3.0	13.4
Div13	Div14	-10.44	-10.61	552	2.0	12.6
Div14	MH10-102A	-10.61	-10.75	484	-2.0	8.8
TOTAL FOOTAGE =	6,267					
GRADE =	0.0295%					

Proposed Conditions - Alternate 2

From Manhole	To Manhole	Upstream El	Downstream El	Pipe Length (ft)	Manhole Rim (ft)	Manhole Depth (ft)
PS 6	Div1	-10.80	-10.81	292	8.5	19.3
Div1	Div2	-10.81	-10.83	565	10.2	21.0
Div2	Div3	-10.83	-10.86	696	11.0	21.9
Div3	Div4	-10.86	-10.88	572	12.0	22.9
Div4	Div5	-10.88	-10.89	400	14.0	24.9
Div5	Div6	-10.89	-10.92	658	13.0	23.9
Div6	Div7	-10.92	-10.94	587	13.0	23.9
Div7	Div8	-10.94	-10.95	330	10.2	21.2
Div8	Div9	-10.95	-10.96	319	9.0	20.0
Div9	Div10	-10.96	-10.98	516	12.0	23.0
Div10	PS 10	-10.98	-11.00	514	8.0	19.0
TOTAL FOOTAGE =	5,449					
GRADE =	0.0037%					

APPENDIX 11

10/23/2008



Sub-Basins in 2000
Potential by 2030
Potential by 2060
DNR Wetlands

PUMPING STATION 13 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 0.5 1 2 Miles

MMSD

FIGURE 3-34

APPENDIX 12

PUMP STATION 13 FLOW DIVERSION - EFFEFCTS ON DOWNSTREAM PUMP STATIONS

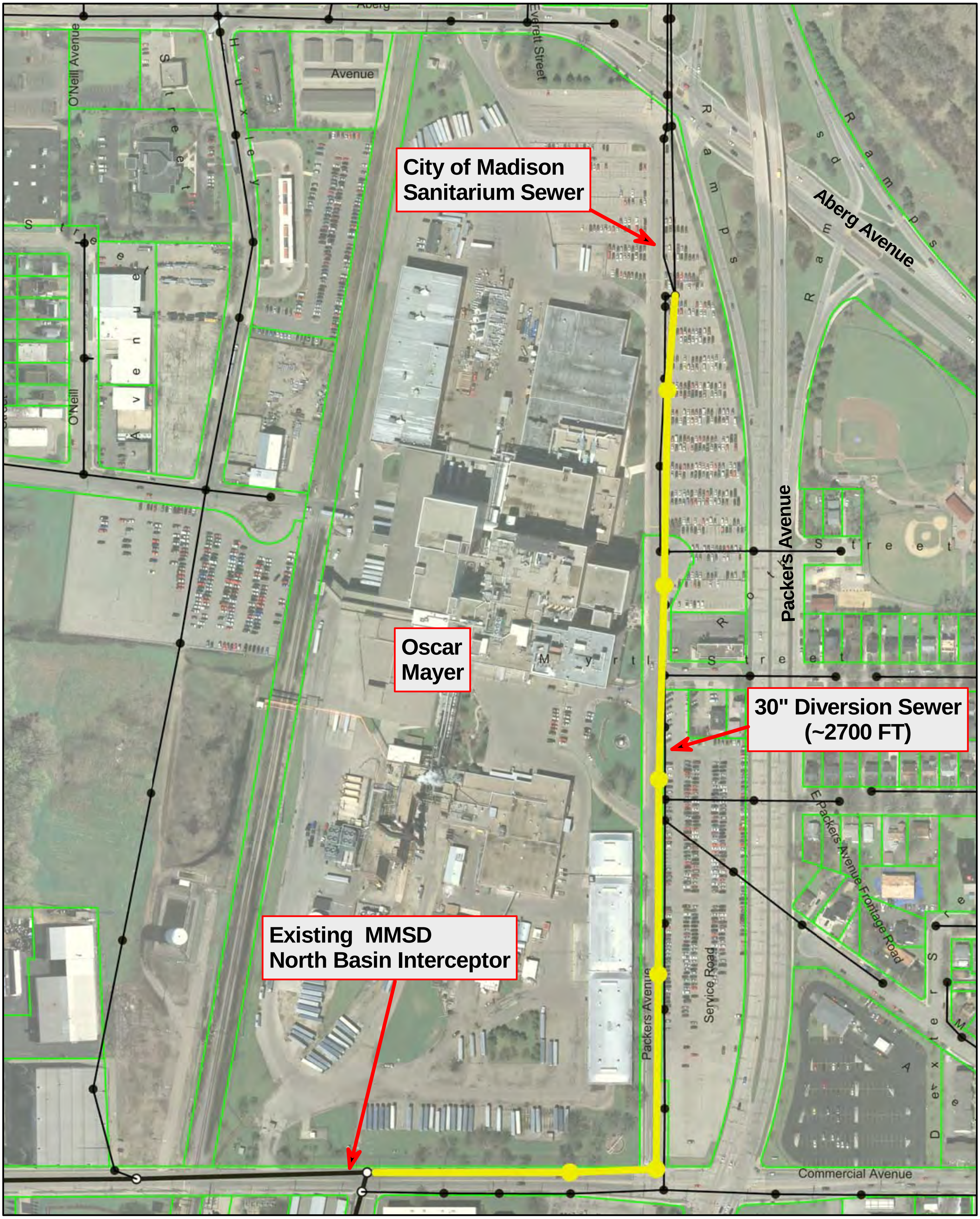
Average Daily Flows at Pump Stations

		No Diversion			With Diversion		
Pumping Station	Firm Pumping Capacity (mgd)	2030 TAZ Average Daily Flow (mgd)	2030 UF Average Daily Flow (mgd)	2060 Average Daily Flow (mgd)	2030 TAZ Average Daily Flow (mgd)	2030 UF Average Daily Flow (mgd)	2060 Average Daily Flow (mgd)
1	35.3	5.22	5.54	6.14	6.45	6.83	7.44
2	41.0	9.69	10.74	12.56	10.92	12.03	13.85
13	20.0	7.40	9.14	10.71	6.16	7.85	9.41
10	42.2	10.62	13.26	14.83	9.39	11.97	13.54
7	39.0	18.14	23.94	28.92	16.91	22.65	27.63

Peak Hourly Flows at Pump Stations

		No Diversion			With Diversion		
Pumping Station	Firm Pumping Capacity (mgd)	2030 TAZ Peak Hourly Flow (mgd)	2030 UF Peak Hourly Flow (mgd)	2060 Peak Hourly Flow (mgd)	2030 TAZ Peak Hourly Flow (mgd)	2030 UF Peak Hourly Flow (mgd)	2060 Peak Hourly Flow (mgd)
1	35.3	16.08	16.90	18.44	19.22	20.16	21.66
2	41.0	27.06	29.53	33.69	29.93	32.49	36.58
13	20.0	***21.56***	***25.77***	***29.44***	18.50	***22.67***	***26.42***
10	42.2	29.25	35.26	38.74	26.37	32.35	35.88
7	39.0	***45.90***	***59.85***	***72.30***	***43.26***	***56.63***	***69.07***

21.56 Peak Hourly Flow Exceeds Firm Capacity



Madison Metropolitan Sewerage District	**Appendix 13- Pump Station 13 Diversion Sewer**	Prepared by: **JP** Scale: **1" = 300'** Date: **5/14/10**

APPENDIX 14

40-Year Present Worth Cost Analysis for Pump Station 13 Diversion

MAJOR CAPITAL COSTS FOR PS 13 DIVERSION

No.	Description	Footnote	Unit Cost	Units	Quantity	Total Cost
1	PS13 to PS1 Connector Sewer	(1)	$700	L.F.	2,700	$1,890,000
2	Upgrade PS13 Firm Capacity	(2)	$150,000	LUMP SUM	1	$150,000
3	NEI (Truax Extension) Relief Sewer	(3)	$850	L.F.	10,000	$8,500,000

Notes:

(1). MMSD 50-Year Master Plan (TM3) cites unit cost of $500 per foot for 30" gravity sewer. Unit cost for PS13 diversion sewer adjusted to account for utility congestion in construction corridor and for construction of new diversion structures at International Lane and Packers Avenue.

(2). Includes cost for one centrifugal pump and drive, analogous to existing Pump 13C, in empty slot at PS13. No other rehabilitation work is included in estimate. Earth Tech's Design Report for PS 13 & 14 Firm Capacity Improvements (2007) suggests that future firm capacity of 30.7 MGD can be achieved by providing a new pump similar to capacity of existing Pump 13C.

(3). Project limits are MH10-145 to MH10-121. Estimated construction cost is based on actual unit cost of $950/ft for MMSD's NEI (PS 10 to Lien Road) project and unit cost of $800/ft as taken from TM 3 of *MMSD 50-Year Master Plan* .

(4). All costs in 2010 dollars.

APPENDIX 14

40-Year Present Worth Cost Analysis for Pump Station 13 Diversion

Project Description	Year	Capital Cost		O&M Costs		Salvage Value		Total 2010 Present Worth
		Cost in Year Constructed	2010 Present Worth	Annual Cost in Year Constructed	2010 Present Worth	Year 2050	2010 Present Worth	
No Diversion								
PS 13 to PS 1 connector	N/A	0	0	0	0	0	0	0
Upgrade to PS 13 Firm Capacity	2020	206,000	150,000	710	14,430	52,000	13,000	151,430
NEI (Truax Extension) Relief Sewer	2032	16,997,000	8,500,000	5,300	43,200	12,918,000	3,263,000	5,280,200
Total Pumping Costs for Diversion Flow	2010	0	0	49,300	3,195,000	0	0	3,195,000
TOTALS								**8,630,000**
With Diversion to PS 1								
PS 13 to PS 1 connector	2020	2,590,000	1,890,000	987	21,000	1,554,000	392,000	1,519,000
Upgrade to PS 13 Firm Capacity	2036	340,000	150,000	1,220	7,000	221,000	56,000	101,000
NEI (Truax Extension) Relief Sewer	2043	24,035,000	8,500,000	7,800	16,800	21,792,000	5,504,000	3,012,800
Total Pumping Costs for Diversion Flow	2010	0	0	52,900	3,429,000	0	0	3,429,000
TOTALS								**8,060,000**

Assumptions and Notes:

(1). Base interest rate = 3.5%
(2). Construction cost escalation rate = 3.2%
(3). Interceptor Service Life (yrs) = 75
(4). Pump/Drive Service Life (yrs) = 40
(4). Annual O&M interceptor cost ($/ft) = 0.25
(5). O&M costs increase at the base interest rate.
(6). Energy escalaction rate = 6.0%
(7). Pumping Costs for PS 13, 10 & 7 = $110/Mgal.
(8). Pumping Costs for PS 1 & 2 = $118/Mgal.
(9). Timing for replacement of facilities determined from CARPC's flow projections utilizing Traffic Analysis Zone data *(2009 MMSD Collection System Evaluation).*

Appendix A4
Interceptor Maintenance Guidelines

MADISON METROPOLITAN SEWERAGE DISTRICT

Protecting Public Health and the Environment

INTERCEPTOR MAINTENANCE PROGRAM GUIDELINES

Original: July, 1999
1st Revision: January, 2000
2nd Revision: April, 2008
3rd Revision: November, 2009

Table of Contents

List of Tables

Introduction

MMSD's wastewater collection system currently includes 17 regional pumping stations, 95 miles of gravity interceptors, 44 miles of forcemains (which includes 15 miles of effluent forcemains and 29 miles of raw wastewater forcemains), and 1,594 manholes. The statistics of the MMSD collection system are summarized on the following page.

The MMSD collection system is an important part of the public works infrastructure in the metropolitan area, and is continuously responsible for transmitting over 40 mgd of raw wastewater to the Nine Springs Wastewater Treatment Plant. The collection system also represents a large investment, with an estimated replacement value over $200 million for the pipeline facilities and over $100 million for the pumping stations.

The purpose of this document is to present a set of guidelines for the maintenance of MMSD’s 139-mile system of interceptors and forcemains. These guidelines represent an updated version of the MMSD Interceptor and Forcemain Maintenance Plan that was originally prepared in November of 1992. These guidelines incorporate much of the original plan, but also reflect various changes and strategies that have occurred at MMSD since 1992. Updated aspects of these guidelines include improved methods for systematic workflow & recordkeeping, availability of computerized maintenance management, contracted field locating services, Diggers Hotline membership, development of MMSD's GIS program, and promotion of cross-training.

MMSD Collection System Statistics

Note that statistics apply only to active structures and main segments

Number of Pumping Stations 17 **Today's Date: 10/30/2009**

Length of Main Segments

	Feet	Miles
Gravity	501,667	95.01
Forcemains	234,625	44.44
All Mains	736,292	139.45

	Feet	Miles
Badfish Creek Effl Diversion Forcemain	26,269	4.98
Badgermill Creek Effl Diversion Forcemain	53,765	10.18
Total All Effluent Diversion Forcemains	80,034	15.16
Total All Forcemains w/o Effluent Diversion	154,591	29.28
Total All Mains w/o Effluent Diversion	656,258	124.29

Number of Structures

Gravity Manholes	1,501
Forcemain Manholes	93
All Manholes	1,594
Shut-off Valves	23
Air-Release w/ Automatic Valve	43
Air-Release w/o Automatic Valve	9

Print This Form

Close

As of October 30, 2009

Table 1: Interceptor Maintenance Program At-A-Glance							
	1 Interceptor Evaluations (TV & Cleaning)	**2** Forcemain Gate Valve Exercising	**3** Air Valve Inspection & Maintenance	**4** Siphons	**5** Stoplog & Flapgate Structures	**6** Special Projects, Events and Repairs (Individual items)	**7** Program Coordination & Management
Scope	• Locate MHs • Evaluate flow • Prepare specs • Bid & award • Monitor work • Review inspection results • Log condition into database	Exercise each isolation valve on MMSD forcemains	Inspect each air valve location twice per year. More often if an active valve is problematic. Clean & repair active air release valves as needed.	Clean each siphon via contracted services and inspect access structures on each end of siphon.	Inspect each stoplog, flapgate, structure, etc. Repair as needed.	• MH repairs • Emerg. repairs • High flow events • I/I work • Complaints • Utility coordination • Inspections • Field measurements • Surface Route Insp.	• Planning • Budgeting • Inventories • Contract services • Diggers & Locator • Cross-training • UTILITY log • Preparedness
Quantity	95 miles total in gravity system	21 isolation valves currently in-service (as of Nov. 2009)	• 52 locations total: • 36 active • 11 manual valve only (not auto). • 2 removed • 3 vent pipe only	11 active siphons	• 20 locations total: • 16 active • 4 removed	As needed. Create individual w/o for each specific event	Involves numerous people from different Departments.
Frequency	Approx. 10% of system each year = 8 to 10 miles/yr.	Each valve twice per year	Each active valve twice per year	Each location twice per year	Each active location twice per year	As needed	As needed and on-going
Lead Responsibilities	• CS Supervisor • Sewer Maint. Crew for field work	Sewer Maint. Field Crew, w/direction from CS Supervisor	Sewer Maint. Field crew, w/direction from CS Supervisor	Contracted services, w/direction from CS Supervisor	Sewer Maint. Field crew, w/direction from CS Supervisor	CS Supervisor. & Sewer Maint. Crew as needed. Additional help from Engr. and O&M as required.	Diggers Hotline, Locating Services & UTILITY log managed by Engr. Dept.
Estimated Crew Time	240 manhours, assuming 2 men for 3 weeks, once/yr.	160 manhours, assuming 2 men for 2 hours per valve, twice/yr.	300 manhours, assuming 2 men for 2 hours per valve, twice/yr.	Work bid on a 2 or 3 year basis. Sewer Maint. Crew to assist as req'd.	120 manhours, assuming 2 men for 2 hrs per valve, twice/yr.	480 manhours. Rough estimate. Individual projects and events will vary from year to year.	Budgeting by CS Supervisor, O&M Dir. & Engr. Dir. Other tasks by CS Sup. & staff as needed.
Work Order Comments	• One WO each year for all work related to TV'ing and Cleaning.	• Two WO's each year. • 21 tasks on each WO. • See Table 2	• Two WO's each year. • 36 tasks on each WO. • See Table 3	• One WO each year • 11 tasks on each WO • See Table 4	• Two WO's each year • 16 tasks on each WO • See Table5	• Create WO's for each event. • Track costs to asset • Costs and time will vary from year to year.	• Create WO's for each task. • 9901005 UTILITY screening • 9901006 Diggers Hotline & Locating

Scope of the Work

Table 1 is a summary of the overall interceptor maintenance program at a glance. As shown, the program has been divided into seven areas or subprojects. Each of these areas is outlined below. Program staffing and recordkeeping are discussed in later sections of this document.

Area 1: Interceptor Evaluations

- MMSD formalized its annual Interceptor Evaluation program in the early 1990's.
- The purpose of the evaluations is to keep MMSD current on the physical condition and hydraulic adequacy of its individual gravity interceptors, and to allow informed decisions regarding the need for significant rehabilitation or replacement projects.
- The program includes televising, cleaning, manhole inspection, flow documentation, and various other work. See the detailed work outline attached as an appendix to this document.
- Interceptor evaluations have been performed on roughly 10% of MMSD's gravity mileage each year (i.e. an average of about 9 miles per year).
- The program has been successful in identifying system needs prior to their becoming emergencies, and has allowed MMSD to more efficiently plan, budget and carry out the necessary repairs and rehab projects.
- Project examples have included MMSD's East Interceptor Replacements Phase III and IV, East Interceptor Rehab/Relining Phase V, South Interceptor Replacement, West Interceptor Replacement at UW Campus, PS2 Forcemain Replacement, Crosstown Forcemain Replacement, North Basin Interceptor, and numerous cured-in-place lining projects.
- The interceptor evaluation program seems to work for MMSD, and should be continued at the rate of approximately 10% per year. An average evaluation interval of about 10 years is a reasonable time frame for a gravity interceptor facility.
- The main new strategies are aimed at the systematic recordkeeping and organization of the work. See program staffing and recordkeeping sections of these guidelines.

Area 2: Forcemain Isolation Valve Exercising

- Table 2 summarizes the exterior isolation valves which formerly existed or which currently exist in MMSD's collection system (not including valves located inside pumping stations). Of the 27 valves listed, 6 have been abandoned/removed and 21 are active (i.e., in-service).
- Some MMSD forcemains were designed with isolation valves just outside of the station, with the primary function to limit possible pumproom flooding in the event of a burst header inside the station.
- In other special cases, isolation valves were added at specific forcemain junction points to allow diversion of flow as part of a construction project.

- Many of the older MMSD isolation valves are double-disc gate valves. As discussed in Sanks and MMSD's Technical Memo, the double disc gate valve is not a particularly good choice for wastewater, since the seating area can become filled with grit and solids, preventing full seating of the valve. At their time of installation, however, double disc valves were the accepted standard for water and wastewater.
- Newer isolation valves (those typically installed after the mid-1990's) are either resilient wedge gate valves or plug valves. These are designed to close better in the presence of grit and solids contained in wastewater.
- Each valve should be regularly exercised and inspected by twice per year.
- Valve exercising verifies that the stem and gearing remain accessible and the valve is in working order.
- Note that valve exercising does not automatically verify that the valve is fully sealing off the flow. Some valves may leak, even though their valve stem exercises freely to closure, and may require additional work to fully close the valve.
- In 1998, MMSD purchased a hydraulic valve operator that is permanently mounted on one of MMSD's trucks. Most buried MMSD valves are accessible by this truck-mounted valve operator, thus allowing the valve to be exercised via power. However, a few valves still require manual operation (i.e., turning by hand).

Table 2: Force Main Isolation Valves

#	Forcemain	MH Station	Comments	Map Sheet
1	Old PS2 FM (30") at Brittingham Park	2-0207 ("Valve 1")	30" double disc gate valve, 1963. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	23.3 Madison
2	Crosstown FM at Brittingham Park	2-0035 ("Valve 2")	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.3 Madison
3	Crosstown FM at Brittingham Park	XT-0095R ("Valve 3")	20" resilient wedge gate valve, 1997. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.3 Madison
4	Crosstown FM at Bedford Street	XT-3420	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.4 Madison
5	Old PS3 FM before junction with old 30" PS2 FM	2-17010	8" hand-operated gate valve. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	30.3 Bl. Grove
6	Old PS4 FM before junction with old 30" PS2 FM	4-0120	16" gate valve, 1967. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	25.3 Madison
7	PS5 FM near PS5	5-22885	16" Val-Matic plug valve in valvebox, 1996. Normally open. Closes cw, 20 turns.	18.4 Madison
8	PS5 FM at junction with PS15FM	5-22384	16" double disc gate valve, 1959. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.	18.4 Madison
9	PS7 FM (1963) in vault in front of PS7	7-8526	36" double disc gate valve, 1963. Normally open. **Closes ccw**.	20.3 Bl. Grove

Table 2: Force Main Isolation Valves… continued

#	Forcemain	MH Station	Comments	Map Sheet
10	PS7 FM (1963) at NSWTP near Storage Building No. 1.	7-1551	36" double disc gate valve, 1963. Normally open. Closes cw.	30.3 Bl. Grove
11	PS7 FM (1948) at NSWTP near Storage Building No. 1.	7-1546A	36" double disc gate valve, 1963. Normally open. Closes cw.	30.3 Bl. Grove
12	PS9 New FM (1987) in valve box at PS9	9-20582	14" double disc gate valve, 1987. Normally open. Closes cw, 43 turns.	3.2 Dunn
13	PS9 Old FM (1961) in manhole at PS9	9-20594	10" double disc gate valve, 1961. Normally closed. Opens ccw, 28 turns.	3.2 Dunn
14	PS15 Old FM (to West Interceptor/PS8) at Allen Blvd.	15-1360	24" double disc gate valve, 1974. Keep valve open for flow to WI / PS8. Close valve to divert flow to PS16. Closes cw, 74 turns.	12.4Middleton
15	PS15 New FM (diversion to PS16) at Allen Blvd.	15-5587	30" double disc gate valve, 1982. Open for flow to PS16. Closes cw, 70 turns. Note: this valve can be left open even when pumping to WI / PS8.	12.4Middleton
16	New PS2 FM. Behind PS2, closest to bldg. (Valve 1)	10+00	24” Val-Matic plug valve, 2001. Normally open. Closes cw, 60 turns.	23.3 Madison
17	New PS2 FM. Behind PS2, further from bldg. (Valve 2)	10+00	24” Val-Matic plug valve, 2001. Normally closed. Opens ccw, 60 turns.	23.3 Madison
18	PS4 to PS2 bypass. SW of PS2, near air release MH.	11+32	16” Val-Matic plug valve, 2001. Normally closed. Opens ccw, 20 turns.	23.3 Madison
19	New PS2 FM, prior to PS4 tee (behind PS4, near RR).	109+25	36” Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.	25.3 Madison
20	New PS2 FM, after PS4 tee (behind PS4, near RR).	109+41	36” Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.	25.3 Madison
21	PS4 FM, prior to connection with new 36” PS2 FM.	109+33	16” Val-Matic plug valve, 2001. Normally open. Closes cw, 20 turns.	25.3 Madison
22	PS3 FM, prior to connection with new 36” PS2 FM.	173+28	8” resilient wedge gate valve, 2001. Normally open. Closes cw, 26 turns.	30.3 Bl. Grove
23	New XTFM. Behind PS2, furthest from bldg. (Valve 3)	0+20 (On connection)	30” Val-Matic plug valve, 2003. Normally open. Closes cw, 80 turns.	23.3 Madison
24	New XTFM. At SW corner of PS1.	9+69	24” resilient wedge gate valve, 2000. Normally open. Closes cw, 73 turns.	6.3 Bl. Grove
25	PS15 FM at junction with PS 5 FM	15-7264	24” resilient wedge gate valve. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.	18.4 Madison
26	PS10FM drain valve (at low-point of forcemain)	10-23080	6” plug valve with blind flange. ¼ -turn to open or close.	9.1 BlGr.
27	BM Creek Effluent Return	305+05	6” Waterous resilient wedge gate valve, 19 turns. Used for golf course irrigation trial.	3.3 Fitchburg

Area 3: Air Valve Inspection and Maintenance

- Table 3 summarizes the air valves previously within or currently active within the MMSD collection system. These include 52 valves total: 36 "active" locations with automatic air valves; 11 "active" locations with manual gates valves (not automatic); 2 locations that have been removed; and 3 locations with standpipes (vents) that are open all the time.
- Most of MMSD's air valves are "combination" valves, i.e. they perform both a vacuum breaking function and an air release function.
- The vacuum breaking function admits air into the forcemain during low pressure conditions (such as during pump shutdowns), thus preventing possible vapor cavity formation & water column separations which could lead to waterhammer failures.
- The air release function prevents air pockets from accumulating and potentially restricting the flow at forcemain high points.
- To ensure that each valve remains in working order, each air valve should be inspected and cleaned twice each year. In some cases it may be possible to clean and repair the valve in the field. In most cases, the valve should be removed and returned to the shop where it can be inspected and cleaned prior to reinstallation at the site.

Table 3: Air Valve Locations

#	Forcemain	MH Station	Location & Comments	Map Sheet
1	PS02	2-17710	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and valve removed during 10th addition.***	30.3 BlGr.
2	PS07 (1963)	7-6750	Engel St. near WPS. ***MH with 2" gate valve and ARI automatic valve. 2" gate valve N.C. Opened only as-needed.***	29.2 BlGr.
3	PS08	8-4009	Under Beltline Nob Hill viaduct. ***Manual valve only. No automatic valve at this site.***	36.1 Mad.
4	PS08	8-8079	Bram St. near Coliseum. ***Removed in 2008. Manual valve only. No automatic valve.***	25.3 Mad.
5	PS08	8-11264	1722 Kenward St. ***Removed in 2008. Manual valve only. No automatic valve.***	26.4 Mad.
6	PS09	9-1500	Between Paulson Road & Railroad	34.3 BlGr.
7	PS10	10-24760	Hwy 51 East R.O.W. south of Robertson Rd.	4.4 BlGr.
8	PS11	11-1073	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and standpipe removed during 10th addition.***	30.3 BlGr.
9	PS15 (to West Int.)	15-1525	2045 Allen Blvd. near Univ. Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	12.4 Midltn
10	PS15 (to West Int.)	15-2411	Thorstrand Rd. @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	13.1 Midltn
11	PS15 (to West Int.)	15-4827	Capital Drive @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	18.2 Mad.
12	PS15 Diversion to PS16	16-106	St. Dunstan's Drive. ***MH with 2" gate valve and automatic valve. 2" gate valve N.C. Opened only as-needed.***	13.1 Midltn

Table 3: Air Valve Locations… continued				
#	**Forcemain**	**MH Station**	**Location & Comments**	**Map Sheet**
13	PS17	17-2050	Bruce Street	22.3 Ver.
14	PS17	17-3050	Locust Drive	22.3 Ver.
15	PS17	17-4113	Hwy. M east of Locust Drive	22.4 Ver.
16	PS17	17-8900	South of Verona Rd. and West of Hwy PB	14.3 Ver.
17	BM Creek Effluent	6650	Near Goose Lake. South of USH 18/151 and West of Fitchrona Road.	12.4 Ver.
18	BM Creek Effluent	10200	4' Dia MH. 2" ball valve and 2" galvanized steel ***standpipe***. There is also a 1" corporation stop in the MH. No automatic air valve.	7.3 Fitch
19	BM Creek Effluent	12900	4' Dia MH. 2" ball valve and 2" galvanized steel ***standpipe***. There is also a 1" corporation stop in the MH. No automatic air valve.	7.2 Fitch
20	BM Creek Effluent	29050	Longford Terrace	4.4 Fitch.
21	BM Creek Effluent	42000	McCoy Rd. near RR	2.4 Fitch.
22	BM Creek Effluent	44450	McCoy Rd. near Hwy 14	1.2 Fitch.
23	BM Creek Effluent	46500	Clayton Road	1.2 Fitch.
24	BM Creek Effluent	53720	NSWTP north of Moorland Road	30.3 BlGr.
25	Effluent 54"	2300	NSWTP north of Moorland Road	30.3 BlGr.
26	Effluent 54"	7090	North of Meadowview Road	31.3 BlGr.
27	Effluent 54"	11800	North of Goodland Park Road	6.3 Dunn
28	Effluent 54"	13478	Lalor Road south of Goodland Park Road	7.2 Dunn
29	Effluent 54"	16575	Lalor Road	7.3 Dunn
30	Effluent 54"	20250	Lalor Road	18.2 Dunn
31	Effluent 54"	25808	Back of 2399 White Oak Trail. ***Standpipe only. No air valve at this site.***	19.1 Dunn
32	New 36" PS02	11+24	50' SW of PS2	23.3 Mad.
33	New 36" PS02	69+36	Corner of Van Deusen & Rowell Streets	26.1 Mad.
34	New 36" PS02	111+81	South of PS4, along RR tracks. ***Trial in-progress in 2009 to determine if automatic valve can be removed. Gate valve only. Inspected for air every two weeks.***	25.3 Mad.
35	New 36" PS02	151+52	South of Nob Hill Road, near bike path	36.1 Mad.
36	New 30" XT	7+41	Brittingham Park at bike path intersection	23.3 Mad.
37	New 30" XT	33+26	Next to Boathouse at Bedford Street	23.4 Mad.
38	New 30" XT	38+17	Between bike path and North Shore Drive	23.4 Mad.
39	New 30" XT	45+27	Near tennis courts, south of Broom Street	24.2 Mad.
40	New 30" XT	103+61	RR embankment north of Monona Terrace	24.2 Mad.
41	New 30" XT	113+90	Median of E. Wilson, in front of Essen Haus	13.3 Mad.
42	New 30" XT	117+43	Between MG&E and RR tracks, north of Blair	13.3 Mad.
43	New 30" XT	121+61	MG&E parking lot south of Blount Street	13.3 Mad.
44	New 30" XT	127+13	Bike path, between Blount & Livingston	13.4 Mad
45	New 30" XT	135+72	Bike path, between Livingston & Patterson	13.4 Mad.
46	New 30" XT	139+60	Bike path, between Patterson & Brearly	13.4 Mad.
47	New 30" XT	146+75	Bike path, between Brearly & Ingersol	13.1 Mad.
48	New 30" XT	157+29	East Wilson Street at Few Street	13.1 Mad.

Table 3: Air Valve Locations… continued				
#	**Forcemain**	**MH Station**	**Location & Comments**	**Map Sheet**
49	New 30" XT	179+85	Median of E. Wash. Ave, south of Thornton	7.2 BlGr
50	New 30" XT	174+98	Between E. Wash. Ave. and Dickinson St.	7.2 BlGr
51	PS07 (1948)	7-5385	Automatic 6" Air Release Valve installed 2002. Adjacent to 7-6750 MH. ***6" gate valve and Vent-O-Mat automatic valve. 6" gate valve N.C. Opened only as-needed.***	29.2 BlGr.
52	PS01	09300 +/-	30"x 4" tapping sleeve, 4" companion flange, 2" SS nipple, and 2" ball valve installed in 2006. East Wash Ave @ 2nd Street. ***No automatic valve. Manual air release only.***	6.3 BlGr.

Area 4: Siphon Cleaning

- Table 4 summarizes the 11 active inverted siphons currently owned by MMSD.
- As of 2009, nine of the eleven MMSD siphons are cleaned twice per year. Due to its' length, the WI West Point Extension siphon at Pheasant Branch Creek is not routinely cleaned (i.e., it is classified as a forcemain). The WI Campus Relief siphon on Randall Avenue is also not routinely cleaned.
- The purpose of a siphon is to carry the wastewater flow beneath an obstacle (such as a streambed or a major utility line) which would otherwise block the interceptor's gravity profile.
- One disadvantage of a siphon is that it typically carries a lower velocity (since it always flows full) and thus creates greater potential for solids deposition. Newer siphons with multiple barrels are designed to minimize the potential for solids deposition.
- MMSD has generally not experienced significant problems with its siphons, except for the Shorewood Hills siphon. That siphon has needed numerous cleanings over the years due to grease accumulation, and has been the responsibility of the City of Madison since it was constructed in conjunction with a City storm sewer project.
- MMSD began contracting out the regular cleaning of its siphons in 1998. Prior to 1998, siphons were cleaned only if specific problems occurred. These services are typically contracted for a two or three year period.
- It is recommended that MMSD continue its' current program of contracted siphon cleaning. This should help to catch any problems before they become serious.
- The contractor's cleaning operations should be observed, and the adjacent siphon manholes should be visually inspected at the time of cleaning to determine if any additional work is needed.

Table 4: Siphons

#	Interceptor	Location	Manholes	Year	Comments	Map Sheet
1	WI West Point Ext.	Pheasant Branch Creek at Hwy. M	5-116 to 5-115A	1966 & 1957	2094 ft. of 14" AC pipe. ***Due to length, classified as a forcemain. Not routinely cleaned.***	1.4 Middleton
2	West Int. Relief	Walnut Street Underpass at Campus Drive	2-517 to 2-516	1959	105 ft. of 36" RCP	21.1 Madison
3	Old West Interceptor	Midvale Blvd. at University Ave.	2-054A to 2-053B	1958	31 ft. of 16" CI pipe installed in 1958 to clear new storm sewer box conduit	20.1 Madison
4	Old West Interceptor	Shorewood Blvd. north of University Ave.	2-047B to 2-047A	1972	21 ft. of 15" RCP installed in 1972 to clear City storm sewer. City agreed to maintain siphon.	20.1 Madison
5	West Int. Replacement at UW Campus	Randall Avenue at Wendt Engineering Library	No manholes	1999	120 ft. of 30" DI installed in 1999 to clear twin UW chilled water lines and MGE gas line. ***No manholes…not routinely cleaned.***	22.1 Madison
6	West Int. Spring Street Relief	Brooks Street at College Court	2-309B to 2-309A	1975	46 ft. of 24" CI pipe installed in 1975 to clear 5'x12' storm box	22.1 Madison
7	West Int. Spring Street Relief	Brooks Street at Regent Street	2-309 to 2-308	1940	91 ft. of 24" CI pipe	22.1 Madison
8	West Int. Spring Street Relief	Brooks Street at Milton Street, near Meriter Hospital	2-307 to 2-306	1965	63 ft. of 24" CI pipe	23.3 Madison
9	South Int. Baird Street Relief	Wingra Creek at Baird Street	4-312 to 4-311	1995	Two barrels, 156 ft. of 14" and 10" DI pipe inside of 36" steel casing, grouted in place.	26.4 Madison
10	Southeast Int.	Siggelkow Road underpass at USHwy 51	7-218A21 to A20 to A19	1961 & 1992	185 ft. of 8" DI and CI pipe (145 ft. replaced with DI in 1992)	34.3 Bl. Grove
11	East Monona Interceptor	Fair Oaks Avenue at Starkweather Creek	6-108F to 6-108E	1925	85 ft. of 14" CI pipe, crossing Starkweather Creek	5.4 Bl. Grove
NA	INACTIVE: Old West Int.	Regent Street at Murray Street	2-005A to 2-005	1968	50 ft. of 24" CI pipe. Flow diverted to City sewer in 1995	23.3 Madison

Area 5: Stoplog & Gate Structures

- Table 5 lists the 20 stoplog and gate structures located within the MMSD collection system. Of these, 16 are currently in-service and 4 have been removed/abandoned.
- Some of these structures are overflows to nearby streams or lakes. These should be inspected during high flow events to make sure the nearby waterway is not overflowing into the collection system.
- Some of these structures were constructed at junction points between adjacent interceptor projects and are used to divert flow from one interceptor to another.
- Others were originally constructed as flushing manholes (no longer used) for the purpose of periodic flushing of the interceptor with adjacent surface water.

To ensure that the stoplog and flapgate structures remain in good condition, are at the correct elevation, and not leaking, MMSD should inspect each structure twice per year and provide any stoplog or gate replacements or repairs that are needed.

Table 5: Stoplog and Gate Locations

#	Facility	MH	Location & Comments	Map Sheet
1	Bedford Street Stoplogs.	CT-3420	Northshore Drive at end of Bedford Street, adjacent to Monona Bay.	23.4 Mad.
2	Burke Outfall Stoplog for diversion to 30”	93+10	Pennsylvania Ave south of Commercial Ave. ***Abandoned/removed during North Basin Interceptor project.***	31.3 Burke
3	PS5 Stoplog	5-403	Mendota Drive across from PS5	18.4 Mad.
4	PS6 Flapgate	6-102	Drainage ditch near PS6	5.4 Bl. Gr.
5	PS7 Stoplog	PS7	Entrance chamber behind PS7	20.3 Bl. Gr.
6	PS8 Stoplog at Wingra Creek	8-100	North side of Wingra Creek across from PS8	26.3 Mad.
7	SWI Junction MH for emergency diversion from PS2 to PS8.	8-106	Haywood Street at Wingra Drive, near entrance to Arboretum. ***Slide gate normally removed, allowing overflow to PS2. Gate stored in MH.***	26.2 Mad.
8	SEI Flushing Valve (upstream of PS9)	9-108	East side of Hwy. 51, north of Yahara River, south of Yahara Drive. ***Gate valve to remain closed always.***	3.2 Dunn
9	NEI Flapgate upstream of PS10	10-114	At Starkweather Creek, south of Sycamore Ave and west of Walsh Rd. ***Removed in 2009 during NEI-PS10 to Lien Road Project.***	33.4 Burke
10	PS11 Flapgate	PS11	PS11 near entrance chamber	31.3 Bl. Gr.
11	NSVI MP Ext. Flapgate upstream of PS12	12-113	Along Badger Mill Creek, north of Nesbitt Road and west of Maple Grove Road. ***Flap gate removed in 2004 during City Greenway Modification Project. MH remains.***	12.3 Verona

Table 5: Stoplog and Gate Locations… continued				
#	**Facility**	**MH**	**Location & Comments**	**Map Sheet**
12	NEI Truax Ext Flapgate upstream of PS13	13-105	Along drainage ditch, west of Hwy 51 at Dane County Airport access road. ***Inside airport perimeter fence.***	20.1 Burke
13	PS15 Slidegate with hole for gravity diversion to PS5	5-102A	130 feet south of PS15 along Allen Blvd., in Marshall Park.	12.4 Middl.
14	WI Relief junction with Old WI, allowing overflow to old WI d/s	2-513	South side of Campus Drive across from Veterinary Science ***Abandoned/removed during WI-Campus Relief Phase 4 Project***	22.2 Mad
15	WI Campus Relief Phase 1 junction with WI Relief.	8-207	At UW Met. Engineering Bldg. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	22.1 Mad
16	WI Campus Relief Phase I junction with Old WI	8-206	Randall Ave just south of RR. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	22.1 Mad
17	WI Relief junction with Old WI	2-014A	Randall Ave. south of Dayton St. Slide gate blocks flow to Old WI d/s. ***Gate always in-place and flow is always blocked to Old WI.***	22.1 Mad
18	WI Randall Relief cross-connect with Old WI at MH 2-012B	8-122	Randall Ave. between Spring Street and Regent Street. ***Gate always in-place, but if flow is 2.5' +/- above invert of MH 8-122 it will overflow to MH02-012B in the Old WI.***	22.1 Mad
19	WI Spring Street Relief cross-connect with Old WI	2-316B	Randall Ave. south of Monroe Street. ***Gate always in place. Diverts flow from Old WI (Monroe Street) into the WI Spring Street Relief.***	22.1 Mad
20	PS16 Overflow to Gammon Extension	5-230	Gammon Road, just west of PS16. ***Brick dam to divert gravity flow from PS16 to PS5 via the WI Gammon Ext.***	13.2 Middl.

Area 6: Special Projects, Repairs and Events

- Areas 1 through 5 above represent the regular planned maintenance activities.
- Area 6 includes the numerous specific projects, repairs and events that occur every year in the operation and maintenance of interceptors and forcemains.
- Examples include high flow events, emergency repairs, connection inspections, odor complaints, backup events, I/I work, specific manhole repairs, surface route inspections, and other events.

- As discussed later under the Recordkeeping section, a separate workorder should be created for each specific event as it comes up.
- These specific events are an important aspect of an interceptor maintenance program, and maintaining a record of these events will be helpful for future decisions and management of the MMSD program.

Area 7: Coordination and Management Functions

Coordination and management of the interceptor maintenance program includes numerous functions needed to make the program successful. Examples include the following.

- Preparing annual program budget and tracking it during the year. This is typically performed by the Collection System Supervisor and Director of O&M.
- Tracking and documenting work performed and work outstanding. This is typically performed by the Collection System Supervisor.
- Updating interceptor GIS database and maps. This is typically performed by GIS personnel in the Engineering Department.
- Managing inventory. This is typically performed by the Collection System Supervisor.
- Managing annual siphon cleaning and TV & Clean contracts. This is typically performed by the Collection System Supervisor.
- Managing Diggers' Hotline membership and locating services. This is typically performed by the Engineering Department.
- Organization of emergency preparedness. This is typically performed by the Collection System Supervisor
- Screening projects being done by other utilities and municipalities via the UTILITY log (spreadsheet). This is performed by the Engineering Department.
- Organizing cross-training activities.
- Recommending periodic improvements to the program.

Program Staffing

The proposed staffing plan outlined below is a team approach, and a joint effort of several departments, employees and outside resources.

Collection System Supervisor

- The interceptor maintenance program is to be managed primarily by the Collection System Supervisor. Oversight of the program will be provided by the Director of Operations & Maintenance and Director of Engineering. Assistance will be provided by the Engineering Department staff whenever necessary.
- Planning, budgeting, prioritizing, tracking, and management of the program will be accomplished via a joint effort between the Collection System Supervisor, Director of O&M, Director of Engineering, and Engineering Department staff. Work will be tracked and documented through the Computerized Maintenance Management System.
- The role of Collection System Supervisor focuses on organizing and supervising the day-to-day field operations and seeing that they are successfully carried out.
- The Collection System Supervisor personally conducts much of the field "reconnaissance" work, i.e. monitoring contractors, attending preconstruction meetings, inspecting connections, addressing complaints, meeting with property owners, etc.
- The Collection System Supervisor should consult with the Director of O&M, the Director of Engineering, and Engineering Department staff on a regular basis to keep others informed of day-to-day operations, decisions, and observations made in the field.
- The Collection System Supervisor should schedule work for the field crew, monitor the results of the field work, hire outside contractors, and other transfer knowledge to MMSD staff as needed. All are essential to the program's success.
- The Collection System Supervisor will organize the work, create the necessary workorders, and recruit help as required from the Buildings & Grounds Supervisor.

Field Crew

- Personnel from the Monitoring Services/Sewer Maintenance Crew will carry-out the day-to-day field work needed for specific interceptor maintenance activities.
- If necessary, the Building and Grounds Crew will provide members to assist the Monitoring Services/Sewer Maintenance Crew when needed for specific interceptor maintenance activities.
- Regular planned activities requiring field crew participation are as follows:
  a) Manhole field locations prior to annual televising/cleaning.
  b) Semiannual gate valve exercising.
  c) Semiannual air valve inspection & maintenance.
  d) Semiannual inspection and maintenance of special structures.
  e) Various special projects and emergencies, as required.

- Per Table 1, the anticipated Field Crew commitment is estimated at roughly1300 manhours/yr., but this may vary from year to year.
- Through cross-training, involving different personnel, and assigning hands-on projects to different people, it is desired to build up a significant knowledge of the MMSD interceptor system in members of the Monitoring Services/Sewer Maintenance field crew.

Outside Services

- Heavy construction work, major repairs, excavation, and specialty services should typically be contracted out to private firms. The Collection System Supervisor or Engineering Department will coordinate this work.
- Contracting out such work frees MMSD from the cost of owning and maintaining extensive specialty equipment (i.e., backhoes, vactor trucks, etc.) and allows MMSD to focus on what is does best: Managing the overall collection system.
- Examples of efficient outside services for MMSD's interceptor maintenance have included televising & cleaning work, surveying work, field marking, excavation work, emergency excavation & repairs, significant construction work, etc.

Other Staff Resources

- The Collection System Supervisor should recruit the participation of other MMSD staff whenever needed for specific advice, engineering evaluation, emergencies, etc.
- Examples include map updates by the GIS/CAD specialist, UTILITY project screening, assistance by the Engineering Department during emergency events, etc.
- Major projects that become identified through interceptor maintenance will need to be budgeted and assigned to a project manager. This will be done by the Director of Engineering though the annual capital budgeting process.

Recordkeeping and CMMS

General Organization

- The overall interceptor maintenance program has been packaged as "INT MAINT" within the Project module of MMSD's CMMS system.
- The Project "INT MAINT" is subdivided into seven Subprojects corresponding to the seven work areas shown on Table 1.

Creating Workorders

- When creating an interceptor maintenance workorder, it should typically be linked to one of the seven subprojects under "INT MAINT".
- When entering the work order description, the name of the facility involved, e.g. NEI, PS8 Forcemain, etc., should typically be included in the description.
- **Subproject 1: Interceptor Evaluations**. One work order should be created each year for all work associated with the TV/Clean/Evaluation project that year.
- **Subproject 2: FM Gate Valve Exercising.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each valve location that requires valve exercising.
- **Subproject 3: Air Valve Inspections.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each air valve location that requires inspection.
- **Subproject 4: Siphons.** A semiannual activity, one work order should be created for the entire year (both cleanings). The workorder should be "tied" to the purchase order for the contractor hired to clean the siphons. The workorder should have eleven tasks, one for each siphon location.
- **Subproject 5: Stoplog & Flapgate Structures.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each structure that requires inspection.
- **Subproject 6: Special Projects, Events and Repairs.** Most of the workorder activity will take place in this subproject. Individual work orders should be created for each significant project, event or repair. If a specific event will involve more than a few hours of time, or if it's simply an event that's worth documenting, a separate work order should be created to track the work.
- **Subproject 7: Program Coordination & Management.** For work not related to one specific event or asset (i.e., the overall collection system) or work that takes less than a few hours to complete, the standing workorders shown in Table 1 should be used. These include for General Coordination, UTILITY Log and Diggers Hotline/Locating Services. Note: These should be used as little as possible. Specific workorders related to the event or asset should be created and used whenever possible.

Finishing and Closing Workorders

- The Collection System Supervisor should frequently search through the list of all active "INT MAINT" workorders and all workorders related to the collection system maintenance to determine what work is outstanding and to guide daily workflow.
- Whenever an item has been completed, the Sewer Maintenance Crew and/or Collection System Supervisor should enter a comment under the "Notes" field. The Note should briefly indicate what was done, who did it, and the date it took place. These "Notes" are one of the main benefits of having a CMMS and are a great way to document observations, problems, and fixes.
- After the work is finished and "notes" have been entered, the Collection System Supervisor should change the TASK to "finished".
- After all tasks on a work order have been finished (most work orders will have just one task), the Collection System Supervisor should change the work order to "closed". Note: The CMMS will not allow the work order to be "closed" until the day following the "finishing" of the last task.

Generating Lists and Reports

- Various reports and search capabilities are available or are being developed within the CMMS.
- The CMMS Work Order Selection Search provides on-screen lists of work orders. The user can designate desired workorders by status (active, closed, etc.), by Account No., by Subproject, by date, etc.
- The ACCESS database "Employee Timekeeping" report shows staff hours and $ amounts for a specified calendar year.
- The ACCESS database "Total Cost of WO's by Crew" is a departmental report listing all workorders in chronological order, along with total costs for each.
- The ACCESS database "Employee Hours by WO" shows each individual employee's time charged for a specific selected workorder.
- The ACCESS database "WO Total Cost w/ Hours & Mtls" report shows detailed costs for a specific selected workorder.
- The CMMS report writing and usage is still a developing area at MMSD. Personnel should look for the reports that are most useful to Interceptor Maintenance Program, and provide suggestions for any modifications that would be helpful.

Reference Documents for Interceptor Maintenance

Numerous documents and sources of information are available for reference when working with the MMSD interceptor system. Some of the most useful references are listed below.

- MMSD Collection System Map Book (hard copies)
- MMSD GIS and Mapping
- MMSD Collection System Database. This database provides valuable information concerning the details of the MMSD collection system.
- MMSD Collection System Inspection Database. This database provides detailed results of the annual televising and cleaning of MMSD interceptors
- MMSD Emergency Response Manual provides important emergency contacts, phone numbers, and forcemain emergency repair information
- MMSD Forcemain Profiles. These drawings provide detailed profiles at-a-glance for each forcemain. (Electronic files are located on the network and hard copies are located in the maintenance files. Numerous personnel also have hard copies of the profiles).
- Interceptor Maintenance Files (hard copy) are in the file room maintenance section, organized by interceptor and pumping station. These include hard copies of correspondence, memos, etc.
- Original as-built project construction plans (hard copy) are located in the file room on the plan racks.
- The Computerized Maintenance Management System (CMMS) database (see discussion above).
- Shared network drives, which include project documentation and various documents related to maintenance, including these guidelines.
- The “MMSD Collection System Evaluation”, prepared by the staff of the Capital Area Regional Plan Commission. This was last completed in 2008.
- The MMSD “Collection System Facilities Plan”. This includes a comprehensive look at the entire MMSD Collection system, from both a capacity and condition aspect. The original plan was completed in 2002, with an update scheduled for completion in 2010.

As paper copies become superseded by electronic information, an ongoing goal will be to consolidate the relevant information in the most effective way for easy access. The document management system, CMMS reporting system, GIS mapping, and databases will be warehouses for much of the interceptor maintenance information. Use of the network drives and OnBase should also be encouraged to store key spreadsheets, documents, tables, etc. for easy access and sharing.

Summary

This document provides guidelines for MMSD's interceptor maintenance program. It is an updated version of MMSD's original 1992 Interceptor Maintenance Plan. The interceptor maintenance program has been organized as a separate project called "INT MAINT" within MMSD's CMMS system, and is divided into seven main work areas as summarized in Table 1. The program is staffed as a team effort of several departments and employees, including the Collection System Supervisor, the Monitoring Services/Sewer Maintenance Crew, personnel from Buildings and Grounds as required, outside contractors, and other MMSD staff as needed. The program is intended to be a flexible and cost-efficient approach to interceptor maintenance. The program managers are encouraged to look for opportunities to improve the program whenever possible.

APPENDIX NO. 1

Work Sequence Guidelines
For
Interceptor Evaluations

Appendix No. 1

Interceptor Evaluations

Detailed Work Sequence Guidelines

a) Budget. Recommend and budget for the particular interceptor system(s) desired to be evaluated in the following year. Aim for an overall average of about 10% per year, but allow this to vary from year to year in order to evaluate entire interceptor systems as a unit wherever possible.

b) Pre-inspect. Pre-inspect the entire route of the proposed evaluation project. Identify any manhole access problems, special property issues or other conditions that might affect the proposed contractor televising and cleaning operations.

c) Document actual flows. The two main objectives of the interceptor evaluations are to evaluate the *physical condition* and the *hydraulic adequacy* of the interceptor system. To address hydraulic adequacy, it is important to document actual measured flow rates in the key branches of the system. In some cases, flow information may be directly available from an upstream or downstream pumping station flow meter. Due to multiple interceptor branches, however, pumping station records alone will often be insufficient to determine the desired interceptor flows. Contracted installation of temporary flow vs. time meters has been used successfully by MMSD and should be considered for key interceptor branch locations. One week contracted installations are fairly inexpensive and have provided both the average and the time distribution of flow, depth and velocity.

Use the documented *average* flow and the Greeley and Hansen formula to compute the peak flow. Compare this to the nominal pipe capacity (based on the Manning equation) to determine the hydraulic adequacy of the interceptor. Also use the measured flow information to determine whether or not special flow control measures (for example, diversion pumping, night-time televising) will be needed for proper cleaning and televising.

d) TV and Cleaning Specs. Prepare specifications for contracting the cleaning and televising of the interceptor system to be evaluated. Use MMSD's standard format, and keep this standard spec up-to-date with desired new features (for example, pan and tilt camera technology). In preparing the specs, give special consideration to any access problems or easement issues. Also, specifically indicate any flow control or diversion requirements and any night-time work requirements.

e) Advertise, Bid and Award. Advertise, bid and award the televising and cleaning contract work.

f) Contractor's Field Work. Prior to the start of the field work, notify any property owners and municipal public works departments that may be affected by the work. Monitor the contractor's field operations to ensure that the work is proceeding in accordance with the specifications.

g) Map Edits. Review MMSD's collection system maps during the pre-inspection and during the field work. Do the MMSD maps correctly show the interceptor? Is the information shown on the maps accurate? Make note of any changes or corrections needed (for example, sewer lengths, incoming connections, etc.) and route these to MMSD's GIS/CAD specialist for incorporation.

h) Tape review and Pipe Condition Log. Review the contractor's completed televising tapes and summarize the pipe condition using MMSD's pipe rating log. Enter the rating data into the Collection System Inspection database (see attached).

i) Evaluation memo. Prepare a summary evaluation memo which documents the results of the above items and which provides specific recommendations for any follow-up action. The memo should be concise, but should cover each of the following:

- Is the interceptor pipe structurally adequate? Or does rehabilitation or replacement need to be considered?
- Document the average interceptor flows and address the interceptor's hydraulic adequacy.
- Are the manholes in satisfactory condition, or are specific repairs needed?
- Document the estimated total gpm of clearwater infiltration, and recommend whether or not the specific sources are cost effective to repair.
- Note any corrections or additions to be made to the GIS collection system maps or data. Attach marked-up map copies and forward to the GIS/CAD Technician for incorporation.
- Provide recommendations for any action and/or work required.

Interceptor Condition Evaluation Form

Date Evaluated: _______________

Recorded by: ______________

Ranking System (Choose One)
- N: None
- I: Insignificant
- M: Moderate
- S: Severe

Type of Pipe
- (RCP) Reinf. Concrete Pipe
- (CI) Cast Iron Pipe
- (DI) Ductile Iron Pipe
- (VC) Vitrified Clay Pipe
- (AC) Asbestos Cement Pipe
- (PVC) Plastic Pipe

Pipe Defects
- (BP) Broken Pipe
- (CP) Cracked Pipe
- (CO) Corrosion
- (FO) Flow Obstructions
- (GA) Gasket Problems
- (GR) Grease Buildup
- (IB) Iron Buildup
- (JB) Joint Buildup
- (OJ) Offset Joint
- (R) Roots (before cleaning)

I / I (gpm)
Estimate the total gpm of leakage in the entire pipe section

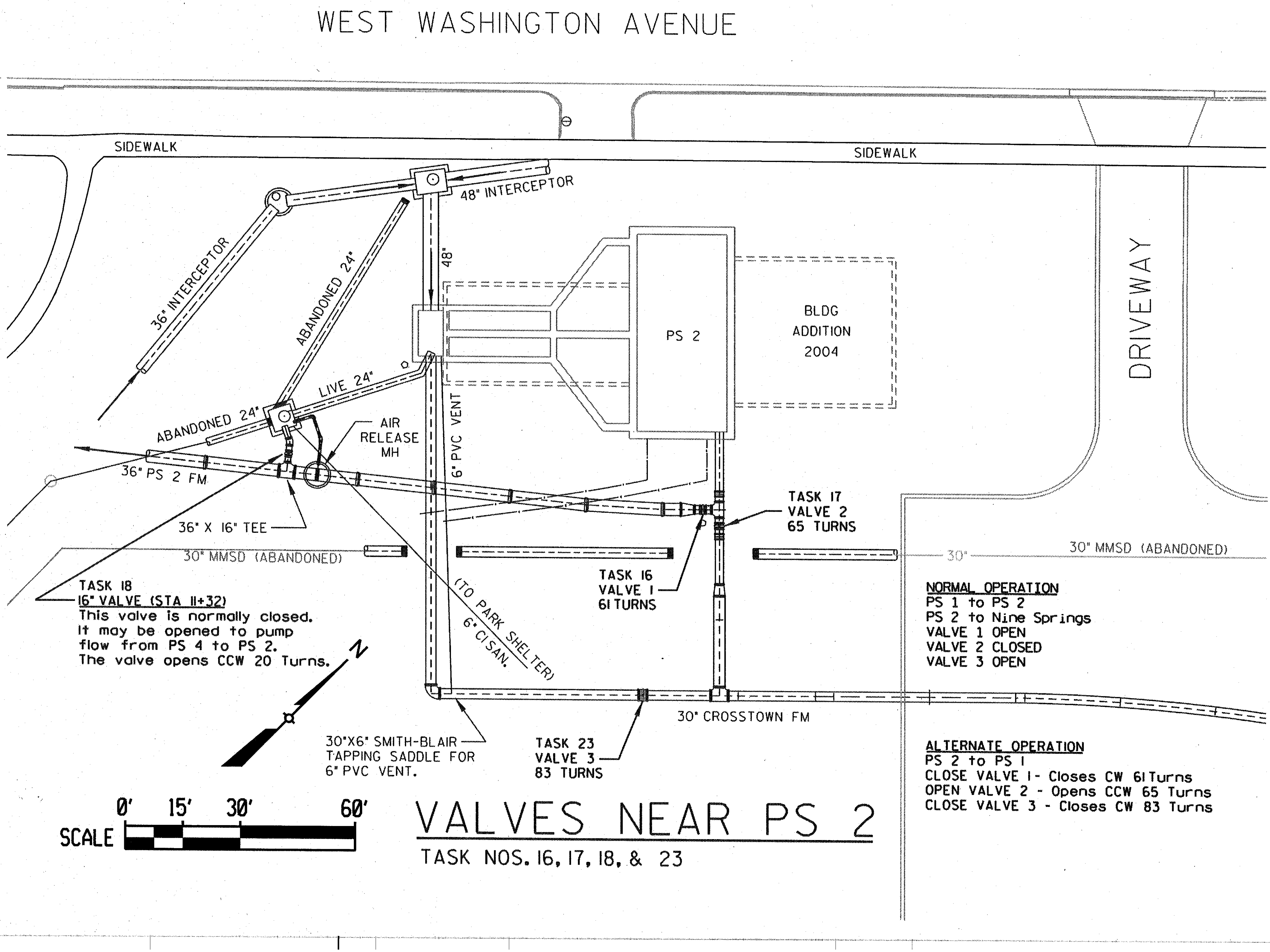
MH Defects
Using N, I M, S system, rank the Manhole at the *Downstream end of each pipe section*

Interceptor Name	Pipe Section		Date	Pipe	Pipe Defects										I / I	MH	Other Remarks
	From	To	Televised	Type	BP	CP	CO	FO	GA	GR	IB	JB	OJ	R	gpm	d / s	

Interceptor Reporting Form

APPENDIX NO. 2

Maps of Certain Valve Clusters

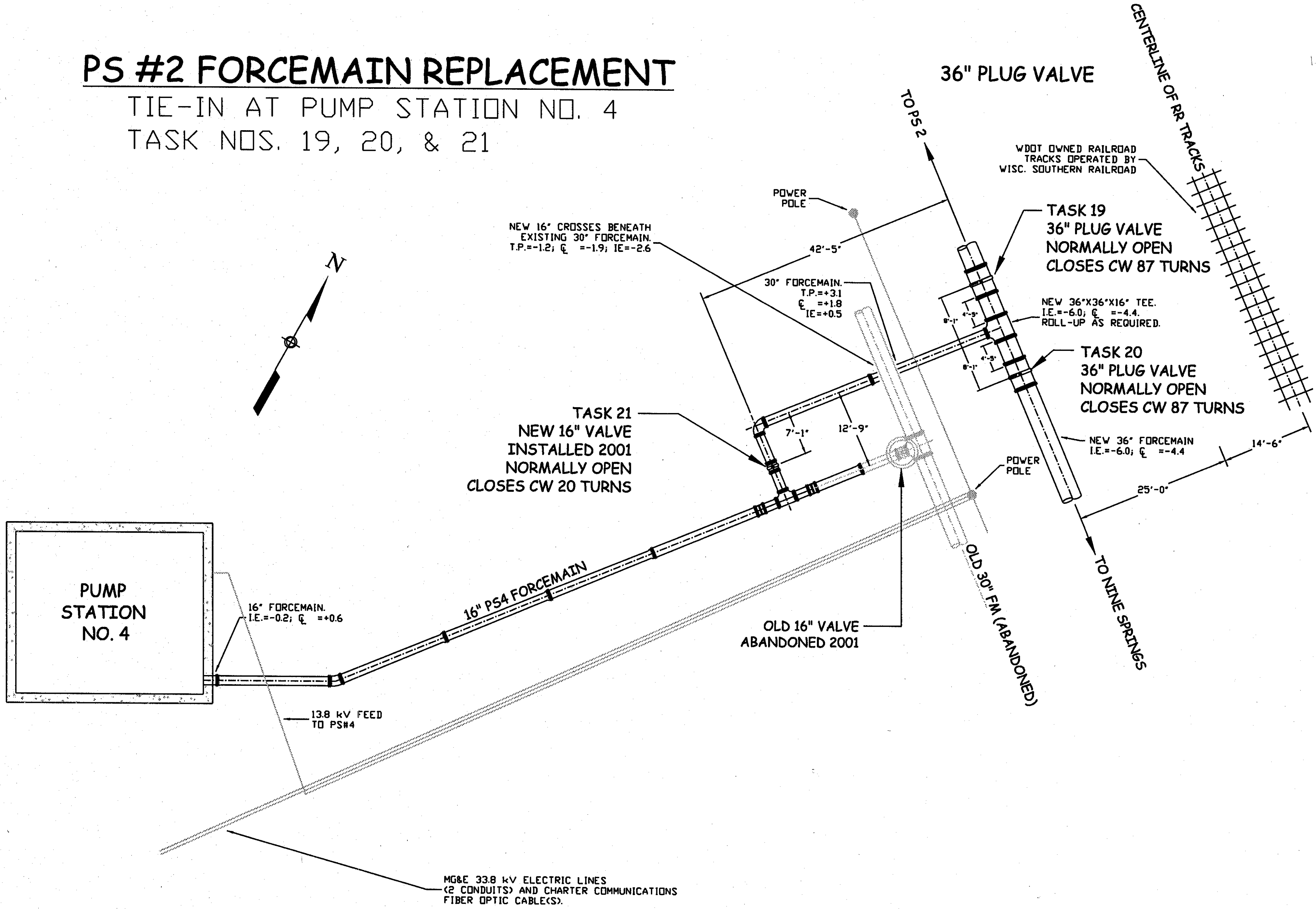


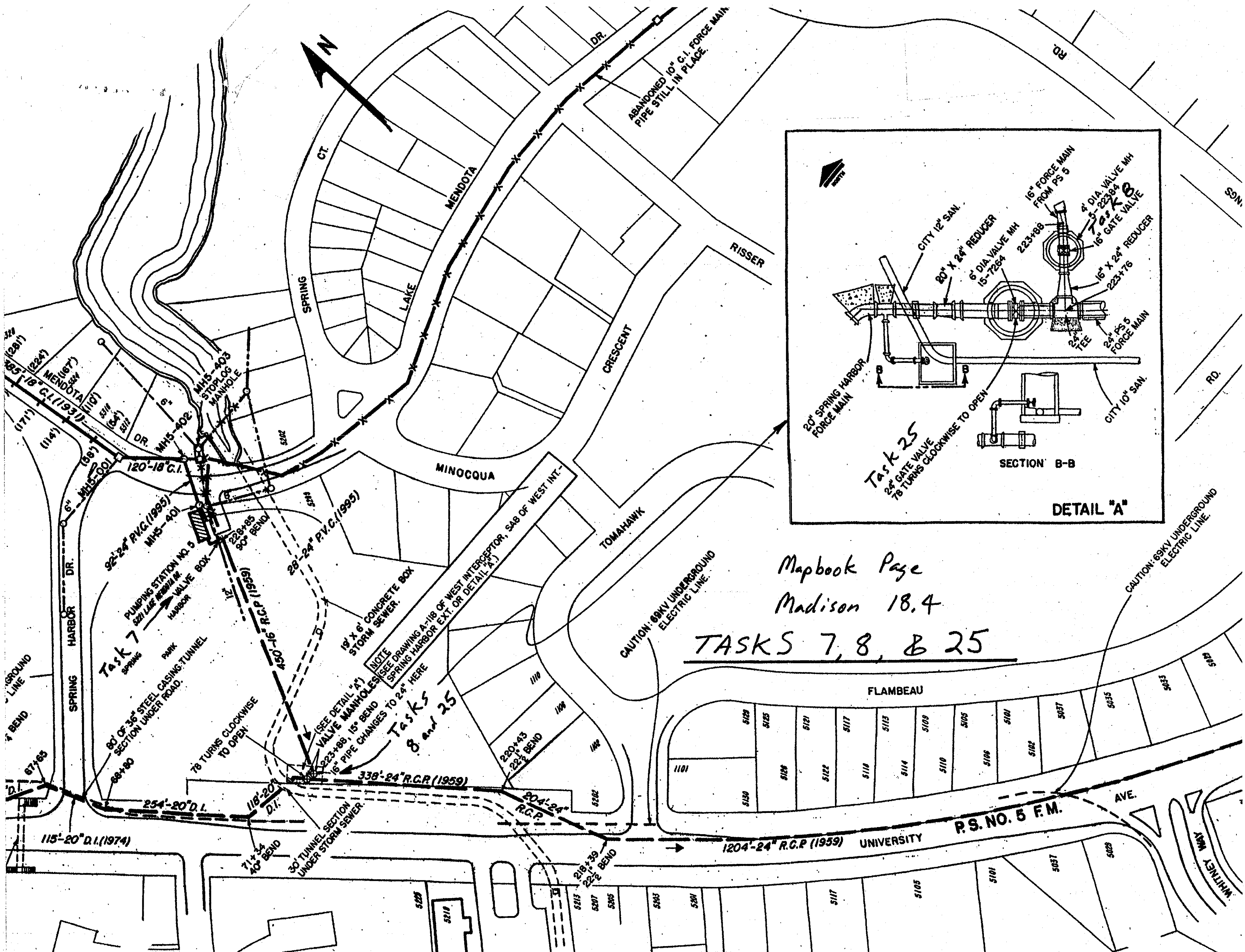
VALVES NEAR PS 2

TASK NOS. 16, 17, 18, & 23

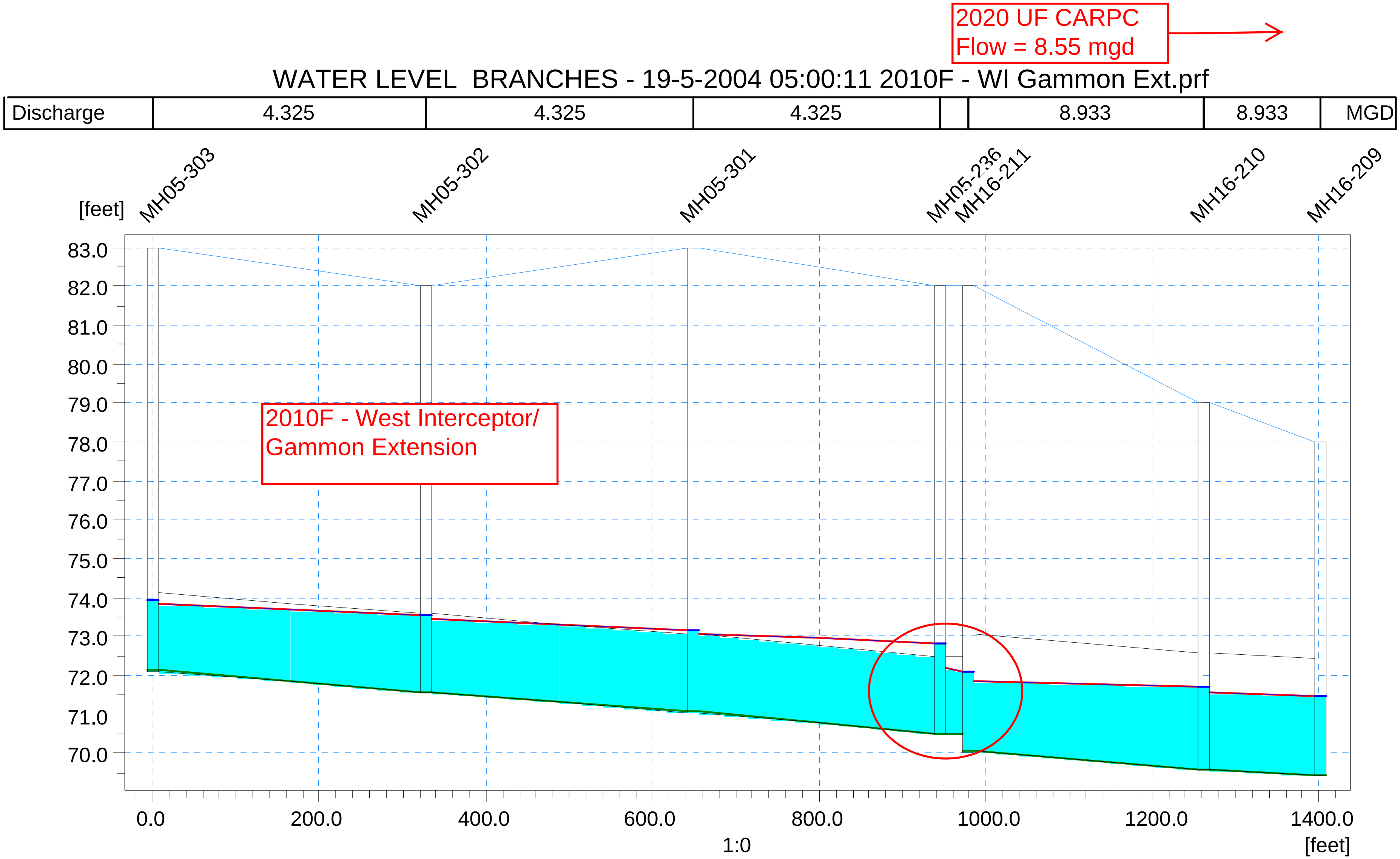
PS #2 FORCEMAIN REPLACEMENT

TIE-IN AT PUMP STATION NO. 4
TASK NOS. 19, 20, & 21



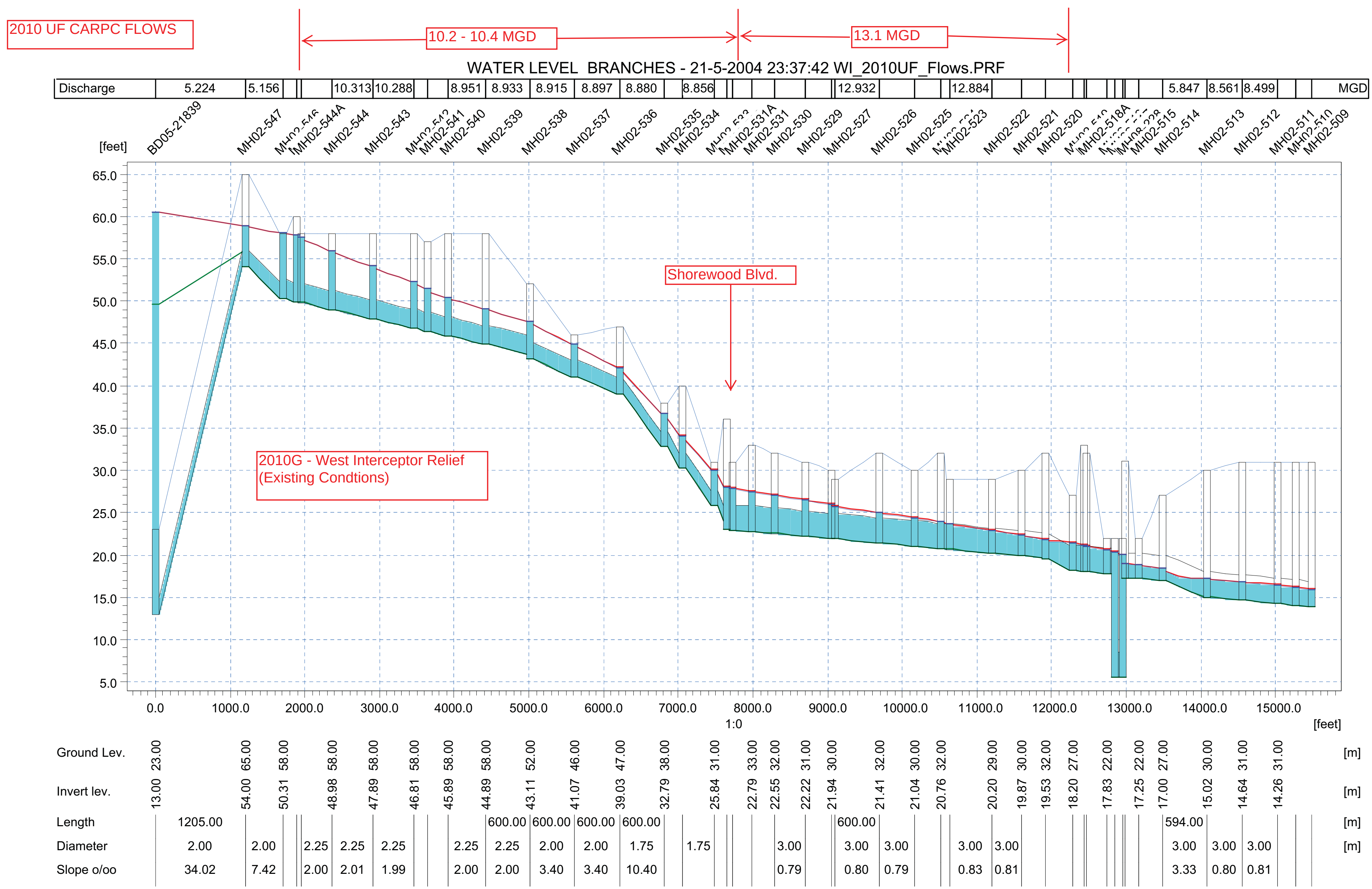

Mapbook Page
Madison 18.4
TASKS 7, 8, & 25
N
ABANDONED 10" C.I. FORCE MAIN PIPE STILL IN PLACE.
MENDOTA
LAKE
SPRING
CT.
DR.
RISSER
CRESCENT
MINOCQUA
TOMAHAWK
FLAMBEAU
UNIVERSITY
AVE.
WHITNEY WAY
RD.
SPRING HARBOR DR.
MENDOTA DR.
18" C.I. (1931)
120'-18" C.I.
MH5-001
MH5-401
MH5-402
MH5-403 STOPLOG MANHOLE
92'-24" P.V.C.(1995)
28'-24" P.V.C.(1995)
228+85 90° BEND
450'-16" R.C.P.(1959)
PUMPING STATION NO. 5
VALVE BOX
Task 7
SPRING HARBOR PARK
80' OF 36" STEEL CASING TUNNEL SECTION UNDER ROAD.
19' x 6' CONCRETE BOX STORM SEWER.
NOTE SEE DRAWING A-118 OF WEST INTERCEPTOR, SAB OF WEST INT.-SPRING HARBOR EXT. OR DETAIL "A".)
(SEE DETAIL "A") VALVE MANHOLES
223+88, 15° BEND
16" PIPE CHANGES TO 24" HERE
Tasks 8 and 25
78 TURNS CLOCKWISE TO OPEN
338'-24" R.C.P.(1959)
220+43 22½° BEND
204'-24" R.C.P.
254'-20" D.I.
118'-20" D.I.
115'-20" D.I.(1974)
67+65
68+80
71+34 40° BEND
30' TUNNEL SECTION UNDER STORM SEWER.
218+39 22½° BEND
1204'-24" R.C.P.(1959)
P.S. NO. 5 F.M.
CAUTION: 69KV UNDERGROUND ELECTRIC LINE.
CAUTION: 69KV UNDERGROUND ELECTRIC LINE.
16" FORCE MAIN FROM PS 5
4' DIA. VALVE MH 5-22384
Task 8
16" GATE VALVE
16" x 24" REDUCER
223+76
223+88
CITY 12" SAN.
20" x 24" REDUCER
6' DIA. VALVE MH 15-7264
24" TEE
24" PS 5 FORCE MAIN
20" SPRING HARBOR FORCE MAIN
CITY 10" SAN.
B
Task 25
24" GATE VALVE 78 TURNS CLOCKWISE TO OPEN
SECTION B-B
DETAIL "A"

Appendix A5
Hydraulic Modeling Results

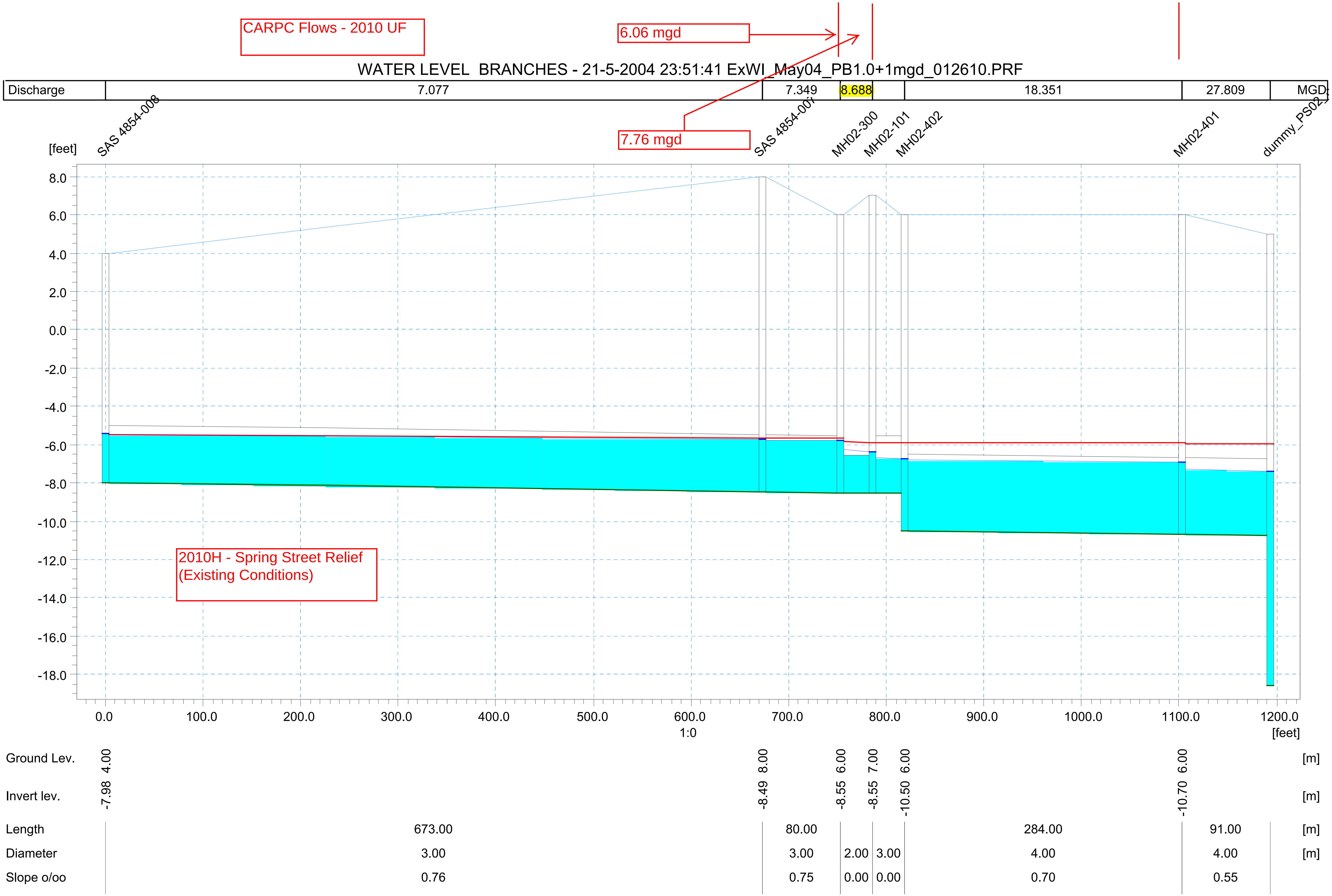


Ground Lev.	83.00	82.00	83.00	82.00	79.00	[m]
Invert lev.	72.12	71.58	71.06	70.49	69.58	[m]

Length	328.00	320.00	298.00	282.00	141.00	[m]
Diameter	2.00	2.00	2.00	3.00	3.00	[m]
Slope o/oo	1.65	1.63	1.91	1.67	1.13	

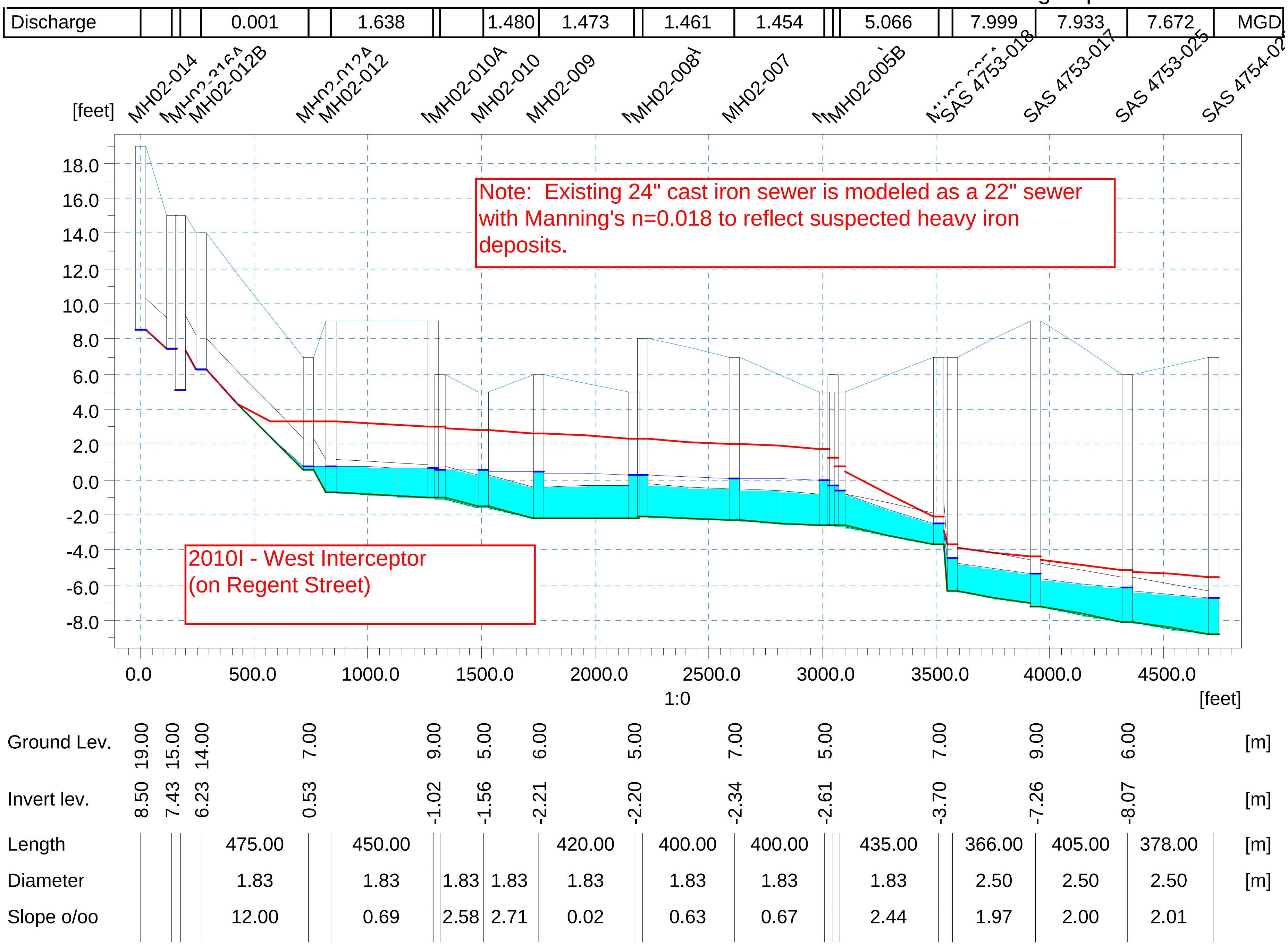


2010 UF CARPC FLOWS
10.2 - 10.4 MGD
13.1 MGD
WATER LEVEL BRANCHES - 21-5-2004 23:37:42 WI_2010UF_Flows.PRF
Discharge 5.224 5.156 10.313 10.288 8.951 8.933 8.915 8.897 8.880 8.856 12.932 12.884 5.847 8.561 8.499 MGD
BD05-21839
MH02-547
MH02-544A
MH02-544
MH02-543
MH02-541
MH02-540
MH02-539
MH02-538
MH02-537
MH02-536
MH02-535
MH02-534
MH02-531A
MH02-531
MH02-530
MH02-529
MH02-527
MH02-526
MH02-525
MH02-523
MH02-522
MH02-521
MH02-520
MH02-518A
MH02-515
MH02-514
MH02-513
MH02-512
MH02-511
MH02-509
[feet]
Shorewood Blvd.
2010G - West Interceptor Relief
(Existing Condtions)
1:0
[feet]
Ground Lev. 23.00 65.00 58.00 58.00 58.00 58.00 58.00 58.00 52.00 46.00 47.00 38.00 31.00 33.00 32.00 31.00 30.00 32.00 30.00 32.00 29.00 30.00 32.00 27.00 22.00 22.00 27.00 30.00 31.00 31.00 [m]
Invert lev. 13.00 54.00 50.31 48.98 47.89 46.81 45.89 44.89 43.11 41.07 39.03 32.79 25.84 22.79 22.55 22.22 21.94 21.41 21.04 20.76 20.20 19.87 19.53 18.20 17.83 17.25 17.00 15.02 14.64 14.26 [m]
Length 1205.00 600.00 600.00 600.00 600.00 600.00 594.00 [m]
Diameter 2.00 2.00 2.25 2.25 2.25 2.25 2.25 2.00 2.00 1.75 1.75 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 [m]
Slope o/oo 34.02 7.42 2.00 2.01 1.99 2.00 2.00 3.40 3.40 10.40 0.79 0.80 0.79 0.83 0.81 3.33 0.80 0.81

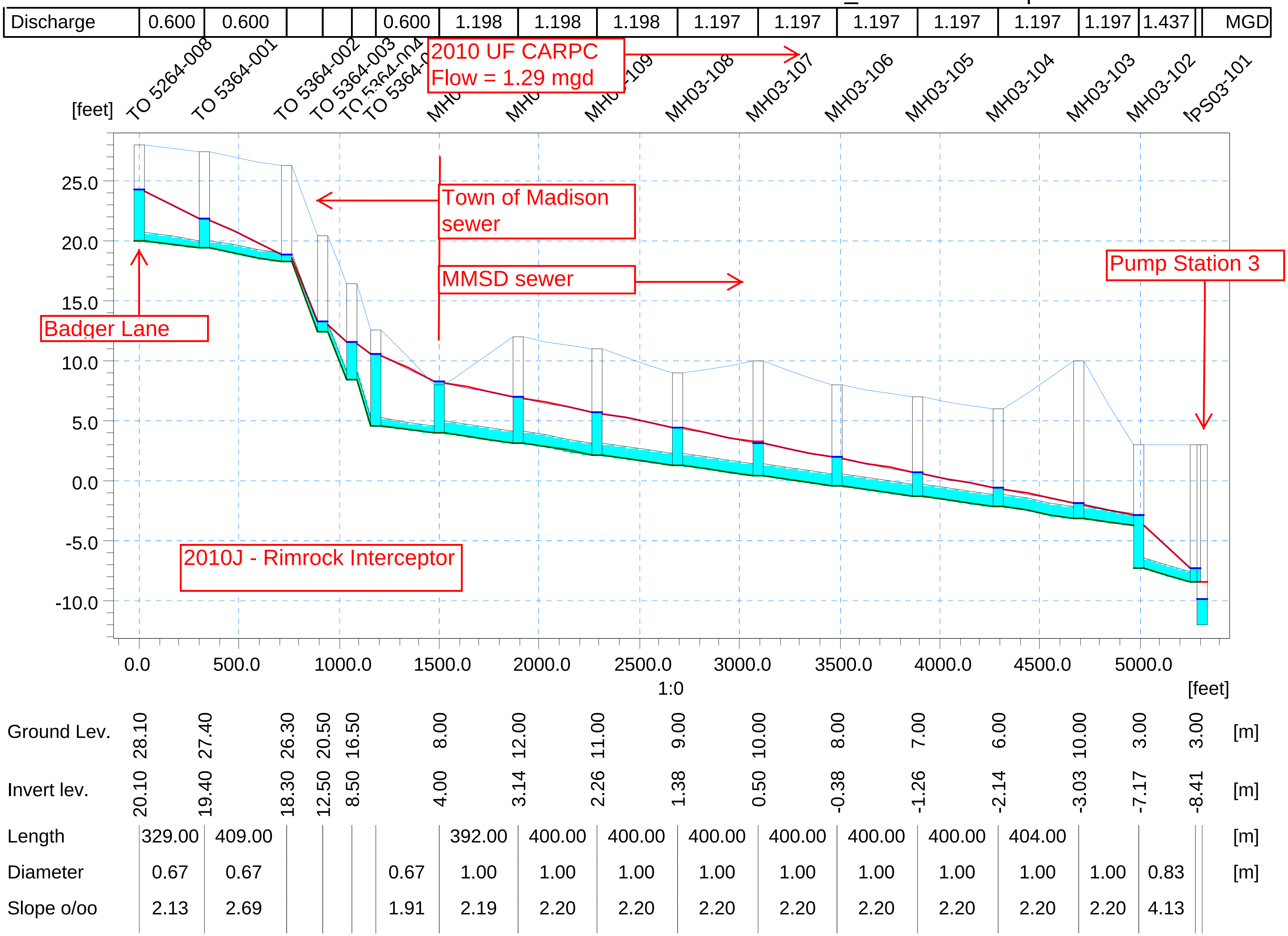


CARPC Flows - 2010 UF
6.06 mgd
7.76 mgd
WATER LEVEL BRANCHES - 21-5-2004 23:51:41 ExWI_May04_PB1.0+1mgd_012610.PRF
Discharge
7.077
7.349
8.688
18.351
27.809
MGD
SAS 4854-008
SAS 4854-007
MH02-300
MH02-101
MH02-402
MH02-401
dummy_PS02
[feet]
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
2010H - Spring Street Relief
(Existing Conditions)
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
1000.0
1100.0
1200.0
1:0
[feet]
Ground Lev.
4.00
8.00
6.00
7.00
6.00
6.00
[m]
Invert lev.
-7.98
-8.49
-8.55
-8.55
-10.50
-10.70
[m]
Length
673.00
80.00
284.00
91.00
[m]
Diameter
3.00
3.00
2.00
3.00
4.00
4.00
[m]
Slope o/oo
0.76
0.75
0.00
0.00
0.70
0.55

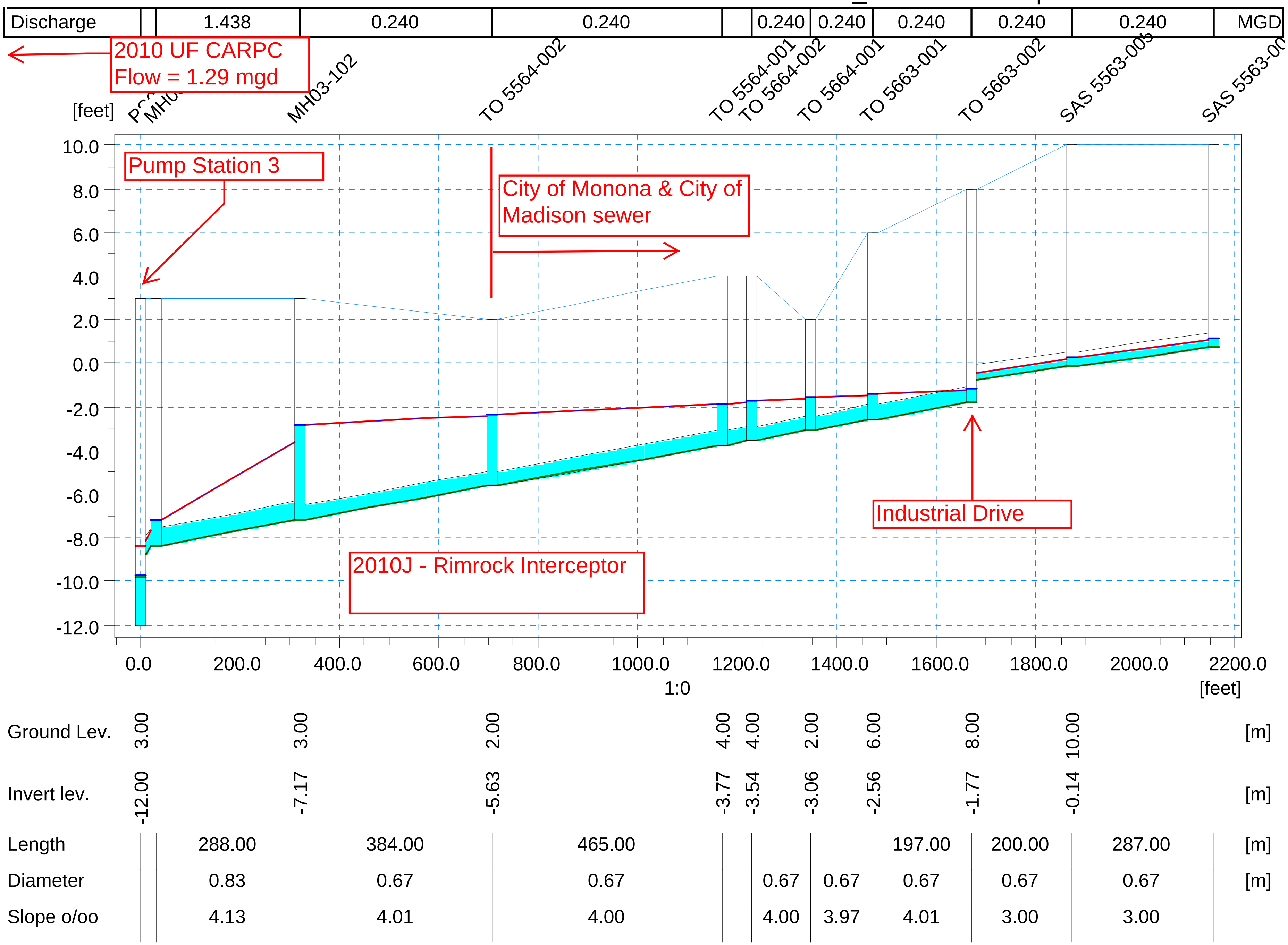
WATER LEVEL BRANCHES - 21-5-2004 07:51:56 2010I - WI - 22 inch & RoughPipe.PRF

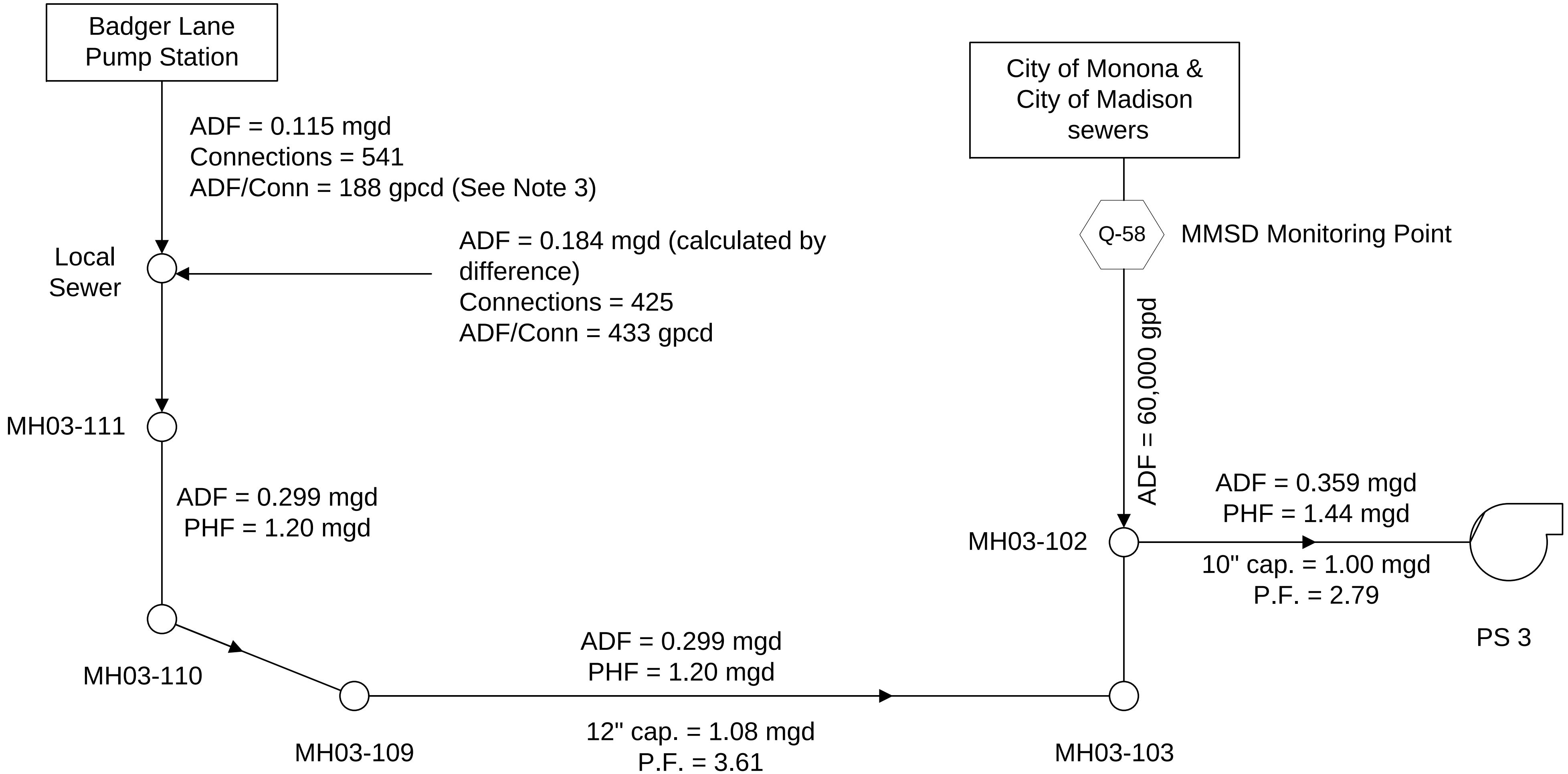


WATER LEVEL BRANCHES - 19-5-2004 05:00:29 2010J_Rimrock Interceptor.PRF



WATER LEVEL BRANCHES - 19-5-2004 06:00:03 2010J_Rimrock Interceptor.PRF





NOTES:

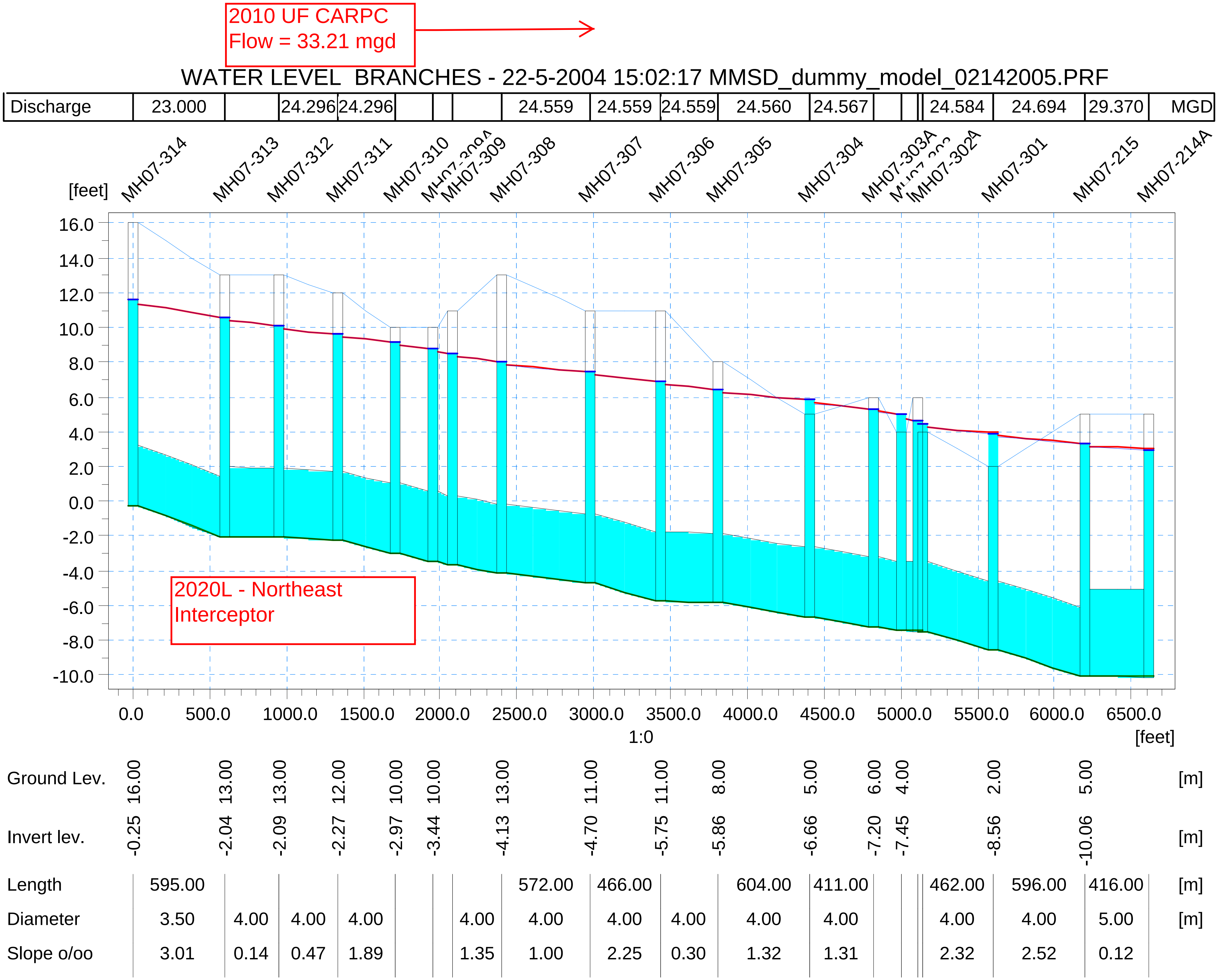
(1). All average daily flows (ADF) shown are for Year 2009. PS 3 flows are metered via magmeter. Badger Lane Pump Station flows are estimated from run time hours. Flows at Q-58 are monitored by MMSD personnel on a quarterly basis for one week durations.

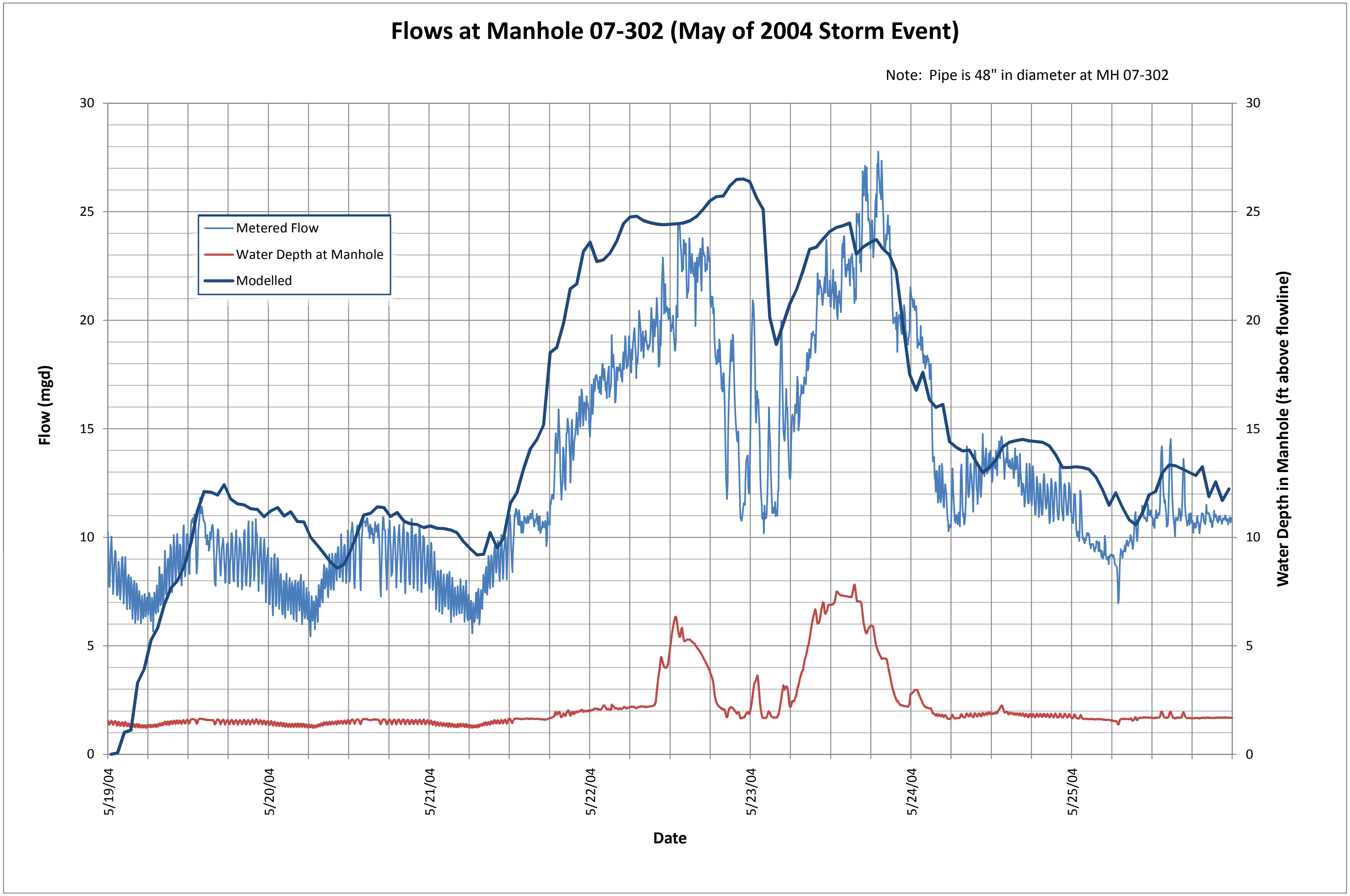
(2). Connection counts obtained from MMSD's User Charge billing system (last revised 2000).

(3). Large flow generators, Clarion Hotel (6,700 gpd) and Department of Revenue Building (6,900 gpd), not included in "flow/connection" calculation.

(4). CARPC's 2010 UF flow estimate for average daily flow at PS 3 is 0.322 mgd.

2010J – RIMROCK INTERCEPTOR – FLOW SCHEMATIC

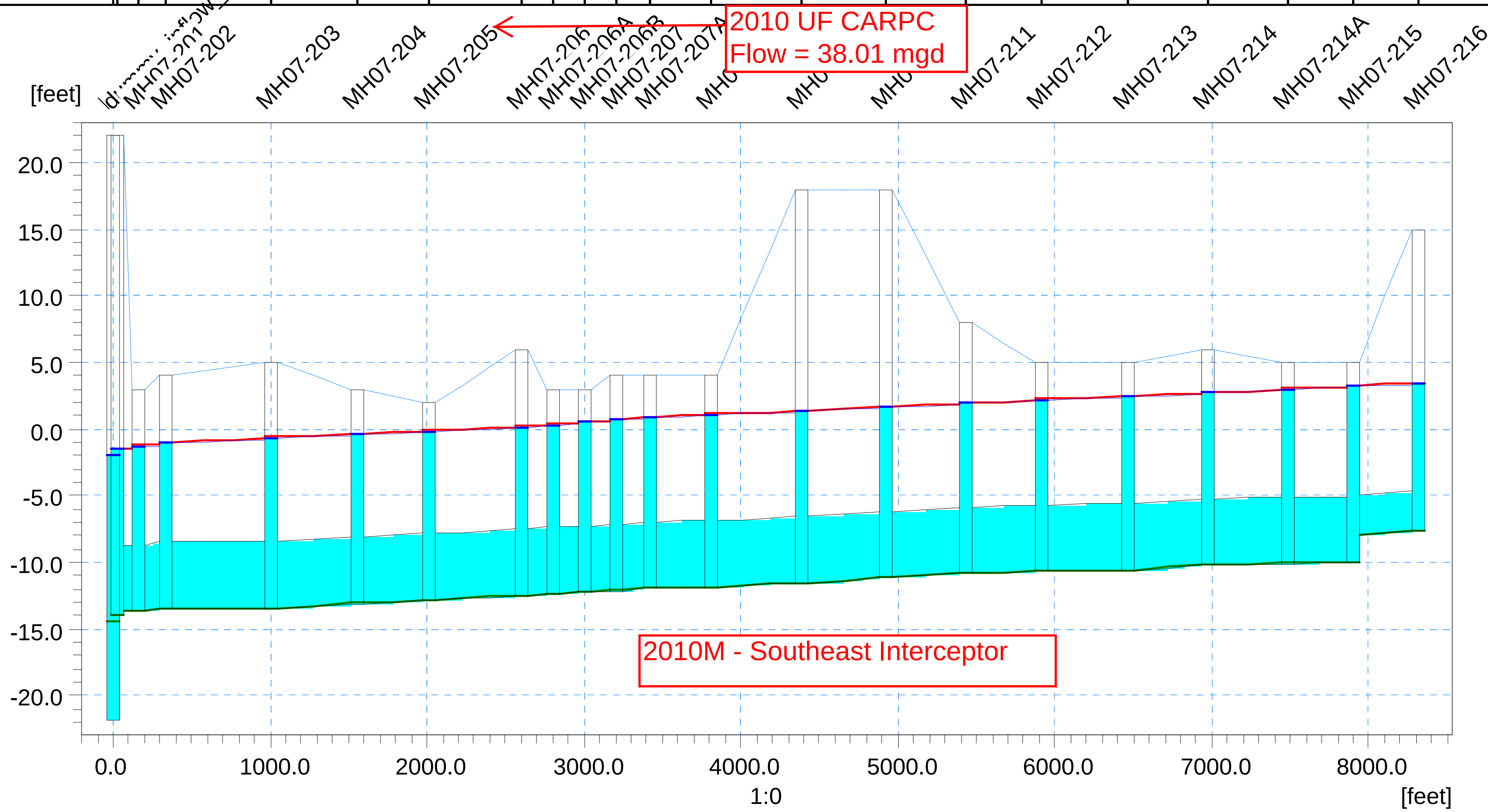

2010 UF CARPC
Flow = 33.21 mgd
WATER LEVEL BRANCHES - 22-5-2004 15:02:17 MMSD_dummy_model_02142005.PRF
Discharge 23.000 24.296 24.296 24.559 24.559 24.559 24.560 24.567 24.584 24.694 29.370 MGD
MH07-314
MH07-313
MH07-312
MH07-311
MH07-310
MH07-309
MH07-308
MH07-307
MH07-306
MH07-305
MH07-304
MH07-303A
MH07-302A
MH07-301
MH07-215
MH07-214A
[feet]
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
2020L - Northeast Interceptor
0.0 500.0 1000.0 1500.0 2000.0 2500.0 3000.0 3500.0 4000.0 4500.0 5000.0 5500.0 6000.0 6500.0
1:0
[feet]
Ground Lev. 16.00 13.00 13.00 12.00 10.00 10.00 13.00 11.00 11.00 8.00 5.00 6.00 4.00 2.00 5.00 [m]
Invert lev. -0.25 -2.04 -2.09 -2.27 -2.97 -3.44 -4.13 -4.70 -5.75 -5.86 -6.66 -7.20 -7.45 -8.56 -10.06 [m]
Length 595.00 572.00 466.00 604.00 411.00 462.00 596.00 416.00 [m]
Diameter 3.50 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 5.00 [m]
Slope o/oo 3.01 0.14 0.47 1.89 1.35 1.00 2.25 0.30 1.32 1.31 2.32 2.52 0.12



Flows at Manhole 07-302 (May of 2004 Storm Event)
Note: Pipe is 48" in diameter at MH 07-302
Metered Flow
Water Depth at Manhole
Modelled
Flow (mgd)
Water Depth in Manhole (ft above flowline)
0
5
10
15
20
25
30
5/19/04
5/20/04
5/21/04
5/22/04
5/23/04
5/24/04
5/25/04
Date

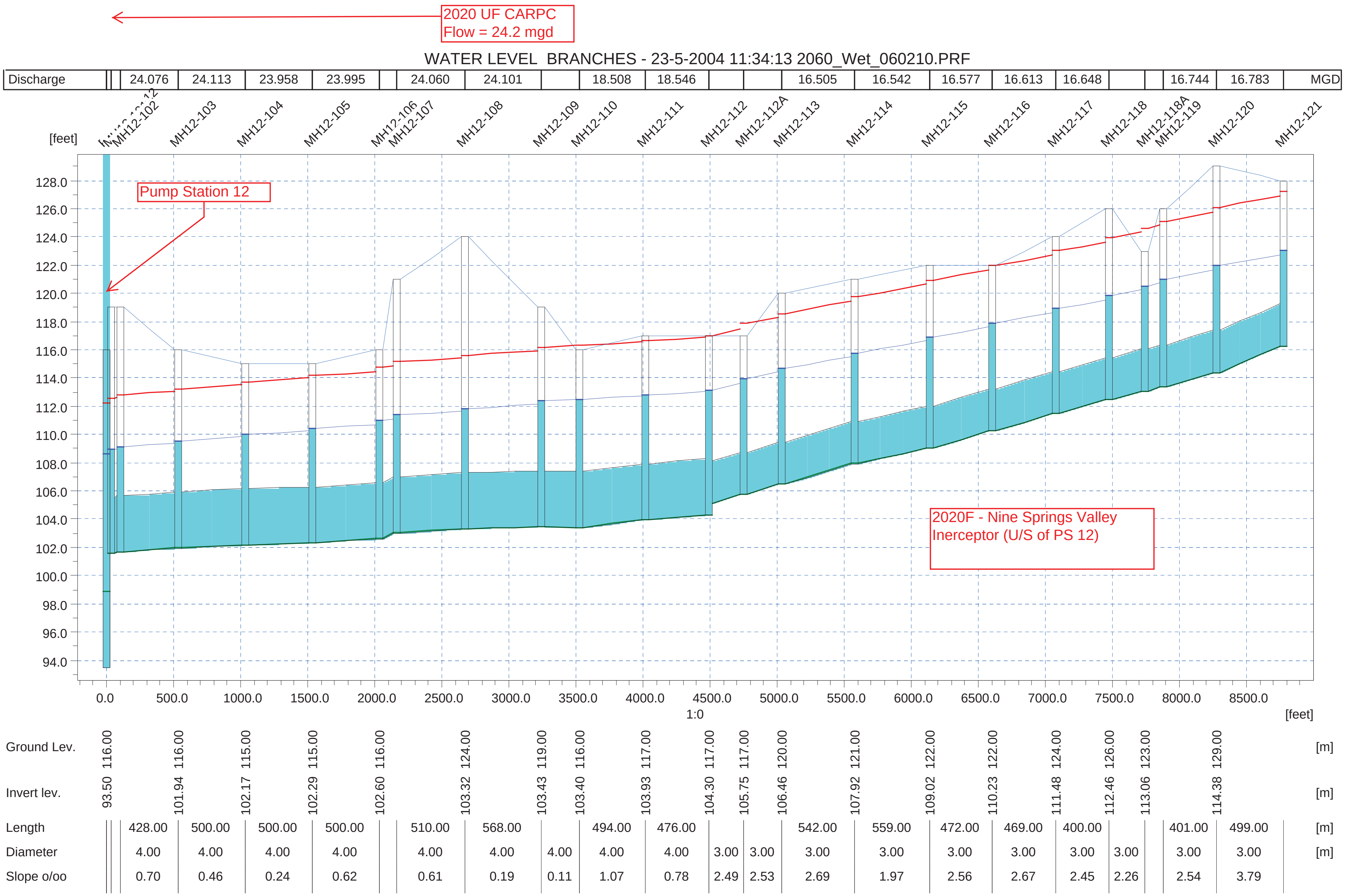
WATER LEVEL BRANCHES - 22-5-2004 15:02:17 MMSD_dummy_model_02142005.PRF

Discharge	30.235	30.234		29.614		29.609	29.608	29.606	29.605	29.373	29.372	29.371		4.676	MGD

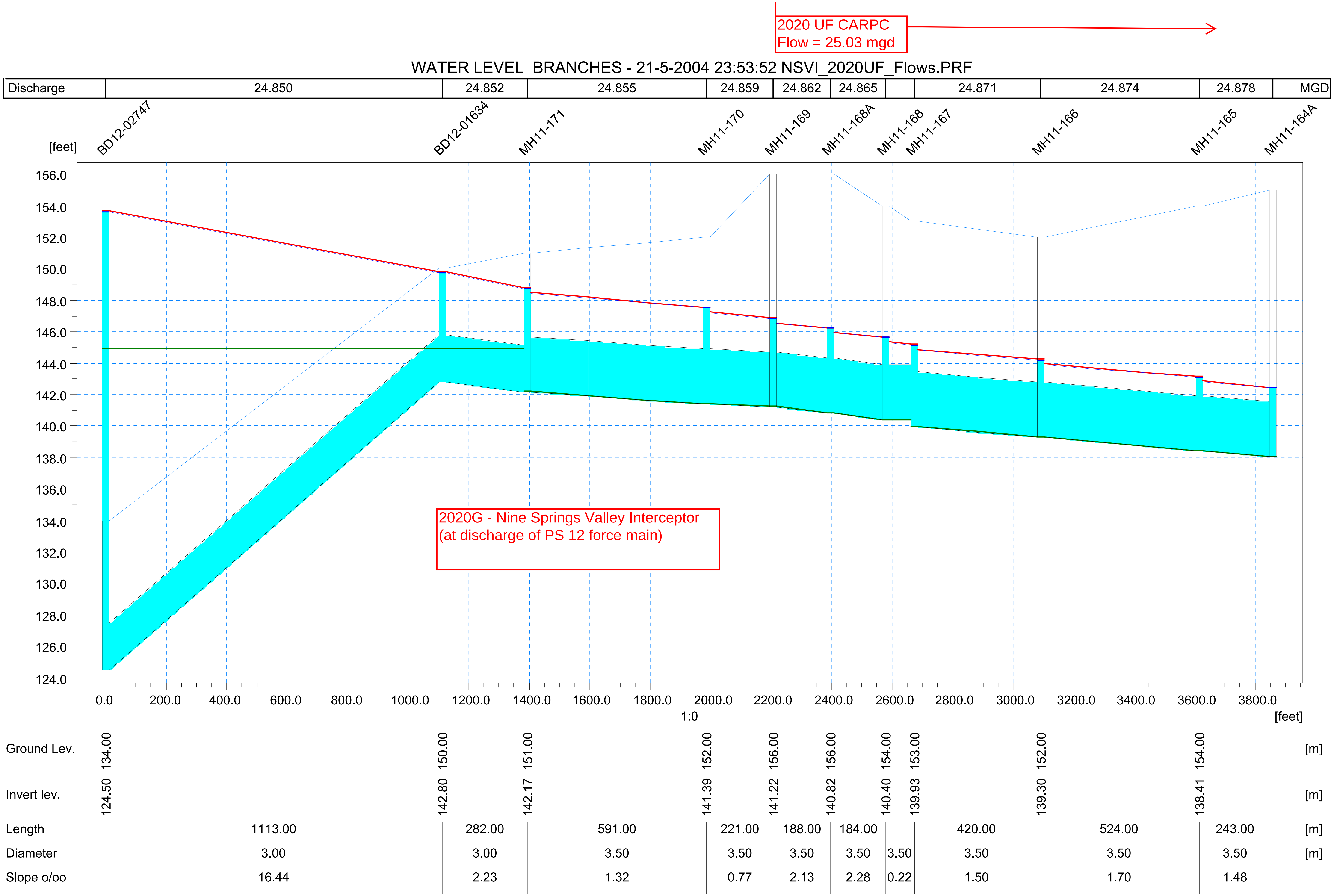


Ground Lev.	22.00	4.00	5.00	3.00	2.00	6.00	3.00	4.00	4.00	18.00	18.00	8.00	5.00	5.00	6.00	5.00	5.00 [m]
Invert lev.	-21.80	-13.49	-13.47	-13.10	-12.87	-12.52	-12.28	-11.97	-11.88	-11.57	-11.19	-10.84	-10.68	-10.63	-10.20	-10.11	-10.06 [m]

Length	670.00	545.00		600.00		577.00	541.00	498.00		553.00	505.00	505.00			[m]
Diameter	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00	[m]
Slope o/oo	0.03	0.68	0.50	0.58	0.23	0.54	0.70	0.70	0.33	0.09	0.85	0.18	0.12	0.81	

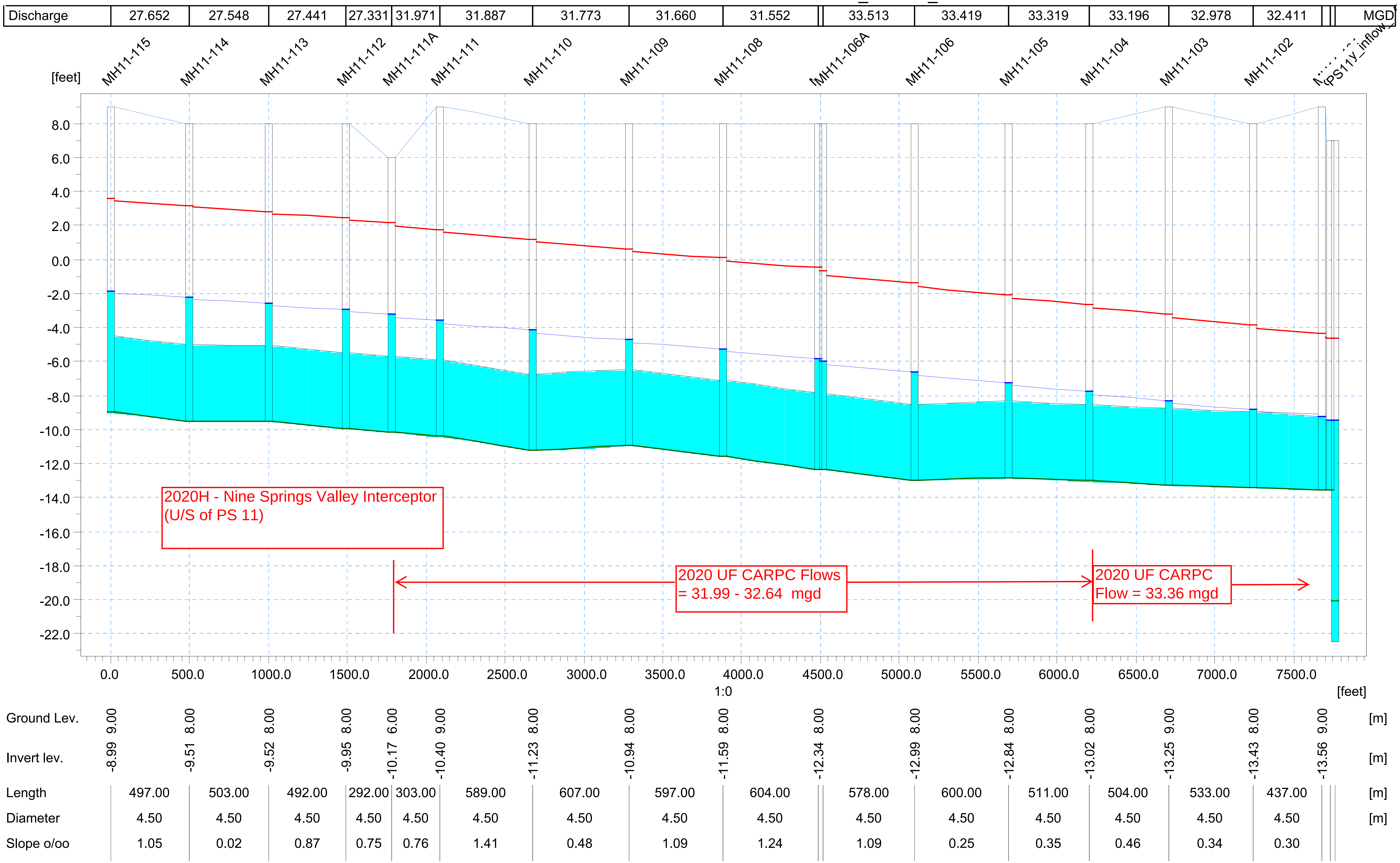


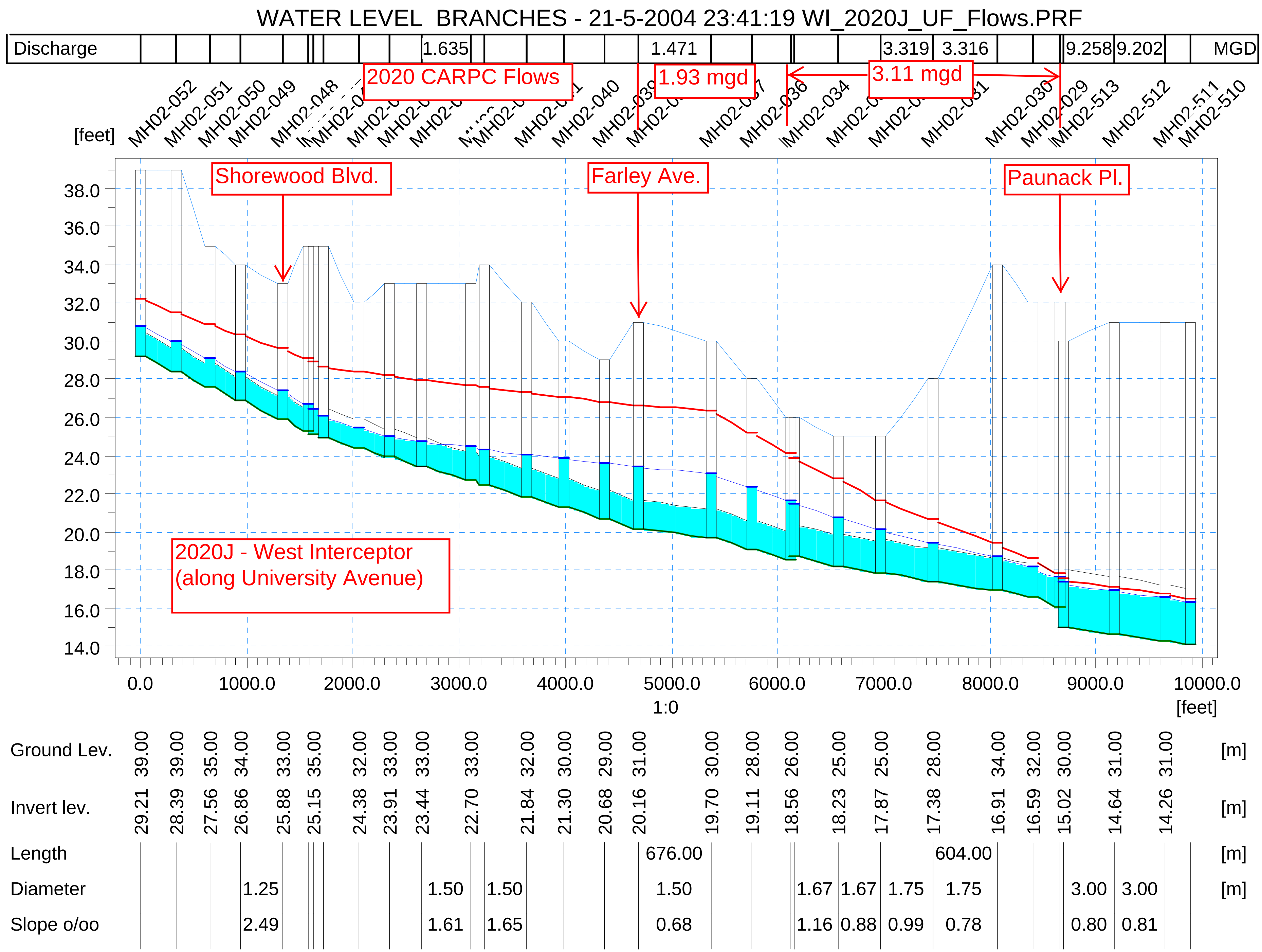
2020 UF CARPC
Flow = 24.2 mgd
WATER LEVEL BRANCHES - 23-5-2004 11:34:13 2060_Wet_060210.PRF
Discharge 24.076 24.113 23.958 23.995 24.060 24.101 18.508 18.546 16.505 16.542 16.577 16.613 16.648 16.744 16.783 MGD
MH12-102 MH12-103 MH12-104 MH12-105 MH12-106 MH12-107 MH12-108 MH12-109 MH12-110 MH12-111 MH12-112 MH12-112A MH12-113 MH12-114 MH12-115 MH12-116 MH12-117 MH12-118 MH12-118A MH12-119 MH12-120 MH12-121
[feet]
Pump Station 12
2020F - Nine Springs Valley Inerceptor (U/S of PS 12)
128.0 126.0 124.0 122.0 120.0 118.0 116.0 114.0 112.0 110.0 108.0 106.0 104.0 102.0 100.0 98.0 96.0 94.0
0.0 500.0 1000.0 1500.0 2000.0 2500.0 3000.0 3500.0 4000.0 4500.0 5000.0 5500.0 6000.0 6500.0 7000.0 7500.0 8000.0 8500.0
1:0
[feet]
Ground Lev. 116.00 116.00 115.00 115.00 116.00 124.00 119.00 116.00 117.00 117.00 117.00 120.00 121.00 122.00 122.00 124.00 126.00 123.00 129.00 [m]
Invert lev. 93.50 101.94 102.17 102.29 102.60 103.32 103.43 103.40 103.93 104.30 105.75 106.46 107.92 109.02 110.23 111.48 112.46 113.06 114.38 [m]
Length 428.00 500.00 500.00 500.00 510.00 568.00 494.00 476.00 542.00 559.00 472.00 469.00 400.00 401.00 499.00 [m]
Diameter 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00 [m]
Slope o/oo 0.70 0.46 0.24 0.62 0.61 0.19 0.11 1.07 0.78 2.49 2.53 2.69 1.97 2.56 2.67 2.45 2.26 2.54 3.79



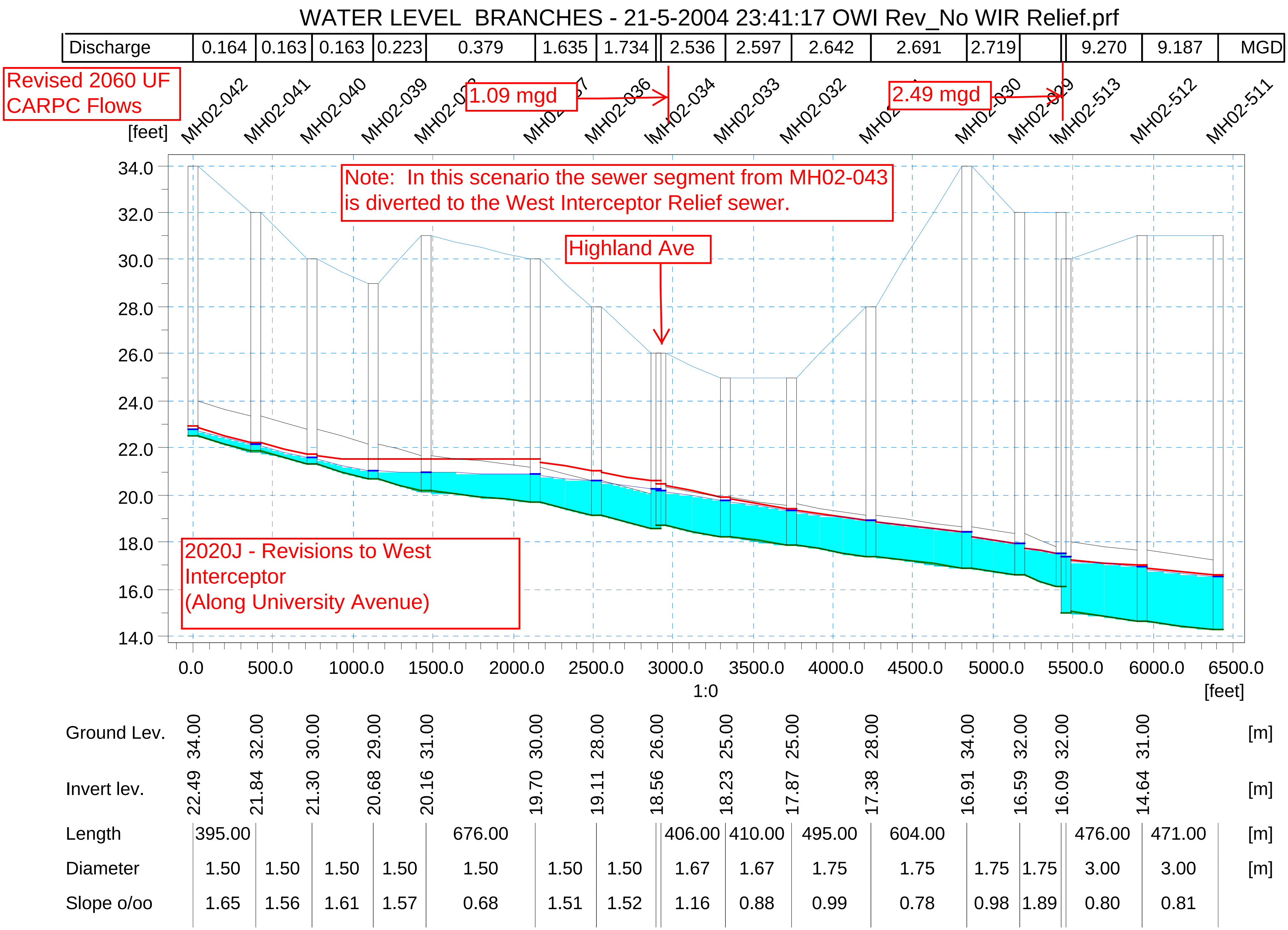
2020 UF CARPC
Flow = 25.03 mgd
WATER LEVEL BRANCHES - 21-5-2004 23:53:52 NSVI_2020UF_Flows.PRF
Discharge
24.850
24.852
24.855
24.859
24.862
24.865
24.871
24.874
24.878
MGD
BD12-02747
BD12-01634
MH11-171
MH11-170
MH11-169
MH11-168A
MH11-168
MH11-167
MH11-166
MH11-165
MH11-164A
[feet]
156.0
154.0
152.0
150.0
148.0
146.0
144.0
142.0
140.0
138.0
136.0
134.0
132.0
130.0
128.0
126.0
124.0
2020G - Nine Springs Valley Interceptor
(at discharge of PS 12 force main)
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2000.0
2200.0
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
1:0
[feet]
Ground Lev. 134.00 150.00 151.00 152.00 156.00 156.00 154.00 153.00 152.00 154.00 [m]
Invert lev. 124.50 142.80 142.17 141.39 141.22 140.82 140.40 139.93 139.30 138.41 [m]
Length 1113.00 282.00 591.00 221.00 188.00 184.00 420.00 524.00 243.00 [m]
Diameter 3.00 3.00 3.50 3.50 3.50 3.50 3.50 3.50 3.50 3.50 [m]
Slope o/oo 16.44 2.23 1.32 0.77 2.13 2.28 0.22 1.50 1.70 1.48

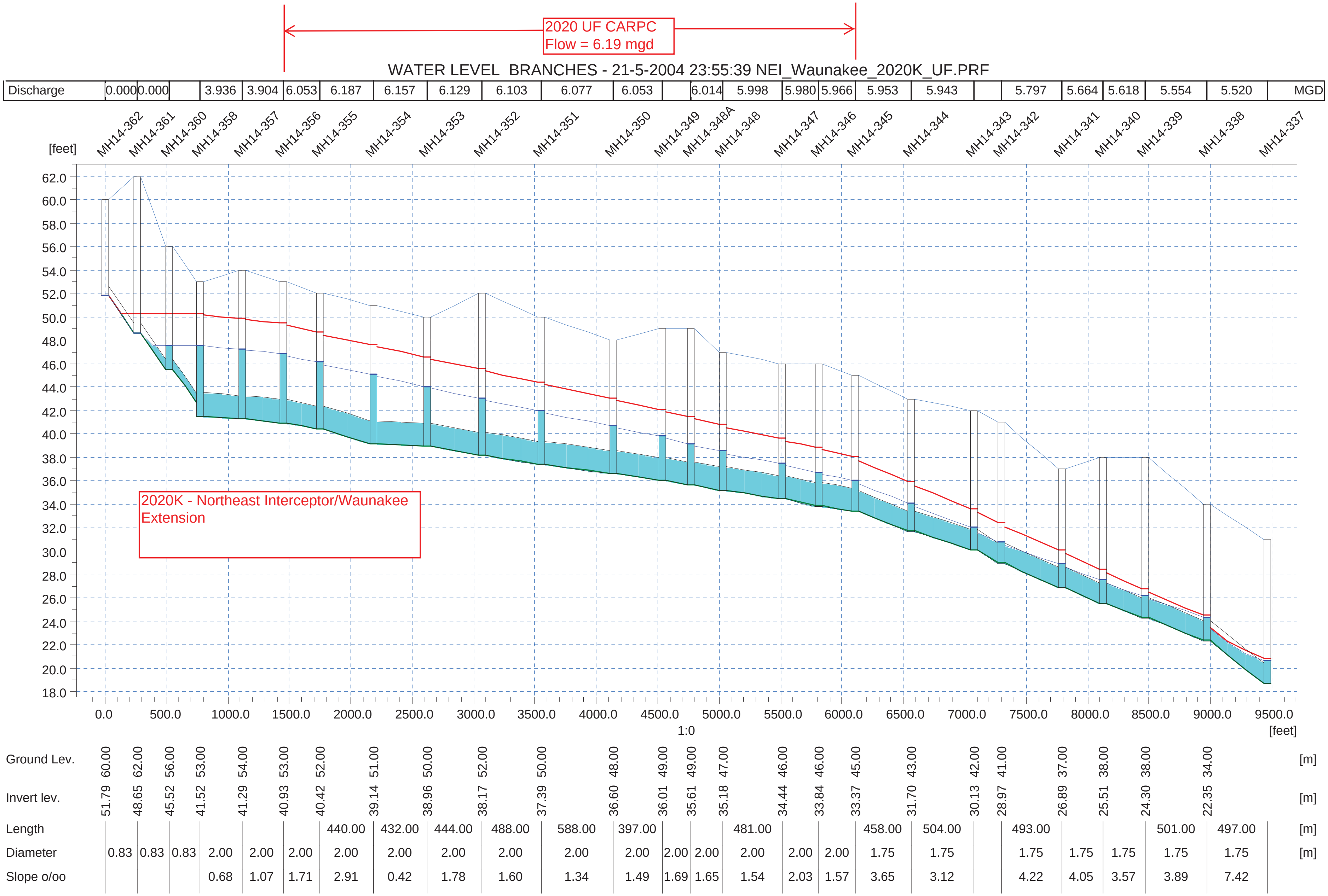
WATER LEVEL BRANCHES - 21-5-2004 17:58:44 NSVI_2020UF_Flows.PRF

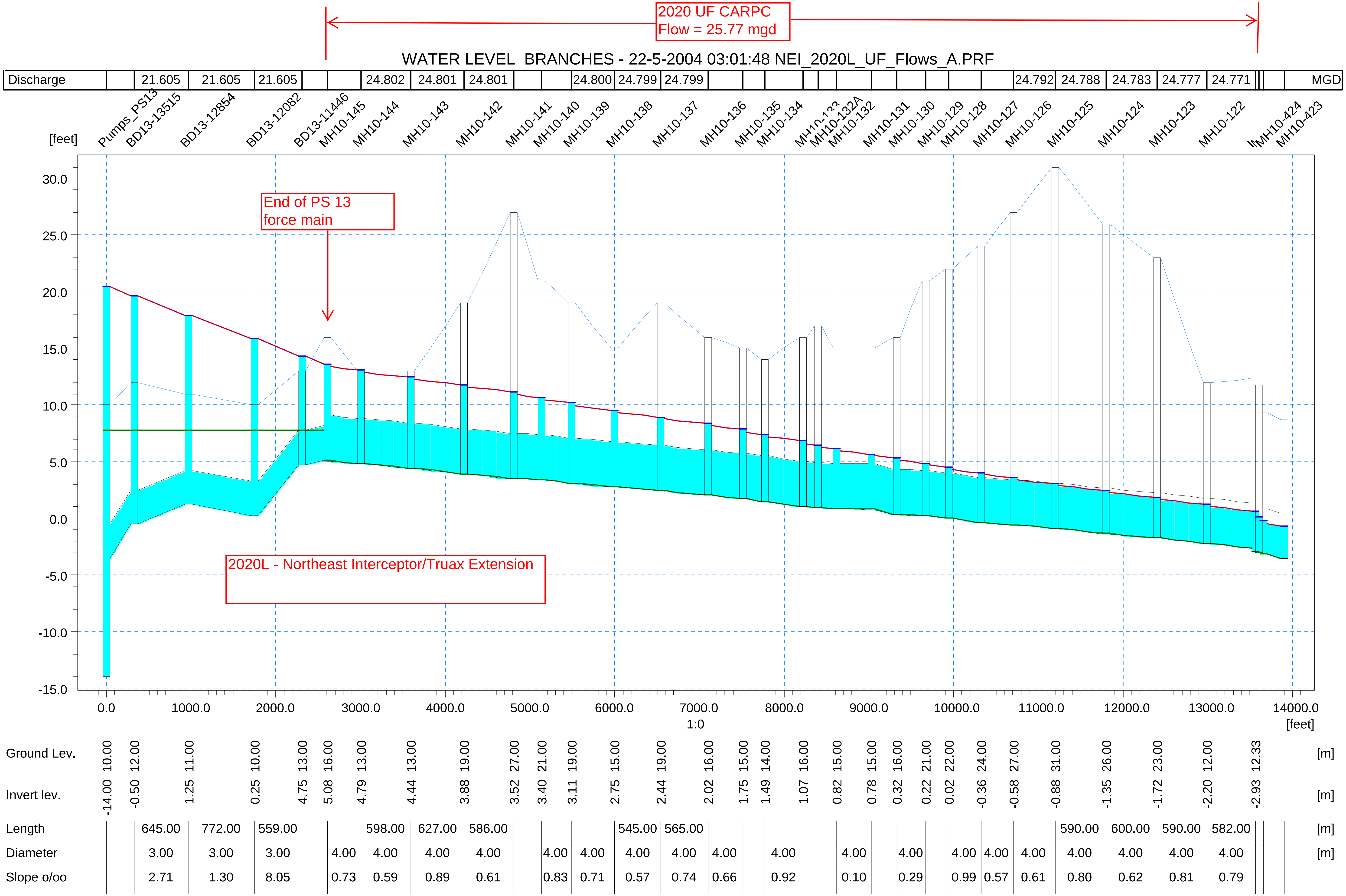




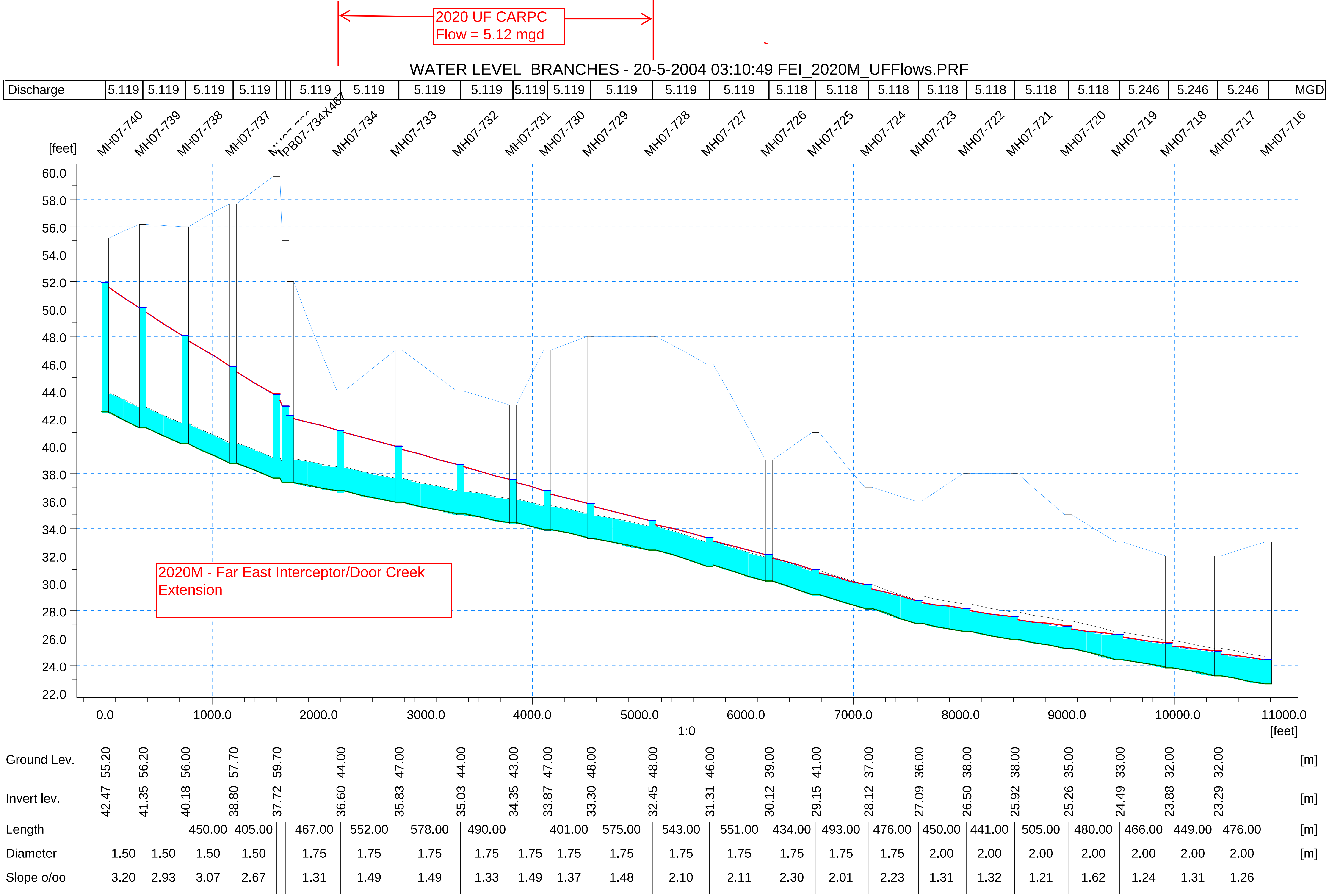
WATER LEVEL BRANCHES - 21-5-2004 23:41:19 WI_2020J_UF_Flows.PRF
Discharge
1.635
1.471
3.319
3.316
9.258
9.202
MGD
2020 CARPC Flows
1.93 mgd
3.11 mgd
MH02-052
MH02-051
MH02-050
MH02-049
MH02-048
MH02-040
MH02-036
MH02-034
MH02-030
MH02-029
MH02-513
MH02-512
MH02-511
MH02-510
[feet]
Shorewood Blvd.
Farley Ave.
Paunack Pl.
2020J - West Interceptor
(along University Avenue)
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
0.0
1000.0
2000.0
3000.0
4000.0
5000.0
6000.0
7000.0
8000.0
9000.0
10000.0
1:0
[feet]
Ground Lev.
39.00 39.00 35.00 34.00 33.00 35.00 32.00 33.00 33.00 33.00 32.00 30.00 29.00 31.00 30.00 28.00 26.00 25.00 25.00 28.00 34.00 32.00 30.00 31.00 31.00
[m]
Invert lev.
29.21 28.39 27.56 26.86 25.88 25.15 24.38 23.91 23.44 22.70 21.84 21.30 20.68 20.16 19.70 19.11 18.56 18.23 17.87 17.38 16.91 16.59 15.02 14.64 14.26
[m]
Length
676.00
604.00
[m]
Diameter
1.25
1.50
1.50
1.50
1.67
1.67
1.75
1.75
3.00
3.00
[m]
Slope o/oo
2.49
1.61
1.65
0.68
1.16
0.88
0.99
0.78
0.80
0.81


WATER LEVEL BRANCHES - 21-5-2004 23:41:17 OWI Rev_No WIR Relief.prf
Discharge 0.164 0.163 0.163 0.223 0.379 1.635 1.734 2.536 2.597 2.642 2.691 2.719 9.270 9.187 MGD
Revised 2060 UF CARPC Flows
[feet]
MH02-042
MH02-041
MH02-040
MH02-039
1.09 mgd
MH02-036
MH02-034
MH02-033
MH02-032
2.49 mgd
MH02-030
MH02-513
MH02-512
MH02-511
Note: In this scenario the sewer segment from MH02-043 is diverted to the West Interceptor Relief sewer.
Highland Ave
2020J - Revisions to West Interceptor (Along University Avenue)
34.0 32.0 30.0 28.0 26.0 24.0 22.0 20.0 18.0 16.0 14.0
0.0 500.0 1000.0 1500.0 2000.0 2500.0 3000.0 3500.0 4000.0 4500.0 5000.0 5500.0 6000.0 6500.0
1:0
[feet]
Ground Lev. 34.00 32.00 30.00 29.00 31.00 30.00 28.00 26.00 25.00 25.00 28.00 34.00 32.00 32.00 31.00 [m]
Invert lev. 22.49 21.84 21.30 20.68 20.16 19.70 19.11 18.56 18.23 17.87 17.38 16.91 16.59 16.09 14.64 [m]
Length 395.00 676.00 406.00 410.00 495.00 604.00 476.00 471.00 [m]
Diameter 1.50 1.50 1.50 1.50 1.50 1.50 1.50 1.67 1.67 1.75 1.75 1.75 1.75 3.00 3.00 [m]
Slope o/oo 1.65 1.56 1.61 1.57 0.68 1.51 1.52 1.16 0.88 0.99 0.78 0.98 1.89 0.80 0.81


2020 UF CARPC
Flow = 6.19 mgd
WATER LEVEL BRANCHES - 21-5-2004 23:55:39 NEI_Waunakee_2020K_UF.PRF
Discharge 0.000 0.000 3.936 3.904 6.053 6.187 6.157 6.129 6.103 6.077 6.053 6.014 5.998 5.980 5.966 5.953 5.943 5.797 5.664 5.618 5.554 5.520 MGD
MH14-362 MH14-361 MH14-360 MH14-358 MH14-357 MH14-356 MH14-355 MH14-354 MH14-353 MH14-352 MH14-351 MH14-350 MH14-349 MH14-348A MH14-348 MH14-347 MH14-346 MH14-345 MH14-344 MH14-343 MH14-342 MH14-341 MH14-340 MH14-339 MH14-338 MH14-337
[feet]
62.0 60.0 58.0 56.0 54.0 52.0 50.0 48.0 46.0 44.0 42.0 40.0 38.0 36.0 34.0 32.0 30.0 28.0 26.0 24.0 22.0 20.0 18.0
2020K - Northeast Interceptor/Waunakee Extension
0.0 500.0 1000.0 1500.0 2000.0 2500.0 3000.0 3500.0 4000.0 4500.0 5000.0 5500.0 6000.0 6500.0 7000.0 7500.0 8000.0 8500.0 9000.0 9500.0
1:0
[feet]
Ground Lev. 60.00 62.00 56.00 53.00 54.00 53.00 52.00 51.00 50.00 52.00 50.00 48.00 49.00 49.00 47.00 46.00 46.00 45.00 43.00 42.00 41.00 37.00 38.00 38.00 34.00 [m]
Invert lev. 51.79 48.65 45.52 41.52 41.29 40.93 40.42 39.14 38.96 38.17 37.39 36.60 36.01 35.61 35.18 34.44 33.84 33.37 31.70 30.13 28.97 26.89 25.51 24.30 22.35 [m]
Length 440.00 432.00 444.00 488.00 588.00 397.00 481.00 458.00 504.00 493.00 501.00 497.00 [m]
Diameter 0.83 0.83 0.83 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00 1.75 1.75 1.75 1.75 1.75 1.75 1.75 [m]
Slope o/oo 0.68 1.07 1.71 2.91 0.42 1.78 1.60 1.34 1.49 1.69 1.65 1.54 2.03 1.57 3.65 3.12 4.22 4.05 3.57 3.89 7.42



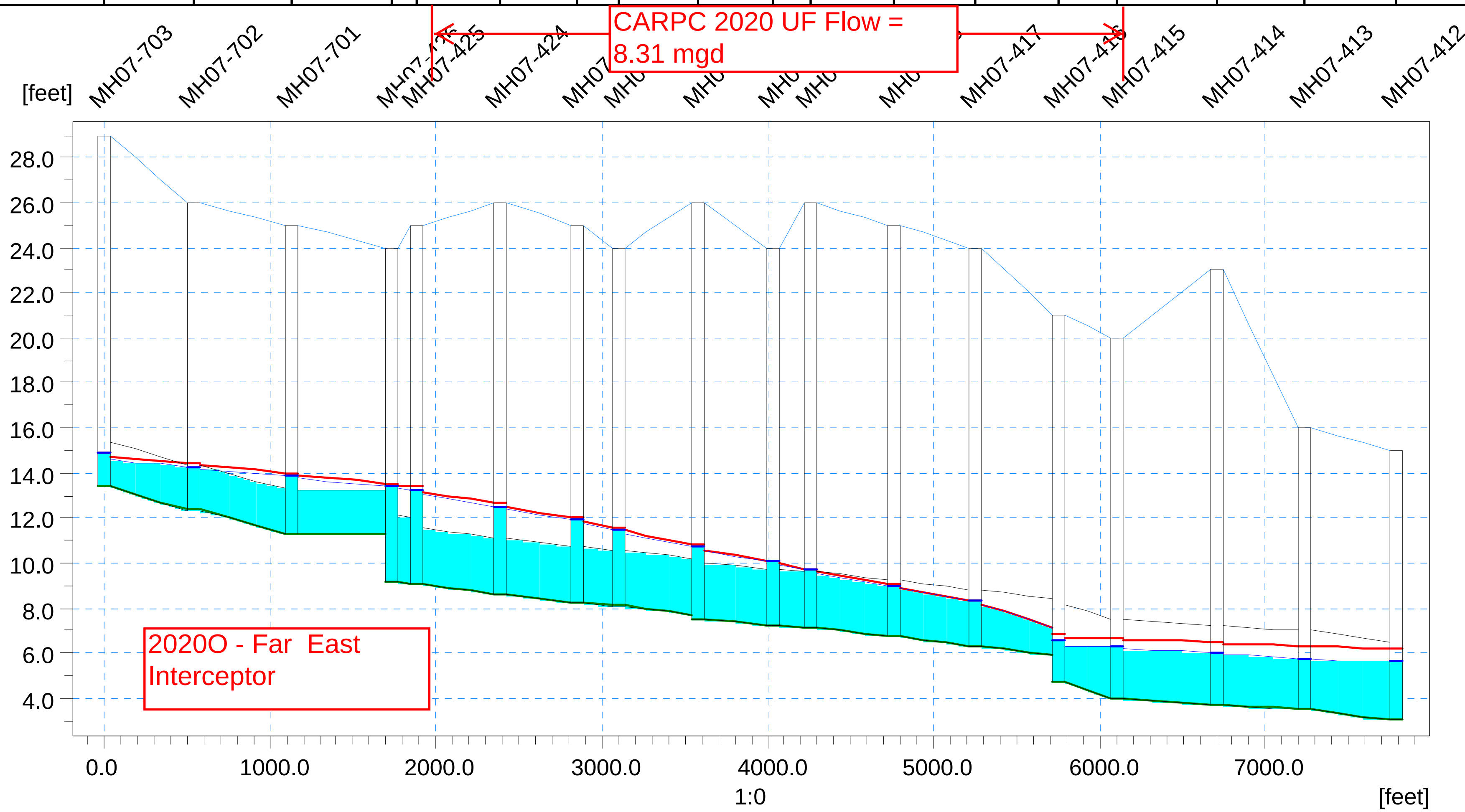
2020 UF CARPC
Flow = 25.77 mgd
WATER LEVEL BRANCHES - 22-5-2004 03:01:48 NEI_2020L_UF_Flows_A.PRF
Discharge 21.605 21.605 21.605 24.802 24.801 24.801 24.800 24.799 24.799 24.792 24.788 24.783 24.777 24.771 MGD
Pumps_PS13 BD13-13515 BD13-12854 BD13-12082 BD13-11446 MH10-145 MH10-144 MH10-143 MH10-142 MH10-141 MH10-140 MH10-139 MH10-138 MH10-137 MH10-136 MH10-135 MH10-134 MH10-132A MH10-132 MH10-131 MH10-130 MH10-129 MH10-128 MH10-127 MH10-126 MH10-125 MH10-124 MH10-123 MH10-122 MH10-424 MH10-423
[feet]
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
End of PS 13
force main
2020L - Northeast Interceptor/Truax Extension
0.0 1000.0 2000.0 3000.0 4000.0 5000.0 6000.0 7000.0 8000.0 9000.0 10000.0 11000.0 12000.0 13000.0 14000.0
1:0
[feet]
Ground Lev. 10.00 12.00 11.00 10.00 13.00 16.00 13.00 13.00 19.00 27.00 21.00 19.00 15.00 19.00 16.00 15.00 14.00 16.00 15.00 15.00 16.00 21.00 22.00 24.00 27.00 31.00 26.00 23.00 12.00 12.33 [m]
Invert lev. -14.00 -0.50 1.25 0.25 4.75 5.08 4.79 4.44 3.88 3.52 3.40 3.11 2.75 2.44 2.02 1.75 1.49 1.07 0.82 0.78 0.32 0.22 0.02 -0.36 -0.58 -0.88 -1.35 -1.72 -2.20 -2.93 [m]
Length 645.00 772.00 559.00 598.00 627.00 586.00 545.00 565.00 590.00 600.00 590.00 582.00 [m]
Diameter 3.00 3.00 3.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 4.00 [m]
Slope o/oo 2.71 1.30 8.05 0.73 0.59 0.89 0.61 0.83 0.71 0.57 0.74 0.66 0.92 0.10 0.29 0.99 0.57 0.61 0.80 0.62 0.81 0.79



2020 UF CARPC
Flow = 5.12 mgd
WATER LEVEL BRANCHES - 20-5-2004 03:10:49 FEI_2020M_UFFlows.PRF
Discharge 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.119 5.118 5.118 5.118 5.118 5.118 5.118 5.118 5.246 5.246 5.246 MGD
MH07-740 MH07-739 MH07-738 MH07-737 IPB07-734X467 MH07-734 MH07-733 MH07-732 MH07-731 MH07-730 MH07-729 MH07-728 MH07-727 MH07-726 MH07-725 MH07-724 MH07-723 MH07-722 MH07-721 MH07-720 MH07-719 MH07-718 MH07-717 MH07-716
[feet]
60.0 58.0 56.0 54.0 52.0 50.0 48.0 46.0 44.0 42.0 40.0 38.0 36.0 34.0 32.0 30.0 28.0 26.0 24.0 22.0
2020M - Far East Interceptor/Door Creek Extension
0.0 1000.0 2000.0 3000.0 4000.0 5000.0 6000.0 7000.0 8000.0 9000.0 10000.0 11000.0
1:0
[feet]
Ground Lev. 55.20 56.20 56.00 57.70 59.70 44.00 47.00 44.00 43.00 47.00 48.00 48.00 46.00 39.00 41.00 37.00 36.00 38.00 38.00 35.00 33.00 32.00 32.00 [m]
Invert lev. 42.47 41.35 40.18 38.80 37.72 36.60 35.83 35.03 34.35 33.87 33.30 32.45 31.31 30.12 29.15 28.12 27.09 26.50 25.92 25.26 24.49 23.88 23.29 [m]
Length 450.00 405.00 467.00 552.00 578.00 490.00 401.00 575.00 543.00 551.00 434.00 493.00 476.00 450.00 441.00 505.00 480.00 466.00 449.00 476.00 [m]
Diameter 1.50 1.50 1.50 1.50 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 2.00 2.00 2.00 2.00 2.00 2.00 2.00 [m]
Slope o/oo 3.20 2.93 3.07 2.67 1.31 1.49 1.49 1.33 1.49 1.37 1.48 2.10 2.11 2.30 2.01 2.23 1.31 1.32 1.21 1.62 1.24 1.31 1.26

WATER LEVEL BRANCHES - 21-5-2004 17:33:11 2020O_FEI.prf

Discharge																	
Discharge	4.299	4.295	4.294		8.310	8.310		8.310	8.310		8.309	8.309	8.308	8.385	8.257	8.187	8.089	MGD

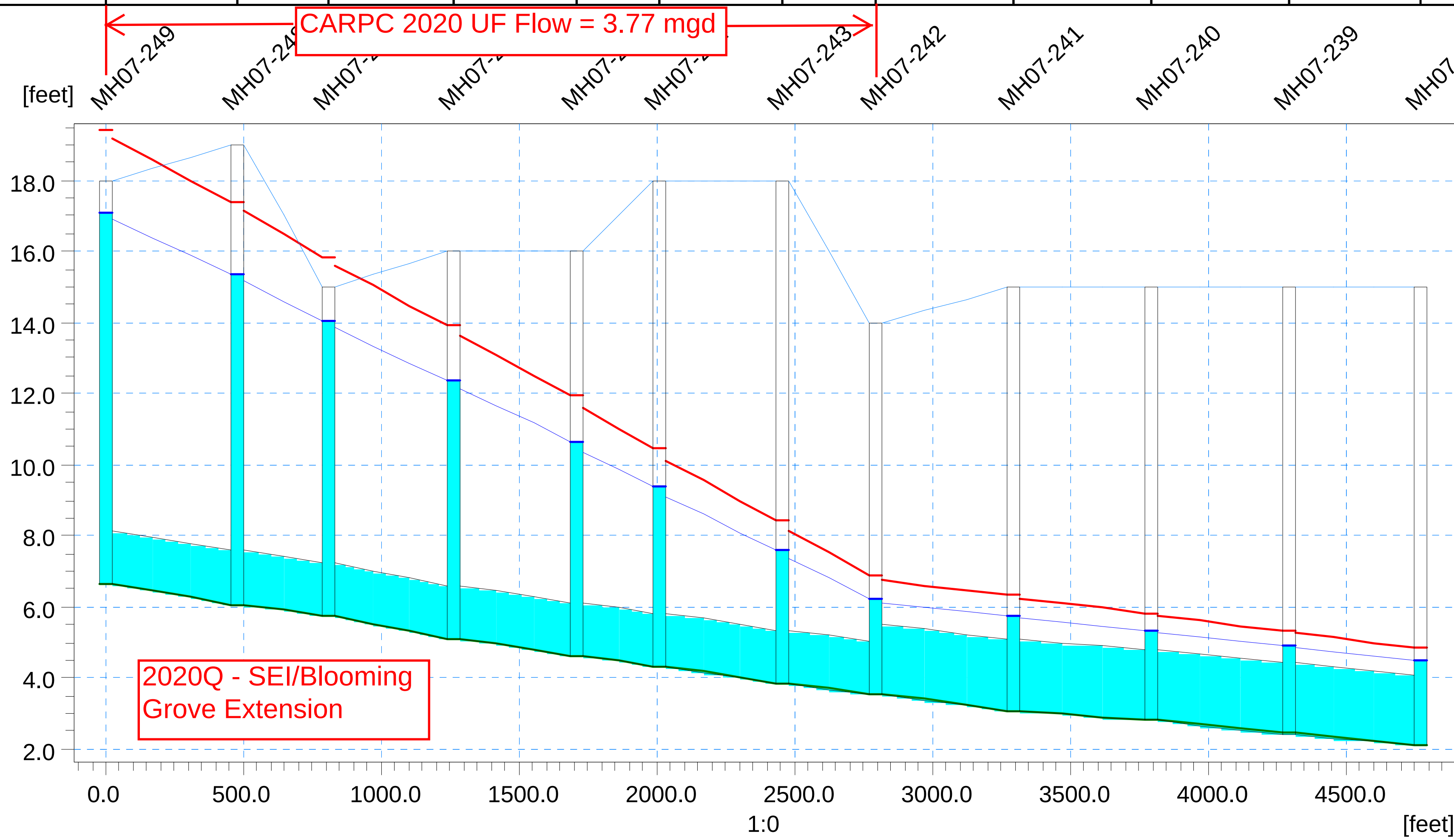


Ground Lev.	29.00	26.00	25.00	24.00	26.00	25.00	24.00	26.00	24.00	26.00	25.00	24.00	21.00	20.00	23.00	16.00	[m]
Invert lev.	13.38	12.34	11.27	9.15	8.63	8.25	8.10	7.52	7.25	7.13	6.74	6.29	4.69	3.98	3.70	3.50	[m]

Length	534.00	602.00	600.00		500.00			486.00			507.00	492.00	498.00		595.00	536.00	550.00	[m]
Diameter	2.00	2.00	2.00		2.50	2.50		2.50	2.50		2.50	2.50	2.50	3.50	3.50	3.50	3.50	[m]
Slope o/oo	1.97	1.74	0.02		0.80	0.82		0.80	0.60		0.77	0.91	0.70	2.00	0.47	0.37	0.87	

WATER LEVEL BRANCHES - 21-5-2004 02:10:20 2020Q - BG Ext.PRF

Discharge	3.748	3.763	3.777	3.789	3.799	3.806	3.813	3.817	3.822	3.826	3.829	MGD

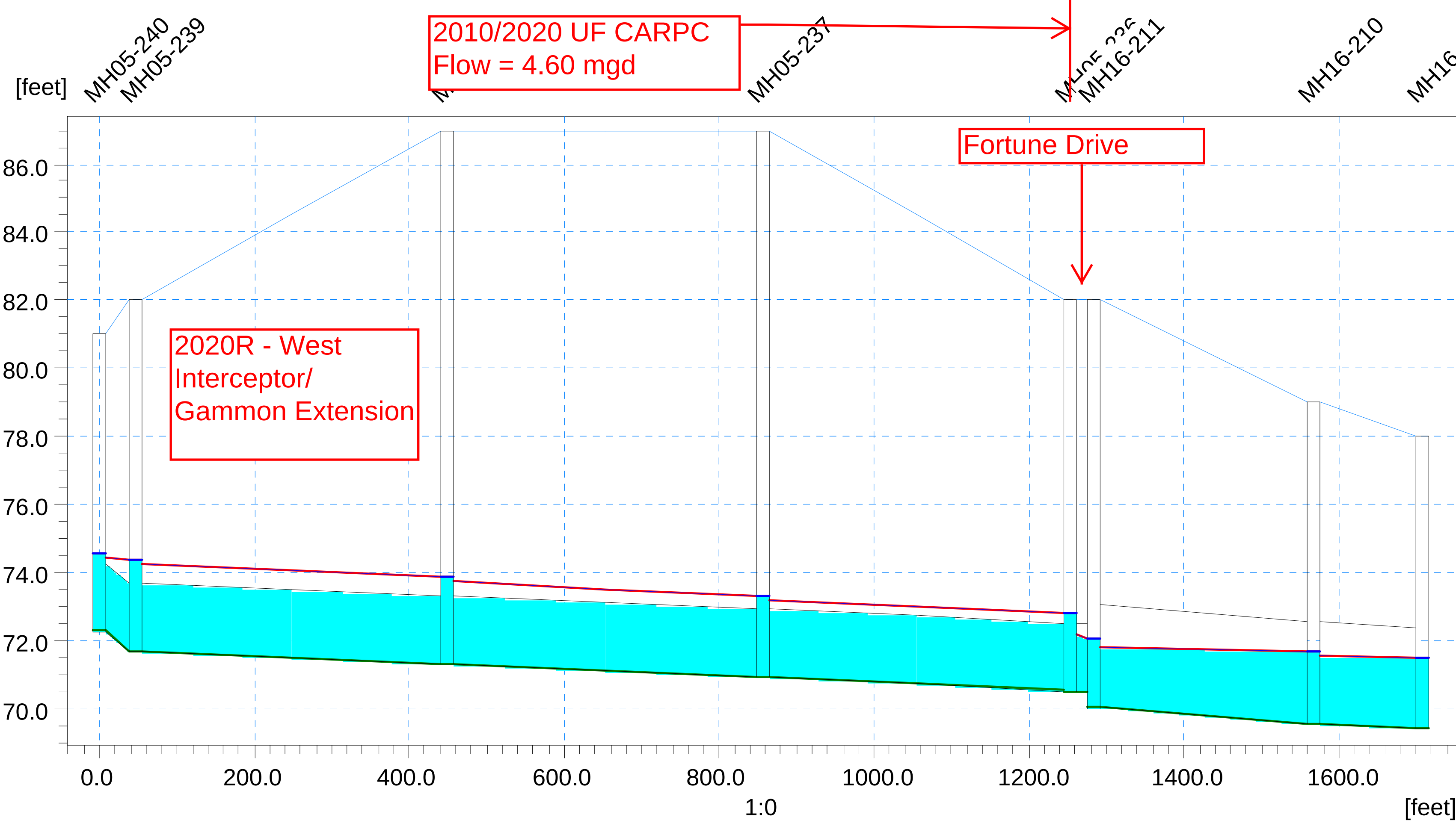


Ground Lev.	18.00	19.00	15.00	16.00	16.00	18.00	18.00	14.00	15.00	15.00	15.00	[m]
Invert lev.	6.66	6.07	5.73	5.11	4.63	4.33	3.83	3.54	3.07	2.80	2.43	[m]

Length	474.00	337.00	450.00	450.00	300.00	445.00	338.00	502.00	497.00	498.00	479.00	[m]
Diameter	1.50	1.50	1.50	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	[m]
Slope o/oo	1.24	1.01	1.38	1.07	1.00	1.12	0.86	0.94	0.54	0.74	0.71	

WATER LEVEL BRANCHES - 20-5-2004 12:01:18 2010F - WI Gammon Ext.prf

Discharge		4.608	4.608	4.608		8.933	8.933	MGD



Ground Lev.	81.00	82.00	87.00	87.00	82.00	79.00	[m]
Invert lev.	72.29	71.71	71.33	70.93	70.49	69.58	[m]

Length		402.00	406.00	396.00	282.00	141.00	[m]
Diameter		2.00	2.00	2.00	3.00	3.00	[m]
Slope o/oo		0.95	0.99	0.98	1.67	1.13	

Appendix A6
Lower Badger Mill Creek Interceptor

MADISON METROPOLITAN SEWERAGE DISTRICT

Lower Badger Mill Creek Sewer Service Report

Lead Author: Jon Schellpfeffer

January 2005

Introduction

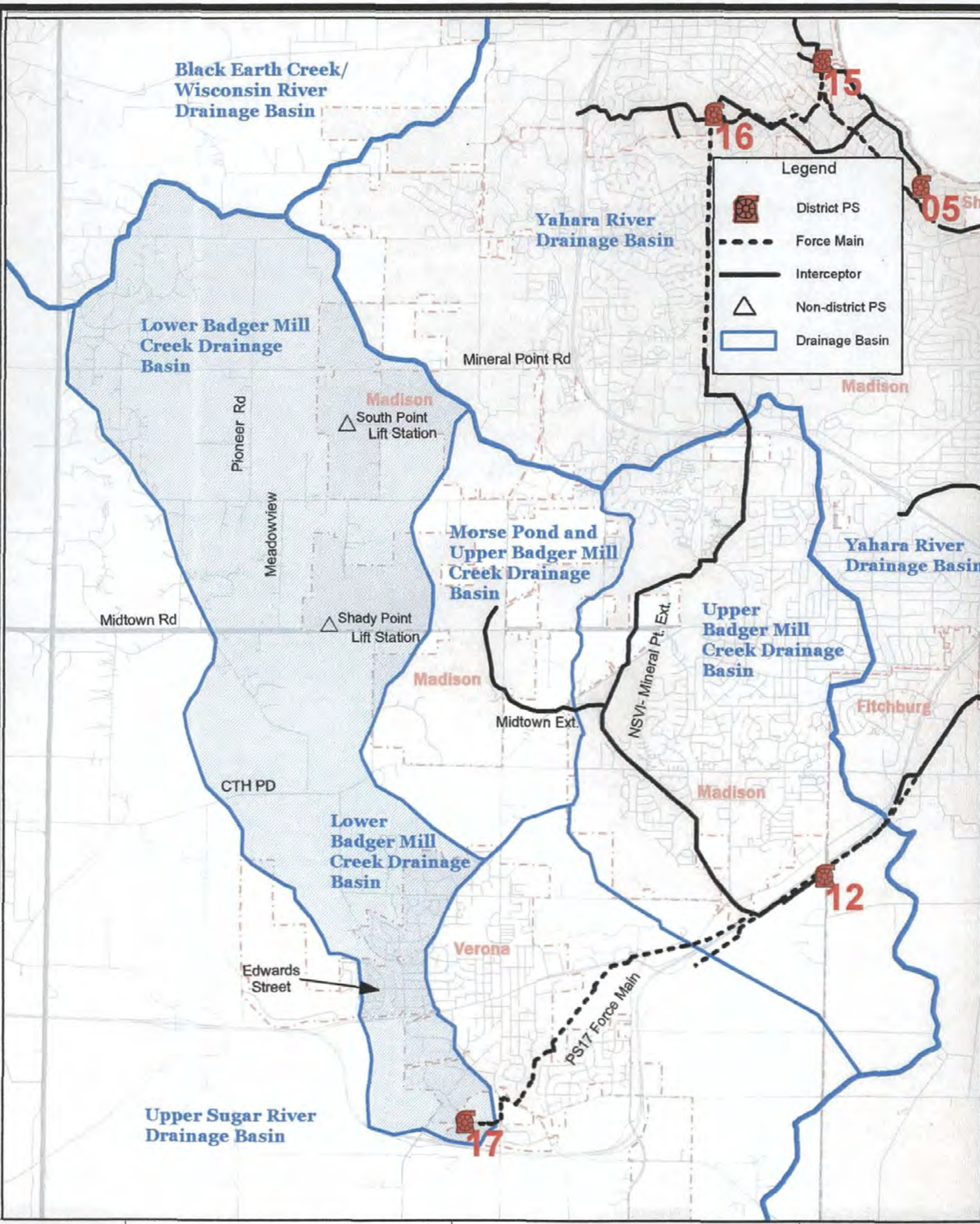
The purpose of this report is to present an analysis of options to provide sewer service in the Lower Badger Mill Creek watershed. The location of this watershed is shown in Figure 1. There are four municipal entities in this watershed, and the timing of sewer service availability is somewhat different in each area.

1. The Town of Middleton is the furthest upstream municipality in the watershed. There is currently no municipal sewer service in the town although there is significant residential development on large rural lots. These homes are served by private septic tank and drain field systems, and the town has no plans to replace these systems through the provision of public sewerage. However, it would be prudent to include capacity in any long-term sewer system facilities for these areas and other vacant land in the town.

2. The City of Madison portion of this watershed is north of Midtown Road and is expected to develop rapidly over the next decade. The first City of Madison development in this watershed occurred in 2000. The area is currently served by two small lift stations. The South Point Lift Station serves a proposed industrial/commercial area south of Mineral Point Road and discharges to the City of Madison's Wexford Interceptor that flows to Pumping Station No. 16. The Shady Point Lift Station serves the southern portion of the city's development north of Midtown Road and pumps easterly to the Nine Springs Valley Interceptor – Midtown Extension.

3. The Town of Verona portion of this watershed is located between Midtown Road on the north and the City of Verona to the south. The Town of Verona has no plans to provide sewer service in the area. The City of Madison's 1990 Peripheral Development Plan also calls for this area to be permanent open space. However, this area is adjacent to developing areas in the City of Madison and the City of Verona, and unless an inter-municipal boundary agreement is developed to permanently preserve this area as agricultural open space, it is likely to be annexed to one of these cities and developed within the next few decades. Unless a definitive agreement is in place to preserve this area as permanent open space, any sewerage facilities constructed to serve this watershed should be built with sufficient capacity to serve this area.

4. The City of Verona is located at the downstream end of this watershed. The city is growing rapidly in this area and plans are underway to increase sewerage capacity to serve this growth. The District intends to work with the city to assure that any new sewerage facilities constructed in this area have sufficient capacity to serve the areas upstream of the city in the future.



MMSD

Madison Metropolitan Sewerage District

Figure 1
Lower Badger Mill Creek
Drainage Basin

Prepared by: JP
Approved by: JS
Date: 1/12/2005

A 20-year present worth cost analysis was conducted that included the following major variables related to serving this area:

- Rate of growth in the watershed – a high growth rate double the current growth rate and a low growth rate equal to the current growth rate were used. This growth is assumed to occur outside of the South Point Lift Station service area.
- Provision of sewer service in the Town of Verona – one option was included that would provide service in this area immediately, another that would provide service within the next fifteen years, and two options were included that would maintain this area as permanent open space.
- Future treatment plant locations – all options and growth rates were analyzed for the scenario of a new Sugar River Treatment Plant that would go on-line in 2020 and for the scenario of new relief sewers along the route of the Nine Springs Valley Interceptor and expansion of the Nine Springs Treatment Plant.

  Under the most likely scenario, a Sugar River regional treatment plant will be constructed when the capacity is needed to economically maintain the inter-basin water balance and to relieve the Nine Springs Valley Interceptor and loadings to the Nine Springs treatment plant. Initial flows to this plant will be in the range of 4 to 5 mgd, and it will have a design capacity of 7 to 10 mgd. It will be located south of the City of Verona. Pumping Station No. 17 will be modified to serve as the influent pumping station to this plant. A diversion sewer will be constructed from the Nine Springs Valley Interceptor – Mineral Point Extension to Pumping Station No. 17 to divert the wastewater generated in the Upper Badger Mill Creek watershed from the Nine Springs treatment plant to the new Sugar River treatment plant. Existing flows from the City of Verona and the Lower Badger Mill Creek watershed would also be treated at this new plant.

  In a less likely scenario, all wastewater would continue to be treated at the Nine Springs plant. Then, the existing Nine Springs Valley Interceptor downstream of Pumping Station No. 12 would require relief beginning in about 2020. The Nine Springs Plant would require expansion between 2025 and 2030. To maintain the water balance between the Sugar River and Yahara River basins, additional facilities would need to be constructed to return effluent from the Nine Springs plant to the Sugar River basin.

The area in the City of Madison north of Midtown Road in the Lower Badger Mill Creek drainage basin had 260 residential connections as of May, 2004. This area started to develop in 2000. The average growth rate has been 65 connections per year.

The Shady Point Lift Station serves the current development in this basin and is located in the Hawks Landing development on Midtown Road. It has a capacity of 630 gallons per minute (907,200 gallons per day) and a current average daily flow of 45,000 gallons per day. It has sufficient capacity to serve 1,250 residential connections. At the current growth rate in this basin, it would reach this level in 2020. If the growth rate were to double to 130 new connections per year, it would reach full capacity in 2012.

The Shady Point Lift Station is not located on the floor of the Lower Badger Mill Creek valley. In order to serve 1,250 connections, another small lift station could be built on the valley floor and pump to the Shady Point Lift Station. The location of this small lift station would coincide with the location of the interceptor sewer that would serve this valley. It would be located 1,000 feet west of the Shady Point Lift Station, which is located on the north side of Midtown Road as shown on Figure 1.

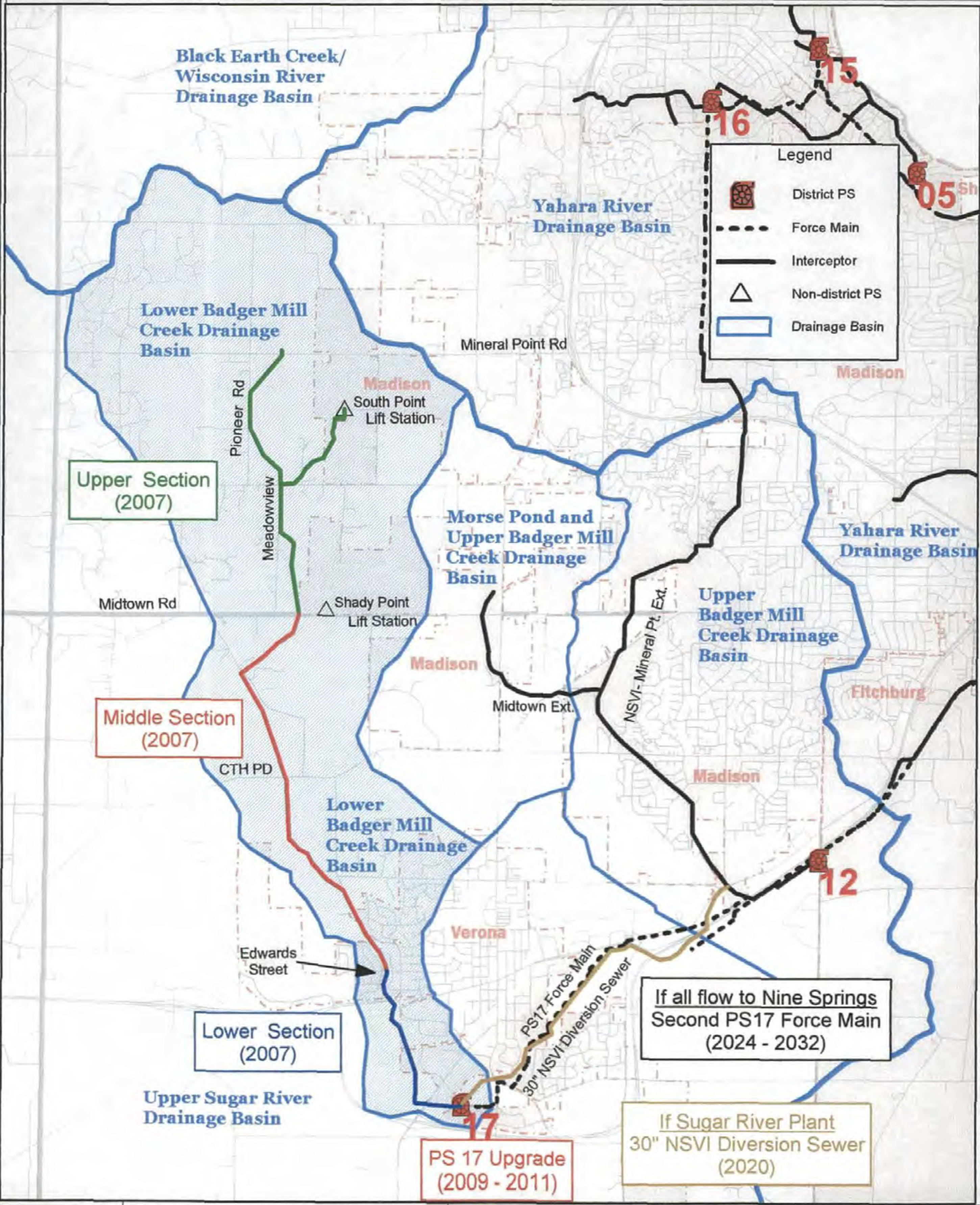
A second lift station in this basin, the South Point Lift Station, is located south of Mineral Point Road at the site of the City of Madison's future public works building. It has a capacity of 500 gallons per minute (720,000 gallons per day), but no current usage. It is currently configured to pump to the City of Madison's Wexford Interceptor that flows to Pumping Station No. 16. The Wexford Interceptor has sufficient capacity to handle an additional 500 gpm of flow, but no more. If the capacity of the this interceptor is reached, there is an option to divert the flows from this lift station to the City of Madison's RIK Interceptor, which also flows to Pumping Station No. 16. This would require extending sewers from the Blackhawk Neighborhood north of Old Sauk Road south to Mineral Point Road, which is part of the long-range plan for that neighborhood. The existing South Point Lift Station has sufficient capacity to serve 1,000 equivalent dwelling units which should be enough to handle the flow from the first phase development in this area as defined in the City of Madison's 2004 Pioneer Neighborhood Development Plan.

Development in the Lower Badger Mill Creek basin north of Midtown Road will continue as the City of Madison grows in this area. The City of Madison has developed neighborhood plans for all lands east of Pioneer Road and Meadowview Road in this basin, and much of this area has been annexed to the city. Construction of additional small lift stations that pump over the eastern drainage divide of this basin to existing sewers that flow to the Nine Springs Valley Interceptor is impractical as a long-range solution to providing sewer service. As this area builds out, a more economical system with better reliability will be needed. This can best be provided by the construction of an interceptor sewer north of Midtown Road. This interceptor should be built by 2007 with sufficient capacity to serve areas in the City of Madison and the Town of Middleton.

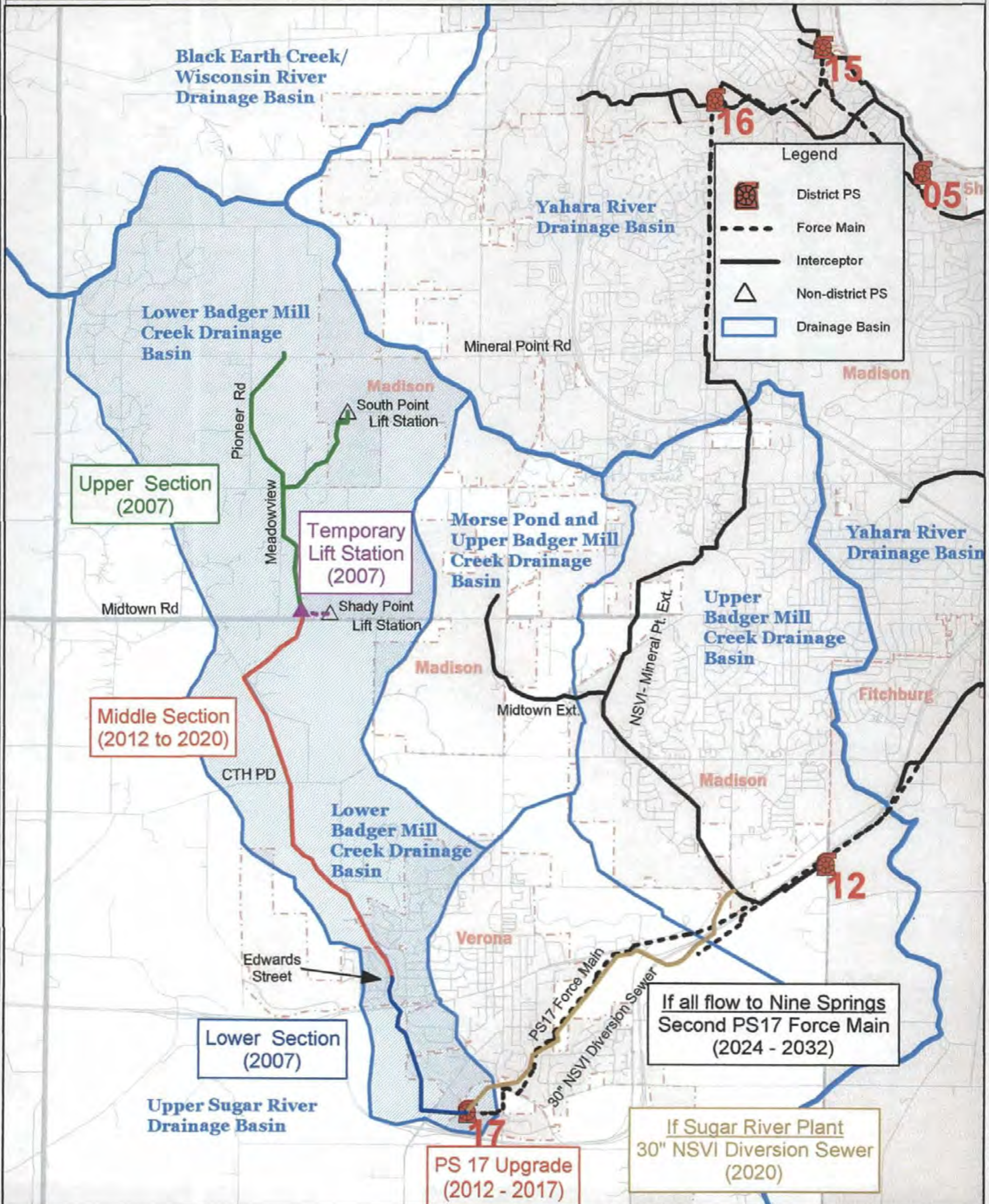
The floor of the Lower Badger Mill Creek valley south of Midtown Road includes a narrow drainage way through a section of large rural residential lots north of Shady Oak Lane and then spreads over a broad area of prime farmland that extends from Shady Oak Lane to the north side of the City of Verona. The narrow drainage way north of Shady Oak Lane dictates the location of an interceptor sewer in this reach of the valley. There is no immediate need for service in this valley south from Midtown Road to the north side of the City of Verona. The Town of Verona and the City of Madison both show this area to be permanent open space in their land use plans. However, no boundary agreements are yet in place that would preserve this area as open space. If no such agreements are reached, development in this area can logically be expected at some point in the future since it is adjacent to City of Madison development to the north and east and to City of Verona development to the south. If an interceptor was built to convey wastewater from the area north of Midtown Road to Pumping Station No. 17 on the south side of the City of Verona, it could also provide service to this area if required in the future.

The immediate question is how the wastewater generated north of Midtown Road should be handled. Four options are described below and shown on Figures 2, 3, 4, and 5. In addition to the location of the various components included in each option, the year, or the range of years, when the component will be constructed is also shown on these figures. All four options assume that the portion of the interceptor north of Midtown Road and the lower portion of the interceptor from Pumping Station No. 17 to Edwards Street in the City of Verona will be built in 2007. It is also assumed that the South Point Lift Station will remain in service until permanent facilities are constructed with sufficient capacity to serve the entire basin north of Midtown Road.

- Option 1 – Build the intermediate portion of the interceptor from Edwards Street to Midtown Road in 2007 (Figure 2).
- Option 2 – Build a temporary lift station at the terminus of the upper portion of the interceptor near Midtown Road and 1,000 feet of force main to pump wastewater to the Shady Point Lift Station in 2007. When the Shady Point Lift Station reaches capacity, build the intermediate portion of the interceptor from Edwards Street to Midtown Road (Figure 3).
- Option 3 – Build a small lift station at the terminus of the upper portion of the interceptor near Midtown Road and 1,000 feet of force main to pump wastewater to the Shady Point Lift Station in 2007. When the Shady Point Lift Station reaches capacity, build a permanent lift station and relief force main that would replace both the Shady Point Lift Station and the small station and would pump to the Midtown Extension (Figure 4).
- Option 4 – Build a permanent pumping station at the terminus of the upper portion of the interceptor near Midtown Road and 1,000 feet of force main to pump wastewater to the Shady Point Lift Station in 2007. When the Shady Point Lift Station reaches capacity, build a relief force main to the Midtown Extension from this station and replace the pumps and motors with larger units (Figure 5).



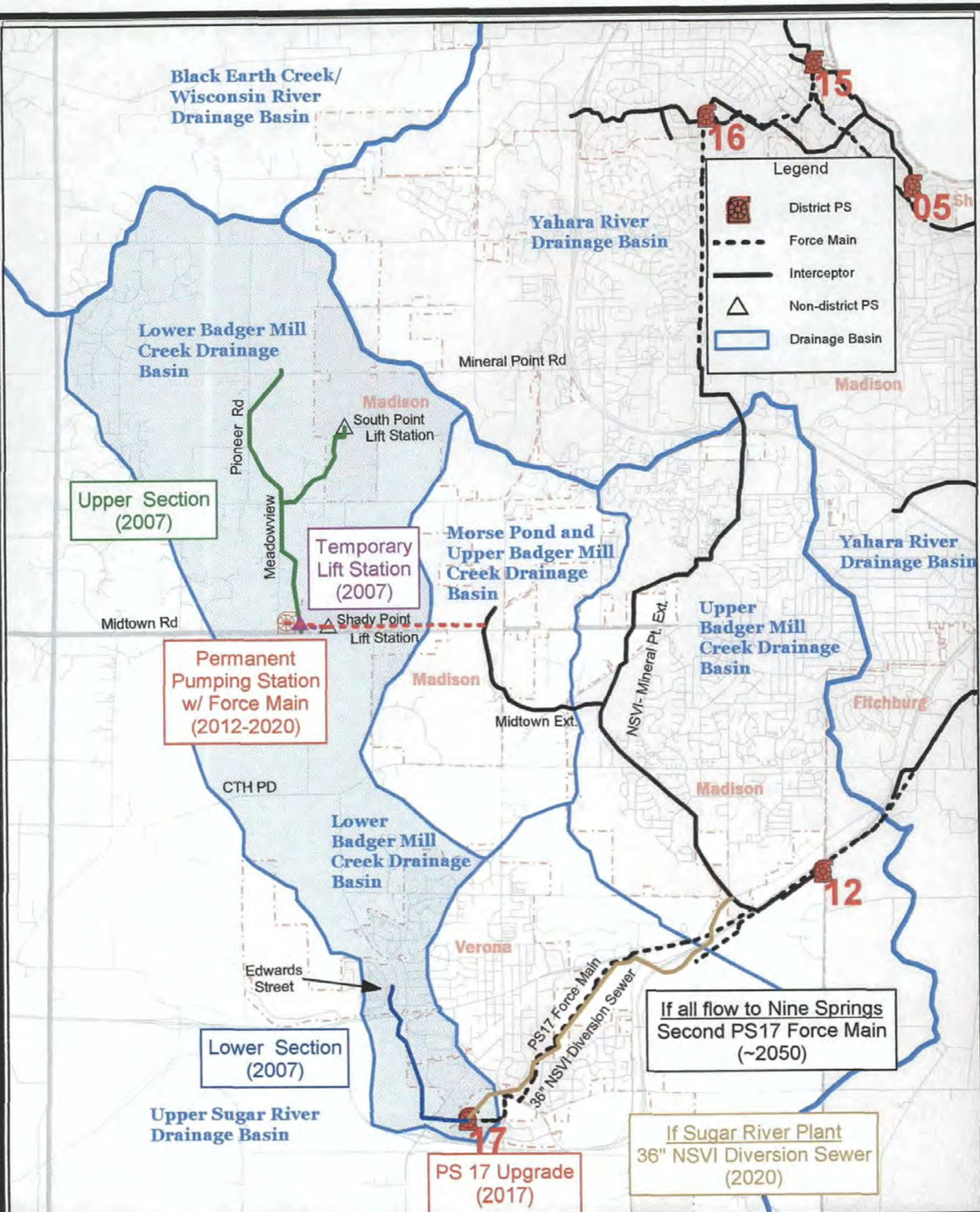
MMSD	**Madison Metropolitan Sewerage District**	Figure 2 Option 1 Facilities Plan	Prepared by: JP Approved by: JS Date: 1/12/2005



Madison Metropolitan Sewerage District

Figure 3
Option 2 Facilities Plan

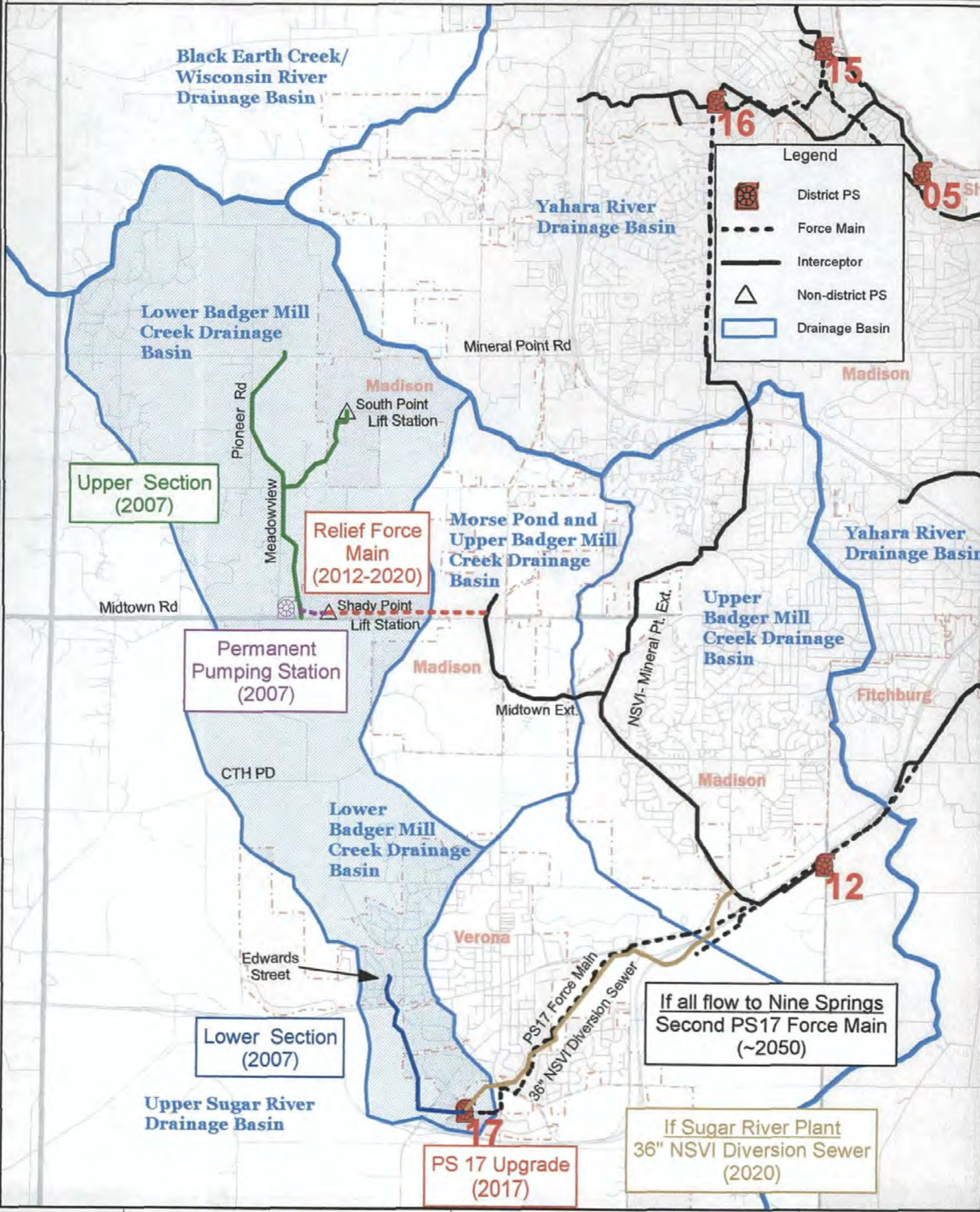
Prepared by: JP
Approved by: JS
Date: 1/12/2005



Madison Metropolitan Sewerage District

Figure 4
Option 3 Facilities Plan

Prepared by: JP
Approved by: JS
Date: 1/12/2005



Madison Metropolitan Sewerage District

Figure 5
Option 4 Facilities Plan

Prepared by: JP
Approved by: JS
Date: 1/12/2005

Impact on Downstream Facilities

Pumping Station No. 17. This pumping station has a capacity of 2,900 gpm with two of its three pumps operating in parallel. This capacity is sufficient for an average daily flow of 1.05 mgd. Once this flow is reached, new 250 horse-power motors and variable-speed drives can be installed on the existing pumps to increase the peak capacity to 4,300 gpm with two of the three pumps operating in parallel. This capacity is sufficient for an average daily flow of 1.68 mgd. Once the average daily flow reaches this level, a second force main would need to be constructed to handle higher flows.

Under Option 1 all flows in the watershed would flow by gravity to this pumping station beginning in 2007. Depending on when the City of Madison built sewers to relieve the South Point Lift Station, flows from that service area would be handled by Pumping Station No 17 as early as 2007 also. This would necessitate increasing the capacity of Pumping Station No. 17 by upgrading the motors and drives in 2009 under the high growth scenario and in 2011 under the low growth scenario.

Under Option 2, only flows from the Verona Urban Service Area would be handled by this pumping station until the intermediate portion of the interceptor were constructed. Under the high growth scenario, this would happen in 2012, and would require upgrading the motors and drives at Pumping Station No. 17 at that time. Under the low growth scenario, the motors and drives would be upgraded in 2017 and the intermediate portion of the interceptor would be built in 2020.

For both Options 1 and 2 the second force main to the Nine Springs Valley Interceptor would be required in 2024 under the high growth scenario and in 2032 under the low growth scenario. This force main would not be necessary if a Sugar River treatment plant were constructed.

Costs associated with modifying Pumping Station No. 17 for use as the main pumping station to a new Sugar River treatment plant would be the same under all four service options, so they have not been included in the present worth cost analysis. Under Options 3 and 4, Pumping Station No. 17 would handle only flows from the Verona Urban Service Area if all flows continue to be pumped to the Nine Springs plant. In that case, the motors and drives at this pumping station would be upgraded in 2017, and the second force main would not be required until about 2050.

Nine Springs Valley Interceptor – Mineral Point Extension (NSVI-MP Ext). The portion of this interceptor from its junction with the Midtown Extension to its junction with the Pumping Station No. 17 force main will carry different flows under the various options. Replacement of this portion of the NSVI-MP Ext will not until after 2050 under options 1 and 2, and will be needed no sooner than 2030 under options 3 and 4. Costs that far in the future have no impact on the 20-year present worth of an option and were not included in this analysis.

Nine Springs Valley Interceptor Diversion Sewer to Pumping Station No. 17. When the Sugar River treatment plant is built, all wastewater generated in the Lower Badger Mill Creek basin will be treated at that plant. The wastewater generated in the Upper Badger Mill Creek basin, which is served by the NSVI-MP Ext, will also be treated at that plant. This will require a new interceptor that would be built to divert a portion of the flow from the NSVI-MP Ext to Pumping Station No. 17. It will parallel the Pumping Station No. 17 force main as shown on Figures 2 - 5. This interceptor will be built in 2020. Under Options 1 and 2, it would be a 30-inch sewer. Under Options 3 and 4 it would be a 36-inch sewer.

Present Worth Cost Analysis

The following table shows the results of the 20-year present worth cost analysis. Details are included in the appendix.

	Treatment at Nine Springs		New Sugar River Plant	
Option	High Growth	Low Growth	High Growth	Low Growth
1	$2,900,000	$2,741,000	$3,511,000	$3,397,000
2	$2,783,000	$2,067,000	$3,390,000	$2,723,000
3	$3,855,000	$2,737,000	$4,583,000	$3,570,000
4	$4,214,000	$4,100,000	$5,066,000	$4,933,000

In the table above, costs can only be compared within each column. Although the present worth analysis presents data for two different treatment plant scenarios, the costs for a similar option and growth rate cannot be compared across the treatment plant scenarios since the full costs associated with the future treatment plant scenarios are not included. Rather, the costs of the options under each growth rate column can be compared since each of these options includes the costs of all the facilities that may vary in size or time of construction for that particular growth rate and that particular treatment plant scenario.

Option 2 provides the lowest present worth cost under all four scenarios. Two sensitivity analyses were conducted between Options 1 and 2 to further study the cost difference. In the first, the growth rate was increased until the present worths of the two options were equal. This analysis showed that the lift station built in 2007 at Midtown Road would have to have at least a four-year service life to be cost-effective. This would require about 140 connections to be added in this area each year between 2004 and 2011. Option 1 would be equally cost-effective in that case. The high growth rate analyzed in this study assumes the addition of 130 new homes a year. A growth rate higher than 140 connections per year is not out of the question.

The second sensitivity analysis considered added cost over time for constructing the intermediate portion of the interceptor between Verona and Midtown Road. The longer the time until this portion of the interceptor is built, the more congested the area along the route of this sewer will become. Added development may mean more road crossings, poorer access for construction, and similar situations that would add to the initial cost of the facility. Under the high growth rate conditions analyzed, this congestion would need to increase the costs at a rate of three-fourths of a percent per year beyond the rate of construction inflation to result in Option 1 being more cost-effective than Option 2. This amounts to an increase above the rate of construction inflation of $23,000 a year. This would not be an unreasonable expectation of increased cost. Under the low growth rate conditions analyzed, this congestion would need to increase the costs at a rate of five and three-fourths of a percent per year beyond the rate of construction inflation to result in

Option 1 being more cost-effective than Option 2. This amounts to an increase above the rate of construction inflation greater than $175,000 a year, and seems unlikely.

There are no conditions under which Option 3 or 4 would be the most cost-effective option. If other considerations favored the construction of a permanent lift station at Midtown Road, Option 3 is always more cost-effective than Option 4.

Non-Economic Issues

Options 1 and 2 would ultimately provide service to the entire valley and would result in the most reliable service in the likely scenario of a future regional treatment plant in the Sugar River basin. Options 3 and 4 would require that additional sewers be built to serve the intermediate portion of the valley.

Options 3 and 4 are consistent with the Town of Verona's long-range plans for preserving farmland in this portion of the town and the City of Madison's 1990 Peripheral Development Plan that calls for the area between Midtown Road and the City of Verona to remain as permanent open space between the cities of Madison and Verona. Although the presence of an interceptor does not guarantee development of the adjacent areas, it does increase the pressure to develop these lands. Option 2 would reduce development pressure in this area for a short period of time, and Option 1 would result in the greatest amount of pressure to develop this area.

It is envisioned that Pumping Station No. 17 located on the south side of the City of Verona would serve as the main pumping station to a treatment plant in the Sugar River basin. The interceptor system under options 1 and 2 would result in the most efficient and reliable service to the Lower Badger Mill Creek basin since the wastewater generated there would only be pumped one time, at Pumping Station No. 17, to reach the treatment plant. In addition to double-pumping of the wastewater generated in the Lower Badger Mill Creek basin under options 3 and 4, the capacity of the diversion interceptor from the NSVI-MP Ext to Pumping Station No. 17 would need to be greater than under options 1 or 2.

If all wastewater continues to be pumped to the Nine Springs plant, there are only minor service advantages to options 1 and 2 since there would be one less pumping station to operate and maintain. All wastewater generated in the Lower Badger Mill Creek basin would be pumped three times to reach the plant.

When the South Point Lift Station reaches capacity and needs to be relieved, downstream facilities that relieve the Shady Point Lift Station under Option 2, 3, or 4 must be in place. It is possible that relief of the South Point Lift Station will be the milestone that triggers the need to relieve the Shady Point Lift Station, rather than growth in the remainder of the watershed north of Midtown Road. As this condition nears, it may be possible to prolong the life of the downstream temporary facilities by building an overflow structure at the South Point Lift Station that would allow flows in excess of this lift station's capacity to be bypassed to the relief sewer rather than simply abandoning this lift station and diverting all of its service area flows to the relief sewer at that time.

Recommendations

1. The temporary lift station at Midtown Road and force main to the Shady Oak Lift Station should be constructed in 2007. This will preserve both the future option of building a full gravity interceptor system to serve this valley and the future option of building a permanent lift station at Midtown Road once the Shady Oak Lift Station reaches its capacity. Additional information is expected to be available at that time to aid in the selection of one of these options. The comprehensive plans of the City of Madison, the City of Verona, and the Town of Verona will be adopted and may include a more definitive plan for the area between Midtown Road and the City of Verona, and a final decision concerning a future Sugar River Treatment Plant may have been made.
2. To preserve capacity at the Shady Point Lift Station, the South Point Lift Station should remain in service as long as possible.
3. The District and the City of Madison should enter an agreement that would allow the District to purchase a portion of the capacity of the interceptor north of Midtown Road in the future if it becomes necessary to provide service in the Town of Middleton.
4. To maintain the flexibility to implement Option 2 in the future, the following activities are recommended:
    a. The District should work with the City of Madison and the City of Verona as they design the upper and lower reaches of this interceptor to assure that an overall interceptor design is formulated that would allow for the later construction of the intermediate portion of this interceptor without compromising the capacity of this sewer. Along those reaches of this interceptor where the topography dictates its location, easements should be secured at the time of design to lessen the future work load and the potential for delays that sometimes accompany the procurement of easements.
    b. The District and the City of Verona should enter an agreement that defines the area in this watershed that is expected to be served by the City of Verona and how the costs for the portion of the interceptor built by the City of Verona should be split between the City of Verona and the District.
5. The District should communicate with the Town of Middleton and the Town of Verona concerning the long-range plan for providing service in this watershed and the impact it may have on their jurisdictions.
6. The District should provide this information to the Dane County CAPD for their review and for use in updating the Dane County Water Quality Plan.

Appendix

Capital Cost Estimates,
Flow and Power Usage Estimates,
and
Present Worth Cost Analyses Details

Capital Costs

Lower Badger Mill Creek Interceptor (LBMC Int)

This is the portion of the interceptor from Edwards Street in the City of Verona to Midtown Road.

Description	Unit Cost	Units	Number of Units	Cost
30" Interceptor from Edwards Street to Midtown Road	$ 130.00	Lineal Feet	19,300	$ 2,500,000
Special construction in Nine Mound Road ravine	$ 500.00	Lineal Feet	1,000	$ 500,000
Special construction in Shady Oak Lane ravine	$ 500.00	Lineal Feet	200	$ 100,000
Total Cost (2004)				**$ 3,100,000**

Pumping Station No. 17 Motors and Drives Replacement

This project involves replacing the original 100 HP motors and variable-speed drives with 250 HP motors and new variable-speed drives and associated electrical work.

Description	Unit Cost	Units	Number of Units	Cost
250 HP Motor and Variable-Speed Drive Units	$ 100,000	Each	3	$ 300,000
Total Cost (2004)				**$ 300,000**

Second PS 17 Force Main

This force main would run from the PS 17 dry well to the Nine Springs Valley Interceptor and be parallel to the original force main.

Description	Unit Cost	Units	Number of Units	Cost
16" Force Main from PS 17 to NSVI	$ 90.00	Lineal Feet	13,500	$ 1,200,000
Total Cost (2004)				**$ 1,200,000**

Small Lift Station at Midtown Road (Small LS)

This would be a submersible pumping station design, similar to the Shady Point Lift Station.

Description	Unit Cost	Units	Number of Units	Cost
8-foot diameter Dry Well and Wet Well	$ 30,000	Each	2	$ 60,000
Submersible Pumps and Piping	$ 40,000	Each	2	$ 80,000
Site Work	$ 10,000	Each	1	$ 10,000
Electrical Work	$ 25,000	Each	1	$ 25,000
Total Cost (2004)				**$ 175,000**

Force Main from Samll Lift Station at Midtown Road to the Shady Point Lift Station

Description	Unit Cost	Units	Number of Units	Cost
6" PVC Force Main	$ 50.00	Lineal Feet	1,000	$ 50,000
Total Cost (2004)				**$ 50,000**

Permanent Midtown Pumping Station

Description	Unit Cost	Units	Number of Units	Cost
General Construction - Structure	$ 1,000,000	Each	1	$ 1,000,000
Pumps and Variable-Speed Drives	$ 100,000	Each	3	$ 300,000
Other Mechanical Equipment and Piping	$ 350,000	Each	1	$ 350,000
Site Work	$ 50,000	Each	1	$ 50,000
Electrical Work	$ 500,000	Each	1	$ 500,000
Total Cost (2004)				**$ 2,200,000**

Force Main from Permanent Midtown Pumping Station to the Shady Point Lift Station

This force main would be constructed at a constant grade such that it could serve as a gravity sewer from the Shady Point Lift Station in the future.

Description	Unit Cost	Units	Number of Units	Cost
18" PVC Force Main	$ 100.00	Lineal Feet	1,000	$ 100,000
Total Cost (2004)				**$ 100,000**

Force Main from Permanent Midtown Pumping Station to Midtown Extension

This force main would be built parallel to and operate in parallel with the existing 10-inch force main from the Shady Point Lift Station to the Midtown Extension.

Description	Unit Cost	Units	Number of Units	Cost
18" PVC Force Main (includes pavement restoration)	$ 150.00	Lineal Feet	5,300	$ 800,000
Total Cost (2004)				**$ 800,000**

Pumping Station Power Requirements

High Growth Rate

Year	Average Day Flow				Daily KWH							PS 17 Alone		PS 17 w/LBMC	
						Midtown PS		PS 17 Alone		PS 17 w/LBMC		PS 17 Avg	PS 17 Avg	PS 17 Avg	PS 17 Avg
	Small LS	PS 17 Alone	PS 17 w/LBMC	Midtown PS	Small LS	One FM	Two FMs	PS 17 Current	PS 17 250 HP	PS 17 Current	PS 17 250 HP	Pumping Rate	Input Power	Pumping Rate	Input Power
	(gpd)	(gpd)	(gpd)	(gpd)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(gpm)	(KW)	(gpm)	(KW)
2004	45,000	789,735	834,735	45,000	34	134	120	488		510		765	23.00	765	23.00
2005	69,130	809,598	878,729	69,130	53	156	135	498		532		765	23.00	765	23.00
2006	93,261	829,461	922,722	93,261	71	179	150	508		542		765	23.00	801	23.43
2007	117,391	849,324	966,715	117,391	89	201	165	518		549		765	23.00	839	23.82
2008	141,522	869,187	1,010,708	141,522	107	224	180	528		557		765	23.00	877	24.22
2009	165,652	889,049	1,054,702	165,652	126	246	196	536			588	772	23.10	2,000	56.40
2010	189,783	908,912	1,098,695	189,783	144	269	211	539			608	789	23.30	2,000	56.40
2011	213,913	928,775	1,142,688	213,913	162	291	226	543			629	806	23.50	2,000	56.40
2012	238,043	948,638	1,186,681	238,043	181	314	241	546			650	823	23.66	2,000	56.40
2013	262,174	968,501	1,230,675	262,174	199	336	256	550			670	841	23.85	2,000	56.40
2014	286,304	988,364	1,274,668	286,304	217	359	271	553			691	858	24.00	2,000	56.40
2015	310,435	1,008,226	1,318,661	310,435	236	381	286	557			712	875	24.20	2,000	56.40
2016	334,565	1,028,089	1,362,655	334,565	254	404	301	560			732	892	24.38	2,000	56.40
2017	358,696	1,047,952	1,406,648	358,696	272	426	316		585		753	2,000	56.40	2,000	56.40
2018	382,826	1,067,815	1,450,641	382,826	291	449	331		594		774	2,000	56.40	2,000	56.40
2019	406,957	1,087,678	1,494,634	406,957	309	471	346		603		794	2,000	56.40	2,000	56.40
2020	431,087	1,107,541	1,538,628	431,087	327	494	361		613		815	2,000	56.40	2,000	56.40
2021	455,217	1,127,403	1,582,621	455,217	346	516	376		622		836	2,000	56.40	2,000	56.40
2022	479,348	1,147,266	1,626,614	479,348	364	539	392		631		857	2,000	56.40	2,000	56.40
2023	503,478	1,167,129	1,670,607	503,478	382	561	407		641		877	2,000	56.40	2,000	56.40
2024	527,609	1,186,992	1,714,601	527,609	401	584	422		650		761	2,000	56.40	2,000	46.80
2025	551,739	1,206,855	1,758,594	551,739	419	606	437		659		778	2,000	56.40	2,000	46.80
2026	575,870	1,226,718	1,802,587	575,870	437	629	452		669		795	2,000	56.40	2,000	46.80
2027	600,000	1,246,581	1,846,581	600,000	456	651	467		678		812	2,000	56.40	2,000	46.80

Note: For PS 17 average day flows greater than 1,680,000, a second 16" force main is assumed (2024 and later).

Low Growth Rate

Year	Average Day Flow				Daily KWH							PS 17 Alone		PS 17 w/LBMC	
						Midtown PS		PS 17 Alone		PS 17 w/LBMC		PS 17 Avg	PS 17 Avg	PS 17 Avg	PS 17 Avg
	Small LS	PS 17 Alone	PS 17 w/LBMC	Midtown PS	Small LS	One FM	Two FMs	PS 17 Current	PS 17 250 HP	PS 17 Current	PS 17 250 HP	Pumping Rate	Input Power	Pumping Rate	Input Power
	(gpd)	(gpd)	(gpd)	(gpd)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(KWH)	(gpm)	(KW)	(gpm)	(KW)
2004	45,000	789,735	834,735	45,000	34	134	120	488		510		765	23.00	765	23.00
2005	56,087	809,598	865,685	56,087	43	144	127	498		526		765	23.00	765	23.00
2006	67,174	829,461	896,635	67,174	51	155	134	508		537		765	23.00	778	23.19
2007	78,261	849,324	927,585	78,261	59	165	141	518		543		765	23.00	805	23.47
2008	89,348	869,187	958,534	89,348	68	175	148	528		548		765	23.00	832	23.75
2009	100,435	889,049	989,484	100,435	76	186	155	536		553		772	23.10	859	24.03
2010	111,522	908,912	1,020,434	111,522	85	196	162	539		559		789	23.30	886	24.31
2011	122,609	928,775	1,051,384	122,609	93	206	169	543			586	806	23.50	2,000	56.40
2012	133,696	948,638	1,082,334	133,696	102	217	176	546			601	823	23.66	2,000	56.40
2013	144,783	968,501	1,113,283	144,783	110	227	182	550			615	841	23.85	2,000	56.40
2014	155,870	988,364	1,144,233	155,870	118	237	189	553			630	858	24.00	2,000	56.40
2015	166,957	1,008,226	1,175,183	166,957	127	248	196	557			644	875	24.20	2,000	56.40
2016	178,043	1,028,089	1,206,133	178,043	135	258	203	560			659	892	24.38	2,000	56.40
2017	189,130	1,047,952	1,237,083	189,130	144	268	210		585		673	2,000	56.40	2,000	56.40
2018	200,217	1,067,815	1,268,032	200,217	152	279	217		594		688	2,000	56.40	2,000	56.40
2019	211,304	1,087,678	1,298,982	211,304	160	289	224		603		703	2,000	56.40	2,000	56.40
2020	222,391	1,107,541	1,329,932	222,391	169	299	231		613		717	2,000	56.40	2,000	56.40
2021	233,478	1,127,403	1,360,882	233,478	177	310	238		622		732	2,000	56.40	2,000	56.40
2022	244,565	1,147,266	1,391,832	244,565	186	320	245		631		746	2,000	56.40	2,000	56.40
2023	255,652	1,167,129	1,422,781	255,652	194	330	252		641		761	2,000	56.40	2,000	56.40
2024	266,739	1,186,992	1,453,731	266,739	203	341	259		650		775	2,000	56.40	2,000	56.40
2025	277,826	1,206,855	1,484,681	277,826	211	351	266		659		790	2,000	56.40	2,000	56.40
2026	288,913	1,226,718	1,515,631	288,913	219	361	273		669		804	2,000	56.40	2,000	56.40
2027	300,000	1,246,581	1,546,581	300,000	228	372	279		678		819	2,000	56.40	2,000	56.40

[redacted] [redacted]ture[redacted]e Sp[redacted]s Tre[redacted]ent [redacted]Exp[redacted]on [redacted]

Options 1 thru 4 with High Growth

Option 1 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	5,100	9,500	86,000	4,691,000	2,141,000	1,352,000
PS 17	2007			49,000	52,000		99,000			99,000
PS 17 - 250 HP Motors	2009	351,000	325,000		56,000	139,000	945,000	248,000	113,000	1,157,000
Second PS 17 FM	2024	2,253,000	1,157,000		134,000	164,000	220,000	2,377,000	1,085,000	292,000
Totals			**4,889,000**				**1,350,000**		**3,339,000**	**2,900,000**

Option 2 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
PS 17	2007			48,000	59,000		237,000			237,000
LBMC Int	2012	3,988,000	3,278,000	0	5,300	9,500	65,000	5,117,000	2,335,000	1,008,000
PS 17 - 250 HP Motors	2012	386,000	317,000		68,000	139,000	781,000	310,000	141,000	957,000
Second PS 17 FM	2024	2,253,000	1,157,000		134,000	164,000	220,000	2,377,000	1,085,000	292,000
Totals			**4,999,000**				**1,345,000**		**3,561,000**	**2,783,000**

Option 3 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	59,000		237,000			237,000
Permanent Midtown PS	2012	2,830,000	2,326,000	0	69,500	159,900	976,000	2,270,000	1,036,000	2,266,000
Force Main to Midtown Ext	2012	1,029,000	846,000	0	600	1,100	7,000	1,320,000	602,000	251,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	449,000	709,000	413,000	188,000	826,000
Second PS 17 FM	2050									
Totals			**3,779,000**				**1,971,000**		**1,895,000**	**3,855,000**

Option 4 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Permanent Midtown PS	2007	2,198,000	2,198,000	52,000	66,100		261,000	1,376,000	628,000	1,831,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	59,000		237,000			237,000
Upgrade Permanent Midtown PS	2012	386,000	317,000	0	69,500	159,900	976,000	310,000	141,000	1,152,000
Force Main to Midtown Ext	2012	1,029,000	846,000	0	600	1,100	7,000	1,320,000	602,000	251,000
PS 17 - 250 HP Motors	2017	452,000	294,000		95,000	152,000	602,000	426,000	194,000	702,000
Second PS 17 FM	2050									
Totals			**3,765,000**				**2,083,000**		**1,634,000**	**4,214,000**

Assumptions: Base interest rate is 4.0%
Construction cost escalation rate is 3.2%
Electric energy escalation rate is 6.0%
Annual O&M costs for interceptors are $0.20 per foot
Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
O&M costs increase at the base interest rate

Future Nine Springs Treatment Plant Expansion
Options 1 thru 4 with Low Growth

Option 1 with Low Growth Rate

Project	Year	Construction Cost		O&M Costs				Salvage Value		Total 2007 Present Worth
		Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	
LBMC Int	2007	3,407,000	3,407,000	4,300	5,100	9,500	86,000	4,691,000	2,141,000	1,352,000
PS 17	2007			49,000	57,000		199,000			199,000
PS 17 - 250 HP Motors	2011	374,000	320,000		61,000	154,000	1,002,000	289,000	132,000	1,190,000
Second PS 17 FM	2032									
Totals			**3,727,000**				**1,287,000**		**2,273,000**	**2,741,000**

Option 2 with Low Growth Rate

Project	Year	Construction Cost		O&M Costs				Salvage Value		Total 2007 Present Worth
		Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	
Small LS	2007	192,000	192,000	5,800	19,000	0	109,000	0	0	301,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
PS 17	2007			48,000	76,000		487,000			487,000
LBMC Int	2020	5,131,000	3,082,000	0	7,200	9,500	30,000	5,800,000	2,647,000	465,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	154,000	642,000	413,000	188,000	759,000
Second PS 17 FM	2032									
Totals			**3,634,000**				**1,268,000**		**2,835,000**	**2,067,000**

Option 3 with Low Growth Rate

Project	Year	Construction Cost		O&M Costs				Salvage Value		Total 2007 Present Worth
		Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	
Small LS	2007	192,000	192,000	5,800	19,000	0	109,000	0	0	301,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	0	0	110,000
PS 17	2007			48,000	76,000		487,000			487,000
Permanent Midtown PS	2020	3,642,000	2,187,000	0	92,500	130,900	404,000	3,481,000	1,589,000	1,002,000
Force Main to Midtown Ext	2020	1,324,000	795,000	0	900	1,100	4,000	1,497,000	683,000	116,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
Second PS 17 FM	2050									
Totals			**3,589,000**				**1,608,000**		**2,460,000**	**2,737,000**

Option 4 with Low Growth Rate

Project	Year	Construction Cost		O&M Costs				Salvage Value		Total 2007 Present Worth
		Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	
Permanent Midtown PS	2007	2,198,000	2,198,000	50,600	93,600		680,000	1,376,000	628,000	2,250,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	76,000		487,000			487,000
Upgrade Permanent Midtown PS	2020	497,000	298,000	0	92,500	130,900	404,000	475,000	217,000	485,000
Force Main to Midtown Ext	2020	1,324,000	795,000	0	900	1,100	4,000	1,497,000	683,000	116,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
Second PS 17 FM	2050									
Totals			**3,706,000**				**2,179,000**		**1,785,000**	**4,100,000**

Assumptions:
- Base interest rate is 4.0%
- Construction cost escalation rate is 3.2%
- Electric energy escalation rate is 6.0%
- Annual O&M costs for interceptors are $0.20 per foot
- Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
- Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
- O&M costs increase at the base interest rate

[redacted] F[redacted] Su[redacted]iver[redacted]tme[redacted]ant [redacted]

Options 1 thru 4 with High Growth

Option 1 with High Growth Rate

		Construction Cost		O&M Costs				Salvage Value		Total 2007
Project	Year	Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	5,100	9,500	86,000	4,691,000	2,141,000	1,352,000
PS 17	2007			49,000	52,000		99,000			99,000
PS 17 - 250 HP Motors	2009	351,000	325,000		56,000	170,000	1,192,000	248,000	113,000	1,404,000
30" NSVI Diversion to PS 17	2020	6,800,000	4,084,000	0	6,100	8,000	21,000	7,557,000	3,449,000	656,000
Totals			**7,816,000**				**1,398,000**		**5,703,000**	**3,511,000**

Option 2 with High Growth Rate

		Construction Cost		O&M Costs				Salvage Value		Total 2007
Project	Year	Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
PS 17	2007			48,000	59,000		237,000			237,000
LBMC Int	2012	3,988,000	3,278,000	0	5,300	9,500	65,000	5,117,000	2,335,000	1,008,000
PS 17 - 250 HP Motors	2012	386,000	317,000		68,000	170,000	1,024,000	310,000	141,000	1,200,000
30" NSVI Diversion to PS 17	2020	6,800,000	4,084,000	0	6,100	8,000	21,000	7,557,000	3,449,000	656,000
Totals			**7,926,000**				**1,389,000**		**5,925,000**	**3,390,000**

Option 3 with High Growth Rate

		Construction Cost		O&M Costs				Salvage Value		Total 2007
Project	Year	Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	59,000		237,000			237,000
Permanent Midtown PS	2012	2,830,000	2,326,000	0	69,500	159,900	976,000	2,270,000	1,036,000	2,266,000
Force Main to Midtown Ext	2012	1,029,000	846,000	0	600	1,100	7,000	1,320,000	602,000	251,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
36" NSVI Diversion to PS 17	2020	8,700,000	5,225,000	0	6,100	8,000	21,000	9,669,000	4,413,000	833,000
Totals			**9,004,000**				**1,887,000**		**6,308,000**	**4,583,000**

Option 4 with High Growth Rate

		Construction Cost		O&M Costs				Salvage Value		Total 2007
Project	Year	Cost in Year Constructed	2007 Present Worth	2007	Intermediate Year	2027	2007 Present Worth	Year-20	2007 Present Worth	Present Worth
Permanent Midtown PS	2007	2,198,000	2,198,000	52,000	66,100		261,000	1,376,000	628,000	1,831,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	59,000		237,000			237,000
Upgrade Permanent Midtown PS	2012	386,000	317,000	0	69,500	159,900	976,000	310,000	141,000	1,152,000
Force Main to Midtown Ext	2012	1,029,000	846,000	0	600	1,100	7,000	1,320,000	602,000	251,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
36" NSVI Diversion to PS 17	2020	8,700,000	5,225,000	0	6,100	8,000	21,000	9,669,000	4,413,000	833,000
Totals			**9,001,000**				**2,106,000**		**6,041,000**	**5,066,000**

Assumptions:
- Base interest rate is 4.0%
- Construction cost escalation rate is 3.2%
- Electric energy escalation rate is 6.0%
- Annual O&M costs for interceptors are $0.20 per foot
- Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
- Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
- O&M costs increase at the base interest rate

Future Sugar River Treatment Plant
Options 1 thru 4 with Low Growth

Option 1 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	5,100	9,500	86,000	4,691,000	2,141,000	1,352,000
PS 17	2007			49,000	57,000		199,000			199,000
PS 17 - 250 HP Motors	2011	374,000	320,000		61,000	154,000	1,002,000	289,000	132,000	1,190,000
30" NSVI Diversion to PS 17	2020	6,800,000	4,084,000	0	6,100	8,000	21,000	7,557,000	3,449,000	656,000
Totals			**7,811,000**				**1,308,000**		**5,722,000**	**3,397,000**

Option 2 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	5,800	19,000	0	109,000	0	0	301,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
PS 17	2007			48,000	76,000		487,000			487,000
LBMC Int	2020	5,131,000	3,082,000	0	7,200	9,500	30,000	5,800,000	2,647,000	465,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	154,000	642,000	413,000	188,000	759,000
30" NSVI Diversion to PS 17	2020	6,800,000	4,084,000	0	6,100	8,000	21,000	7,557,000	3,449,000	656,000
Totals			**7,718,000**				**1,289,000**		**6,284,000**	**2,723,000**

Option 3 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	5,800	19,000	0	109,000	0	0	301,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	0	0	110,000
PS 17	2007			48,000	76,000		487,000			487,000
Permanent Midtown PS	2020	3,642,000	2,187,000	0	92,500	130,900	404,000	3,481,000	1,589,000	1,002,000
Force Main to Midtown Ext	2020	1,324,000	795,000	0	900	1,100	4,000	1,497,000	683,000	116,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
36" NSVI Diversion to PS 17	2020	8,700,000	5,225,000	0	6,100	8,000	21,000	9,669,000	4,413,000	833,000
Totals			**8,814,000**				**1,629,000**		**6,873,000**	**3,570,000**

Option 4 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Permanent Midtown PS	2007	2,198,000	2,198,000	50,600	93,600		680,000	1,376,000	628,000	2,250,000
FM to Shady Point LS	2007	110,000	110,000	0	0	0	0	151,000	69,000	41,000
PS 17	2007			48,000	76,000		487,000			487,000
Upgrade Permanent Midtown F	2020	497,000	298,000	0	92,500	130,900	404,000	475,000	217,000	485,000
Force Main to Midtown Ext	2020	1,324,000	795,000	0	900	1,100	4,000	1,497,000	683,000	116,000
PS 17 - 250 HP Motors	2017	452,000	305,000		82,000	138,000	604,000	413,000	188,000	721,000
36" NSVI Diversion to PS 17	2020	8,700,000	5,225,000	0	6,100	8,000	21,000	9,669,000	4,413,000	833,000
Totals			**8,931,000**				**2,200,000**		**6,198,000**	**4,933,000**

Assumptions:
- Base interest rate is 4.0%
- Construction cost escalation rate is 3.2%
- Electric energy escalation rate is 6.0%
- Annual O&M costs for interceptors are $0.20 per foot
- Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
- Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
- O&M costs increase at the base interest rate

Future Sugar River Treatment Plant
Determination of Year when Option 1 equals Option 2

Option 1

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	5,100	9,500	86,000	4,691,000	2,141,000	1,352,000
Total										**1,352,000**

Year Shady Point Lift Station reaches capacity: **2011**

Option 2 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	6,800	11,500	0	34,000	0	0	226,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
LBMC Int	2011	3,873,000	3,302,000	0	5,100	9,500	68,000	5,038,000	2,299,000	1,071,000
Total										**1,352,000**

Assumptions: Base interest rate is 4.0%
Construction cost escalation rate is 3.2%
Electric energy escalation rate is 6.0%
Annual O&M costs for interceptors are $0.20 per foot
Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
O&M costs increase at the base interest rate

Future Sugar River Treatment Plan
Option 1 versus Option 2 with Factor to Reflect Added Costs for Interceptor Construction Due to Devlopment Along the Route Over Time Equal to 0.75% for High Growth 5.74% for Low Growth

Option 1 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	5,300	9,500	86,000	4,691,000	2,141,000	1,352,000
Totals			**3,407,000**				**86,000**		**2,141,000**	**1,352,000**

Option 2 with High Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
LBMC Int	2012	4,226,000	3,473,000	0	5,300	9,100	65,000	5,423,000	2,475,000	1,063,000
Totals			**3,720,000**				**107,000**		**2,475,000**	**1,352,000**

Option 1 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
LBMC Int	2007	3,407,000	3,407,000	4,300	7,000	8,800	86,000	4,691,000	2,141,000	1,352,000
Totals			**3,407,000**				**86,000**		**2,141,000**	**1,352,000**

Option 2 with Low Growth Rate

Project	Year	Construction Cost: Cost in Year Constructed	Construction Cost: 2007 Present Worth	O&M Costs: 2007	O&M Costs: Intermediate Year	O&M Costs: 2027	O&M Costs: 2007 Present Worth	Salvage Value: Year-20	Salvage Value: 2007 Present Worth	Total 2007 Present Worth
Small LS	2007	192,000	192,000	6,800	12,700	0	42,000	0	0	234,000
FM to Shady Point LS	2007	55,000	55,000	0	0	0	0	0	0	55,000
LBMC Int	2020	12,200,000	7,327,000	0	7,200	8,800	30,000	13,790,000	6,294,000	1,063,000
Totals			**7,574,000**				**72,000**		**6,294,000**	**1,352,000**

Assumptions:
- Base interest rate is 4.0%
- Construction cost escalation rate is 3.2%
- Electric energy escalation rate is 6.0%
- Annual O&M costs for interceptors are $0.20 per foot
- Annual O&M costs for small lift stations are 2.0% of initial cost + energy costs for pumping
- Annual O&M costs for PS 17 are based on historical data + energy costs for pumping
- O&M costs increase at the base interest rate

verona

CITY OF VERONA
Public Works
Parks & Recreation
410 Investment Court
Verona, Wisconsin 53593-8749

Fax: (608) 845-5761
Telephone: (608) 845-6695

April 7, 2006

RECEIVED

APR 11 2006

Madison Metropolitan
Sewerage District

Madison Metropolitan Sewerage District
Attn: Jon Schellpfeffer
1610 Moorland Rd.
Madison, WI 53713

Dear Mr. Schellpfeffer:

Enclosed is a copy of the Memorandum of Understanding: Lower Badger Mill Creek Interceptor, Phase 1 Pumping Station 17 to Edward Street.

If you have any questions or comments, you can contact me at 848-6801.

Sincerely,

RONALD R. RIEDER
Director, Public Works

RRR/pr
Enc.

Memorandum of Understanding:
Lower Badger Mill Creek Interceptor – Phase 1
Pumping Station 17 to Edwards Street

This memorandum of understanding describes a cooperative joint effort by the Madison Metropolitan Sewerage District (MMSD) and the City of Verona (the City) for the purpose of constructing the first section of the Lower Badger Mill Creek Interceptor from MMSD Pumping Station 17 to Edward Street in the City of Verona.

The City of Verona needs to replace its Westside Interceptor at this time to accommodate growth in the City. MMSD needs to construct an interceptor sewer in the Lower Badger Mill Creek valley to service existing and proposed development in the cities of Madison and Verona and the towns of Middleton and Verona. The route of the existing City Westside Interceptor and the proposed MMSD Lower Badger Mill Creek Interceptor are identical from MMSD Pumping Station 17 to Edward Street.

To realize the economies of scale provided by constructing a single sanitary sewer, rather than two separate sewers, the City and MMSD agreed to work together to ensure the Lower Badger Mill Creek Interceptor sewer has been designed with sufficient capacity to transport sewage from existing and future development in the City, from currently developed and undeveloped areas in MMSD, and from currently developed and undeveloped areas beyond the current MMSD boundaries in the Lower Badger Mill Creek valley.

Since the more immediate need for additional capacity is the result of growth in the City of Verona, the City contracted with Earth Tech for the design of this proposed sewer and has paid all of the design costs. The estimated construction cost of this sewer and the related work of reconnecting local City sewers to the new interceptor sewer is $2,392,660. Based on the design flows from the City of Verona that would be tributary to the Lower Badger Mill Creek Interceptor at Edward Street or downstream of Edward Street, the design flows for the balance of the interceptor, and the estimated cost of the various project components, the equitable split of design and construction costs for the Lower Badger Mill Creek Interceptor from Pumping Station 17 to Edward Street is thirty percent (30%) to the City and seventy percent (70%) to MMSD.

The design flow at Pumping Station 17 from the City is 3.019 cfs. The balance of the design flow at Pumping Station 17 is 5.925 cfs. The design flow at Manhole 17-102 from the City is 2.174 cfs, and the balance of the design flow at this manhole is 5.925 cfs. The design service area for the City of Verona to this sewer includes those lands in the Lower Badger Mill Creek valley and the Sugar River valley that are currently served by the City's Westside Interceptor and future service areas in the Lower Badger Mill Creek valley in sections 9, 10, 21, 27, and 28 of the Town of Verona (T6N, R8E) and in the Sugar River valley east of the Sugar River in sections 7, 8, 17, 21, and 28 of the Town of Verona (T6N, R8E).

This memorandum of understanding details the responsibilities of the City and MMSD, the allocation of design and construction costs, and the schedule of payments for the design and construction of this interceptor sewer. It also defines the interceptor connection charge rates to be applied to newly served areas tributary to this interceptor.

a) The City of Verona will complete the design and construction of the project.

b) MMSD will review and approve the plans for the project prior to construction.

c) The City will obtain all necessary easements necessary for the construction of this project. All permanent easements shall be granted to both the City and MMSD.

d) After completion of all design work, the City will provide an accounting of all design costs and invoice MMSD for their seventy percent (70%) share of the design costs. MMSD will pay for these design services within 30 days of receipt of the invoice.

e) During construction of the project, the City will provide the contractor's monthly payment request to MMSD for review and approval.

f) During construction of the project, the City will invoice MMSD monthly for their seventy percent (70%) share of the construction costs and related engineering costs, and MMSD will pay the City for these costs within 30 days of receipt of the invoice.

g) The cost of change orders to the contract shall be split between the City and MMSD based on the location of the change. Changes related to construction of the interceptor sewer shall be split seventy percent (70%) to MMSD and thirty percent (30%) to the City. Changes related to the City's sewers, including connections to the interceptor sewer, shall be paid in total by the City.

h) The City will make all payments to the contractor.

i) The City will furnish MMSD one full size set of as-built plans for the project and a CD with electronic files of the as-built plans in both AutoCad 2002 and Microstation V8.

j) Upon completion of construction and acceptance of the project by the City and MMSD, MMSD will assume ownership of the interceptor sewer and will provide all operation and maintenance activities for it, including repair and replacement as necessary to maintain service.

k) Newly served areas in the City of Verona that are tributary to this interceptor at or downstream of Edward Street and which were included in the City's design service area described above will be assessed an MMSD interceptor connection charge at the time sanitary sewerage service is provided based on the PS 17 Service Area rate.

l) In accordance with MMSD policy, MMSD will establish a new interceptor connection charge rate for the Lower Badger Mill Creek Interceptor, and all newly served areas, except those described in the previous paragraph, that are tributary to this interceptor will be assessed an MMSD interceptor connection charge at the time sanitary sewerage service is provided based on this new rate.

m) MMSD shall be responsible for injuries, claims and losses arising from or caused by the acts or omissions of its officers, employees, agencies, boards, commissions and representatives. The City shall be responsible for injuries, claims and losses arising from or caused by the acts or omissions of its officers, employees, agencies, boards, commissions and representatives. The obligations of the parties under this paragraph shall survive the expiration or termination of this agreement.

Signed:

For MMSD:

Jon W. Schellpfeffer
Chief Engineer and Director

Date: 3-1-06

For City of Verona:

John Volker
Mayor

Date: 3/27/06

AGREEMENT

THIS AGREEMENT, entered into on this 28 day of January, 2008, by and between the City of Madison, a Municipal Corporation in Dane County, Wisconsin, hereinafter referred to as the "City of Madison", and the Madison Metropolitan Sewerage District, a Municipal Corporation in Dane County, Wisconsin, hereinafter referred to as the "MMSD".

WITNESSETH:

WHEREAS, the MMSD provides regional sewerage service in central Dane County, Wisconsin, including sanitary sewer interceptor service, and

WHEREAS, the MMSD policy *Construction and Use of District Interceptors* states in part:

> "The District shall construct and operate an interceptor only when such interceptor will serve at least two municipalities, or when, in the judgment of the Commission, to a reasonable engineering probability, an interceptor will serve two municipalities in the reasonably foreseeable future", and

WHEREAS, the City of Madison intends to construct a sanitary sewer interceptor in the Lower Badger Mill Creek drainage basin north of Midtown Road to serve existing and future City of Madison Sewer Utility customers, and

WHEREAS, there are no current plans to provide sanitary sewerage service to the areas in the drainage basin north of Midtown Road outside of the current City of Madison boundary, and

WHEREAS, it would be wise and cost-effective to construct this interceptor with sufficient capacity to serve all areas in the drainage basin north of Midtown Road, including those areas beyond the current City of Madison boundary, and

WHEREAS, it is unlikely that this interceptor will serve more than City of Madison Sewer Utility customers in the foreseeable future, and

WHEREAS, areas in the Town of Middleton, currently served or planned to be served by private sewerage systems, may, at some time in the future, require municipal sanitary sewerage service, and

WHEREAS, such future municipal sanitary sewerage service in the Town of Middleton might be provided through the formation of a town sanitary district or town utility district, and

WHEREAS, such a town sanitary district or town utility district may be annexed to the MMSD,

NOW THEREFORE, the City of Madison and the Madison Metropolitan Sewerage District agree as follows:

1. The MMSD shall have the right to purchase this interceptor from the City of Madison at any time upon written request by MMSD, the purchase price being based upon the then present value of outstanding interceptor impact fees or special assessments.

2. After purchase, the MMSD shall have the right to recuperate the cost of the interceptor by imposing future interceptor connection charges for all lands, whether located in the City of Madison, Town of Middleton, or any other municipality, that are not served by the interceptor at the time of purchase.

3. After purchase, the MMSD will be responsible for all future operating, maintenance, and replacement costs of this interceptor.

IN WITNESS WHEREOF, the City of Madison and MMSD have executed this Agreement effective as of the date when all parties hereto have affixed their respective and duly authorized signatures.

CITY OF MADISON, DANE COUNTY, WISCONSIN

[signature] 1-31-08
David J. Cieslewicz, Mayor — Date

Maribeth Witzel-Behl 1-25-2008
~~Ray Fisher~~, City Clerk — Date

Countersigned:

for Randy Whitehead 1-28-08
Dean Brasser, Comptroller — Date

Approved as to Form:

[signature] 28 January 2008
Michael P. May, City Attorney — Date

MADISON METROPOLITAN SEWERAGE DISTRICT, DANE COUNTY, WISCONSIN

Edward V Schten 1-17-08
Edward V. Schten, President — Date

[signature] 1-17-08
P. Mac Berthouex, Secretary — Date

Appendix A7
EPA Request for Information, April 2010

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

Jon W. Schellpfeffer
Chief Engineer & Director

Protecting Public Health and the Environment

December 3, 2009

Water Enforcement and Compliance Assurance Branch
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd. (WC-15J)
Chicago, IL 60604

Attention: Duane Heaton

Subject: **Wet Weather/Sanitary Sewer System Information Request**
Docket No. V-W-10-308-01

Dear Mr. Heaton:

Enclosed please find the response of the Madison Metropolitan Sewerage District to the subject information request. If you require anything further, please contact me.

Sincerely,

Jon W. Schellpfeffer
Chief Engineer and Director

Encl. as stated

metrogro

REQUEST FOR INFORMATION

1. Provide the name and address of the location(s) where records relative the operation and maintenance of the wastewater collection system are maintained.

Madison Metropolitan Sewerage District
1610 Moorland Road
Madison, WI 53713

2. Provide the name of the primary contact person responsible for wastewater and collection system maintenance. Also include telephone, fax and email contact information.

Paul Nehm
Director of Operations & Maintenance
Phone: 608-222-1201 (x252)
Fax: 608-222-2703
pauln@madsewer.org

3. Provide missing collection system data as indicated below:

A. Service Area 179.37 (in square miles)

B. Population Served 335,700 *(per Dane County Capital Area Regional Planning Commission's "MMSD Collection System Evaluation", January 2009. See attached.)*

C. System Inventory

Miles of gravity sewer	Miles of force main	Number of maintenance access structures	Number of pump stations	Number of siphons	Number of air, vacuum, or air/vacuum relief valves
95	44(1)	1,594	17	11	52

(1) The District operates and maintains 29 miles of force mains conveying raw wastewater and 15 miles of force mains conveying effluent from Nine Springs WWTP.

D.. Number of Service Connections(1)

Residential 89,422	Commercial 12,626
Industrial 293	Public Authorities 764
Other Users 44	Total 103,149

(1). *Data taken from public water supply annual reports as submitted to Wisconsin Public Service Commission (2008). See attached summary report.*

E. Indicate or describe a property owner's responsibility for maintenance and repair of lateral sewer lines (check one):

1. At main line connection only _____
2. From main line to property line or easement/cleanout _____
3. Beyond property line/cleanout _____
4. Other __X__ Explain.

The property owner is responsible for maintenance and repair of the sewer lateral from the District's sewer main to the building it serves. In general lateral connections are made to local sewers that are owned and maintained by the District's satellite communities. The District only permits direct connection to its interceptor sewers in special circumstances.

F. Is the collection system combined (storm and sanitary)?
Yes_____ No __X__
If yes, what percent of the collection system is a combined system? _____

G. Does the collection system have constructed relief points?
Yes__X__ No_____ If yes, describe the locations of the relief points in the system, indicate if they are in the separate sanitary portion of the system or in a combined area and identify the water body or location where these relief points discharge. *(Please see attached an edited version of Table 5 from the District's "Interceptor Maintenance Program Guidelines" for a listing of relief points).*

H. Average Annual Precipitation __34__ (in inches)

(Please see attached map from National Weather Service)

I. Provide the flow ratings/characteristics at the wastewater treatment plant:

Design Average Daily Flow (MGD)	Design Peak Dry Weather Flow (MGD)	Design Peak Wet Weather Flow (MGD)
50	N/A	140

Provide current actual flows or ratings experienced: *(See attached sheets)*

	Average Daily Flow (MGD)	Average Daily Water Consumption (MGD)
Residential	N/A	14.6
Commercial	N/A	14.6
Industrial	N/A	3.0
Other	N/A	4.4
Total[1]	47.3	36.6

(1). Totals are 2008 values. Year 2008 selected as basis to allow for comparison with water consumption data from Public Service Commission. Rainstorm events in 2008 significantly impacted lake levels and I/I and likely contributed to a higher than normal discrepancy between water consumption and wastewater flows.

	Per Capita Wastewater Flow (gpcd)	Per Capita Water Consumption Flow (MGD)
Maximum Month	141	N/A
Maximum Week	177	N/A
Maximum Day	226	N/A

J. Provide infrastructure age distribution estimates for the collection system

Age[1]	Gravity Sewer, miles	Force Mains, miles ~~or feet~~	Number of Pump Stations
0 - 25 years	21.28	20.88	2
26 - 50 years	60.81	14.71	11
51 - 75 years	6.91	8.16	4
> 76 years	6.08	0	0

(1). Note: This does not take into account rehabilitation and revitalization projects undertaken by the District.

K. Provide pipe size distribution estimates for the collection system

Diameter in inches	Gravity Sewer, miles	Force Mains, miles ~~or feet~~
8 inches or less	0.19	0.01
9 - 18 inches	18.29	3.58
19 - 36 inches	54.48	24.24
> 36 inches	22.11	15.92

4. Does the collection system receive flow from satellite communities?
Yes _X_ No_____ If yes, complete the following chart and answer questions A-C below:

Satellite Name (If additional room is needed, continue on last page.)	% of flow contribution
(See attached pages for complete list of community flows in 2008)	

A. Is flow measured where satellite flow enters the Madison Metropolitan Sewerage District sewer system?
Yes _X_ No_____

B. Does the Madison Metropolitan Sewerage District have the authority to surcharge satellites for excessive flows (e.g., for excessive I/I?)
Yes _X_ No_____

C. Has the Madison Metropolitan Sewerage District exercised its authority to surcharge satellites for excessive flows (e.g., for excessive I/I?)
Yes_____ No _X_

5. Do satellite communities enter into written agreements for wastewater services (contracts, charters, court orders, etc.)?

Yes_____ No_X_ If yes, answer A-C below: *(Please see attached correspondence from MMSD legal counsel to Wisconsin Department of Natural Resources for further details regarding this issue).*

A. Does the agreement extend the requirements of the sewer use ordinance (SUO) to the satellites?
Yes_____ No_____

B. Do the agreements have a date of termination and allow for renewal under different terms?
Yes_____ No_____

C. Does Madison Metropolitan Sewerage District maintain the legal authority to control the maximum flow introduced into the collection system from satellite communities?
Yes_____ No_____

6. Does the SUO clearly document standards, inspections, and approval for new connections?

Yes_X_ No_____ *(per Article IV of MMSD Sewer Use Ordinance)*

7. Does the SUO require satellite communities to adopt the same inspection and sampling schedules as required by the pretreatment ordinance?

Yes_____ No _X_

Inspection and sampling schedules are not specifically outlined in the District's Sewer Use Ordinance. Instead they are provided for in the District's "Pretreatment Program Procedures" (June 1991) and in the individual discharge permits that are issued for users requiring pretreatment. There is no specific requirement for satellite communities to adopt the same standards that the District imposes regarding inspection of facilities and sampling of flows. The Wisconsin Department of Natural Resources has reviewed and approved the District's "Pretreatment Program Procedures".

8. Does the SUO contain procedures for the following: inspection standards, pretreatment requirements, building/sewer permit issues, inflow prohibition?

Yes _X_ No_____

9. Does the SUO contain procedures and enforcement authority to control for the following:

A. Fats, oils, and grease (FOG)? Yes_X_ No____
B. Inflow and infiltration? Yes_X_ No____
C. Building structures over the sewer lines? Yes____ No_X_
D. Storm water connections to sanitary lines? Yes_X_ No____
E. Defects in service laterals located on private property? Yes____ No _X_
F. Sump pumps, air conditioner discharge? Yes_X_ No____

10. Describe the processes or procedures that are used to determine whether the capacity of existing gravity sewer system, pump stations and force mains are adequate for new connections. Address the following in the description:

A. Is metering of flow performed prior to allowing new connections?
B. Is a hydraulic model of the system used to predict the effects of new connections?
C. Is there any certification as to the adequacy of the sewer system to carry additional flow from new connections required?

District staff reviews each new or rehabilitated connection to the collection system that is proposed. A separate review is also conducted by the Wisconsin Department of Natural Resources and by the regional planning agency to assess conformance with adopted water quality plans. The applicant is required to state on the application form how much flow is anticipated from the new development and the adequacy of the downstream collection system to convey the additional flow.

In general the District uses flow evaluations of its collection system as a guide in determining capacity for new connections. The Dane County Area Regional Planning Commission recently completed a report entitled "MMSD Collection System Evaluation (2008)" for the District. This document assesses the existing capacity of each interceptor segment in the District's collection system and projects peak flows through the year 2060. The District is also updating its Collection System Facilities Plan at this time. This facility plan addresses both capacity and condition concerns for the District's collection system.

The District routinely performs flow monitoring for billing of its satellite communities, but this data is generally not needed or used for analysis of new connections. The District recently acquired a new hydraulic model of its collection system. The model has been used for analysis of new connections in special cases.

11. Describe the number of wastewater treatment plant effluent limitation exceedances, partial treatment bypass, or treatment upsets due to wet weather flow experienced in the last five (5) years. Provide the dates of those incidents.

There were no effluent limitation exceedances, partial treatment bypasses, or treatment upsets due to wet weather flow during the last five years. The only wet weather-related treatment plant incidents involve the routing of treated water to Nine Springs Creek, which is not one of the two permitted discharge points. On May 24, 2006, July 27, 2006, and June 13, 2008, the flow rate of water through the treatment plant was greater than *the capacity of the effluent pumps. The excess flows were discharged to Nine Springs Creek instead of being pumped to Badfish Creek or Badger Mill Creek. Volumes of these exceedances have been estimated for each of the events as follows:*

- *May 24, 2006: 39,000 gallons*
- *July 27, 2006: 381,000 gallons*
- *June 13, 2008: 14,600,000 gallons*

12. Describe any atypical local conditions that may increase the complexity or difficulty during design, construction, operation, and maintenance of the collection system. Provide a brief explanation of the local conditions and measures utilized to compensate for the condition such as:

A. Weather (ex. precipitation, temperature);
B. Terrain/Geology/Soils;
C. Groundwater or surface water body influence.

MMSD's collection system is unique due to the presence of four large lakes, hilly topography, and a densely populated isthmus in the City of Madison. Although a direct correlation between lake level and wastewater flows has not been clearly documented, flows to the treatment plant do tend to rise and fall with the levels of Lake Mendota and Lake Monona and the intensity of precipitation. As a result of the aforementioned local conditions, the District has an usually high number of pumping stations (17) in its collection system. The District's satellite communities also have a significant number of pumping stations, 44 of which the District maintains for its customers. The District's maintenance staff ensures that all of these stations are visited and inspected no less than once per week.

13. Has the system experienced corrosion problems in the last five (5) years? Describe the extent that corrosion in the collection system is a maintenance problem. Is there a corrosion control program in place? If so, what has been the preferred treatment or prevention program selected or implemented?

Deterioration of pipes due to corrosion has been a problem primarily for concrete interceptor sewers in MMSD's collection system. Most problems are observed above the water line in intercepting sewers due to attack of the pipe wall by sulfuric acid, a byproduct of hydrogen sulfide. Force mains constructed of concrete typically do not show any deterioration due to their fully submerged condition and generally appear in excellent condition when inspected.

Interceptor sewers, in general, are televised no less than once every ten years and any corrosion problems are noted during this time. The District's standard practice when detecting corrosion problems is to replace the corroded sections in their entirety or rehabilitate the concrete sewer with a new lining. Sliplining has also been used as a rehabilitation tool. In the past ten years the following concrete interceptors have been replaced or rehabilitated due to concerns with corrosion:

- *Northeast Interceptor: PS10 to Lien Road (2009-10) – 9,200 ft of 48", 54" & 63"*
- *Cottage Grove Extension to Far East Interceptor (2009-2010) – 5,500 ft of 18"*
- *Northeast Interceptor at Dane County Regional Airport (2006-08) – 7,300 ft of 48"*
- *West Interceptor Extension (2007) – 3,200 feet of 36" & 42"*
- *Northeast Interceptor: Buckeye Road to Femrite Drive (2005) – 7,200 feet of 36", 42", 48" & 54"*
- *Nine Springs Valley Interceptor (2001) – 1,100 feet of 30"*

As standard practice the District no longer uses concrete pipe for interceptor sewers. Fiberglass, PVC, and epoxy-lined ductile iron are commonly chosen materials for new sewers.

14. Is there an odor control program in place? Describe the extent of any odor control issues and identify the locations where odor complaints originate.

Odor complaints have been received in the vicinity of the following District pumping stations;

Pump Station 2 - 833 West Washington Avenue, Madison
Pump Station 7 - 6300 Metropolitan Lane, Monona
Pump Station 10 – 110 Regas Road, Madison
Pump Station 13 – 3634 Amelia Earhart Drive, Madison
Pump Station 16 – 1301 Gammon Road, Middleton

At Pump Stations 2 and 16 odors have been reported by neighboring residents. A restaurant next door to Pump Station 7, a US Post Office next to Pump Station 10, and a restaurant next to Pump Station 13 have reported odors from these stations. At Pump Stations 2 and 10 the ventilation has been modified to reduce or eliminate the odors in surrounding homes and businesses. At Pump Stations 7, 10, 13, and 16 a chemical addition system has been installed in the ventilation systems.

15. Is there a grease control program in place? Describe the program and the extent that grease blockages in the collection system are a problem, and identify the locations where chronic grease blockages occur. What tools are used to address grease problems, e.g., grease trap ordinances and inspections, physical removal of grease, or chemical additions to dislodge or dissolve grease?

Blockages in the District's collection system due to grease are rare. See the 2005 incident reported in Question 17. The District has eleven siphons. Nine of them are cleaned twice per year to avoid problems that could be caused by grease or other debris. The wet wells at many of the pumping stations are cleaned several times each year to remove grease and debris. The District's Sewer Use Ordinance contains limitations on grease of petroleum origin and grease of animal or vegetable origin.

16. Is there a root control program in place? Describe the program and the extent that root blockages in the collection system are a problem and identify the locations where chronic root blockages occur.
Roots in the collection system have not been a problem. If roots are found during the television of an interceptor they are cut out. Roots had been prevalent in a section of the Southwest Interceptor near 5 Boston Court in the City of Madison. For a number of years the roots were removed annually as a preventive measure. That section of interceptor has been lined and roots are no longer a problem.

17. Provide a description of Sanitary Sewer Overflows (SSOs), discharges, releases or bypasses (e.g., whenever the sewage left its piping system) that have occurred in the collection system within the last five (5) years. Include the following information for each incident:

- Date
- Location
- Estimated volume of the SSO, discharges, release or bypass
- Cause of the SSO, discharge, release, or bypass
- Disposition of the SSO, discharge, release, or bypass (did the release reach a waterway, flow to storm sewer, paved areas, basements, etc.)
- Actions taken to mitigate the SSO, discharges, release, or bypass

The following sanitary sewer overflows have occurred in the last five years per the District's Annual Reports to the Wisconsin Department of Natural Resources:

<u>*October 7, 2005*</u> – *The District's Rimrock Interceptor was plugged by grease and other debris. Approximately 40,500 gallons of wastewater was discharged to the surrounding wetland area. For a period of time a grease dissolving enzyme was added to a small pumping station. A review was made to determine if there were any unusual sources of grease in the service area of the interceptor. No sources were found and the problem has not reoccurred.*

<u>*January 20, 2006*</u> – *Debris became stuck in the air release valve in the manhole at station 111+81 on the Pump Station 2 force main. About 100 gallons of water exited the manhole and soaked into the surrounding ground. The valve was taken apart to determine if anything other than debris had caused the failure. Nothing was found.*

<u>*July 14, 2006*</u> – *Debris became stuck in the air release valve on the District's Cross Town force main near the intersection of Wilson Street and Few Street in Madison. Much of the water released was recovered from a pit type of catch basin. About 300-400 gallons of water was not captured and flowed to a storm sewer. Checking of the air release valves is on a maintenance schedule. This schedule was reviewed and the frequency of checking specific valves was increased.*

<u>*August 6, 2007*</u> - *A contractor who was clearing trees on a District project damaged the District's West Interceptor in Lakeview Park in Middleton near Allen Boulevard. This allowed water to flow out of the interceptor and into a stormwater drainage way. The*

water eventually flowed to Lake Mendota. When the leak was discovered, several vactor trucks were used to remove water upstream of the leak. Portable pumps were also used to pump water around the damaged area. It was estimated that about 200,000 gallons was released from the system. The pipe was repaired.

<u>August 24, 2007</u> - While checking the air release valve in the manhole at station 111+81 on the Pump Station 2 force main our crew found that a small amount of water was running out of the air release valve. This was during a wet weather event and stormwater had run into the manhole and filled it. The rate that water was flowing out of the valve was similar to what would flow from a garden hose. Because of the amount of stormwater in the area, it was not possible to estimate how much wastewater had flowed onto the ground. Debris was removed from the air release valve.

<u>June 8, 2008</u> – Because of several extreme rainfall events during this week several bypasses were made in the collection system to prevent basement back-ups. See the attached June 14, 2008 letter to Larry Benson of the Wisconsin Department of Natural Resources for details. The District took a number of measures in response to this event. Please see Jon Schellpfeffer's September 24, 2008 letter to Larry Benson for details.

<u>June 30, 2008</u> – A late evening automobile accident caused the failure of both electric power feeds to the District's Pump Station 7 at 6300 Metropolitan Lane in Monona. As soon as power was lost at the station, all of the upstream pumping stations that pump wastewater toward Pump Station 7 were shut off. A generator was taken to the pump station, but before power could be restored wastewater was released from manholes along Winnequah Road in Monona. We estimated that 250,000 to 275,000 gallons of wastewater was discharged. Most of this water probably entered Lake Monona. After the event a permanent generator receptacle was installed at the station. In addition, the power utility has provided a third feed to the station. This feed enters the station area from a different direction than the other two feeds.

<u>September 14, 2008</u> – The control system at the District's Pump Station 3 was not operational due to a failed programmable logic controller (PLC). This prevented the station pumps from operating. The station is located at the northwest side of the treatment plant grounds. To minimize any overflow, the pumps at the station were turned on before efforts were made to determine if an overflow had occurred. The area west and north of the pump station is a marsh area with a drainage way running through it. A small overflow was located at a manhole north of the marsh. Based on pumping records an overflow of 110,000 gallons was calculated. Visual observations led us to believe that the overflow was less than this. As soon as the problem at the station was known, a pump was set up to pump water from the drainage way to the pumping station in an attempt to capture water which may have been discharged from the collection system. The station's PLC was replaced and alarms have been added to the treatment plant's SCADA system to warn of a similar problem if it would occur in the future.

<u>January 21, 2009</u> – A contractor who was making soil core borings for a non-District project bored a hole in the District's 36 inch diameter reinforced concrete force main

from Pump Station 6. This occurred on Monona Drive near its intersection with Buckeye Road in Monona. Water leaked out of the pipe as soon as the hole was made. This water entered Lake Monona. The station was shut off, and the District's trucks normally used to haul biosolids were used to haul wastewater from the Pump Station 6 wet well to other areas of the collection system. A temporary plug was placed in the hole to allow the station to be returned to service until repair parts could be obtained. During the final repair the force main was drained back to the station and vactor trucks were used to collect any wastewater that drained from the pipe when it was cut to make the repair. We estimate that about 248,000 gallons of water was discharged during this event. The District has used and continues to use an underground utilities location service to respond to "Digger's Hotline" requests for underground utility locations.

<u>May 8, 2009</u> - A significant amount of debris became stuck in the air release valve in the manhole at station 111+81 on the Pump Station 2 force main. Pumps had to be used to pump water out of the manhole to allow an employee to enter it to close the manual shut-off valve on the line. It was estimated that about 370,000 gallons of water was discharged to the surrounding area. A portion of this water probably entered Lake Monona. After review of a surge analysis on this force main, it was decided to keep the valve to the air release valve closed. The shut off valve is opened manually periodically to check for trapped air. This eliminated the potential for this valve to be stuck open in the future.

<u>September 9, 2009</u> – Wastewater was released from the air release valve manhole on the District's Cross Town force main between Patterson Street and Brearly Street in Madison. A District repair crew had removed the air release valve the previous day for repair. They had closed the isolation valve, but it evidently was not closed completely. It is estimated that the amount of water released was small and most was recovered by a vactor truck. Procedures were implemented to require a blind flange to be bolted over isolation valves whenever an air release valve is removed.

18. Of the SSOs, discharges, releases or bypasses to waterways that are identified in response to the proceeding question, how many were to surface waters that could affect:

A. Primary contact recreation (swimming, bathing, waterskiing, etc.)? _7_ *(Note: One of these incidents occurred in the winter).*

B. Drinking water sources? _0_

19. Approximately how many of SSOs, discharges, releases, or bypasses were from:

A. Manholes? _7_

B. Pump stations? _2_

C. Main and trunk sewers? _1_

D. Lateral and branch sewers? _0_

E. Structural bypasses? _0_

F. Force main break? _1_

20. Approximately how many of the SSOs, discharges, releases, or bypasses were caused by the following:

A. Debris buildup? __5__
B. Collapsed pipe? __1__
C. Root intrusion? __0__
D. Capacity limitations? __0__
E. Excessive infiltration and inflow? __1__
F. Fat/Oil/Grease? __1__
G. Vandalism/*utility excavation by others*? __1__
H. Power Interruption and/or Lack of Backup Power Source? __1__
I. Mechanical or Electronic Failure? __1__
J. Pump failure and/or Lack of Backup (or Duplex) Pumps? __0__

21. What equipment is available for responding to SSOs, discharges, releases, or bypasses?

A. Two 6" portable pumps and hoses
B. Two 4" portable pumps and hoses
C. Three 2" portable pumps and hoses
D. One 1 ½" portable pump and hoses
E. Fourteen 5000 to 6000 gallon trailers to be pulled by semi tractors
F. Piping sections of various sizes
G. Repair clamps
H. Three portable generators
I. Access to City of Madison vactor trucks
J. Barricades
K. Bobcat loader and trailer
L. Endloader
M. Three dump trucks and access to contractor trucks
N. Hydraulic underground valve turner
O. Forklift
P. Manhole sections
Q. Manhole covers
R. Various power and hand tools
S. Stoplogs
T. Confined space entry equipment
U. Five pick-up trucks with mechanical tools
V. Five vans and trucks with electrical tools
W. Three sewer maintenance vehicles with tools

22. Has Madison Metropolitan Sewerage District developed and adopted written procedures or instructions for the following:

A. SSO, bypass and containment? Yes_____ No __X__
B. Reporting all SSOs to the state regardless of size? Yes____ No __X__
C. Containment or cleanup to mitigate effect of SSOs? Yes_____ No__X__
D. Problem evaluation and solution? Yes_____ No __X__

The District has not formally adopted written procedures for the issues referenced above. However, the District has prepared and updates on a regular basis its "Emergency

Response Manual". This document includes procedures for dealing with a variety of issues involving emergency response, including force main breaks and power interruptions at pumping stations. It also includes contact information for public health officials, municipal customers, regulators, and other emergency contacts.

All employees involved in SSO incidents understand the importance of containment of SSOs and bypasses. This is demonstrated in the incidents listed in question 17. Measures are taken to contain discharges whenever possible.

All SSOs are reported to the District's Area Engineer (Larry Benson) at the Wisconsin Department of Natural Resources. Copies of the reports are stored in the District's filing system and are further reported on the annual Compliance Maintenance Annual Report (CMAR).

23. Are locations where multiple SSOs, discharges, releases, or bypasses have occurred posted with warning signs?

No. The District is not aware of any points in the collection system with multiple and/or recurring SSO discharges that would necessitate the posting of warnings.

24. Are there areas that experience sanitary sewer limitations resulting in basement backups or street flooding?

Yes_____ No __X____ If yes, describe these areas.

25. Provide the following information related to SSOs, discharges, release or bypasses that occurred during dry weather:

A. Number of stoppages annually.
B. Average time to clear a stoppage.
C. Number of stoppages resulting in overflows and/or backups annually.
D. Total quantity of overflows or releases.

The District has had only one reportable dry weather event in the last five years. That was the 2005 plugging of the Rimrock Interceptor (see Question 17 for details). In that incident it took about 3.5 hours to unplug the line. A release of about 40,500 gallons occurred.

26. Provide the following information related to pump and lift station design:

A. Total number of stations in the collection system. ___17___
B. Number of pump stations with pump capacity redundancy. ___15___

All of the District's pump stations have two or more pumps to incorporate redundancy. It is assumed that this question is referring to the provision of firm capacity. Two pumping stations (PS 4 & PS 7) have firm pumping capacities that are slightly less than benchmark peak flowrates. Firm capacity improvements at both stations are scheduled between 2012 and 2020. Please see attached Table 2.2 from the District's 'Collection

System Facilities Plan (2002)', which is currently being updated, for further details on the firm capacities at all of the District's pumping stations.

C. Number of pump stations with backup power sources. 16

Note: MMSD's Pump Station 3 requires a portable generator as its backup power source. This pumping station is located on the grounds of the treatment plant where the portable generator is stored.

D. Number of pump stations with dry weather capacity limitations. 0

E. Number of pump stations with wet weather capacity limitations. 0

F. Number of pump or lift station failures resulting in overflows/releases or backups in the last five (5) years. 2

G. Total quantity of SSOs, discharges, releases, or bypasses expressed in gallons or million gallons (MG). 0.38 MG *(See Question 17)*

H. For each SSO, discharge, release or bypass, is failure mode and effect diagnosed?
Yes X No____

I. Are future preventive measures initiated based on diagnosis?
Yes X No____

27. Provide the number of miles or feet of force main monitored annually (visual surface inspection of alignment). **See below**

MMSD does not have a formal program for surface inspection of its force mains. Internal inspections of force mains are not possible. They must remain in-service at all times and are impossible to bypass. Further, they are pressurized at all times, prohibiting access. MMSD's Sewer Maintenance crew does perform inspection and maintenance of air release valves on its force mains on a semiannual basis, although the entire length of the force main is generally not inspected.

28. Provide the miles or feet of force main monitored annually (pressure profile, capacity). 6.3 miles/year (44 miles total every 7 years)

MMSD staff is currently preparing an update to its 'Collection System Facilities Plan (2002).' In this document is a tabular listing of all force main segments with corresponding capacities and characteristics, including any pressure limitations. Typically MMSD force mains have plenty of capacity and the amount of flow does not change drastically from year-to-year. Table 2.3 of the District's 'Collection System Facilities Plan' is attached for further reference.

Several MMSD force mains are protected with surge relief valves or surge tanks located at the pumping stations.

29. Provide the number of force main failures in the last five (5) years. 6

September, 2009	*Crosstown FM Air Release Valve*
May, 2009	*PS2FM Air Release Valve*
January, 2009	*PS6FM Break by Soil-Boring Machine*
August, 2007	*PS2FM Air Release Valve*
July, 2006	*Crosstown FM Air Release Valve*
January, 2006	*PS2FM Air Release Valve*

30. Provide a description of the cause(s) of each force main failure in the last five (5) years.

Of the six failures, five have been directly related to failure of air release valves on District force mains. The District's most commonly used air release valve employs the use of a float that rises and falls in the valve in response to fluctuations in system pressure. Hard plastics and grease in the raw wastewater have been found to impede the free movement of the float assembly and/or wedge the float in the "open" position. MMSD maintenance staff has increased the frequency for cleaning of these valves in the collection system. Further, MMSD has isolated some air release valves from service in locations where they are not deemed necessary to control surges and to provide air release or vacuum relief.

With regard to the other force main failure, it was due to a broken pipe caused by the drilling of a soil boring contractor. Please see Question 17 for additional information regarding this failure.

31. Provide the following information related to service to wastewater system users and customers:

A. Average annual user charge rate for residential user. __________
In 2008 the District's service charge for the average residential user was about $10 per month. The additional charge from the satellite community for the average residential user was about $7 per month. This results in an average annual charge of $202. (from Typical Charges for City of Madison Residential Customer.xls and 2008 Service Charge Rates.xls)

B. Is the residential rate based on water consumption or a flat rate? Describe.
The residential service charge is based on a combination of a volume charge based on consumption and a flat rate based on the capacity of the water meter.

C. Number of user complaints annually for the last five (5) years.
From 2004 through 2008 the District logged an average of 10 complaints per year. Odor, vehicle operation, and biosolids reuse program complaints averaged 2 per year each. Noise from the treatment plant averaged one complaint per year. (MMSD complaint database - summarized)

D. Number of complaints that are Madison Metropolitan Sewerage District responsibility annually for the last five (5) years.
About 9 out of 10 complaints received each year were the District's responsibility. (MMSD complaint database)

E. Number of wastewater public health or other warnings issued by Madison Metropolitan Sewerage District annually for the last five (5) years.
The District works with the City of Madison/Dane County Public Health Department to issue warnings. The District does not issue warnings directly. In June, 2008, during a series of heavy rain storms that resulted in flooding and wastewater by-passes, the District and the health department worked closely over about a one week period to inform the public of beaches that had been closed on the Madison lakes due to sewage overflows. Also in June of 2008, the District notified the health department of an overflow caused by the loss of both electric power feeds to one of the District's pump stations that resulted in the overflow of sewage to Lake Monona and the Yahara River. This amounts to about one warning per year, even though all warnings over the last five years were issued in one month; June, 2008. (personal recollection of Jon Schellpfeffer)

F. Number of claims for damages due to backups annually for the last five (5) years.
Four claims for damage have been received and/or acted on in the last five years. One of these was from the City of Madison Parks Department for suspected damage to wetland plants due to the by-pass of wastewater in June, 2008. Two claims were submitted for basement back-ups caused by a pump station failure. The final claim was submitted for a back-up into a commercial building from a District interceptor sewer.

G. Provide the total cost of claims against Madison Metropolitan Sewerage District related to wastewater management settled annually for the last five (5) years. *(Information taken from District's accounting software)*

1. *2009: $444.00 to clean a residential basement when there was a backup at the Bible Camp pump station.**
2. *2008: No claims paid to date due to wetlands damage in City of Madison.*
3. *2007: $112.78 to clean a residential basement when there was a backup at the Bible Camp pump station.**
4. *2005: $906.57 to clean a commercial building when there was a back-up on the north leg of the Southwest Interceptor*

* *Note: Bible Camp pump station is maintained by MMSD and owned by a satellite community.*

Total cost is $1463.35.

H. When was the last wastewater-related rate increase? January 1, 2009

32. Provide the following information related to financial management of wastewater service: *(information based on 2008 Financial Report and 2009 budget and rates)*

A. Total annual revenue received from wastewater user charges:
In 2008 the District received $20,776,193 in service charge revenue.
   1. Percent of revenue used for long-term debt; *34 percent.*
   2. Percent of revenue used for treatment and disposal; *45 percent.*
   3. Percent of revenue used for collection and conveyance. *12 percent.*

B. Other sources of revenue (i.e., property tax, tap-in fees, etc.):
For servicing pump stations owned by certain satellite communities, $393,313; from septage disposal, $262,903; from pretreatment fees, $20,378; from investment income, $663,046; from rent, $59,336; from connection charges, $496,515; and miscellaneous revenues of $60,007, for a total of $1,955,498.
   1. Percent of revenue used for long-term debt; *25 percent.*
   2. Percent of revenue used for treatment and disposal; *34 percent.*
   3. Percent of revenue used for collection and conveyance. *9 percent.*

C. Provide the annual operation and maintenance budget: *(for 2009)*
   1. For the wastewater treatment plant; *$9,565,235.*
   2. For wastewater collection and conveyance system. *$2,097,242.*

D. Provide the annual costs of operation and maintenance for:
   1. The wastewater treatment plant for the most recently completed service year; *For 2008, $9,401,294.*
   2. The wastewater collection and conveyance system for the most recently completed service year. *For 2008, $2,431,166.*

E. Does Madison Metropolitan Sewerage District have a long-range wastewater Capacity Improvement Project (CIP) plan for system expansion, rehabilitation, and replacement?
Yes _X_ No____

33. Have infiltration/inflow (I/I) assessments been done to determine the extent of these components as part of the system's wastewater flow? Has it been proven that it is cost effective to eliminate I/I rather than continue to treat it? Has a sewer system evaluation survey (SSES) been performed on system? If yes, when? Have rehabilitation projects been prioritized for correcting I/I problems? If so, how far has the I/I elimination program progressed?

The District completed an extensive sewer system evaluation survey (SSES) in February of 1978. This evaluation resulted in the discovery and documentation of a significant *amount of I/I in the collection systems of the District and those of its satellite communities. This evaluation also led to the formalization of important inspection and maintenance programs for District sewers.*

The District periodically assesses the amount of inflow and infiltration in its collection system in response to high flow storm events and requests that satellite communities do the same. Internal studies have been performed periodically to assess if it is cost effective to eliminate I/I rather than convey it to the plant for treatment. In general it has been determined that it is more cost effective to eliminate I/I in remote parts of the collection system (due to pumping costs) and cheaper to treat it when it is located closer to the treatment plant.

The following I/I initiatives have been undertaken directly by the District or the City of Madison within the last fifteen years:

- *Memorandum entitled 'High Flow Event of June 17, 1996', prepared by MMSD staff. This internal study and memo analyzed the impact of a significant rainfall event on the District's collection system in June of 1996 and provided recommendations for future follow-up from the District and its satellite communities.*

- *Report on 'Hoard/Kedzie Street' (1997), prepared by Strand Associates, Inc. for City of Madison at request of MMSD. This I/I study investigated chronic problems in a sewer basin tributary to MMSD Pump Station 1.*

- *'Sanitary Sewerage Conveyance System Study, Baldwin Street & Elizabeth Street Area' (1998) for City of Madison at request of MMSD. This I/I study investigated chronic problems in a sewer basin tributary to MMSD Pump Station 1.*

- *Report on 'Stormwater Inflow Monitoring' (1999), prepared by Strand Associates, Inc. for MMSD. This study employed the use of extensive flow monitoring in three different pump station basins in an attempt to quantify the amount of I/I in the District's collection system.*

- *'Collection System Facilities Plan' (2002), prepared by MMSD. This facility plan proposed that I/I studies be undertaken in the following pump station service areas: 9, 10, 12, 13 & 14. Studies have been completed for Pump Stations 9, 12, and 13.*

- *'Truax Area Sewer Study' (2005), prepared by Brown and Caldwell, for City of Madison at request of MMSD. This study employed the use of flow metering, smoke testing, manhole inspections, and hydraulic modeling to investigate chronic I/I problems upstream of MMSD Pump Station 13.*

- *The District submitted a written request to 15 of its satellite communities in August of 2009 requesting that I/I investigations of their collection systems be undertaken (see attached letter).*

- *The District has acquired a dynamic hydraulic model of its collection system. One intended use for this model is to identify areas of the collection system with excessive I/I and evaluate reduction strategies within those areas.*

34. Does the Madison Metropolitan Sewerage District operate an industrial pretreatment program? Yes _X_ No_____

35. Does the Madison Metropolitan Sewerage District or the municipalities within the WWTP service area have a private source inflow and infiltration reduction program?
Yes _____ No _X_ If yes, describe this program.

36. Does the Madison Metropolitan Sewerage District use:

A. Internal T.V. inspection for evaluating the condition of the collection system? Yes _X_ No_____

B. Smoke testing? Yes_X_ No_____

37. Does the Sanitary Sewer System experience chronic O & M problems that are the result of design issues in the system? If yes, provide brief explanation.

No, the District is not aware of any design deficiencies that result in increased O&M problems.

38. Does the Sanitary Sewer System experience chronic O & M problems that are the result of construction issues in the system? If yes, provide brief explanation.

No.

CERTIFICATION

I certify under penalty of law that this response and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Jon W. Schellpfeffer
Chief Engineer & Director, MMSD

QUESTION # 3B

Table 2-1: Population Trends and Forecasts for the MMSD

	1980	1990	2000	2009	2030	2060
Central USA	218,344	245,390	268,850		339,222	*404,204*
Cottage Grove USA	901	1,131	4,059		9,372	*11,798*
Dane USA			799		1,351	*1,594*
Fox Bluff LSA			240		240	*240*
Kegonsa LSA			2,228		2,252	*2,252*
Morrisonville USA			352		428	*464*
Northern USA	5,393	7,160	9,901		16,883	*23,825*
Verona USA			7,306		15,685	*20,178*
Waubesa LSA			2,027		2,027	*2,027*
Waunakee USA	3,890	5,899	9,000		17,458	*23,367*
Windsor Prairie LSA			509		509	*509*
Westport LSA			377		377	*377*
MMSD	228,528	259,580	305,648	335,700	405,804	*490,835*

Historic and forecasted population figures for three urban service areas that are outside, but nearby, the current MMSD service area are shown in Table 2-2.

Table 2-2: Population Trends and Forecasts for Other USAs

	1980	1990	2000	2030	2060
Oregon USA	3,927	4,528	7,514	13,106	*17,275*
Stoughton USA	8,256	9,265	12,671	18,609	*23,064*
Sun Prairie USA	13,306	15,481	20,533	36,211	*45,188*

Traffic Analysis Zone Data

In addition to population forecasts at the urban service area level, socioeconomic data is available in smaller analysis units called traffic analysis zones (TAZ). The Madison Area Transportation Planning Board (MATPB) developed the most recent TAZ data in 2000 for transportation planning. This data divides Dane County into over 1,000 analysis zones, which range in size from 3.7 acres in the central urban area, to over 6,000 acres in rural areas. The socioeconomic data associated with each zone includes population, number of households, and total employment for the year 2000 as well as forecasts for the year 2030.

TAZ Data Sources

The TAZ allocation of year 2000 population and household data is based on US Census data and Census block boundaries. The MATPB developed the TAZ 2030 population and household data by allocating the DOA/CARPC population forecasts to TAZ regions based on community comprehensive plans and neighborhood development plans. They noted in their *Regional Transportation Plan 2030*, that the allocation of forecasted 2030 growth is far less than a build-out scenario of the planned growth identified in local plans.

QUESTION #3D

COMMUNITY WATER METERS - 2008

	Classification of Meters[1]						
Municipality	Residential	Commercial	Industrial	Public Authority	Wholesale, Interdepartmental or Utility Use	In Stock and Deduct Meters	TOTAL LESS DEDUCT AND IN STOCK METERS
Cottage Grove	2,086	112	10	21	0	59	2,229
Dane	320	31	3	6	0	42	360
DeForest	2,840	255	35	21	0	139	3,151
Fitchburg	5,244	742	39	13	0	0	6,038
Madison	56,033	8,783	53	481	12	663	65,362
Maple Bluff	549	6	0	6	0	41	561
McFarland	2,586	271	0	29	6	128	2,892
Middleton	4,821	864	48	55	10	73	5,798
Monona	2,512	309	0	24	0	114	2,845
Morrisonville	148	5	0	3	0	23	156
Shorewood	591	28	0	7	0	49	626
Verona	3,549	362	87	43	0	106	4,041
Waunakee	3,703	272	1	24	13	30	4,013
Westport	324	33	0	1	0	10	358
Windsor #1	822	88	6	2	1	78	919
TOTAL METERS WITH PUBLIC WATER SUPPLY	**86,128**	**12,161**	**282**	**736**	**42**	**1,555**	**99,349**
CORRECTION FOR PRIVATE WATER SUPPLIES[2]	**1.04**	**1.04**	**1.04**	**1.04**	**1.04**		
TOTAL CONNECTIONS	**89,422**	**12,626**	**293**	**764**	**44**		**103,149**
% OF TOTAL	**86.7%**	**12.2%**	**0.3%**	**0.7%**	**0.0%**	**0.0%**	

(1). Information taken from Municipality Annual Reports provided to Public Service Commission of Wisconsin.

(2). MMSD customer records indicate approximately 3,800 customers are served by private water supplies.

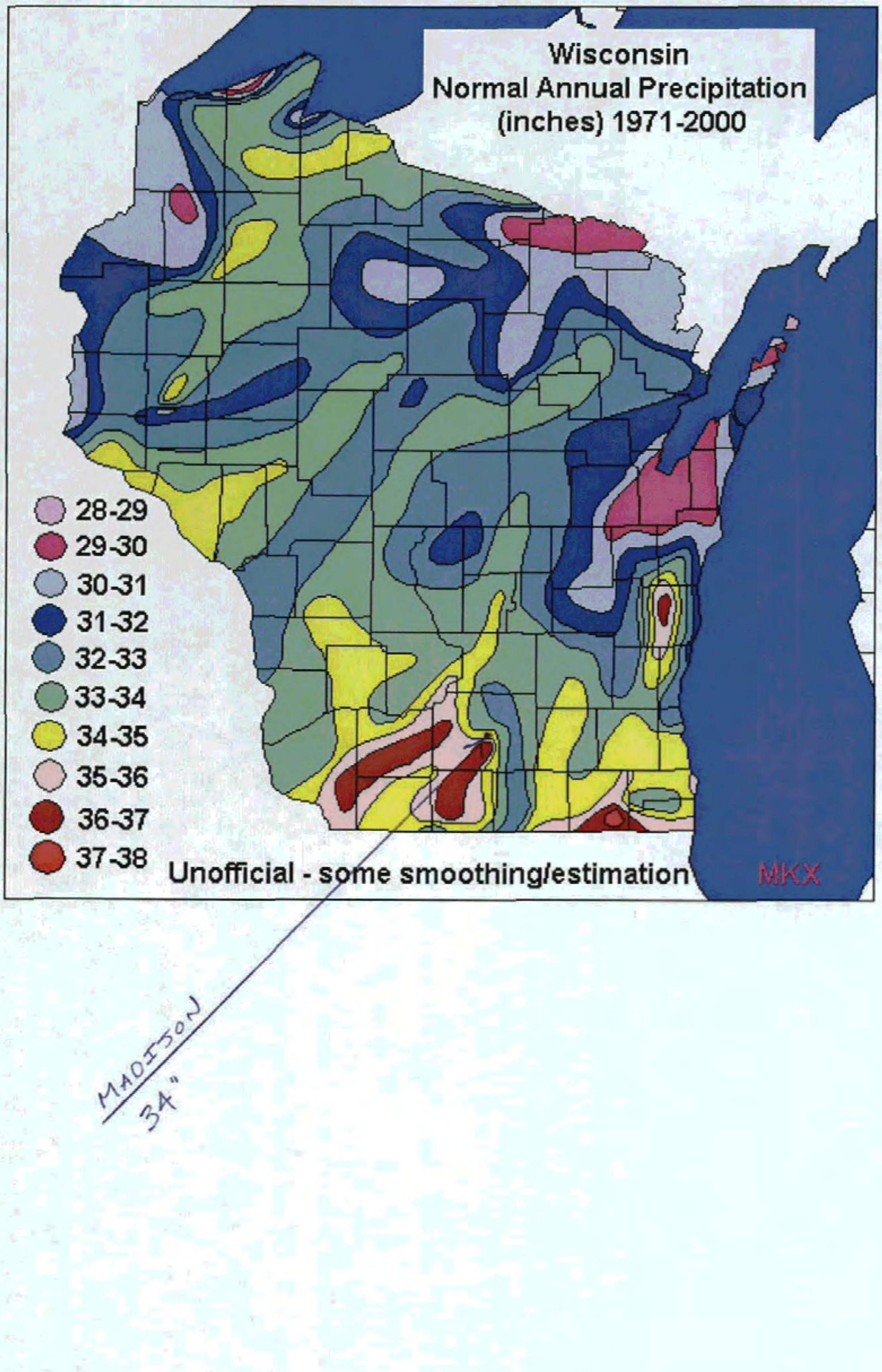
11/25/2009

QUESTION 3G

MMSD RELIEF POINTS				
	Facility	**MH**	**Location & Comments**	**Downstream Watercourse**
1	Bedford Street Stoplogs.	CT-3420	Northshore Drive at end of Bedford Street, adjacent to Monona Bay.	Monona Bay
2	PS5 Stoplog	5-403	Mendota Drive across from PS5	Lake Mendota
3	PS6 Flapgate	6-102	Drainage ditch near PS6	Lake Monona
4	PS7 Stoplog	PS7	Entrance chamber behind PS7	Yahara River
5	PS8 Stoplog at Wingra Creek	8-100	North side of Wingra Creek across from PS8	Wingra Creek
6	NEI Flapgate upstream of PS10	10-114	At Starkweather Creek, south of Sycamore Ave and west of Walsh Rd. To be removed in 2009 during NEI-PS10 to Lien Road Project.	Starkweather Creek
7	PS11 Flapgate	PS11	PS11 near entrance chamber	Upper Mud Lake
8	NEI Truax Ext Flapgate upstream of PS13	13-105	Along drainage ditch, west of Hwy 51 at Dane County Airport access road. Inside airport perimeter fence.	Starkweather Creek

NOTE: All relief points constructed in separate sanitary sewerage system.

QUESTION #3H



* Map provided by National Weather Service.

QUESTION #31

COMMUNITY WATER SALES - 2008

Thousands of Gallons of Water Sold

Municipalities with Public Water Supplies	Unmetered Sales: Residential	Unmetered Sales: Commercial	Unmetered Sales: Industrial	Unmetered Sales: Public Authority	Metered Sales: Residential	Metered Sales: Commercial	Metered Sales: Industrial	Metered Sales: Public Authority
Cottage Grove	1	1	0	0	117,765	22,608	14,120	2,059
Dane	0	0	0	0	17,040	2,398	1,879	93
DeForest	0	0	0	0	157,840	53,048	12,696	4,842
Fitchburg	5	0	0	0	324,859	321,689	41,427	1,868
Madison	0	21,325	0	0	3,276,816	3,962,569	753,572	1,485,966
Maple Bluff	0	0	0	0	51,562	3,052	0	0
McFarland	3,355	0	0	0	144,172	43,166	0	7,530
Middleton	0	0	0	0	300,517	361,137	56,792	0
Monona	0	720	0	0	173,422	146,853	0	5,181
Morrisonville	0	0	0	0	8,969	401	0	0
Shorewood	0	0	0	0	42,838	6,695	0	2,347
Verona	0	1,858	0	0	206,550	66,686	76,221	22,504
Waunakee	1	38	0	0	245,107	64,780	106,043	8,892
Westport	0	0	0	0	19,237	17,998	0	0
Windsor #1	40	0	0	0	51,014	26,511	6,836	623
TOTALS	3,402	23,942	0	0	5,137,708	5,099,591	1,069,586	1,541,905
% OF TOTAL	0.03%	0.18%	0.00%	0.00%	39.14%	38.85%	8.15%	11.75%
PUBLIC WATER SYSTEMS (MGD)	0.01	0.07	0.00	0.00	14.08	13.97	2.93	4.22
CORRECTION FOR PRIVATE WATER SUPPLIERS[1]	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
TOTAL ESTIMATED WATER CONSUMPTION (MGD)	0.01	0.07	0.00	0.00	14.61	14.51	3.04	4.39

Municipalities with Public Water Supplies	Private Fire Protection	Public Fire Protection	Other	Resale	Inter-departmental	TOTAL VOLUME LESS RESALE (1,000 gal)	TOTAL FLOW (MGD)
Cottage Grove	0	0	0	0	0	156,554	0.4
Dane	0	0	0	0	0	21,410	0.1
DeForest	0	0	0	0	0	228,426	0.6
Fitchburg	0	0	0	0	0	689,848	1.9
Madison	0	0	0	229,288	0	9,729,536	26.7
Maple Bluff	0	0	1,148	0	0	55,762	0.2
McFarland	0	0	0	0	0	198,223	0.5
Middleton	0	0	20,579	0	0	739,025	2.0
Monona	0	0	0	0	0	326,176	0.9
Morrisonville	0	0	114	0	0	9,484	0.0
Shorewood	0	0	0	0	0	51,880	0.1
Verona	0	0	0	0	0	373,819	1.0
Waunakee	0	0	0	0	212	425,073	1.2
Westport	0	0	0	0	0	37,235	0.1
Windsor #1	0	0	0	0	0	85,024	0.2
TOTALS	0	0	21,841	229,288	212	13,127,475	36.0
% OF TOTAL	0.00%	0.00%	0.17%	1.75%	0.00%		
PUBLIC WATER SYSTEMS (MGD)	0.00	0.00	0.06	0.63	0.00		36.0
CORRECTION FOR PRIVATE WATER SUPPLIERS[1]							
TOTAL ESTIMATED WATER CONSUMPTION (MGD)							36.6

(1). Total number of public water customers in MMSD collection system is approximately 99,300 per PSC records (see attached sheet). MMSD customer records indicate approximately 3,800 customers are served by private water supplies.

12/3/2009

QUESTION # 4

PUMPING STATIONS OPERATED AND MAINTAINED BY THE DISTRICT

Owner	Number of Pumping Stations
Madison Metropolitan Sewerage District	17
City of Madison	29
City of Verona	1
Village of Maple Bluff	3
Town of Dunn Sanitary District No. 1	4
Town of Dunn Sanitary District No. 3	3
Town of Madison	3
Dane County Lake Farm Park	1
Total	**61**

Quantity of Wastewater

The District received 17,292,768,000 gallons of wastewater at the Nine Springs Wastewater Treatment Plant in 2008. This was a 10.5% increase from 2007. The average daily quantities received from each municipality and through infiltration into the District's intercepting sewers in 2008 were as follows:

→ **AVERAGE DAILY QUANTITIES OF WASTEWATER** *

Municipality	2008(GPD)	% of Total
City of Fitchburg	1,960,000	4.15
City of Madison	31,649,000	66.99
City of Middleton	1,939,000	4.10
City of Monona	1,038,000	2.20
City of Verona	914,000	1.93
Village of Cottage Grove	755,000	1.60
Village of Dane	59,000	0.13
Village of DeForest	1,053,000	2.23
Village of Maple Bluff	264,000	0.56
Village of McFarland	705,000	1.49
Village of Shorewood Hills	705,000	0.43
Village of Waunakee	1,722,000	3.64
Town of Blooming Grove	5,500	0.01
Town of Blooming Grove San. Dist. No. 2	228,000	0.48
Town of Blooming Grove San. Dist. No. 10	17,000	0.04
Town of Burke Util. Dist. No. 2	4,000	0.01
Town of Burke Util. Dist. No. 6	800	<0.01
Town of Burke – Token Creek San. Dist.	123,000	0.26
Town of Dunn San. Dist. No. 1	252,000	0.53
Town of Dunn San. Dist. No. 3	74,000	0.16
Town of Dunn San. Dist. No. 4	38,000	0.08

* Information taken from MMSD's 2008 Annual Report

Municipality	2008(GPD)	% of Total
Town of Dunn Kegonsa San. Dist.	172,000	0.36
Town of Madison	932,000	1.97
Town of Middleton San. Dist. No. 5	16,000	0.03
Town of Pleasant Springs San. Dist. No. 1	61,000	0.13
Town of Verona	600	<0.01
Town of Verona Util. Dist. No. 1	23,000	0.05
Town of Vienna Util. Dist. No. 1	51,000	0.11
Town of Vienna Util. Dist. No. 2	45,000	0.09
Town of Westport Util. Dist. No. 1	165,000	0.35
Town of Westport Util. Dist. No. 2	433,000	0.92
Town of Westport Util. Dist. No. 3	15,000	0.03
Town of Westport Util. Dist. No. 4	14,000	0.03
Town of Westport - Cherokee Golf and Tennis	4,900	0.01
Town of Windsor San. Dist. No. 1	284,000	0.60
Town of Windsor San. Dist. No. 3	400	<0.01
Town of Windsor - Illinois Foundation Seed	100	<0.01
Town of Windsor - Hidden Springs San. Dist.	3,700	0.01
Town of Windsor - Lake Windsor San. Dist.	60,000	0.13
Town of Windsor - Morrisonville San. Dist.	84,000	0.18
Town of Windsor - Oak Springs San. Dist.	40,000	0.09
Total Wastewater	45,410,000	96.11
Infiltration into District Interceptors	1,838,000	3.89
Total Received at the Treatment Plant	47,248,000	100

Wastewater Treatment

The Nine Springs Wastewater Treatment Plant is located in the Town of Blooming Grove at the intersection of South Towne Drive and Moorland Road.

Preliminary treatment includes influent wastewater fine screening and grit removal. Fine screening is accomplished with three rotating band screens with 6 mm openings and a vortex grit system for grit removal. Variable speed drives for the band screens are used to control the influent well level and to maintain a minimum level above the influent flow meters. Grit is removed continuously from the vortex grit chambers. The grit and screenings are disposed of by Waste Management, Inc.

All material removed by the fine screens is conveyed to a screenings processing well. Two to four times a day the grit must be removed from the well with the operators present to oversee the pumping operation. The grit and accompanying rags are pumped to a separate settling basin (termed a "Snail") which had previously been used by the District in a primary sludge degritting process. The material settled in the snail was conveyed to small two yard dumpsters and required removal and contract hauling to the landfill three to five times per week. In November 2008, an auger was installed to transport grit removed by the Snail into a much larger grit dumpster. This eliminated the extra labor and expense required to move and haul temporary two-yard dumpsters.

QUESTION #5

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT. OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

Box 7921
Madison, Wisconsin 53707

March 17, 1992

IN REPLY REFER TO: 8700 CWF

Mr. James Nemke
Madison Metropolitan Sewerage District
1610 Moorland Road
Madison, Wi 53713

SUBJECT: Intermunicipal Agreements

Dear Mr. Nemke:

The Department has reviewed your January 10, 1992 correspondence discussing the necessity of MMSD having intermunicipal agreements with its constituent municipalities to meet the requirements of Wis. Admin. Code NR 162.08(4)(a)2. The Department agrees with your interpretation of Wis. Stats.,s. 66.20 that it is not necessary for MMSD to have intermunicipal agreements with municipalities that have been annexed into the District, thus becoming a part of the District. The statutory requirement of annexation of territory into a metropolitan sewerage district, therefore eliminates the need for intermunicipal agreements to meet the requirements of the Clean Water Fund loan program.

If you have any questions, please call Diane Alme of my staff at 608-266-5889.

Sincerely,

Ruthe Badger

Ruthe Badger, Chief
Project Management Section
Bureau of Environmental Loans

DKA:RB
CC: Milton Donald/EA 6
Southern District
Sheila Henneger/EL
Bureau of Finance

*A*XLEY *B*RYNELSON

Attorneys Since 1885

Madison
Manchester Place
2 East Mifflin Street
Post Office Box 1767
Madison, WI 53701-1767
Telephone (608) 257-5661
Facsimile (608) 257-5444

Wisconsin Dells
313 Broadway
Post Office Box 237
Wisconsin Dells, WI 53965
Telephone (608) 254-2000
Facsimile (608) 254-8582

Ralph E. Axley
of Counsel
Floyd A. Brynelson
of Counsel
James C. Herrick
Frank J. Bucaida
Griffin G. Dorschel
Bradley D. Armstrong
John H. Schmid, Jr
Timothy D. Fenner
John C. Mitby
Daniel T. Hardy
John Walsh
Bruce L. Harms
David Easton
Peter Weisenberger
Curtis C. Swanson
Michael S. Anderson
Patricia M. Gibeault
Michael J. Westcott
Larry K. Libman
Richard E. Petershack
Carl H. Creedy
Catherine J. Furay
Richard W. Cross
Eric J. Wendorff
Steven A. Brezinski
Arthur E. Kurtz
Steven M. Streck
Edith F. Merila
Joy L. O'Grosky
Michael J. Modl
Sabin S. Peterson
Saul C. Glazer
Thomas W. Shellander
Guy DuBeau
Terry J. Finman

January 10, 1992

Ms. Diane Alme
Wisconsin Department of Natural Resources
Bureau of Environmental Loans
P.O. Box 7921
Madison, WI 53707

RE: Intermunicipal Agreements - Financial Assistance
Our File No. 36352

Dear Ms. Alme:

Pursuant to our telephone conversation of January 8, 1992, the purpose of this letter is to discuss the necessity and desirability of Madison Metropolitan Sewerage District having intermunicipal agreements with its constituent municipalities for treatment of the wastewater that is discharged to the District from their territories which have been annexed to the District.

As I indicated by telephone, the position of MMSD is that such contracts would not be appropriate with respect to the handling of normal wastewater generated within the established boundaries of the District because all of such receipt and treatment of sewage is a matter of <u>intradistrict</u> governance and is not to be determined by <u>intermunicipal</u> agreement. All of the rights and obligations of the District relative to the territory that comprises the District are set forth in the comprehensive statutory framework of <u>Wis</u>. <u>Stats</u>. 66.20 <u>et. seq.</u> It is MMSD's view that none of those statutory rights, duties and obligations of MMSD with respect to its own territories should be subject to creation, diminution or modification by contract, and indeed any attempt to do so is subject to serious legal challenge.

Pursuant to Sec. 66.22, the creation of the district must simultaneously determine the territory to comprise the District, and must be accomplished by a finding that the formation of the District will be conducive to fiscal and physical management of a "unified system of sanitary sewage collection and treatment." Similarly, Sec. 66.26 permits the addition of territory to the District on motion of either a municipality or the District itself only again on a finding that it be conducive to a "unified" system. There is no provision for detachment of territory from the district, and indeed, once territory has become part of a unified system of collection and treatment, there can be no right of detachment.

The essence of the statutory framework is that once territory is added to the District, the District exercises direct jurisdictional control over all wastewater aspects, and governs the system directly by ordinance and rule. With respect to matters within the purview of the unified system, none of the constituent municipalities retain any rights of control under statute except as permitted by the District or as elsewhere set forth by statute. The District's right of control over the treatment process and the wastewater and the involvement of other municipalities is completely determined by statute, and is in no way dependent upon the subsequent decisions of other municipalities to grant contractual authority. For the District to seek contractual authority and arrangements from other municipalities is for it to undermine the direct statutory grants of authority that exist. The need for intermunicipal agreements relates solely to situations of extraterritorial matters.

One of the purposes of intermunicipal agreements in these cases is to provide assurance that the financial assistance will be meaningful in promoting sewage collections and treatment, and the resulting constructed facilities will be useful, appropriate and effective. Thus, Wis. Stats. Sec. 144.241 (8)(d) provides that an unsewered municipality that is not constructing a treatment work and will be disposing of wastewater to another municipality is not eligible unless it enters into an agreement with the other municipality to treat the wastewater.

This is also the purpose of NR 162.08(4)(a)(2), which requires an applicant to submit:

> "An executed intermunicipal agreement, if wastewater generated by the applicant will be discharged to or through wastewater facilities of another municipality. The department may waive the requirement of an executed intermunicipal agreement if an order under 144.07(1), Stats., has been issued." (Emphasis added)

Thus, the rule has applicability only to the situation where wastewater generated by the applicant will be discharged for treatment to another municipality. The concern in that case is that the applicant does not own or control the treatment facility. The purposes of the grant could be thwarted by subsequent refusal of the other municipality to accept sewage for treatment, so a contract is needed to demonstrate the applicant's access to treatment facilities. In our case, the applicant is MMSD. It does not generate any wastewater. It receives wastewater and treats it at its owned facilities. It is not dependent on any other municipality for control of treatment facilities.

It is further instructive that the rule permits waiver where the DNR has ordered a municipality to receive wastewater from another. In that case, the statutory order supersedes any need for contractual agreement. In our case, the very nature of the District renders contractual assurances superfluous, as the District owns and controls all treatment facilities and exercises direct jurisdiction over all territory within its boundaries.

Moreover, for a number of policy reasons, the execution of agreements between MMSD and other municipalities for treatment of wastewater generated within the District is dangerous and inappropriate.

1. Such an agreement undermines the District's statutory authority to own and operate the underlying treatment system.

2. Such an agreement undermines the operation of a unified treatment system over which the respective municipalities have ceased to exercise individual control.

3. Such an agreement opens the door for different and discriminatory provisions in the various contract documents, which would furnish a basis for legal claims of discrimination.

4. Such agreement would detract from the underlying financial security by substituting uncertain contractual obligations for the clear and certain statutory rights that presently apply.

AXLEY BRYNELSON

Attorneys Since 1885

We would be pleased to further discuss the various points covered in this letter. If we can provide further information or assistance, please advise.

Very truly yours,

AXLEY BRYNELSON

Griffin G. Dorschel

GGD:msk

cc: ✓Mr. John Schellpfeffer

QUESTION #17 – JUNE 8, 2008 STORM EVENT

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

Jon W. Schellpfeffer
Chief Engineer & Director

Protecting Public Health and the Environment

June 14, 2008

Mr. Larry Benson
DNR South Central Region
3911 S. Fish Hatchery Road
Madison, WI 53711

Dear Larry:

I am writing to report on the bypass and diversion events that occurred during the record rainfall events of the week of June 8, 2008. The wet weather resulted in the largest amount of water being treated at our treatment plant in a single day. Most of the pumping stations owned by the District and lift stations owned by others but maintained by the District were operating at their peak capacity. All of the wastewater that entered the treatment plant received complete advanced secondary treatment. We are still checking our records, but we think that all of the water also received ultraviolet disinfection. If any of the effluent was not disinfected, it was stored in our effluent storage lagoon.

The first significant rainfall event began on the morning of Sunday, June 8. At 9:45 am that day the total flow rate to the treatment plant was 48 MGD. Three hours later the flow rate had increased to 122 MGD. Our records show that we saw this rapid increase in flow throughout our service area. By 6:00 pm the flow rate into the plant had decreased to 70 MGD. However, the storm that started about that time and continued through the evening resulted in a peak flow rate to the plant of 145 MGD at 11:45 pm that night. During this time dual pumping was occurring at our pumping stations 1, 2, 5, 7, 8, 11, 12, and 17. Dual pumping also occurred at many of the pumping stations that we maintain for other communities. The flow rate into the plant remained above 80 MGD until about 11:45 pm on Tuesday, June 10. The rainfall events of June 12 and 13 resulted in the flow rate to the plant increasing to above 100 MGD by 8:00 pm on June 12 and remaining above 100 MGD until 5:00 pm on June 13.

metrogro

Woodley Pump Station Bypass

The first bypass in the collection system occurred at about 9:00 pm on June 8 at the City of Madison's Woodley Pumping Station. This station is located at 2712 Waunona Way on the south shore of Lake Monona. Earlier that afternoon we received a report that a significant basement backup had occurred near the station as a result of the morning storm. Our crew and a City of Madison Crew investigated at that time and could not find any problems with the station. Due to the afternoon storm, this station went on high well alarm at 6:50 pm even though both pumps in the station were pumping. Both the District and the City of Madison began receiving numerous calls indicating that basements were backing up in this area. Our crew found that the pumps at the station were operating, but the local sewers downstream of where the station discharges were full. It appeared that pumping from the station was being inhibited by the surcharged downstream sewers. To prevent further basement flooding, it was decided to pump from the station wet well to Lake Monona. At this time water was already running out of a few manholes in this area. The pumping lasted about 1.75 hours. We are estimating that a little over 50,000 gallons of water was bypassed in this event.

Pump Station 14 Bypass

The District's Pump Station 14 is located at 5000 School Road near Cherokee Marsh. This station began being adversely affected by the rainfall events on the morning of June 8. The wet well level at this station was 6.6 ft at 9:00 am. By 11:30 am the level had risen to 12.1 ft. At 1:15 pm the level had risen to a point that further increases could not be read by the level sensor. Visual observations from crews in the field indicated that the wet well level was rising to the point that basements in the area around the station would soon be backing up. The decision was made to pump water from the wet well to the surrounding surface waters to prevent the basement backups. A six inch portable pump began pumping out of the well at 12:30 am on June 9. This operation continued until 6:30 pm on June 9. During that time we estimate that about 1,080,000 gallons were bypassed.

Pump Station 13 Bypass

Pump Station 13 is located east of the airport at 3634 Amelia Earhart Drive. This station receives the flow being discharged by Pump Station 14, several City of Madison pump stations, and local gravity sewers. The wet well level at Pump Station 13 was 8.2 ft at 9:45 am on June 8. It rose quickly to 11.4 ft at 11:30 am. By 11:50 pm it was at 20.6 ft. To avoid basement backups in this area and to reduce the amount of water that would need to be handled downstream at Pump Station 10, which was already flooded, the decision was made to pump from the wet well to the area surrounding the station. A six inch portable pump pumped from this station from 1:00 am on June 9 to 5:00 am that morning. We estimate that 245,000 gallons were bypassed during this operation.

James Street Bypass

The City of Madison's James Street Pump Station is located along Starkweather Creek at 3135 James Street. This station has two ejectors rather than pumps. The ejectors were not able to keep up with the flow of water coming to the station. Many basements in the area were experiencing sewer backups. One of our mechanics connected a small portable pump to the discharge line from the station to increase the amount of water being pumped. However, this was not enough added capacity to prevent the backups. From 6:00 am to 11:30 am on June 9 a three inch portable was used intermittently to pump water from the collection system to Starkweather Creek. We estimate that about 48,000 gallons were bypassed.

Winnequah Road Bypass

On the morning of June 9 it was discovered that the covers on several manholes along Winnequah Drive had been lifted off of the manholes by the surcharged water. Water had flowed out of the manholes onto lawns along Lake Monona's Squaw Bay. Since the overflows were not reported to us and had stopped by the time we were aware that the covers were off of the manholes, it is difficult to estimate the volumes that were discharged. Since this area is just upstream of the District's Pump Station 7, I compared the ground level of the manholes to the water level in the wet well at Pump Station 7. It appears the level of water in the sewer was probably high enough to lift the covers only from about 10:00 pm to 11:00 pm on June 8. I have estimated no more than 4000 gallons were bypassed.

Pump Station 14 discharge line bypass

The forcemain from Pump Station 14 discharges to the District's 48 inch Northeast Interceptor. On the morning of June 10 it was discovered that the interceptor was surcharged at the point of the forcemain discharge. This caused some of the water being pumped into the interceptor to flow onto the surrounding ground. This is at the south side of the Cherokee Golf Course along Golf Course Road. Later in the afternoon the bypass stopped. This is consistent with our records showing that the water level in the interceptor was beginning to drop. If the bypass was due to high levels in the interceptor, the bypass could have started around 9:00 pm on June 8. We estimate that about 17,200 gallons were bypassed.

Carroll Street bypass:

During the week the forcemain at the City of Madison's Carroll Street Pumping Station at 621 North Carroll Street broke. I do not believe this was related to the storm events. While the forcemain was being repaired, wastewater flowed into Lake Mendota. I understand that reporting of this incident is being handled by the City of Madison.

Effluent Storage Lagoon Diversion

During times when the District's effluent pumps can not discharge effluent faster than it is being produced, the excess water flows into the District's effluent storage lagoons. Treated effluent began to flow into the lagoons at 11:20 am on June 8. All of the treated water was captured in the lagoons until 7:00 am on June 13. At that time the lagoons were full and water began to flow over the weirs at the diversion structure. This water was a combination of the rain that had fallen on the lagoons and the treated effluent that had been placed in it. Daily samples were collected in accordance with our WPDES permit. The results will be submitted to you. Two six-inch pumps have been installed to pump the contents of the lagoon back to the treatment plant. As of Saturday, June 14, the pumps have been turned on. However, it is expected that throughout the day there will be times when treated water will be placed in the lagoons as flows to the plant rise.

The DNR form 3400-184 Sanitary Sewer Overflow or Bypass Notification Summary Report has been completed for each bypass and is included with this letter. If you have any questions about the information that I have supplied, please contact me.

Sincerely,

Paul H Nehm

Paul H. Nehm
Director of Operations and Maintenance

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
Madison Metropolitan Sewerage District	Date: June 9, 2008	Time: ≈ 8:00 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR	**DNR Office and Person Contacted**	
Paul Nehm	Larry Benson Southern District	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
June 8, 2008	9:00 [ ] am [X] pm	June 8, 2008	10:45 [ ] am [X] pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
1 hr 45 min	50,000

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

City of Madison Woodley Pump Station at 2712 Waunona Way in Madison

Circumstances Causing the Overflow or Bypass (check all that apply)

[X] Rain	[ ] Power Outage	[ ] Equipment Failure
[ ] Rain and Snow Melt	[ ] Plugged Sewer	[X] Widespread Flooding
[ ] Snow Melt	[ ] Broken Sewer	[ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Significant widespread flooding cause numerous basement backups in the station service area. The pumps at the station could not keep up because the downstream sewers were surcharged.

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date: June 7, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm	End Date: June 8, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 6.34" on June 7 and 8		Amount of Snow Melt (estimated inches melted):	

Contributing Soil Conditions (saturated, frozen, soil type)

Saturated soils

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to:

☐ Storm sewer. Name of surface water it drains to:

☒ Surface water direct discharge: Water was discharged to Lake Monona at the station

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The station was operating at capacity.
The City of Madison will investigate
sources of inflow and infiltration.

Report Completed By

Authorized Representative Name (Print)	Title
Paul H. Nehm	Director of Operations and Maintenance
Authorized Representative Signature	**Date**
Paul H Nehm	June 14, 2008

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all <u>unscheduled sanitary sewer overflow or bypass occurrences</u>. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

<u>Use one form per occurrence.</u> A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
Madison Metropolitan Sewerage District	Date: June 9, 2008	Time: about 8:00 am [X] am [ ] pm
Person Representing Permittee Who Contacted DNR: Paul Nehm	DNR Office and Person Contacted: Larry Benson Southern District	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
June 9, 2008	12:30 [X] am [ ] pm	June 9, 2008	6:30 [ ] am [X] pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
18 hours	1,080,000

Location of the Overflow or Bypass (complete a separate form for **each discharge** location)

The District's Pump Station 14 at 5000 School Road in Madison

Circumstances Causing the Overflow or Bypass (check all that apply)

- [X] Rain
- [ ] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [X] Widespread Flooding
- [ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Significant widespread flooding caused the well level at the station to reach a level that would cause basement backups.

Wet Weather Data (If applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
June 7, 2008	☐ am ☐ pm	June 8, 2008	☐ am ☐ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 6.34" on June 7 and 8

Amount of Snow Melt (estimated inches melted):

Contributing Soil Conditions (saturated, frozen, soil type): Saturated soils

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to:

☐ Storm sewer. Name of surface water it drains to:

☒ Surface water direct discharge: Discharge was to Cherokee Marsh

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The pumping station was pumping at capacity. Construction is underway to increase the firm capacity of the station. Sources of inflow and infiltration will be investigated.

Report Completed By

Authorized Representative Name (Print)	Title
Paul H. Nehm	Director of Operations and Maintenance

Authorized Representative Signature	Date
Paul H. Nehm	June 14, 2008

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all unscheduled sanitary sewer overflow or bypass occurrences. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
Madison Metropolitan Sewerage District	Date: June 9, 2008	Time: ≈ 8:00 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted	
Paul Nehm	Larry Benson Southern District	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for each occurrence)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
June 9, 2008	1:00 [X] am [ ] pm	June 9, 2008	5:00 [X] am [ ] pm

Duration of the overflow or bypass (hours and minutes): 4 hours

Estimated Volume of Wastewater Discharged (gallons): 245,000

Location of the Overflow or Bypass (complete a separate form for each discharge location)

The Districts' Pump Station 13 at 3634 Amelia Earhart Drive in Madison

Circumstances Causing the Overflow or Bypass (check all that apply)

- [X] Rain
- [ ] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [X] Widespread Flooding
- [ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Significant wide spread flooding caused the well level at the Station to reach a level that would cause basement backups

Wet Weather Data (If applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date June 7, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm	End Date June 8, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy) 6.34" on June 7 and 8		Amount of Snow Melt (estimated inches melted)	

Contributing Soil Conditions (saturated, frozen, soil type)

Saturated soils

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to:

☐ Storm sewer. Name of surface water it drains to:

☒ Surface water direct discharge: Surface discharge eventually flowed to Starkweather Creek

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The pumping station was operating at capacity. Construction is underway to increase the firm capacity of the station. Sources of inflow and infiltration will be investigated.

Report Completed By

Authorized Representative Name (Print)	Title
Paul H Nehm	Director of Operations and Maintenance
Authorized Representative Signature	Date
Paul H Nehm	June 14, 2008

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
Madison Metropolitan Sewerage District	Date: June 9, 2008	Time: ~ 8:00 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR: Paul Nelson	DNR Office and Person Contacted: Larry Benson Southern District	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
June 9, 2008	6:00 [X] am [ ] pm	June 9, 2008	11:30 [X] am [ ] pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
Intermittent over 5 hours 30 minutes	48,000

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

City of Madison James St Pump Station at 3135 James Street in Madison

Circumstances Causing the Overflow or Bypass (check all that apply)

- [X] Rain
- [ ] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [X] Widespread Flooding
- [ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Significant widespread flooding caused numerous basement backups in the station service area. The ejectors at the station could not keep up with the high amount of water flowing into the system

Wet Weather Data (If applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date June 7, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm	End Date June 8, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy) 6.34" on June 7 and 8		Amount of Snow Melt (estimated inches melted)	

Contributing Soil Conditions (saturated, frozen, soil type)

saturated soil

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to:

☐ Storm sewer. Name of surface water it drains to:

☒ Surface water direct discharge: Discharge was to Starkweather Creek at the station

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The station was operating at capacity. We will discuss potential modifications of the station with the city of Madison. Sources of inflow and infiltration will be investigated.

Report Completed By

Authorized Representative Name (Print)	Title
Paul H. Nehm	Director of Operations and Maintenance
Authorized Representative Signature	**Date**
Paul H Nehm	June 14, 2008

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all <u>unscheduled sanitary sewer overflow or bypass occurrences</u>. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
Madison Metropolitan Sewerage District	Date: June 10, 2005	Time: ? ☐ am ☐ pm
Person Representing Permittee Who Contacted DNR	**DNR Office and Person Contacted**	
Paul Nehm	Larry Benson Southern Region	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for each occurrence)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
Estimated June 8	≈ 10:00 ☐ am ☒ pm	Estimated June 8	≈ 11:00 ☐ am ☒ pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
Estimated one hour	4000

Location of the Overflow or Bypass (complete a separate form for each discharge location)

Squaw Bay on Lake Monona along Winnequah Road

Circumstances Causing the Overflow or Bypass (check all that apply)

☒ Rain	☐ Power Outage	☐ Equipment Failure
☐ Rain and Snow Melt	☐ Plugged Sewer	☒ Widespread Flooding
☐ Snow Melt	☐ Broken Sewer	☐ Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Significant widespread flooding caused the well level at Pump Station 7 to rise high enough to surcharge the sewer along Winnequah Road and lift several manhole covers.

Wet Weather Data (If applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date: June 7, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm	End Date: June 8, 2008	Time (to nearest 15 minutes) ☐ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 6.34" on June 7 and 8		Amount of Snow Melt (estimated inches melted)	

Contributing Soil Conditions (saturated, frozen, soil type)

Saturated soils

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to: ______

☐ Storm sewer. Name of surface water it drains to: ______

☐ Surface water direct discharge: ______

☒ Other, describe: Water leaving the manhole flowed across lawns to Lake Monona

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The downstream pumping station was operating at capacity. Sources of inflow and infiltration will be investigated

Report Completed By

Authorized Representative Name (Print)	Title	
Paul H. Nehm	Director of Operations and Maintenance	
Authorized Representative Signature		Date
Paul H. Nehm		June 14, 2008

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all <u>unscheduled sanitary sewer overflow or bypass occurrences</u>. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

<u>Use one form per occurrence.</u> A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name): Madison Metropolitan Sewerage District

Overflow or Bypass Reported To DNR

Date: June 13 Time: ? ☐ am ☐ pm

Person Representing Permittee Who Contacted DNR: Paul Nehm

DNR Office and Person Contacted: Larry Benson Southern Region

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
Estimated June 9, 2008	9:00 ☐ am ☒ pm	June 10, 2008	~ 2:00 ☐ am ☒ pm

Duration of the overflow or bypass (hours and minutes): Estimated 17 hours

Estimated Volume of Wastewater Discharged (gallons): 17,200

Location of the Overflow or Bypass (complete a separate form for **each discharge location**): South of Cherokee Golf Course on Golf Course Road

Circumstances Causing the Overflow or Bypass (check all that apply)

- ☒ Rain
- ☐ Rain and Snow Melt
- ☐ Snow Melt
- ☐ Power Outage
- ☐ Plugged Sewer
- ☐ Broken Sewer
- ☐ Equipment Failure
- ☒ Widespread Flooding
- ☐ Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Surcharging of downstream sewers due to widespread flooding resulted in some of the water being discharged by Pump Station 14 from entering the sewer system

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date: June 7, 2008	Time (to nearest 15 minutes): ☐ am ☐ pm	End Date: June 8, 2008	Time (to nearest 15 minutes): ☐ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 6.34" on June 7 and 8		Amount of Snow Melt (estimated inches melted):	

Contributing Soil Conditions (saturated, frozen, soil type)

Saturated Soils

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☐ Ditch. Name of surface water it drains to: ______

☐ Storm sewer. Name of surface water it drains to: ______

☐ Surface water direct discharge: ______

☒ Other, describe: Ran onto ground and drained to Cherokee Marsh

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

The elevation of the top of the manhole will be raised. Sources of inflow and infiltration will be investigated.

Report Completed By

Authorized Representative Name (Print)	Title
Paul H. Nehm	Director of Operations and Maintenance
Authorized Representative Signature	**Date**
Paul H Nehm	June 14, 2008

QUESTION #17 – JUNE 8, 2008 STORM EVENT

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

Jon W. Schellpfeffer
Chief Engineer & Director

Protecting Public Health and the Environment

COMMISSIONERS

Edward V. Schten
President
Thomas D. Hovel
Vice President
P. Mac Berthouex
Secretary
Caryl E. Terrell
Commissioner
John E. Hendrick
Commissioner

September 24, 2008

Mr. Larry Benson
DNR South Central Region
3911 S. Fish Hatchery Road
Madison, WI 53711

Subject: **Response to June Flooding Events and Subsequent Sewage Overflows**

Dear Mr. Benson:

I am writing to tell you some of the things we are doing to help to reduce the possibility of needing to bypass flows in the northeast portion of the District's collection system during extreme rainfall events. The District is also taking the following actions to lessen the likelihood of future events overwhelming the sewerage system throughout our service area:

1. The District is reviewing its design standards for sizing interceptor sewers and pumping stations. The District currently provides an allowance for high flows in these facilities that varies from peak flow capacities 4.0 times greater than the average daily flows for facilities with average day design flows of one million gallons per day to peak flow capacities 2.5 times greater than the average daily flows for facilities with average day design flows of 20 million gallons per day. The review will include data from the storm events of the past fifteen years. If higher peaking factors are judged to be necessary, the schedule for construction of replacement interceptor sewers and pumping stations will need to be accelerated, and new and replaced facilities will be larger. This will lessen the likelihood of back-ups and overflows and will result in higher costs for service.
2. The District is reviewing its design standards for materials used in constructing interceptor sewers, including manholes, to assure that rain waters are less likely to leak into these facilities during heavy rains and floods.
3. The District is reviewing flow data and inspecting its existing interceptor sewers to identify and repair defects that allowed excessive rain water leakage into the District's system. Although no major defects have been found, several manholes were identified that needed repair upstream of Pumping Station 14.
4. The District is reviewing flow data from its customer communities collected during the recent high flow events. This review will identify likely areas in community sewer systems that experienced excessive leakage during the recent

high flow events. The District will work with these communities to address these areas.

5. The District will make greater efforts to educate the public in the area of water conservation and how to prevent rain water from leaking into basements. Water conservation and reduced inflow will have positive impacts in both dry and wet weather.

The District is in the process of developing a 50 year Master Plan. Included in this plan will be an evaluation of satellite versus central treatment, future growth, and the condition and capacity of existing facilities. The District is also developing an Asset Management strategy for the collection system and the treatment plant.

We are currently in the process of addressing issues in the northeast portion of our collection system.

- Upgrades are being made at Pump Station 13 and Pump Station 14 to increase the firm capacity of each of these stations. The work is expected to be completed in November.
- We are also relining a portion of our Northeast interceptor between Pump Station 13 and Pump Station 14 at the Dane County Regional Airport. This is approximately 5,300 feet of 48 inch diameter pipe that was installed in the 1960's and crosses under two airport runways. Four of the five sections of this project have been completed. The last section is scheduled for installation this week.
- We have recently sent out requests for proposals for design of facilities to address the condition and capacity of our Northeast Interceptor upstream of Pump Station 10. This section of interceptor has less capacity than the interceptors upstream of it. This project will result in the installation of about 9,500 feet of parallel relief sewer or replacement of the existing pipe with a larger diameter pipe.
- The ability to convey additional volumes of water from the northeast portion of our system will require additional capacity downstream. We have purchased land on which to construct Pump Station 18. This station will relieve Pump Station 7 and provide additional pumping capacity directly to the treatment plant. Design is expected to begin in 2010, and the new pump station and force main should be operational by the end of 2013.

We will be continuing our current program of cleaning and televising a portion of our interceptor system each year. This maintenance program helps us to identify those portions of the system which need repairs or capacity improvements.

Please contact me if you have any questions on this information.

Sincerely,

Jon W. Schellpfeffer
Chief Engineer and Director

QUESTION # 26 (B)

Table 2.2
Pumping Station Capacities and Projected Flows
Madison Metropolitan Sewerage District

Pumping Station No.	Diversion Status	Station Maximum Pumping Capacity (mgd)	Station Firm Pumping Capacity (mgd)	Average Flows (mgd)			Benchmark Peak Flows (mgd) per Madison Design Curve[4]			Ratio Firm Capacity / Benchmark		Ratio Max. Capacity / Benchmark	
				2000	2007[1]	2030[3]	2000	2007	2030	2007	2030	2000	2030
1	Normal Scenario: PS15 pumps tp PS8.	38.3	35.3	6.87	5.37	5.54	20.27	16.47	16.91	2.14	2.09	2.33	2.27
2		41.0	41.0	4.48	10.59	10.74	21.34	29.18	29.52	1.41	1.39	1.41	1.39
3		1.5	1.5	0.30	0.34	0.35	1.20	1.36	1.40	1.11	1.08	1.11	1.08
4		4.2	4.2	0.91	1.16	1.03	3.69	4.53	4.10	0.93	1.02	0.93	1.02
5		3.6	3.6	0.70	0.60	0.63	2.80	2.40	2.52	1.50	1.43	1.50	1.43
6		24.2	24.2	7.75	2.60	1.74	15.23	8.94	6.38	2.71	3.80	2.71	3.80
7		45.0	39.0	20.15	16.32	23.94	42.95	41.99	59.85	0.93	0.65	1.07	0.75
8		34.1	34.0	8.77	7.38	9.31	24.89	21.53	26.18	1.58	1.30	1.58	1.30
9		4.5	4.5	0.81	0.87	1.28	3.24	3.48	4.92	1.29	0.91	1.29	0.91
10		42.2	42.2	8.79	8.11	13.26	24.94	23.31	35.26	1.81	1.20	1.81	1.20
11		31.2	25.5	7.50	8.61	15.03	21.82	24.51	39.18	1.04	0.65	1.27	0.80
12		23.5	16.6	4.32	5.42	10.48	13.71	16.60	28.92	1.00	0.57	1.42	0.81
13		20.2	20.0	5.60	6.53	9.14	17.06	19.42	25.77	1.03	0.78	1.04	0.78
14		15.6	15.0	3.34	4.07	5.26	11.04	13.04	16.19	1.15	0.93	1.20	0.96
15		8.8	5.8	1.30	1.27	1.83	4.99	4.89	6.65	1.19	0.87	1.80	1.32
16		18.7	18.7	1.37	1.85	3.05	5.48	6.71	10.23	2.78	1.83	2.78	1.83
17		4.6	4.6	0.67	0.82	3.41	2.68	3.28	11.24	1.40	0.41	1.40	0.41

Pumping Station No.	Diversion Status	Station Maximum Pumping Capacity (mgd)	Station Firm Pumping Capacity (mgd)	Average Flows (mgd)			Benchmark Peak Flows (mgd) per Madison Design Curve(4)			Ratio Firm Capacity / Benchmark		Ratio Max. Capacity / Benchmark	
				2000	2007(1)	2030(3)	2000	2007	2030	2007	2030	2000	2030
8	Alternate Scenario: PS15 pumps to PS16	34.1	34.0	7.47	6.11	7.48	21.75	18.36	21.77	1.85	1.56	1.86	1.57
11		31.2	25.5	8.80	9.88	16.86	24.96	27.52	43.16	0.93	0.59	1.13	0.72
12		23.5	16.6	5.62	6.69	12.31	17.11	19.82	33.12	0.84	0.50	1.19	0.71
15		9.4	4.3	1.30	1.27	1.83	4.99	4.89	6.65	0.88	0.65	1.92	1.41
16		18.7	18.7	2.67	3.12	4.88	9.14	10.43	15.20	1.79	1.23	1.79	1.23

Notes:

1). Year 2007 actual average flows are based on MMSD metered data for PS1, 2, 3, 5, 6, 7, 8, 10, 11, 16 and 17. Pump run-time records are used at all other stations.

2). Year 2007 was selected as the baseline year for recent average annual flows due to the unusually wet weather experienced in 2008. Year 2007 is believed to be a more representative year for purposes of analysis and comparison.

3). Projected Year 2030 average flows are per CARPC's January 2009 report. These flows are generated from population forecasts utilizing traffic analysis zones and application of an uncertainity factor (UF).

4). Benchmark peak flow requirements are computed per Madison Design Curve. Peaking factor of 4.0 applied for all average flowrates less than 1 MGD. Peaking factor of 2.5 applied for all average flowrates greater than 20 MGD. All other peaking factors equal to 4/(ADF)^0.158).

5). Year 2007 flows from PS 1 were apportioned to downstream pumping stations as follows: (a). 5.20 MGD to PS 2; and (b). 0.17 MGD to PS 6. Benchmark peak flows were based on these average flowrates.

6). All flows from PS 15 in Year 2007 were directed to PS 8. No flow was diverted to PS 16.

7). PS15 pump capacities pumping to PS16, as shown, are different than those pumping to PS8.

QUESTION # 28

Table 2.3
Forcemain Capacities and Characteristics
Madison Metropolitan Sewerage District

Pumping Station Forcemain No.	Forcemain Characteristics					Nominal FM Capacity (mgd) based on 8 fps velocity	2030 Benchmark Peak Flows (mgd)	
	Segment Length (feet)	Dia. (inches)	Mat'l	Year Installed	Comments		If PS15 pumps to PS8	If PS15 pumps to PS16
1 (to PS 6)	2,638	30	RCCP	1948		25.4	0.00	
1 (to PS 2)	1,340	24	DI	2000	Segment from PS1 to E. Washington Ave.	16.2	16.91	
	998	20	PVC	1995	Segment under Monona Terrace	11.3		
	14,205	30	DI	2002	Balance of FM from E. Wash. Ave. to PS2	25.4		
2	17,064	36	DI	2001	From PS2 to near old meter vault @ NSWTP	36.5	29.52	
	364	36	DI	2005	Installed during the 10th Addition			
3	5	8	CI	1959	Original forcemain remaining	1.8	1.40	
	21	8	DI	2000	Installed dring PS2FM replacement			
4	100	16	CI	1959	Original forcemain remaining	7.2	4.10	
	60	16	DI	2000	Installed dring PS2FM replacement			
5	28	16	DI	1996	Segment from new PS5 to 1959 junction	7.2	2.52	
	504	16	RCCP	1959	Segment to PS15 FM junction	7.2		
	1,746	24	RCCP	1959	Segment from PS5/15 junction to Whitney	16.2		
6	7,208	36	RCCP	1948		36.5	6.38	
7	6,996	2 x 36	RCCP	1948, 63	Dual forcemains from PS7 to plant grounds	65 (based on 8 fps) 55-60 (based on transients) see note 3 below	59.85	
	1,332	48	RCCP	1963	Through plant grounds to 10th Add connection			
	323	48	DI	2005	Installed during the 10th Addition			
8	13,174	42	RCCP	1964	78' of 42" abandoned during 10th Addition	49.7	26.18	21.77
	194	36	RCCP	1964	Located outside of PS#8	36.5		
	334	42	DI	2005	Installed during the 10th Addition	49.7		
9	4,812	20	DI	1987		11.3	4.92	

Pumping Station Forcemain No.	Forcemain Characteristics					Nominal FM Capacity (mgd) based on 8 fps velocity	2030 Benchmark Peak Flows (mgd)	
	Segment Length (feet)	Dia. (inches)	Mat'l	Year Installed	Comments		If PS15 pumps to PS8	If PS15 pumps to PS16
10	11,112	36	RCCP	1964		36.5	35.26	
11	3,945	36	RCCP	1965	230' of 36" abandoned during 10th Addition	36.5	39.18	43.16
	91	36	DI	2005	Installed during the 10th Addition			
	0	30	RCCP	1964	All 30" was abandoned during 10th Addition			
12	4,795	36	RCCP	1968		36.5	28.92	33.12
13	2,588	36	RCCP	1969		36.5	25.77	
14	4,354	30	RCCP	1971		25.4	16.19	
15 (to PS8)	2,467	24	DI	1974	Segment from PS15 to Thorstrand air release	16.2	6.65	
	4,811	20	DI	1974	Segment from Thorstrand to PS5 FM junction	11.3		
	1,746	24	RCCP	1959	Segment from PS5 FM juction to Whitney Way	16.2		
15 (to PS16)	1,378	24	DI	1974	Segment from PS15 to junction near Univ. Ave.	16.2	6.65	
	4,893	30	RCCP	1982	Segment from FM junction to near PS16	25.4		
16	7,214	36	DI	1979	Segment from PS16 to Gammon high point	36.5	10.23	15.20
	2,965	30	DI	1980	Segment from high point to near Min. Pt. Rd.	25.4		
17	13,357	16	DI	1995	Segment from PS17 to Hwy. 18/151 high pt.	7.2	11.24	
	3,071	20	DI	1995	Forced gravity segment from high pt. to NSVI	11.3		

Notes:

1 Benchmark flows per Table 2.2
2 Nominal FM Capacities shown are based on 8 feet/sec velocity in principal FM segments
3 Limiting capacity for the PS7 FM is 55-60 MGD due to maximum allowable transient pressures in 36"-1948 FM.

QUESTION # 33

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

Jon W. Schellpfeffer
Chief Engineer & Director

Protecting Public Health and the Environment

August 11, 2009

Terri Winans
Waunona Sanitary District No. 2
3325 Thurber Avenue
Madison, WI 53714

Subject: **Request for Efforts to Reduce Infiltration and Inflow**

Dear Ms. Winans:

The District has measured higher than normal volumes of wastewater discharges from Waunona Sanitary District No. 2 over the past eighteen months. This coincides with a period of above normal precipitation and resulting high groundwater levels. The combination of higher than normal wastewater volumes and above normal precipitation and ground water levels indicate potentially excessive amounts of infiltration and inflow (I/I) in your sanitary sewer system. Higher wastewater volumes lead to the need for the Madison Metropolitan Sewerage District to increase the capacity of the conveyance and treatment systems that the District owns and operates. Higher wastewater volumes also increase the District's operating costs. In turn, this increases the sewer service bill we send you each quarter.

If excessive levels of I/I can be eliminated in local sewer systems, the need to expand capacity can be delayed and operating costs for pumping can be reduced. It is generally less expensive to eliminate sources of I/I than to provide capacity and operate a system to handle this clear water. The first step is to identify sources of excessive I/I. Once sources have been identified, remedial efforts can be defined to reduce or eliminate them. Improvements to manholes in flood-prone areas can often be made with limited expense. Improvements include raising the manhole above the flood-zone, replacing leaky adjusting rings, installing gasketed manhole covers, and installing chimney seals.

The Madison Metropolitan Sewerage District requests that Waunona Sanitary District No. 2 include money in your 2010 budget for an I/I study of your sanitary sewer system. Efforts should concentrate in areas with higher groundwater levels, such as near streams, wetlands, and lakes, and on roadways subject to flooding. Inspection of homes for illegally connected sump pumps and roof drains should be conducted as part of this effort. Funding of remedial efforts required in the public portion of your sanitary sewer system, depending on the results of the study, should be considered in the following years. Illegally connected sump pumps and roof drains should be disconnected from the sanitary sewer system as soon as practical, but no more than one year after notification.

metrogro

The Madison Metropolitan Sewerage District will continue to monitor available capacity in our facilities and will upgrade these facilities as necessary to provide capacity for expected growth throughout the District. Your efforts to eliminate excessive I/I will assure that future District expenditures will not be made sooner than necessary, will be limited to the level necessary to provide capacity for expected growth, and not over-sized to handle excessive I/I. Your quarterly charges from the District will also be reduced as this clear water is eliminated from the system.

If you have any questions concerning this request, please contact me by telephone at 222-1201 ext. 266 or by email at jons@madsewer.org. We appreciate your cooperation in assuring continued provision of cost-effective sewer service.

Sincerely,

Jon W. Schellpfeffer
Chief Engineer and Director

Appendix A8

Analysis of West Intercepting System, July 2010

Appendix A8 - Analysis of West Intercepting System
Madison Metropolitan Sewerage District
July, 2010

Outline

This analysis is organized into the following sections:

- Introduction
- Background and History
- CARPC's *Collection System Evaluation*
    - West Interceptor Relief
    - Old West Interceptor
    - Midvale Relief
    - Spring Street Relief
    - Randall Relief
    - Campus Relief
- Conclusions & Recommendations
- Appendices

Introduction

A design memorandum for capacity improvements in the West Intercepting System at the UW campus was included in Appendix V of the 2002 *Collection System Facilities Plan.* The capacity analysis performed in that memo found that the District's interceptors through the west end of campus did not have adequate capacity to serve existing or future peak flows from upstream areas and the UW campus. The memo recommended the installation of a relief interceptor through the west campus area from the intersection of Randall Avenue and Dayton Street to the intersection of Campus Drive and Walnut Street. The District constructed this relief interceptor in four phases, with the first project being completed in 1999 and the final project being completed in 2004.

Even with the Campus Relief project completed, however, the design memo noted that capacity improvements would likely be needed in the West Intercepting System between Walnut Street and Whitney Way in the long term. This appendix will update the 2002 capacity analysis for the West Intercepting System west of Walnut Street based on CARPC's 2009 *Collection System Evaluation.*

Background and History

The West Intercepting System is a complex network of parallel sewers that provides service to the near west side of the City of Madison, the City of Middleton, the Village of Shorewood, and the Town of Westport. In general the system is comprised of two parallel sewer networks that extend westward from Pumping Stations 2 and 8. A more complete description of these improvements and the interconnections in these systems can be found at the end of this document in an internal memo by Gerald Sachs dated July 16, 2008 (Appendix A8-1).

The sewers comprising this system range in age from six to 94 years and in size from 18" to 48". A summary of the main components of the system are shown in Table A8-1:

Table A8-1: West Intercepting System Characteristics

Interceptor Name	Limits		Size (in)	Primary Years of Construction
	From	To		
West Interceptor Relief	Randall Ave & Dayton St	Old Middleton Rd & Whitney Way	21-36	1959
Old West Interceptor	PS 2	PS 15	12-24	1916 & 1931
Midvale Relief	Shorewood Blvd	Midvale Blvd	21	1971
Spring Street Relief	PS 2	Spring St & Randall Ave	24	1940
Randall Relief	PS 8	Randall Ave & Dayton St	33-48	1964
Campus Relief	Randall Ave & Dayton St	Campus Dr & Walnut St	27-48	1999-2004

CARPC's *Collection System Evaluation (2009)*

Much of the West Intercepting System has adequate capacity at this time and in the long term future. The Spring Street Relief, Randall Relief, and Campus Relief are not expected to have capacity needs through the year 2060 according to CARPC's evaluation. CARPC has identified several sections of the West Intercepting System located west of Walnut Street that are in need of capacity relief in the near term. Each major component of the system with near term capacity needs is discussed in turn.

<u>West Interceptor Relief</u>

CARPC's capacity evaluation suggests an urgent need to provide additional capacity in the West Interceptor Relief Sewer (Table A8-2). Their evaluation estimates that approximately 4,300 feet of 24" and 27" sewer between Whitney Way (MH02-545) and Shorewood Boulevard (MH02-036) has already reached capacity, along with another 4,300 feet of 36" sewer between Shorewood Boulevard and Walnut Street. Many other segments of this interceptor are estimated to reach capacity between 2010 and 2020.

Table A8-2: West Interceptor Relief

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-547	MH02-546	497	24	12.57	7.42	59%	7.75	62%	8.15	65%	7.47	59%	8.54	68%	9.52	76%	> 2060
GR	MH02-546	MH02-545	192	27	8.95	7.42	83%	7.75	87%	8.15	91%	7.47	83%	8.54	95%	9.52	106%	> 2060
GR	MH02-545	MH02-538	3,121	27	8.95	9.79	109%	10.22	114%	10.72	120%	10.20	114%	11.21	125%	12.15	136%	**2000**
GR	MH02-538	MH02-536	1,200	24	8.52	9.79	115%	10.22	120%	10.72	126%	10.20	120%	11.21	132%	12.15	143%	**2000**
GR	MH02-536	MH02-535	600	21	10.44	9.79	94%	10.22	98%	10.72	103%	10.20	98%	11.21	107%	12.15	116%	**2010-2020**
GR	MH02-535	MH02-532	841	21	10.44	9.79	94%	10.22	98%	10.72	103%	10.20	98%	11.21	107%	12.15	116%	**2010-2020**
GR	MH02-532	MH02-531A	65	36	12.19	9.98	82%	10.42	85%	10.91	89%	10.39	85%	11.40	94%	12.34	101%	2030-2060
GR	MH02-531A	MH02-519	4,363	36	12.19	12.58	103%	13.07	107%	13.20	108%	12.93	106%	14.17	116%	15.27	125%	**2000**
GR	MH02-519	MH02-518	465	36	25.85	12.58	49%	13.07	51%	13.62	53%	12.93	50%	14.17	55%	15.27	59%	> 2060
SI	MH02-518	MH02-516	204	36	12.19	12.58	103%	13.07	107%	13.62	112%	12.93	106%	14.17	116%	15.27	125%	2000
GR	MH02-516	MH08-228	10	36	12.19	14.21	117%	14.66	120%	15.16	124%	14.45	119%	15.67	129%	16.75	137%	2000
GR	MH08-228	MH02-513	1,112	36	12.19	6.68	55%	6.89	57%	7.13	58%	6.79	56%	7.36	60%	7.87	65%	> 2060
GR	MH02-513	MH08-209	2,175	36	12.19	9.29	76%	9.77	80%	10.28	84%	9.47	78%	10.78	88%	11.92	98%	> 2060
GR	MH08-209	MH08-207	625	36	12.19	7.74	63%	8.01	66%	8.30	68%	7.80	64%	8.59	70%	9.42	77%	> 2060
GR	MH08-207	MH02-503	463	36	12.19	3.63	30%	3.76	31%	3.90	32%	3.66	30%	4.03	33%	4.40	36%	> 2060
GR	MH02-503	MH02-502	142	36	12.19	3.63	30%	3.76	31%	3.90	32%	3.66	30%	4.03	33%	4.40	36%	> 2060
GR	MH02-502	MH02-014A	513	36	12.19	5.34	44%	5.48	45%	5.63	46%	5.31	44%	5.78	47%	6.23	51%	> 2060

Table A8-3: 2010 Average Daily Flows to West Interceptor Relief

	PS 15	PS 5	Gettle PS	Gravity Flow	Total Flow
2010 Measured Flows[(1)]	1.34	0.67	0.70	0.03	2.74
2010 CARPC Flows	1.58	0.61	0.85		3.05
Notes: (1). January, 2010 through June, 2010 (2). All values in units of 'mgd'.					

It appears that CARPC's projections for 2010 flowrates are reasonable. The upstream terminus of the West Interceptor Relief receives flow from four major sources: (1). Pumping Station No. 15; (2). Pumping Station No. 5; (3). City of Madison's Gettle Pumping Station; and (4). Gravity flow near Whitney Way and Old Middleton Road. A summary of these flows based on MMSD pumping records and a comparison to CARPC's flow projections is shown in Table A8-3.

Hydraulic modeling of the West Interceptor Relief Sewer indicates that appreciable surcharging is expected to occur in sewer segments west of Shorewood Boulevard for CARPC's 2010 UF flows (see Appendix A8-2). Field monitoring of this interceptor during wet weather events and historical data does not confirm the surcharging indicated by CARPC's analysis or by the hydraulic model, however. It is possible that this interceptor is able to withstand a certain degree of surcharging without adverse effects due to the lack of local main and lateral connections between Whitney Way and Shorewood Boulevard.

The hydraulic model was used to simulate the effect of a 36" sewer built parallel to the West Interceptor Relief between Walnut Street and Whitney Way. This sewer should have adequate capacity to convey the flows projected by CARPC for 2060. No surcharging is observed in either of the 36" sewers for CARPC's 2060 peak flowrate of 15.3 mgd through the system (see Appendix A8-3).

The Campus Relief (Phase IV) project ended just east of Walnut Street. It is assumed that a new relief sewer for the West Interceptor Relief would begin on the west side of Walnut Street and that the existing siphon underneath Walnut Street would not receive additional capacity. Construction of a new siphon at this road crossing is not feasible due to the adjacent bridge abutments in the area. The hydraulic model estimates a difference in water surface elevation of approximately seven inches across the siphon for CARPC's 2060 projected flowrate of 15.3 mgd. Thus, the existing siphon should be adequate. The siphon was cleaned in 2008 and was found to be in reasonably good condition.

The most likely route for installation of a new relief sewer from the west side of Walnut Street to Whitney Way is parallel to the existing West Interceptor Relief. The new sewer would be located in or just outside the existing railroad corridor along the entire length. There are many existing utilities along this corridor and construction would be difficult. Additionally, the City of Madison has plans to install a new storm box culvert between Shorewood Drive and Walnut Street along this same corridor and the new relief sewer would need to be closely coordinated with that project.

Old West Interceptor

The Old West Interceptor (OWI) is one of the District's oldest facilities in the collection system. It was constructed in 1916 from Pumping Station No. 2 to the intersection of University Avenue and Farley Avenue and extended to the City of Middleton in 1931. Those portions of the OWI which are upstream of Pumping Stations No. 5 and 15 have sufficient capacity for projected 2060 flows. The OWI upstream of PS No. 5 and along the shore of Lake Mendota (MH05-011 to MH05-021) was rehabilitated with a cured-in-place-pipe (CIPP) in 2011. CARPC's analysis of the OWI (see Table A8-4) indicates two sections with capacity needs prior to 2030: (1). Approximately 4,000 feet of 18”-21” sewer on University Avenue between Farley Avenue and Paunack Place; and (2). Approximately 2,200 feet of 24” sewer on Regent Street between S. Orchard Street and N. Murray Street.

University Avenue Section

CARPC’s capacity evaluation estimates that capacity in the Old West Interceptor on University Avenue from Farley Avenue to Paunack Place will be reached between 2010 and 2020. Hydraulic modeling of this section shows moderate surcharging between two and three feet between MH02-032 (Walnut Street) and MH02-042 (Ridge Street) for 2020 UF flows (see Appendix A8-4).

The City of Madison has plans for a full reconstruction of University Avenue between Grand Avenue and Breese Terrace in 2011. Given the age and possible hydraulic constraints in this section prior to 2020, an opportunity exists for the District to replace or rehabilitate the Old West Interceptor as part of the City’s street reconstruction project. As mentioned in the previous section, there is also a need to provide additional capacity in the West Interceptor Relief Sewer in the near term. The West Interceptor Relief and Old West Interceptor run roughly parallel to each other from the western edge of the UW campus to Whitney Way. Rather than provide additional capacity in each system, it would be more cost effective for the District to interconnect portions of these two systems and build additional capacity in only one system (i.e. a parallel relief sewer to the West Interceptor Relief).

Downstream of Pumping Station No. 5 the Old West Interceptor serves the Village of Shorewood and the City of Madison. This includes flows from subbasins 8-H, 8-I, and 8-J on Figure A8-1. Most of the future growth and increased flows to this interceptor are estimated to occur in the Hilldale Mall area (Subbasin 8-H). In order to alleviate overloading of the OWI, flows from Subbasin 8-H could be diverted from the OWI to the West Interceptor Relief at MH02-043 near Ridge Street upon installation of a new 36” relief sewer. Thus, the section from MH02-060 to MH02-043 would connect to the West Interceptor Relief sewer at MH02-528. Under this scenario the section from MH02-042 to MH02-513 would receive flow only from subbasins 8-I and 8-J, which are both located entirely in the City of Madison. A comparison of the projected flowrates for existing conditions and the OWI flow diversion scenario is presented in Table A8-5.

Table A8-5 demonstrates that diverting flows in subbasin 8-H away from the OWI and into the West Interceptor Relief system will alleviate capacity exceedances in this section of the OWI through the year 2060. A new relief sewer for the West Interceptor Relief system would have to be designed to accept this additional flow. Even without the need to provide additional capacity in this section of the OWI, it should be rehabilitated with a cured-in-place liner given its age and condition history (numerous cracked sections of VC pipe). This rehabilitation should take place in conjunction or shortly after the City’s street reconstruction project in 2011.

The City of Madison has indicated a desire to provide direct connections from homes and businesses to the OWI along University Avenue. Given the proposed flow diversion in the OWI,

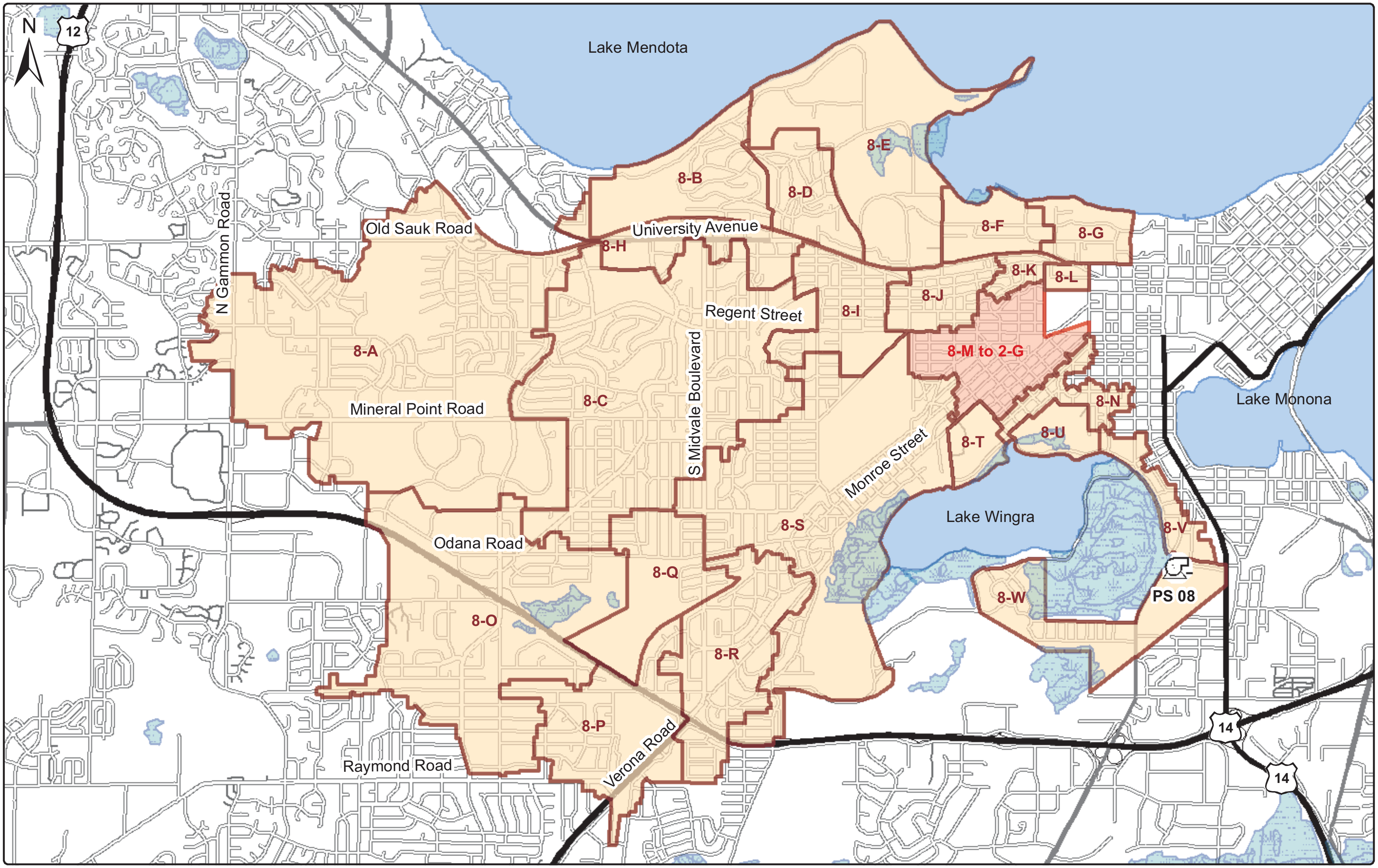
Table A8-4: Old West Interceptor (Downstream of PS 5 to PS 2)

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-060	MH02-047	5,066	12-18	2.09	*0.71*	34%	*0.89*	43%	*1.07*	51%	*0.82*	39%	*1.25*	60%	*1.84*	88%	> 2060
GR	MH02-047	MH02-041	1,914	18	2.71	*0.71*	26%	*0.89*	33%	*1.07*	39%	*0.82*	30%	*1.25*	46%	*1.84*	68%	> 2060
GR	MH02-041	MH02-038	1,063	18	2.71	*1.40*	52%	*1.67*	62%	*1.93*	71%	*1.49*	55%	*2.20*	81%	*2.93*	108%	2030-2060
GR	MH02-038	MH02-034	1,460	18	1.92	*1.40*	73%	*1.67*	87%	*1.93*	101%	*1.49*	78%	*2.20*	115%	*2.93*	153%	**2010-2020**
GR	MH02-034	MH02-032	816	20	2.84	*2.41*	85%	*2.76*	97%	*3.11*	110%	*2.49*	88%	*3.47*	122%	*4.28*	151%	**2010-2020**
GR	MH02-032	MH02-513	1,704	21	3.24	*2.41*	74%	*2.76*	85%	*3.11*	96%	*2.49*	77%	*3.47*	107%	*4.28*	132%	**2020-2030**
GR	MH02-021	MH02-014A	2,153	24	4.85	*3.44*	71%	*3.33*	69%	*3.22*	66%	*3.11*	64%	*3.11*	64%	*3.11*	64%	> 2060
GR	MH02-012	MH02-011	450	24	4.62	*0.00*	0%	*1.36*	29%	*1.52*	33%	*1.25*	27%	*1.68*	36%	*2.06*	45%	> 2060
GR	MH02-011	MH02-008	900	24	4.62	*5.65*	122%	*6.95*	150%	*7.32*	158%	*6.59*	143%	*7.69*	166%	*8.85*	192%	**2000**
GR	MH02-008	MH02-005A	1,260	24	5.27	*5.65*	107%	*6.95*	132%	*7.32*	139%	*6.59*	125%	*7.69*	146%	*8.85*	168%	**2000**
GR	MH02-005A	MH02-402	1,296	30	12.43	*5.65*	45%	*6.95*	56%	*7.32*	59%	*6.59*	53%	*7.69*	62%	*8.85*	71%	> 2060
GR	MH02-005	MH02-101	1,268	24	8.89	*0.23*	3%	*0.22*	2%	*0.22*	2%	*0.21*	2%	*0.21*	2%	*0.21*	2%	> 2060
GR	MH02-101	MH02-402	10	36	26.21	*7.38*	28%	*7.93*	30%	*8.47*	32%	*8.08*	31%	*9.01*	34%	*11.16*	43%	> 2060
GR	MH02-402	MH02-401	284	48	24.55	*11.97*	49%	*13.61*	55%	*14.43*	59%	*13.42*	55%	*15.25*	62%	*18.24*	74%	> 2060
GR	MH02-401	PS2	30	48	37.12	*12.83*	35%	*14.45*	39%	*15.25*	41%	*14.10*	38%	*16.04*	43%	*19.14*	52%	> 2060

Table A8-5: Comparison of Flows in Old West Interceptor on University Avenue

Section		Capacity (mgd)	Scenario	CARPC Projected Peak Flows (mgd)		
				2010 UF	2030 UF	2060 UF
MH02-041	MH02-038	2.71	Existing WI	1.67	2.20	2.93
			OWI Diversion	0.77	0.94	1.09
MH02-038	MH02-034	1.92	Existing WI	1.67	2.20	2.93
			OWI Diversion	0.77	0.94	1.09
MH02-034	MH02-032	2.84	Existing WI	2.76	3.47	4.28
			OWI Diversion	1.87	2.21	2.49
MH02-032	MH02-513	3.24	Existing WI	2.76	3.47	4.28
			OWI Diversion	1.87	2.21	2.49

2.93 Denotes capacity exceeded in section for specified time increment



Sub-Basins in 2000
Removed in 2003
Potential by 2030
Potential by 2060
DNR Wetlands

PUMPING STATION 8 SUB-BASINS
MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 0.5 1 2 Miles

MMSD

Figure A8-1

the request to allow direct connections is feasible given that the sewer will act more like a local sewer with regards to flowrate. Additionally, since this section of the OWI will serve only City of Madison customers, it may make sense for the District to transfer ownership of this sewer to the City of Madison upon completion of the flow diversion project.

Regent Street Section

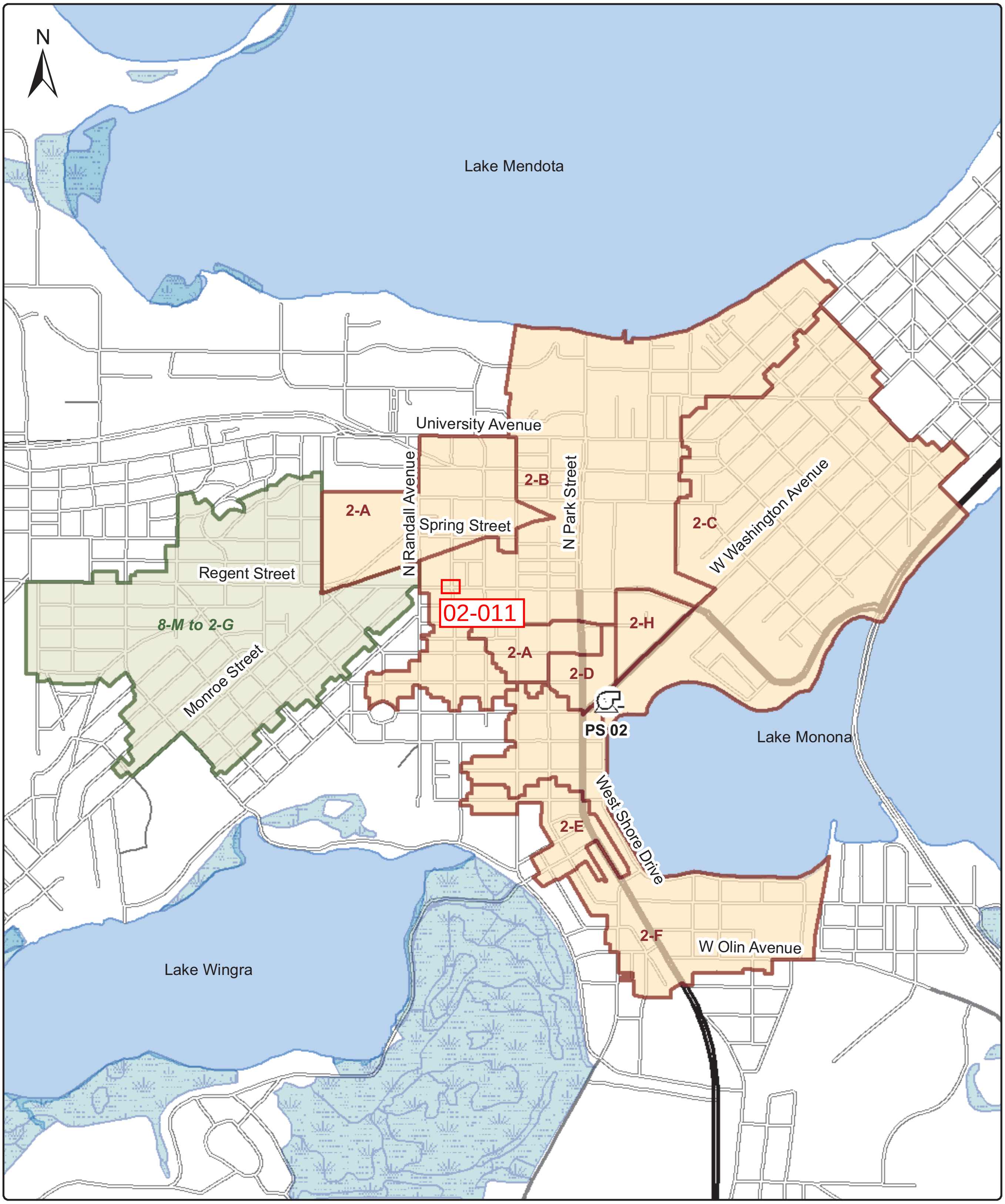
CARPC's analysis in Table A8-4 shows that capacity in the 24" section between S. Orchard Street and N. Murray Street was exceeded in the year 2000. This section of cast iron sewer was constructed in 1916 by the City of Madison and transferred to MMSD in 1933. The analysis for this system assumes that all flow from subbasin 2-B flows into the OWI at MH02-011 (see Figure A8-2). Basin 2-B comprises much of the flow from the west side of downtown Madison and is estimated to be 1.60 mgd for 2010 UF flows. The effect of inputting all of the flow from subbasin 2-B into MH02-011 is shown in Figure A8-3. The capacity in all segments downstream of MH02-011 in the OWI would be exceeded for this assumption.

In looking at the City of Madison's sanitary sewer records, however, subbasin 2-B discharges to MMSD's West Interceptor primarily in two locations: (1). An 18" sewer on N. Park Street (MH02-006A); and (2). A 30" sewer along the southerly extension of East Campus Mall (MH02-402). Using a rough assumption that the total flow from subbasin 2-B is apportioned equally to these two discharge points, a revised analysis shows that capacity is not currently exceeded in the OWI on Regent Street (see Figure A8-4).

Previous inspection of this sewer section has revealed severe mineral deposits and tuberculation along its entire length. Therefore, the diameter and capacity of this sewer section may be somewhat smaller than the values indicated in Table A8-4 due to the deteriorated pipe condition. If it were assumed that mineral deposits had built up to a depth of one inch around the circumference of the 24" pipe, the capacity from N. Mills Street to N. Murray Street would be reduced from approximately 5.27 mgd to 4.19 mgd. A brief summary of revised flowrates for different time periods and diameters of the OWI are shown in Table A8-6.

Table A8-6: Revised Flowrate Analysis for Old West Interceptor on Regent Street

				Peak Flowrates (mgd)		
From	**To**	**Pipe diameter (in)**	**Pipe Capacity (mgd)**	**2010 UF**	**2030 UF**	**2060 UF**
MH02-012	MH02-008	24	4.62	1.36	1.68	2.06
		22	3.68			
MH02-008	MH02-005A	24	5.27	4.47	4.98	5.76
		22	4.19			
MH02-005A	MH02-402	30	12.43	6.95	7.69	8.85



Sub-Basins in 2000
Added in 2003
Potential by 2060
DNR Wetlands

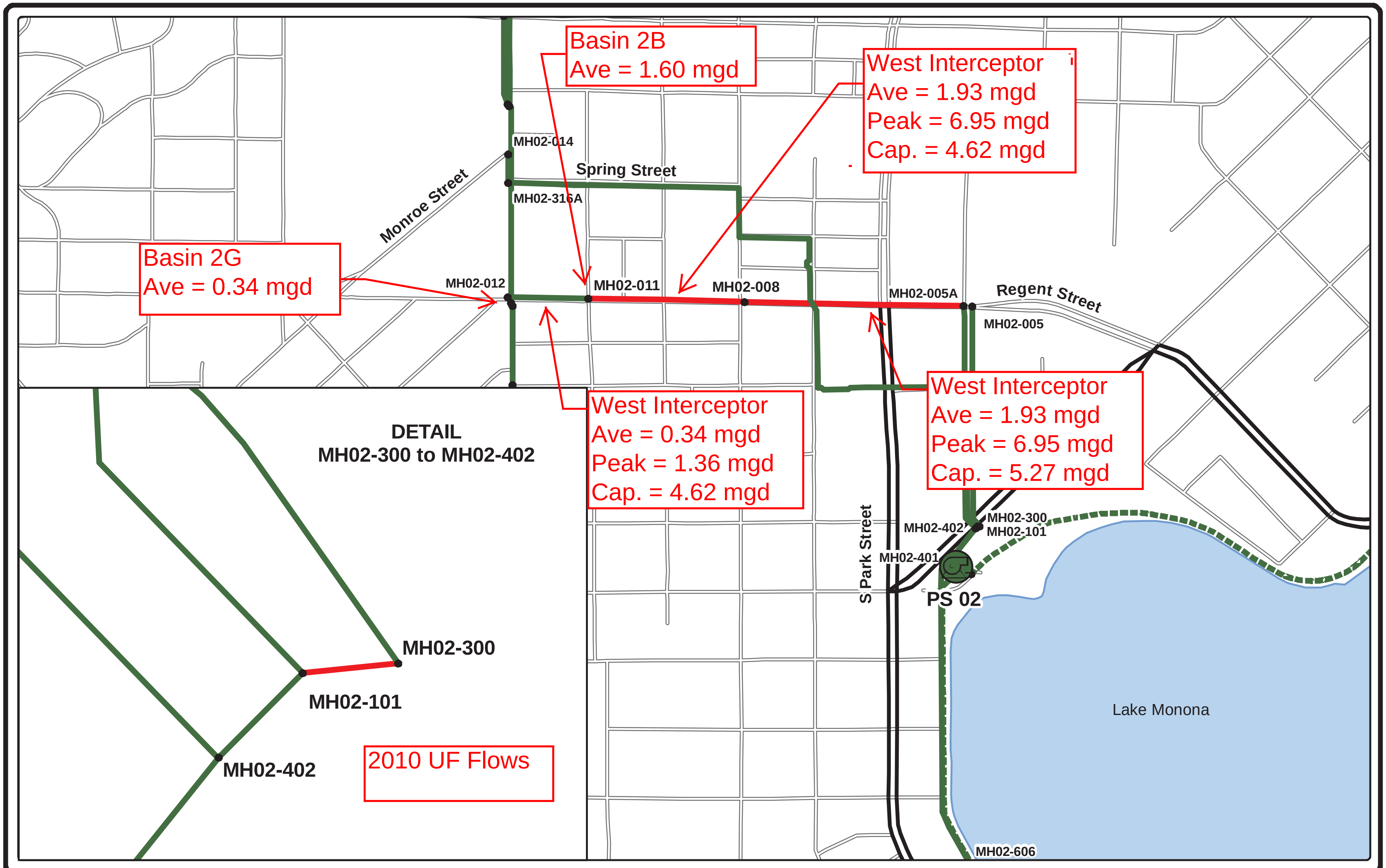
PUMPING STATION 2 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 0.25 0.5 1 Miles

Figure A8-2

12/23/2008



Capacity Reached

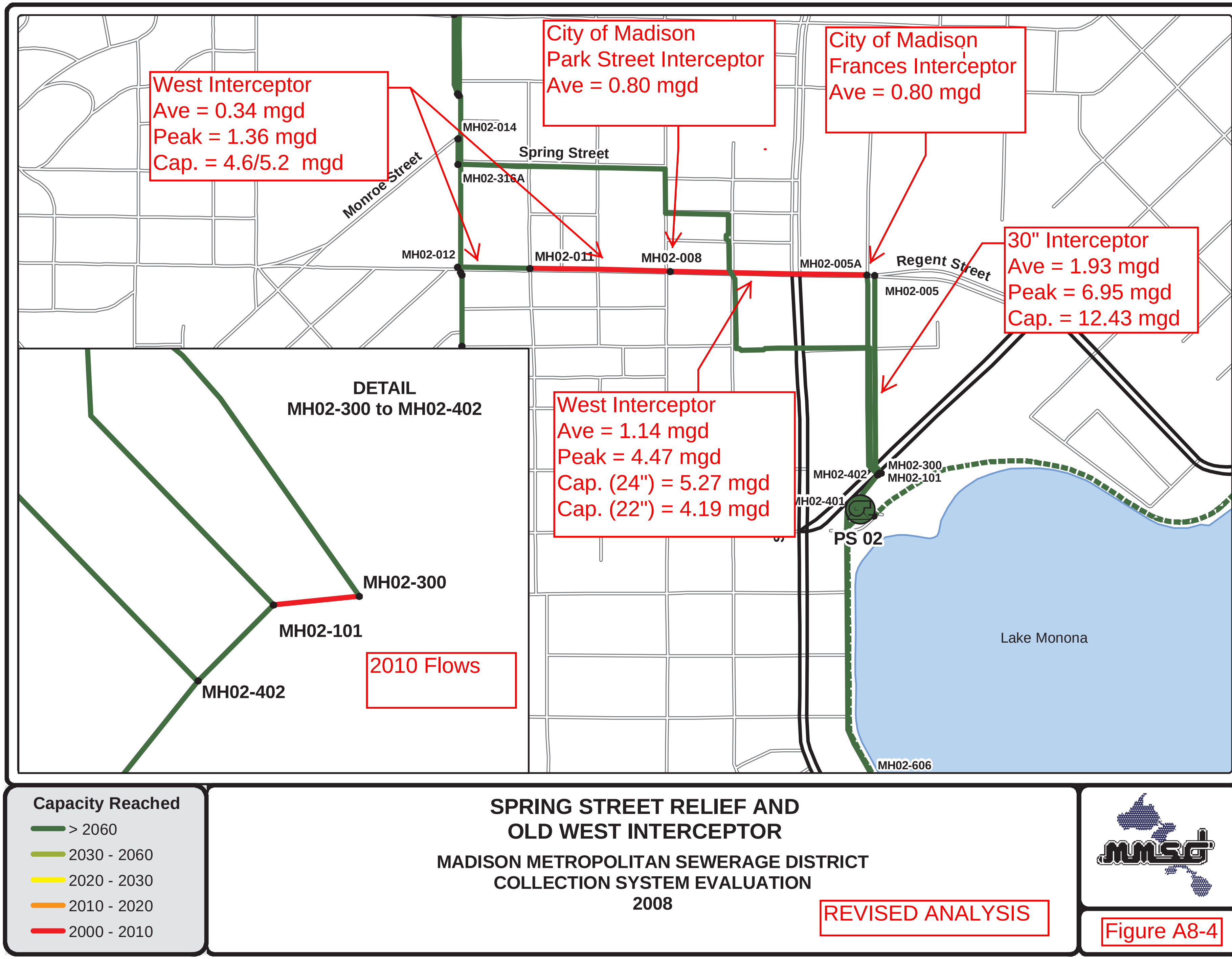
- > 2060
- 2030 - 2060
- 2020 - 2030
- 2010 - 2020
- 2000 - 2010

SPRING STREET RELIEF AND OLD WEST INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

Figure A8-3

12/23/2008



SPRING STREET RELIEF AND OLD WEST INTERCEPTOR

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

REVISED ANALYSIS

Figure A8-4

Table A8-6 shows that the section from MH02-012 to MH02-008 has adequate capacity until 2060 for a 24” sewer and a 22” sewer in a deteriorated condition. The section from MH02-008 to MH02-005A should have adequate capacity to convey flows up to the year 2030, but may not have sufficient capacity if a deteriorated 22” pipe is assumed. A more thorough flow analysis is required to assess capacity needs in this section beyond 2030, however. No capacity upgrades are anticipated for the section from MH02-005A to MH02-402 prior to 2060.

In summary, it does not appear that the Old West Interceptor on Regent Street has imminent capacity needs as suggested by CARPC’s *Collection System Evaluation.* While it appears that adequate capacity exists at this time, a more detailed study of this system should be performed. This study should include a more thorough analysis of the flow distribution between the City of Madison’s N. Park Street and Frances Street Interceptors and a television inspection of the OWI to verify pipe condition and actual carrying capacity.

Midvale Relief

CARPC’s analysis shows that capacity in the Midvale Relief will be reached sometime between 2020 and 2030 (Table A8-7). This 21” sewer is approximately 2,650 feet in length and extends along University Avenue from Shorewood Boulevard to Midvale Boulevard. Hydraulic modeling of this sewer section demonstrates that the water surface elevation is impacted by downstream conditions in the West Relief Interceptor. With the West Interceptor Relief flowing nearly full, the surcharge depth on segments in the Midvale Relief is modeled to be approximately one to two feet for CARPC’s 2010 peak flow estimates (Appendix A8-5). In looking at Appendix A8-5, however, it should be noted that the hydraulic grade line for the Midvale Relief is below the elevation for most of the local sewers along its length.

Much of the surcharging problem can be attributed to the elevation at which the 21” Midvale Relief sewer connects to the 36” West Interceptor Relief sewer at MH02-531A. Normally in cases where sewers of different diameters connect the elevations would be set such that the crowns of the sewers are at the same elevation. In this instance, the sewer inverts are at the same elevation at the connection point.

This causes the smaller sewer to surcharge when the larger sewer is flowing full. Unfortunately there is no opportunity to match crowns at the connection point for these two sewers as the West Interceptor Relief sewer cannot be lowered any further between Shorewood Boulevard and Walnut Street. The surcharging situation is much improved in the Midvale Relief sewer with the addition of a new 36” relief sewer for the West Interceptor Relief system (Appendix A8-6). In this scenario there is little to no surcharging in the Midvale Relief for CARPC’s 2010 peak flow projections. With only modest growth expected in the Midvale Relief basin until year 2060, the modeled surcharge is approximately one foot for 2060 flows with a new relief sewer for the West Interceptor Relief.

Table A8-7: West Interceptor – Midvale Relief

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-531I	MH02-531A	2,653	21	3.55	*3.19*	90%	*3.32*	94%	*3.44*	97%	*3.16*	89%	*3.57*	101%	3.88	109%	**2020-2030**

Table A8-8: West Interceptor – Spring Street Relief

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-014	MH02-316A	150	24	7.73	*2.23*	29%	*2.22*	29%	*2.20*	28%	*2.05*	27%	2.19	28%	*2.35*	30%	> 2060
GR	MH02-316A	MH02-300	4,577	24	6.54	*2.23*	34%	*2.22*	34%	*2.20*	34%	*2.05*	31%	2.19	33%	*2.35*	36%	> 2060
GR	MH02-300	MH02-101	3	24	6.54	*7.20*	110%	*7.76*	119%	*8.31*	127%	*7.92*	121%	8.86	135%	*11.01*	168%	**2000**

Table A8-8(1): West Interceptor – Spring Street Relief (Revised)(1)

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-014	MH02-316A	150	24	7.73	*2.23*	29%	*2.22*	29%	*2.20*	28%	*2.05*	27%	2.19	28%	*2.35*	30%	> 2060
GR	MH02-316A	MH02-300	4,577	24	6.54	*2.23*	34%	*3.60*	55%	*3.58*	55%	*3.43*	52%	3.57	55%	*3.73*	57%	> 2060
GR	MH02-300	MH02-101	3	24	6.54	*7.20*	110%	*9.14*	140%	*9.69*	148%	*9.3*	142%	10.24	157%	*12.39*	189%	**2000**

Notes: (1). Includes intermittent peak wet weather flow from UW Charter Street Heating Plant. This permitted flow expected to cease in 2011-12.

Spring Street Relief

The Spring Street Relief was constructed in 1940 to provide relief for the West Interceptor on the near west side of the City of Madison. It extends from Pumping Station No. 2, travels through the Regent Street area, and connects to the OWI at the intersection of Spring Street and Randall Avenue. Per Table A8-8, adequate capacity exists in all segments of this relief sewer through the year 2060 except for a three-foot segment of 24" sewer just upstream of PS 2. Hydraulic modeling of this short segment of sewer shows negligible surcharge for 2010 flows and does not indicate a need or benefit to replacing this section in the near term (see Appendix A8-7).

The Spring Street Relief sewer receives flow from several unique sources on the UW campus, including Camp Randall stadium and the UW heating plant on Charter Street. The average daily flow from Camp Randall in 2000 was 41,016 gallons per day according to City of Madison Water Utility data. However, a peak instantaneous flowrate of 1.43 mgd was used for the design of the restrooms at the stadium. While it is unlikely that the peak flow from the stadium actually reaches this value, Table A8-8 suggests that the Spring Street Relief has adequate capacity to accommodate the flow if necessary.

In 2007 MMSD granted permission to representatives of the UW's Charter Street heating plant for a discharge of up to 1.38 mgd into the Spring Street Relief sewer at MH02-312A. The discharge is comprised primarily of stormwater runoff from an area surrounding the plant's coal unloading station. The dust created from the unloading operation is considered unsuitable for discharge into the public stormwater system. As shown in the revised analysis of system capacity in Table A8-8(1), this additional flow does not have an appreciable effect for much of the Spring Street Relief sewer. The University intends to cease the burning of coal at the plant in 2011 or 2012 and switch to natural gas as its primary fuel. It is expected that the District's permit to allow stormwater into the Spring Street Relief sewer will expire with the transition to a new fuel source.

Randall Relief

The Randall Relief was constructed in 1964 from Pumping Station No. 8 to the intersection of Dayton Street and Randall Avenue. CARPC's evaluation indicates that capacity is adequate for all sections of this interceptor through the year 2060 (Table A8-9). A small exceedance in capacity is projected for two 30" sewers passing underneath a City of Madison storm box at the intersection of Regent Street and Randall Avenue, although it is relatively minor and should not be a cause for concern at this time.

Table A8-9: West Interceptor - Randall Relief to PS 8

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH02-014A	MH08-201	29	33	25.10	*7.97*	32%	*8.02*	32%	*8.08*	32%	*7.71*	31%	*8.15*	32%	*8.56*	34%	> 2060
GR	MH08-201	MH08-121	1,127	33	25.10	*19.93*	79%	*20.45*	81%	*21.02*	84%	*19.83*	79%	*21.58*	86%	*23.23*	93%	> 2060
GR	MH08-121	MH08-120	16	2@30	21.13	*19.93*	94%	*20.45*	97%	*21.02*	99%	*19.83*	94%	*21.58*	102%	*23.23*	110%	**2020-2030**
GR	MH08-120	MH08-119	473	42	25.17	*19.93*	79%	*20.45*	81%	*21.02*	84%	*19.83*	79%	*21.58*	86%	*23.23*	92%	> 2060
GR	MH08-119	MH08-117	1,201	42	25.17	*20.67*	82%	*20.45*	81%	*21.02*	84%	*19.83*	79%	*21.58*	86%	*23.23*	92%	> 2060
GR	MH08-117	MH08-113	1,479	42	25.17	*20.93*	83%	*20.70*	82%	*21.27*	85%	*20.08*	80%	*21.83*	87%	*23.48*	93%	> 2060
GR	MH08-113	MH08-109	1,237	48	27.84	*20.75*	75%	*20.61*	74%	*21.12*	76%	*20.01*	72%	*21.63*	78%	*23.22*	83%	> 2060
GR	MH08-109	MH08-106	1,279	48	27.84	*21.07*	76%	*20.94*	75%	*21.45*	77%	*20.34*	73%	*21.96*	79%	*23.54*	85%	> 2060
GR	MH08-106	PS 8	3,179	48	30.78	*24.90*	81%	*24.74*	80%	*25.34*	82%	*24.04*	78%	*25.94*	84%	*27.80*	90%	> 2060
FM	PS 8	RD08-13205	194	36	36.50	*25.13*	69%	*24.97*	68%	*25.57*	70%	*24.27*	66%	*26.17*	72%	*28.02*	77%	> 2060
FM	RD08-13205	WWTP	13,508	42	49.70	*25.13*	51%	*24.97*	50%	*25.57*	51%	*24.27*	49%	*26.17*	53%	*28.02*	56%	> 2060

Table A8-10: West Interceptor - Campus Relief

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH08-228	MH08-223	1,933	36	15.04	*7.53*	50%	*7.77*	52%	*8.04*	53%	*7.66*	51%	*8.30*	55%	*8.88*	59%	> 2060
GR	MH08-223	MH08-221	161	36	15.04	*9.69*	64%	*9.90*	66%	*10.15*	67%	*9.70*	64%	*10.39*	69%	*11.01*	73%	> 2060
GR	MH08-221	MH08-220	118	2 @ 24	15.64	*9.69*	62%	*9.90*	63%	*10.15*	65%	*9.70*	62%	*10.39*	66%	*11.01*	70%	> 2060
GR	MH08-220	MH08-216	514	36	15.04	*9.69*	64%	*9.90*	66%	*10.15*	67%	*9.70*	64%	*10.39*	69%	*11.01*	73%	> 2060
GR	MH08-216	MH08-210	1,051	36	16.40	*9.69*	59%	*9.90*	60%	*10.15*	62%	*9.70*	59%	*10.39*	63%	*11.01*	67%	> 2060
GR	MH08-210	MH08-209	64	36	15.04	*9.69*	64%	*9.90*	66%	*10.15*	67%	*9.70*	64%	*10.39*	69%	*11.01*	73%	> 2060
GR	MH08-209	MH08-208	629	48	34.68	*9.52*	27%	*9.87*	28%	*10.25*	30%	*9.62*	28%	*10.63*	31%	*11.51*	33%	> 2060
GR	MH08-208	MH08-207	12	36	15.04	*9.52*	63%	*9.87*	66%	*10.25*	68%	*9.62*	64%	*10.63*	71%	*11.51*	77%	> 2060
GR	MH08-207	MH08-201	1,234	36	17.80	*13.64*	77%	*14.13*	79%	*14.66*	82%	*13.77*	77%	*15.18*	85%	*16.54*	93%	> 2060

City of Madison storm box at the intersection of Regent Street and Randall Avenue, although it is relatively minor and should not be a cause for concern at this time.

Campus Relief

The Campus Relief project was completed in four construction phases, beginning in 1999 and ending in 2004. The project added additional capacity to the West Intercepting system through the UW campus area from the intersection of Dayton Street and Randall Avenue to the intersection of Campus Drive and Walnut Street. As shown in Table A8-10, adequate capacity is available in this interceptor system through the year 2060.

Conclusions and Recommendations

The West Intercepting System is a complex network of parallel and interconnected sewers that has been constructed and continually updated to provide sewer service to the west side of the City of Madison and surrounding communities. According to CARPC's *2009 Collection System Capacity Evaluation* and analysis by District staff, adequate capacity is sufficient in several portions of the system through 2060, including:

- WI – Spring Street Relief
- WI – Randall Relief
- WI – Campus Relief

Other portions of the system require additional capacity prior to 2060. The following recommendations provided in Table A8-10 are a general guideline for improvements needed for the West Intercepting System within the next twenty years.

Table A8-10: Summary of Improvements for West Side Conveyance System

Facility	Limits: From	Limits: To	Improvements	Timeline
West Interceptor Relief	Walnut Street (MH02-517)	Whitney Way (MH02-547)	Construct 36" (or 42") interceptor parallel to existing interceptor	2015-2020
Old West Interceptor	Grand Avenue (MH02-037)	Forest Street (MH02-030)	Rehabilitate aging 18"-21" VP with cured-in-place liner	2011-2012
Old West Interceptor	University Ave & Ridge St (MH02-043)		Divert flow from old West Interceptor into West Interceptor Relief Sewer system (existing 36" WI Relief parallel to future 36" relief sewer)	2015-2020

Appendix A8-1

MADISON METROPOLITAN SEWERAGE DISTRICT
1610 MOORLAND ROAD
MADISON, WI 53713-3398
PHONE (608) 222-1201
FAX (608) 222-2703

MEMO

DATE: 7/16/08
TO: Bruce Borelli, DOE
From: Gerald Sachs, Municipal Engineer
RE: Collection System Evaluation-West Interceptor System Capacity

This Memo is a follow up to discussions regarding the capacity analysis of the West Interceptor System. The West Intercepting System consists of parallel and connecting interceptors built over time to serve the west side of the District. These interceptors extend from Pumping Stations 2 and 8 westward to Pumping Station 15 and are comprised of nine separate projects: West Interceptor-1916, West Interceptor Relief-1959, Randall Relief-1962, Midvale Relief-1971, Spring Harbor Relief-1972, and the four Campus Relief projects built from 1999 to 2004.

The interceptors, while parallel and connected in various locations, are not totally interconnecting allowing free flow from one to another. The system is best described as two parallel interceptors at different elevations with parallel interconnecting legs.
The original West Interceptor extends from Pumping Station 2 at Brittingham Park westerly along Regent St, Randall Ave, and University Ave ending at Shorewood Blvd. The Randall Relief extends northerly from Pumping Station 8 intersecting the West Interceptor in Randall Ave at MH02-014A. The West Interceptor Relief joins both the West Interceptor and Randall Relief at MH02-014A and extends northerly up Randall Ave, westerly along University Ave and the railroad corridor through Shorewood Hills to Whitney Way, then to Pumping Station 5. The Midvale Relief joins the West Interceptor Relief at MH02-531A in Shorewood Blvd. and extends west along University Ave to Midvale Blvd. The Spring Harbor Relief joins the West Interceptor Relief at the end of the Pumping Station 5 force main and extends westerly along University Ave, then north along Allen Blvd. to Pumping Station 15.

Summary:
An analysis of the interceptors that comprise the West Intercepting System identifying the flow diversion points, free flow connection points and cross connection points indicates the following:
All flow into Spring Harbor Relief, West Interceptor Relief, Midvale Relief, Campus Relief and West Interceptor upstream of manhole MH02-014A flows to Pumping Station 8 through the Randall Relief.
All flow into the West Interceptor downstream of manhole MH02-014A flows to Pumping Station 2 through the Spring Street Relief, West Interceptor and City of Madison's Francis Street Interceptor. See attached copy of connection points.

Connection Points

The following is a list of points where the interceptors either join or connect and comments relative to the direction of the flow.

1. Flow Diversion Points

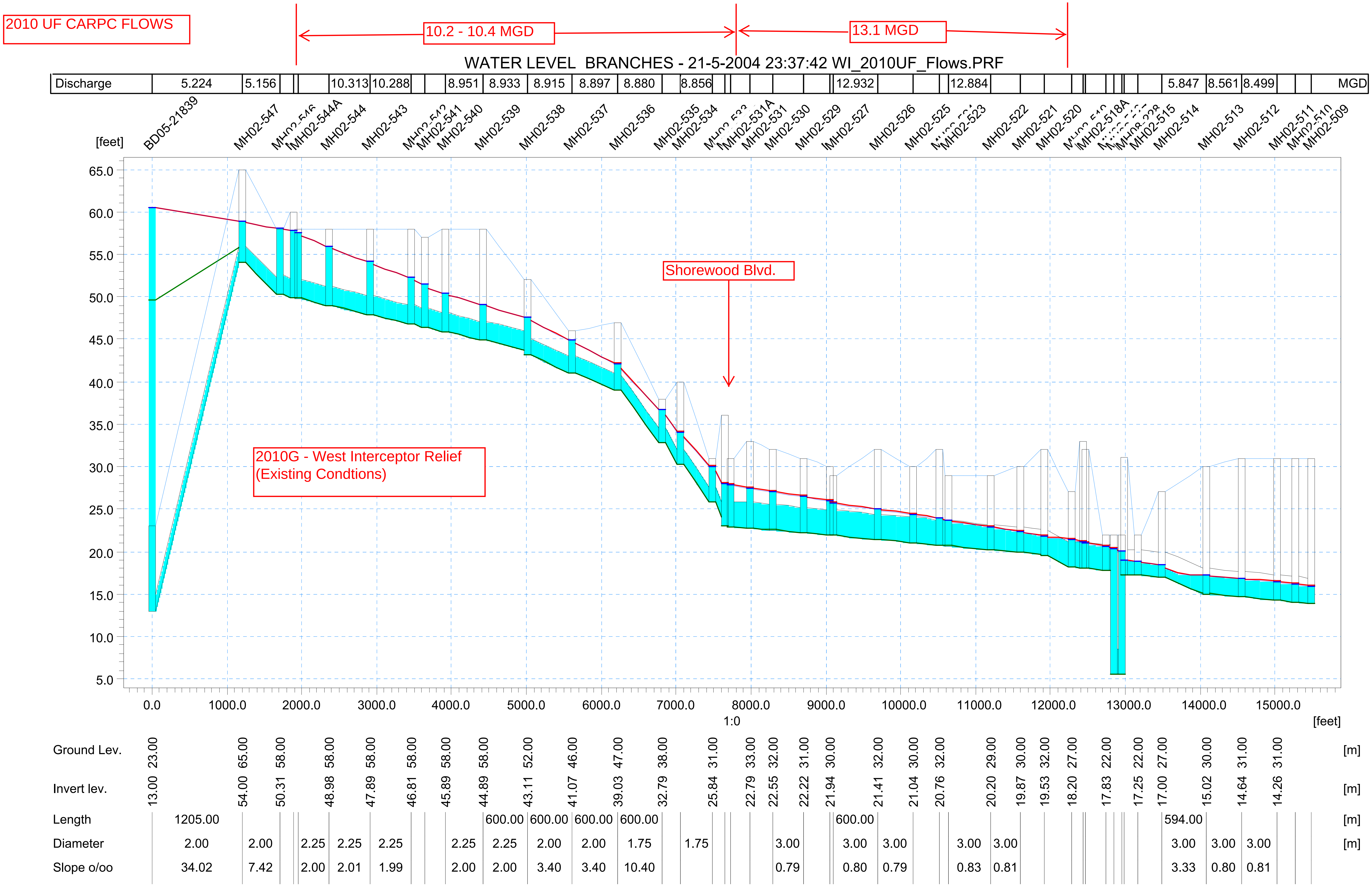
MH08-122/02-012B, Slide gate in MH08-122 allows flow to cross over into West Interceptor when removed.
MH02-316, Flow from WI drops into Spring Street Relief to PS2
MH02-014A, Slide gate in manhole forces flow from WI, WI Relief and Campus Relief into Randall Relief to PS8.
MH08-210, Flow from Campus Relief directed south to junction manhole MH08-209 between WI Relief and Campus Relief
MH02-513, Flow from WI along University Ave directed into WI Relief
MH02-531A, Flow from Midvale Relief into WI Relief
MH15-01360, Valve in manhole directs flow from PS15 into West Intercepting System

2. Free Flow Connection Points

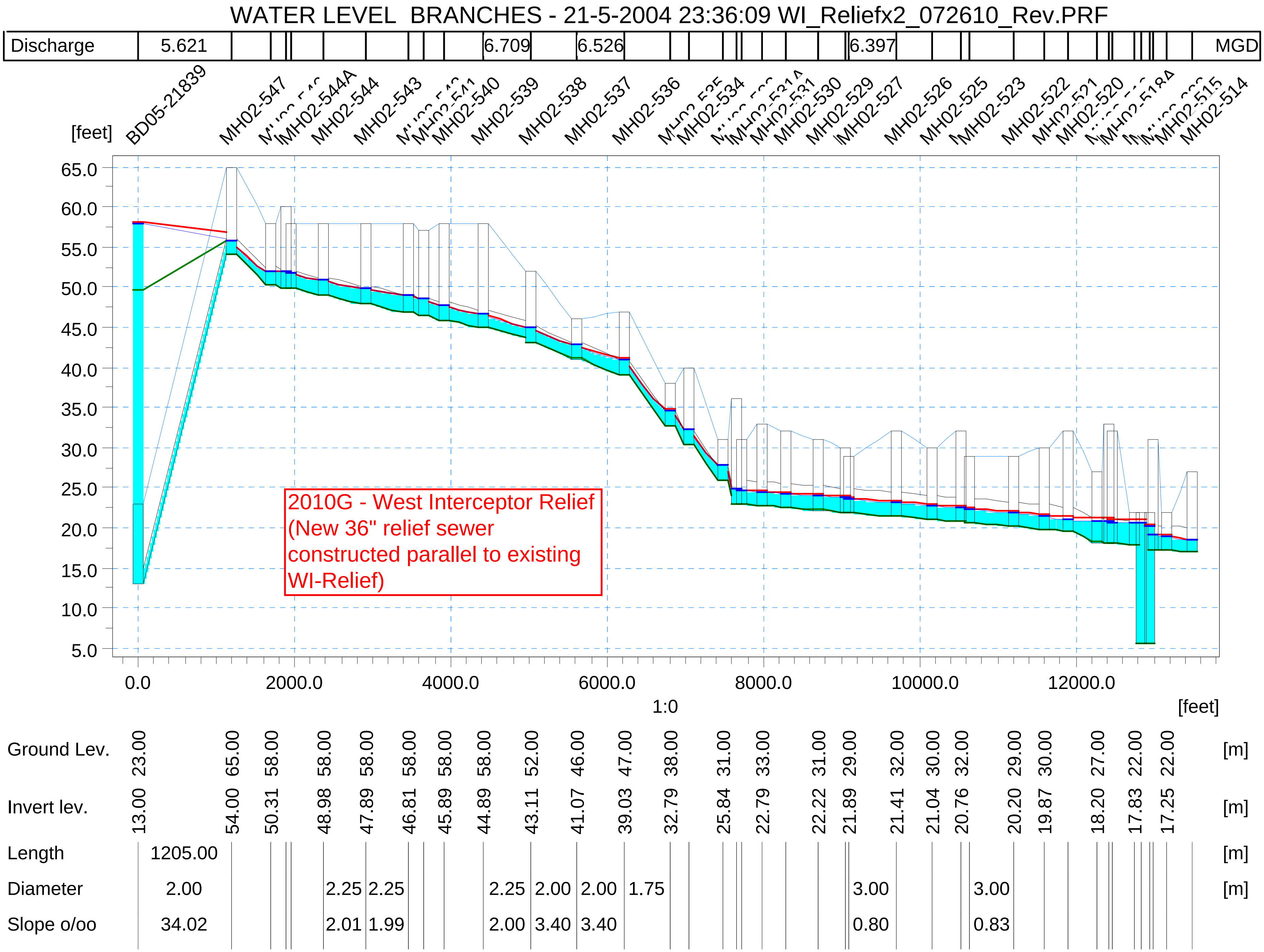
MH08-206, Free flow from WI in Campus area to Campus Relief
MH08-207, Free flow between WI Relief and Campus Relief
MH08-209, Free flow between WI Relief and Campus Relief
MH08-228, Free Flow between WI Relief and Campus Relief

3. Cross Connection Points

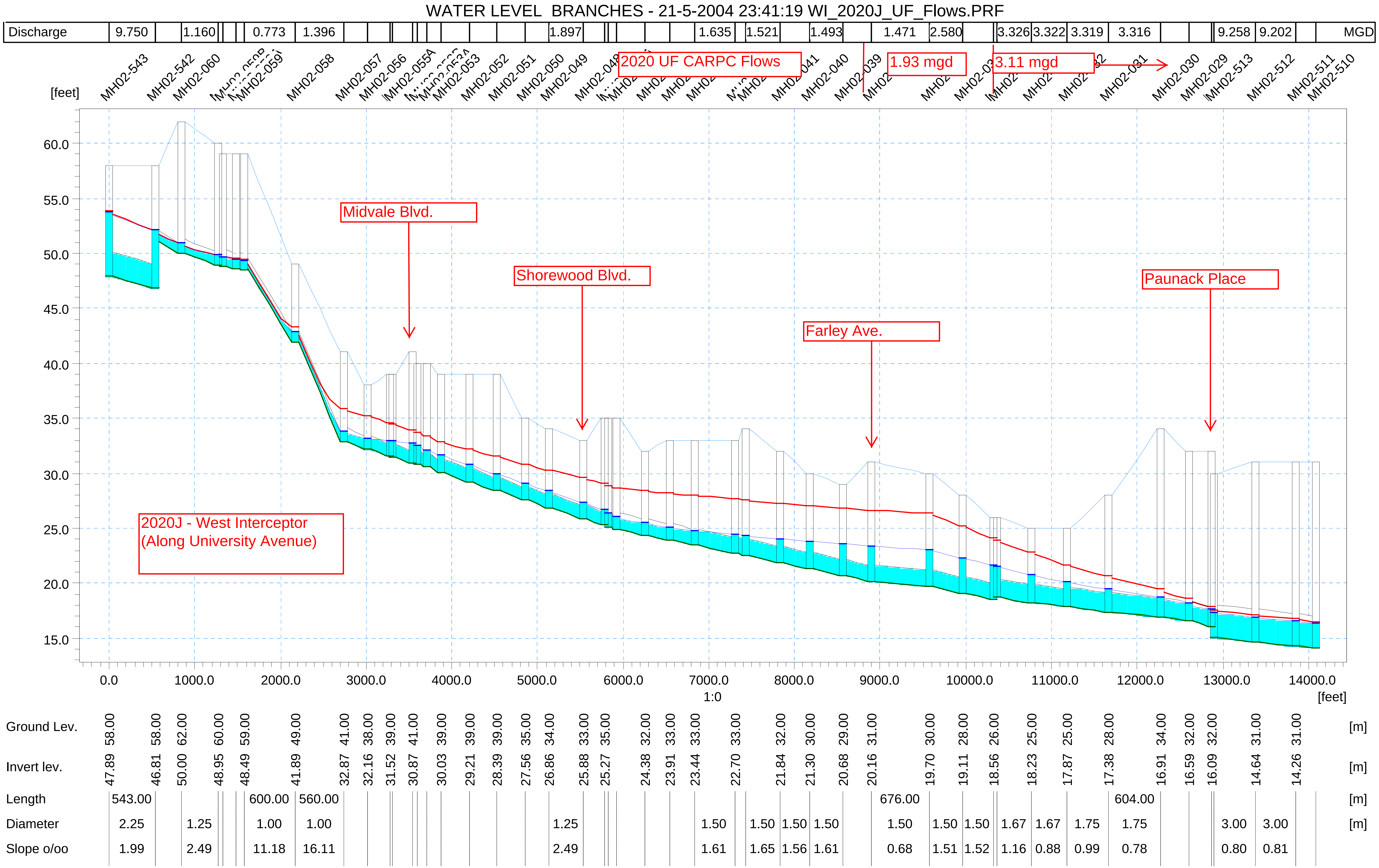
MH02-530/02-045, 8” Shorewood sewer between manholes. Cross flow will occur when WI Relief is surcharged ~1”, (El. ~26.2).
MH02-531/02-046, 12” and 10” Shorewood sewers between manholes. Cross flow will occur when WI Relief is surcharged ~1”, (El. ~26.8).
MH02-532/02-047, 12” Shorewood sewer between manholes. Cross flow will occur when WI Relief is surcharged ~1’, (El.27.0).
MH02-531I/02-054A, 12” City sewer between manholes. Cross flow will occur when Midvale is surcharged ~4-1/2’ or when WI is full, (El. Midvale MH02-531I is 26.2. El. WI MH02-054A is 30.8 cross connected by a City 12” EL. ~31.0). Siphon just downstream in WI can cause flow to be diverted over into Midvale Relief if surcharged.
MH02-542, Junction of WI Relief and WI. The WI upstream of this manhole is abandoned and does not exist. Cross flow from the WI Relief to the WI will occur when the WI Relief is surcharged ~5’, (WI Relief El. ~46.8 and WI El. ~52.0).



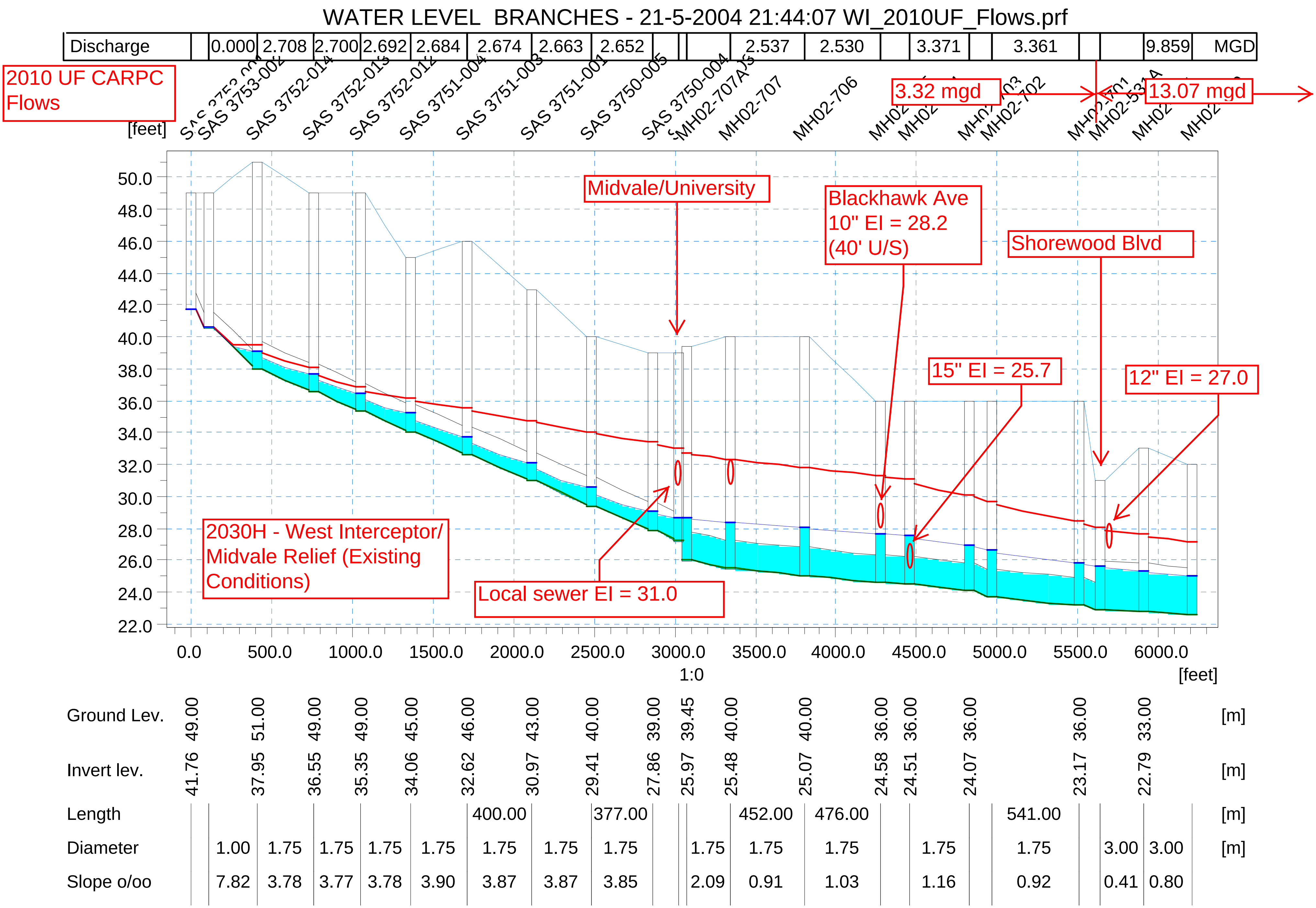
APPENDIX A8-2



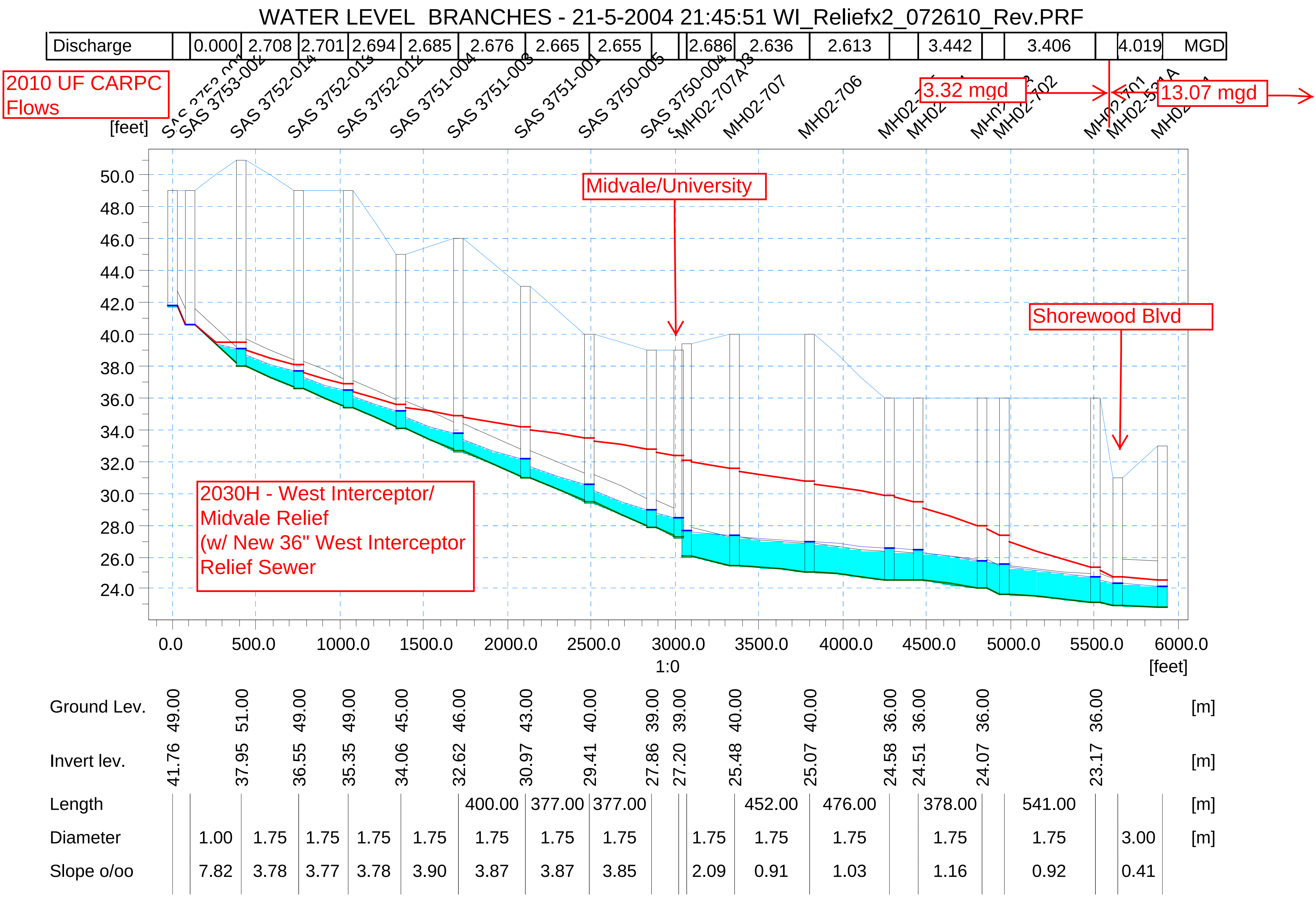
Appendix A8-3



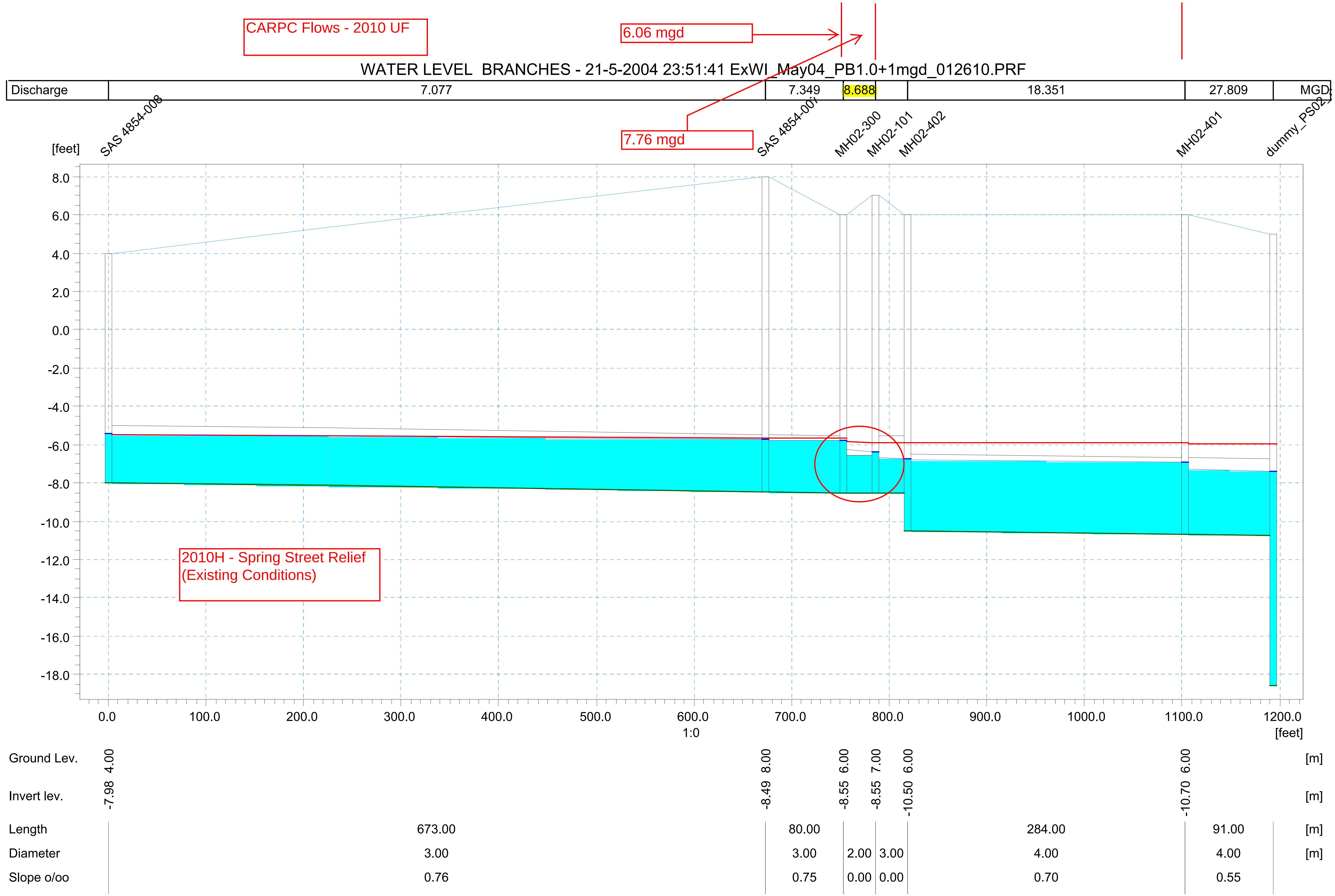
Appendix A8-4



Appendix A8-5



Appendix A8-6



Appendix A8-7

Appendix A9

Pumping Station 18 Feasibility Study, August 2010

Appendix A9
Pumping Station 18 Feasibility Study
Madison Metropolitan Sewerage District
August, 2010

Outline

This study is organized into the following sections:

- Introduction
- Background and History
- Purpose of Study
- Preliminary Design Flows and System Needs
- Siting of Pumping Station 18 and Related Improvements
- Schedule for Improvements
- Alternative Design Concepts for Pumping Station 18
- Peak Design Flow Assumptions for PS7 and New PS18
  - Madison Design Curve
  - Modified Madison Design Curve
- Discussion of Alternatives
  - Alternative 1
  - Alternative 2
  - Alternative 3
- Preliminary Sizing of PS18 Pumps and Force Main for Peak Flows
- Emergency Diversions
- Hydraulic Modeling of PS18
- Estimated Power Costs
- Summary and Recommendations

Introduction

CARPC's projected peak hourly flowrates at PS7 for 2030 and 2060 are 60 mgd and 72 mgd, respectively. The existing firm capacity at Station 7 is only 39 mgd, thus a major capacity upgrade would be required at this station to convey these future flowrates. Available space is limited in the pump room at PS7 and expansion at the site is not feasible. Additional conveyance would also need to be provided in the PS7 forcemain system and in the Southeast Interceptor from PS7 to its junction with the Northeast Interceptor. Relief or replacement for this section of the Southeast Interceptor would be very difficult and costly. Given these constraints and the District's preference not to convey such large flows through a single station with no diversion options, the District has proposed the construction of a new Pumping Station 18 to serve a portion of the Eastside collection system.

Background and History

A major feature of the *2002 Collection System Facilities Plan* was a study of the District's Crosstown Forcemain between Pumping Stations 1 and 2. Three alternative strategies for replacing or rehabilitating the old 20" forcemain were introduced: (1). Abandon the Crosstown forcemain and convey all flows from PS1 to PS6; (2). Reline the existing Crosstown forcemain to improve its condition and maintain 7.2 mgd of hydraulic relief from PS1 to PS2; and (3). Replace the Crosstown forcemain with a new 30" pipe and provide up to 21 mgd of hydraulic relief from PS1 to PS2. All three of the alternatives had implications with regard to relief of PS7 and the need and timing for a new PS18 as part of the Eastside collection system. Alternatives 1 and 2 required a new PS18 much sooner than Alternative 3.

The recommendation of the study was to replace and provide additional capacity in the Crosstown forcemain (Alternative 3). The District completed this project in 2003 and began pumping both average daily and peak flows from PS1 to PS2 at that time. This change in operation provided a considerable amount of relief in the Eastside collection system, primarily at PS6 and PS7.

Recognizing that hydraulic relief for PS7 was still needed within ten years of completion of this project, the District acquired land along East Broadway in the City of Monona in 2003 as a site for PS18. This vacant property is approximately 1.7 acres in area and is located near the intersection of the Southeast Interceptor and the Northeast Interceptor.

Purpose of Study

This study will explore the following issues related to the need, siting, timing, design, construction, and operation of a new PS18:

- Preliminary design flows and capacity of Eastside collection system
- Siting of pump station and routing of PS18 forcemain and Northeast Interceptor Relief sewer
- Timing of PS18 construction and related improvements
- Station capacity and alternative design concepts
- Emergency diversion with PS7

Each of these issues will be discussed at a general level as part of this study. It is anticipated that a detailed engineering study will be performed to further refine and expand on the ideas presented here.

Preliminary Design Flows and System Needs

The average flows used in this study are based on year 2010, 2030 and 2060 flow projections prepared by the Capital Area Regional Planning Commission (CARPC) as part of their 2009 report entitled *MMSD Collection System Evaluation.*

CARPC's report utilizes the "Madison Design Curve" (MDC) as a benchmark tool for determining the peak design capacity of the District's wastewater conveyance facilities. This curve was prepared for MMSD by the engineering consulting firm, Greeley and Hansen, in their *Report on Sewerage and Sewage Treatment* (1961) and has been standard MMSD design practice since that time. The Madison Design Curve is represented by the following formulas:

1. $$\textit{Peaking Factor} = 4 \Big/ \left(Q_{avg}\right)^{0.158}$$ (Q in mgd)

   Note:
   - Peaking factor = 4.0 for $Q_{avg} \leq 1.0$ mgd
   - Peaking factor = 2.5 for $Q_{avg} \geq 20$ mgd

2. $$Q_{peak} = 4 * \left(Q_{avg}\right)^{0.842}$$ (Q in mgd)

The MDC provides a useful overall benchmark or reference for comparison of design flows. In general, it is considered by MMSD to be a reasonable design curve for a reasonably tight collection system.

Table 1 shows a summary of the projected flowrates and capacities for PS7 and related facilities over the next fifty years based on the Madison Design Curve and CARPC's report. Timing for the improvements is based on population estimates using high-growth rate (UF) and normal-growth rate (TAZ) scenarios. For purposes of this analysis the high-growth rate scenario is used. There is a near-term need to provide hydraulic relief at PS7 and in the Southeast Interceptor and Northeast Interceptor upstream of PS7. The firm capacity of 39 mgd at PS7 is currently exceeded and the maximum capacity of 45 mgd will be exceeded prior to 2030. Peak hourly flows in the 60" Southeast Interceptor immediately upstream of PS7 are approaching the nominal capacity of the interceptor. Similarly, peak flows in the 48" Northeast Interceptor are at or slightly greater than the nominal capacity of the interceptor.

Construction of a new PS18 and associated forcemain, with a capacity similar to PS7, will relieve the current capacity concerns at PS7. Likewise, a new PS18 will remove the need to provide additional capacity in the Southeast Interceptor as it is anticipated that all, or a significant portion, of the flow from the Northeast Interceptor will be intercepted by PS18. Construction of PS18 will not relieve the capacity shortfall in the Northeast Interceptor from MH07-215 to MH07-313. Additional capacity will have to be provided in that section and should be coordinated with the PS18 project.

Siting of Pumping Station 18 and Related Improvements

As mentioned previously, the District acquired land along East Broadway in the City of Monona in 2003 as a site for PS18. This vacant property is approximately 1.7 acres in area and is located near the intersection of the Southeast Interceptor and the Northeast Interceptor (see Figure 1 in attachments). Locating the pump station at this site will provide the opportunity to easily divert flows from the Northeast Interceptor to the new station. The site for the new station is also well situated to accept reverse flow from PS7 to PS18 along the Southeast Interceptor during high-flow events or emergency situations.

Table 1: Capacities and Projected Flowrates for PS7 and Related Facilities

Facility	Limits		Firm or Nominal Capacity (mgd)	CARPC Peak Hourly Flowrate by Year (mgd)						Capacity Reached	
	From	To		2000	2010 UF	2020 UF	2030 UF	2030 TAZ	2060	UF Estimate	TAZ Estimate
PS7	-	-	39.00	35.13	42.99	50.59	59.86	45.90	72.30	2005	2011
PS7 FM	PS7	NSWTP	55.00	35.13	42.99	50.59	59.86	45.90	72.30	2024	2032
SEI	PS7	MH07-211	37.62	30.09	38.01	45.63	53.01	40.74	65.62	2010	2021
SEI	MH07-211	MH07-215	37.62	29.44	37.33	44.93	52.28	40.10	64.74	2011	2023
NEI	MH07-215	MH07-313	32.14	26.75	33.21	39.44	45.50	35.94	53.68	2008	2018

Notes:
(1). TAZ = Traffic Analysis Zone
(2). UF = Uncertainity Factor
(3). SEI = Southeast Interceptor
(4). NEI = Northeast Interceptor

A new forcemain will need to be constructed from PS18 to the Nine Springs Wastewater Treatment Plant (NSWTP). The preliminary route for the new forcemain is shown in Figure 2 of the attachments . The forcemain is shown extending north from the new pumping station to East Broadway (Point A), at which point it turns to the west and travels along East Broadway approximately 6,500 feet (Point B). At this point the forcemain would shift direction and head southwest approximately 4,700 feet to the Wisconsin and Southern Railroad corridor (Point C). The stretch of forcemain from Point B to Point C would pass through the western edge of the wetlands surrounding Upper Mud Lake, just to the east of WPS Insurance and Business Park.

Alternate routes for the forcemain from Point B to Point C are problematic. An alternate route for consideration would be along West Broadway. This alternate route is challenging as West Broadway carries a high traffic volume, was reconstructed within the last ten years, and has a complex interchange with USH 12 & 18 that would make construction in this area expensive and disruptive to users of the transportation system.

From Point C the forcemain would extend to the west approximately 1,300 feet through lowlands to the NSWTP grounds (Point D). The forcemain would continue approximately 1,700 feet around the northerly and westerly boundaries of the plant grounds and connect to an existing 42” pipe (Point E) which was installed as part of the District’s 10th Addition project.

The other major project related to the construction of a new PS18 is capacity relief for the Northeast Interceptor from its junction with the Southeast Interceptor to its junction with the Far East Interceptor. The existing 48” sewer travels along Progress Road and Femrite Drive in the City of Madison and has several local main connections and direct lateral connections. Due to the number of these connections, it is thought that the existing sewer should remain in place and a relief sewer should be constructed to provide the additional capacity which is required. A preliminary route for the relief interceptor is shown in Figure 3 of the attachments.

The new interceptor would extend north from the new station to East Broadway and head east on East Broadway approximately 800 feet (Point A). From this point the interceptor would turn to the north approximately 1,500 feet along Copps Avenue to a stormwater drainage way (Point B). The interceptor would extend approximately 2,600 feet to the northeast from this point and parallel the drainage way, including a crossing of USH 51, until its junction with the Far East Interceptor at MH07-932 (Point C). It is anticipated that the existing and relief interceptors would have two or more junction structures along the route. Most of the proposed route for the relief interceptor is along paved roadways or adjacent to paved parking lots of existing businesses. Short wetland crossings would be needed for this route both west and east of USH 51. Crossing USH 51 at Femrite Drive is a possible option to avoid the wetlands crossing, but doing so may conflict with future interchange improvements that are being considered by the Wisconsin Department of Transportation at USH 12/18 and USH 51.

Schedule for Improvements

As can be seen in Table 1, there is a near-term need to provide hydraulic relief at PS7 and in the Southeast and Northeast Interceptors. Projects to provide relief for these facilities have been included in the District’s ten year Capital Projects Budget. These projects include a new PS18, a new PS18 forcemain, and a relief sewer for the Northeast Interceptor. A preliminary schedule for the design, construction, and start-up of these facilities is summarized in Table 2.

It should be noted that a rehabilitation project at PS7 will be undertaken soon after the start-up of PS18. While the scope of this work has not been fully developed, it will likely include, at a minimum, installation of a full size impeller for Pump 7B and replacement of control panels.

Table 2: Schedule of Improvements for PS18 and Related Projects

Activity	Time Period
Prepare Request for Design Proposals (RFP)	Winter 2010
Mail RFP	February 2011
Notice to Proceed for engineering consultant(s)	April 2011
Pre-design report completed	Fall 2011
Detailed design	Fall 2011 to Fall 2012
Bid improvement projects	Winter 2012
Begin construction	Spring 2013
Completion of projects and start-up of facilities	Fall 2015

Alternative Design Concepts for Pumping Station 18

The following alternative design concepts will be considered for PS18 and the implications of each will be evaluated in turn.

> **Alternative 1:** Station 18 would be sized to collect and pump all average daily and peak flows conveyed by the Northeast Interceptor upstream of its junction with the Southeast Interceptor. Under this scenario Station 7 would still receive flows from the Southeast Interceptor and East Interceptor (including Stations 6 and 9).
>
> **Alternative 2:** Station 18 would be sized to collect and pump all average daily and peak flowrates conveyed by the Northeast Interceptor up to a maximum, pre-defined flowrate, such that peak flows would be split equally between PS7 and PS18. This alternative would require the installation of a flow splitting structure in the Northeast Interceptor near PS18 to divert flows in excess of the maximum PS18 flowrate to PS7.
>
> **Alternative 3:** Station 18 would be used primarily to convey only average daily flows in the Northeast collection system. Flows in excess of the average daily flows from the Northeast Interceptor would be conveyed to Station 7, along with flows from Stations 6 and 9. As flows increase in the Northeast collection system over time, Station 18 would have to convey correspondingly greater flows to ensure that firm capacity at Station 7 is not exceeded.

Each of the alternatives has a direct effect on the pumping capacity and operational strategies at PS7. As such, one of the goals for each alternative should be to minimize or negate the need to provide additional capacity at PS7. While PS7 is in need of rehabilitation from a condition perspective, it would be desirable to not have to significantly increase the capacity at this station due to space constraints. In addition to providing hydraulic relief in the Eastside collection system, another goal for each of the alternatives should be to provide diversion capabilities and system flexibility. Thus, each station should be able to convey the 2060 average daily flowrate in the Eastside collection system, at a minimum, in the event of an outage at either of the stations.

Peak Design Flow Assumptions for PS7 and New PS18

Madison Design Curve

As mentioned previously in the section on Preliminary Flows and System Needs, CARPC has projected flowrates for the PS7 and PS18 service areas through the year 2060 based on the Madison Design Curve. Figures 4, 5 and 6 show these preliminary projected peak design flows for the years 2010, 2030, and 2060 for each of the three alternatives at key points in the collection system (see attachments).

The service areas for PS7 and all upstream pumping stations are shown in Figures 14-18 of the attachments. The development of peak hourly flows from average daily flows in these service areas for each pumping alternative are shown in Tables 8A-1, 8A-2, and 8A-3 of the attachments. Using the standard Madison Design Curve, the ultimate (Year 2060) peak capacity for PS18 for each alternative would be as follows:

- Alternative #1 = 54 mgd
- Alternative #2 = 37 mgd
- Alternative #3 = 22 mgd

Modified Madison Design Curve

Consideration should be given to the utilization of more conservative peaking factors for the long-term sizing of PS18.   Several severe wet weather events in the past 10-15 years have stressed portions of the District's collection system. Recent investigation into the effects of climate change, as described in greater detail in Chapter 8, suggest that storms are becoming more intense and additional consideration needs to be given to the adjustment of peaking factors in service areas that are prone to inflow and infiltration, such as those for PS7 and PS18.

It is recommended that design peak hourly flows for PS18 be established from more conservative peaking factors. These conservative flow estimates should be used in establishing the ultimate footprint of the PS18 pump room and in sizing the associated suction and discharge piping so that the pumping capacity at the station is readily expandable and flexible in the event that actual future flowrates at PS18 are higher than estimated by the Madison Design Curve.

Currently the minimum peaking factor allowed by the Madison Design Curve is 2.5 and applies to average daily flowrates in excess of 20 mgd. To reinforce the Eastside Collection System and the new PS18 infrastructure improvements, it is proposed to modify the Madison Design Curve by restricting the minimum peaking factor to 3.0, rather than 2.5. Thus, the same formulas for computing peaking factors and peak hourly flows that were presented previously would still be used, but the minimum peaking factor would be limited to 3.0. The effect of this adjustment is that the ultimate capacity of PS18 would be increased from 54 mgd to 66 mgd under Alternative 1, an increase of approximately 22%. Figures 4A, 5A, and 6A show the distribution of peak hourly flows in the Eastside Collection System based on the modified peaking factors. It should be noted that the modifications shown in the figures apply only to the service areas upstream of PS7 and PS18. Calculations of the peak hourly flows using the modified peaking factors can be found in Tables 9A-1, 9A-2, and 9A-3 of the attachments.

Discussion of Alternatives

Alternative 1

Using the traditional Madison Design Curve, PS18 would have a peak pumping capacity of 54 mgd and would convey both average daily and peak hourly flows from the Northeast Interceptor. This capacity would be sufficient to serve flows in the Northeast Interceptor through year 2060. All flows from PS6, PS9, and the Southeast Interceptor (Blooming Grove Extension) would continue to be served by PS7 (Q_{avg} = 7.2 mgd; Q_{peak} = 21.0 mgd in 2060). Under the modified Madison Design Curve the ultimate peak pumping capacity would be increased to 66 mgd.

The primary advantage of this alternative is that it provides the greatest capacity and flexibility amongst the alternatives. PS18 would have significantly more pumping capacity than PS7 under this scenario. Thus it would provide excellent redundancy in the Eastside collection system in the event of a station outage at PS7. This alternative would also be relatively easy to construct and operate, with little need for advanced instrumentation and controls. All flows from the Northeast Interceptor would be directed to PS18. An overflow connection would need to be constructed to connect PS18 with the Southeast Interceptor (and PS7).

The disadvantages of this alternative are high construction costs to provide the required capacity and higher pumping costs during wet weather flow events relative to PS7. While the design of PS18 would be similar to PS7 with regards to flow capacity and building footprint, the PS18 force main will be approximately 7,000 feet longer than the PS7 force main. As a result the total dynamic head for PS18 will be higher than PS7, increasing the cost to pump flow to NSWWTP.

Alternative 2

Alternative 2 is similar to Alternative 1 in that average daily and peak hourly flows in the Northeast Interceptor would be directed and conveyed primarily to PS18. However, under this alternative the capacity of PS18 would be lowered and limited to 37 mgd (Madison Design Curve) or 44 mgd (modified Madison Design Curve). This is approximately one-half of the projected 2060 peak flows in the Eastside collection system. The balance of the flows would be conveyed to PS7.

A goal in developing this alternative is to provide two similar-sized stations that will each convey approximately one-half of the flow in the Eastside collection system. Operation of PS18 under this scenario would be slightly more challenging than Alternative 1. Careful consideration would have to be given to the design of a diversion structure such that flows in excess of the pre-determined capacity of PS18 would be directed towards PS7.

Alternative 3

Under Alternative 3 PS18 would convey average daily flows from the Northeast Interceptor similar to the two other alternatives, but all excess flows would be directed towards PS7. The conveyance of average daily flows from the Northeast Interceptor by PS18 would be enough to keep the pumping equipment in good working order and maintain adequate flushing velocities in the force main, while minimizing peak pumping costs relative to PS7.

Flows at PS18 would continue to grow over time with increased development and wastewater flows in the Eastside collection system. The primary advantages sought in developing this alternative are lower construction costs and energy efficiency. Only average daily flows from the Northeast Interceptor would be conveyed from PS18 in an effort to limit energy costs.

Several disadvantages are noted for this alternative. The primary disadvantage of this alternative is that the conveyance of *all* wet weather flows from the Northeast Interceptor would be directed to PS7. The firm capacity of PS7 would be exceeded prior to 2030 as a result. Another significant disadvantage to this alternative is that PS18 would have limited ability to convey flows diverted from PS7 during high flow or emergency events. For these reasons, it is not recommended that Alternative 3 be advanced for further study during preliminary design of the PS18 improvements.

Preliminary Sizing of PS18 Pumps and Force Main for Peak Flows

In order to assess the number and size of pumps that may be needed to achieve the maximum pumping capacity for PS18, a preliminary analysis of pump configurations was conducted. This analysis was performed for Alternative 1, which has the highest capacity requirements (54 mgd for traditional MDC and 66 mgd for modified MDC).

Given that nearly half of the District's pumping stations currently utilize pumps manufactured by Fairbanks Morse, maximum station capacity for Alternative 1 was evaluated for Fairbanks Morse centrifugal pumps in 20" and 24" outlet sizes. The 20" pumps used in the analysis are Fairbanks Model No. 5722, with 30" impellers, a two-vane impeller design, and an operating speed of 705 rpm. They are very similar to the pumps that were installed at PS8 in 2010. The 24" pumps are also Model No. 5722 with 36"- 40" impellers and an operating speed of 585 rpm. The 24" pumps have a five-vane impeller design, however, which raises concerns related to pump plugging with rags and other stringy material. The District's largest pumps in the collection system are currently 20" pumps. It would be preferable to use 20" pumps with a two-vane impeller at PS18 if possible, for purposes of familiarity, consistency, and reliability.

The maximum station capacity for PS18 was also analyzed for a 42" and 48" diameter forcemain from PS18 to the existing 42" forcemain at the Nine Springs Wastewater Treatment Plant. The scenarios that were analyzed and the results of this analysis are summarized briefly in Table 3.

For purposes of this analysis it was assumed that all pumps used to achieve the maximum pumping capacity were identical units. Further, it was assumed impractical to provide more than four pumping units to achieve maximum capacity.

Table 3: Analysis of PS18 Peak Flow Capacity (Alternative 1)

Peak Flow Scenario	Pump Size (in)	Forcemain diameter (in)	Adequate Capacity Available	Minimum Number of Pumps Needed	System & Pump Curves
Madison Design Curve (54 mgd)	20	42	No	>4	Fig 7
		48	Yes	3	Fig 7
	24	42	Yes	2	Fig 8
		48	Yes	2	Fig 8
Modified Madison Design Curve (66 mgd)	20	42	No	>4	Fig 7A
		48	Yes	4	Fig 7A
	24	42	Yes	3	Fig 8A
		48	Yes	3	Fig 8A

Peak Flows from Madison Design Curve (54 mgd)

Four equal-sized 20" pumps cannot deliver enough flow through a 42" forcemain to achieve a maximum capacity of 54 mgd. These three pumps would be sufficient for a 48" forcemain, however. Two equal-sized 24" pumps could provide the maximum capacity of 54 mgd in either a 42" or 48" forcemain.

Peaks Flows from 'Modified' Madison Design Curve (66 mgd)

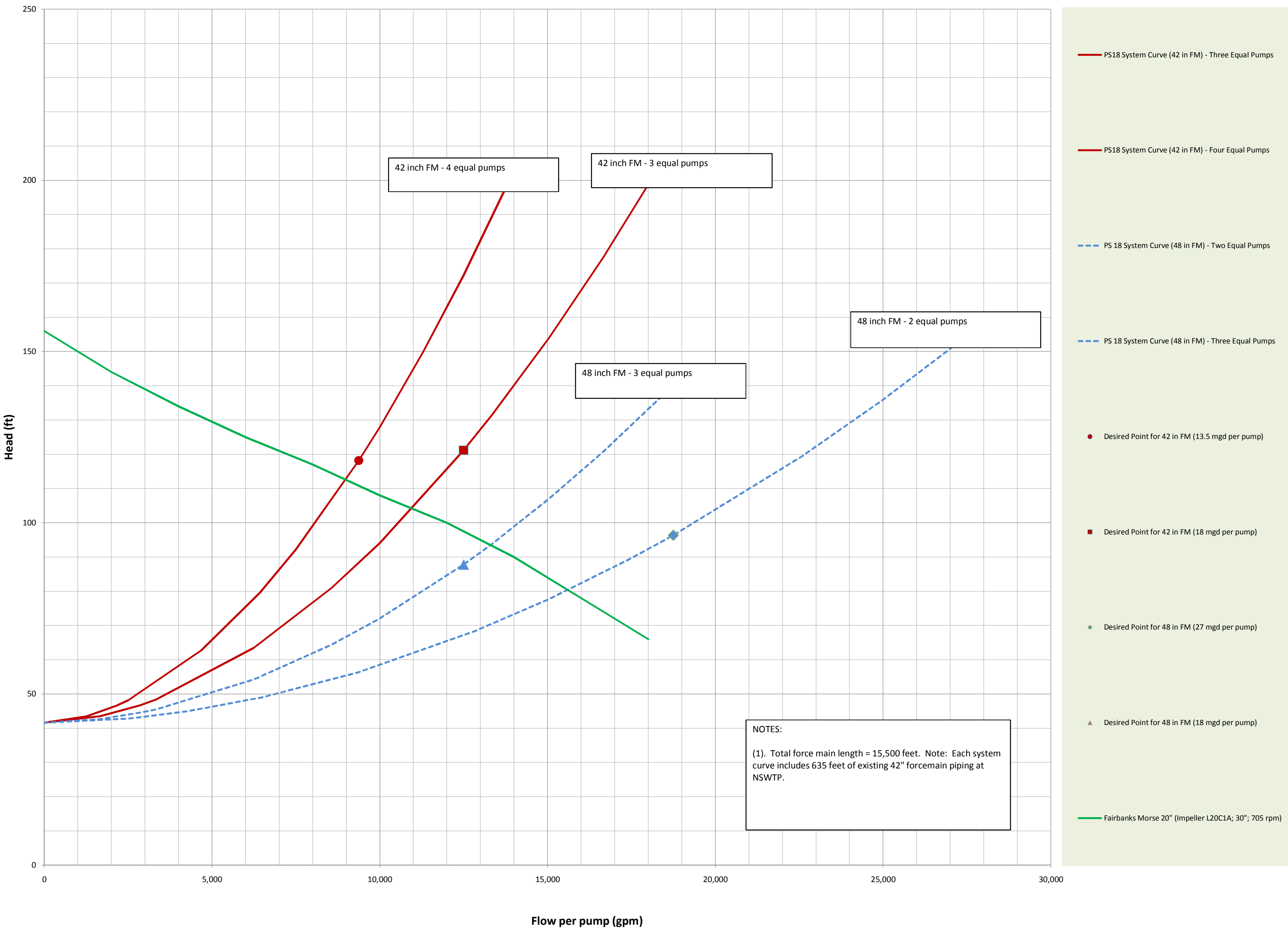
In order to achieve the maximum capacity of 66 mgd as required for the modified Madison Design Curve, four equal-sized 20" pumps and a 48" diameter forcemain would be needed. It would be impractical, however, to provide 20" pumps and a 42" diameter forcemain to achieve the desired capacity due to the number of pumps required. The maximum capacity could also be achieved using three equal-sized 24" pumps and either a 42" or 48" forcemain.

Conclusions

A summary of key design parameters for conveying peak flows at PS18 for Alternative 1 is provided in Table 4. The table includes a comparison of the parameters for both a 42" and a 48" forcemain. In looking at Table 4, it should be noted that the velocity in the 42" forcemain is in excess of 8 feet per second for both station capacities under Alternative 1 (54 and 66 mgd). Exceeding this value is not considered good design. For a station capacity of 66 mgd the maximum flowrate of 8.12 feet per second in a 48" forcemain would exceed the standard by only

Figure 7: Preliminary Pump Sizing for Alternative 1 (54 mgd)

20" Pumps



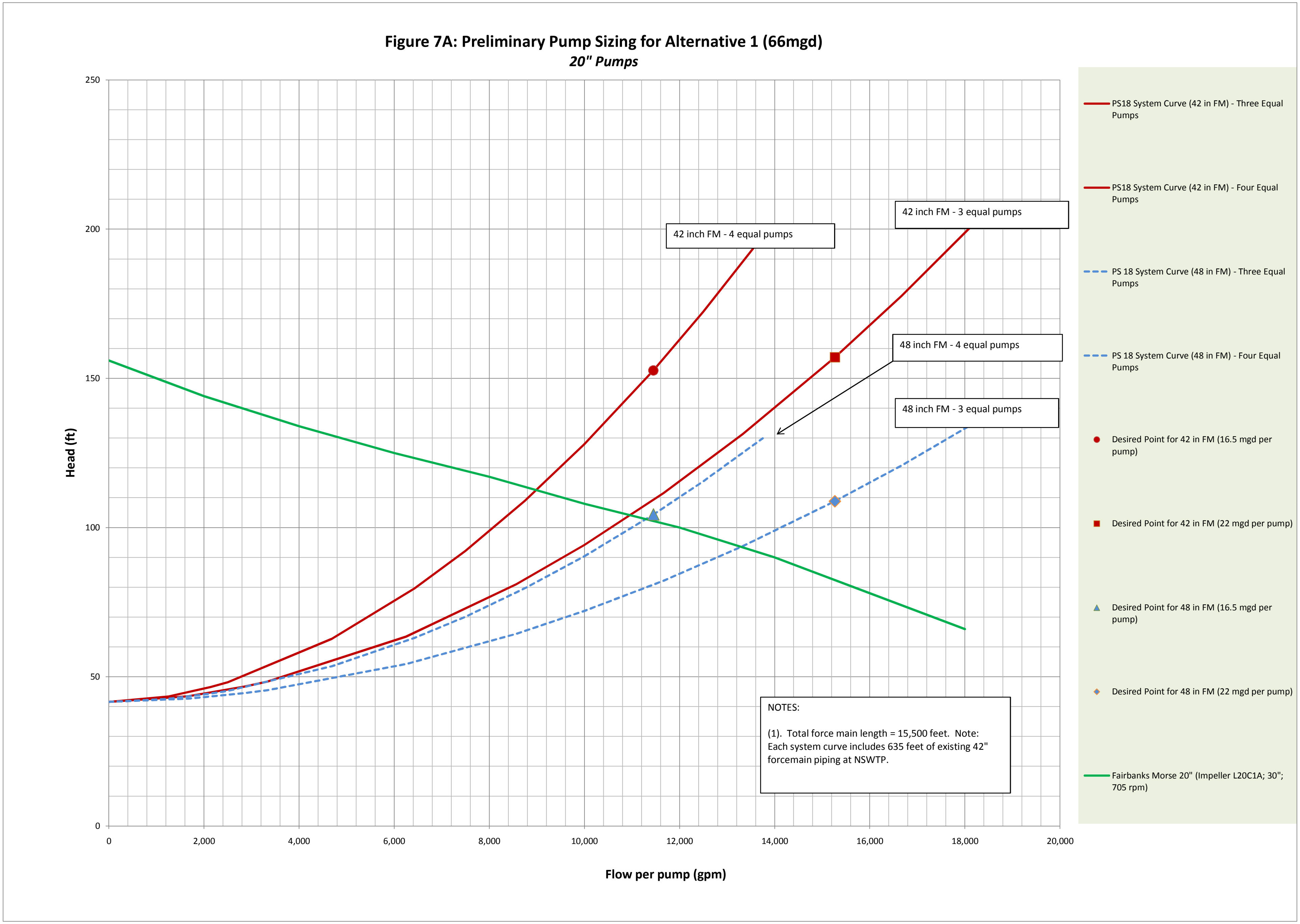
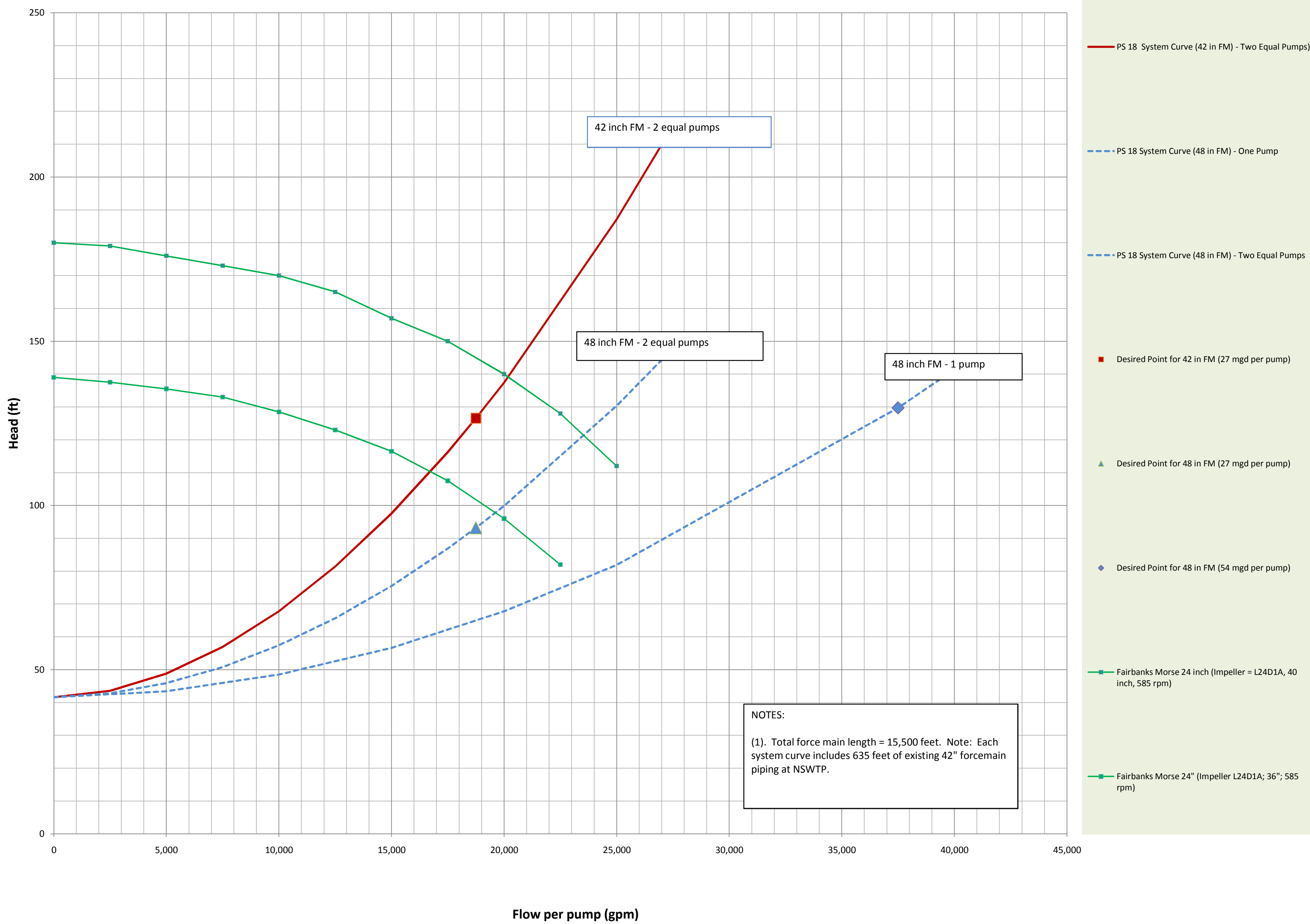


Figure 7A: Preliminary Pump Sizing for Alternative 1 (66mgd)
20" Pumps
Head (ft)
Flow per pump (gpm)
0
50
100
150
200
250
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
42 inch FM - 4 equal pumps
42 inch FM - 3 equal pumps
48 inch FM - 4 equal pumps
48 inch FM - 3 equal pumps
NOTES:
(1). Total force main length = 15,500 feet. Note: Each system curve includes 635 feet of existing 42" forcemain piping at NSWTP.
PS18 System Curve (42 in FM) - Three Equal Pumps
PS18 System Curve (42 in FM) - Four Equal Pumps
PS 18 System Curve (48 in FM) - Three Equal Pumps
PS 18 System Curve (48 in FM) - Four Equal Pumps
Desired Point for 42 in FM (16.5 mgd per pump)
Desired Point for 42 in FM (22 mgd per pump)
Desired Point for 48 in FM (16.5 mgd per pump)
Desired Point for 48 in FM (22 mgd per pump)
Fairbanks Morse 20" (Impeller L20C1A; 30"; 705 rpm)

Figure 8: Preliminary Pump Sizing for Alternative 1 (54 mgd)

24" Pumps



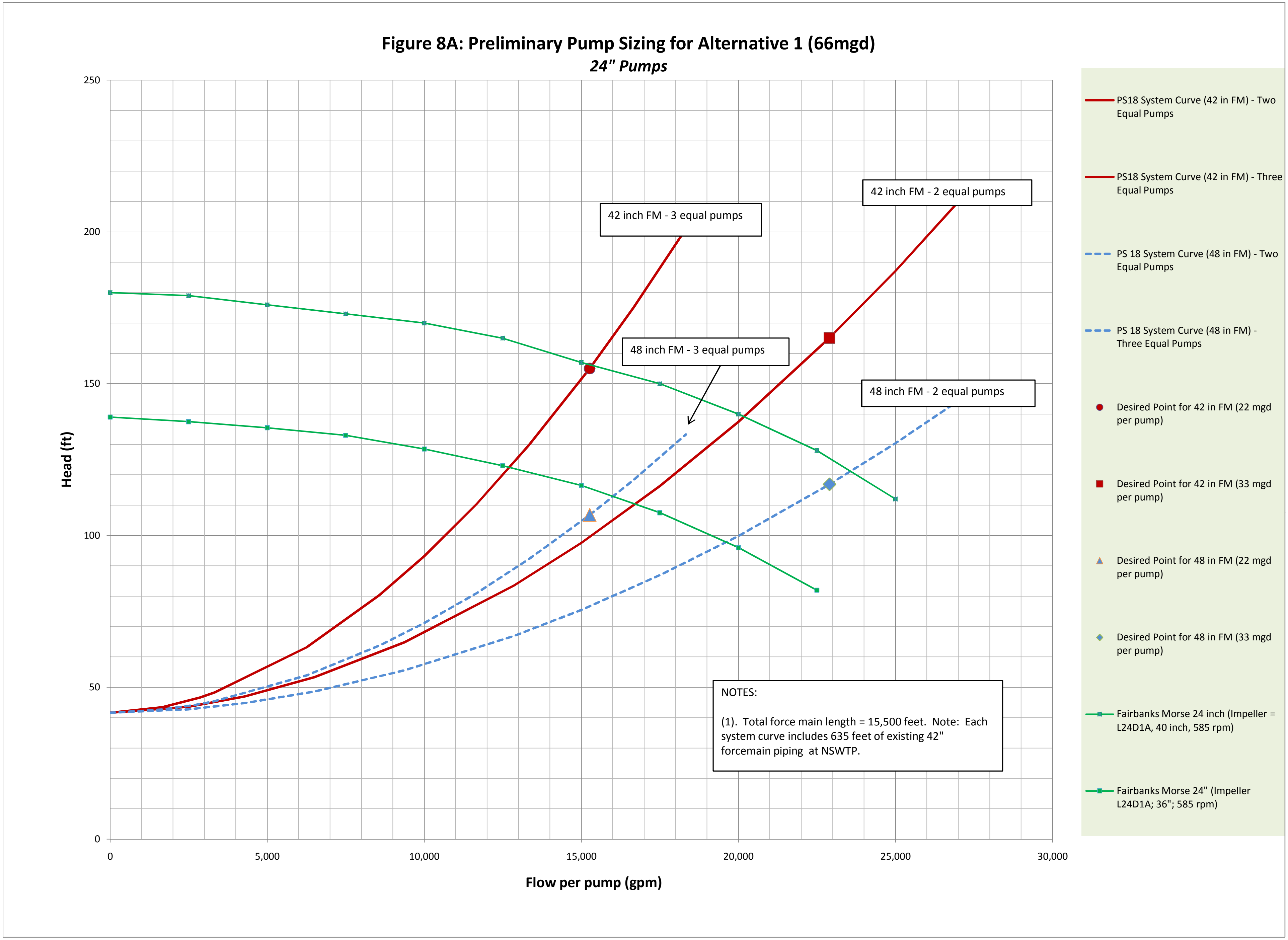


Figure 8A: Preliminary Pump Sizing for Alternative 1 (66mgd)
24" Pumps
Head (ft)
Flow per pump (gpm)
250
200
150
100
50
0
5,000
10,000
15,000
20,000
25,000
30,000
42 inch FM - 3 equal pumps
42 inch FM - 2 equal pumps
48 inch FM - 3 equal pumps
48 inch FM - 2 equal pumps
NOTES:
(1). Total force main length = 15,500 feet. Note: Each system curve includes 635 feet of existing 42" forcemain piping at NSWTP.
PS18 System Curve (42 in FM) - Two Equal Pumps
PS18 System Curve (42 in FM) - Three Equal Pumps
PS 18 System Curve (48 in FM) - Two Equal Pumps
PS 18 System Curve (48 in FM) - Three Equal Pumps
Desired Point for 42 in FM (22 mgd per pump)
Desired Point for 42 in FM (33 mgd per pump)
Desired Point for 48 in FM (22 mgd per pump)
Desired Point for 48 in FM (33 mgd per pump)
Fairbanks Morse 24 inch (Impeller = L24D1A, 40 inch, 585 rpm)
Fairbanks Morse 24" (Impeller L24D1A; 36"; 585 rpm)

a small margin. In addition, it can be seen that the headlosses due to friction are significantly higher in the 42” forcemain relative to the 48” forcemain, especially at higher flowrates.

Table 4: Design Parameters for PS18 Peak Flow Pumping (Alternative 1)

Parameter per pump or per forcemain	*Madison Design Curve (54 mgd)*		*‘Modified Madison Design Curve (66 mgd)*	
	42” FM	48” FM	42” FM	48” FM
Number and size of pumps	2 – 24”	3 – 20”	3 – 24”	4 – 20”
Pump capacity (mgd)	27.0	18.0	22.0	16.5
Total pumping head (ft)	127	88	155	104
Maximum forcemain velocity (fps)	8.68	6.65	10.61	8.12
Motor horsepower	705	330	705	355
Forcemain velocity (fps) for 2010 ADF of 12.35 mgd	1.99	1.52	1.99	1.52
Forcemain velocity (fps) for 2020 ADF of 15.15 (fps)	2.44	1.87	2.44	1.87
Forcemain velocity (fps) for 2030 ADF of 17.95 mgd	2.89	2.21	2.89	2.21
Forcemain velocity (fps) for 2060 ADF of 21.85 mgd	3.51	2.69	3.51	2.69

Notes: ADF = Average daily flow

An additional factor to consider in selecting a 48” forcemain is that it favors the use of 20” pumps rather than 24” pumps to achieve the maximum capacity. This is an important consideration from an operational perspective. The use of smaller 20” pumps may also provide more flexibility in conveying average daily flows at PS18 by allowing them to be equipped with adjustable frequency drives.

Based on the information provided in Tables 3 and 4, it is recommended that a 48” forcemain be installed from PS18 to the existing 42” forcemain at the Nine Springs Wastewater Treatment Plant. The larger forcemain provides greater flexibility in meeting the peak flow requirements of PS18 under Alternative 1 and in conveying average daily flows. It should be noted that the velocity in a 48” forcemain will be below the recommended minimum velocity of 2 feet per second until approximately 2024 based on average daily flowrates. The lack of adequate flushing velocity will need to be evaluated during detailed design and a pumping strategy will need to be implemented during the initial years of operation to ensure that solids deposition does not occur. The District has utilized daily flushing cycles with large pumps at other pumping stations to prevent solids deposition and similar programming could be used at PS18.

It should also be stressed that the preliminary sizing discussed in this section considers only peak pumping considerations for Alternative 1 (worst case scenario) and not the conveyance of average daily flows. Final pump selection for PS18 will need to consider the peak flow requirements for other alternatives and pump sizes that are suitable for both everyday operation and for intermittent operation during peak flow events. Combinations of constant-speed pumps and pumps with adjustable frequency drives will likely be required to achieve the desired flowrates.

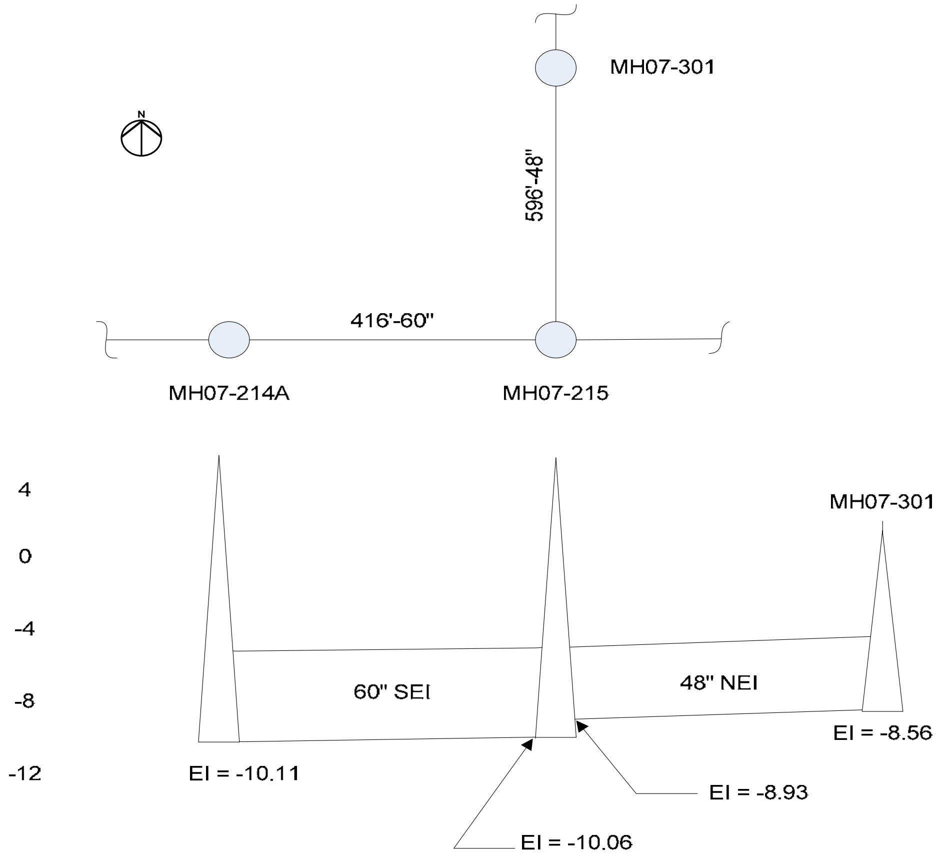
Emergency Diversions

Besides providing additional capacity for the Eastside collection system, a major feature of a new PS18 should be the ability to transfer flows with PS7 in emergency situations. In the event that PS7 has a loss of power or other type of failure and/or one or both of the PS7 forcemains become disabled, it would be desirable for PS18 to accommodate the flow that is normally conveyed through PS7. While it may not be possible to transfer all of the flow during high-flow events, it would be beneficial if dry weather and smaller wet weather flows from PS7 could be conveyed to PS18.

One critical factor in conveying flows from PS7 to a new PS18 is the elevation and size of the sewers at the junction of the Southeast Interceptor and Northeast Interceptor (see Figure 9). There is an elevation difference of approximately 1.1 feet in the inverts at the junction of the Southeast and Northeast interceptors (MH07-215). The 596 foot segment of 48” interceptor upstream of MH07-215 has significant headlosses relative to the 60” Southeast Interceptor and will force the water to rise higher in the PS7 wet well in order to drive the flow backwards along the Southeast Interceptor to the Northeast Interceptor and eventually to PS18. The design of a new PS18 should consider the construction of a new connector line from the Southeast Interceptor to PS18 that minimizes this elevation drop and increases the size of the connector line to PS18.

Preliminary calculations were performed to estimate the hydraulic grade line between PS7 and PS18 in the event of an outage at PS7 (see Table 5 in attachments for calculations). The analysis includes both existing conditions (48” NEI from MH07-215 to PS18) and proposed conditions (60” NEI from MH07-215 to PS18). The analysis assumes that MH07-301, located near PS18, is flowing full. It also assumes that PS18 has adequate capacity to convey all flows in the Eastside collection system, including those from PS7 to PS18. Table 6 is a summary of the water surface elevations in the PS7 wet well that can be expected for various peak flowrate scenarios at PS7.

Figure 9: Plan and Profile of Existing Southeast and Northeast Interceptor Junction



As can be seen in Table 6, for all the scenarios listed the water surface elevation in the PS7 wet well would exceed the high water alarm at the station. The District's *Emergency Response Manual* directs users to contact the City of Monona if the wet well reaches an elevation of -2.5 feet to alert them of possible flooding near PS7. This water surface elevation corresponds to a flowrate of approximately 24.5 mgd for existing conditions. At a water surface elevation of +1.00 in the PS7 wet well water would begin to overflow to the Yahara River, although it is likely that many basements in the Monona area would experience backups prior to reaching this elevation. It is estimated that a flowrate of 40 mgd could be achieved at the overflow elevation.

In summary, Alternative 1 provides the greatest diversion capacity. The water surface elevation would not rise above the level of anticipated basement flooding for any of the scenarios shown. Replacement of the 48" gravity interceptor from MH07-214A to PS18 would not be needed under this alternative. For Alternative 2, the water surface elevation at PS7 would exceed the expected level of basement flooding by the year 2025. Providing additional capacity between MH07-214A and PS18 could prolong exceedance of the flooding elevation by approximately five years to 2030. Alternative 3 could not provide sufficient wet weather diversion capacity for any of the scenarios.

The analysis shown in Table 6 is a theoretical exercise that was performed to: (1). Estimate the maximum wet well level elevation at PS7 for various rates of peak flow; and (2). Assess the need for a new interceptor segment from MH07-214A to PS18. This analysis has limited usefulness in that it is not able to accurately simulate the splitting and routing of flows with time in the Northeast Interceptor and Southeast Interceptor near PS18. A more practical simulation of the flow diversion capabilities between PS7 and PS18 is needed and is presented in the next section.

Table 6: Maximum Wet Well Elevations at PS7 for Emergency Diversion to PS18

PS 18 Alternative(1)	Year	PS18 Peak Hourly Flowrate (mgd)	PS7 Peak Hourly Flowrate (mgd)	Water Surface Elevation at PS 7 (ft)		PS 7 High Water Alarm (ft)
				Existing Conditions	Proposed Conditions(2)	
1	2010 2030 2060	33 46 54	14 18 21	-3.89 -3.45 -3.05	-3.98 -3.60 -3.26	-6.50 -6.50 -6.50
2	2010 2030 2060	33 37 37	14 27 37	-3.89 -2.06 +0.13	-3.98 -2.41 -0.52	-6.50 -6.50 -6.50
3	2010 2030 2060	12 18 22	35 46 53	-0.37 +2.69 +5.06	-0.94 +1.67 +3.71	-6.50 -6.50 -6.50

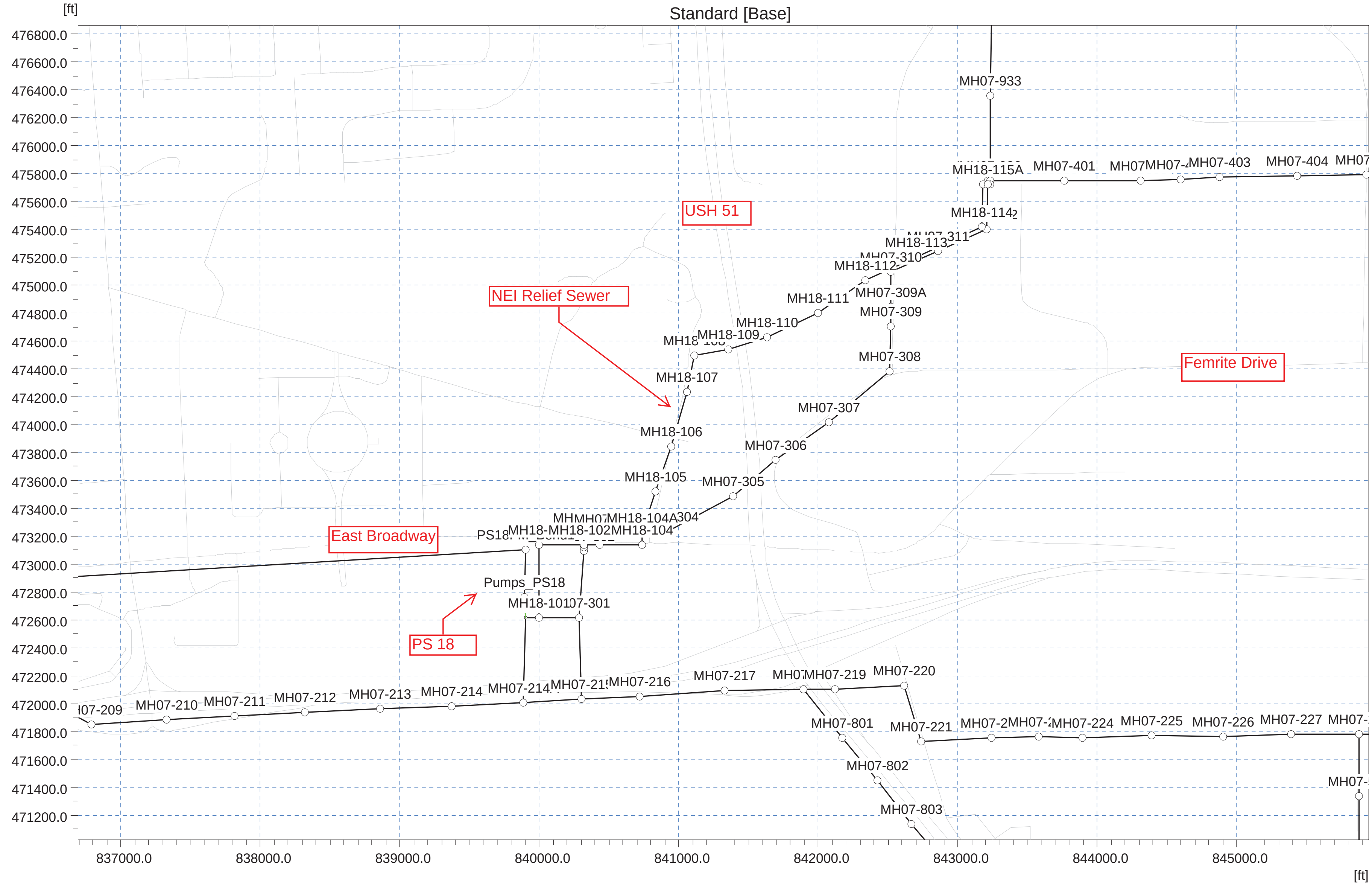
Notes:
(1). For peak hourly flows derived from Madison Design Curve only.
(2). Assumes a new 60” gravity line from Southeast Interceptor to PS18 to replace existing 48” line.

Hydraulic Modeling of PS18

The District’s hydraulic model was used to simulate the conveyance of peak flows in the Eastside collection system and the diversion capabilities between PS7 and PS18. The location and alignments for new PS18, the new PS18 forcemain, and the Northeast Interceptor relief sewer were input into the model as described previously in this study (see Figure 10). Recognizing that PS18 will be very similar to PS7 in terms of size and capacity, the general layout of the wet well and pump capacities for the PS18 model were set nearly identical to those for PS7 for modeling purposes.

The model was run to simulate a service outage at PS7 in order to estimate the well level rise at PS7 that could be expected under existing and proposed conditions. Existing conditions include operation of a new PS18 and continued operation of the 48” interceptor sewer segment from MH07-215 to MH07-301. Proposed conditions include operation of a new PS18 and the

Figure 10: Hydraulic Model for Pump Station 18



replacement of the aforementioned sewer segment with a new 60" sewer from MH07-214A to PS18. For each condition the model was evaluated at 2010 flowrates for periods of dry and wet weather.

PS7 Out of Service - Dry Weather Simulation

The results of the dry weather simulation are shown in Figure 11. The average daily dry weather flowrate from PS7 to PS18 was modeled at approximately 2.4 mgd. At this flowrate the average wet well levels at PS7 for existing and proposed conditions are -7.1 and -8.5, respectively. These elevations are both below the current high water alarm elevation of -6.5. As a result, basement flooding in the PS7 service area should not be a concern while diverting flows from PS7 to PS18 in periods of dry weather. It should be pointed out that replacing the 48" NEI segment from MH07-215 to PS18 with a 60" sewer will keep the PS7 wet well level approximately 1.4 feet lower during the diversion of flows from PS7 to PS18.

PS7 Out of Service – Wet Weather Simulation

Modeling of the inter-tie between PS7 and PS18 during wet weather is shown in Figure 12. To simulate the effect of wet weather, storm data for the period of May 19-22, 2004, was used. During this storm event the District's collection system received approximately 5.96 inches of rain (as measured at the Dane County Regional Airport). A plot of the rainfall distribution and the modeled pumping rate at PS18 can be found in Figure 13.

For existing conditions the modeled wet well level at PS7 rose to a maximum elevation of -5.9 and remained slightly above the high water alarm elevation for approximately a one-day period. Under proposed conditions the modeled wet well level at PS7 rose gradually but never exceeded Elevation -7.5.

PS18 flowrate information is also shown on Figure 12 for the modeled wet weather event. Prior to the storm event the average daily flowrate at PS18 was approximately 17.3 mgd. This modeled flowrate agrees very well to the actual 2010 average daily flowrate at PS7 (16.8 mgd). Approximately 2.5 mgd of this flow prior to the storm was being diverted from PS7 to PS18, similar to the dry weather simulation. The modeled flowrate at PS18 rose steadily during the wet weather simulation and reached peaks of approximately 60 mgd. During the storm the average flowrate from PS7 to PS18 increased from 2.5 mgd to 4.7 mgd.

Summary

Hydraulic modeling suggests that 2010 dry weather flows can safely be conveyed from PS7 to PS18 during a loss of power or other operational problems at PS7 that require the station to be taken out of service. For existing conditions the well level at PS7 should remain below the high water alarm elevation during diversion events. Replacing the Northeast Interceptor segment directly upstream of the Southeast Interceptor will provide an additional level of comfort for diversion of flow during dry weather. It is expected that the well level at PS7 will be approximately 1.5 feet lower for these conditions.

Figure 11: Hydraulic Modeling of Dry Weather Flow Diversion - 2010 (PS 7 to PS 18)

NOTES:

(1). PS 7 is out of service for the duration of the modeled event.

(2). Flow from PS7 to PS18 is shown as 'negative' flow.

(3). Existing conditions include diverting flow through 48" gravity interceptor from MH07-215 to MH07-301 (i.e. PS18).

(4). Proposed conditions include removing 48" gravity interceptor from MH07-215 to MH07-301 and replacing it with a new 60" line from MH07-214A to PS18.

(5). Flows are estimates for Year 2010.

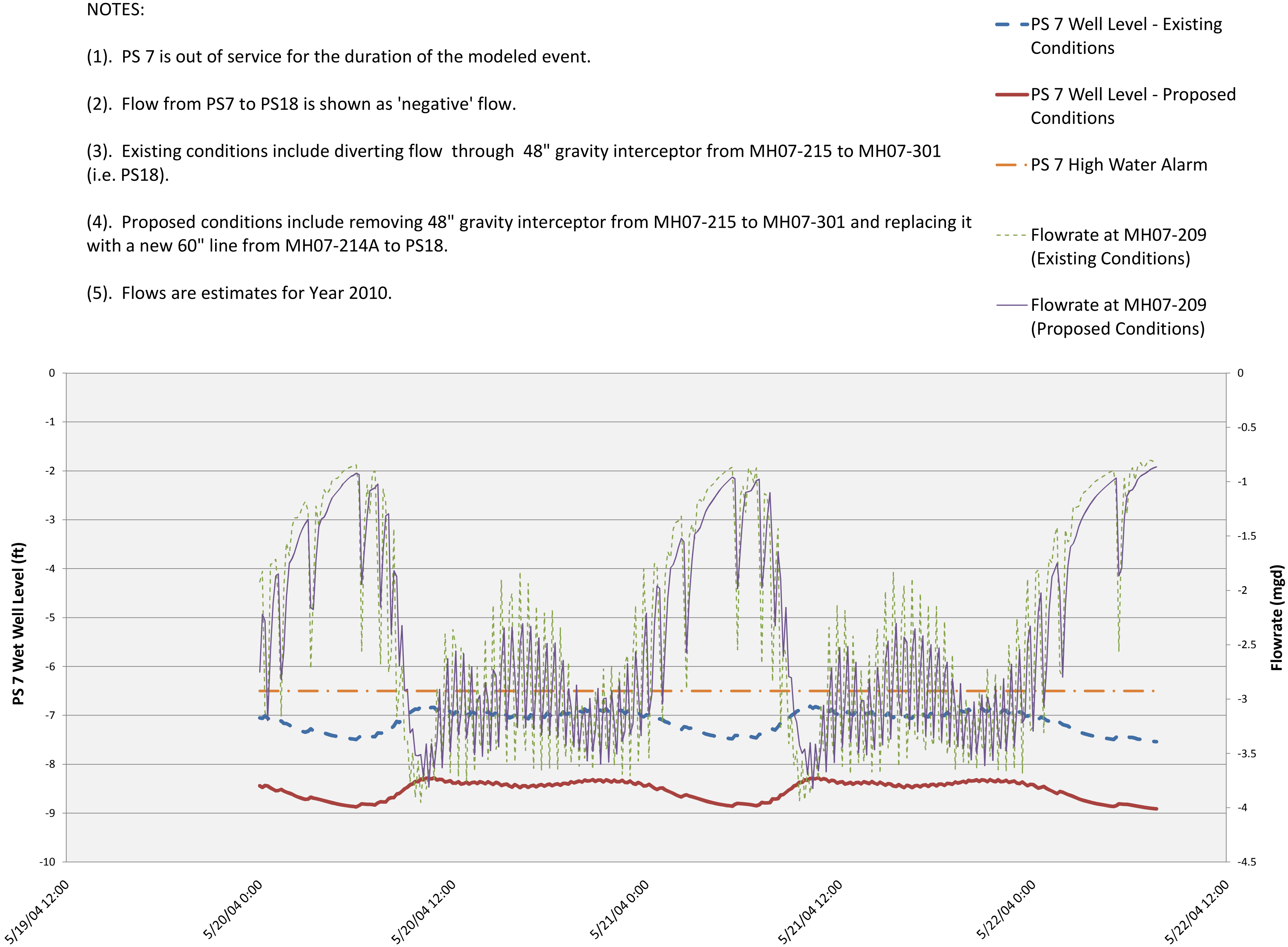


Figure 11A: Hydraulic Modeling of Dry Weather Flow Diversion - 2060 (PS 7 to PS 18)

NOTES:

(1). PS 7 is out of service for the duration of the modeled event.

(2). Flow from PS7 to PS18 is shown as 'negative' flow.

(3). Existing conditions include diverting flow through 48" gravity interceptor from MH07-215 to MH07-301 (i.e. PS18).

(4). Proposed conditions include removing 48" gravity interceptor from MH07-215 to MH07-301 and replacing it with a new 60" line from MH07-214A to PS18.

(5). Flows are estimates for Year 2060.

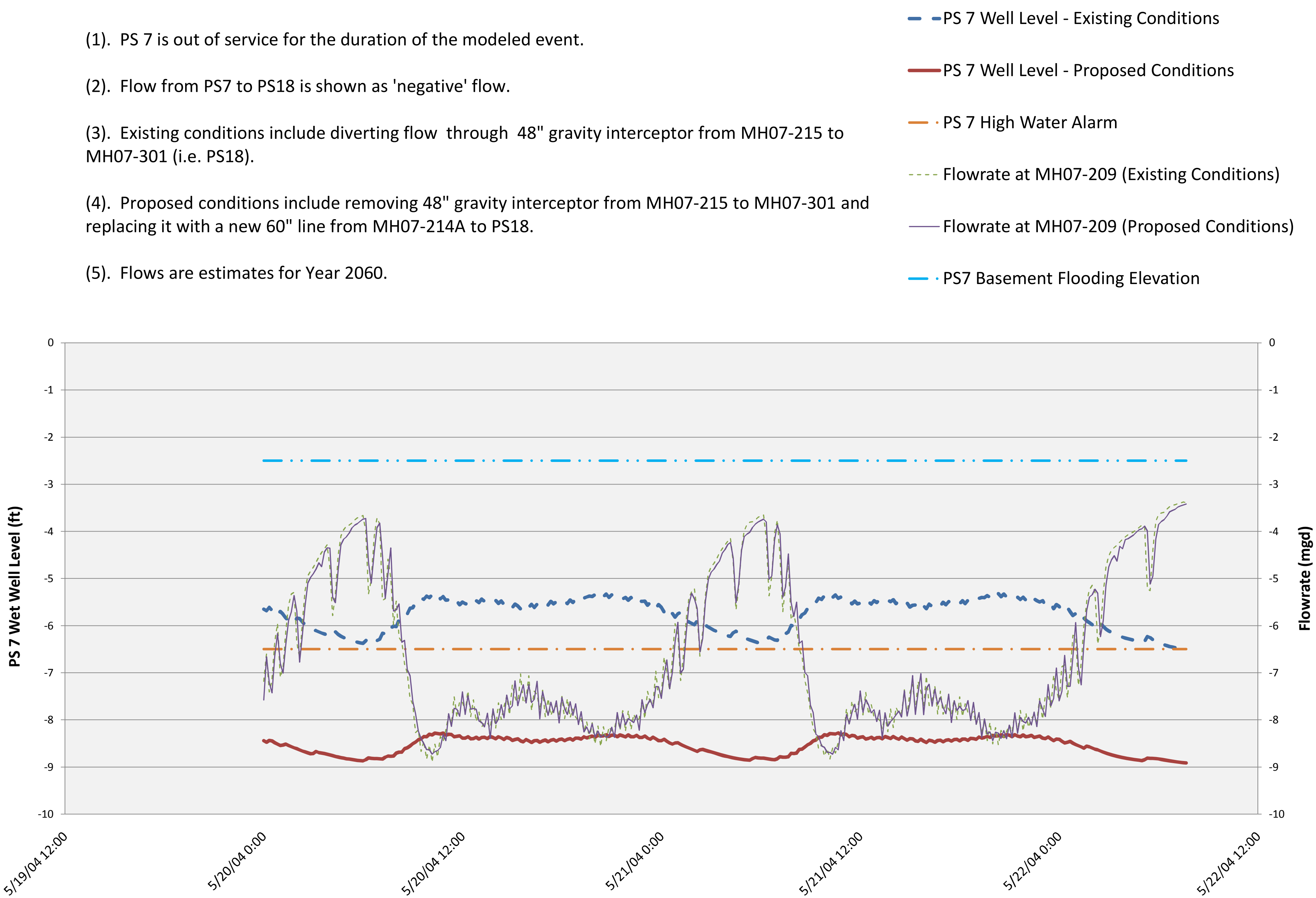


Figure 12: Hydraulic Modeling of Wet Weather Flow Diversion (PS 7 to PS 18)

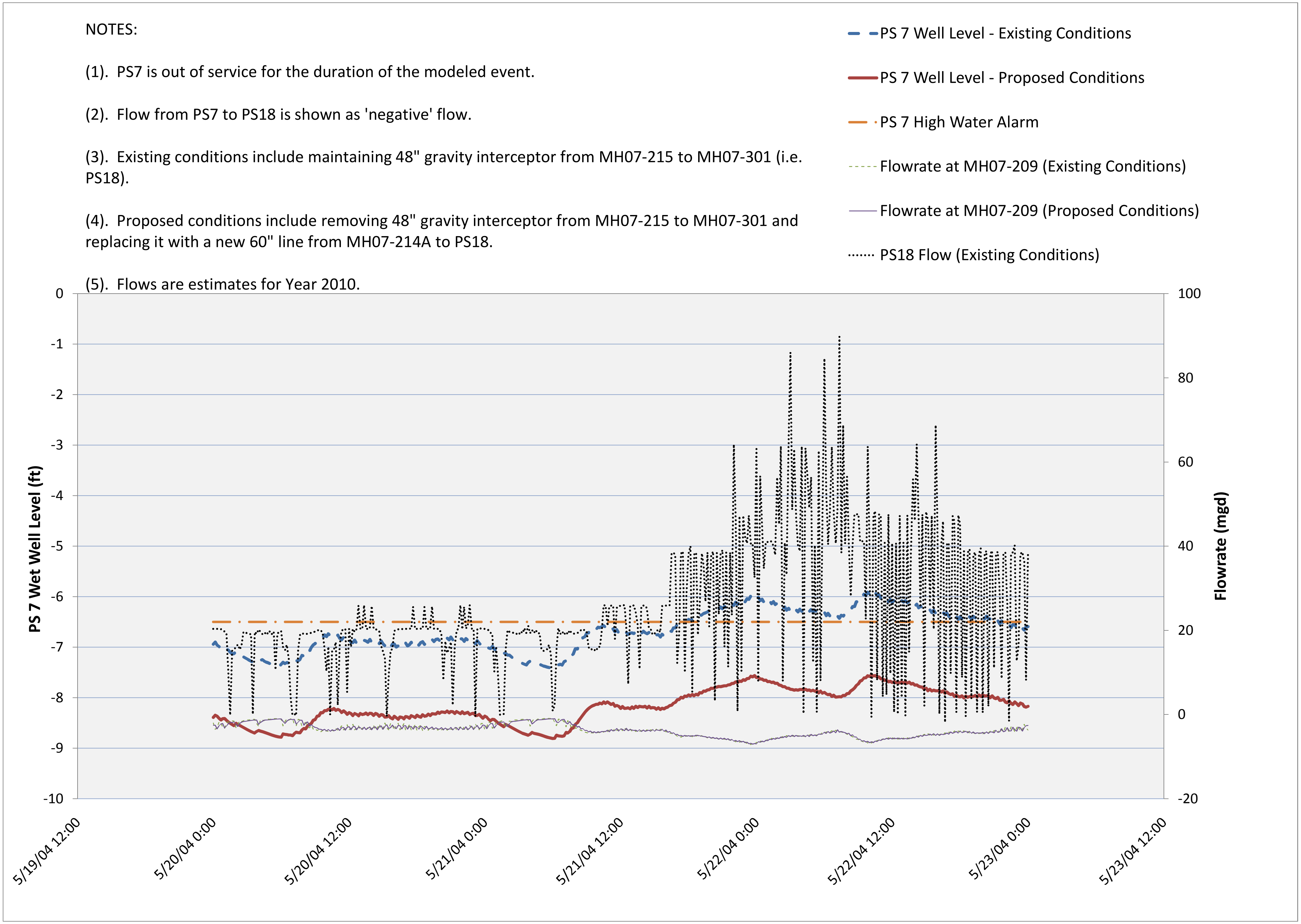
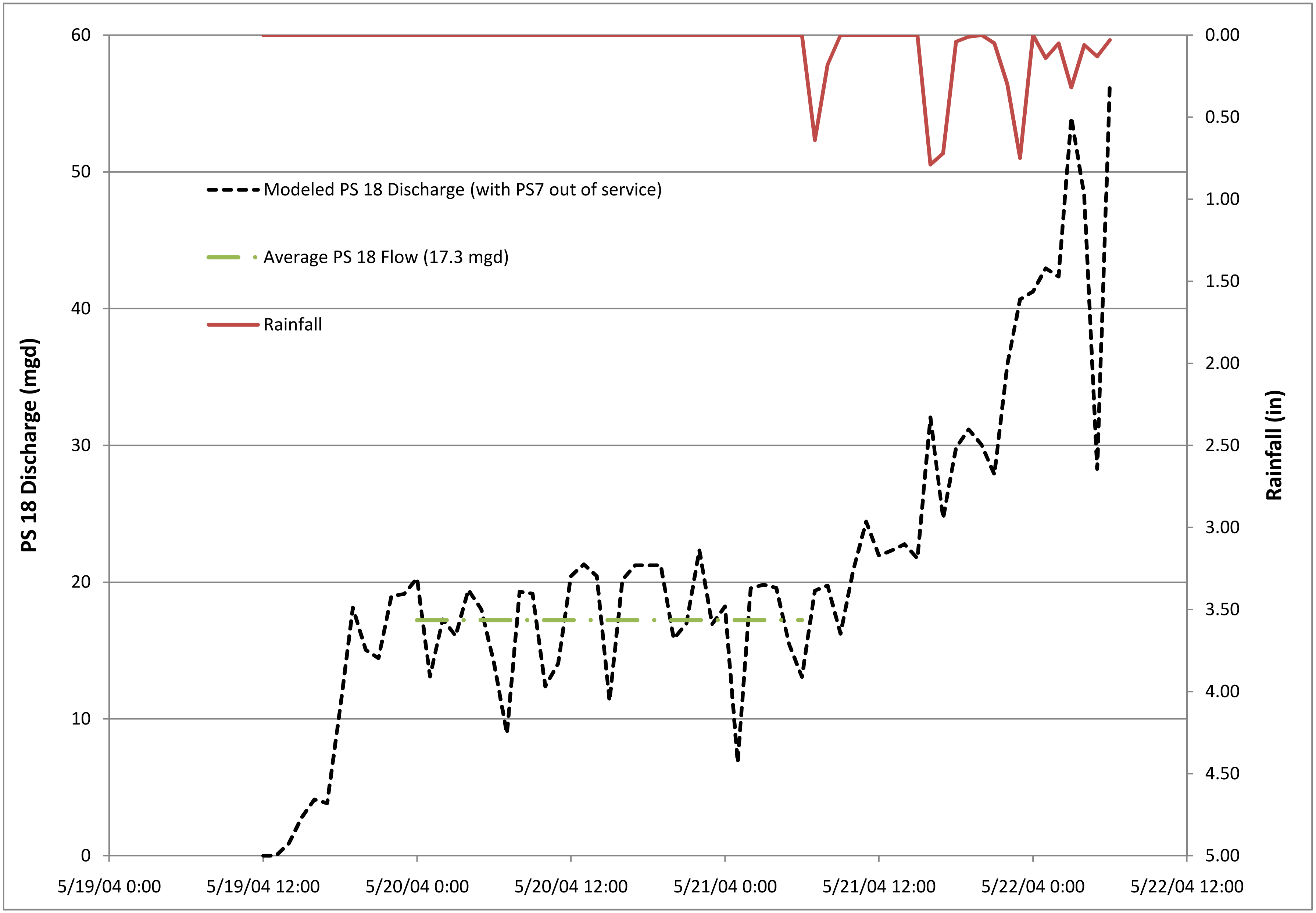


Figure 13: Wet Weather Flow (May 19-22, 2004 Storm)



Hydraulic modeling for 2060 dry weather flows shows that the wet well at PS7 will be above the high water alarm elevation for existing conditions but below the anticipated level at which basement flooding would occur (Figure 11A). The wet well level at PS7 for 2060 dry weather flows and proposed conditions would remain well below the high alarm level for a service outage at PS7.

Diverting flow from PS7 to PS18 during moderate wet weather events appears to be feasible without significant basement flooding in the PS7 service area. Diverting flows for long durations and/or for extreme wet weather events may not be possible without some basement flooding near PS7.

Replacing the existing 48" interceptor sewer segment (MH07-215 to MH07-301) with a new 60" sewer has an appreciable benefit during the diversion of flows from PS7 to PS18 during dry weather. It is estimated that the wet well at PS7 will be approximately 1.4 feet lower during diversion events if the 60" sewer is installed. It should be noted that installation of the 60" sewer will result in more flow being diverted from the Southeast Interceptor to PS18 during normal operations due to the lower invert elevation at MH07-214A. A cost-benefit analysis is recommended during the preliminary design phase to investigate this issue further.

Estimated Power Costs

The average daily flow at each pumping station is the same across all of the described operating alternatives. The alternatives differ in how the peak flows are distributed between the two pumping stations. Thus, for purposes of estimating annual energy use, only the average daily flowrates will be considered in this section.

Table 7 shows the approximate annual energy costs for PS7 and PS18 for existing and proposed conditions across three time periods. In this analysis it is assumed that the pumping rate is equal to the average daily flowrate and that the pump and motor efficiencies are the same for all conditions. As can be seen in this simplified calculation, the annual costs to pump average daily flows at PS7 and PS18 for all operating scenarios are very similar to the annual pumping costs for existing conditions at PS7. It is assumed in this analysis that a 48" force main is installed for PS18.

Energy costs associated with the pumping of wet weather flows were not considered in this analysis. While these costs are relevant, this preliminary analysis of pumping costs suggests that energy use may not be a primary factor in selection of the preferred alternative for the operation of PS18. Electric demand charges and back-up power requirements are important considerations that will need to be considered during preliminary design, however.

Table 7: Estimated Power Use for Pumping Scenarios at PS7 & PS18

	PS7				PS18				
Year	Average Daily Flow (mgd)	Pump Head (ft)	Energy Usage (kw·hr per Mgal)	Total Annual Energy Use ($/yr)	Average Daily Flow (mgd)	Pump Head (ft)	Energy Usage (kw·hr per Mgal)	Total Annual Energy Use ($/yr)	Total Annual Energy Use ($/yr)
Proposed conditions - PS7 + PS18									
2010	4.4	44.1	175.17	$28,000	12.4	49.4	196.23	$89,000	$117,000
2030	6.0	44.6	177.16	$70,000	18.0	55.6	220.85	$262,000	$332,000
2060	7.0	44.9	178.35	$200,000	22.0	61.2	243.10	$856,000	$1,056,000
Existing Conditions - PS7									
2010	16.8	50.6	200.99	$123,000	-	-	-	-	$123,000
2030	24.0	51.1	202.98	$321,000	-	-	-	-	$321,000
2060	29.0	54.4	216.09	$1,003,000	-	-	-	-	$1,003,000

Constants/Assumptions

(1). Pump Efficiency	0.85
(2). Motor Efficiency	0.93
(3). Unit Energy Cost ($/kw·hr)	$0.10
(4). Energy Escalation Rate (%)	3%
(5). PS18 force main diameter (in)	48

Summary and Recommendations

The District has identified a need to upgrade capacity and provide redundancy in its Eastside collection system. Immediate needs include an upgrade to firm pumping capacity at PS7, capacity relief in the Southeast Interceptor from PS7 to the Northeast Interceptor junction, and capacity relief for the Northeast Interceptor between the Southeast Interceptor and Far East Interceptor. The District also wishes to provide additional pumping capacity in this system to lessen the reliance on PS7 and provide more flexibility and diversion capabilities.

A new Pumping Station 18, located approximately 6,300 feet southeast of PS7, will accomplish the following goals:

1. Allow firm capacity pumping requirements at PS7 to be met, thus eliminating the need to increase the size of PS7 and the potential addition of another forcemain from PS7 to the NSWWTP.

2. Provide benchmark capacity for the Southeast Interceptor between PS7 and Northeast Interceptor junction, thus eliminating the need to provide a relief sewer from PS7 to the NEI junction.

3. Provide system redundancy and improve reliability for the Eastside collection system during service interruptions at PS7 for dry weather and small wet weather events.

It is expected that the capacity of PS18 will be very similar to that of PS7. Three alternate operating strategies have been proposed in this study for PS18 with regard to the conveyance of peak flows. Alternatives 1 and 2 are similar in their approach and propose that PS18 convey both average daily and peak flows from the Northeast Interceptor near MH07-301. Alternative 3 involves the pumping of primarily average daily flows from the Northeast Interceptor in an attempt to minimize construction costs and reduce annual pumping costs.

A preliminary analysis of pumping energy costs shows that Alternative 3 does not result in significant energy savings. This alternative does not alleviate the need for future capacity upgrades to PS7 and does provide sufficient diversion capacity for PS7. It is not recommended that Alternative 3 be advanced for further study.

Alternatives 1 and 2 provide peak flow capacity at PS18 that would provide the most benefit to PS7 and the Southeast Interceptor in both the near and long term. These alternatives are also capable of providing the required redundancy with PS7. Alternative 1 provides the greatest pumping capacity at PS18 (54 mgd) and is derived using MMSD's traditional peaking factors. It is recommended that PS18 be sized for an ultimate pumping capacity of 66 mgd based on the use of more conservative peaking factors.

Hydraulic modeling suggests that emergency diversion of flows from PS7 to PS18 can be performed safely during dry weather and possibly some moderate rain events. This diversion should not be relied upon for severe wet weather events or for extended outages in wet weather.

Further analysis is needed to determine how much peak flow capacity should be provided at PS18 relative to PS7 and the best method to split flows at PS18. This analysis should include a detailed investigation of the hydraulic inter-tie and the control strategies needed for splitting flows.

Attachments

1. Figure 1: Pumping Station 18 Site
2. Figure 2: Preliminary Route for Pumping Station 18 Forcemain
3. Figure 3: Preliminary Route for Northeast Interceptor Relief Sewer
4. Figure 4: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2010 Flows) – Peak Flows from Madison Design Curve
5. Figure 4A: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2010 Flows) – Peak Flows from 'Modified' Madison Design Curve
6. Figure 5: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2030 Flows) – Peak Flows from Madison Design Curve
7. Figure 5A: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2030 Flows) – Peak Flows from 'Modified' Madison Design Curve
8. Figure 6: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2060 Flows) – Peak Flows from Madison Design Curve
9. Figure 6A: Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2060 Flows) – Peak Flows from 'Modified' Madison Design Curve
10. Table 5: Diversion from PS7 to PS18 (MH07-301)
11. Table 8A-1: Peak Hourly Flows for PS18 and PS7 – Alternative 1 (Madison Design Curve)
12. Table 8A-2: Peak Hourly Flows for PS18 and PS7 – Alternative 2 (Madison Design Curve)
13. Table 8A-3: Peak Hourly Flows for PS18 and PS7 – Alternative 3 (Madison Design Curve)
14. Table 9A-1: Peak Hourly Flows for PS18 and PS7 – Alternative 1 (Modified Madison Design Curve)
15. Table 9A-2: Peak Hourly Flows for PS18 and PS7 – Alternative 2 (Modified Madison Design Curve)
16. Table 9A-3: Peak Hourly Flows for PS18 and PS7 – Alternative 3 (Modified Madison Design Curve)

17. Figure 14: Pumping Station 14 Sub-basins

18. Figure 15: Pumping Station 13 Sub-basins

19. Figure 16: Pumping Station 10 Sub-basins

20. Figure 17: Pumping Station 9 Sub-basins

21. Figure 18: Pumping Station 7 Sub-basins

MMSD	**Madison Metropolitan Sewerage District**	**Figure 1** **Pumping Station 18 Site**	Prepared by: TWG Date: August, 2011

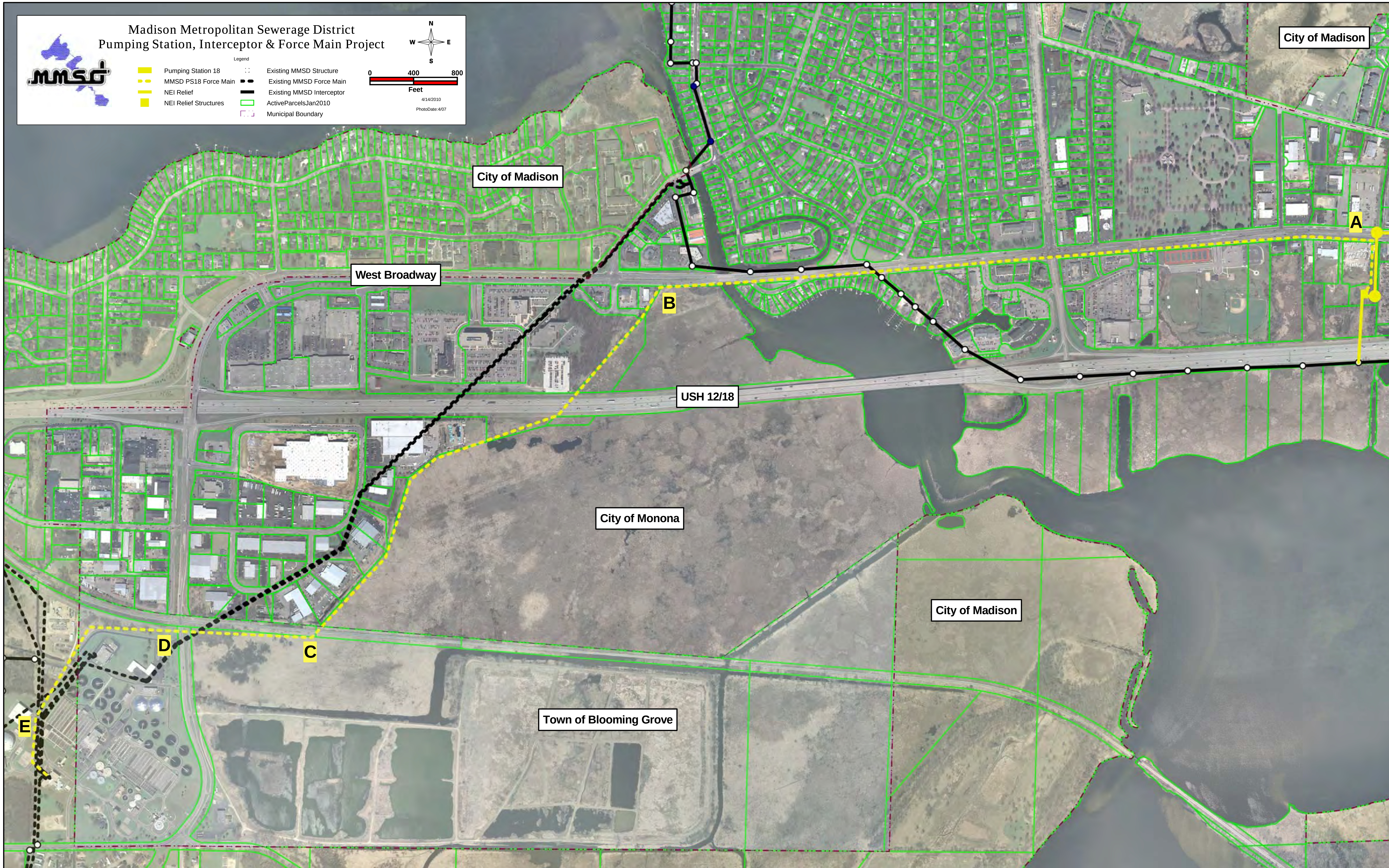


Figure 2 - Preliminary Route for Pumping Station 18 Forcemain

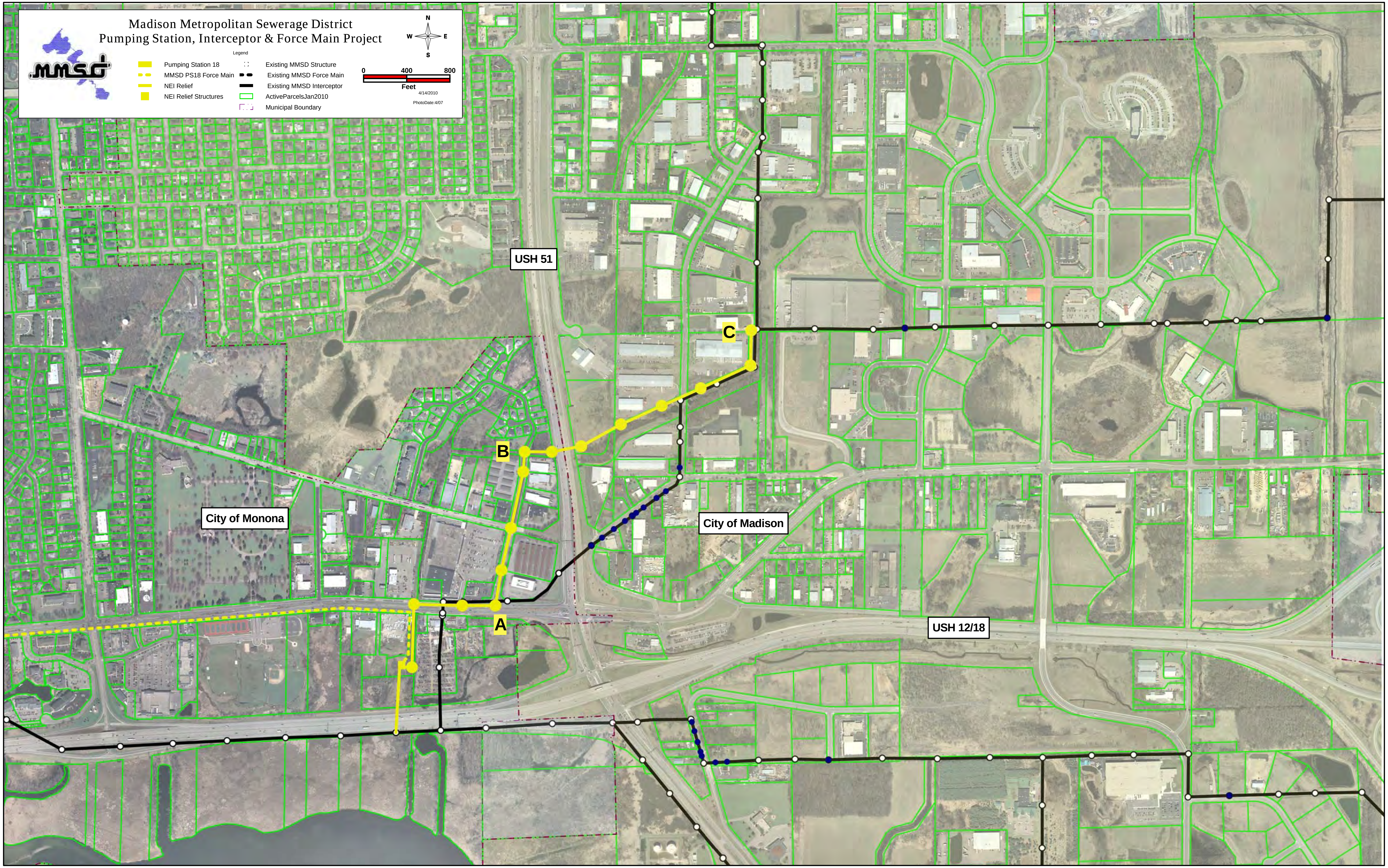
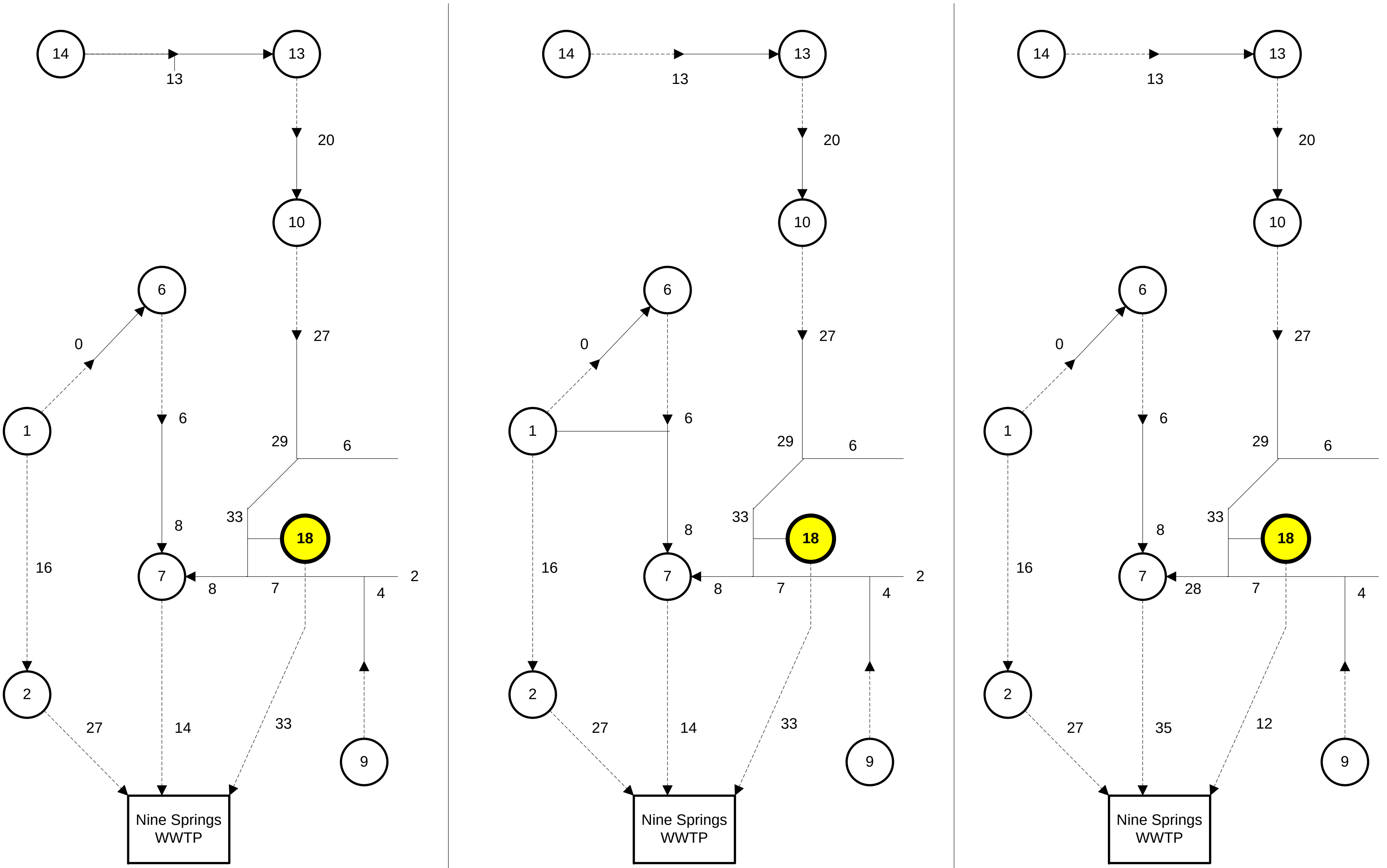


Figure 3 - Preliminary Route for Northeast Interceptor Relief Sewer



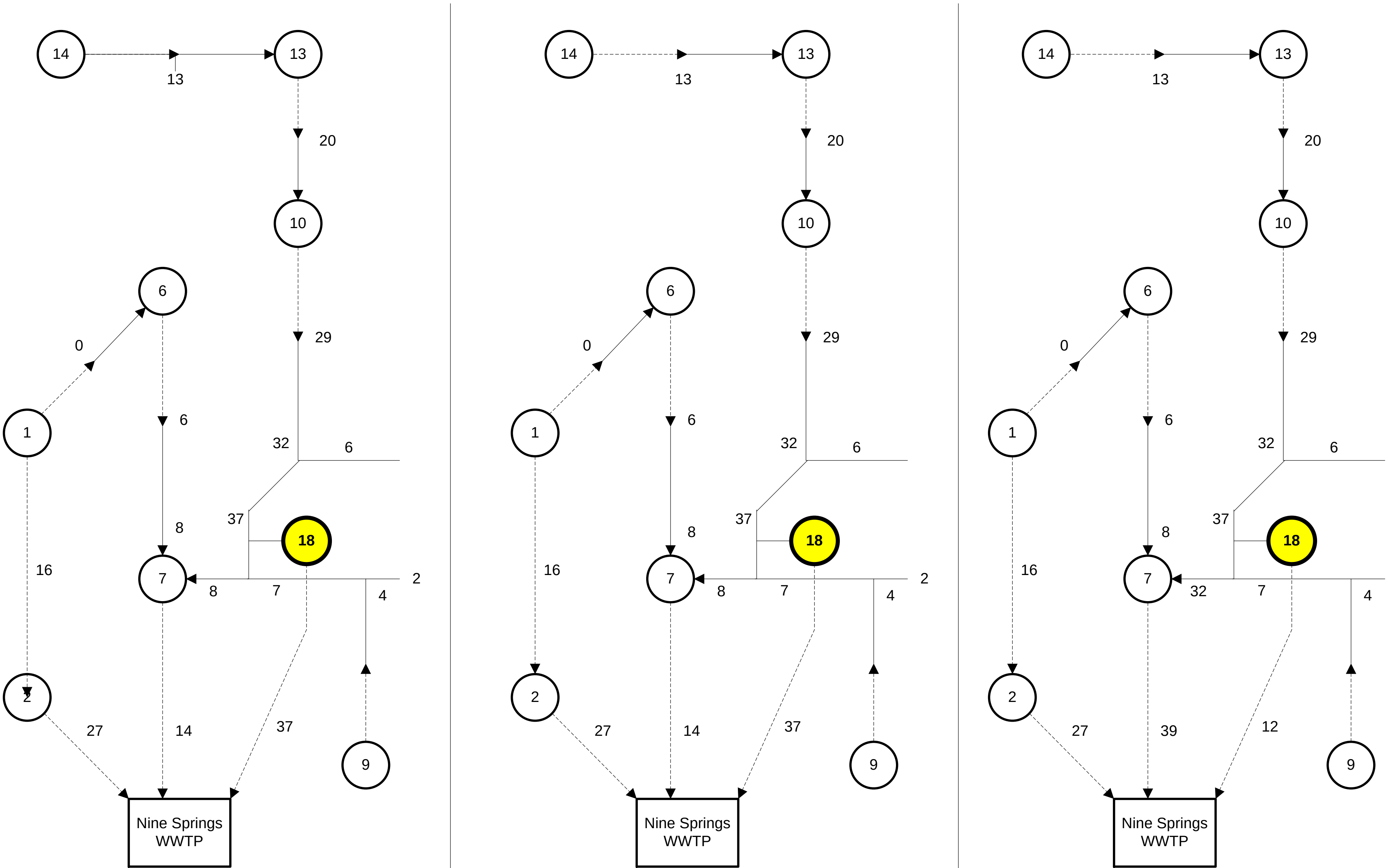
Alternative 1
PS 18 = 54 mgd peak capacity

Alternative 2
PS 18 = 37 mgd peak capacity

Alternative 3
PS 18 = Northeast Interceptor
Average Daily Flow

Figure 4 – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2010 Flows)

Peak flows derived from Madison Design Curve



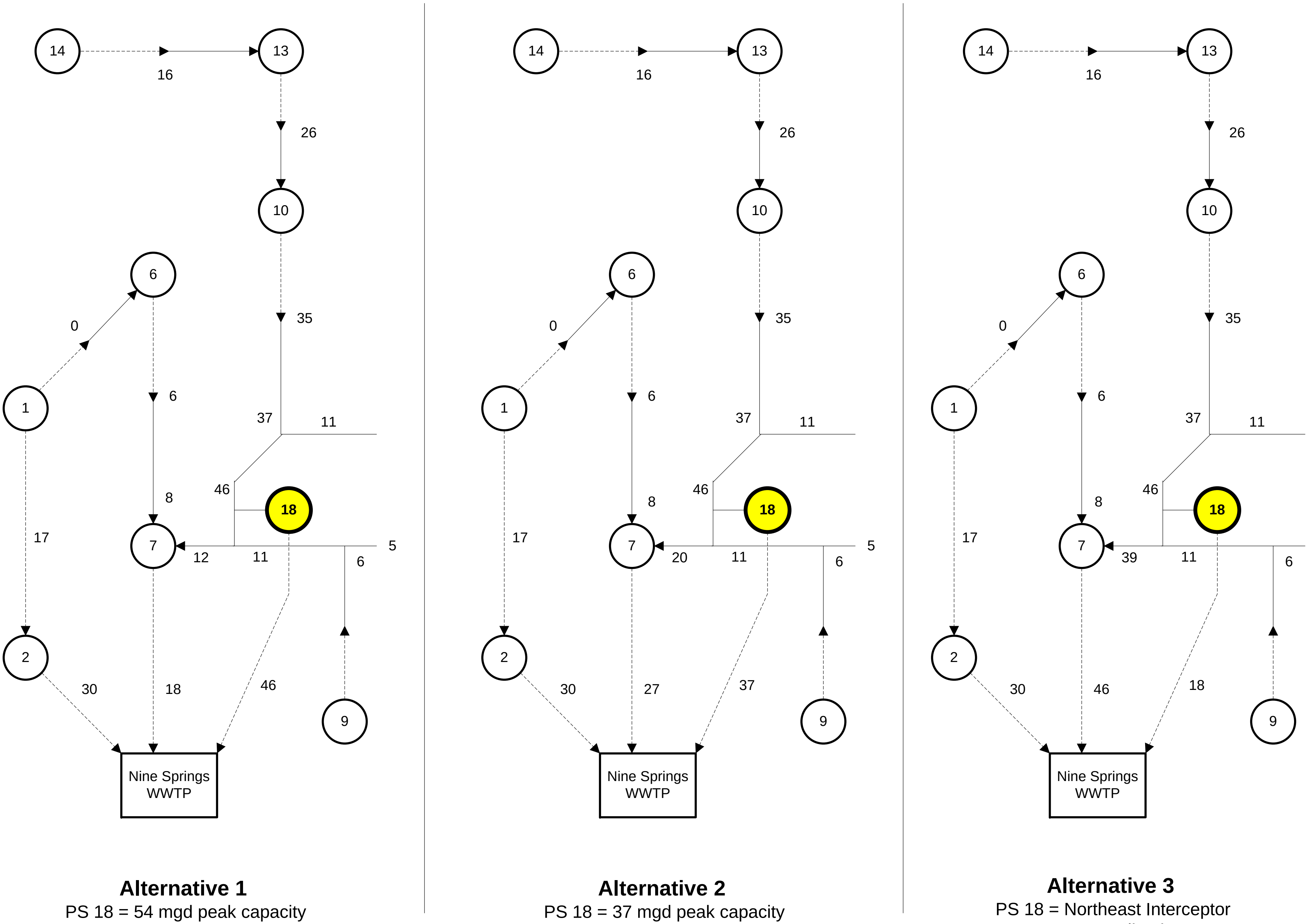
Alternative 1
PS 18 = 66 mgd peak capacity

Alternative 2
PS 18 = 44 mgd peak capacity

Alternative 3
PS 18 = Northeast Interceptor Average Daily Flow

Figure 4A – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2010 Flows)

Peak flows derived from 'Modified' Madison Design Curve



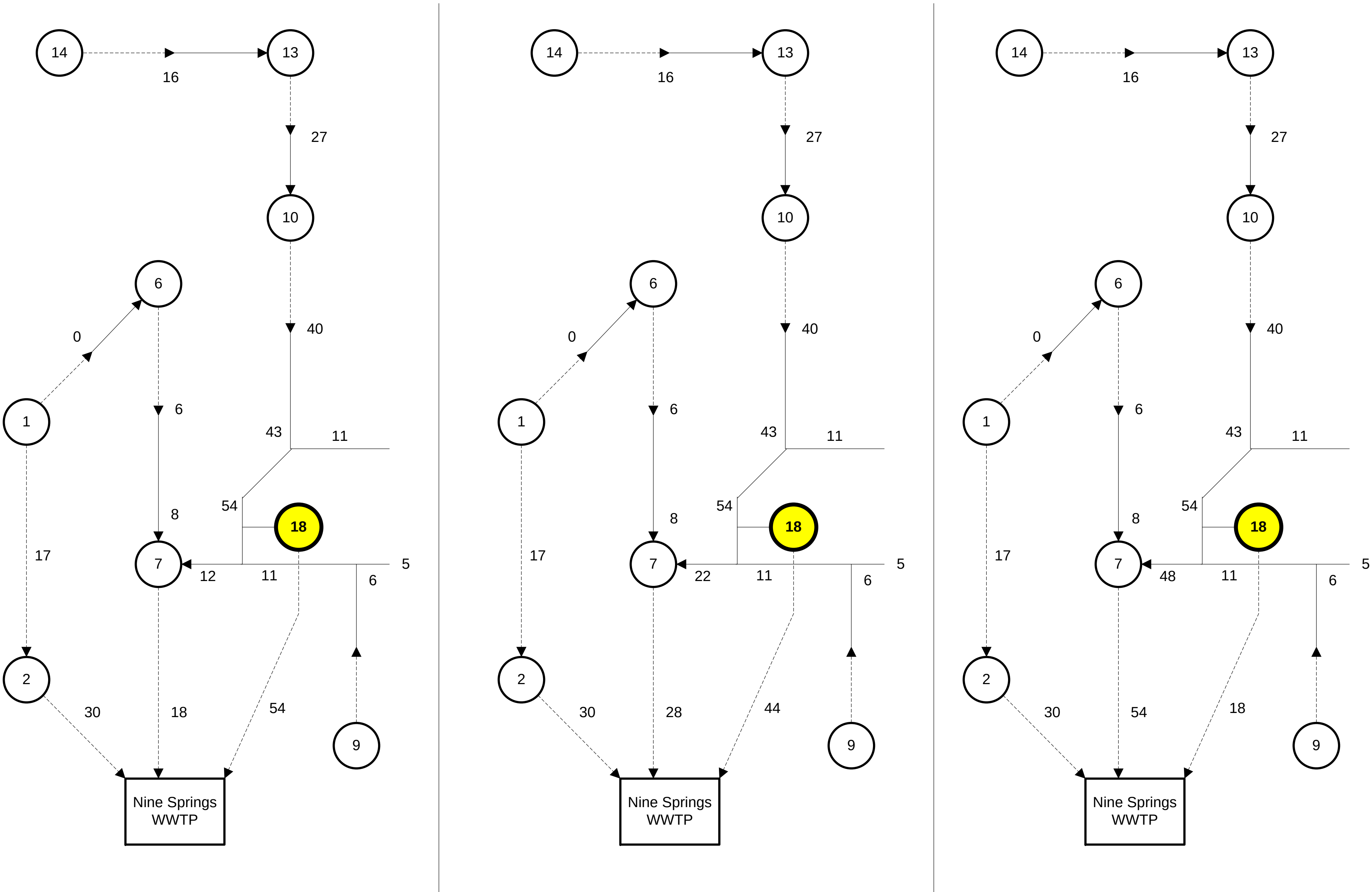
Alternative 1
PS 18 = 54 mgd peak capacity

Alternative 2
PS 18 = 37 mgd peak capacity

Alternative 3
PS 18 = Northeast Interceptor Average Daily Flow

Figure 5 – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2030 Flows)

Peak flows derived from Madison Design Curve



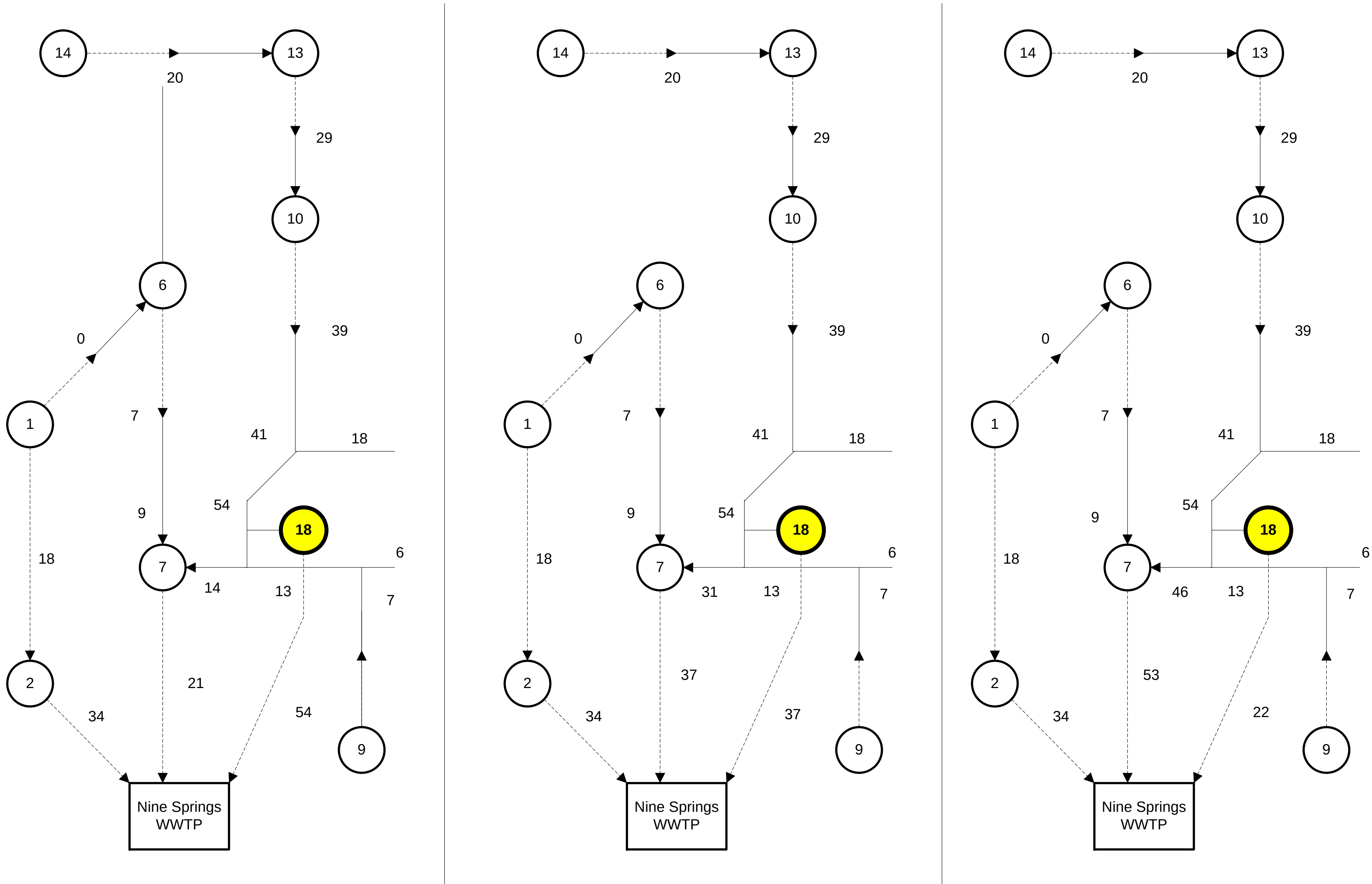
Alternative 1
PS 18 = 66 mgd peak capacity

Alternative 2
PS 18 = 44 mgd peak capacity

Alternative 3
PS 18 = Northeast Interceptor Average Daily Flow

Figure 5A – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2030 Flows)

Peak flows derived from 'Modified' Madison Design Curve



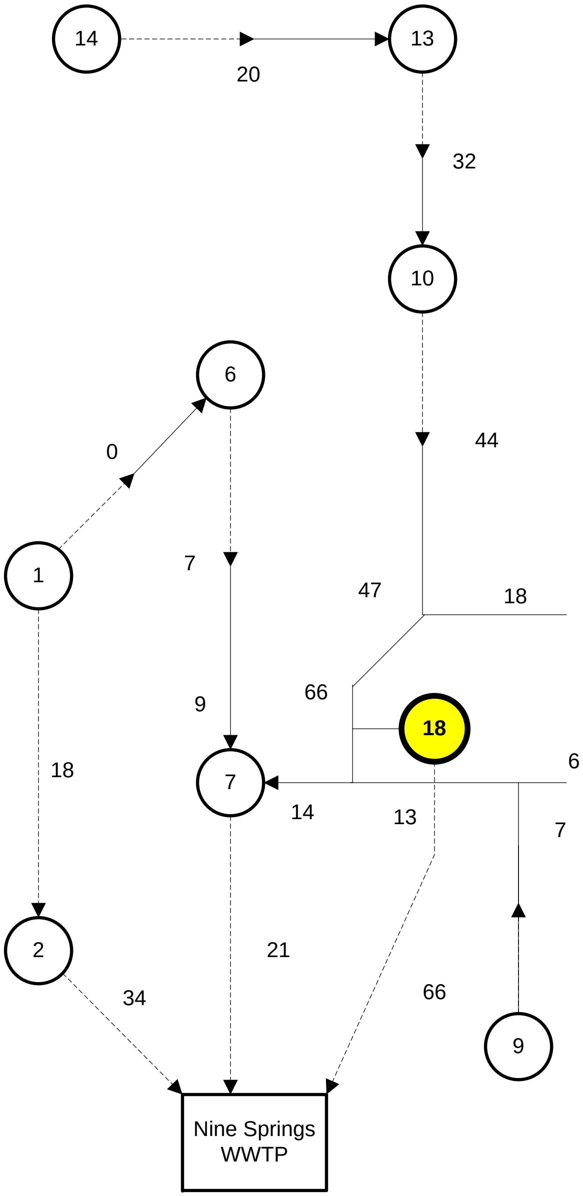
Alternative 1 – PS 18 = 54 mgd peak capacity

Alternative 2 – PS 18 = 37 mgd peak capacity

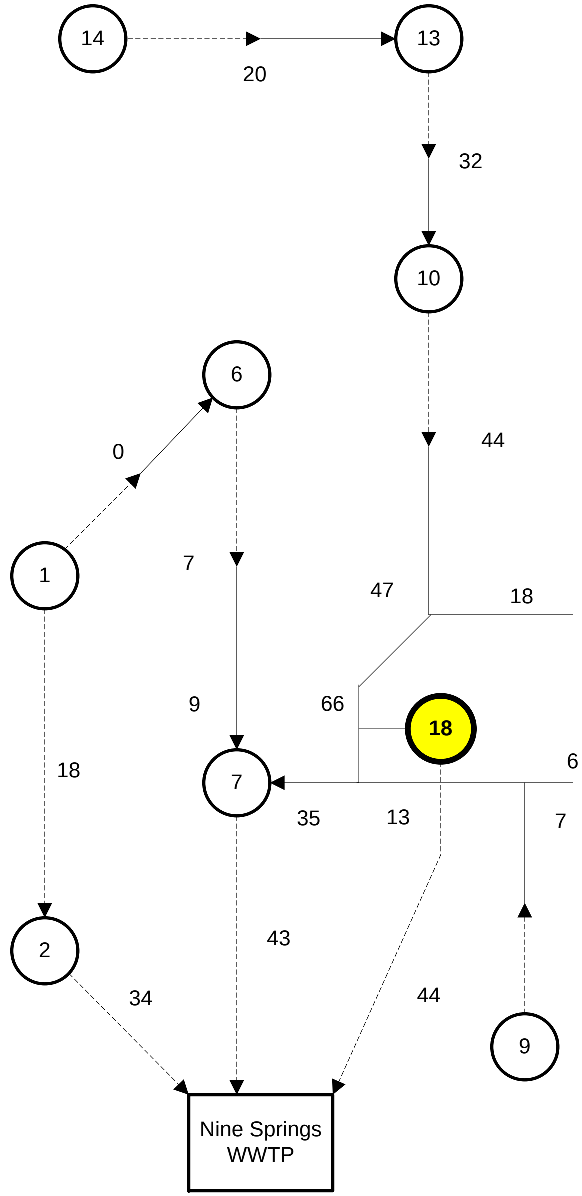
Alternative 3 – PS 18 = Northeast Interceptor Average Daily Flow

Figure 6 – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2060 Flows)

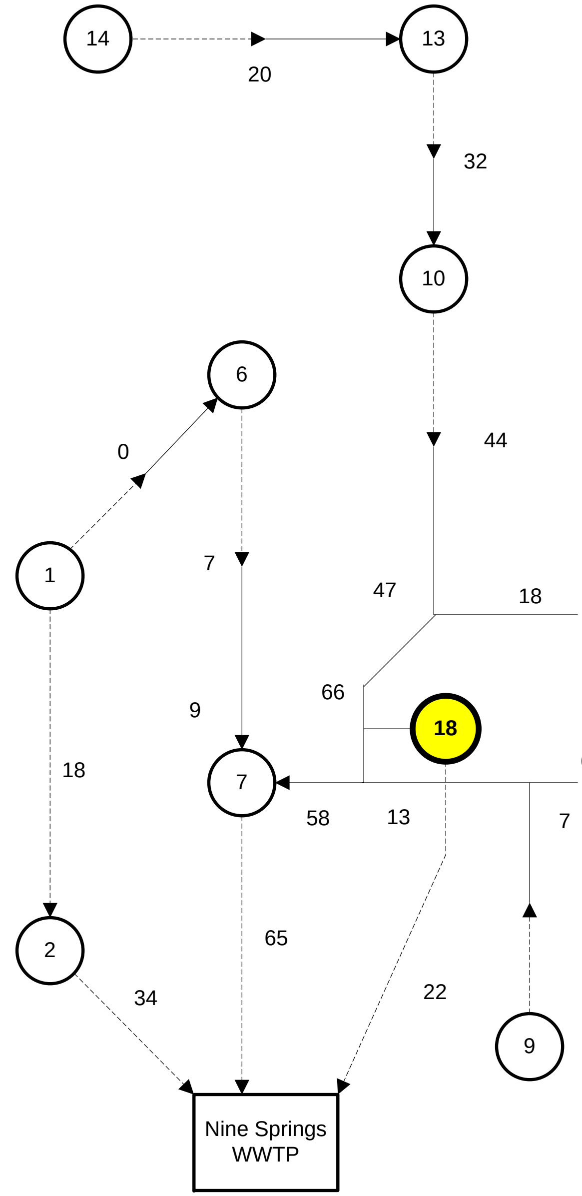
Peak flows derived from Madison Design Curve



Alternative 1 – PS 18 = 66 mgd peak capacity



Alternative 2 – PS 18 = 44 mgd peak capacity



Alternative 3 – PS 18 = Northeast Interceptor Average Daily Flow

Figure 6A – Preliminary Peak Design Flow Schematic for Pump Station 18 Alternatives (2060 Flows)

Peak flows derived from 'Modified' Madison Design Curve

TABLE 5 - EMERGENCY DIVERSION FROM PS7 TO PS18 (MH07-301)

Existing Conditions

FIND: Wet well elevations at Pump Station No. 7 for various rates of "backflow" from PS 7 to PS18 (MH07-301

I. PHYSICAL CHARACTERISICS OF DIVERSION

NEI Section		SEI Section	
Length, L, of 48" overflow (ft) =	596	Length, L, of 60" overflow (ft) =	7,810
Pipe diameter, D (ft) =	4.00	Pipe diameter, D (ft) =	5.00
Pipe area, A (ft^2) =	12.566	Pipe area, A (ft^2) =	19.635
Hydraulic radius, R (ft) =	1.00	Hydraulic radius, R (ft) =	1.25
Manning's n =	0.013	Manning's n =	0.013

Water surface elevation at MH07-301 = -4.56 (assume 48" NEI is flowing full)

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in NEI Section (ft)	Water Surface Elevation at MH07-215 (ft)	Head Loss, ΔH, in SEI Section (ft)	Water Surface Elevation at PS7 (ft)
53.0	81.99	1.93	-2.63	7.69	5.06
52.0	80.44	1.86	-2.70	7.40	4.70
51.0	78.90	1.79	-2.77	7.12	4.35
50.0	77.35	1.72	-2.84	6.84	4.00
49.0	75.80	1.65	-2.91	6.57	3.66
48.0	74.26	1.58	-2.98	6.31	3.33
47.0	72.71	1.52	-3.04	6.05	3.00
46.0	71.16	1.45	-3.11	5.79	2.69
45.0	69.62	1.39	-3.17	5.54	2.37
44.0	68.07	1.33	-3.23	5.30	2.07
43.0	66.52	1.27	-3.29	5.06	1.77
42.0	64.97	1.21	-3.35	4.83	1.48
41.0	63.43	1.16	-3.40	4.60	1.20
40.0	61.88	1.10	-3.46	4.38	0.92
39.0	60.33	1.05	-3.51	4.16	0.65
38.0	58.79	0.99	-3.57	3.95	0.38
37.0	57.24	0.94	-3.62	3.75	0.13
36.0	55.69	0.89	-3.67	3.55	-0.12
35.0	54.15	0.84	-3.72	3.35	-0.37
34.0	52.60	0.79	-3.77	3.16	-0.60
33.0	51.05	0.75	-3.81	2.98	-0.83
32.0	49.50	0.70	-3.86	2.80	-1.05
31.0	47.96	0.66	-3.90	2.63	-1.27
30.0	46.41	0.62	-3.94	2.46	-1.48
29.0	44.86	0.58	-3.98	2.30	-1.68
28.0	43.32	0.54	-4.02	2.15	-1.88
27.0	41.77	0.50	-4.06	2.00	-2.06
26.0	40.22	0.46	-4.10	1.85	-2.25
25.0	38.68	0.43	-4.13	1.71	-2.42
24.0	37.13	0.40	-4.16	1.58	-2.59
23.0	35.58	0.36	-4.20	1.45	-2.75
22.0	34.03	0.33	-4.23	1.32	-2.90
21.0	32.49	0.30	-4.26	1.21	-3.05
20.0	30.94	0.28	-4.28	1.09	-3.19
19.0	29.39	0.25	-4.31	0.99	-3.32
18.0	27.85	0.22	-4.34	0.89	-3.45
17.0	26.30	0.20	-4.36	0.79	-3.57
16.0	24.75	0.18	-4.38	0.70	-3.68
15.0	23.21	0.15	-4.41	0.62	-3.79
14.0	21.66	0.13	-4.43	0.54	-3.89
13.0	20.11	0.12	-4.44	0.46	-3.98

TABLE 5 - EMERGENCY DIVERSION FROM PS7 TO PS18
Proposed Conditions

FIND: Wet well elevations at Pump Station No. 7 for various rates of "backflow" from PS 7 to PS18

I. PHYSICAL CHARACTERISICS OF DIVERSION

PS18 Overflow		**SEI Section**	
Length, L, of 60" overflow (ft) =	620	Length, L, of 60" overflow (ft) =	7,810
Pipe diameter, D (ft) =	5.00	Pipe diameter, D (ft) =	5.00
Pipe area, A (ft^2) =	19.635	Pipe area, A (ft^2) =	19.635
Hydraulic radius, R (ft) =	1.25	Hydraulic radius, R (ft) =	1.25
Manning's n =	0.013	Manning's n =	0.013

Water surface elevation at PS18 = -4.56

II. CALCULATE FLOW BY MANNING'S EQUATION

$Q = (1.49/n) * A*R^{2/3} *S^{1/2}$

$\Delta H = ((Q*n)/(1.49*A*R^{2/3}))^2 * L$

Diversion Flow, Q (mgd)	Diversion Flow, Q (cfs)	Head Loss, ΔH, in NEI Section (ft)	Water Surface Elevation at MH07-215 (ft)	Head Loss, ΔH, in SEI Section (ft)	Water Surface Elevation at PS7 (ft)
53.0	81.99	0.61	-3.95	7.69	3.74
52.0	80.44	0.59	-3.97	7.40	3.43
51.0	78.90	0.57	-3.99	7.12	3.12
50.0	77.35	0.54	-4.02	6.84	2.82
49.0	75.80	0.52	-4.04	6.57	2.53
48.0	74.26	0.50	-4.06	6.31	2.25
47.0	72.71	0.48	-4.08	6.05	1.97
46.0	71.16	0.46	-4.10	5.79	1.69
45.0	69.62	0.44	-4.12	5.54	1.42
44.0	68.07	0.42	-4.14	5.30	1.16
43.0	66.52	0.40	-4.16	5.06	0.90
42.0	64.97	0.38	-4.18	4.83	0.65
41.0	63.43	0.37	-4.19	4.60	0.41
40.0	61.88	0.35	-4.21	4.38	0.17
39.0	60.33	0.33	-4.23	4.16	-0.07
38.0	58.79	0.31	-4.25	3.95	-0.29
37.0	57.24	0.30	-4.26	3.75	-0.52
36.0	55.69	0.28	-4.28	3.55	-0.73
35.0	54.15	0.27	-4.29	3.35	-0.94
34.0	52.60	0.25	-4.31	3.16	-1.15
33.0	51.05	0.24	-4.32	2.98	-1.34
32.0	49.50	0.22	-4.34	2.80	-1.54
31.0	47.96	0.21	-4.35	2.63	-1.72
30.0	46.41	0.20	-4.36	2.46	-1.90
29.0	44.86	0.18	-4.38	2.30	-2.08
28.0	43.32	0.17	-4.39	2.15	-2.24
27.0	41.77	0.16	-4.40	2.00	-2.41
26.0	40.22	0.15	-4.41	1.85	-2.56
25.0	38.68	0.14	-4.42	1.71	-2.71
24.0	37.13	0.13	-4.43	1.58	-2.86
23.0	35.58	0.11	-4.45	1.45	-3.00
22.0	34.03	0.11	-4.45	1.32	-3.13
21.0	32.49	0.10	-4.46	1.21	-3.26
20.0	30.94	0.09	-4.47	1.09	-3.38
19.0	29.39	0.08	-4.48	0.99	-3.49
18.0	27.85	0.07	-4.49	0.89	-3.60
17.0	26.30	0.06	-4.50	0.79	-3.71
16.0	24.75	0.06	-4.50	0.70	-3.80
15.0	23.21	0.05	-4.51	0.62	-3.90
14.0	21.66	0.04	-4.52	0.54	-3.98
13.0	20.11	0.04	-4.52	0.46	-4.06

Table 8A-1

Peak Hourly Flows for PS18 and PS7 - Alternative 1 (Madison Design Curve)

			2010 U.F.				2030 U.F.				2060			
Pumping Station Sub Basin	From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	2.9	20.84
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	2.9	21.24
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	2.9	22.52	196,939	9.35	2.8	26.28
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	2.8	25.77	1,353,883	10.71	2.8	29.44
PS 13				6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
	PS 13	MH10-145		6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
10-A	MH10-145	MH10-121	932,249	7.70	2.9	22.30	1,149,110	10.29	2.8	28.47	1,149,110	11.86	2.7	32.08
10-B	MH10-121	MH10-201	412,216	8.11	2.9	23.30	461,286	10.75	2.7	29.54	461,286	12.32	2.7	33.13
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.86	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	2.8	25.03		12.27	2.7	33.02		13.84	2.6	36.54
10-E	MH10-115	MH10-104A	173,558	9.00	2.8	25.44	185,986	12.45	2.7	33.44	185,986	14.02	2.6	36.95
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	2.8	25.89		12.64	2.7	33.87		14.21	2.6	37.38
10-G	MH10-102A	MH10-101	11,479	9.20	2.8	25.91	17,319	12.66	2.7	33.91	17,319	14.23	2.6	37.42
10-H	MH10-101	PS 10	579,684	9.78	2.8	27.28	599,396	13.26	2.7	35.26	599,396	14.83	2.6	38.74
PS 10				9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74
	PS 10	MH07-955		9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74

Table 8A-1
Peak Hourly Flows for PS18 and PS7 - Alternative 1 (Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F.				2030 U.F.				2060			
			Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	2.8	29.32	980,335	14.24	2.6	37.44	980,335	15.81	2.6	40.88
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	2.7	33.21	226,623	17.95	2.5	45.50	226,623	21.85	2.5	53.68
PS 18 - Alternative 1				12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
	PS 18	WWTP		12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
7-M	MH07-211	PS 7	305,045	2.15	3.5	7.61	350,317	3.57	3.3	11.68	350,317	4.40	3.2	13.93
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
PS 7 - Alternative 1				4.43	3.2	14.01		5.99	3.0	18.06		7.07	2.9	20.77
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	18.06		7.07	2.9	20.77

Table 8A-2
Peak Hourly Flows for PS18 and PS7 - Alternative 2 (Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F. Sub-Basin Flow (gpd)	2010 U.F. Cumulative Flow (MGD)	2010 U.F. Peak Factor	2010 U.F. Cumulative Peak Flow (MGD)	2030 U.F. Sub-Basin Flow (gpd)	2030 U.F. Cumulative Flow (MGD)	2030 U.F. Peak Factor	2030 U.F. Cumulative Peak Flow (MGD)	2060 Sub-Basin Flow (gpd)	2060 Cumulative Flow (MGD)	2060 Peak Factor	2060 Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	2.9	20.84
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	2.9	21.24
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	2.9	22.52	196,939	9.35	2.8	26.28
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	2.8	25.77	1,353,883	10.71	2.8	29.44
PS 13				6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
	PS 13	MH10-145		6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
10-A	MH10-145	MH10-121	932,249	7.70	2.9	22.30	1,149,110	10.29	2.8	28.47	1,149,110	11.86	2.7	32.08
10-B	MH10-121	MH10-201	412,216	8.11	2.9	23.30	461,286	10.75	2.7	29.54	461,286	12.32	2.7	33.13
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.86	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	2.8	25.03		12.27	2.7	33.02		13.84	2.6	36.54
10-E	MH10-115	MH10-104A	173,558	9.00	2.8	25.44	185,986	12.45	2.7	33.44	185,986	14.02	2.6	36.95
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	2.8	25.89		12.64	2.7	33.87		14.21	2.6	37.38
10-G	MH10-102A	MH10-101	11,479	9.20	2.8	25.91	17,319	12.66	2.7	33.91	17,319	14.23	2.6	37.42
10-H	MH10-101	PS 10	579,684	9.78	2.8	27.28	599,396	13.26	2.7	35.26	599,396	14.83	2.6	38.74
PS 10				9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74
	PS 10	MH07-955		9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74

Table 8A-2
Peak Hourly Flows for PS18 and PS7 - Alternative 2 (Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F.				2030 U.F.				2060			
			Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	2.8	29.32	980,335	14.24	2.6	37.44	980,335	15.81	2.6	40.88
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	2.7	33.21	226,623	17.95	2.5	45.50	226,623	21.85	2.5	53.68
				12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
	PS 18	WWTP		12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
PS 18 - Alternative 2				12.41	2.7	33.21		14.12	2.6	37.00		14.12	2.6	37.00
	PS 18	WWTP		12.41	2.7	33.21		14.12	2.6	37.00		14.12	2.6	37.00
Excess peak flow to PS7						0.00				8.50				16.68
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	6.69		3.22	3.3	19.21		4.05	3.2	29.67
7-M	MH07-211	PS 7	305,045	2.15	3.5	7.61	350,317	3.57	3.3	20.18	350,317	4.40	3.2	30.61
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
				4.43	3.2	14.01		5.99	3.0	26.56		7.07	2.9	37.45
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	26.56		7.07	2.9	37.45
PS 7 - Alternative 2				4.43	3.2	14.01		5.99	4.4	26.56		7.07	5.3	37.45
	PS 7	WWTP		4.43	3.2	14.01		5.99	4.4	26.56		7.07	5.3	37.45

Table 8A-3

Peak Hourly Flows for PS18 and PS7 - Alternative 3 (Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F. Sub-Basin Flow (gpd)	2010 U.F. Cumulative Flow (MGD)	2010 U.F. Peak Factor	2010 U.F. Cumulative Peak Flow (MGD)	2030 U.F. Sub-Basin Flow (gpd)	2030 U.F. Cumulative Flow (MGD)	2030 U.F. Peak Factor	2030 U.F. Cumulative Peak Flow (MGD)	2060 Sub-Basin Flow (gpd)	2060 Cumulative Flow (MGD)	2060 Peak Factor	2060 Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	2.9	20.84
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	2.9	21.24
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	2.9	22.52	196,939	9.35	2.8	26.28
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	2.8	25.77	1,353,883	10.71	2.8	29.44
PS 13				6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
	PS 13	MH10-145		6.76	3.0	20.00		9.14	2.8	25.77		10.71	2.8	29.44
10-A	MH10-145	MH10-121	932,249	7.70	2.9	22.30	1,149,110	10.29	2.8	28.47	1,149,110	11.86	2.7	32.08
10-B	MH10-121	MH10-201	412,216	8.11	2.9	23.30	461,286	10.75	2.7	29.54	461,286	12.32	2.7	33.13
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.86	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	2.8	25.03		12.27	2.7	33.02		13.84	2.6	36.54
10-E	MH10-115	MH10-104A	173,558	9.00	2.8	25.44	185,986	12.45	2.7	33.44	185,986	14.02	2.6	36.95
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	2.8	25.89		12.64	2.7	33.87		14.21	2.6	37.38
10-G	MH10-102A	MH10-101	11,479	9.20	2.8	25.91	17,319	12.66	2.7	33.91	17,319	14.23	2.6	37.42
10-H	MH10-101	PS 10	579,684	9.78	2.8	27.28	599,396	13.26	2.7	35.26	599,396	14.83	2.6	38.74
PS 10				9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74
	PS 10	MH07-955		9.78	2.8	27.28		13.26	2.7	35.26		14.83	2.6	38.74

Table 8A-3
Peak Hourly Flows for PS18 and PS7 - Alternative 3 (Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F. Sub-Basin Flow (gpd)	2010 U.F. Cumulative Flow (MGD)	2010 U.F. Peak Factor	2010 U.F. Cumulative Peak Flow (MGD)	2030 U.F. Sub-Basin Flow (gpd)	2030 U.F. Cumulative Flow (MGD)	2030 U.F. Peak Factor	2030 U.F. Cumulative Peak Flow (MGD)	2060 Sub-Basin Flow (gpd)	2060 Cumulative Flow (MGD)	2060 Peak Factor	2060 Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	2.8	29.32	980,335	14.24	2.6	37.44	980,335	15.81	2.6	40.88
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	2.7	33.21	226,623	17.95	2.5	45.50	226,623	21.85	2.5	53.68
				12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
	PS 18	WWTP		12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
PS 18 - Alternative 3				12.35	2.7	33.21		17.95	2.5	45.50		21.85	2.5	53.68
	PS 18	WWTP		12.35				17.95				21.85		
Excess flow to PS7						20.86				27.55				31.84
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	27.55		3.22	3.3	38.26		4.05	3.2	44.82
7-M	MH07-211	PS 7	305,045	2.15	3.5	28.47	350,317	3.57	3.3	39.23	350,317	4.40	3.2	45.76
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
				4.43	3.2	14.01		5.99	3.0	18.06		7.07	2.9	20.77
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	18.06		7.07	2.9	20.77
PS 7 - Alternative 3				4.43	3.2	34.87		5.99	3.0	45.61		7.07	2.9	52.60
	PS 7	WWTP		4.43	3.2	34.87		5.99	3.0	45.61		7.07	2.9	52.60

Table 9A-1

Peak Hourly Flows for PS18 and PS7 - Alternative 1 (Modified Madison Design Curve)

			2010 U.F.				2030 U.F.				2060			
Pumping Station Sub Basin	From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	3.0	21.31
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	3.0	21.79
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	3.0	23.35	196,939	9.35	3.0	28.06
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	3.0	27.42	1,353,883	10.71	3.0	32.12
PS 13				6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
	PS 13	MH10-145		6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
10-A	MH10-145	MH10-121	932,249	7.70	3.0	23.09	1,149,110	10.29	3.0	30.86	1,149,110	11.86	3.0	35.57
10-B	MH10-121	MH10-201	412,216	8.11	3.0	24.32	461,286	10.75	3.0	32.25	461,286	12.32	3.0	36.95
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.86	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	3.0	26.48		12.27	3.0	36.80		13.84	3.0	41.51
10-E	MH10-115	MH10-104A	173,558	9.00	3.0	27.00	185,986	12.45	3.0	37.36	185,986	14.02	3.0	42.06
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	3.0	27.56		12.64	3.0	37.93		14.21	3.0	42.64
10-G	MH10-102A	MH10-101	11,479	9.20	3.0	27.60	17,319	12.66	3.0	37.99	17,319	14.23	3.0	42.69
10-H	MH10-101	PS 10	579,684	9.78	3.0	29.34	599,396	13.26	3.0	39.78	599,396	14.83	3.0	44.49
PS 10				9.78	3.0	3.4		13.26	3.0	39.78		14.83	3.0	44.49
	PS 10	MH07-955		9.78	3.0	29.34		13.26	3.0	39.78		14.83	3.0	44.49

Table 9A-1
Peak Hourly Flows for PS18 and PS7 - Alternative 1 (Modified Madison Design Curve)

			2010 U.F.				2030 U.F.				2060			
Pumping Station Sub Basin	From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	3.0	31.95	980,335	14.24	3.0	42.73	980,335	15.81	3.0	47.43
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	3.0	37.05	226,623	17.95	3.0	53.85	226,623	21.85	3.0	65.54
PS 18 - Alternative 1				12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
	PS 18	WWTP		12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
7-M	MH07-211	PS 7	305,045	2.15	3.5	7.61	350,317	3.57	3.3	11.68	350,317	4.40	3.2	13.93
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
PS 7 - Alternative 1				4.43	3.2	14.01		5.99	3.0	18.06		7.07	3.0	21.22
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	18.06		7.07	3.0	21.22

Table 9A-2

Peak Hourly Flows for PS18 and PS7 - Alternative 2 (Modified Madison Design Curve)

			2010 U.F.				2030 U.F.				2060			
Pumping Station Sub Basin	From	To	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	3.0	21.31
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	3.0	21.79
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	3.0	23.35	196,939	9.35	3.0	28.06
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	3.0	27.42	1,353,883	10.71	3.0	32.12
PS 13				6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
	PS 13	MH10-145		6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
10-A	MH10-145	MH10-121	932,249	7.70	3.0	23.09	1,149,110	10.29	3.0	30.86	1,149,110	11.86	3.0	35.57
10-B	MH10-121	MH10-201	412,216	8.11	3.0	24.32	461,286	10.75	3.0	32.25	461,286	12.32	3.0	36.95
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.86	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	3.0	26.48		12.27	3.0	36.80		13.84	3.0	41.51
10-E	MH10-115	MH10-104A	173,558	9.00	3.0	27.00	185,986	12.45	3.0	37.36	185,986	14.02	3.0	42.06
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	3.0	27.56		12.64	3.0	37.93		14.21	3.0	42.64
10-G	MH10-102A	MH10-101	11,479	9.20	3.0	27.60	17,319	12.66	3.0	37.99	17,319	14.23	3.0	42.69
10-H	MH10-101	PS 10	579,684	9.78	3.0	29.34	599,396	13.26	3.0	39.78	599,396	14.83	3.0	44.49
PS 10				9.78	3.0	29.34		13.26	3.0	39.78		14.83	3.0	44.49
	PS 10	MH07-955		9.78	3.0	29.34		13.26	3.0	39.78		14.83	3.0	44.49

Table 9A-2

Peak Hourly Flows for PS18 and PS7 - Alternative 2 (Modified Madison Design Curve)

Pumping Station Sub Basin	From	To	2010 U.F.				2030 U.F.				2060			
			Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)	Sub-Basin Flow (gpd)	Cumulative Flow (MGD)	Peak Factor	Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	3.0	31.95	980,335	14.24	3.0	42.73	980,335	15.81	3.0	47.43
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	3.0	37.05	226,623	17.95	3.0	53.85	226,623	21.85	3.0	65.54
				12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
	PS 18	WWTP		12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
PS 18 - Alternative 2				12.35	3.0	37.05		17.95	2.5	44.00		21.85	2.0	44.00
	PS 18	WWTP		12.35	3.0	37.05		17.95	2.5	44.00		21.85	2.0	44.00
Excess peak flow to PS7						0.00				9.85				21.54
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	6.69		3.22	3.3	20.56		4.05	3.2	34.53
7-M	MH07-211	PS 7	305,045	2.15	3.5	7.61	350,317	3.57	3.3	21.54	350,317	4.40	3.2	35.47
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
				4.43	3.2	14.01		5.99	3.0	27.91		7.07	3.0	42.76
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	27.91		7.07	3.0	42.76
PS 7 - Alternative 2				4.43	3.2	14.01		5.99	4.7	27.91		7.07	6.0	42.76
	PS 7	WWTP		4.43	3.2	14.01		5.99	4.7	27.91		7.07	6.0	42.76

Table 9A-3

Peak Hourly Flows for PS18 and PS7 - Alternative 3 **(Modified Madison Design Curve)**

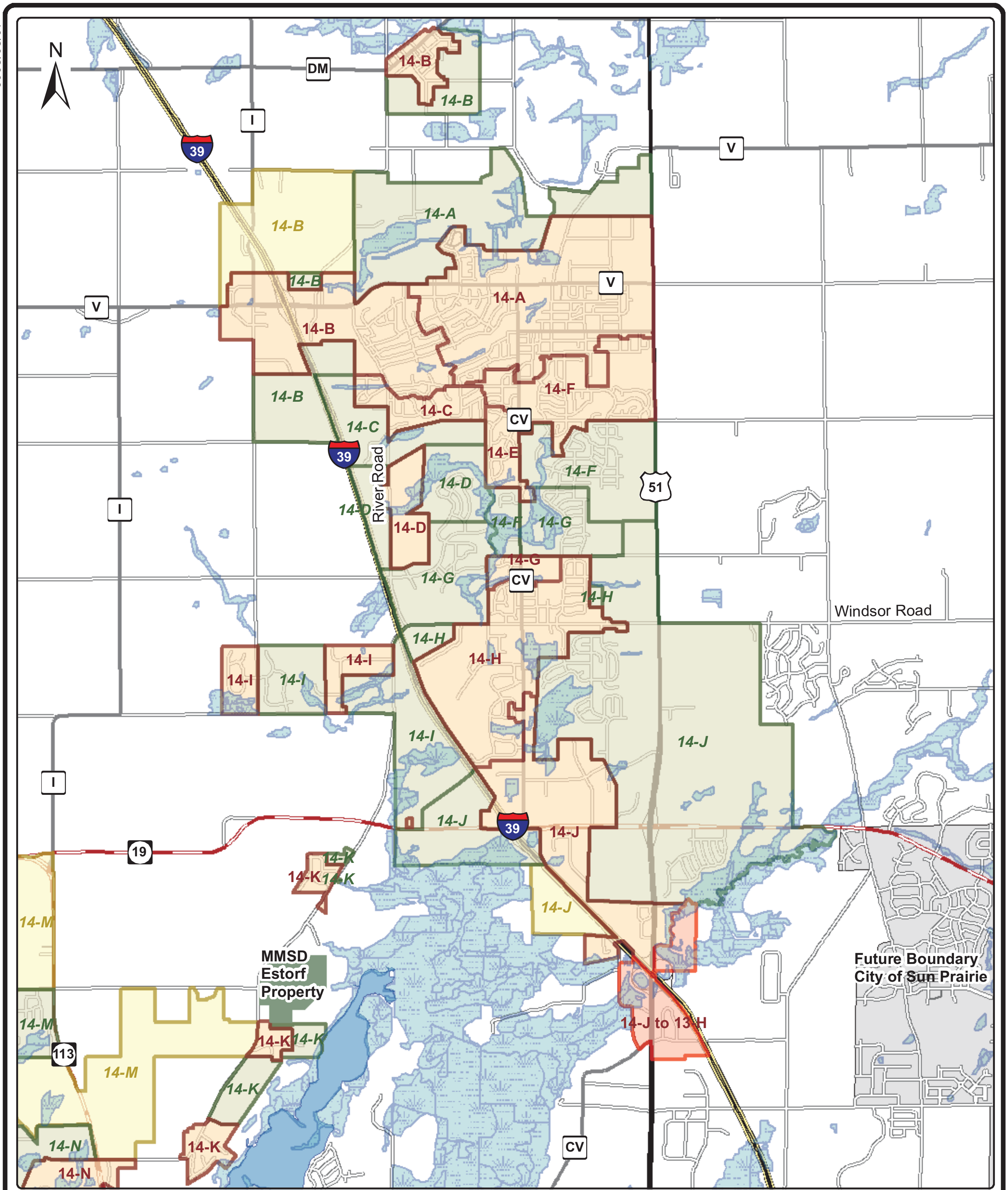
Pumping Station Sub Basin	From	To	2010 U.F. Sub-Basin Flow (gpd)	2010 U.F. Cumulative Flow (MGD)	2010 U.F. Peak Factor	2010 U.F. Cumulative Peak Flow (MGD)	2030 U.F. Sub-Basin Flow (gpd)	2030 U.F. Cumulative Flow (MGD)	2030 U.F. Peak Factor	2030 U.F. Cumulative Peak Flow (MGD)	2060 Sub-Basin Flow (gpd)	2060 Cumulative Flow (MGD)	2060 Peak Factor	2060 Cumulative Peak Flow (MGD)
14-A	MH 14-209	MH14-196	498,879	0.50	4.0	2.00	589,606	0.59	4.0	2.36	772,585	0.77	4.0	3.09
14-B	MH14-196	MH14-193	249,667	0.75	4.0	2.99	312,984	0.90	4.0	3.61	588,677	1.36	3.8	5.19
14-C	MH14-193	MH14-182	62,225	0.81	4.0	3.24	97,850	1.00	4.0	4.00	97,850	1.46	3.8	5.50
14-D	MH14-182	MH14-171	49,884	0.86	4.0	3.44	95,650	1.10	3.9	4.32	95,650	1.55	3.7	5.80
14-E	MH14-171	MH14-166	38,588	0.90	4.0	3.60	38,534	1.13	3.9	4.45	38,534	1.59	3.7	5.92
14-F	MH14-166	MH14-162	198,077	1.10	3.9	4.33	278,829	1.41	3.8	5.35	440,112	2.03	3.6	7.27
14-G	MH14-162	MH14-156	47,461	1.14	3.9	4.48	116,120	1.53	3.7	5.72	116,120	2.15	3.5	7.62
14-H	MH14-156	MH14-143	241,874	1.39	3.8	5.27	257,963	1.79	3.6	6.52	257,963	2.41	3.5	8.38
14-I	MH14-143	MH14-134	64,346	1.45	3.8	5.47	101,606	1.89	3.6	6.83	132,023	2.54	3.5	8.77
14-J	MH 14-416	MH14-134	308,576	0.31	4.0	1.23	519,368	0.52	4.0	2.08	624,919	0.62	4.0	2.50
14-K	MH14-134	MH14-102	53,627	1.81	3.6	6.60	66,727	2.48	3.5	8.58	66,727	3.23	3.3	10.74
14-Q	MH14-362	MH14-358	356,101	0.36	4.0	1.42	395,964	0.40	4.0	1.58	450,369	0.45	4.0	1.80
14-L	MH14-359	MH14-358	621,271	0.62	4.0	2.49	811,364	0.81	4.0	3.25	1,074,825	1.07	4.0	4.25
	MH14-358	MH14-356		0.98	4.0	3.91		1.21	3.9	4.69		1.53	3.7	5.71
14-M	MH14-356	MH14-323	429,812	1.41	3.8	5.33	747,196	1.95	3.6	7.03	1,094,496	2.62	3.4	9.00
14-N	MH14-323	MH14-315	153,514	1.56	3.7	5.82	204,977	2.16	3.5	7.65	261,387	2.88	3.4	9.75
14-O	MH14-315	MH14-102	194,823	1.76	3.7	6.42	214,995	2.37	3.5	8.28	305,002	3.19	3.3	10.61
	MH14-102	MH14-101		3.57	3.3	11.68		4.85	3.1	15.12		6.42	3.0	19.14
14-P	MH14-101	PS 14	400,678	3.97	3.2	12.77	409,746	5.26	3.1	16.18	409,746	6.83	3.0	20.16
PS 14				3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
	PS 14	TE14-11057		3.97	3.2	12.77		5.26	3.1	16.18		6.83	3.0	20.16
13-F	TE14-11057	MH13-132	265,790	4.24	3.2	13.49	275,917	5.54	3.1	16.90	275,917	7.10	3.0	21.31
13-G	MH13-132	MH13-122A	122,964	4.36	3.2	13.82	160,919	5.70	3.0	17.31	160,919	7.26	3.0	21.79
13-A	MH13-122A	MH13-105A	351,739				367,673				367,673			
13-B	MH13-122A	MH13-105A	49,458				66,873				66,873			
13-C	MH13-122A	MH13-105A	639,164				730,012				730,012			
13-D	MH13-122A	MH13-105A	708,753				726,821				726,821			
13-E	MH13-122A	MH13-105A	188,234	6.30	3.0	18.83	196,939	7.78	3.0	23.35	196,939	9.35	3.0	28.06
13-H	MH13-105A	PS 13	468,068	6.76	3.0	20.00	1,353,883	9.14	3.0	27.42	1,353,883	10.71	3.0	32.12
PS 13				6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
	PS 13	MH10-145		6.76	3.0	20.00		9.14	3.0	27.42		10.71	3.0	32.12
10-A	MH10-145	MH10-121	932,249	7.70	3.0	23.09	1,149,110	10.29	3.0	30.86	1,149,110	11.86	3.0	35.57
10-B	MH10-121	MH10-201	412,216	8.11	3.0	24.32	461,286	10.75	3.0	32.25	461,286	12.32	3.0	36.95
10-C	MH10-220	MH10-214	325,867	0.33	4.0	1.30	964,209	0.96	4.0	3.2	964,209	0.96	4.0	3.86
10-D	MH10-214	MH10-201	392,316	0.72	4.0	2.87	554,722	1.52	3.7	5.69	554,722	1.52	3.7	5.69
	MH10-201	MH10-115		8.83	3.0	26.48		12.27	3.0	36.80		13.84	3.0	41.51
10-E	MH10-115	MH10-104A	173,558	9.00	3.0	27.00	185,986	12.45	3.0	37.36	185,986	14.02	3.0	42.06
10-F	MH10-305	MH10-104A	188,221	0.19	4.0	0.75	190,971	0.19	4.0	0.76	190,971	0.19	4.0	0.76
	MH10-104A	MH10-102A		9.19	3.0	27.56		12.64	3.0	37.93		14.21	3.0	42.64
10-G	MH10-102A	MH10-101	11,479	9.20	3.0	27.60	17,319	12.66	3.0	37.99	17,319	14.23	3.0	42.69
10-H	MH10-101	PS 10	579,684	9.78	3.0	29.34	599,396	13.26	3.0	39.78	599,396	14.83	3.0	44.49
PS 10				9.78	3.0	29.34		13.26	3.0	39.78		14.83	3.0	44.49
	PS 10	MH07-955		9.78	3.0	29.34		13.26	3.0	39.78		14.83	3.0	44.49

Table 9A-3

Peak Hourly Flows for PS18 and PS7 - Alternative 3 **(Modified Madison Design Curve)**

Pumping Station Sub Basin	From	To	2010 U.F. Sub-Basin Flow (gpd)	2010 U.F. Cumulative Flow (MGD)	2010 U.F. Peak Factor	2010 U.F. Cumulative Peak Flow (MGD)	2030 U.F. Sub-Basin Flow (gpd)	2030 U.F. Cumulative Flow (MGD)	2030 U.F. Peak Factor	2030 U.F. Cumulative Peak Flow (MGD)	2060 Sub-Basin Flow (gpd)	2060 Cumulative Flow (MGD)	2060 Peak Factor	2060 Cumulative Peak Flow (MGD)
7-A	MH07-955	MH07-932	871,342	10.65	3.0	31.95	980,335	14.24	3.0	42.73	980,335	15.81	3.0	47.43
7-C	MH07-734	MH07-426	693,680	0.69	4.0	2.77	1,989,624	1.99	3.6	7.14	3,771,162	3.77	3.2	12.23
7-B	MH07-437	MH07-426	550,457	0.55	4.0	2.20	1,018,340	1.02	4.0	4.06	1,566,335	1.57	3.7	5.84
7-D	MH07-426	MH07-415	157,183	1.40	3.8	5.31	357,817	3.37	3.3	11.11	357,817	5.70	3.0	17.31
7-E	MH07-415	MH07-932	85,825	1.49	3.8	5.59	116,336	3.48	3.3	11.44	116,336	5.81	3.0	17.60
7-F	MH07-932	MH07-215	213,427	12.35	3.0	37.05	226,623	17.95	3.0	53.85	226,623	21.85	3.0	65.54
				12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
	PS 18	WWTP		12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
PS 18 - Alternative 3				12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
	PS18	WWTP		12.35	3.0	37.05		17.95	3.0	53.85		21.85	3.0	65.54
Excess flow to PS7						24.70				35.90				43.70
7-J	MH07-249	MH07-228	518,417	0.52	4.0	2.07	1,368,622	1.37	3.8	5.21	1,734,576	1.73	3.7	6.36
9-A	MH09-108	MH09-104	647,586	0.65	4.0	2.59	918,416	0.92	4.0	3.67	1,380,367	1.38	3.8	5.25
9-B	MH09-104	PS 9	317,105	0.96	4.0	3.86	364,702	1.28	3.8	4.93	364,702	1.75	3.7	6.39
PS 9				0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
	PS 9	MH07-517		0.96	4.0	3.86		1.28	3.8	4.93		1.75	3.7	6.39
7-G	MH07-517	MH07-512	10,080	0.97	4.0	3.90	25,880	1.31	3.8	5.02	25,880	1.77	3.7	6.47
7-H	MH07-618	MH07-512	77,097	0.08	4.0	0.31	141,857	0.14	4.0	0.57	141,857	0.14	4.0	0.57
7-I	MH07-512	MH07-228	56,267	1.11	3.9	4.36	141,304	1.59	3.7	5.92	141,304	2.05	3.6	7.33
	MH07-228	MH07-224		1.63	3.7	6.02		2.96	3.4	9.98		3.79	3.2	12.28
7-K	MH07-224	MH07-218	121,062	1.75	3.7	6.40	156,277	3.12	3.3	10.42	156,277	3.94	3.2	12.70
7-L	MH07-823	MH07-218	94,512	0.09	4.0	0.38	104,614	0.10	4.0	0.42	104,614	0.10	4.0	0.42
	MH07-218	MH07-215		1.84	3.6	6.69		3.22	3.3	10.71		4.05	3.2	12.99
	MH07-215	MH07-211		1.84	3.6	31.39		3.22	3.3	46.61		4.05	3.2	56.68
7-M	MH07-211	PS 7	305,045	2.15	3.5	32.31	350,317	3.57	3.3	47.59	350,317	4.40	3.2	57.62
6-A	MH06-209	MH06-108A	180,399	0.18	4.0	0.72	178,257	0.18	4.0	0.71	196,459	0.20	4.0	0.79
6-B	MH06-122	MH06-108A	156,634	0.16	4.0	0.63	201,410	0.20	4.0	0.81	209,378	0.21	4.0	0.84
6-C	MH06-108A	PS 6	36,339	0.37	4.0	1.49	35,643	0.42	4.0	1.66	44,024	0.45	4.0	1.80
6-D	NA	PS 6	1,235,750	1.24	3.9	4.78	1,321,888	1.32	3.8	5.06	1,540,062	1.54	3.7	5.75
PS 6				1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
	PS 6	MH07-129		1.61	3.7	5.97		1.74	3.7	6.37		1.99	3.6	7.14
7-N	MH07-129	PS 7	675,724	2.28	3.5	8.02	682,620	2.42	3.5	8.42	682,620	2.67	3.4	9.15
				4.43	3.2	14.01		5.99	3.0	18.06		7.07	3.0	21.22
	PS 7	WWTP		4.43	3.2	14.01		5.99	3.0	18.06		7.07	3.0	21.22
PS 7 - Alternative 3				4.43	3.2	38.71		5.99	3.0	53.96		7.07	3.0	64.91
	PS7	WWTP		4.43	3.2	38.71		5.99	3.0	53.96		7.07	3.0	64.91

10/23/2008



- Sub-Basins in 2000
- Removed by 2030
- Potential by 2030
- Potential by 2060
- DNR Wetlands

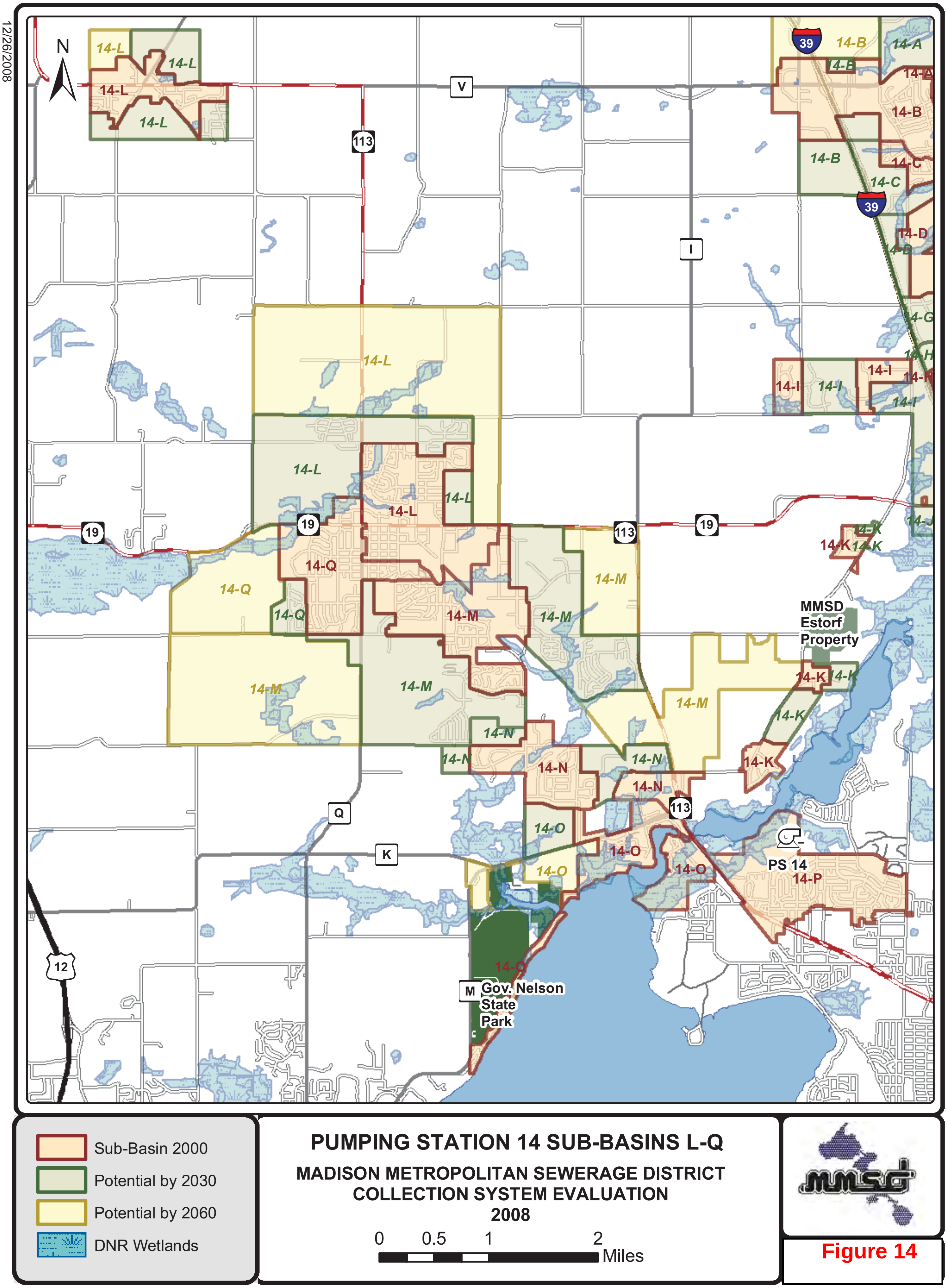
PUMPING STATION 14 SUB-BASINS A-K

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 0.5 1 2 Miles

Figure 14

12/26/2008

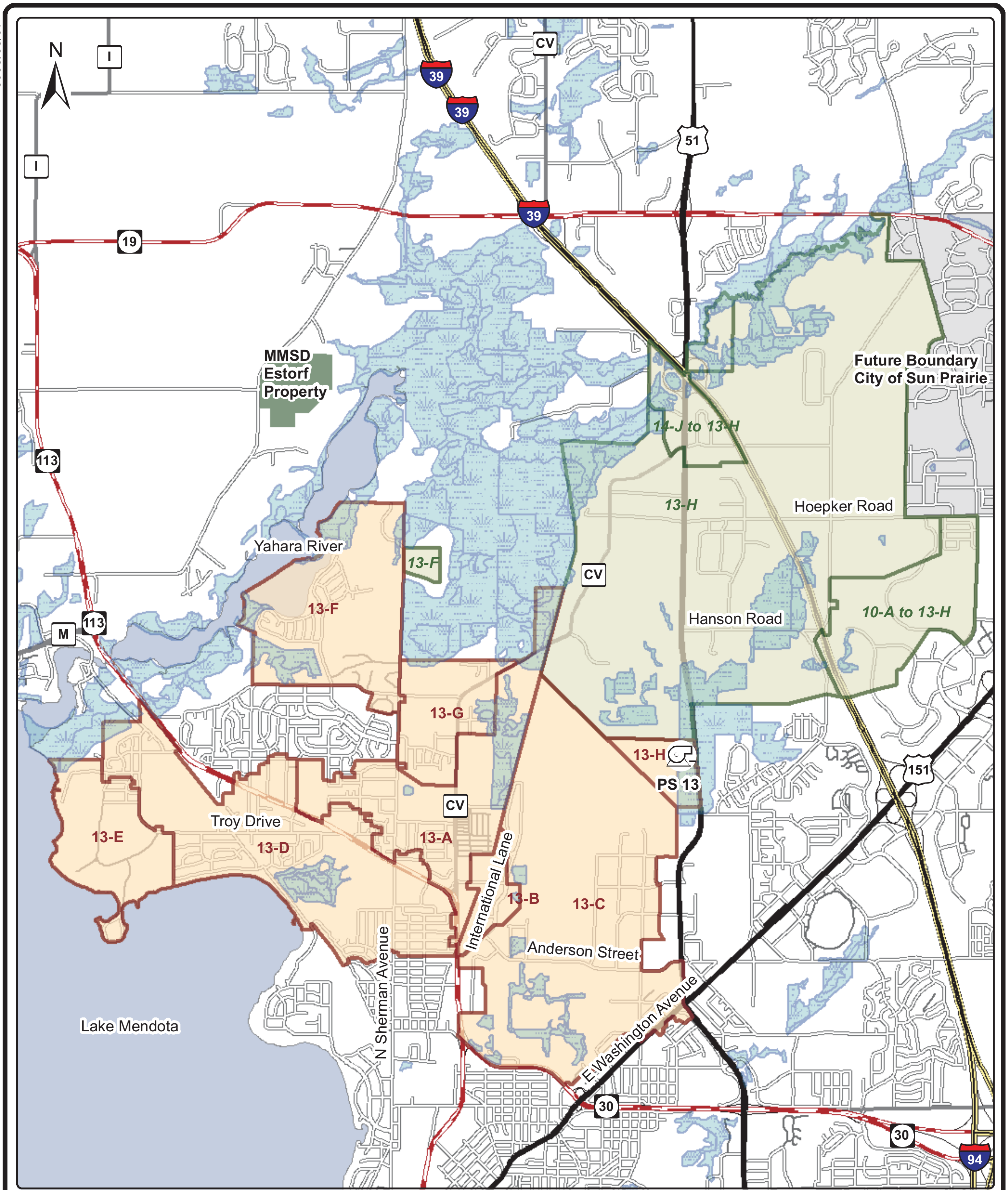


PUMPING STATION 14 SUB-BASINS L-Q

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

Figure 14

10/23/2008



Sub-Basins in 2000

Potential by 2030

Potential by 2060

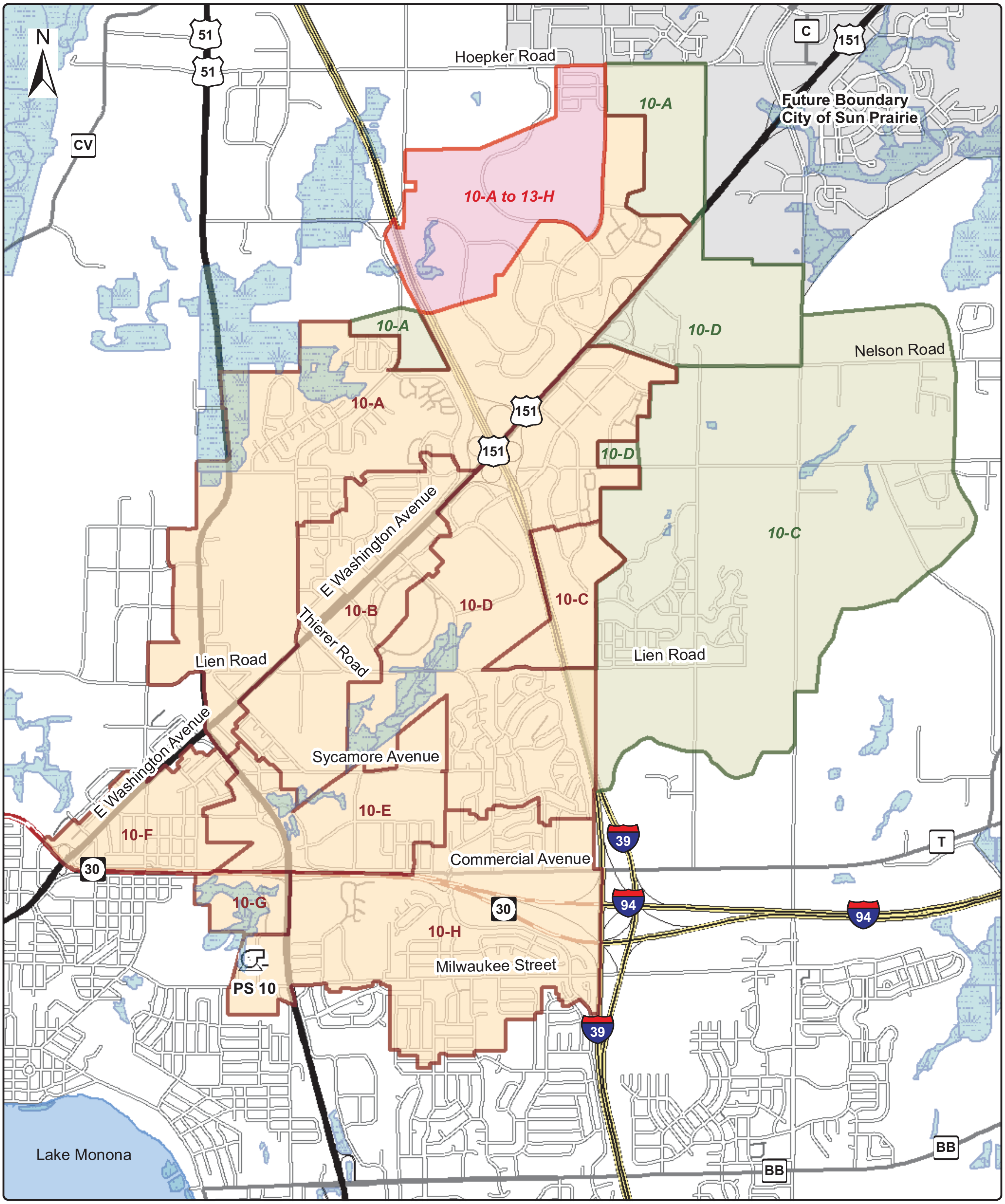
DNR Wetlands

PUMPING STATION 13 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 0.5 1 2 Miles

Figure 15



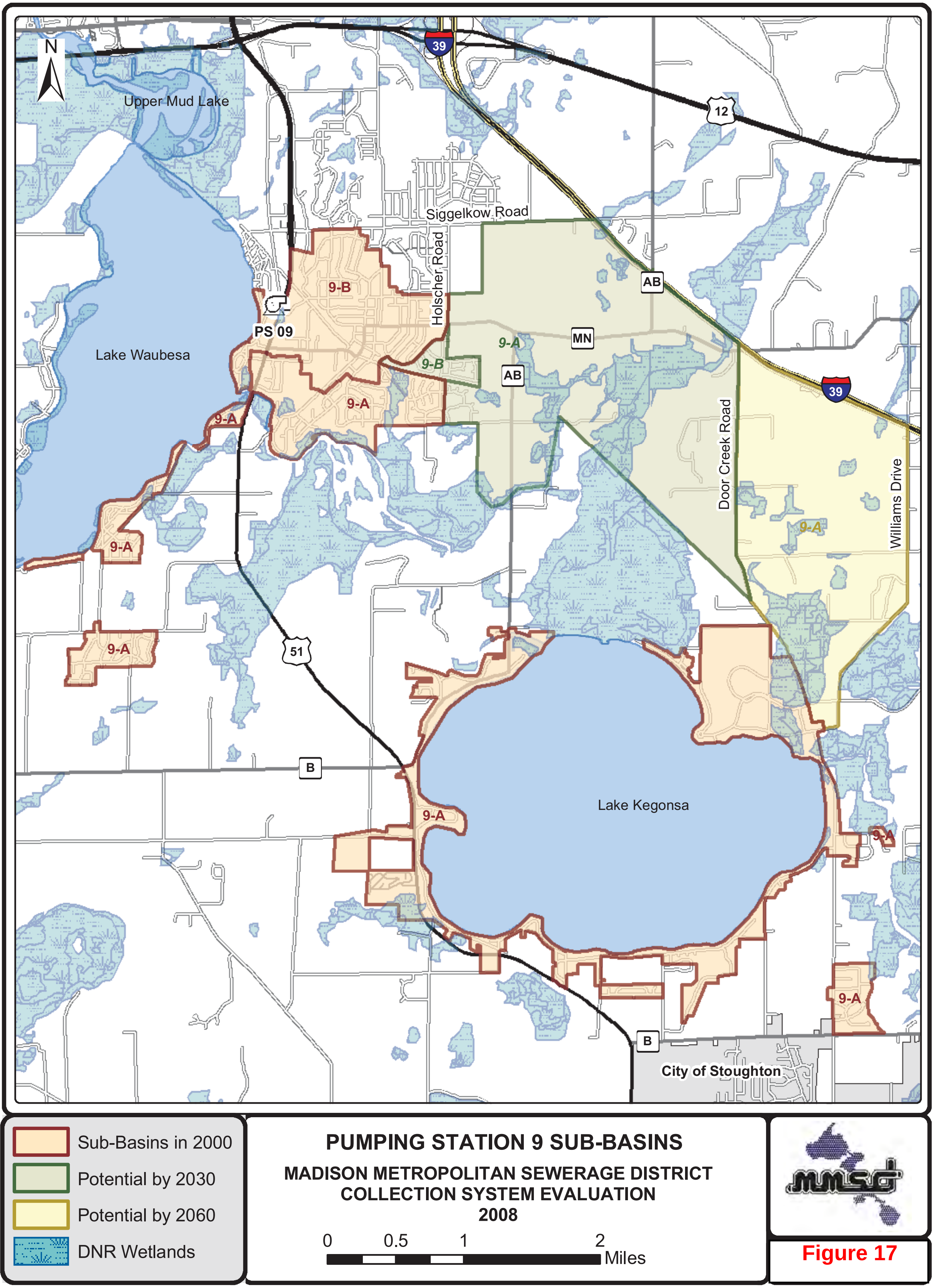
	Sub-Basins in 2000
	Removed by 2030
	Potential by 2030
	Potential by 2060
	DNR Wetlands

PUMPING STATION 10 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT COLLECTION SYSTEM EVALUATION 2008

0 0.45 0.9 1.8 Miles

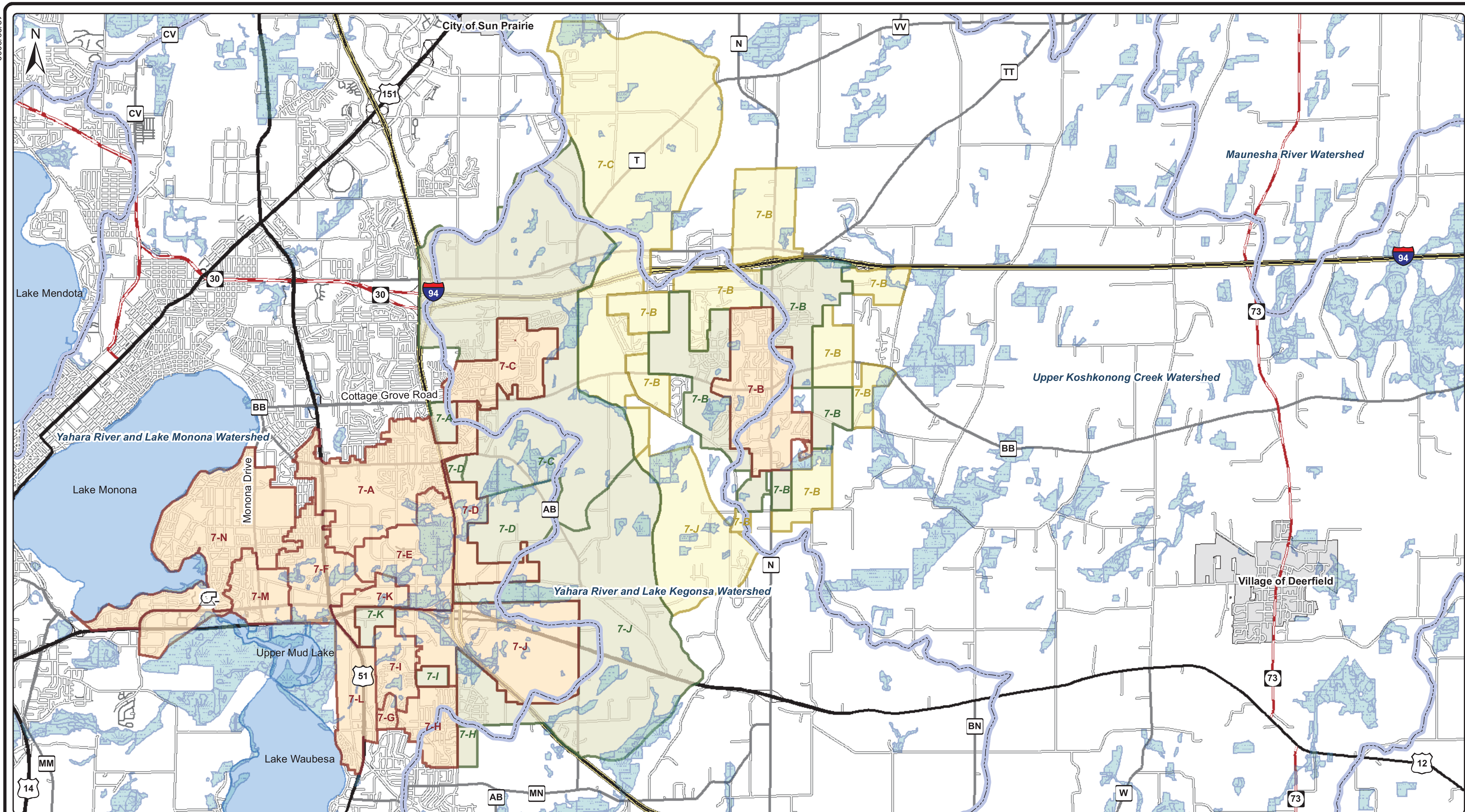
Figure 16



PUMPING STATION 9 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

Figure 17



DNR Wetlands

Sub-Basins 2000

Potential by 2030

Potential by 2060

PUMPING STATION 7 SUB-BASINS

MADISON METROPOLITAN SEWERAGE DISTRICT
COLLECTION SYSTEM EVALUATION
2008

0 1.5 3 6 Miles

MMSD

Figure 18

Appendix A10
District Response to June (2008) High Flow Events

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

Jon W. Schellpfeffer
Chief Engineer & Director

Protecting Public Health and the Environment

Memo

To: District Municipal Customers

From: Jon W. Schellpfeffer, Chief Engineer and Director JWS

Subject: **June 2008 High Flow Events**

Date: July 17, 2008

The Madison Metropolitan Sewerage District is recovering from the extraordinary precipitation events and subsequent flooding that took place in early June. We trust things are also getting back to normal in your community. The District measured its all-time high peak flow rate of 100,000 gallons per minute and its all-time high one-day wastewater volume of 106 million gallons on June 9. The average daily flow received at the Nine Springs Wastewater Treatment Plant in June was 62 million gallons per day (mgd). Daily flows are still above 50 mgd. Typical volumes during periods of normal weather are about 40 mgd.

The high flows resulted from rain water that leaked into basements and rain water that flooded streets and low areas and leaked into manholes and through defects in sewer lines. The excess flow from these sources overwhelmed the District's conveyance system for a period of about 30 hours on June 8 and 9. Even though all pumping equipment was available and in operation during this entire event, many homes and businesses experienced basement back-ups from the sewer system. The District employed portable pumping equipment at two pumping stations to remove water from the sewer system and prevent further basement backups. Even so, the sewer system overflowed from manholes at several points. System overflows and the portable pump discharges ultimately reached nearby wetlands, streams, and the lakes.

Over the past fifteen years the District has experienced six or more significant storm events that have led to high flows in the sewer system. Many scientists now expect that storms of higher intensity and longer duration will be experienced more frequently in the future. To address this possibility and to lessen the likelihood of future events overwhelming the sewer system, the Madison Metropolitan Sewerage District is taking the following actions:

1. The District is reviewing its design standards for sizing interceptor sewers and pumping stations. The District currently provides an allowance for high flows in these facilities that varies from peak flow capacities 4.0 times greater than the

average daily flows for facilities with average day design flows of one million gallons per day to peak flow capacities 2.5 times greater than the average daily flows for facilities with average day design flows of 20 million gallons per day. The review will include data from the storm events of the past fifteen years. If higher peaking factors are judged to be necessary, the schedule for construction of replacement interceptor sewers and pumping stations will need to be accelerated, and new and replaced facilities will be larger. This will lessen the likelihood of back-ups and overflows and will result in higher costs for service.

2. The District is reviewing its design standards for materials used in constructing interceptor sewers, including manholes, to assure that rain waters are less likely to leak into these facilities during heavy rains and floods. We encourage you to do the same. During our plan review process, we will pay particular attention to details in sewer extension plans that will be constructed in areas more prone to flooding.
3. The District is reviewing flow data and inspecting its existing interceptor sewers to identify and repair defects that allowed excessive rain water leakage into the District's system. We encourage you to make similar inspections and repairs in your local system.
4. The District is reviewing flow data from each municipality collected during the recent high flow events. We will attempt to identify likely areas in community sewer systems that experienced excessive leakage during the recent high flow events. The District will work with these communities to address these areas.
5. The District will make greater efforts to educate the public in the area of water conservation and how to prevent rain water from leaking into basements. Water conservation and reduced inflow will have positive impacts in both dry and wet weather.

Although the events of June were unprecedented, this will not be the last challenge of this type that we will face. The District is taking action now to better insure that future events will have less impact on the public and the environment.

Memo

To: File

From: Jon W. Schellpfeffer, Chief Engineer and Director

Subject: Responses to June 2008 High Flow Event

Date: June 3, 2009

The purpose of the memo is to review the various actions the District has taken since the high flow events of June 2008. At that time the District developed a list of actions it would take in response to that event, and those actions are the section headings used in this memo.

Review of Design Standards for Sizing Interceptors and Pump Stations.

Historically the District has used a peak flow factor based on information in the 1961 Greeley and Hansen Report on Sewerage and Sewage Treatment. The peak hourly flow (PHF) factor developed in that report is applied to average daily flows (ADFs) in the range of 1 mgd to 20 mgd as follows: $PHF = (ADF)^{0.842} \times 4$. For ADFs less than 1 mgd, the peaking factor is 4. For ADFs greater than 20 mgd, the peaking factor is 2.5. It appears that this factor may not provide sufficient capacity for all District interceptors and pump stations. For those interceptors and pump stations located closer to the lakes, it appears that the peak flow factor may need to be increased by about 1.0 to account for the higher peak flows experienced recently.

More analyses need to be done to determine more precisely in which areas of the District's service area this more conservative factor should be applied. These additional analyses will be included in the Collection System Facilities Plan and completed by the end of this year. Since application of a more conservative peaking factor would, in all likelihood, accelerate the need to increase the conveyance system capacity beyond what is practical or doable, initial efforts to reduce high flows will concentrate on hardening the interceptor system to prevent excessive levels of inflow and infiltration. The appropriate peaking factor as determined by a thorough analysis of available data will be applied to all future conveyance system projects.

Review of Design Standards for Interceptor and Manhole Materials.

During interceptor design, additional attention will be directed to pipe gasket details, connections between pipes and manholes, connections between manhole sections, and sealing between manhole decks and castings. All manhole castings will be provided with gasketed manhole covers and will be installed with chimney seals. These standards have been in use on new interceptors built in areas that could experience flooding, but will now be used for all new interceptor sewers. Where flooding is currently possible and whenever practical (for example, during pavement replacements), older manhole castings and chimneys will be replaced with new gasketed castings and chimney seals. This work will be performed by the District's Sewer Maintenance crew. Those manholes potentially subject to flooding should be upgraded by the end of this year; however, this will be an on-going effort as new information becomes available through regular inspections, anecdotally, or from information provided by others.

Review of Flow Data and Inspection of Existing Interceptors.

Review of flow data from the June 2008 high flow event identified a number of record high flows in the conveyance system. As mentioned earlier, those portions of the conveyance system in lower-lying areas around the lakes appeared to experience the highest of the high flows. The interceptors in these areas were the first inspected after the event to locate possible inflow sources.

Immediately after the June 2008 high flow events, the District's Sewer Maintenance crew began inspecting manholes in areas that had been flooded. One major source of inflow was discovered and repaired upstream of Pumping Station 12. Several manholes appeared to have been under water in other areas. Castings on those were raised, and those that were not equipped with gasketed covers and chimney seals were rebuilt using castings with gasketed covers and chimney seals. System inspection and the follow-up work to harden the District's system against inflow and infiltration is an on-going and routine part of the Sewer Maintenance crew's work. Larger more costly, but less urgent, projects are typically included in the District's capital budget for repair, rehabilitation, or replacement.

Review of Communities Flow Data.

As with the District's conveyance system, those communities located in low-lying areas and near the lakes experienced the highest flows. The District sent a memo to all of its municipal customers following the event. The memo summarized the record high flows and the actions the District planned to take in response to this and other recent high flow events. The memo also encouraged the communities to undertake an inspection and repair program for their local sewer systems. The District also has provided individual reports to the City of Madison, Town of Dunn Sanitary Districts 1 and 3, and Town of Windsor Lake Windsor Sanitary District. At this time, the District has not directed any community to take any specific action related to high flows.

Greater Efforts at Public Education.

In April of this year the District ran a series of four radio spots related to efforts home owners could take to prevent rain water from entering their basements (and then likely the sanitary sewer system). The District had budgeted $20,000 for this effort and has spent about $14,000 so far. Based on anecdotal feedback and increased hits on the District's website, it appears that we were successful in reaching a fairly large audience with this information. We will need to undertake follow-up public education efforts in this area.

Appendix A11
Public Participation

MADISON METROPOLITAN SEWERAGE DISTRICT

NOTICE OF PUBLIC HEARING
February 22, 2012

COLLECTION SYSTEM FACILITIES PLAN UPDATE

The Madison Metropolitan Sewerage District will hold a Public Hearing on **Wednesday, February 22, 2012 at 6:30 p.m. at the Nine Springs Wastewater Treatment Plant**, 1610 Moorland Road, Madison, WI, 53713. The hearing will be held in the Commission Room of the Operations Building, which is handicap accessible. MMSD staff will be present to answer questions and receive comments prior to a short presentation at 7:00 p.m.

The purpose of the hearing is to receive public input regarding submission of MMSD's Collection System Facilities Plan Update to the Wisconsin Department of Natural Resources. The Plan provides recommendations for improvements to the District's collection system facilities through the Year 2030. The Plan is available for public inspection at the Nine Springs Wastewater Treatment Plant on weekdays from 7:00 a.m – 4:00 p.m. It will also be made available for viewing at the District's website (www.madsewer.org).

Anyone interested is invited to attend this meeting. If you wish to comment but cannot be present at the public hearing, please submit a written statement by 3:00 p.m., Monday, February 20, 2012, to Mr. D. Michael Mucha, Madison Metropolitan Sewerage District, 1610 Moorland Road, Madison, WI 53713.

Dated this 7th day of February 2012.

D. Michael Mucha
Chief Engineer & Director, MMSD

Capital Newspapers Proof of Publication Affidavit

Ad #: 1879986 Price: $51.34 Ad ID: PO #1200053

Retain this portion for your records.
Please do not remit payment until you receive your advertising invoice.

Mail to:

MADISON METROPOLITAN SEWERAGE DISTRICT
Debi IGLESIAS
1610 MOORLAND RD
MADISON, WI 53713 3398

FEB -4 2012

STATE OF WISCONSIN }
Dane County } ss.

SHARON SCALLON

being duly sworn, doth depose and say that he (she) is an authorized representative of Capital Newspapers, publishers of

Wisconsin State Journal

a newspaper, at Madison, the seat of government of said State, and that an advertisement of which the annexed is a true copy, taken from said paper, was published therein on February 10th, 2012

MADISON METROPOLITAN SEWERAGE DISTRICT
NOTICE OF PUBLIC HEARING
February 22, 2012
COLLECTION SYSTEM FACILITIES PLAN UPDATE

The Madison Metropolitan Sewerage District will hold a Public Hearing on **Wednesday, February 22, 2012 at 6:30 p.m. at the Nine Springs Wastewater Treatment Plant,** 1610 Moorland Road, Madison, WI, 53713. The hearing will be held in the Commission Room of the Operations Building, which is handicap accessible. MMSD staff will be present to answer questions and receive comments prior to a short presentation at 7:00 p.m. The purpose of the hearing is to receive public input regarding submission of MMSD's Collection System Facilities Plan Update to the Wisconsin Department of Natural Resources. The Plan provides recommendations for improvements to the District's collection system facilities through the Year 2030. The Plan is available for public inspection at the Nine Springs Wastewater Treatment Plant on weekdays from 7:00 a.m – 4:00 p.m. It will also be made available for viewing at the District's website (www.madsewer.org).

Anyone interested is invited to attend this meeting. If you wish to comment but cannot be present at the public hearing, please submit a written statement by 3:00 p.m., Monday, February 20, 2012, to Mr. D. Michael Mucha, Madison Metropolitan Sewerage District, 1610 Moorland Road, Madison, WI 53713.

Dated this 7th day of February 2012.

D. Michael Mucha
Chief Engineer & Director, MMSD

PUB. WSJ: February 10, 2012
#1879986 WNAXLP

(Signed) Sharon Scallon

(Title) Principal Clerk

Subscribed and sworn to before me on

Feb 10, 2012

Eileen M. Morgan
Notary Public, Dane County, Wisconsin

My Commission expires May 24th, 2013

MADISON METROPOLITAN SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

D. Michael Mucha, P.E.
Chief Engineer & Director

Protecting Public Health and the Environment

February 7, 2012

Mr. Paul Woodard
City of Fitchburg Public Works Department
5520 Lacy Road
Fitchburg, WI 53711

RE: Notice of Public Hearing - MMSD Collection System Facilities Plan Update

Dear Mr. Woodard:

The Madison Metropolitan Sewerage District will hold a Public Hearing on **Wednesday, February 22, 2012 at 6:30 p.m. at the Nine Springs Wastewater Treatment Plant** regarding the above referenced facility plan. The hearing will be held in the Commission Room of the Operations Building, which is handicap accessible. MMSD staff will be present to answer questions and receive comments prior to a short presentation at 7:00 p.m.

The purpose of the hearing is to receive public input regarding submission of MMSD's Collection System Facilities Plan Update to the Wisconsin Department of Natural Resources. The Plan provides recommendations for improvements to the District's collection system facilities through the Year 2030. The Plan is available for public inspection at the Nine Springs Wastewater Treatment Plant on weekdays from 7:00 a.m – 4:00 p.m. It will also be made available for viewing at the District's website (www.madsewer.org).

Anyone interested is invited to attend this meeting. If you wish to comment but cannot be present at the public hearing, please submit a written statement by 3:00 p.m., Monday, February 20, 2012, to my attention at the following address:

Madison Metropolitan Sewerage District
1610 Moorland Road
Madison, WI 53713

Please feel free to contact Todd Gebert, of my staff, at 608-222-1201 (ext 235) with any questions regarding the facility plan and/or public hearing.

Sincerely,

D. Michael Mucha
Chief Engineer & Director

metrogro

Mailing List for Notice of Public Hearing
MMSD *Collection System Facilities Plan Update*
Wednesday, February 22, 2012

No.	Name	Representing	Address
1	Paul Woodard	City of Fitchburg	5520 Lacy Road, Fitchburg, WI 53711
2	Rob Phillips	City of Madison	210 Martin Luther King Jr. Blvd, Room 115, Madison, WI 53703
3	Shawn Stauske	City of Middleton	7426 Hubbard Avenue, Middleton, WI 53562
4	Dan Stephany	City of Monona	5211 Schluter Road, Monona, WI 53716
5	Ron Rieder	City of Verona	410 Investment Court, Verona, WI 53593
6	Mike Wolf	Town of Blooming Grove	1880 South Stoughton Road, Madison, WI 53716
7	Terri Winans	Waunona Sanitary District No. 2	3325 Thurber Avenue, Madison, WI 53714
8	Brenda Ayers	Town of Burke	5365 Reiner Road, Madison, WI 53718
9	Dan Paltz	Town of Dunn Sanitary District #1	3022 Waubesa Avenue, Madison, WI 53711
10	Tammy Rayfield	Town of Dunn Sanitary District #3	2879 Exchange Street, McFarland, WI 53558
11	John Ong	Town of Dunn Sanitary District #4	4725 Nora Lane, Madison, WI 53711
12	Michael Sherry	Town of Dunn - Kegona Sanitary District No. 2	P.O. Box 486, Stoughton, WI 53589
13	Rick Rose	Town of Madison	2120 Fish Hatchery Road, Madison, WI 53713
14	David Shaw	Town of Middleton Sanitary District No. 5	7555 W. Old Sauk Road, Verona, WI 53593
15	Gary Teigen	Town of Pleasant Springs Sanitary District No. 1	2083 Williams Drive, Stoughton, WI 53589
16	Rose Johnson	Town of Verona Utility District No. 1	335 N. Nine Mound Road, Verona, WI 53593
17	Shawn Haney	Town of Vienna	7161 County Highway I, DeForest, WI 53532
18	Bob Anderson	Town of Westport	5387 Mary Lake Road, Waunakee, WI 53597
19	Jeff Bartosiak	Town of Windsor	P.O. Box 473, Windsor, WI 53598
20	Victor Schneider	Lake Windsor Sanitary District	P.O. Box 411, Windsor, WI 53598
21	Kitty Repas	Morrisonville Sanitary District #1	P.O. Box 200, Morrisonville, WI 53571
22	Peter Byfield	Oak Springs Sanitary District	4534 South Hill Court, DeForest, WI 53532
23	Jim Hessling	Village of Cottage Grove	221 East Cottage Grove Road, Cottage Grove, WI 53527
24	Rebecca Simpson	Village of Dane	P.O. Box 168, Dane, WI 53529
25	Deane Baker	Village of DeForest	205 DeForest Street, DeForest, WI 53532
26	Tom Schroeder	Village of Maple Bluff	18 Oxford Place, Madison, WI 53704
27	Allan Coville	Village of McFarland	5115 Terminal Drive, P.O. Box 110, McFarland, WI 53558
28	Denny Lybeck	Village of Shorewood Hills	810 Shorewood Boulevard, Madison, WI 53705
29	Kevin Even	Village of Waunakee	500 W. Main Street, Waunakee, WI 53597

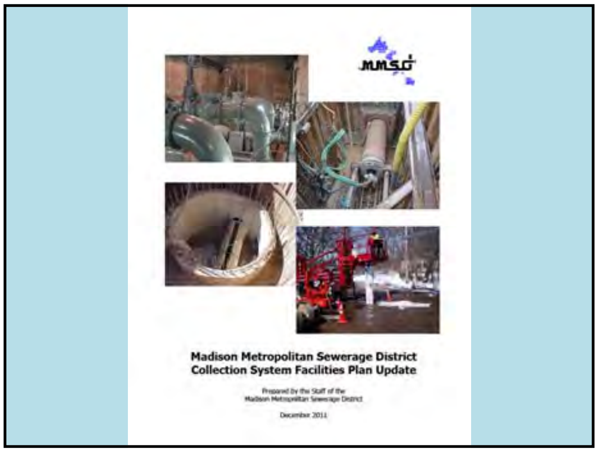
- **Home**
- **Search**
- **50 Year Master Plan**
- **About us**
- **Commission Business**
- **Construction Projects**
- **Contact Us**
- **Employment**
- **FAQ**
- **Links**
- **Programs and Initiatives**
- **Public Education**
- **Publications**
- **Questions/Suggestions**
- **Sewer Use Ordinance**

Collection System Facilities Plan Update

PUBLIC HEARING ATTENDANCE

Collection System Facilities Plan Update
Madison Metropolitan Sewerage District
Wednesday, February 22, 2012, 6:30 p.m.

NAME	REPRESENTING	ADDRESS
TODD GEBERT	MMSD	1610 MOORLAND RD. MADISON, WI
MIKE SIMON	MMSD	"

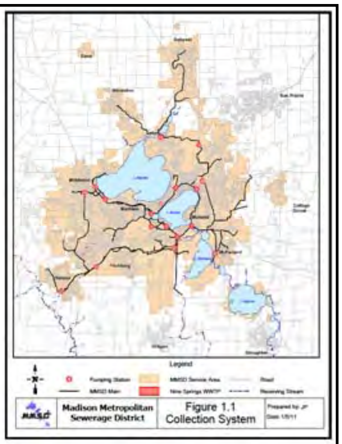


Presentation Outline

- **Overview of MMSD Collection System**
- **Purpose of Facility Plan**
- **Assessment Methodologies**
  - Capacity
  - Condition
- **Plan Initiatives and Recommendations**
- **Rate Impacts**
- **Questions**

MMSD Collection System Statistics

- 37 customers served
- Service area = 180.7 square miles
- Service population ~342,000
- Miles of gravity sewer = 94
- Number of pumping stations = 17
- Miles of force main = 29



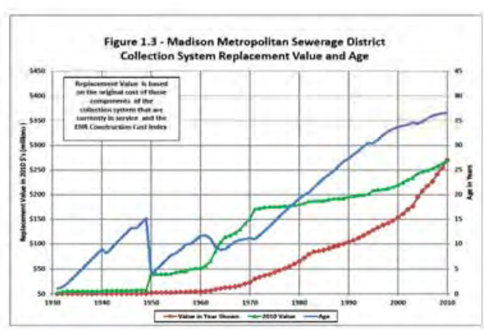
What is a Collection System Facilities Plan?

- MMSD's Facilities Plan **provides an assessment of existing collection system assets and identifies required system improvements to meet customer demands and future growth.**
- **Major collection system assets include:**
  - Pumping Stations
  - Intercepting sewers and manholes
  - Raw wastewater forcemains

Uses of Collection System Facilities Plan

1. **Satisfy WDNR Facility Planning requirements and approval of projects**
2. **Development of Capacity, Management, Operation and Maintenance (CMOM) program**
3. **Provide basis for planning and budgeting of capital improvement projects**

System Value and Age



Status of Recommended Projects from 2002 CSFP

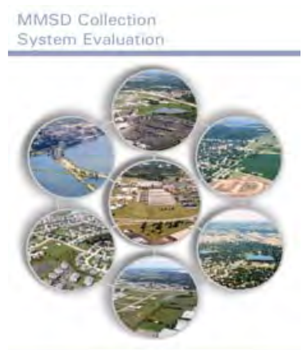
- **48 of 52 projects have been completed to date**
- **Remaining projects:**

Project	Status	Projected Completion
New PS 18	Facility planning starting in 2011	2015
PS 18 – New forcemain	Facility planning starting in 2011	2015
PS 10 – I/I study	Pending	-
PS 14 – I/I Study	Recommended per CSFP Update	2012-2013

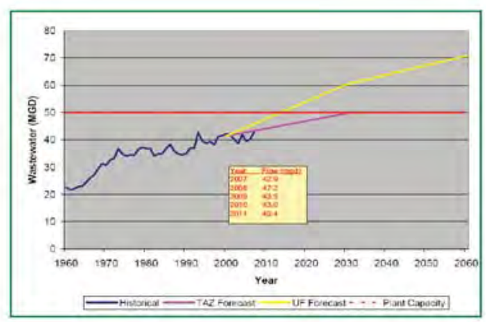
Major Focus Areas of Facilities Plan

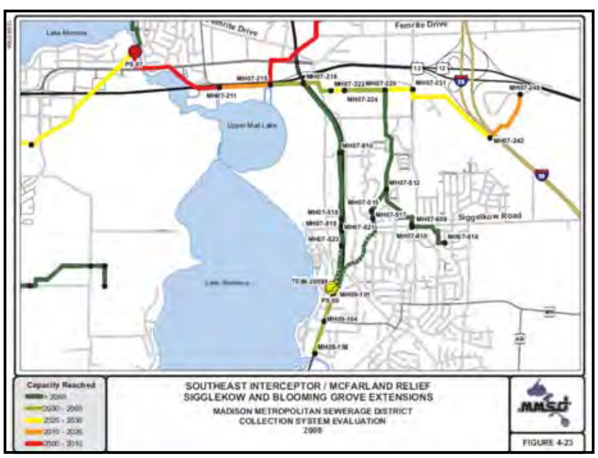
1. Asset management and CMOM
2. **System capacity and projected flows**
3. **Condition and needs assessment of major assets**
4. Special projects and diversions
5. Collection system maintenance
6. Addressing I/I issues and high flows
7. **Recommended projects and initiatives**

CARPC's MMSD Collection System Evaluation

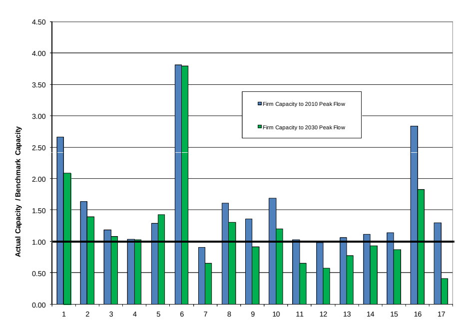


CARPC's Projected Wastewater Forecast





Pumping Station Capacity Analysis



Interceptor and Forcemain Capacity Analysis

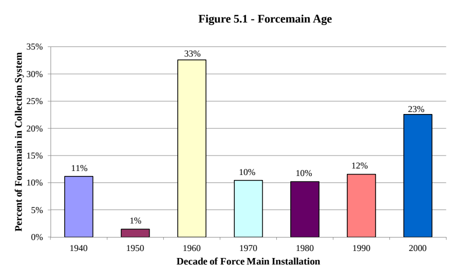
Pumping Station Service Area	Total Gravity Interceptor Mileage in Service Area (miles)	Total Force Main Mileage in Service Area (miles)	Mileage Predicted to Reach Benchmark Capacity By 2020				Mileage Predicted to Reach Benchmark Capacity By 2030			
			Gravity Interceptors		Force Mains		Gravity Interceptors		Force Mains	
			(miles)	(%)	(miles)	(%)	(miles)	(%)	(miles)	(%)
PS1	1.71	3.67	0.00	0%	0.45	12%	0.00	0%	0.45	12%
PS2	2.73	3.29	0.41	15%	0.00	0%	0.41	15%	0.00	0%
PS3	0.72	0.005	0.72	100%	0.00	0%	0.72	100%	0.00	0%
PS4	1.55	0.03	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS5	3.00	0.42	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS6	1.91	1.37	0.00	0%	0.00	0%	0.00	0%	0.00	0%
PS7	19.76	2.96	4.44	22%	0.00	0%	8.39	42%	1.33	45%
PS8	14.64	2.60	2.39	16%	0.00	0%	3.22	22%	0.00	0%
PS9	0.63	1.24	0.00	0%	0.01	1%	0.05	9%	0.01	1%
PS10	6.59	2.10	2.07	31%	0.00	0%	2.07	31%	0.00	0%
PS11	10.04	0.79	1.21	12%	0.00	0%	5.29	53%	0.79	100%
PS12	7.86	0.91	0.67	8%	0.00	0%	0.67	8%	0.00	0%
PS13	2.96	0.49	0.00	0%	0.00	0%	0.36	12%	0.00	0%
PS14	15.84	0.85	0.88	6%	0.00	0%	3.49	22%	0.00	0%
PS15	1.97	2.80	0.00	0%	0.00	0%	0.04	2%	0.00	0%
PS16	1.63	1.93	0.00	0%	0.00	0%	0.53	32%	0.00	0%
PS17	2.52	3.11	0.00	0%	2.53	81%	0.00	0%	2.53	81%
Totals	96.06	28.57	12.80	13%	2.98	10%	25.25	26%	5.10	18%

Condition Assessment - Pumping Stations

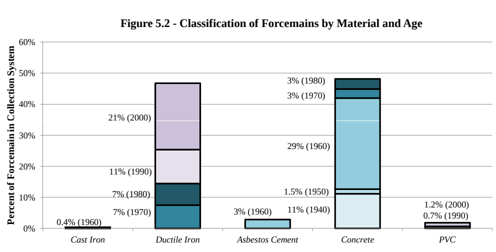
Facility	Adequacy/Condition of Mission Critical Category Likert Scale (1-5) - Category dependent (see text for explanation)						Total	Mean Weighting Factor (Sliding scale of 1 to 2)	Overall Rating	Ordinal Ranking (1 - 17)
	Peak Flow Capacity Qp (5 points)	Firm Flow Capacity Qf (5 points)	Power System Redundancy (5 points)	Mechanical Condition/ (5 points)	Structural Integrity (5 points)	Electrical Condition (5 points)				
PS NO. 1	1	1	1.5	1	1	1	6.5	1.75	11.38	**13**
PS NO. 2	1	1	1.5	1	1	1	6.5	1.95	12.68	**11**
PS NO. 3	2.5	1.5	3	1.5	4	1	13.5	1.00	13.50	**9**
PS NO. 4	3	2	3	1.5	2	3	14.5	1.15	16.68	**7**
PS NO. 5	1	1	1	1	1	1	6	1.20	7.20	**17**
PS NO. 6	1	1	1.5	1	1	1	6.5	1.30	8.45	**16**
PS NO. 7	3.5	3.5	2	2.5	1	2	14.5	2.00	29.00	**2**
PS NO. 8	1	1	1.5	1	1	1	6.5	1.85	12.03	**12**
PS NO. 9	2	2	1	1	2	1	9	1.10	9.90	**15**
PS NO. 10	1.5	1	1.5	1.5	1	1	7.5	1.70	12.75	**10**
PS NO. 11	3	3	3	3	2	4	18	1.70	30.60	**1**
PS NO. 12	2.5	4	4	2	2	3.5	18	1.50	27.00	**3**
PS NO. 13	3.5	3	4	1	3	3.5	18	1.30	23.40	**4**
PS NO. 14	2.5	2.5	4	1	3	3.5	16.5	1.15	18.98	**6**
PS NO. 15	1	2.5	4	2.5	4	3	17	1.25	21.25	**5**
PS NO. 16	1	1	2	2.5	2	1.5	10	1.10	11.00	**14**
PS NO. 17	3.5	3	1	4	1	1	13.5	1.15	15.53	**8**

Condition Assessment – Interceptor Sewers

Condition Assessment – Forcemain Age



Condition Assessment – Forcemain Material



Collection System Initiatives

- Evaluate peaking factors for wet weather flows.
- Develop risk-based condition assessment tool to help identify and prioritize projects.
- Provide enhancements to District's televising program for sewer condition assessment

Figure 2 - Preliminary Route for Pumping Station 18 Forcemain

Rate Impacts

- Projects in Facility Plan to be funded from MMSD reserves and borrowed funds.
- Borrowed funds will average approximately $7M/yr for next 20 years.
- Annual service charge for average household in MMSD to increase by approximately $4/year (does not include increases associated with inflation in wages, materials, energy, etc).

Questions?

Appendix A12
Regulatory Approval

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S. Webster Street
Box 7921
Madison WI 53707-7921

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
FAX 608-267-3579
TTY Access via relay - 711

WISCONSIN DEPT. OF NATURAL RESOURCES

RECEIVED
JUL 20 2012
MADISON METROPOLITAN SEWERAGE DISTRICT

July 19, 2012

Project No. S-2012-0195
CWF No. 4010-39

Mr. Michael Mucha
Madison Metropolitan Sewerage District
1610 Moorland Road
Madison, WI 53713-3398

Subject: Approval For Sanitary Sewer Collection System Facilities Planning Report Update -- Madison Metropolitan Sewerage District

Dear Mr. Mucha:

The Department of Natural Resources has completed the review of the referenced wastewater facilities planning report update addressing proposed improvements for the sanitary sewer collection system at the Madison Metropolitan Sewerage District. The facilities planning report update is hereby approved. We concur with the report recommendations which preliminarily address various proposed sanitary sewer and sewage lift station rehabilitation / upgrade projects over approximately the next 20 years for the Madison Metropolitan Sewerage District.

If you believe that you have a right to challenge this decision, you should know that the Wisconsin statutes, administrative rules and case law establish time periods within which requests to review Department decisions must be filed.

To request a contested case hearing pursuant to section 227.42, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. All requests for contested case hearings must be made in accordance with section NR 2.05(5), Wis. Adm. Code, and served on the Secretary in accordance with section NR 2.03, Wis. Adm. Code. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the time period for filing a petition for judicial review.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Wis. Stats., you must file your petition with the appropriate circuit court and serve the petition on the Department within the prescribed time period. A petition for judicial review must name the Department of Natural Resources as the respondent.

Sincerely,

Thomas J. Mugan, P.E., Chief
Wastewater Section
Bureau of Water Quality

Stephen J. Smith, P.E.
Wastewater Section
Bureau of Water Quality

Cc: Mr. Todd Gebert – Madison Metropolitan Sewerage District (Madison, WI)
Amy Schmidt / Bernie Robertson -- Fitchburg Service Center
Maureen Hubeler -- CF/2 (CWF No. 4010-39)

CAPITAL AREA REGIONAL PLANNING COMMISSION

RECEIVED

210 Martin Luther King Jr. Blvd. Room 362 Madison, WI 53703 Phone: 608-266-4137 Fax: 608-266-9117 www.CapitalAreaRPC.org info@CapitalAreaRPC.org

JUN 20 2012

MADISON METROPOLITAN
SEWERAGE DISTRICT

June 18, 2012

Mr. Thomas Mugan
Wisconsin Department of Natural Resources
Central Office
Madison, WI 53703

RE: Collection System Facilities Plan Update, 2011
Madison Metropolitan Sewerage District (MMSD),
1610 Moorland Road, Madison, WI 53713

Dear Mr. Mugan:

We have reviewed the Madison Metropolitan Sewerage District's Collection System Facilities Plan Update, 2011. The flow and loading estimates used as the basis for this facilities plan are consistent with the range of the 2035 population forecasts for the MMSD service area. These forecasts were based on official population projections and a detailed evaluation of sub-basins within the MMSD service area, and are consistent with the *Dane County Water Quality Plan* as revised and updated through June 8, 2012. The detailed evaluation has been documented in our MMSD Collection System Evaluation study report dated January, 2009.

Please don't hesitate to contact us if we can be of further assistance.

Sincerely,

Kamran Mesbah, Director
Environmental Resources Planning

Cc: Mr. Michael Mucha, Chief Engineer and Director, MMSD
Mr. Todd Gebert, Collection System Engineer, MMSD

APPENDIX C – MMSD EMERGENCY OPERATIONS MANUAL (2023)

Madison Metropolitan Sewerage District

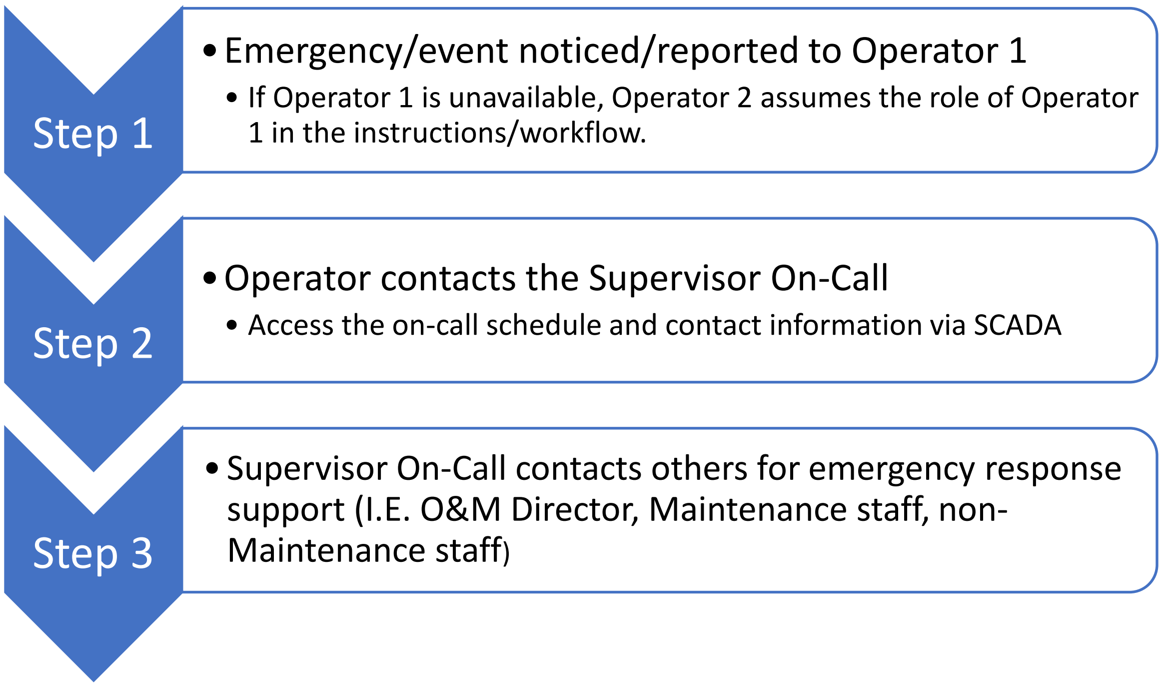
EMERGENCY OPERATIONS MANUAL

LAST MAJOR REVISION
March 2023

General Emergency Information & First Contact

Update Responsibility: **Eric Dundee**
Last Review Date:
Last Revision Date: **02/10/2023 (created)**

Intent: Provide all staff with emergency expectations, District resource information, and guidance
Use the Emergency 911 number for accidents with injuries, fires, or major chemical spills.



- Operator #1 phone number: 608-225-8470
- Operator #2 phone number: 608-576-9637
- Operator #3 phone number: 608-692-6395 (not available 24 hours or on weekends)

Supervisor On-Call
An Operations and Maintenance department designated person is on-call 24 hours a day to respond to emergencies. Operators and the SCADA system have this information for use. If an Operator is unresponsive, the schedule can be found on the district network: P:\OandM\Supervisor OnCall

The Supervisor On-Call should be contacted as soon as possible for guidance and support in the case of an emergency.

General District Emergency Response
District staff must be called for response to an emergency. Maintenance staff are dispatched by the supervisor on-call. The Supervisor On-Call in consultation with other district leadership (O&M director/managers/supervisors, Engineering director) will support calling additional staff in the case of a major incident.

For staff response outside of the maintenance department, use the District's phone list (on the intranet in Templates/Guides/Forms).

For a major incident, FEMA Incident Management System structure should be used to coordinate response. The O&M director is the immediate incident command unless unavailable or otherwise designated. All Supervisor On-Call staff are trained in this structure for implementation.

IT and SCADA System Emergency Response

Refer to guidance within this document for contacts and steps to respond to a cyber emergency incident.

Health and Disaster Emergency Response

Guidance for health and disaster emergency response (i.e., tornado, confined space emergency, threatening person, suspicious person/vehicle/package) should reference the District emergency flip chart. (Not created as of March 2023. Contact the Health and Safety Officer for assistance.)

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

Monitoring Services (User Charge) Sample Site Locations

Update Responsibility: **Ray Schneider**
Last Review Date: **2/27/2023**
Last Revision Date: 2**/27/2023**

The attached table provides information on Collection System Services sampling site locations. This table provides directions to emergency crews in case of an accident involving the Collection System Services crew.

UC Site No.			City/Village/Town	Nearest Street Address	Nearest Road Intersection		GPS Latitude	GPS Longitude
E03		Vienna No. 1	T. Vienna	7131 River Road	River Rd & W. Lexington Pkwy.		43° 14.79' N	89° 22.07' W
E05		Dunn No. 3	T. Dunn	2874 Bible Camp Rd.	Camp Leonard Rd.		43° 00.18' N	89° 18.66' W
E08		Baywood	V. Maple Bluff	20 Bayside Dr.	Old Shore Rd. & Bayside Dr.		43° 06.25' N	89° 21.01' W
E13		Westport No. 1	T. Westport	Mendota County Park	HWY M & HWY Q		43° 06.57' N	89° 28.10' W
E14	4	Dunn #1, station #4	T. Dunn	3159 Waucheeta Tr.	Waucheeta & Alma		43° 01.09' N	89° 20.01' W
E15		Arbor Hills	C. Madison	2714 W. Beltline Hwy	Todd Dr. & E. Beltline		43° 02.12' N	89° 25.40' W
E19	E	Cottage Grove	V. Cottage Grove	4195 Vilas Rd.	Vilas Road & Weald Bridge Road		43° 04.64' N	89° 12.80' W
E21	A	Dunn Kegonsa	T. Dunn	2238 CTH AB	HWY 51 & CTH AB		42° 58.1023'N	89° 16.9473'W
E22	S	Pleasant Springs	T. Pleasant Springs	1878 Country Club Rd.	Giehler Dr./ Country Club Dr		43° 56.92' N	89° 14.78' W
E25	Y	Morrisonville S.D	V. Windsor	4686 Peck Street 4684 CTH DM	County DM & Lynn Street		43° 16.70526'N	89° 21.61296'W
E26	Y	V. Dane Pumping Station	V. Dane	Capitol Drive	Capitol Drive & Capitol Valley Way		43° 14.59536'N	89° 29.21046'W
Q004	S	Oak Springs	T. Windsor	4582 Oak Springs Circle	Oak Springs & Bridgeman Road		43° 13.88' N	89° 20.86' W
Q007	R	Lake Windsor	V. Windsor	4587 Linden Dr.	Linden Dr. & Linden Circle		43° 13.16' N	89° 21.05' W
Q034		Pump Station 15 Bypass	C. Madison	2101 Allen Blvd @ PS15	Marshall Park & Allen Blvd		43° 05.62' N	89° 28.93' W
Q036		Dean Avenue East	C. Monona	Monona Grove Golf Course	Dean & Monona Dr		43° 04.18' N	89° 19.48' W
Q037		University Housing	V. Shorewood Hills	1244 Oxford Rd.	Bowdoin & Oxford		43° 04.91' N	89° 26.46' W
Q038		Shorewood Boulevard	V. Shorewood Hills	1925 Shorewood Blvd.	Shorewood & Topping Rd.		43° 04.68' N	89° 26.61' W
Q039		Tallyho Lane	V. Shorewood Hills	3215 Tally Ho	Shorewood & Tally Ho		43° 04.68' N	89° 06.67' W
Q041		Dunn No. 4	T. Dunn	4675 Meadowview Rd.	Meadowview Rd. &View Rd.		43° 01.10' N	89° 21.54' W

UC Site No.			City/Village/Town	Nearest Street Address	Nearest Road Intersection		GPS Latitude	GPS Longitude
Q043		Buick Street	T. Madison	2203 Buick St.	Buick, Park St		43° 02.48' N	89° 23.56' W
Q048		Cherokee	T. Burke	5000 N. Sherman Avenue	practice greens		43° 09.12' N	89° 21.96' W
Q049		Maple Bluff	V. Maple Bluff	466 Sherman Ave	Commercial & Sherman		43° 06.44' N	89° 21.86' W
Q050		Midmoor	C. Monona	4606 Midmoor	Midmoor & Dean		43° 04.25' N	89° 20.02' W
Q051		Dean Avenue West	C. Monona	404 Dean Ave	Dean & Schofield		43° 04.30' N	89° 19.75' W
Q053		Birch Haven Circle	C. Monona	1011 Birch Haven Circle	Birch Haven Circle/Schluter/ Winnequah		43° 03.45' N	89° 20.55' W
Q057		Area V - Beltline	C. Monona	Bank One @ 802 Broadway	Bridge Rd & Broadway		43° 02.90' N	89° 20.25' W
Q063		Scientific Protein Laboratory	V. Waunakee	700 East Main Street	NW corner of SPL fence		43° 11.3420'N	89° 26.5041'W
Q067		HWY 14 Extension	T. Madison	2853 Cty Hwy MM	Cty MM, Rimrock		43° 01.80' N	89° 23.08' W
Q072		Tawhee Drive	C. Madison	5202 Meadowwood	Meadowwood, Celia Ct		43° 01.63' N	89° 28.11' W
Q075		CTH Hwy M, Westport #2	T. Westport	5442 CTH Hwy M	CTH HWY M, HYW 113		43° 9.18894'N	89° 24.3865'W
Q079		Golf Drive	V. Windsor	4542 Golf Dr	Golf Dr. & Charlie Grimm Rd.		43° 12.75' N	89° 20.86' W
Q082		Pump Station 14	C. Madison	Parklands near PS-14	Wheeler & School Rd		43° 08.93' N	89° 23.00' W
Q095		Lake Road	V. Windsor	Mobile Station @ CTH CV	Cty CV, Hwy 19		43° 11.72' N	89° 20.58' W
Q096		Northeast Interceptor at Kennedy Rd	T. Westport	5366 Kennedy Rd	near pet cemetery		43° 09.78' N	89° 24.77' W
Q097		Windsor No. 1	V. Windsor	4553 Windsor Rd	Windsor & Charlie Grimm Rd.		43° 12.99' N	89° 20.90' W
Q098		Middleton Street	C. Middleton	1203 Middleton Street	Middleton & Stricker Pond Bike Path		43° 05.16' N	89° 30.41' W
Q100		Falcon Circle	C. Monona	514 E. Broadway	E. Broadway, Falcon		43° 02.81' N	89° 19.88' W
Q101		Token Creek - South	T. Burke	4246 Daentl	Buckley & Daentl		43° 10.79' N	89° 19.73' W
Q102		Token Creek - North	T. Burke	6129 US Highway 51	North American Ln.		43° 10.90' N	89° 19.53' W
Q106		Chalet Gardens	C. Fitchburg	2409 Montclair Manor	Chalet Gardens & Chalet Gard. Ct.		43° 01.48' N	89° 27.68' W
Q107		Crescent Drive	C. Fitchburg	4617 Crescent Dr	Crescent Dr, Red Arrow Tr		43° 01.52' N	89° 27.39' W
Q108		CTH PD- Greenway Crossing	C. Fitchburg	2927 S. Fish Hatchery Rd.	McKee Rd & Yarmouth Greenway		43° 00.94' N	89° 25.64' W
Q109		High Ridge Trail	C. Fitchburg	2462 High Ridge Tr	High Ridge Tr, Fish Hatch		43° 01.30' N	89° 25.33' W
Q110		Leopold Way	C. Fitchburg	101 Whispering Pines Way	Leopold & Whispering Pines Way		43° 01.39' N	89° 25.50' W
Q112		Fitchburg Ridge Shopping Center	C. Fitchburg	3070 Fish Hatchery Rd.	Sidewalk		43° 01.47' N	89° 24.86' W
Q116		Westport No. 4	T. Westport	6082 River Rd	River Rd. & Koster Rd. Driveway		43° 11.34' N	89° 22.08' W

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

UC Site No.			City/Village/Town	Nearest Street Address	Nearest Road Intersection		GPS Latitude	GPS Longitude
Q117		RIK interceptor	C. Middleton	1313 John Q. Hammons Drive	John Q. Hammons Drive & Holiday Avenue		43° 05.24' N	89° 31.46' W
Q120		Seminole Interceptor	C. Fitchburg	3134 Seminole HWY.	Seminole, McKee		43° 01.50' N	89° 26.88' W
Q121		Vienna No. 2	T. Vienna	6420 River Rd	River Rd & Easy St		43° 12.40' N	89° 21.72' W
Q122		HWY 19	V. Windsor	E. of Super America	CTH CV & HWY 19		43° 11.69' N	89° 20.42' W
Q123		CTH PD-McKee Relief	C. Fitchburg	2955 Triverton Pike Drive	McKee & Triverton Pike		43° 00.91' N	89° 25.70' W
Q125		Terminal Drive - McFarland	C. Madison	3910 Terminal Dr	Terminal Dr, Hwy 51		43° 02.47' N	89° 18.19' W
Q126		Fish Hatchery Road	C. Fitchburg	3052 Cahill Man	High Ridge Trail & Fish Hatchery		43° 1.27008'N	89° 25.0693'W
Q128		Monona Metro Market	C. Madison	310 E. B**roadway**	East Side Copp's foods		43° 2.73546'N	89° 19.3064'W
Q130		Token Creek Commerce Park	Town of Burke	4409 Hwy 19	Hwy 19 & Pepsi Way @ McDonalds		43° 11.6661'N	89° 20.2971'W
Q132		Commercial Park	C. Fitchburg	6133 McKee Rd.	McKee & Commerce Dr.		43° 0.87852'N	89° 28.1988'W
Q134		Siggelkow Rd	V. McFarland	5414 Siggelkow Rd.	Sigggelkow and Marsh		43° 1.56108'N	89° 17.2150'W
Q135		Swan Creek Syene Int	C. Fitchburg	3082 Herman Rd.	McCoy and Herman Rd On Bike Path		43° 1.32006'N	89° 23.1279'W
Q136		Ashbourne Lane	C. Fitchburg	5666 Ashbourne Lane	Wooded area near RR & interceptor		43° 1.43106'N	89° 26.0425'W
Q137		Winnequah Road	C. Monona	6221 Winnequah Road	Winnequah Road & Bridge Road		43° 3.15'N	89° 20.2129'W
Q139		Windsor Road	V. DeForest	4550 Windsor Road	Windsor Road & Charlie Grimm Road		43° 12.9917'N	89° 20.9298'W
Q142		Parkside Circle	V. Windsor	7002 Parkside Circle	Parkside Circle & Gray Road		43° 13.2878'N	89° 20.4072'W
Q144		Greenway Cross	C. Madison	1325 Greenway Cross	Greenway Cross & Index Road		43° 1.88016'N	89° 3.0072'W
Q145		Pump Station 12	C. Fitchburg	2739 Fitchrona Rd.	Nesbit & Fitchrona		43° 0.24462'N	89° 29.0812'W
Q146		CTH PD/Verona Road	C. Fitchburg	5321 Verona Rd.	CTH PD & Verona Road		43° 0.936'N	89° 28.2316'W
Q147		Nesbitt Road	T. Verona	6354 Nesbitt Road	Nesbitt Road & Allegheny Drive		43° 0.39882'N	89° 29.1366'W
Q148		Capital City Trail	C. Fitchburg	2961 Syene Road	Syene Road & McCoy Road On Bike Trail		43° 1.02096'N	89° 24.3295'W
Q149		Kennedy Drive	T. Westport	5492 Kennedy Drive	Kennedy Drive & Shannon Way		43° 9.55194'N	89° 25.0828'W
Q150		Goose Lake – Verona #1	T. Verona	6429 Demarco Trail	Pheasant Lane & Goose Lake Drive		43° 0.01248'N	89° 29.5011'W
Q152		Pederson Crossing	V. Windsor	6570 Pederson Crossing Blvd.	Bear Tree Parkway & Pederson Crossing		43° 12.3237'N	89° 19.0240'W
Q153		Meadowview Road	T. Dunn	3158 Zuercher Ct	Meadowview Road & Zuercher Court		43° 1.09524'N	89° 21.7962'W
Q154		Syene Road	C. Madison	2801 Syene Rd	South off ramp to Highway 14 from Highways 12 & 18		43° 2.00364'N	89° 23.4912'W
P01		Pump Station 1	C. Madison	104 N. First St	N First St & E Mifflin St		43° 5.57064'N	89° 21.6726'W
P02		Pump Station 2	C. Madison	833 W. Washington Ave.	W. Washington Ave & S Park St		43° 3.81186'N	89° 23.96364'W

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

UC Site No.			City/Village/Town	Nearest Street Address	Nearest Road Intersection		GPS Latitude	GPS Longitude
P03		Pump Station 3	C. Madison	1610 Moorland Rd.	Raywood Rd &Moorland Rd		43° 02.26' N	89° 21.58' W
P04		Pump Station 4	C. Madison	620 John Nolen Dr.	John Nolen Dr. &W Expo Dr		43° 2.96352'N	89° 22.5793'W
P05		Pump Station 5	C. Madison	5221 Lake Mendota Dr	Lake Mendota Dr & Spring Harbor Dr		43° 4.83276'N	89° 28.2234'W
P06		Pump Station 6	C. Madison	402 Walter St	Walter St & Sargent St		43° 5.47368'N	89° 19.7307'W
P07		Pump Station 7	C. Monona	6300 Metropolitan Lane	Bridge Rd, Metropolitan Ln		43° 02.97' N	89° 20.23' W
P08		Pump Station 8	C. Madison	967 Plaenert Dr.	Fish Hatchery Rd & Plaenert Dr		43° 2.94126'N	89° 23.96238'W
P09		Pump Station 9	V. McFarland	4612 Larsen Beach Rd	Larson Beach Rd & Highway 51		43° 1.0728'N	89° 18.0944'W
P10		Pump Station 10	C. Madison	110 Regas Rd	Regas Rd & W Corporate Dr		43° 6.01272'N	89° 19.1997'W
P11		Pump Station 11	C. Fitchburg	4760 E. Clayton Rd.	E Clayton Rd & Larsen Rd		43° 1.49712'N	89° 21.8748'W
P12		Pump Station 12	T. Verona	2739 Fitchrona Rd	Nesbitt, Fitchrona		43° 00.26' N	89° 29.09' W
P13		Pump Station 13	C. Madison	3634 Amelia Earhart Dr	Amelia Earhart Dr & Corben Ct		43° 8.47794'N	89° 19.4992'W
P14		Pump Station 14	C. Madison	5000 School Rd.	Wheeler & School Rd		43° 08.99' N	89° 23.02' W
P15		Pump Station 15	C. Middleton	2115 Allen Blvd.-Middleton	Marshall Park, Allen Blvd		43° 05.67' N	89° 29.09' W
P16		Pump Station 16	C. Middleton	1303 Gammon Rd.-Middleton	Gammond Rd. & Fortune Drive		43° 05.29' N	89° 30.09' W
P17		Pump Station 17	C. Verona	704 Bruce St.	Bruce St. & Hwy 69		42° 58.58' N	89° 32.33' W
P18		Pump Station 18	C. Monona	1100 E. Broadway	East Broadway & Copps Avenue		43° 02.80’ N	89° 18.84’ W
		MS (UC) Shop @ Nine Springs					43° 02.29' N	89° 21.30' W

Supplemental Emergency Phone Numbers – Owner Communities

Update Responsibility: **CSS/Resource Team**
Last Review Date: **03/29/2021**
Last Revision Date: **03/02/2023**

Find an updated list on our website at www.madsewer.org/contact/owner-community-contacts/

NOTE: Updated owner community contacts must be shared with the Resource Team to update the website.

Customer	Contact, "first call" listed first	Phone Number
City of Fitchburg	Normal Hours After Hours Tracy Foss Foreman	608-270-4260 608-235-2589 608-270-4272 (c) 608-235-8143
City of Madison	Engineering Operations Kathy Cryan, Ops Supervisor Jim Streich Sewer Supervisor Ryan Schmidt Street Supervisor, Chris Sharf (Water Dept.) (After-hours)	608-266-4430 608-266-4819 608-243-5897 (o) 608-235-6058 (c) 608-266-4086 (o) 608-225-8632 (c) 608-267-1973 (o) 920-550-8491 (c) 608-266-4665
City of Middleton	David Sarbacker, Utility Manager Ryan Madigan Police dispatch (After-hours)	608-821-8370 (o) 608-469-3300 (c) 608-513-5464 (c) 608-824-7300

Customer	Contact, "first call" listed first	Phone Number
City of Monona	Sewer Utility, businesss hrs. Police Department, after hrs Mike Trotter, Utilities Foreman (Assistant Supervisor) Jeff Johnson (Deputy Director) Daniel Stephany, DPW	608-222-2525 608-222-0463 608-692-4107 608-222-2525 (o) 608-216-7482 (c) 608-222-2525 (o) 608-692-8457 (c)
City of Verona	Emergency On-Call After Hours Theran Jacobson, Director of Public Works Kyle Geisler , Streets Superintendant Jeff Batson, Sr. Distribution Engineer Matt Barlett, Manager Operations	608-575-0552 (c) 608-845-6695 608-845-6695 608-848-6801 (o) 608-516-2781 (c) 608-845-1130 608-845-1144
Dane County Landfill	John Welch, Director Robert Regan-Solid Waste	608-516-4154 608-266-4139
Mendota Mental Health Institute (Veith Lift Station Grinder)	Facility Services Clayton Friedland - Bldg/Grounds Supr Security (if other #s don't pick up)	608-301-1070 608-301-1038 608-301-1060
Town of Burke-Token Creek S.D.#1	**(See Village of DeForest)**	
Town of Dunn	Town Office	608-838-1081
Town of Dunn S.D. #1	Cathie Richards Dan Paltz	608-838-3655 (h) 608-347-3712 (c) 608-513-4110 (c)

Customer	Contact, "first call" listed first	Phone Number
Town of Dunn S.D. #3	Al Monroe Cathie Richards Tammy Rayfield	608-838-0118 (h) 608-825-1899 (o) 608-838-3655 (h) 608-516-7100 (c)
Town of Dunn S.D. #4	Sy (John) Ong Jason Lohr Cathy Hasslinger	608-222-6489 (h) 608-556-3509 608-838-1081 x208
Town of Dunn-Kegonsa S.D.	Office Emergency cell Brian Shotliff – Operator Cindy Lehr - KSD Clerk	608-873-0230 (w) 608-843-6026 (c) 608-669-0446 (c) 608-843-4138 (c)
Town of Pleasant Springs S.D. #1	Office Richard Everson	608-873-3074 (o) 205-8714 (c)
Town of Verona	Mark Judd - Public Works Town Hall Chris Barnes	608-807-4469 (c) 608-845-7187 608-845-7187 (o) 608-807-4471 (direct)
Town of Vienna: Utility District #1 and Utility District #2	Town Hall Kathy Clark Scott Benson	608-846-3800 (w) 608-846-3800 608-850-3800 (h) 608-712-5384 (w) 608-712-0191 (c)
Town of Westport-All Utility Districts	Barry Buckwalter After Hours Call	608-219-1416 (c) 608-849-4372
Village of Cottage Grove	Village Office Maintenance Dept. Brian Peterson, Director of Public Works & Utilities Jon Bublitz, Utility Superintendent	608-839-4704 608-839-5813 608-621-1788(c) 920-540-8272(h) 608-358-9907(c) 608-333-6365(h)
Village of Dane	Shane Clapper – Public Works Teresa-Hughey Groves – clerk	608-849-5425 (w) 608-849-5422 (w)
Village of DeForest	Sewer- Brian Delapp After Hours Greg Hall	608-846-6756 x1405 (w) 608-807-7083 (c) 608-576-1504 (c) 608-807-7023
Village of Maple Bluff	Tom Schroeder-Pub.Works Paul Elliott Tanner Nystrom-Vil. Adm.	608-244-3048 (w) 608-209-5022 (c) 608-886-6787 (w) 608-244-3048 (w)

Customer	**Contact, “first call” listed first**	**Phone Number**
Village of McFarland	Utility Office Lee Igl - DPW On-call crew member	608-838-7287 608-838-7287 608-212-2625
Village of Shorewood Hills	Mike Meier On call Village Hall Police Department Fire Department	608-267-2680 (w) 608-209-5024 (c) 608-444-6246 608-267-2680 608-267-1110 608-267-2680
Village of Waunakee	Randy Dorn (Office-but will go to 24-hour service) Kevin Even Water “on call” phone # After Hours	608-849-8111 608-235-6442 (c) 608-849-6276 608-235-5669 608-849-4111
Village of Windsor	Emergency Number Jon Claas Davis Clark	608-234-4668 608-444-1198 608-235-1196

Emergency Phone Numbers: Other Useful Contacts

Update Responsibility: **Ray Schneider/Carly Amstadt**
Last Review Date: **2/28/2023**
Last Revision Date: **2/28/2023**

Contact	Telephone #
Diggers Hotline	1-800-242-8511 or dial 811
Alliant Energy	Primary: 800-551-1743 Secondary: 1-800-862-6261
City of Madison Sewer Lines(1)	608-266-4430
City of Madison Water Lines	608-266-4665 (24-hour emergency service)
City of Madison Water Dept.	608-266-4651 (general billing/office hours only)
City of Madison – Sewer Maintenance	
Kathy Cryan – Engineering Supervisor	608-266-4819
Wane Brown-Sewer Maint Foreman Chris Scharf-Streets Jim Streich – Sewer Maint Supervisor General Radio	No Number yet 608-267-1973 608-235-6058 608-266-4430 608-267-1181-705389
Dane County-Truax Airport Operations	608-235-1001
Public Health Dept. - Madison & Dane Co.	608-266-4821
Dane County Garage-Stoughton	608-873-6565
MMSD Contacts for locating assistance **during** regular business hours	
Adam Carlson	608-338-7413
Kody Wright	608-609-7759
Ray Schneider	608-347-3628
MMSD Contacts for locating assistance **after** regular business hours	
Sewer Maintenance On Call	608-335-4030
WDNR South Central District Office Ashley Brechlin – DNR Wastewater Engineer	608-438-9930
Beth Perk DNR Air Management Engineer	715-214-9558
Wisconsin DOT	608-246-3841
Wisconsin State Patrol, DeForest Post	608-846-8500
Honey Wagon	608-271-5008 or 608-873-6726 or 608-835-9588

Footnote:
Calls not answered at City of Madison Sewer Lines are automatically forwarded to the City of Madison Water Line's 24-hour emergency service.

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

Permitted Haulers List

Update Responsibility: Julie Maas
Last Review Date: 2/6/2023
Last Revision Date: 2/6/2023

Company	Office Phone	Cell Phone	Contact	Email
A-1 Sewer Service, Inc.	(608) 249-5845	(608) 846-9040	Lisa Thompson	A1SewerService15@Yahoo.com
Anderson Custom Processing	(608) 217-1473	(608) 217-1473	Tyler Anderson	kleggestein@andersonprocessing.com
B & R Pumping Service LLC	(608) 835-8195		David or Lynne Johnson	davidmjohnson1966@gmail.com
Badger Sewer & Drain	(608) 712-4759	(608) 712-4759	Mark Bakken	badgerseweranddrain@gmail.com
Badgerland Portables	(608) 580-0580	(608) 509-2069	Michael Lange	Mlange@lrsrecycles.com
Bergendal Septic Service, LLC	(608) 754-7816	(608) 728-3027	Tirea Bergendal	Bergendalseptic@gmail.com
Bucky's Dumpsters and Restrooms Inc	(608) 835-3459	(608) 212-2039	Chuck Kerns	sales@buckyspt.com
Bytec Transfer Inc	(608) 328-8200			operations@bytecinc.net
CK Septic Service	(608) 341-6249		Katie Mosley	cksepticservice@gmail.com
Country Plumber, Inc.	(608) 742-2648	(608) 697-5336	Bill DeMars	billd@countryplumber.com
Dvorak Pumping LLC	(608) 255-1022	(608) 576-1713	Ronda Erickson	dvorakpumping@yahoo.com
Eckmayer, Inc.	(608) 837-5297	(920) 626-1026	Steve Tesmer	eckmayer@frontier.com
Elsing Septic	(608) 635-2835	(608) 235-4996	Dave Falk	elsingseptic16@gmail.com
Environmental Specialists, LLC	(920) 261-4000	(920) 342-3251	Darwin Lamke	DLAMKE@ENVSPEC.COM
Fanning Excavating	(608) 754-6100		Roger Fanning	fanningoffice@gmail.com
GFL Environmental	(414) 761-9421		Scott Golibrzuch	SGolibrzuch@gflenv.com
Giddings Hawkins	(414) 649-8474	(414) 881-8213	Chuck Wilson	service@giddingshawkins.com
Hellenbrand Septic Service, LLC	(608) 424-9400	(608) 438-3145	Becky Hellenbrand	hellenbrandseptic@gmail.com
Honey Wagon Services, Inc.	(608) 873-6726	(608) 628-5757	John & Anisha Olsen	jpoasbo@charter.net
Hubred Septic Pumping	(608) 764-5068	(608) 438-5068	Kae Hubred	saekae18@yahoo.com
K.G. Smith Septic	(608) 575-0629		Ken Smith	KGSMITH56@HOTMAIL.COM
Kalscheur Septic Service, Inc.	(608) 836-6677	(608) 712-3685	Rick Kalscheur	kalscheurseptic@yahoo.com
Lee's Roto Rooter Sewer Service	(608) 256-5189	(608) 513-5629	Terra Herale / Dave Griswald	terra@rotorootersewerdrain.com

Liquid Environmental Solutions	(773) 646-9700	(920) 342-4705	Kelly Gill	hdd53147@gmail.com
Madison Gas & Electric Co.	(608) 252-7281		Brenda Sargent	bsargent@mge.com
Mark's Reddi-Rooter and Plumbing	(608) 241-2382	(608) 446-5965	Kasey Nordin	msubola@marksrr.com AND knordin@marksrr.com
McCann's Roto Sewer & Drain	(608) 222-6007		Kelly McCann	mccannsundergnd@aol.com
Monona Plumbing & Fire Protection, Inc.	(608) 216-9022	(608) 225-8529	Alicia Santeramo	dschmidt@mononapfp.com
Monson Septic	(608) 482-0563		Jeff Monson	monsonseptic@gmail.com
Picketts Septic Service Inc.	(608) 254-7254	(608) 963-6938	Aaron Stanford	csta@frontier.com
Quality Removal LLC	(262) 677-4817	(262) 689-3377	Lee Schowalter	qualityremoval@yahoo.com
RDR Septic & Well Services LLC.	(920) 988-7372		Ronald Raduenz	RDR@NETWURX.NET
SCS Engineers	(608) 224-2830		Eric Oelkers	eoelkers@scsengineers.com
Speedway Sewer Service	(608) 833-1263		Rick Sanders	speedwaysewer@gmail.com
Stoughton Lumber Co	(608) 873-4141	(608) 438-3144	John Olsen	ashleyb@stoughtonlumber.com
Strander's Sanitary Service, LLC	(608) 592-5808	(608) 772-6266	Marc Hamilton	marc@standerssanitary.com
United Septic & Drain Services, Inc	(920) 696-3500		Jenny Wolter	jennyw@unitedsepticanddrain.com
Uphoff Company Inc	(608) 209-3915		Kendal Uphoff	uphoffcompany@gmail.com

Procedures for Pump Station Power Outages

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

In the event of a power outage at a pump station, please follow these procedures:

1. Refer to the "Power Schedule for District Operated Pump Stations" in this manual or on the network drive at \\ENGFILE01\ElecEngr\Electrical Record Files\Power Schedule\Current Power Schedule.xlsx

   Each station is listed along with its address and the electric circuit identification numbers for that station. There is also an indication of whether there is a generator connection at the station.

   The last two columns of the table show estimates for the amount of time the station can be without power during a "Normal Outage" and a "High Flow Outage." A normal outage means during dry weather conditions or light rainfall. High flow outage refers to heavy rainfall conditions or when we know the ground is saturated. Determine which column applies to your situation. Remember, these are only estimated times and are used to compare stations. Error on the side of keeping basements dry. **Any power outage at any station should be treated as an emergency with the goal to be to return power as soon as possible.**

2. The "Power Schedule for District Operated Pump Stations" table also shows which electric power company provides service to each station. **Immediately** call the proper power company to report the outage. Often the call from the operators is the first notice the power company has of the outage. Give them the street address and the circuit number identification numbers. **Alliant Energy** may also need to know what city the pumping station is located in.

   For MGE, call: 608-252-7111 (general outage number)
   Stay on the line to talk to an MGE employee

   608-252-1550 (key customer outage line)
   Dial 0 rather than leaving a message

   For Alliant, call: 800-255-4268 (Primary) or 800-862-6261 (Secondary)
   Follow the menu to speak to a dispatcher.

   A. *Make sure that the power company knows that you are with the Madison Metropolitan Sewerage District* (they will put a flag next to our calls to give them priority) and are reporting an outage for a wastewater pumping station and that basements may flood if the power is not returned to the station. Give them the pump station number or name and its address.

B. Ask if the power company knows how long it may be until they can service the problem. If there are widespread outages, they may be unable to tell you.

C. Ask the power company to call you back when they have restored power to the station.

3. If the power company does not feel that they can restore power within the time limit in the "Power Schedule for District Operated Lift Stations," contact the O&M supervisor on call. If you cannot reach a supervisor, call out two electricians from the call-out list and ask them to take one of our portable generators to the station. If no electricians can be reached, call out two mechanics to take the generator to the station. If there is difficulty finding a second person for the call out, Facilities Maintenance staff can be called in to assist the electrician or mechanic.

4. If several station outages require multiple portable generators, also call the City of Madison Sewer Department (608-266-4430). They have a generator similar to ours. They can be directed to take their generator to their stations that need power. The Verona Public Works Department also has a generator they can take to their Epic Station and Scenic Ridge Station.

5. Call the power company for an update if power has not been restored within the time they estimated it would be restored. **If you are calling MGE, use the 608-252-1550 number. Tell them that this outage is already in their computer system.** Explain that you know they are probably very busy, but you need to know the status of the repair to determine if we need to take additional action as a matter of public health and safety.

6. Check this manual's High Flow Procedures section to see if you need to report the station outage or high well level information to anyone in the area of the station outage. Some of the pump station screens will also display such a message, so check them as well. Contact Ray Schneider (or **after hours,** the on-call Collection System Services crew member from the Control Room Call-out sheet) to see if they have any equipment in the areas with high flows. They may need to remove this equipment.

7. If actual wastewater bypassing or basement backups appear likely, notify Ray Schneider for insurance and homeowner follow-up activities.

8. If any of our field crews report that power seems to have returned to the neighborhood surrounding a station, but the station is still without power or the pumps won't run, it is possible that one of the phases is out on the station feed. Notify the power company of this situation.

High Flows — General

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

Definition: In general, high flow events are situations where the instantaneous flow to the plant exceeds 90 MGD or conditions where any pumping station uses its maximum pumping capacity and the wetwell level continues to rise. The plant has conveyed 155 MGD instantaneous flow for short periods without significant incidents in the past. Still, **special attention is necessary in these cases for the collection system and the plant.**

General actions to take during high flows

Contact your supervisor when you see a high flow event starting to develop during normal working hours. During non-weekday hours, contact the supervisor on call **and** one of the staff listed below, starting at the top of the list.

Name	Home #
Ray Schneider	608-347-3628 (c)
Erik Rehr	608-279-0816 (c)
Jen Hurlebaus	608-438-8257 (c)
Todd Gebert	608-556-3448 (c)
Eric Hjellen	608-630-7551 (h), 608-347-3613 (c)
Alan Grooms	608-347-2887 (c)

Document: If conditions allow, document the times that people were contacted, high well level readings, whether any reports of high levels were received, any overflows or basement backups noted, and any other information that may be pertinent.

Specific actions to take during high flows

(Note: The information immediately below is duplicated in the Operations WordPress Wiki for PS01, PS02, PS06, PS07, PS12, PS13 & PS14.)

High Flows in the PS13 area – Operator Actions

In the event of flooding in the PS13 area, it is possible for flooding to occur around the station's electrical service. A loss of electrical service to the station and a failure of the backup generator would result in an extended outage for the station. If flooding is anticipated, contact District field personnel to inspect the station and the water level surrounding the electrical service.

Procedures for Emergency Diversion of Flow at Pump Station 14

In an emergency requiring wastewater to be diverted at Pump Station 14, follow these procedures to minimize environmental damage to Cherokee Marsh.

1. A four-inch or six-inch pump should be set up alongside the station outside the wet well entrance.
2. A suction hose should be connected from the pump to the wet well.
3. A discharge hose should be attached to the pump and laid along the driveway and across the road. This is a distance of about 150 feet. The hose should extend into the low area on the east side of the road.

4. Place a barricade on the road to prevent traffic from running over the hose.
5. After the pump has been running for about 10 minutes, collect a sample of the water coming out of the hose. Take the sample to the District's laboratory for analysis. Additional samples may be taken during the time the pump is diverting flow. District management will determine if additional samples need to be collected.
6. District management should contact the City of Madison Parks Department (266-4711) as soon as possible if diversion becomes necessary.

Water should never be discharged to the west or north of the pumping station.

Homeowner and Business Contacts When High Flows Occur

Pumping Station No. 2

If the wet well level rises above elevation –3.0 feet elev. (depth=15.6'), Collection System Services, Ray Schneider, should contact the business at 516 S. Park Street. During previous high flow conditions, their basement flooded and they were advised at that time to have a backflow preventer installed. They may not have installed a working backflow preventer, so let them know that flooding may be about to occur. They have a plug to screw down over the floor drain.

Pumping Station No. 6

If the well level gets to –5.0 feet elev. (depth=15.3') call the City of Madison Sewer Department (266-4430). Advise the City to pump out of the John Street sewer to avoid backup in this area. This is done by pumping out one of the manholes located near the intersection of Johns Street and Walter Street.

Pumping Station No. 7

If the well gets to –2.5 feet elev. (depth=19.3'): Call the City of Monona dispatcher at 222-0463
Tell the dispatcher that there is potential for flooding in the Monona sewer system. The dispatcher should contact the Monona Public Works Department, who should contact local residences.

Other Useful Telephone Numbers

In responding to a high flow event, District staff may need to make additional contacts. Useful names and telephone numbers are listed below:

Name	Telephone Number
Ross Hollfelder	608-609-7725/608-219-5769(c)
Honey Wagon	608-271-5008 or 608-873-6726 or 608-835-9588
A-1 Sewer Service	608-249-5845
MG&E General Key Customer Outage Phone	 608-252-7111 608-252-1550
Alliant Energy	Primary: 800-255-4268 Secondary: 1-800-862-6261
Ashley Brechlin, Wastewater Engineer	608-438-9930
City of Madison Public Health Dept.	608-266-4821
City of Madison Sewer Maintenance	608-266-4430

Procedures for Pump Station 13, 14 and 15 Drywell Bypassing

Update Responsibility: **Erik Rehr**
Last Review Date: **3/6/2023**
Last Revision Date: **3/6/2023**

Pump stations 13, 14, and 15 are equipped with emergency bypass pumping provisions that allow for a portable pump to be used to pump directly from a manhole or wetwell to the stations respective forcemain.

Individual Pump Station Drywell Bypassing Instructions

For each of the pump stations below, both a 4-inch or 6-inch portable pump can be used, but it is more desirable to bring the 6-inch pump if possible due to increase capacity and pumping head. In the event the drywell of a pump station needs to be bypassed, bring the selected portable pump to the station along with 40-feet of suction piping, 100-feet of discharge piping and necessary quick connect cam-lock adapters to connect to each stations bypass piping. Listed below are the location to place the suction piping, the connection size and location of the station bypass line, and any special instructions pertaining to each station. Before connecting any of the bypass piping or opening the bypass valves, lock out all pumps at the station to prevent them from coming on inadvertently.

Pumping Station No. 13

- Pumping location: MH13-101 located 25-feet north of the pump station.
- Bypass connection size: 6-inch
- Bypass connection location: Exterior of the north wall of the pump station.
- Special instructions: Inside the pump station, open the station bypass valve located on the catwalk in the drywell.

Pumping Station No. 14

- Pumping location: MH14-101 located 25-feet northwest of the pump station.
- Bypass connection size: 6-inch
- Bypass connection location: Exterior of the northwest wall of the pump station.
- Special instructions: Inside the pump station, open the station bypass valve located on the catwalk in the drywell.

Pumping Station No. 15

- Pumping location: Pump station 15 wetwell
- Bypass connection size: 8-inch <u>(will need a 6-inch to 8-inch adapter)</u>
- Bypass connection location: Inside of Isolation Valve FMC15-00046 structure located 40-feet south of the station wetwell
- Special instructions: Inside the Isolation Valve FMC15-00046 structure, close the focemain isolation valve and open the bypass line isolation valve. A 2-inch square valve key or valve truck will be needed to operate both valves. The valves are located approximately 8 feet below grade, so the appropriate key should be brought to the station.

Sewer Line Emergency – Gravity Lines, Force Mains, and Backups

Update Responsibility: Ray Schneider/Erik Rehr
Last Review Date: 2/6/2023
Last Revision Date: 2/6/2023

Identify: Location and type of problem. Be as specific as possible.

Step #1: Follow the Collection System Services on-call sheet to get assistance diagnosing the problem (unless there is certainty that this is a District sewer line emergency), then:

Step #2: The operator should contact **one** of the engineering staff listed below, starting at the top of the list

Name	Work Extension #	Home #
Ray Schneider	259	608-347-3628
Lisa Coleman	133	608-698-1295 (c)
Jen Hurlebaus	248	608-438-8257
Erik Rehr	294	608-279-0816 (c)
Eric Hjellen	348	608-630-7551 (h), 608-347-3613 (c)

The plant operator should be kept updated on any action that needs to be performed or any information that he/she may need. This could include making temporary changes to divert flow, isolate lines, etc.

Document: All actions taken by the plant operator in response to a sewer line emergency should be documented in writing. The plant operator has been provided with complaint forms, which should be used anytime a complaint is received regarding a sewer backup or related problem. The complaint form should be given to one of the engineering staff listed above.

Other Contacts:

The District engineer or supervisor may determine that other resources outside of the District need to be contacted. Following is an abbreviated list of non-District contacts.

Company	Contact	Telephone #
Capitol Underground	Office Gordy Morauske Tom Morauske Jim Lee	608-318-1595 608-333-9566 (mobile) 608-333-9591 (mobile) 608-333-9585
Maddrell Excavating	Office Josh Ula	608-897-9396 608-214-0370 (mobile)

Company	Contact	Telephone #
Speedway Sand & Gravel	Office Dustin Bittner	608-836-1071 608-836-1071, ext. 228

Organization	Name	Telephone #
Police		911
Fire		911
Dane County Highway Dept.	Dan Behrend	266-4014
WDNR – (spills etc.)	Ashley Brechlin Engineer	608-438-9930
Liberty Towing Service LLC		608-221-3600
First Supply	Office Lawrence Pearson	608-222-7799 608-223-6618 (w) 608-316-0366 (c)
Ferguson Enterprises		608-838-9857
Thompson Pipe Group (for prestressed concrete cylinder FMs)		877-853-0130 (24-hour) or (815) 389-4800
Core & Main		608-834-1311

Pumping Station No. 1 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

The Crosstown Forcemain normally handles all the flow of Pumping Station No. 1 (pumps A or B pump through this line). The Crosstown Forcemain was built between 2000 and 2002 and is 24" and 30" ductile iron pipe. A portion under the Monona Terrace was installed in 1995 and is 20" C905 PVC. The average daily flow from this station is approximately 3 MGD. In the event of an emergency associated with the PS02 force main, the Crosstown Forcemain should also be used to pump flow from PS02 to PS01. Valving behind PS02 (see drawing next sheet for location of the valves) and inside PS01 would need to be modified for this to occur. Engineering or Sewer Maintenance should be contacted to assist with valving.

The original Pump Station 1 force main from PS01 to PS06 was built in 1948 under the East Interceptor, Division Q. This force main is 30" reinforced concrete non-cylinder pipe. This is a concrete pipe with two layers of rebar and no metal cylinder or prestressing wires. This force main is used during high flows events to pump some of the flow to PS06 by pumping with either the C or D pump. If necessary, this force main can also be used on a day-to-day basis to pump all the flow from PS01 to PS06 (rather than to PS02 via the Crosstown Forcemain). Pump C or D would be used for this, as they pump to PS06.

Shutdown and Diversion

The first step for handling a leak in either force main would be to switch the pumps so that the station flow is pumped through the other force main. Pumps A & B pump to PS02, and pumps C & D pump to PS06. Either set of pumps can easily handle normal daily flows and can also handle significant peak flows.

Repairs

The PS01 force main to PS06 was built under the same contract as the PS06 & PS07 force mains. Call Thompson Pressure Pipe at 877-853-0130 (24-hour) or 815-389-4800 for potential repair parts. This force main has been in service since it was built in 1948 and only one repair was required to date. This repair occurred in late 1970’s when leaks just outside the station were repaired and encased in concrete.

The District stocks 30" pipe and repair parts for the Crosstown Force main. Pipe is located in the Storage Yard near PS03 and repair parts are in inventory and located in the Service Building.

Pumping Station No. 2 Force Main Emergency and Repair Information

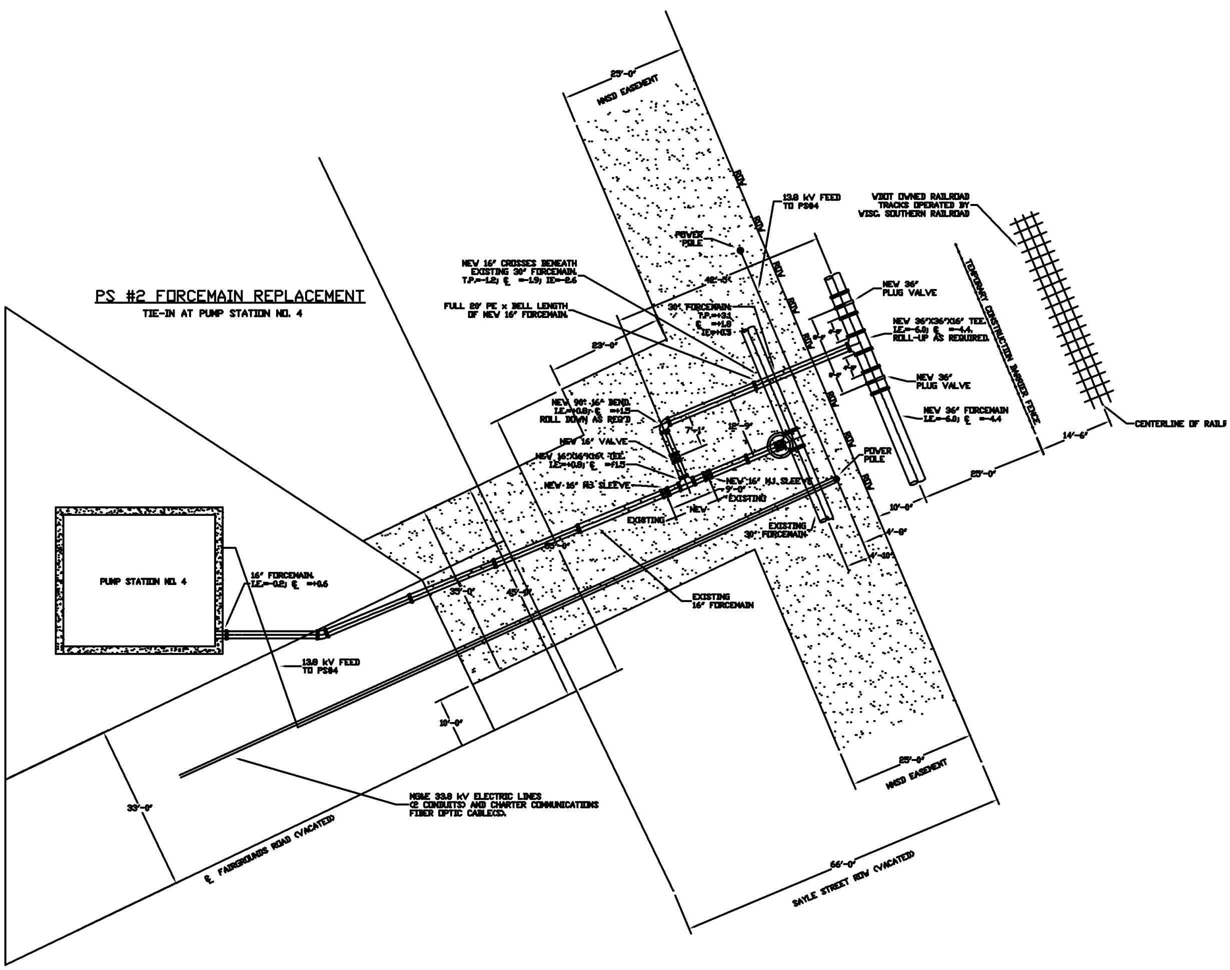
Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 2 force main was built and placed in service in 2001. The force main is a 36" ductile iron line. This is one of the five major force mains (PS02, PS07, PS08, PS11, PS18) that carry all District flow to the plant. PS03 & PS04 force mains connect to the PS02 force main. The average daily flow from this PS02 force main is approximately 8.5 MGD (4.0 MGD from the PS02 service area; 3.0 MGD from PS01; 1.0 MGD from PS04; and 0.3 MGD from PS03).

Critical Levels

The PS02 wet well level reached an elevation of approximately 0.0 elev. (depth=18.6') when emergency force main repairs were needed in the past. Diversion (via the Southwest Interceptor on Haywood Street) of flow to PS08 begins at about wet well elevation -4.8 (depth=13.8') and should stabilize at wet well elevation -2.5 (depth=16.1') under normal flow conditions



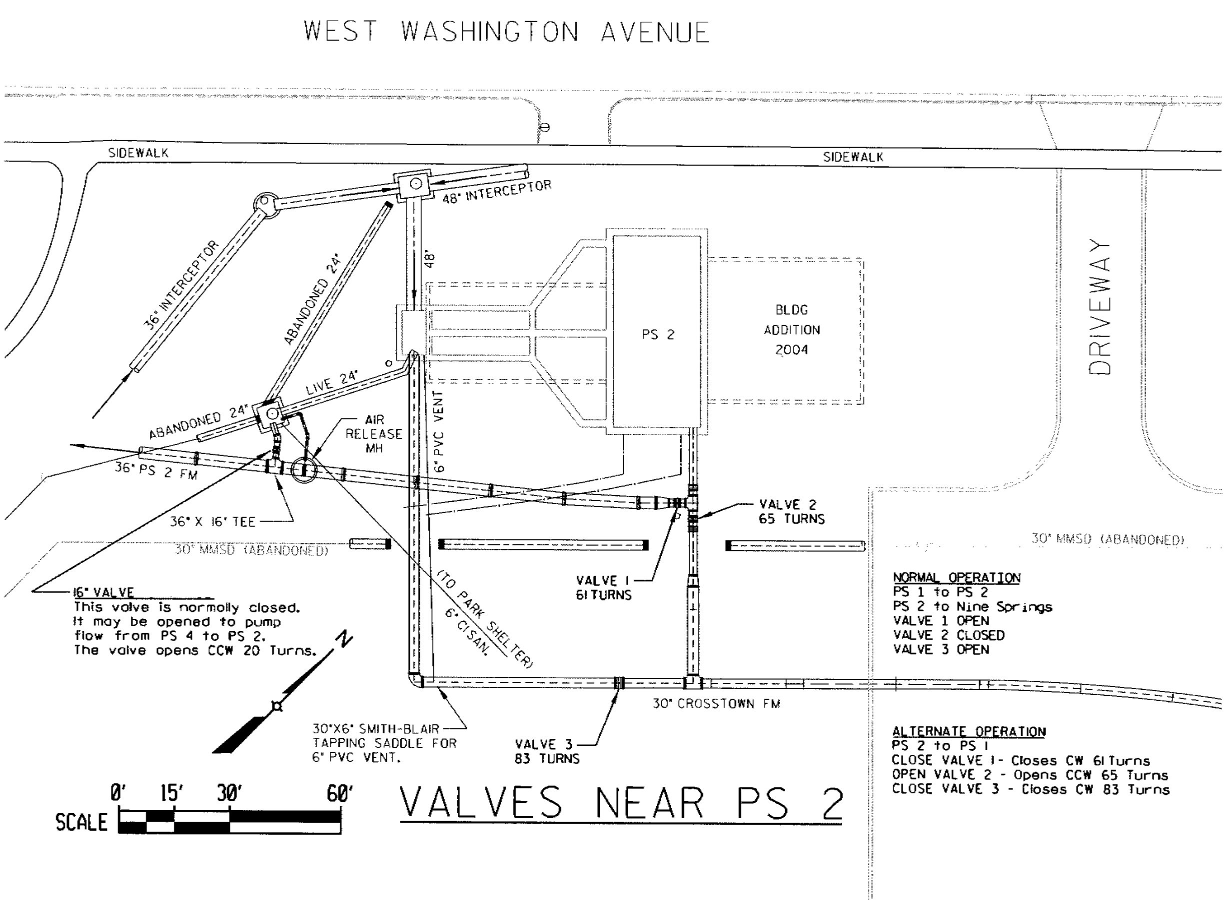
Shutdown and Diversion

If the wet well rises above elevation -3.0 (depth=15.6'), Collection System Services, Ray Schneider, should contact the business at 516 S. Park Street (formerly the Rustic Tavern) and Burnie's On Park, 636 S. Park Street, 608-630-9419 (shop) or 608-695-4538(direct). Both properties have a plug to screw down over the floor drain (confirmed 5/10/10) to prevent basement flooding.

For an emergency shutdown on the PS02 force main, back flow from the plant and flows from PS03 & PS04 may need to be shut down. The plant flow is shut down by closing the gate marked '2' in the Headworks Building. The flows from PS03 and PS04 can be shut off from the inside of the stations or via buried valves near the connection point to the PS02 forcemain. (See GIS mapping or station construction drawings for details.)

The Crosstown Forcemain can be used to pump flow from PS02 to PS01 in an emergency. Valving behind PS02 and inside PS01 would need to be modified for this to occur (see PS02 valve drawing on previous page).

Valving behind PS04 allows the PS02 force main to be isolated on either side of where the PS04 force main connects to the PS02 force main. If an emergency shutdown is required between PS02 and PS04, a valve in the 36" PS02 force main behind PS04 (see the PS04 tie in drawing below) can be closed to allow



PS04 (and PS03) to continue to pump to NSWTP. Conversely, if an emergency shutdown is required between PS04 and the NSWTP, a second valve in the 36" PS02 force main behind PS04 can be closed to allow PS04 to pump backwards to PS02. Valving behind PS02 (16" valve on “Valves Near PS 2” drawing) would need to be modified in this scenario and hauling would be required from PS03.

Access to the valves on the PS02 force main, behind PS04, is through the parking lot of by Holiday Inn Express Hotel. Parked cars may prohibit the valve turning truck from accessing the valves. The hotel will restrict parking, as needed, upon notice from MMSD staff. Call the Hotel Front Desk at 608-709-5050.

Repairs

The District stocks pipe sections and repair clamps for this 36-inch line. If additional pipe is required, call Milwaukee Water Utility at (414) 286-2824 or First Supply at (608) 222-7799 or Core & Main at (608) 834-1311.

Pumping Station No. 3 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 3 force main was replaced along with the PS02 force main in 2001. The force main is an 8" ductile iron pipe. This force main carries approximately 0.3 MGD.

Shutdown and Diversion

For any emergency shutdown of the PS03 force main, the buried valve outside the station would need to be closed. There is no overflow for this station, but sewage will flow out of the manhole No. 3-102 at an elevation of approximately +3.0. This Station can be bypassed by pumping flow out of the wet well. Flow can be bypassed by hauling if it is a short-term shutdown or by pumping to the treatment plant Headworks Building for a long-term shutdown. Approximately 1200' of discharge hose would be required for this operation. The hauling would be done by the Metrogro trucks. The average flow would be approximately 3 truckloads per hour.

Repairs

The District has 8" repair clamps in stock for repairing a leak in this line. They are located in the Service Building.

Pumping Station No. 4 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 4 force main was built in 1967 under the mechanical contract for the station construction. This force main is a 16" cast iron line that is approximately 100 feet long. The force main extends from the station wall to where it joins the PS02 force main. Part of the 16" force main was replaced with ductile iron pipe under the PS02 force main replacement project in 2001. There is an isolation valve near this connection point which is shown in GIS and in the previous diagram for the PS02 force main. This force main carries approximately 1.0 MGD.

Shutdown and Diversion

For emergency shutdown of PS04 force main, it is very important to close the isolation valve near the connection to the PS02 force main. There is no overflow or diversion for this pumping station. The only recourse in an emergency would be to attempt to haul the flow via Metrogro trucks or to bypass by pumping some of the flow into Murphy's Creek. The Metrogro trucks would need to haul about 10 loads per hour in order to keep up. **Note: Four Metrogro trucks were able to haul the flow during a break in 1997 for almost 6 hours.**

Repairs

The District has repair clamps in stock for this force main. We would have to call various suppliers if pipe sections were required for the repair. Contact First Supply at (608) 222-7799 or Core & Main at (608) 834-1311 for emergency repair parts. The City of Madison Water Department also stocks repair parts up to 24".

Pumping Station No. 5 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **42/6/2023**

General

Pumping Station No. 5 force main was built in 1959 under the West Interceptor, Division C. This force main consists of 16" and 24" prestressed concrete cylinder pipe made by the G.H.A. Lock Joint Pipe (now Thompson Pressure Pipe) company in South Beloit, Illinois. The average daily flow at this station is 0.65 MGD.

Shutdown and Diversion

The only recourse to prevent bypassing would be hauling the flow via Metrogro tanker trucks. An average of 6 truckloads per hour would be needed. NOTE: As of 2019, the overflow structure at MH05–000 is no longer functional. Flow could back-up in the West Interceptor and be pumped at PS15, but this will likely flood basements.

Repairs

Thompson Pressure Pipe Company stocks repair parts for the PS05 force main. Their phone number is 877-853-0130 or 815-389-4800. They would also send a representative to instruct us on the repair procedures.

Pumping Station No. 6 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 6 force main was built in 1948 under the East Interceptor, Division Q. The average daily flow through this force main is approximately 2.0 MGD (now that flow from PS01 is routinely pumped to PS02 via the Crosstown Forcemain). During nighttime flushing of the PS01 to PS06 force main, a flow of less than 1.0 MGD will be seen for a short period of time amounting to approximately several hundred thousand gallons over the flushing period. The PS06 force main is a 36" reinforced concrete non-cylinder pipe (concrete pipe with two layers of rebar and no metal cylinder or prestressing wires) furnished by Price Brothers Pipe (now Thompson Pressure Pipe) Company.

Critical Levels and High Flow Actions

If well level gets to elev. -5.0 (depth=15.3'), call the City of Madison Sewer Department (266-4430) or 266-4275. Advise the City to pump/vactor out of the John Street sewer to avoid backups in this area. This is done by pumping out one of the manholes located near the intersection of John Street and Walter Street.

Shutdown and Diversion

The first step for emergency shutdown of Station No. 6 force main is to make sure the pumps at PS01 (pumps C & D) are locked out of service (this prevents PS01 flow from reaching PS06.) The City should be notified (266-4430). There is an overflow structure (MH06-102) that allows flow into Starkweather Creek at elevation 1.0. Many basements would flood before this elevation is reached. Stop logs could be removed to lower the overflow elevation if lake levels allow this. Metrogro trucks could be called in to haul the flow for short periods during an emergency.

Repairs

Thompson Pressure Pipe stocks repair parts and will send a pipe specialist to assist with repairs. For a Thompson Pressure Pipe repair specialist or repair parts call the 24-hour emergency phone number 877-853-0130 or 815-389-4800.

For a small leak or puncture, two repair sleeves clamped together can be used. These are currently in stock and located in the Service Building inventory.

Pumping Station No. 7 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 7 has two 36" force mains that converge into a 48" line at the plant. The first force main was built in 1948 when the station was built under the East Interceptor Division Q. The second force main was added in 1963, under Division A of the East Interceptor. The 36" and the 48" force mains, from 1963, are SP-5 prestressed concrete cylinder pipe. The older force main, from 1948, was made by Price Brothers and is reinforced concrete non-cylinder pipe (concrete pipe with two layers of rebar and no metal cylinder or prestressing wires). The 1963 line was made by Lock Joint Pipe Company (both of these pipe companies are now Thompson Pressure Pipe). The average daily flow from this station is approximately 5-15 MGD, depending on how much flow from the Northeast Interceptor is pumped by PS18 (this also assumes pumping from PS01 to PS02).

Critical Levels and High Flow Actions

If the well level gets to -2.5 (depth=19.3'), call the City of Monona dispatcher at 222-0463. Tell the dispatcher that there is potential for flooding in the Monona Sewer System. The dispatcher will contact the Monona Public Works Department, who should notify nearby residences.

Shutdown and Diversion

If an emergency shutdown of PS07 is required, the pumps at PS07 can be locked out and any incoming flow can be backed up and reversed (i.e., flow backwards) in the Southeast Interceptor to PS18. This can be done for an extended time (I.e., days) during normal flows. Well levels would need to be watched closely depending on the amount of flow going to PS07 in a high-flow event. Stations 10, 13, and 14, normally flow to PS18 so the operation of PS18 should be verified before shutting down PS10, PS13, or PS14. The other stations that could be shut down (that contribute flow to PS07 area) would be Stations 6 & 9. There is an overflow located just behind the station that would overflow if the elevation reached ~2.0. The overflow flows into the Yahara River during an extreme emergency. Many basements would be flooded before reaching the overflow elevation.

The two force mains could be isolated if necessary. If either of the force mains would rupture, the appropriate isolation valves at PS07 (both were automated/powered during the PS7 Improvements project in 2020) and at the plant grounds (where the two forcemains combine to one near Shop 1), would need to be closed (see GIS mapping). One force main could handle approximately 21 MGD of flow during the repair operation. Concern of over-pressurizing the force main would have to be addressed if dual pumping was necessary while operating with one force main.

A part of both force mains cross under the First Supply Building as shown in the GIS system. A third line was installed under the building to be used as a replacement section if either of the force mains develops a leak under the building. Details of this replacement section are noted in the files.

Repairs

Thompson Pressure Pipe stocks repair parts and will send a pipe specialist to assist with repairs. For a Thompson Pressure Pipe repair parts or to contact a repair specialist call the 24-hour emergency phone number 877-853-0130 or 815-389-4800.

For a small leak or puncture, two repair sleeves clamped together can be used. These are in stock currently and located in the Service Building inventory.

Pumping Station No. 8 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 8 force main was built in 1964 under Division E of the West Interceptor Randall Relief. This force main consists of 36" and 42" SP-5 prestressed concrete cylinder pipe made by the GHA Lock Joint Pipe (now Thompson Pressure Pipe) Company. The average daily flow to this station is approximately 6.5 MGD.

Shutdown and Diversion

If any rupture of the PS08 force main occurs, the force main must be isolated from the plant. This is accomplished by closing the gate marked ‘8’ in the Headworks Building to prevent the plant flow from backing up into the force main. There is an emergency overflow manhole (MH08-100) that discharges into Wingra Creek near the station. The overflow elevation is 3.7. Station flow can back-up to PS02 via the SWI on Haywood Dr. This begins to occur at elevation -6.0 ft (wetwell depth=14.3 ft) and should stabilize at elevation -4.2 ft (wetwell depth = 16.1 ft) under normal flow conditions.
To reduce the amount of flow coming to PS08 in an emergency event, flow from PS15 can be diverted to PS16. This is accomplished by switching the valves at the PS15 force main located near the intersection of Allen Boulevard and University Avenue.

Repairs

There is only approximately 200 feet of 36" pipe (immediately outside of PS8) and the remainder is 42". Thompson Pressure Pipe is now handling the product that was previously sold by the Lock Joint Company. For a Thompson Pressure Pipe repair parts or to contact a repair specialist call the 24-hour emergency phone number 877-853-0130 or 815-389-4800. This number should be called to locate repair parts needed. They will send a repair specialist to the site, if needed.

Pumping Station No. 9 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 9 force main was built in 1987 under Division J of the Southeast Interceptor. This force main is a 20" ductile iron pipeline. There is also an old 10" force main for this station that is not used routinely. This old force main is cast iron or asbestos cement and it was built in 1961 under Division B of the Southeast Interceptor. PS09 average daily flow is 0.8 MGD.

Shutdown and Diversion

If a problem develops with the new 20" ductile iron force main, the old force main could be used to handle the flow until the necessary repairs were made. To accomplish this, buried valving immediately outside the station must be reversed. There is also an overflow manhole (MH09-108) near Yahara Drive in the event bypassing is needed.

The overflow manhole is connected to the Yahara River where it discharges from Lake Waubesa. It has two uncovered 24" circular openings in an intermediate level. One opening is to the sanitary sewer and the other is to the overflow chamber. The floor elevation of the intermediate level is +2.67.

The sanitary sewer and the overflow chamber are separated by a concrete wall below the intermediate level. The sanitary side is coated with epoxy. The overflow side is not. The overflow chamber is connected to the Yahara River by at 24" CMP at centerline elevation -4.50. There is a slide gate inside the overflow chamber at the end of the 24" CMP. Typically, the slide gate is open. It is not known if the slide gate can be closed or if it would seal.

There are two openings in the vertical wall separating the sanitary and overflow sides of MH09-108. One opening is a 4" cast iron pipe at centerline elevation -6.00. There is a 4" gate valve on the overflow side that can be opened to allow flow from one side to the other. Opening the 4" gate valve will typically result in the Yahara River flowing through the 4" pipe into the sanitary side of the manhole. The other opening is a 4'tall by 18" wide rectangular opening in the concrete wall. This opening is partially blocked with a metal (aluminum?) plate. The plate blocks the width of the opening from the bottom of the opening to approximately 6" below the top of the opening. The approximate elevation at the top of the metal plate is +1.5.

To summarize, the most likely overflow danger is the Yahara overflowing into the manhole and not the other way round. The elevations of Lake Waubesa and elevations of pipes and openings in the overflow manhole are as follows:

- 4" CI Pipe Centerline Elevation________________ -6.00
- 24" CMP Overflow Centerline________________ -4.50
- Lake Waubesa Summer Minimum_____________ -1.10
- Bottom of 6" x 18" Opening above Metal Plate____ +1.50
- Floor of Intermediate level___________________ +2.67

Repairs

The District stocks several repair clamps for the 20" pipe. We also have several sections of 20" pipe in the stockyard.

Pumping Station No. 10 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 10 force main was built in 1964 under division B of the Northeast Interceptor. The force main is a 36" prestressed concrete cylinder pipe furnished by Lock Joint (now Thompson Pressure Pipe). The force main consists of SP-5 and SP-12 pipe (see laying schedule in project files). The average daily flow to PS10 is 9.5 MGD.

Note: The last 2,000' of the PS10 forcemain was swagelined (a HDPE pipe was installed inside the existing 36” PCCP pipe) in late 2018. As such, this section of forcemain includes an HDPE liner that is tight-fitted into the existing 36" PCCP forcemain.

Shutdown and Diversion

PS13 & PS14 could be shut down temporarily during emergency situations to limit the flow to PS10. This would shut down over half of the flow to PS10. The first areas upstream of PS10 to be affected by reaching elevations above approximately 2.0 would be along Walsh Road near Sycamore Avenue and near the intersection of Milwaukee Street/Regas Road (Woodman’s MH invert elevation is 3.1). There is no overflow from this station, as the overflow manhole was removed during the NEI-PS 10 to Lien Road project constructed during 2010.

Repairs

Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800 for any repair parts needed. They will send a repair specialist to assist with the repairs if needed.

Pumping Station No. 11 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 11 force main was built in 1965 under Division A of the Nine Springs Valley Interceptor. This force main is a 36" prestressed concrete cylinder pipe manufactured by Lock Joint (now Thompson Pressure Pipe). This force main consists of SP-5 and SP-12 pipe (see laying schedule). This force main has an average daily flow of 9.0 MGD.

Shutdown and Diversion

For any emergency shutdown of the PS11 force main, the flow from the plant must be shut down also. The plant flow can be shut down by closing the gate marked '11' in the Headworks Building to prevent the flow from backing up into the force main. There is an overflow located in the station entrance chamber which can overflow into Nine Springs Creek once the valve opens (invert elevation of approximately 1.0). If the flow gets to the overflow level, the incoming interceptors would be backed up to MH11-130, MH11-211, MH11-306 and MH11-414. PS12 can be shut down temporarily to reduce the flow to PS11 during an emergency situation.

Repairs

Thompson Pressure Pipe should be called at 877-853-0130 or 815-389-4800 for any repairs or assistance needed. They will send a repair specialist to assist with the repairs if needed.

Pumping Station No. 12 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

The upstream portion of the Pumping Station No. 12 force main was built in 1968 under Division F of the Nine Springs Valley Interceptor. This force main is Lock Joint (now Thompson Pressure Pipe) 36" prestressed concrete cylinder pipe. The downstream portion, or approximately the last 2,000' of forcemain, was replaced in 2016/2017. This pipe is 36" C905 PVC. The force main carries approximately 5.0 MGD.

Shutdown and Diversion

If an emergency shutdown of PS12 force main is required, PS16 & PS17 can be shut down. Low flow periods (12a-6a) at PS16 can bypass the station and flow to the Gammon Extension by gravity (the Gammon Extension diversion at PS16 can only handle approximately 1.4 MGD). It takes about 3 hours to see the effects of PS16 diversion at PS12. PS17 can be shutdown for several hours to reduce flows at PS12. It takes approximately 30 minutes for the flow from PS17 to reach PS12. PS15 flow should continue to be directed to PS08 if an emergency shutdown of PS12 is required. Manhole 12-113 was an overflow manhole which had a flap gate invert elevation of 112.5. This flap gate was removed and a blind flange installed in 2004, so there is no overflow for this station. Flooded basements were reported (along Fitchrona Road) in 1999 when wet well levels reached elevation 113. During extremely high flow conditions, overflows could occur at MH12-104, MH12-105, MH12-106 and MH12-110 (rim elevations of 114.75 to 115.5).

Repairs

This force main has recorded no breaks or leaks since it was placed into service. Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800 for any other repair parts needed for the prestressed concrete cylinder pipe portion of the force main. They will send a repair specialist to assist with the repairs if needed. MMSD stocks pipe sections and repair fittings for the PVC portion of the force main.

Pumping Station No. 13 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 13 force main was built in 1969 under Division H of the North East Interceptor. This force main is 36" prestressed concrete cylinder pipe which was furnished by the Lock Joint Pipe Company (now Thompson Pressure Pipe). The average daily flow to this pumping station is 6.0 MGD.

Shutdown and Diversion

If an emergency shutdown of PS13 force main is required, PS14 could also be shut down. There is large storage capacity in the Northeast Interceptor upstream of both PS13 and PS14. These stations can be shut down for several hours during normal flow conditions. If PS13 needs to be taken out of service, PS14 should be shut down approximately 1 hour before that time (the travel time from PS14 to PS13 is approximately 50 minutes during normal flows). This would allow the flow from PS14 to be pumped through the Northeast Interceptor System before PS13 needs to be shut off and would provide additional storage capacity in the lines upstream of PS13. Manhole 13-105 is an overflow manhole with a 24” flap gate invert elevation of 7.0. If the flow reaches this elevation, the flow will be backed up to MH13-137.

Repairs

This force main has been in service since 1969 and there is no record of a line break or leaks. Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800 or any other repair parts needed. They will send a repair specialist to assist with the repairs if needed.

Pumping Station No. 14 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 14 force main was built in 1971 under Division K of the North East Interceptor. This force main is 30" prestressed concrete cylinder pipe furnished by Lock Joint Pipe Company (now Thompson Pressure Pipe) and consists of a variety of PCCP pipe types (SP-5, SP-12,etc). See the force main project folder for detailed information on the pipe The average daily flow to PS14 is 4.0 MGD.

Shutdown and Diversion

If an emergency shutdown of PS14 force main is required, the flow can back up in the gravity lines upstream of the station. These lines have enough storage capacity to allow the flow to back up several hours during normal flow. There is no overflow for this station, but manholes will overflow if the sewer backs up to near elevation 7.5. Flooding of basements could occur at elevation 3.0 in the Wheeler-Northland area.

Diversion pumping to nearby surface waters is in High Flows-General section of this manual. Please refer to that section regarding bypassing pumping from the pump station.

Repairs

This force main has been in service since it was built and has had no recorded breaks or leaks. Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800 for any other repair parts needed. They will send a repair specialist to assist with the repairs if needed.

Pumping Station No. 15 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 15 has a single forcemain that leaves the station and it branches into two force mains that can pump to either PS08 or PS16. The PS15 force main to PS08 was built in 1974 under Division M of the West Interceptor. This force main is ductile iron pipe and it is either 24" or 20" pipe depending on where it is located. This original force main joins the PS05 force main just north of University Ave. near Spring Harbor Dr. A 546' section of the force main just south of PS15 was relocated in 1981 under Division P of the West Interceptor. This relocation was necessary due to Allen Blvd Reconstruction. The second force main from PS15 to PS16 was constructed in 1982 under Division O of the Nine Springs Valley Interceptor (NSVI). This diverts the flow from PS15 to PS16. Diverting flow to either PS 08 or PS 16 is accomplished by changing the buried valve positions located near the intersection of Allen Blvd. and University Ave. The diversion force main to PS16 is a 30" prestressed concrete cylinder pipe furnished by Lock Joint Company (now Thompson Pressure Pipe). The PS15 force main average daily flow is 1.3 MGD, with flow typically directed to PS08.

Shutdown and Diversion

Stoplogs in Manhole 05-102A can be removed in an emergency. Removal of stop logs (or allowing the flow to overflow the stop logs) would direct the flow by gravity (via the West Interceptor) to PS05 instead of PS15. The gravity line to PS05 could be overloaded depending on the flow at the time the diversion occurs. The diversion can handle typical maximum diurnal flows reaching approximately 1.8 MGD, but not any flow greater than this rate. As noted above, flow from PS15 can be pumped to PS16 or to the West Interceptor (and PS08) depending on which valve is open in the valve manhole at University Ave. near Allen Blvd.

Repairs

The District has repair parts in stock for the ductile iron force main sections. If concrete pipe repair sections are required, Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800. They will send a repair specialist to assist with the repairs if needed.

Pumping Station No. 16 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

Pumping Station No. 16 force main was built in 1981 under Division N of the West Interceptor. This force main is a 36" and 30" ductile iron pipe. The average daily flow through this force main is 1.7 MGD without PS15 flow. With PS15 flow, the average daily flow is 3.0 MGD.

Shutdown and Diversion

The flow from PS16 can overflow into the Gammon Extension during emergency conditions. This diverts the flow to PS05. This is possible during low flow periods (12a-6a) at PS16, as the Gammon Extension diversion at PS16 can only handle approximately 1.4 MGD). During high flow events and normal daily diurnal flows above 1.4MGD, this diversion could create capacity problems in the gravity line.

During an emergency shutdown, flow from PS15 should continue to be pumped to PS08 and not to PS16.

Repairs

The District has both repair clamps and pipe sections to repair the PS16 force main.

Pumping Station No. 17 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

The Pumping Station No. 17 force main was built in 1996 under Division D of the Verona Pumping Station Contract. This force main is a 16" and 20" ductile iron pipe rated for 250 PSI working pressure. The average daily flow through this force main is approximately 1.0 MGD, and discharges to the Nine Springs Valley Interceptor (and ultimately to PS12) at MH 12-110. The travel time from the end of the PS17 force main to PS12 is approximately 30 minutes.

Shutdown and Diversion

There is no overflow for this station. During the storms of June 1996, the wet well level reached 937.0 (91.4 City of Madison Data) and no basement flooding occurred. During the August 2018 high flow event, the wetwell reached an elevation of approximately 941.0(95.4 City of Madison datum; depth=28.0') with several basement backups recorded upstream.

Repairs

The District has no repair parts in stock for this force main. We would have to call various suppliers to get the necessary repair parts once the leak was isolated. Contact First Supply at (608) 222-7799 or Core & Main at (608) 834-1311 for emergency repair parts. The City Water Department also stocks repair parts for up to 24" pipe.

Pumping Station No. 18 Force Main Emergency and Repair Information

Update Responsibility: **Erik Rehr**
Last Review Date: **2/6/2023**
Last Revision Date: **2/6/2023**

General

The Pumping Station No. 18 force main was built in 2014 under the PS18 force main construction contract. The force main is 48"prestressed concrete cylinder pipe manufactured by Thompson Pressure Pipe. Flow in this force main varies depending on the pumping arrangement at PS18. It can be anywhere between 0-45 MGD (and a peak flow event), but typically will be between 5-10 MGD. The force main is one of five pipes the discharge at the treatment plant Headworks Building.

Shutdown and Diversion

All flow coming to PS18 can be diverted around the station in an emergency. All flow will then travel to PS07 via the Southeast Interceptor. Diverting all flow to PS07 would allow pumping at PS18 to cease and would allow the force main to be repaired. To prevent backflow from the Headworks building, the gate marked ‘18’ in the Headworks Building would need to be closed.

Repairs

This is a new force main with very limited history. Thompson Pressure Pipe should be contacted at 877-853-0130 or 815-389-4800 in the event of the PS18 force Main emergency or if repair parts are needed. They will send a repair specialist to assist with the repairs if needed.

Loss of Power

Update Responsibility: **Jim Meyer**
Last Review Date: **03/06/23**
Last Revision Date: **03/06/23**

Identify: Which buildings, pump stations, etc. are affected by the power outage and which utility company provides power to those buildings, stations. The attached table summarizes important information about each of the District Owned and/or maintained stations and should be referenced in the event of a power outage or power problem. The estimated maximum outage times assume normal flow conditions. These times must be reduced if high flow conditions exist when the outage occurs.

Notify:

For power loss to pumping stations during normal working hours, contact:

Name	Work Extension #	Cell #
Jim Meyer	316	608-628-4203
Jeff Mike	250	608-469-5872
Erik Rehr	294	608-514-3126
Steve Hering	234	608-358-5297
Jon Martinson	249	608-347-2809
Mark Brunner	240	608-347-8550
John Bembinster	204	608-347-3065

For power loss to the plant during normal working hours, contact:

Name	Work Extension #	Cell #
Jim Meyer	316	608-422-2694
Steve Hering	234	608-358-5297
Alan Grooms	253	608-347-2887
Ryszard Zolnik	270	608-332-5879
Aaron Dose	239	608-698-4464
Matt Seib	209	608-347-2864
Carly Amstadt	226	608-335-8624

During off-hours, call the power company directly at the numbers shown below.

Station addresses, utility account numbers and circuit IDs are listed on the following pages of the Emergency Response Manual.

MGE 608-252-7111 (1st number to call) or 1-800-245-1123

- You will be asked to provide
  - Company's name
  - Address of building affected
  - Your name
  - Phone number where you can be reached
- This is MGE's primary emergency phone number which ensures your outage is entered in the master restoration system.

MGE 608-252-1550 (Key Customer Outage Line)

- You will be asked to provide
  - Company's name
  - Address of building affected
  - Your name
  - Phone number where you can be reached
- The on-call MGE Marketing Representative will be paged to receive your message.
- The MGE Marketing Representative will contact you with information and updates as they are available.
- If you cannot wait 5 to 10 minutes for a return phone call, you can press "0" at the end of the voice mail message for immediate assistance.

Alliant 800-551-1743 or 800-551-1744 **Primary**

- Upon prompt, dial the 2-digit District Zone: 15
- You will be asked to provide
  - Advise DDC of customer name: Madison Metro Sewerage
  - Address of building affected
  - Your name
  - Phone number where you can be reached

Alliant 800-862-6261 **Secondary**

- Upon prompt, dial the 2-digit District Zone: 15
- You will be asked to provide
  - Advise DDC of customer name: Madison Metro Sewerage
  - Address of building affected
  - Your name
  - Phone number where you can be reached

Evaluate: If pumps, emergency generator, trucks to pump wells, etc. are needed, a list showing the type and location of District owned can be found at **"**Equipment Available For Use In An Emergency Response**" on page 71).** A list showing some useful telephone numbers (e.g. Honey Wagon) is on page 13.

Document: As time allows, document the time that power was lost, calls that were made/received regarding the problem, who was contacted by the District and the time that they were contacted.

Follow-up: After the emergency situation has been resolved, a District Supervisor should develop a brief report documenting all observations made and actions taken in response to the incident.

MGE non-emergency contact
Account Manager – Jesse Shields
JShields@mge.com
Office: 608-252-4712
FAX: 608-252-4734

Alliant Energy non-emergency contacts:
Account Manager – Jason Price
jasonprice@alliantenergy.com
Office (Madison): 608-458-8413
Mobile: 608-201-8513

Key contacts in the Verona office:
Sr. Distribution Engineer – Jerry Batson: 608-845-1130
Sr. Manager Operations – Matt Bartlett: 608-845-1144
Lead Engineering Technician – Nick Niemann: 608-845-1105

Addresses and Power Schedule for District Operated Lift Stations

Update Responsibility:	**Jim Meyer/Mark Brunner**
Last Review Date:	**03/06/23**
Last Revision Date:	**03/06/23**

- **District Control Room:**
  - 608-222-1201, ext. 310
  - Cell phone: 608-225-8470 (operator #1)
  - Cell phone: 608-576-9637 (operator #2)
- **Madison Gas and Electric:**
  - 608-252-7111 or 1-800-245-1123
  - Key Customer line: 608-252-1550
- **Alliant Energy Power Outage**
  - Primary: 1-800-551-1743 or 1-800-551-1744
  - Secondary: 1-800-862-6261

Information from: Current Power Schedule 03-03-2021.xlx
Where Portable Generators Can Be Used.docx

(Informational tables begin on next page)

Location Owner	Address City	Utility Account #	Circuit 1 ID # Circuit 2 ID #	Generator Requirements	Pump Power Requirements	MMSD Generator for Pump	Normal Outage High Flow Outage	TLM Cont
Nine Springs Plant MMSD	1610 Moorland Rd	MG&E 11224672	NSP 1310 NSP 1313				30 Minutes 30 Minutes	N/A
Pumping Station 01 MMSD	104 N. First St	MG&E 11213857	BLD 1315 RKN 1335	460 V 3 Phase	PA - 600HP - 744FLA PB - 600HP - 744FLA PC - 150HP - 188FLA PD - 150HP - 188FLA	1 1	1 Hour 30 Minutes	T1
Pumping Station 02 MMSD	833 W. Washington Ave	MG&E 11212594	ECA 1309 ECA 1311	460 V 3 Phase	PA - 600HP - 744FLA PB - 600HP - 744FLA PC - 600HP - 744FLA PD - 600HP - 744FLA		1 Hour 30 Minutes	T3
Pumping Station 03 MMSD	1610 Moorland Rd	MG&E 11208998	NSP 1320 None	208 V 3 Phase	PA - 30HP - 80FLA PB - 30HP - 80FLA	1, 2 & 3	3 Hours + 1 Hour	T1
Pumping Station 04 MMSD	522 John Nolen Dr	MG&E 11203098	NSP 1317 NSP 1318	480 V 3 Phase	PA - 40HP - 53FLA PB - 100HP - 127FLA PC - 100HP - 127FLA	1 or 2 1 1	3 Hours 1 Hour	T1
Pumping Station 05 MMSD	5221 Lake Mendota Dr	MG&E 16112120	BLK 1335 BLK 1332	480 V 3 Phase	PA - 50HP - 58.2FLA PB - 50HP - 58.2FLA PC - 50HP - 58.2FLA	1 or 2	2 Hours + 1 Hour	T2
Pumping Station 06 MMSD	402 Walter St	MG&E 10602357	MIL 444 RYS 443	480 V 3 Phase	PA - 125HP - 153FLA PB - 125HP - 153FLA PC - 125HP - 153FLA PD - 125HP - 153FLA	1	1 Hours 30 Minutes	T2
Pumping Station 07 MMSD	6300 Metropolitan Lane Monona	MG&E 11218260	FEM 1304 NSP 1309 3rd: PFL 1306	480 V 3 Phase	PA - 125HP - 160FLA PB - 250HP - 316FLA PC - 350HP - 443FLA PD - 350HP - 446FLA	PS17 Gen PS17 Gen	1 Hours 30 Minutes	T1

Location Owner	Address City	Utility Account #	Circuit 1 ID # Circuit 2 ID #	Generator Requirements	Pump Power Requirements	MMSD Generator for Pump	Normal Outage High Flow Outage	TLM Cont
Pumping Station 08 MMSD	967 Plaenert Dr	MG&E 11208501	WGA 1313 WGA 1312	480 V 3 Phase	PA - 250HP - 361FLA PB - 250HP - 361.1FLA PC - 300HP - 401FLA PD - 300HP - 401FLA		2 Hours 1 Hour	T3
Pumping Station 09 MMSD	4612 Larsen Beach Rd McFarland	Alliant 7496200000	CODN 7253 MCFN 1112	480 V 3 Phase	PA - 40HP - 52FLA PB - 40HP - 58FLA PC - 40HP - 52FLA	1 or 2	2.5 Hours 1 Hour	T1
Pumping Station 10 MMSD	110 Regas Rd	MG&E 11209012	SYC 1310 RKN 1338 3rd: RYS 1312	460 V 3 Phase	PA - 600HP - 744FLA PB - 600HP - 744FLA PC - 600HP - 744FLA		2.5 Hours 1 Hour	T2
Pumping Station 11 MMSD	4760 E. Clayton Rd	MG&E 11225026	SYN 1321 NSP 1320 3rd: NSP 1319	480 V 3 Phase	PA - 250HP - 356FLA PB - 250HP - 356FLA PC - 250HP - 339FLA PD - 250HP - 339FLA		5 Hours 2.5 Hours	T1
Pumping Station 12 MMSD	2745 Fitchrona Rd	MG&E 11226628	OKG 1309 FCH 1315	480 V 3 Phase	PA - 200HP - 353FLA PB - 200HP - 337FLA PC - 200HP - 337FLA PD - 200HP - 337FLA		3 Hours 1 Hour	T3
Pumping Station 13 MMSD	3634 Amelia Earhart Dr	MG&E 11224821	AMN 1313 AMN 1317	480 V 3 Phase	PA - 50HP - 93FLA PB - 50HP - 75FLA PC - 100HP - 175FLA	1 or 2 1 or 2 1	3 Hours 2 Hours	T2
Pumping Station 14 MMSD	5000 School Rd	MG&E 11209574	AMN 1311 HKP 1307	480 V 3 Phase	PA - 60HP - 92FLA PB - 60HP - 98FLA PC - 100HP - 141FLA	1 or 2 1 or 2 1	4 Hours 2 Hours	T2
Pumping Station 15 MMSD	2115 Allen Blvd Middleton	MG&E 11213956	BLK 1332 PHB 1305	480 V 3 Phase	PA - 125HP - 149FLA PB - 125HP - 149FLA PC - 125HP - 149FLA	1 1 1	1 Hours 30 Minutes	T2

Location Owner	Address City	Utility Account #	Circuit 1 ID # Circuit 2 ID #	Generator Requirements	Pump Power Requirements	MMSD Generator for Pump	Normal Outage High Flow Outage	TLM Cont
Pumping Station 16 MMSD	1301 North Gammon Rd Middleton	MG&E 10083723	PHB 1314 PHB 1313	2300 V 3 phase	PA - 500HP - 117FLA PB - 500HP - 117FLA PC - 500HP - 117FLA		4 Hours 2 Hours	T3
Pumping Station 17 MMSD	407 Bruce St Verona	Alliant 4267310000	VER N88 On Site Gen	480 V 3 Phase	PA - 100HP - 112FLA PB - 100HP - 112FLA PC - 110HP - 112FLA	1 or 2	2 Hours 1 Hour	T3
Pumping Station 18 MMSD	1100 E. Broadway Monona	MG&E 26920520	FEM 1304 On Site Gen	480 V 3 Phase	PA - 125HP – 160.7FLA PB - 125HP – 160.7FLA PC - 450HP - 575FLA PD - 450HP - 575FLA PE - 450HP - 575FLA	1 1	2 Hours 1 Hour	T1
Air National Guard City of Madison	3112 Mitchell Street	MG&E ??????	AMN 1313 On Site Gen	208 V 3 Phase	P1 - 3HP – 9.8FLA P2 - 3HP – 9.8FLA	1, 2 & 3	5 Hours 1.5 Hour	T2
American Family City of Madison	4747 Eastpark Blvd	Alliant 5010020000	AMNN8694 None	208 V 3 Phase	P1 - 30HP - 78FLA P2 - 30HP - 78FLA	1, 2 & 3	1.5 Hours 30 Minutes	T2
Arbor Hills City of Madison	2714 W. Beltline Hwy	MG&E 11195286	WGA 1315 None	208 V 3 Phase	P1 - 30HP - 78FLA P2 - 30HP - 78FLA	1, 2 & 3	1.5 Hours 30 Minutes	T1
Atlas City of Madison	702 Atlas Ave	MG&E 11194990	RYS 1310 None	208 V 3 Phase	P1 - 5HP – 13.4FLA P2 - 5HP – 13.4FLA	1, 2 & 3	3.5 Hours 1 Hour	T2
Badfish Creek Outfall MMSD	4520 County Road B Oregon, WI 53575	Alliant 1434150000	934092	230 V 1 Phase	N/A	1, 2 & 3	N/A	N/A
Badger Town of Madison	2200 Badger La	MG&E 10899540	NSP 1319 None	240 V 3 Phase	P1 - 7.5HP – 22.6FLA P2 - 7.5HP – 22.6FLA	1, 2 & 3	3.5 Hours 1 Hour	T1
Baywood Maple Bluff	20 Bayside Dr	MG&E 10165843	BLD 1304 None	240 V 3 Phase	P1 - 5HP - 21.6FLA P2 - 5HP - 21.6FLA	1, 2 & 3	4.5 Hours 2 Hours	T2

Location Owner	**Address City**	**Utility Account #**	**Circuit 1 ID # Circuit 2 ID #**	**Generator Requirements**	**Pump Power Requirements**	**MMSD Generator for Pump**	**Normal Outage High Flow Outage**	**TLM Cont**
Bible Camp Dunn S.D. #3	2874 Bible Camp Rd McFarland	Alliant 6254900000	CODN 7253 On Site Gen	208 V 3 Phase	P1 - 15HP - 40.0FLA P2 - 15HP - 40.0FLA	1, 2 & 3	2.5 Hours 1 Hour	T1
Boathouse Maple Bluff	1321 Farwell Dr Maple Bluff Park	MG&E 10282267	HKP 1308 None	240 V 3 Phase	P1 - 11.25HP - 28FLA P2 - 11.25HP - 28FLA	1, 2 & 3	3.5 Hours 2 Hours	T2
Carroll City of Madison	621 North Carroll St	MG&E 11196581	NWF 24 On Site Gen	208 V 3 Phase	P1 - 15HP - 41FLA P2 - 15HP - 41FLA	1, 2 & 3	1 Hour 30 Minutes	T2
Cherokee No. 1 City of Madison	5119 Commanche Way	MG&E 11198124	AMN 1311 On Site Gen	208 V 3 Phase	P1 - 10HP – 28.6FLA P2 - 10HP – 28.6FLA	1, 2 & 3	3.5 Hours 1 Hour	T2
Cherokee No. 2 City of Madison	1550 Commanche Glen	MG&E 11198132	AMN 1311 None	208 V 3 Phase	P1 - 7.5HP - 21.2FLA P2 - 7.5HP - 21.2FLA	1, 2 & 3	3.5 Hours 1 Hour	T2
Commodore City of Madison	3100 Lake Mendota Dr	MG&E 11221462	SHW 434 None	208 V 3 Phase	P1 - 10HP - 27FLA P2 - 10HP - 27FLA	1, 2 & 3	2 Hours 30 Minutes	T2
Debs City of Madison	407 Debs Rd	MG&E 12125605	HKP 1307 On Site Gen	230 V 1 Phase	P1 - 3HP - 17FLA P2 - 3HP - 17FLA	1, 2 & 3	5.5 Hours 2 Hour	T2
Diemer City of Madison	5002 Lake Mendota Dr	MG&E 11202991	BLK 432 None	240 V 3 Phase	C1 - 3HP - 9.4FLA	1, 2 & 3 NO GEN PLUG	5.5 Hours 2 Hours	T2
Dunn No. 1 Dunn S.D. #1	2816 Waubesa Ave	MG&E 16557225	NSP 1320 None	240 V 3 Phase	P1 - 2HP - 8.4FLA P2 - 2HP - 8.4FLA	1, 2 & 3	2.5 Hours 1 Hour	T1
Dunn No. 2 Dunn S.D. #1	2917 Waubesa Ave	MG&E 10834125	NSP 1320 None	208 V 3 Phase	P1 - 10HP - 28FLA P2 - 10HP - 28FLA	1, 2 & 3	2.5 Hours 1 Hour	T3
Dunn No. 3 Dunn S.D. #1	3060 Waucheeta Tr	MG&E 10835387	NSP 1319 None	208 V 3 Phase	P1 - 5HP - 17.4FLA P2 - 5HP - 17.4FLA	1, 2 & 3	2.5 Hours 1 Hour	T1

Location Owner	Address City	Utility Account #	Circuit 1 ID # Circuit 2 ID #	Generator Requirements	Pump Power Requirements	MMSD Generator for Pump	Normal Outage High Flow Outage	TLM Cont
Dunn No. 4 Dunn S.D. #1	3159 Waucheeta Tr	MG&E 10835379	NSP 1319 None	208 V 3 Phase	P1 - 15HP – 38.8FLA P2 - 15HP – 38.8FLA	1, 2 & 3	2 Hours 1 Hour	T1
Epic City of Verona	1486 Country View Rd	Alliant 4900500000	VER N88 None	480 V 3 Phase	P1 - 30HP – 35.5FLA P2 - 30HP – 35.5FLA	Verona first call 1, 2 & 3	3.5 Hours 2 Hours	T3
Fayette City of Madison	5201 Fayette Ave	MG&E 11199874	NSP 1311 On Site Gen	208 V 3 Phase	P1 - 5HP - 16FLA P2 - 5HP - 16FLA	1, 2 & 3	4 Hours 2 Hours	T1
Fremont City of Madison	2405 Fremont Ave	MG&E 11200417	RKN 1336 On Site Gen	240 V 3 Phase	P1 - 40HP - 94FLA P2 - 40HP - 94FLA	1 or 2	1.5 Hours 30 Minutes	T2
Gettle City of Madison	5414 Gettle Ave	MG&E 11200466	BLK 1331 BLK 1336	480 V, 3 Phase	P1 - 30HP - 42FLA P2 - 30HP - 42FLA P3 - 30HP - 42FLA	1 or 2	1 Hour 30 Minutes	T3
Harper City of Madison	3400 Harper Rd	MG&E 10242857	GRE 451 None	208 V 3 Phase	C1 - 5HP - 14.2FLA C2 - 5HP - 14.2FLA	1, 2 & 3	5.75 Hours 2 Hours	T3
Hermina City of Madison	201 Clyde Gallagher St	MG&E 11197803	FAO 443 None	208 V 3 Phase	P1 - 5HP - 14.2FLA P2 - 5HP - 14.2FLA	1, 2 & 3	4.5 Hours 2 Hours	T2
Hoboken City of Madison	1814 Waunona Way	MG&E 11212602	NSP 1311 None	208 V 3 Phase	P1 - 5HP - 16FLA P2 - 5HP - 16FLA	1, 2 & 3	4.5 Hours 2 Hours	T1
James City of Madison	3139 James St	MG&E 11202223	GWY 1312 None	208 V 3 Phase	C1 - 10HP - 29FLA C2 - 10HP - 29FLA	1, 2 & 3	1.5 Hours 30 Minutes	T2
Jonas Maple Bluff	1010 Bay Ave	MG&E 10514792	RKN 1337 None	208 V 3 Phase	P1 - 10HP – 32.1FLA P2 - 10HP – 32.1FLA	1, 2 & 3	3.5 hours 2 Hours	T2
Jordan Dunn S.D. #3	4370 Jordan Dr McFarland	Alliant 6437510000	CODN7254 On Site Gen 50kW	208 V 3 Phase	P1 - 5HP – 13.4FLA P2 - 5HP – 13.4FLA	1, 2 & 3 NO GEN PLUG	2.5 Hours 1.5 Hours	T1
Lake Farm Park Dane County Parks	3113 Lake Farm Rd	MG&E 18709618	NSP 1319 None	208 V 3 Phase	P1 - 5HP - 16.5FLA P2 - 5HP - 16.5FLA	1, 2 & 3 NO GEN PLUG	4.5 Hours 3 Hours	T1

Location Owner	Address City	Utility Account #	Circuit 1 ID # Circuit 2 ID #	Generator Requirements	Pump Power Requirements	MMSD Generator for Pump	Normal Outage High Flow Outage	TLM Cont
Lake Forest Town of Madison	2021 Dickson Place	MG&E 10800316	WGA 1316 None	240 V 3 Phase	P1 - 5HP - 15.8FLA P2 - 5HP - 15.8FLA	1, 2 & 3	2 Hours 1 Hour	T3
Lois Lowry City of Madison	7838 Lois Lowry Lane	Alliant 6185630000	WTN N7156 None	230 V 1 Phase	P1 - 7.5HP - 30FLA P2 - 7.5HP - 30FLA	1, 2 & 3	2.5 Hours 1 Hour	T3
Lost Pine Trail City of Madison	9432 Lost Pine Trail	Alliant 4009510000	PLVN 8067 None	208 V 3 Phase	P1 - 7.5HP - ???FLA P2 - 7.5HP - ???FLA	1, 2 & 3	4 Hours 3 Hours	T3
Maple Dunn S.D. #3	2684 Maple Dr McFarland	Alliant 6178030000	CODN7254 On Site Gen 60 kW	208 V 3 Phase	P1 - 15HP - 39.0FLA P2 - 15HP - 39.0FLA	1, 2 & 3	2.5 Hours 1 Hour	T1
Mayflower Town of Madison	2318 South Park St	MG&E 10381499	WGA 1317 None	208 V 3 Phase	P1 - 10HP - 25.2FLA P2 - 10HP - 25.2FLA	1, 2 & 3	3.5 Hours 1 Hour	T1
Midtown Road City of Madison	10150 Midtown Rd	Alliant 9567630000	CCSN5961 None	480 V 3 Phase	P1 - 60HP - 71.5FLA P2 - 60HP - 71.5FLA	1 or 2	2.5 Hours 1.5 Hours	T3
Nelson Road City of Madison	5950 Nelson Rd	Alliant 2563200000	BKEN7214 None	208 V 3 Phase	P1 - 20HP - ???FLA P2 - 30HP - 80FLA	1 or 2	2.5 Hours 1 Hour	T2
Redan Drive City of Madison	602 Redan Dr	Alliant 4370617965	PLVN 8067 None	208 V 3 Phase	P1 – 4HP – 11 FLA P2 – 4HP – 11 FLA	1, 2 & 3	3.5 Hours 2 Hours	T3
Regent City of Madison	3933 Regent St	MG&E 11209061	WLT 1315 None	240 V 1 Phase	C1 - 1/2HP - ??? C2 - 1/2HP - ???	1, 2 & 3 NO GEN PLUG	6 Hours 3 Hours	None
Scenic Ridge City of Verona	1324 Locust Dr	Alliant 6696300000	VERN88 None	240/120 V 1 Phase	P1 – 7.5HP – 37FLA P2 – 7.5HP – 37FLA	1, 2 & 3	3 Hours 1.5 Hours	T3
South Point City of Madison	452 South Point Rd	Alliant 1744740000	PLVN 8067 None	480 V 3 Phase	P1 - 40HP - ???FLA P2 - 40HP - ???FLA	1 or 2	6 Hours 3 Hours	T3
Thurber City of Madison	3325 Thurber Avenue	MG&E 28704252	FAO 443 None					T3
Truax Lift City of Madison	2701 Anderson St	MG&E 11194545	SYC 1314 None	208 V 3 Phase	P1 - 20HP - 61FLA P2 - 20HP - 61FLA	1, 2 & 3	2.5 Hours 1 Hour	T2

Location **Owner**	**Address** **City**	**Utility** **Account #**	**Circuit 1 ID #** **Circuit 2 ID #**	**Generator** **Requirements**	**Pump Power** **Requirements**	**MMSD Generator for Pump**	**Normal Outage** **High Flow Outage**	**TLM Cont**
Veith City of Madison	4101 Veith Ave	MG&E 15555246	HKP 1308 None	208 V 3 Phase	P1 - 30HP - 78FLA P2 - 30HP - 78FLA	1, 2 & 3	1 Hour 30 Minutes	T2
Waunona City of Madison	3061 Waunona Way	MG&E 11212610	NSP 1317 None	208 V 3 Phase	P1 - 7.5HP – 20.6FLA P2 - 7.5HP – 22.2FLA	1, 2 & 3	4.5 Hours 2 Hours	T1
Westport City of Madsion	42 Knutson Dr	MG&E 11202876	HKP 1308 None	208 V 3 Phase	P1 - 15HP - 45FLA P2 - 15HP - 45FLA	1, 2 & 3	5.5 Hours 1 Hour	T2
Woodley City of Madison	2712 Waunona Way	MG&E 10774719	NSP 1317 On Site Gen	208 V 3 Phase	P1 - 15HP - 40FLA P2 - 15HP - 42FLA	1, 2 & 3	5.5 Hours 30 Minutes if Waunona is on	T1
Wright Street City of Madison	2722 Wright St	MG&E 15319627	AMN 1313 None	208 V 3 Phase	P1 - 2HP - 8FLA P2 - 2HP - 8FLA	1, 2 & 3	6 Hours 3 Hours	T2

Addresses and Natural Gas Service for District-Operated Lift Stations

Update Responsibility: **Jim Meyer/Jeff Mike**
Last Review Date: **03/06/2023**
Last Revision Date: **03/06/2023**

- **District Control Room:**
  - 608-222-1201, ext. 310
  - Cell phone: 608-225-8470
- **Madison Gas and Electric**
  - Natural gas leak 608-252-1111
  - Electrical 608-252-7111 or 1-800-245-1123
  - Key customer line: 608-252-1550
- **Alliant Energy Power Outage**
  - Primary: 1-800-551-1743 or 1-800-551-1744
  - Secondary: 1-800-862-6261

Location **Owner**	**Address** **City**	**Utility** **Account #**	**Equipment Fed**
Nine Springs Plant MMSD	1610 Moorland Rd	MG&E 11224672	
Pumping Station 01 MMSD	104 N. First St	MG&E 11213857	Unit heaters
Pumping Station 02 MMSD	833 W. Washington Ave	MG&E 11212594	Unit heaters
Pumping Station 05 MMSD	5221 Lake Mendota Dr	MG&E 16112120	Air Handling Unit
Pumping Station 06 MMSD	402 Walter St	MG&E 10602357	Unit heaters
Pumping Station 07 MMSD	6300 Metropolitan Lane Monona	MG&E 11218260	No Natural Gas in the station. Natural Gas line was disconnected outside the station. 02//23/2023
Pumping Station 08 MMSD	967 Plaenert Dr	MG&E 11208501	Unit heaters
Pumping Station 09 MMSD	4612 Larsen Beach Rd McFarland	Alliant 7496200000	Air Handling Unit
Pumping Station 10 MMSD	110 Regas Rd	MG&E 11209012	Unit heaters
Pumping Station 11 MMSD	4760 E. Clayton Rd	MG&E 11225026	Unit heaters
Pumping Station 12 MMSD	2745 Fitchrona Rd	MG&E 11226628	Unit heaters

Pumping Station 15 MMSD	2115 Allen Blvd Middleton	MG&E 11213956	Unit heaters
Pumping Station 17 MMSD	407 Bruce St Verona	Alliant 4267310000	Air Handling Unit
Pumping Station 18 MMSD	1100 E. Broadway Monona	MG&E 2692052	Unit heaters
Bible Camp Dunn S.D. #3	2874 Bible Camp Rd McFarland	Alliant 6254900000	Generator
Carroll City of Madison	621 North Carroll St	MG&E 29649993	Generator
Cherokee No. 1 City of Madison	5119 Commanche Way	MG&E 11198124	Generator
Debs City of Madison	407 Debs Rd	MG&E 30125819	Generator
Fremont City of Madison	2405 Fremont Ave	MG&E 11200417	Generator
Gettle City of Madison	5414 Gettle Ave	MG&E 11200466	Air Handling Unit
James Street City of Madison	3139 James Street	MG&E 30012496	Generator
Jordan Dunn S.D. #3	4370 Jordan Dr McFarland	Alliant 6437510000	Generator
Maple Dunn S.D. #3	2684 Maple Dr McFarland	Alliant 6178030000	Generator
Thurber City of Madison	3325 Thurber Avenue	MG&E Gas service to be installed in 2023	Generator to be installed 2023
Woodley City of Madison	2712 Waunona Way	MG&E 28438588	Generator

District-Owned Mobile Large Generator Equipment

Update Responsibility: Jim Meyer
Last Review Date: 02/23/23
Last Revision Date: 02/23/23

<table>
<tr>
<td>

MMSD Generator #1

- Located in Metrogro Pumping Station
- 105 kw
- 480 breaker size = 250 amp
- 208 breaker size = 400 amp
- 2 receptacles 50 amp 250V single phase
- 2 receptacles 20 amp 120/208 3 phase
- 2 receptacles 20 amp 120 single phase
- Gross vehicle weight = 9500 lbs
- Fuel Tank = 220 gallons, ~24 hours at full load
- Asset ID = E MEQ0032 MPS : V477-06, Caterpillar portable generator #1 , 105 kw, GVW 9,500 lbs.
- SN 16MPF1128YD

</td>
<td>

MMSD Generator #2

- Located in basement of Service Building, south door
- 75 kw
- 480 breaker size = 125 amp
- 208 breaker size = 400 amp
- 2 receptacles 50 amp 250V single phase
- 2 receptacles 20 amp 120/208 3 phase
- 2 receptacles 20 amp 120 single phase
- Gross vehicle weight = 8300 lbs
- Fuel Tank = 130 gallons, ~24 hours at full load
- Asset ID = E MEQ0015 SVC : V477-05, Caterpillar portable generator #2, 75 kw, GVW 8,300 lbs. Service Bld. Door 33-11

</td>
</tr>
<tr>
<td>

MMSD Generator #3

- Located in basement of Service Building, north door
- 30 kw
- 480 breaker size = 50 amp
- 208 breaker size = 125 amp
- 2 receptacles 50 amp 250V single phase
- 2 receptacles 20 amp 120/208 3 phase
- 2 receptacles 20 amp 120 single phase
- Gross vehicle weight = 5600 lbs
- Fuel Tank = 75 gallons, ~24 hours at full load
- Asset ID = E MEQ0057 ST1: V477-07 Caterpillar portable generator #3, 30 kw, 2001 model, purchased Oct. 2006 Model XQ30P2, SN. GABL000896, GVWR 5600 Service Bld. Door 33-10

</td>
<td>

PS17 Generator

- Located at PS17 in the generator building.
- 300 kw
- 480 breaker size = 200 amp
- 480 breaker size = 200 amp
- 2 receptacles 20 amp 120 single phase
- Gross vehicle weight = 12000 lbs
- Fuel Tank = 170 gallons, ~8 hours at full load
- Asset ID = E GEN1700 PS17: Standby Electrical Generator Unit diesel, SN A96059708, Pump Station 17 Onan Model = 300DFBC

</td>
</tr>
</table>

Generator Plugs

Appleton ARC20044CD 200 Amp Connector Body, 200 Amp, Pin & Sleeve Connector Body, 4-Pole, 4-Wire, 250V DC, 600V AC. Cable Size: 0.875" - 1.906". NEMA 4X.

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

Approximate Fuel Consumption Chart

Update Responsibility: **Jim Meyer**
Last Review Date: **02/23/23**
Last Revision Date: **09/14/18**

Found at: http://www.dieselserviceandsupply.com/temp/Fuel_Consumption_Chart.pdf with annotations.

Diesel SERVICE & SUPPLY
INDUSTRIAL DIESEL ENGINES & POWER GENERATORS FOR OVER 30 YEARS

Approximate Fuel Consumption Chart

This chart approximates the fuel consumption of a diesel generator based on the size of the generator and the load at which the generator is operating at. Please note that this table is intended to be used as an estimate of how much fuel a generator uses during operation and is not an exact representation due to various factors that can increase or decrease the amount of fuel consumed.

	Generator Size (kW)	1/4 Load (gal/hr)	1/2 Load (gal/hr)	3/4 Load (gal/hr)	Full Load (gal/hr)	Tank Size
	20	0.6	0.9	1.3	1.6	
Generator #3	30	1.3	1.8	2.4	2.9	75 gal
	40	1.6	2.3	3.2	4	
	60	1.8	2.9	3.8	4.8	
Generator #2	75	2.4	3.4	4.6	6.1	130 gal
Generator #1	100 105	2.6	4.1	5.8	7.4	220 gal
	125	3.1	5	7.1	9.1	
	135	3.3	5.4	7.6	9.8	
	150	3.6	5.9	8.4	10.9	
	175	4.1	6.8	9.7	12.7	
	200	4.7	7.7	11	14.4	
	230	5.3	8.8	12.5	16.6	
	250	5.7	9.5	13.6	18	
PS17 Generator	300	6.8	11.3	16.1	21.5	170 gal
	350	7.9	13.1	18.7	25.1	
	400	8.9	14.9	21.3	28.6	
	500	11	18.5	26.4	35.7	
	600	13.2	22	31.5	42.8	
	750	16.3	27.4	39.3	53.4	
	1000	21.6	36.4	52.1	71.1	
	1250	26.9	45.3	65	88.8	
	1500	32.2	54.3	77.8	106.5	
	1750	37.5	63.2	90.7	124.2	
	2000	42.8	72.2	103.5	141.9	
	2250	48.1	81.1	116.4	159.6	

www.dieselserviceandsupply.com

A DIVISION OF GENERATOR SOURCE

Diesel Service & Supply | 625 Baseline Road, Brighton, Colorado 80603
SALES@DIESELSERVICEANDSUPPLY.COM | WWW.DIESELSERVICEANDSUPPLY.COM
Toll-Free: 800-853-2073 | Main Office: 303-659-2073 | Fax: 720-685-7920

District and Non-District Stations Station Flows

Update Responsibility: **Erik Rehr**
Last Review Date: **2/8/2023**
Last Revision Date: **2/8/2023**

(Graphic form of this data on next page.)

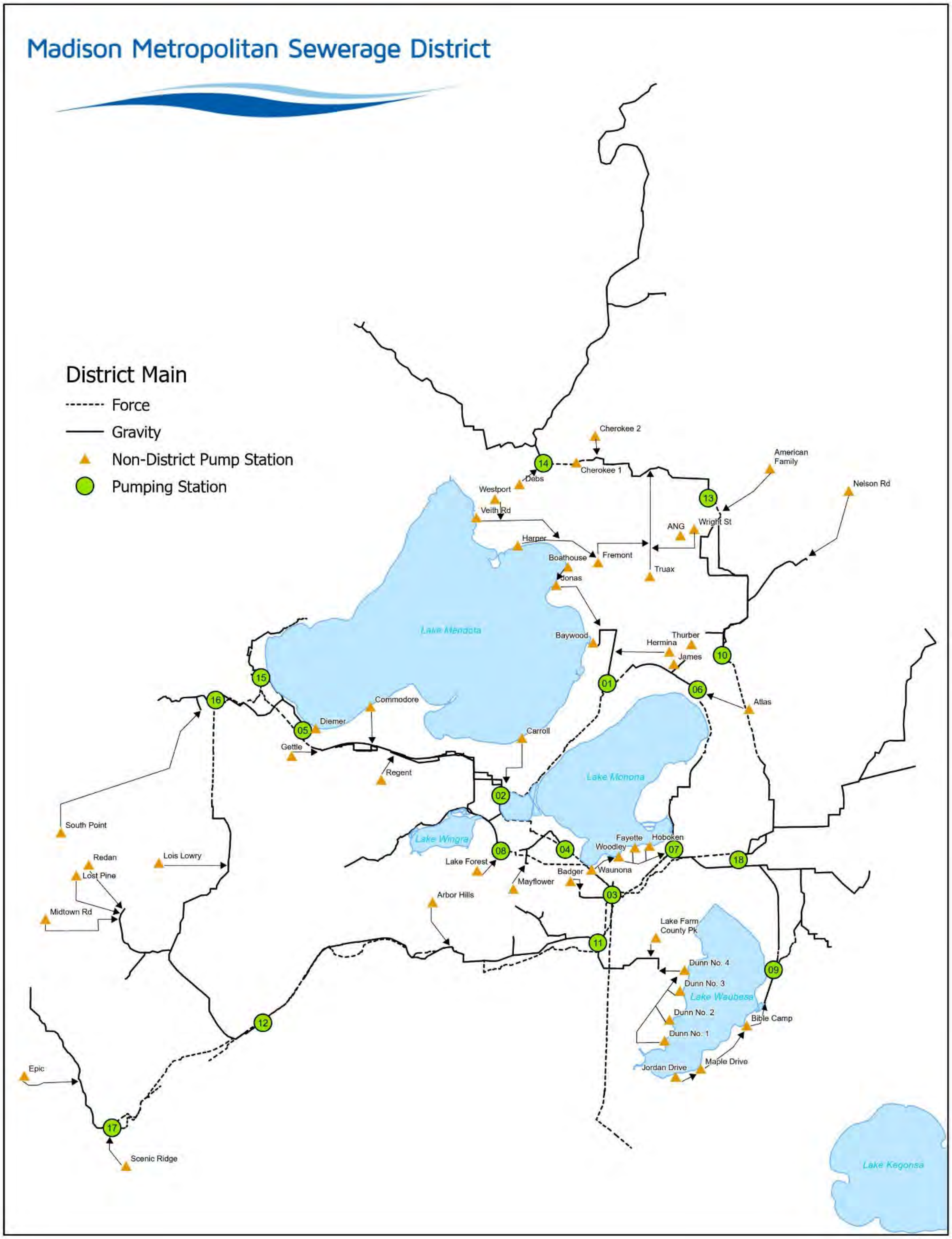
District Station	Non-District Stations Pumping to this District Station	District Stations pumping to this District Station
1	Baywood Boathouse to Jonas Jonas Hermina	
2	Carroll (If PS8 is out of service, all non-district stations that flow to PS8 will flow to PS2)	Pump Station 1 (If PS8 is out of service, all district stations that flow to PS8 will flow to PS2)
3	Badger	
4	Mayflower	
5	Diemer	Pump Station 16 flow will divert to PS5 when PS16 is out of service
6	Atlas James Street Thurber	Pump Station 1 C and D pumps
7	Waunona to Woodley Woodley Fayette Hoboken (If PS18 is out of service, all non-district stations that flow to PS18 will flow to PS7)	Pump Station 6 Pump Station 9 (If PS18 is out of service, all district stations that flow to PS18 will flow to PS7)
8	Commodore Lake Forest Regent Gettle (If PS2 is out of service, all non-district stations that flow to PS2 will flow to PS8)	Pump Station 5 Pump Station 15 (If PS2 is out of service, all district stations that flow to PS2 will flow to PS8)
9	Jordan to Maple Maple to Bible Camp Bible Camp	
10	Nelson Road American Family	Pump Station 13

District Station	Non-District Stations Pumping to this District Station	District Stations pumping to this District Station
11	Arbor Hills Dunn 1 to Dunn 2 Dunn 2 to Dunn 3 Dunn 3 to Dunn 4 Dunn 4 Lake Farm	Pump Station 12
12	Lois Lowry Lane Lost Pine Midtown Redan	Pump Station 16 Pump Station 17
13	Cherokee 2 Fremont Harper Truax Air National Guard Veith Westport Wright	Pump Station 14
14	Cherokee 1 Debs	
15	None	
16	South Point	Pump Station 15 when diverted
17	Epic Scenic Ridge	
18	(If PS7 is out of service, all non-district stations that flow to PS7 will flow to PS18)	Pump Station 10 (If PS7 is out of service, all district stations that flow to PS7 will flow to PS18)

*** A representation of this information is available on the Process SCADA system display by clicking the “Stations” button on the toolbar.

Only Non-District stations that are maintained by the District are shown in the tables above.

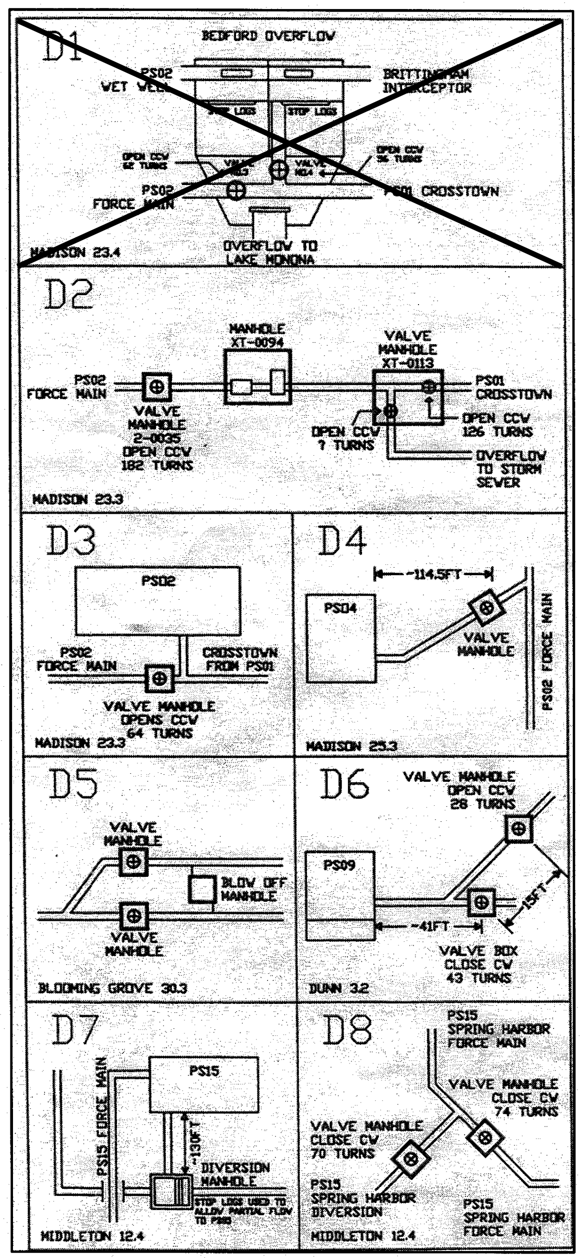
Collection System Layout – Graphic



The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document.

Collection System Layout - Valving

DETATIL DRAWINGS FOR
COLLECTION SYSTEM OVERVIEW



Abandoned September 2018 – filled with concrete. Not functional.

PREPARED BY:
MADISON METROPOLITAN SEWERAGE DISTRICT

COLLECTION SYSTEM LAYOUT
TO AID IN PUMPING FROM STATION TO STATION
WHEN USING GENERATOR

JUNE 09, 1997

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document

Alarms on the Operations Building Annunciator

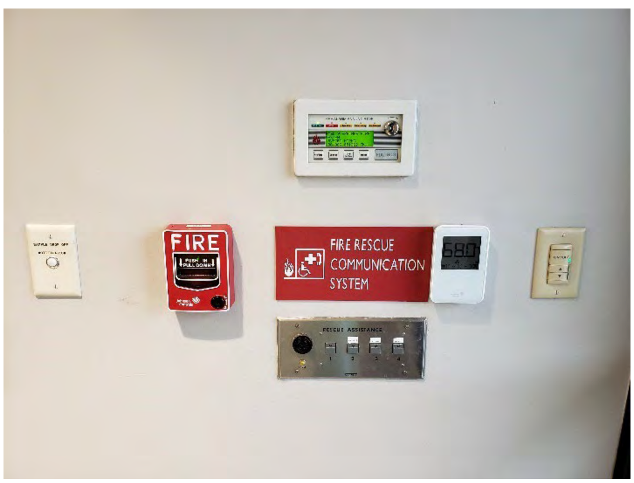
Update Responsibility: Dan Purdy
Last Review Date: 02/25/21
Last Revision Date: 09/14/18

All of the alarms will trigger the process control system alarm, "JOHNSON CONTROLS FIRE ALARM SYSTEM COMMON ALARM". This alarm is configured in the Iconics Genesis64 system and will dial the operator on their cell phone when the alarm occurs.

There are 2 Johnson Controls fire alarm annunciator panels in the Operations Building.

Johnson Controls FCPS-24S8 Notifier Panel in 800 Electrical Room

Small Johnson Controls Panel, Operator Entry



Additional information on these two control panels and a full list of all the associated fire alarms system components can be found in the OB Fire Alarm preventive maintenance SOP.

P:\OandM\MAINTENANCE SOPs final\ELECTRICAL SOPS\OB Fire and Smoke Detector PM SOP 2-188.docx

Biosolid Spill

Update Responsibility: **Ross Hollfelder**
Last Review Date: **03/2/23**
Last Revision Date: **03/2/23**

Stop Spill: Close valves, turn off pumps, etc.

Identify: Note the location, extent of spill (less than or more than 50 gallons), and any special conditions that might exist at the spill site such as environmentally sensitive areas (streams, wetlands, lakes, ditches, grassed waterways, or wells). Take photographs for documentation purposes.

Contact: District staff should be notified immediately in the order below; one of these individuals will go to the site immediately and/or direct subsequent response operations

Order	Name	608-222-1201	Cell
1	Zac Thompson	Ext. 256	608-212-0251
2	Ross Hollfelder	Ext. 254	608-209-7725/608-219-5769
3	Chad Liddicoat	Ext. 244	608-609-3534
4	Erik Rehr	Ext. 294	
5	Martin Griffin	Ext. 124	608-469-5227

Control Spill: If the spill is *less than* **50 gallons**, control the spill, contain the spill, and move to **Cleanup Actions.**

If the spill is **50 gallons or more**, control the spill, contain the spill, then Zac Thompson will call the **WI DNR Spill Hotline, 1-800-943-0003** as soon as the situation is under control. Martin Griffin will call the Spill Hotline in Zac Thompson absence. Ashley Brechlin from WI DNR will be notified through the WI DNR Spill Hotline system. On-site cleanup actions should begin as soon as possible when it is safe and reasonable to do so.

Cleanup: Depending on the location and extent of the spill, the District supervisor may request outside assistance to respond. Assistance may be needed from the fire department, police department, Dane County Highway Department, towing companies, etc. The police may be needed for traffic control. The Dane County Highway Department can supply equipment to assist in cleanup. If the spill occurs on a highway, the fire department can hose off the road after cleanup is complete. Useful telephone numbers are provided below:

Name	Telephone #
Police	911
Fire	911

Dane County Highway Dept. (Tim Pelton)	608-266-4014
Liberty Towing Service LLC	608-221-3600
Schmidt's Towing & Recovery	608-257-0505
R G Huston Co Inc	608-255-9223

Take photographs before and after cleanup for documentation purposes

Spills in the field: If the spill occurs at a field site, it will generally be located by the Nurse Tank. Contain the spill to the maximum extent possible. Put the applicator on 'vacuum' and attach a 3- or 6-inch hose to suck up the bulk of the material. Any material remaining on the ground should be minimal, and should then be tilled in by the applicator's toolbar.

Spills on a road: Safety cones or triangles should be immediately set up to direct traffic to lanes that are not impacted by the spilled material. Control and clean up the spill as soon as possible. Particular attention should be paid to protecting sensitive areas. If the material that is spilled is a liquid, a trailer with pressure/vacuum can be used to pick up the bulk of the material. A reducer hose, found at the VLB will need to be used with the trailer. Based on the judgment of the District's on-site supervisor, the area may then need to be cleaned using either a sweeper and/or pressurized water. If the material is a solid (cake or compost material), the bulk of the material can be picked up with an endloader. Any remaining material should be minimal and can be cleaned using either a sweeper and/or pressurized water.

Follow-up: A detailed letter should be sent to Ashley Brechlin at WI DNR documenting the date, time and location of the spill, quantities involved, the cause of the spill, a summary of actions taken at the site, and any additional pertinent information, including pictures. The letter should also document actions taken, if any, to prevent a reoccurrence of the problem.

Name	Telephone #
Ashley Brechlin	608-438-9930
Fred Hegeman	608-267-7611

DNR notification shall be consistent with the requirements specified in the District's WPDES Discharge Permit (see below).

WPDES Discharge Permit Notification Requirements

1. The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance.
    a. Any noncompliance which may endanger health or the environment.
    b. Any violation of an effluent limitation resulting from an unanticipated bypass.
    c. Any violation of an effluent limitation resulting from an upset.
    d. Any violation of a discharge limitation for any of the pollutants listed by the department in the permit, either for effluent or sludge.

2. A written report describing the noncompliance reported in 1. above, shall be submitted to the Department's regional office within 5 days after the permittee becoming aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

Lagoon Dike Stability Problems or Supernatant Spill

Update Responsibility: **Carly Amstadt**
Last Review Date: **10/15/18**
Last Revision Date: **10/15/18**

The pump station located at the southwest corner of the lagoon (next to the Vehicle Loading Building) is used to return supernatant from the lagoon to the plant. This pump station has two electric pumps and can be operated via computer control or manually. A computerized display of the pump station status can be found by selecting Plant Menu A-Z;; then, Lagoon on a SCADA process control computer. A six-inch diesel pump may be used occasionally to pump supernatant from the capped areas in the back lagoon to the front lagoon. This pump will typically be located on the south dike, just east of the intersection of the front and back lagoons, but may be placed in other areas as well. A map of the lagoon system (otherwise known as the MMSD Wildlife Observation Area) is provided at the end of this section, with arrows indicating typical pumping locations.

Identify: Identify the type of problem. If it is a pumping problem, shut the pump(s) off and notify a supervisor. If the problem is a dike failure, determine whether the dike is an internal dike or an external dike, determine which cells are affected, and whether there is an actual discharge of biosolids or supernatant into the drainage ditch, Nine Springs Creek or into an adjacent cell. During high lake levels, it is possible to breech the dike from the outside in. Also, dike stability problems can result from pumping down the lagoon too rapidly allowing a freeboard of saturated dike material. Greater than 2 MGD is too rapid.

If there is a line break during supernatant pumping, shut off the pump, determine where the break occurred and if there was a discharge of supernatant outside of the lagoon system. Use the attached lagoon diagram when identifying lagoon/dike locations.

Notify: For dike failure or supernatant discharge, immediately notify one of the following. In addition, DNR notification is required if there is a supernatant discharge. DNR notification should follow procedures identified in our WPDES Discharge permit.

IF THERE IS A DIKE FAILURE, NOTIFY LARRY LESTER, DNR.

Name	608-222-1201	Cell
Martin Griffin	Ext. 124	608-469-5227
Lisa Coleman	Ext. 133	608-698-1295
Carly Amstadt	Ext. 226	608-335-8624
Ross Hollfelder	Ext. 116	608-609-7725
Chad Liddicoat	Ext. 244	608-609-3534
Erik Rehr	Ext. 294	608-514-3126

Contacts: Following is a list of contacts that may be necessary or useful when responding to a dike failure or supernatant discharge:

Contact	Telephone #
Speedway Sand & Gravel	608-836-1071
Mary's Trucking	608-764-8301
Schlobohm Trucking	608-764-8101
Rice Grading	608-837-8103
WDNR Dike failure: Larry Lester - remediation & redevelopment Supernatent spill: Ashley Brechlin DNR Wastewater Engineer	 608 400-9933 608-438-9930
Mary Powers	ext. 287 608-471-9744 (c)

Actions: If there is a discharge of material to the Nine Springs Creek or the drainage ditch, DNR should be contacted as soon as possible. An effort must be made to contain the spilled material as quickly as possible and transfer it to a secured area. It may be necessary to construct a temporary dike downstream of the spill area to contain the material. Pumps could then be used to transfer the contained material to a secure area. Water samples may need to be collected to determine when pumping operations can be terminated. If the material that is discharged contains solids, some of the sediment in the creek bed or drainage ditch may have to be removed as part of the response action.

Equipment: See list under "Equipment Available for Use in an Emergency Response", page 70 in this manual for type and location of District owned pumps and other equipment that may be used in responding to a dike failure or supernatant spill.

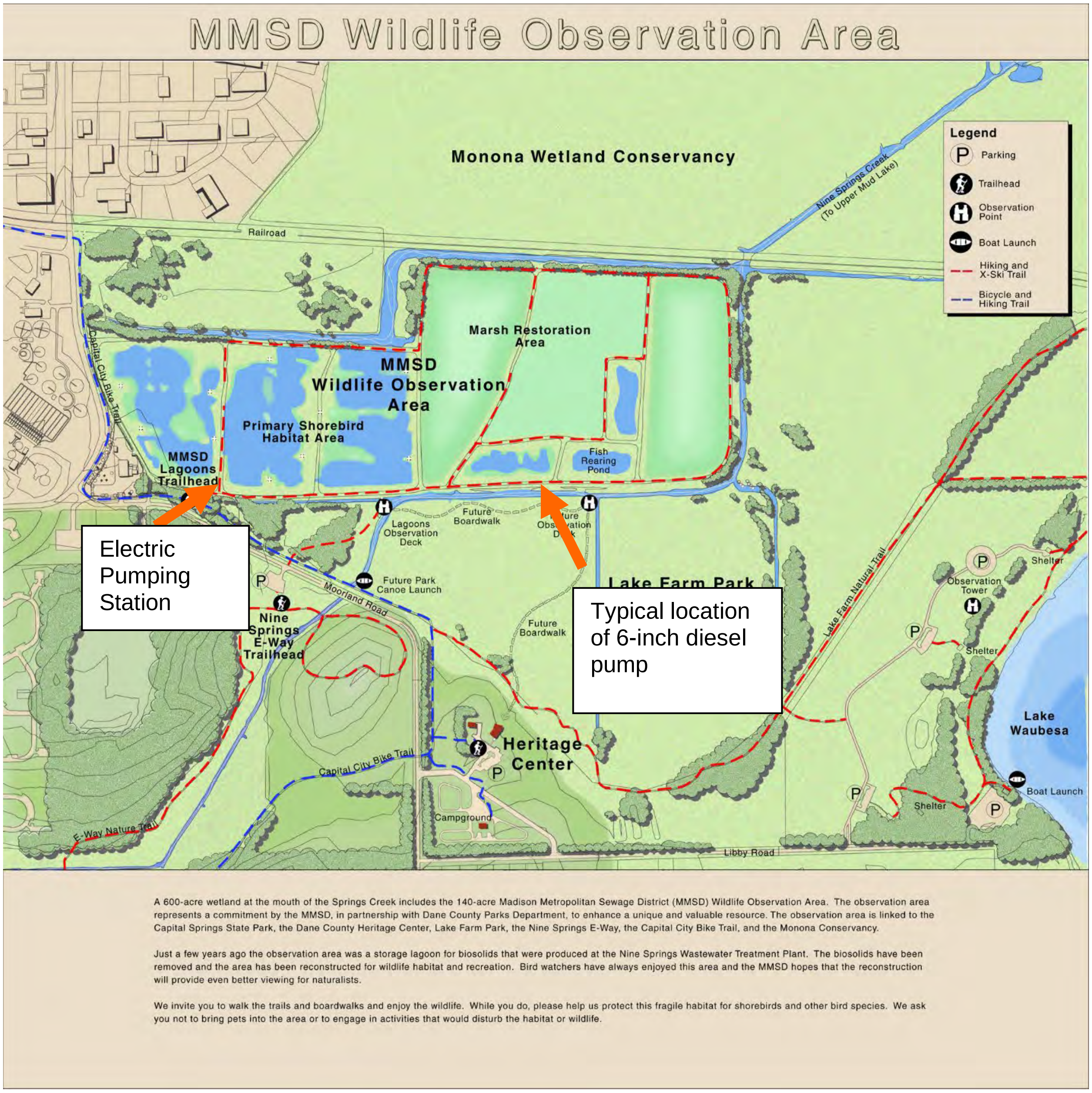
Document: Document the time of the incident and the personnel involved and contacted. If possible, record observations made at the site including probable cause.

Follow-up: After the emergency situation has been resolved, a District supervisor should write a report documenting all observations made and response actions taken. This should include the results of any environmental monitoring conducted as part of the response actions. If there was a release of material outside of the lagoon system, a copy of the report should be sent to DNR.

WPDES Discharge Permit notification requirements

1. The permittee shall report the following types of noncompliance by a telephone call or email to the DNR Basin Engineer within 24 hours after becoming aware of the noncompliance.
   a. Any noncompliance which may endanger health or the environment.
   b. Any violation of an effluent limitation resulting from an unanticipated bypass.
   c. Any violation of an effluent limitation resulting from an upset.
   d. Any violation of a discharge limitation for any of the pollutants listed by the department in the permit, either for effluent or sludge.

2. A written report describing the noncompliance reported in (a) shall be submitted to the Department's regional office within 5 days after the permittee becoming aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.



The areas shaded green in this diagram have been incorporated into the State of Wisconsin designated Capital Springs State Recreation Area.

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document

Equipment Available for Use in an Emergency Response

Update Responsibility: Brady Lessner
Last Review Date: 03/19/21
Last Revision Date: 02/27/23

Sorted by Equipment Description

Equipment Description	Equipment Location
Air compressor-Ingersoll Rand	Service Building (Door 33-8)
Air powered tools	Service Building (Door 33-8)
Barricades	Service Building (Upper Level)
Facilities Maintenance Inventory	Storage Bldg.#2 & Maintenance Facility
Breathing Apparatus-self contained	Maintenance Facility, O.B., Service Building & Some Vehicles
Brick and blocks	Storage lot-blacktop (Bone Yard)
Caulking	Maintenance Facility - Inventory
Cement saw-gas powered	Service Building (Door 33-14)
Chain hoist	Maintenance Facility-First Floor
Chain saws	Service Building (Door 33-10)
Clamps-pipe repair	Service Building (Lower Level-MS Inventory)
Culverts	Storage lot-gravel (Pipe Yard)
Elbows	Storage lot-blacktop (Bone Yard)
Electric sump pumps (2)	Storage Building #2
Electrical Inventory	Maintenance Facility-2nd floor
Electronic/Instrumentation Inventory	Maintenance Facility-2nd floor
Fans-gas and electric	Service Bldg. (Door 33-13)
Fence-chain link	Storage lot-gravel (Pipe Yard)
Floor jack	VLB, Shop #1 & #2, Storage Bldg. #2
Gas detectors-portable	Maintenance Facility-Elec Shop Storage Rm, O.B. In Vehicles 451, 452, 458, 462, 469, 471
Gasket material-rubber	Maintenance Facility
Gear pullers	Maintenance Facility-First Floor
Generator -Caterpillar -diesel, 30 KW	Storage Building #3 (Door 5-7)
Generators- Onan - diesel	PS17
Generators-Caterpillar -diesel, 105 KW	Metrogro Pumping Station (Door 1-3)
Generators-Caterpillar -diesel, 70 KW	Storage Building #3 (Door 5-8)
Geotextile fabric	Storage lot-blacktop
Grinder-portable	Maintenance Facility, VLB, Storage Building #2
Hand tools	Maintenance Facility, Storage Bldg. #2, Shop#2, VLB

Equipment Description	Equipment Location
Hose 2" & $1^1/_2$"	Storage Building #2 & ABC #2
Hose-flexible discharge	Storage Building #1 Door 35-3
Hose-for pumps up to six inches	Storage Building #2, VLB
Iron stock	Shop #2 & Storage Bldg#1
Ladders-Extension	Service Building (Upper Level) Door 33-8
Lead melting pot and equipment	Shop #1 (Basement)
Lead wool	Maintenance Facility (Inventory)
Lime, garden	Service Building,
Lumber and plywood	Service Building (Upper Level)
Manhole-concrete extension	Storage lot-blacktop
Manhole-iron, cones and covers	Storage lot-blacktop
Mechanical Inventory	Maintenance Facility, Shop #1 Basement
Nails	Service Building (Upper Level)
Oakum (Jute)	Service Building (Lower Level)
Pallet jack-portable	Maintenance Facility, Shop #1-Basement and Storage Bld. #2
Pallets	Storage lot-gravel (Pipe Yard)
Picks	Service Building (Upper Level)
Pipe and fittings	Storage lot-gravel & blacktop (Pipe & Bone Yard), Maintenance Facility
Pipe parts	Storage lot-blacktop and Shop #1.
Pipe plugs	Service Bldg. (Lower Level) Door 33-14
Pipe-concrete (and fittings)	Storage lot-blacktop & gravel(Pipe & Bone yard)
Pipe-pvc	Storage Building #1 Door 35-4, Maintenance Facility Mezzanine
Pipes-misc.	Lean to building, Shop #2
Planks	Service Building (Upper Level)
Post drivers	Service Building (Upper Level) Door 33-8
Posts-fence	Service Building (Upper Level) Door 33-8
Power hand tools	Storage Building #2, Maintenance Facility, Shop #2
Pressure washer	VLB, Sludge Dewatering Building
Pressure washers Portable (4)	Service Building (Upper Level) Door 33-7, Sludge Dewatering Building Door 3-5 (trailer mounted)
Pumps Portable (2) $1^1/_2$" & (1) 2" & (2) 4" & (2) Diesel 6"	Storage Building #2
PVC pipe fitting	Maintenance Facility- Expense Store Room
Radios-portable	Maintenance Facility-Elec Shop- Storage Room 150
Rakes	Service Building (Upper Level) Door 33-8
Rope	Maintenance Facility & Storage Bldg. #2

Equipment Description	Equipment Location
Sandblaster	Shop #2 and Service Building Door 33-8 (Compressor)
Scaffolding	Service Building (Lower Level) Door 33-12
Screws	Service Building (Upper Level) Maintenance Facility
Shovels	Service Building Door 33-8
Slings	Maintenance Facility, Storage Bldg.#2, & Mech Trucks
Stop logs (Wood & Alu.)	Behind Biosolids End Use Building
Torch-acetylene	Shop #2, VLB
Tripods	Maintenance Facility, Storage Bldg.#2
Valves	Storage lot-blacktop
WACS Valve Operator (On V481)	Maintenance Facility
Welder-portable	Shop #2 & VLB
Wheelbarrows	Service Building (upper level) Door 33-8

The master copy of this document is retained and updated in OnBase. Electronic copies outside of OnBase or printed copies may not be the latest version of this document

Force Main Emergency Repair Parts

Update Responsibility: **Matt Schuman/Michelle Stransky**
Last Review Date: **2/22/2023**
Last Revision Date: **2/22/2023**

Force main emergency repair parts are generally kept in the service building basement or pipe storage areas (near PS03). These parts are to be used for emergency repairs only. When a repair part is used, another replacement should be ordered as soon as possible.

Stock Code	Stock Description	Manufacturer	Storeroom	Primary Bin	Inv Qty (2/23)
005020	Air Bag, 24"		DIR	DIR	Direct
005021	Air Bag, 30"		DIR	DIR	Direct
005022	Air Bag, 36"		DIR	DIR	Direct
005007	Clamp, Repair, Smith Blair 226-00048012-000, 4", Style 226 Full Circle Stainless Steel Repair Clamp, 4.74 - 5.14 x 12 1/2" Wide	SMITH BLAIR	SER	E4B	3
005001	Clamp, Repair, Smith Blair 226-066312-000, 6", Style 226 Full Circle Stainless Steel, 6.56" - 6.96" O.D. X 12 1/2" Wide,	SMITH BLAIR	SER	E3B	2
005008	Clamp, Repair, Smith Blair 226-060012-000, 6", Style 226 Full Circle Stainless Steel, 5.95" - 6.35" O.D. X 12 1/2" Wide,	SMITH BLAIR	SER	E5B	2
005009	Clamp, Repair, Smith Blair 227-069012-000, 6", Style 227 Full Circle Stainless Steel, 6.84" - 7.64" O.D. X 12 1/2" Wide,	SMITH BLAIR	SER	E6B	2
005030	Clamp, Repair, Smith Blair 226-066315-000, 6", Style 226 Full Circle Stainless Steel , 6.56" - 6.96" O.D. X 15" Wide,	SMITH BLAIR	SER	E4A	1
005036	Clamp, Repair, Smith Blair 226-071015-000, 6", Style 226 Full Circle Stainless Steel , 7.05" - 7.45" O.D. X 15" Wide	SMITH BLAIR	SER	E3C	2
005023	Coupling, Repair, Rockwell 441-00000710-000, 6 1/2"	ROCKWELL	SER	E7A	1
005005	Clamp, Repair, Smith Blair 226-090512-000, 8", Style 226 Full Circle Stainless Steel, 8.99" - 9.39" O.D. X 12 1/2" Wide	SMITH BLAIR	SER	E5C	4
005024	Clamp, Repair, Smith Blair 226-086312-000, Style 226 Full Circle	SMITH BLAIR	SER	E5A	1

Stock Code	Stock Description	Manufacturer	Storeroom	Primary Bin	Inv Qty (2/23)
	Stainless Steel, 8" , 8.54" - 8.94", 12 1/2" Wide				
005026	Clamp, Repair, Smith Blair 226-076007-000, 8", Style 226 Full Circle Stainless Steel, 7.60" - 8.00" X 7 1/2" Wide	SMITH BLAIR	SER	E4C	1
005018	Clamp, Repair, Smith Blair 22600111012000, 10", Style 226 Full Circle Stainless Steel	SMITH BLAIR	SER	E6A	1
005002	Coupling, AC to DI Transition, Smith Blair 441-16221550-900, 14"	SMITH BLAIR	SER	E7B	2
005028	Clamp, Repair, Smith Blair 263-00159220-000, 16", Style 263 Full Circle Stainless Steel, 15.92" - 17.12" x 20" Wide for 14" Westport Extension	SMITH BLAIR	SER	E2C	5
005011	Clamp, Repair, Smith Blair 228-20215220-000, 20", Style 228 Full Circle Stainless Steel, Range: 21.52" - 22.27"	SMITH BLAIR	SER	E1B	4
005012	Clamp, Repair, Smith Blair 411-216015003, 20", Style 411 Solid Blue, 16" Wide	SMITH BLAIR	SER	E11C	2
005017	Clamp, Repair, Smith Blair 274-00002160-000, 20", Bell Joint Leak, Range 21.60-22.06	DRESSER	SER	E10B	3
005055	Clamp, Repair, Smith Blair 228-20192320-001, 20", Style 228 Full Circle Stainless Steel, Range: 19.23 - 19.98"	SMITH BLAIR	SER	E2A	1
005056	Clamp, Repair, Smith Blair 228-20229020-001, 20", Style 228 Full Circle Stainless Steel , Range: 22.90 - 23.65"	SMITH BLAIR	SER	E1A	1
005013	Clamp, Repair, Smith Blair 41100258008003, 24" Style 411 Solid Blue, 8" Wide	SMITH BLAIR	SER	E10C	1
005003	Clamp, Repair, Smith Blair 41100258015003, 24", Style 41, Solid Blue, 15" Wide Range, 25.72" - 25.85"	SMITH BLAIR	SER	FLR1 & FLR2	4
005051	Sleeve, Repair, AP6 24C, 24", White Solid PVC, for A-2000 Pipe	UNKNOWN	OSA	OSA	3

Stock Code	Stock Description	Manufacturer	Storeroom	Primary Bin	Inv Qty (2/23)
005014	Clamp, Repair, Smith Blair 411-00320008-003, 30", Style 411, Solid Blue, 10" Long	SMITH BLAIR	SER	E13C	2
005016	Clamp, Repair, Smith Blair 27400003174000, 30", Bell Joint Leak	SMITH BLAIR	SER	E14C	2
005004	Clamp, Repair, Smith Blair 22830320020000, 30", Style 228 Stainless Steel, for Ductile Iron Pipe, 20" Wide	SMITH BLAIR	SER	E1C	2
005010	Clamp, Repair, Smith Blair 228-30320015-001, 30", Style 228 Stainless Steel for Ductile Iron Pipe, 15" Wide	SMITH BLAIR	SER	E2B	2
005040	MJ Full Body, Tyler 068969, 30", Short Sleeve with Accessories,	TYLER	SER	FLR 9	2
005015	Clamp, Repair, Smith Blair 41100383007001, 36", Style 411, Solid Blue	SMITH BLAIR	SER	E12C	2
005025	Clamp, Repair, Smith Blair 274-00003796-000, 36", Bell Joint Leak	SMITH BLAIR	SER	FLR7	1
005041	MJ Full Body, Short Sleeve with Accessories, 36", Tyler	TYLER	SER	OSA	1
005090	Coupling, Repair, Specified Fitting 5022042, 42", PVC, C905 DR32.5.	SPECIFIED FITTING	SER	OSA	2
005050	Wool, Lead, (5 Pound Box)	UNKNOWN	SER	E12B	5
005060	Gasket, 14"	UNKNOWN	SER	E8A	2
005061	Gasket, 16"	UNKNOWN	SER	E9A	3
005062	Gasket, 20"	UNKNOWN	SER	E9B	13
005063	Gasket, 24"	UNKNOWN	SER	E7C	4
005064	Gasket, 30"	UNKNOWN	SER	E8C	3
005065	Gasket, 36"	UNKNOWN	SER	E8C, E9C	11

Forcemain Information Sheet

Station	Project	Date	Diameter	Material	Std Lay Len	Type	Len, ft
1	EI-Q	1948	30"	RCNCP	12'*	See Files	2,617
1	Crosstown	2002	30", 24", and 20"	DI PVC**	18' 20'	200 PSI C905	16,653
2	PS2FM	2001	36"	DI	20'	200 PSI	17,528
3	Monona	2001	8"	DI	20'	200 PSI	33
4	PS4-B	1967 & 2001	16"	CI & DI	NA	NA	180
5	WI-C	1959	16" & 24"	PCCP	16'	SP-5	2,276
6	EI-Q	1948	36"	RCNCP	12'*	See Files	7,290
7	EI-Q	1948	36"	RCNCP	12'*	See Files	7,036
7	EI-A	1963	36" & 48"	PCCP	16'	SP-5	8,720
8	WI-E	1964	36" & 42"	PCCP	16'	SP-5	13,824
9	SEI-E	1961	10"	AC & CI	NA	NA	2,233
9	SEI-J	1987	20"	DI	16'	CL 50	4,483
10	NEI-B	1964	36"	PCCP	16'	SP-5 & 12	9,192
10		2018	36”	HDPE	N/A	See Files	2,000
11	NSVI-A	1965	36"	PCCP	16'	SP-5 & 12	4,116
12	NSVI-F	1968	36"	PCCP	16'	SP-5	2,824
12		2017	36"	PVC	20’	C905	2,000
13	NEI-H	1969	36"	PCCP	16'	SP-5	2,589
14	NEI-K	1971	30"	PCCP	16'	SP-5 & 12	4,379
15	NSVI-O	1982	30"	PCCP	20'	SP-5	4,881
15	WI-M	1974	20" and 24"	DI	16'	20"--CL6 24"--CL5	7,297
16	NSVI-N	1981	30" & 36"	DI	16'	CL 50	9,810
17	VPS-D	1996	16" & 20"	DI	18'	CL 50	16,426
18	FM-PS18	2014	48"	PCCP	20'	SP-5	15,565
WestPoint FM	WI-K	1966	14"	AC	13'	Class 150	2,587
Badfish Creek FM	ED1-A	1957	54"	PCCP	16'	SP-12	26,225
Badger Mill Creek FM	ERF-A	1997	20"	DI	18'	CL 250 & CL 350	53,758

NOTES:

The above information was assembled for a quick check on the type of pipe needed during an emergency repair. More information is available in the files by checking the laying schedules for the exact location of a break.

*This information was provided by Price Brothers Pipe Company (now Thompson Pressure Pipe, Inc). There is no information in our files that could verify this. Price Brothers stated that there were two types of pipe furnished for these projects.

** The 20" PVC was installed under the Monona Terrace Convention Center.

2018 UPDATE: Hanson Pressure Pipe has been purchased by Thompson Pipe Company.

Hanson Pressure Pipe, Inc.

Emergency Repair Program
For Prestressed Concrete Steel Cylinder Pipe

Scope

Hanson Pressure Pipe, Inc.(HPP) [formally Price Brothers Company] has established a program to organize and coordinate a response to a pipeline emergency involving Prestressed Concrete Steel Cylinder Pipe and Fittings. An emergency contact telephone number has been created which is answered 24 hours per day, 7 days a week.

Contacting Hanson Pipe and Precast, Inc.

Emergency Contact Phone Number: 800-445-1534
This number is answered 24 hours per day by an answering service. The operator will take a detailed message from the customer and then call a list of HPP personnel. The HPP employee contacted by the answering service will then call the customer and begin assisting him with the emergency. During normal business hours, HPP's Dayton, OH office can be reached at 800-543-5147 or at 937-226-8700. Emergencies can also be reported to these numbers.

A HPP emergency repair contact person (reached via the answering service or the Dayton, OH office) must be involved initially in order to determine the nature of the damage and the proper repair/replacement materials to ship. Do not initially contact the HPP manufacturing facilities directly as they will not be able to make these determinations. Also, they are not authorized to ship any materials without the involvement of an emergency repair contact person reached via the channels mentioned above.

HPP can supply the services of an experienced Field Service Representative to assist in evaluating the damage to the pipe and in determining a repair method. The HPP contact person can coordinate this assistance.

Before calling HPP, it's important to assemble as much information about the pipeline and the damage as possible. Doing this will enable the HPP contact person to quickly assess the situation and determine a course of action. Helpful information includes:

Pipe nominal inside diameter and type (LCP or ECP)
Is it a special pipe? (outlet, short length, etc.)
Is the damaged piece a steel fitting rather than a prestressed section?
Where is delivery to be made?
Key customer contact names and telephone numbers (a 24-hour number is handy in case the delivery truck driver needs assistance)

Radio Emergencies (City Towers – Larkin and Lakeview)

Update Responsibility: **Jim Meyer**
Last Review Date: **02/23/23**
Last Revision Date: **02/23/23**

The telemetry repeater sites are located at the city's Larkin radio tower and the city water utility's Lakeview water tower. The City of Madison can be contacted in the event of a telemetry radio emergency. Jim Meyer or Mark Brunner should approve any contact with the City of Madison regarding radio emergencies. In the event that they are unavailable, Erik Rehr, Alan Grooms or Jeff Mike may authorize such contact. The following procedure should be followed when contacting the City of Madison in the event of a telemetry radio emergency:

1. When in need of emergency service during regular work hours, telephone the City Radio Shop supervisor Andy Oliver at 608-266-4768. Follow the answering system's menu-driven instructions.
    - Andy Oliver (lead worker) 608-266-4768, 608-267-1979

2. During off hours, call 608-444-4208 the City Radio Shop on-call person. If no answer, contact the 911 Center Supervisor at 608-267-3913. The Emergency Center will request information from the caller and page the appropriate emergency service responder on-call. The on-call responder will contact the caller who originally requested emergency service.

Cybersecurity Events and Incidents

Update Responsibility: **Laurie Dunn and Matt Erbs**
Last Review Date: **3/10/2023**
Last Revision Date: **3/10/2023**

Definition: Cybersecurity events are situations where there is unauthorized access or unexpected damage to District technology. This can take many forms. This document will list some of those situations and provide guidance for getting assistance.

District technology includes hardware, software, data, phone systems, websites, and physical structures that support and protect that technology.

There are multiple levels of redundancy for much of the District's technology. However, damage to technology can happen and progress quickly, so a high level of attention and urgency is needed when symptoms of a possible cybersecurity issue is observed.

I - Initial Considerations

Documentation

For any of the situations described below, documentation could be important to reducing damage and/or recovering systems. If conditions allow, document:

- The damage and/or events that occurred along with their date/time.
- Equipment/systems affected like software, hardware, specific applications, accounts, etc.
- Location information like area, room, building, or a landmark nearby.
- Anything unusual noticed before or around the time of the event like people, phone calls, threats, intrusions.
- Any actions taken when problem was first noticed.

Emergency Actions and Recommendations

Admin networks:

- If possible, disconnect – but do not turn off - compromised computers from the network to prevent further damage.
- If any IT staff are onsite, engage them as quickly as possible. This would be in addition to making any needed call or contact as listed in the table in Section II.
- If you are familiar with the procedure, disconnect the District's network from the internet service provider(s)

Process Control Networks:

- If possible, disconnect compromised computers from the network to prevent further damage.
- If the SCADA system is compromised, do not trust any data in SCADA. Rely on local HMI control and visibility.
- If a PLC/controller is compromised DO NOT disconnect it from the network as it could cause communication issues/equipment failures in the plant. Control all possible equipment in LOCAL.

- If a PLC/controller is compromised the data coming into SCADA should NOT be trusted and equipment should be considered live and unpredictable unless in LOCAL control.
  - If there is a compromised computer in the Ostara building, that system should but shutdown and disconnected from our PCS network. Ostara should also be contacted by PCS staff. Disconnect Ostara's internet connection if possible.
  - Contact PCS staff as soon as possible.
  - Contact IT (Programmer/Analyst) if data is compromised to stop data retrieval until system is assessed.

II - General actions for suspected cybersecurity events

If you suspect that a cybersecurity event has occurred, but you are unsure of what technology is affected, establish live voice or live text exchange contact with someone on this list. Start at the top of the list and work your way down until you are able to talk/text with someone directly. That person will work with you to define next steps.

Name	Role	Phone #s	Networks
Mickey Bowman	Network Administrator	c: (608) 358-2254	Admin
Ben Seibel	Network Administrator	c: (608) 770-3222	Admin
Matt Erbs	Automation Systems Integrator	c: (608) 235-2721	PCS
Craig Palzkill	Automation Systems Integrator	c: (608) 844-4024	PCS
Laurie Dunn	District Technology Manager	c: (608) 345-5848 h: (608) 345-5848	Admin
Gary Schweisthal	Programmer/Analyst	c: (608) 217-1239	Admin
Kris Huehne	Programmer/Analyst	c: (608) 395-5181	Admin
Courtney Woods	Database Administrator	c: (608) 482-2973	Admin
Amy Bublitz	Records Program Administrator	c: (608) 212-3023	Admin

III - Actions for suspected cybersecurity events related to the Process Control System networks and technology

If you suspect that a cybersecurity event has occurred within the Process Control Network or in/on Process Control technology, please contact the respective individual below. If you are unable to get an immediate response, please use the General Actions table in Section II and start contact attempts at the beginning of the list. If other Operations or IT staff need to be involved, the person you contact will help get that involvement.

Name	Role	Phone #s
Matt Erbs	Automation Systems Integrator	c: (608) 235-2721
Craig Palzkill	Automation Systems Integrator	c: (608) 844-4024

IV - Actions for suspected cybersecurity events

Use the table below to help guide the next steps for a suspected specific cybersecurity event. Find the event in the first column and then reference the Who to Contact person(s) and the What to Do recommendations. If you are unable to get an immediate response from the contacts listed, please follow the process in Section II. If other IT or Operations staff need to be involved, the person you contact will provide that direction.

Cybersecurity Event or Observation	Who to Contact	What to Do
Admin Networks and Technology		
District's administrative network has been compromised. Examples: ransomware is announced, ransom request received, large volume copy/encryption/deletion of data.	Network Administrator (see Section II table for names and numbers)	ASAP, involve one of the District's Network Administrators. Document observations. If possible, and you know how to do it, shut down the District's internet connection. Do not shutdown or unplug any other equipment unless instructed to do so by a Network Administrator.
Large volume copies, encryptions, deletions of data.	Network Administrator and/or Database Administrator (see Section II table for names and numbers)	Alert IT staff as quickly as possible. If this is happening on a local drive of a computer, disconnect the computer from the network. Do not run the computer off.
Defacement of the District's website	Amy Steger, Communications and Marketing Specialist, 608-338-2334	Contact Amy as soon as possible
Compromise of the District's email system	Network Administrator (see Section II table for names and numbers)	
Operations Building Data Center Intrusion	Network Administrator, Lead Operator, District Technology Manager (see Section II table for names and numbers)	
Physical damage to technology or building housing technology	District Technology Manager (see Section II table for name and number)	

Process Networks and Technology		
Tampering with District PLCs	Automation Systems Integrator, Lead supervisor	Alert PCS staff ASAP and communicate which systems were affected. PCS Staff may instruct the shutdown of equipment depending on the situation.
Tampering with District SCADA	Automation Systems Integrator, Lead supervisor	Alert PCS staff ASAP and communicate what was observed. SCADA information should be considered unreliable. Equipment will need to be controlled/monitored locally.
Unusual or concerning issues or performance noted in Citrix, WordPress, or other PCS-related software	Automation Systems Integrator, Network Administrator	Alert PCS staff ASAP and communicate what was observed. If PCS staff cannot be reached, then follow contact list in Section II.
Physical damage to PCS-related technology or building housing PCS-related technology	Automation Systems Integrator, Lead supervisor	Alert PCS staff ASAP and lead supervisor on call. Isolate any equipment locally if able.
Pumping Station Intrusion with assumed tampering	Lead supervisor	See security section related to pump station security. If there is assumed tampering, Contact PCS staff ASAP. PCS Staff should contact Facilities Maintenance and CSS.

V - Other Useful Contacts and Telephone Numbers

When responding to a high flow event, District staff may need to make additional contacts. Useful names and telephone numbers are listed below.

Name	Contact Information
Madison Police Department – emergency	911
Madison Police Department – non-emergency	608-255-2345
CISA – cyber incident reporting 24/7	888-282-0870
National Cybersecurity Communications and Integration Center (NCCIC)	888-282-0870
DHS – Cyber Incident Reporting	*866-347-2423* www.ice.gov/webform/hsi-tip-form
Charter Spectrum Internet Support	855-366-7132,
Department of Homeland Security National Cybersecurity and Communications Integration	888-282-0870 or NCCIC@hq.dhs.gov
Iconics (SCADA Software)	(508) 543-8600
Rockwell (PLC Hardware)	(888) 382-1583

Use of Emergency 911 Number/Phone System

Update Responsibility: Mickey Bowman
Last Review Date: 03/01/2023
Last Revision Date: 03/01/2023

The 911 number is intended to be used for emergency situations and should not be used for routine calls to the police, fire department or other emergency response units. Nonemergency calls should be directed to public service nonemergency numbers. Search online for say: "Madison police nonemergency."

In the event of an emergency, dial 911 on a cell phone and be prepared to describe the emergency and to provide a location to the emergency services personnel. During or immediately after the call, ensure personnel aware of the location of the emergency go to plant gate locations to direct emergency services vehicles.

In the event that our regular telephone system experiences technical problems, emergency calls should be placed using a District or non-District cell phone.

News Media and Public Affairs Contacts

Update Responsibility: **Communications & Public Affairs Manager***
Last Review Date: **02/23/2023**
Last Revision Date: **02/23/2023**

As a general policy, all calls or requests for information from the media or elected officials regarding any District-related activity or program, or any action involving the District or District personnel should be directed to **the Communications & Public Affairs Manager.** If this individual cannot be reached, contact **Michael Mucha (608-807-7273).** If neither can be reached, please direct the call or request to the District's executive coordinator, Janelle Werner, **(608-286-5667)** or the district's general extension (call 608-222-1201 and dial zero) for assistance. Calls to Janelle or the general extension will be redirected to an appropriate contact person within the District, i.e., a department director.

*Update once a new Communications & Public Affairs Manager is hired and remove this note.

Revision Notes

In February/March 2021, the Emergency Response Manual, which previously was last updated in October 2018, underwent a major overhaul. Information specific to the operation of the plant and collection system was pulled into this Emergency *Operations* Manual.

Information related to threats of people, property and processes from the October 2018 Emergency Manual were retained but moved to a separate document. Those items include:

- Accidents/Personal Injury
- Fire
- Tornado
- Confined Space Emergency/Accident (form removed)
- Chemical Spill Emergency Procedures

Some items were removed from both manuals, as there were deemed unnecessary or that these manuals were not the place to save this information. Removals include:

- Employee Contact Information
- Fleet Vehicle List (“Equipment Available for Use in an Emergency Response – District Vehicle Information”)
- Combined “Newspaper, Radio or Television Reporters” with “News Media and Public Affairs Contacts”
- Safety & First Aid Equipment Location

In February/March 2023, this manual was updated. Two sections were added:

- General information and 1st contact
- Procedures for Pump Station 13, 14 and 15 Drywell Bypassing
- Cybersecurity Events & Incidents

APPENDIX D – MADISON METROPOLITAN SEWERAGE DISTRICT SEWER USE ORDINANCE (2017)

SEWER USE ORDINANCE

MADISON METROPOLITAN SEWERAGE DISTRICT

(Revised July 27, 2017 and Effective August 18, 2017)
(Typographical Errors Corrected January 22, 2021)

Table of Contents

MADISON METROPOLITAN SEWERAGE DISTRICT
SEWER USE ORDINANCE

The Commission of the Madison Metropolitan Sewerage District does ordain as follows:

CHAPTER 1 – GENERAL PROVISIONS

Section 1.1. Purpose and Intent.
This Ordinance regulates the use of public and private sewers and drains, disposal of holding tank wastes into the public sewers, and the discharge of waters and wastes into the public Sewerage Systems within the District. It provides for Wastewater treatment service charges, sets uniform requirements for discharges into the public Sewerage System, provides for annexations to the District, and sets requirements for connections to sanitary sewers within the District. This Ordinance provides a means for determining Wastewater volumes, constituents, and characteristics; the setting of charges and fees; and the issuing of permits to certain Users. Revenues derived from the application of this Ordinance shall be used to defray the District's costs of operating and maintaining adequate Wastewater facilities and to provide sufficient funds for capital outlay, debt service costs, and capital improvements. It enables the District to comply with administrative provisions, water quality requirements, toxic and pretreatment effluent standards, and other discharge criteria which are required or authorized by the State of Wisconsin or Federal Law. Its intent is to preserve and obtain the maximum public use of District facilities for Community Customers by regulating the characteristics of Wastewater discharged into the District Interceptor Sewer System or public Sewerage Systems tributary to that Interceptor Sewer System.

Section 1.2. Authority.
This Ordinance is adopted pursuant to and in implementation of Wis. Stat. §§ 200.11(1)(d) and 200.13(3), which gives the District the right to "adopt rules for the supervision, protection, management and use of the systems and facilities operated by the District." The charges and fees herein have been established pursuant to the requirements of Wis. Stat. §§ 66.0821 and 200.13(3). If there is any conflict between this Ordinance and any applicable Statute, the Statute shall be controlling.

Section 1.3. Emergency Rules.
Nothing contained in this Ordinance shall be construed as prohibiting the Commission or District from adopting any emergency rule, in order to preserve the public health, safety, or welfare. Such emergency rule shall be effective only for the period authorized by Wis. Stat. § 200.45(l)(c), as amended from time to time.

<u>Section 1.4. Right of Entry and Access.</u>

<u>1.4.1.</u> General Right of Entry.

District inspectors bearing proper credentials and identification shall be allowed access to all property serviced by the District, for the purpose of inspection, observation, measurement, sampling, and testing of discharges to the Wastewater facilities and for the purpose of inspection, repair, or maintenance of any portion of the District's Wastewater facilities.

<u>1.4.2.</u> Right to Enter Easements.

The Commission, the Director, or other duly authorized employees of the District, bearing proper credentials and identification, shall be permitted to enter all private properties through which the District holds an easement for the purposes of, but not limited to, inspection, observation, measurement, sampling, repair, and maintenance of any portion of the sewerage works lying within said easement, all subject to the terms, if any, of such easement.

<u>1.4.3.</u> Right to Enter Roads.

The District may enter upon any state, county, or municipal street, road, or alley or any public highway for the purpose of installing, maintaining, and operating its Sewerage System; and it may construct in any such street, road, or alley or public highway necessary facilities without a permit or payment of a charge.

<u>1.4.4.</u> Obstructions to District Facilities.

(a) All persons, firms, or corporations lawfully having buildings, structures, works, conduits, mains, pipes, tracks, or other physical obstructions in, over, or under the public lands, avenues, streets, alleys or highways which block or impede the progress of District facilities when in the course of construction, establishment, or repair shall upon reasonable notice by the District, promptly so shift, adjust, accommodate, or remove the same at the cost and expense of such persons, firms, or corporations, as fully to meet the exigency occurring such notice.

(b) Any person, firm, or corporation who shall fail to comply with the provisions of this or who shall fail to comply with any Special Order issued pursuant to Section 11.3, which order requires compliance with Section 1.4.3, shall be subject to the penalties set forth in Section 11.3 in addition to all penalties and costs imposed under this Ordinance. Each day that a failure to comply shall continue after issuance of the notice or Special Order, as the case may be, shall constitute a separate violation.

<u>Section 1.5. General Rules of Interpretation.</u>

<u>1.5.1.</u> Superseding Previous Ordinances.

This Ordinance supersedes all previous regulations and ordinances of the District which are in conflict herewith.

<u>1.5.2.</u> Severability.
The invalidity of any section, clause, sentence, or provision in this Ordinance shall not affect the validity of any other section, clause, sentence, or provision of this Ordinance which can be given effect without such invalid part or parts.

<u>1.5.3.</u> Amendment.
The Commission reserves the right to amend this Ordinance in whole or in part whenever it may deem necessary.

<u>1.5.4.</u> Conflict with District's Ordinance.
In the event that any provision of this Ordinance is in conflict with any ordinance of any municipality, the former shall control.

<u>1.5.5.</u> Effective Date.
This Ordinance shall take effect and be in force upon its publication in a newspaper of general circulation within the District.

CHAPTER 2 – DEFINITIONS

Section 2.1.

Unless the context specifically indicates otherwise, the meaning of terms used in this Ordinance shall be as follows:

(1) "ACTUAL USER" shall mean the number of water meters serving a user. If a user's water consumption is not metered, the Director shall estimate the number and size of the water meter(s) that would otherwise be required to measure such consumption. The Director's estimate shall be in accordance with generally accepted engineering practices.

(2) "APPLICABLE PRETREATMENT STANDARD" shall mean the most restrictive provisions contained in any pretreatment limitations or prohibitive standards (enacted by any federal, state or local governmental entity) and incorporated in this Ordinance, which Application Pretreatment Standard shall be complied with by non-domestic Wastewater users of the Sewerage System.

(3) "BEST MANAGEMENT PRACTICES (BMPs)" shall mean structural or non-structural measures, practices, operating procedures, schedules of activities, treatment requirements, techniques or devices employed to minimize or treat the discharge of pollutants into the sewerage system; to implement prohibitions listed in NR 211.10 (1) or (2); or to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw materials storage areas. Best Management Practices may be specified (i) by EPA and DNR categorical regulations, or (ii) by District and Customer Communities for significant industrial users and non-significant, industrial, institutional, and Commercial Users. In the case of the latter, BMPs are equivalent to local limitations and shall be incorporated into any permits issued by the District or Customer Community.

(4) "BIOCHEMICAL OXYGEN DEMAND (BOD)" shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five (5) days at 20°C, expressed in milligrams per liter. Quantitative determination of BOD shall be made in accordance with 40 C.F.R. pt. 136 and NR 219.

(5) "BUILDING SEWER" or "LATERAL" shall mean a sanitary sewer which begins at the immediate outside of the foundation wall of any building or structure being served and ends at its connection with a Community Sewer or Interceptor.

(6) "CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (CBOD)" shall mean the quantity of oxygen used in the biochemical degradation of organic material in five (5) days at 20°C when the oxidation of reduced forms of nitrogen is prevented by the addition of an inhibitor. This analytical procedure shall be performed in accordance with 40 C.F.R. pt. 136 and NR 219.

(7) "COMMERCIAL USER" shall mean any business or non-profit organization that provides goods or services and generates Wastewater.

(8) “COMMISSION” shall mean the Commission of the District as defined and with such powers as set forth in Wis. Stat. § 200.09, as amended from time to time.

(9) “COMMUNITY CUSTOMER” shall mean a city, village, town sanitary or utility district, or a county, state, or federal agency which is billed directly by the District for sewerage service provided.

(10) “COMMUNITY SEWER” shall mean any sanitary sewer owned and/or operated by any a Customer Community which sewer is tributary to an intercepting sewer or treatment facility owned or operated by the District.

(11) “COMPATIBLE POLLUTANT” shall mean biochemical oxygen demand, suspended solids, pH, or fecal coliform bacteria, plus additional pollutants identified in the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit issued to the District for its Wastewater treatment facility, provided that said Wastewater treatment facility was designed to treat such pollutants or does not have a Detrimental Effect on the treatment facility.

(12) “DETRIMENTAL EFFECT’ means a discharge to the sewerage system that either alone or in combination with other discharges would pass through or interfere with the operation of the sewerage system, cause the District to violate its WPDES permit, or create or constitute a hazard to human health or the environment.

(13) “DIRECTOR” shall be the Director of the District or other authorized representative of the Commission or District.

(14) “DISTRICT” shall mean the Madison Metropolitan Sewerage District (MMSD), a regional sewerage district governed by the Commission.

(15) “DNR” means Wisconsin Department of Natural Resources.

(16) “DOMESTIC WASTEWATER” or “SANITARY SEWAGE” shall mean waste and wastewater from humans or household operations that is discharged from toilets, conveniences, or other sanitary plumbing facilities, and which contain no substances prohibited by the terms of this Ordinance.

(17) “EPA” means the federal Environmental Protection Agency.

(18) “EQUIVALENT METERS” shall mean the number of equivalent 5/8-inch meters and shall be based on the following:

Meter Size	Number of Equivalent 5/8-inch Meters
5/8-inch	1
3/4-inch	1
1-inch	2.5
1-1/4-inch	3.7
1-1/2-inch	5
2-inch	8
3-inch	15
4-inch	25
6-inch	50
8-inch	80
10-inch	120
12-inch	160

Where a user does not have a water meter(s) for measuring the user’s water consumption, the Director shall estimate the number and size of water meter(s) that would otherwise be required to serve that user, based upon standard engineering practices; and the Equivalent Meters shall then be determined on this estimate.

(19) “FEDERAL ACT” shall mean the Federal Water Pollution Control Act of 1972, 33 U.S.C. § 1251 et. seq., as amended, known as the Clean Water Act or as implemented by Wis. Stat. ch. 283, or appropriate sections of the Wisconsin Administrative Code adopted pursuant to Chapter 283, as well as any applicable guidelines, limitations and standards promulgated by the United States Environmental Protection Agency pursuant to the Federal Act.

“FLOATABLE OIL” shall mean oil, fat, or grease in a physical state such that it will separate by gravity from wastewater by treatment in an approved pretreatment facility. A wastewater shall be considered free from Floatable Oil if it is property pretreated and does not interfere with the collection system.

(20) “FLOW PROPORTIONAL SAMPLE” or “COMPOSITE SAMPLE” shall mean a sample consisting of portions of waste taken in proportion to the volume of flow of said waste.
(21) “GENERAL PERMIT” shall mean any permit issued by the District or the community that authorizes similar minor activities by one or more applicants.

(22) “HAULER” shall mean any person who transports a hauled waste to the Wastewater Treatment Plant for disposal.

(23) “HAULED WASTE” shall mean Wastewater or waste sludges transported to and discharged at the Treatment Plant.

(24) “INDUSTRIAL USER” shall mean any person who engages in the manufacture or production of goods and discharges Wastewater other than Sanitary Sewage.

(25) “INDUSTRIAL WASTE” shall mean the Wastewater generated and discharged by an Industrial User, other than Sanitary Sewage.

(26) “INTERCEPTING SEWER” or “INTERCEPTOR” shall mean any sanitary sewer owned or operated by the District.

(27) “INTERFERENCE” shall mean a discharge which, alone or in conjunction with a discharge or discharges from other sources, inhibits or disrupts Wastewater treatment processes or operations or the sludge processes, use or disposal, or is the cause of a violation under any federal or state law.

(28) “LOCAL LIMITATION” shall mean limits developed by POTWs to enforce the specific and general prohibitions, as well as any State and local regulations and can include Best Management Practices as well as specific numeric limits.

(29) “NATIONAL CATEGORICAL PRETREATMENT STANDARDS” shall mean any regulation or order containing pollutant discharge limitations as promulgated by the U.S. Environmental Protection Agency, in accordance with §§ 307(b) and (c) of the Federal Act, which limitations apply to one or more specific categories of Industrial Users.

(30) “NEW SOURCE” shall mean any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced after the publication of proposed pretreatment standards under § 307(c) of the Federal Act which will be applicable to such source, if such standards are thereafter promulgated provided that:

1. The building, structure, facility, or installation is constructed at a site at which no other source is located; or

2. The building, structure, facility, or installation totally replaces or substantially changes the process or production equipment that causes the discharge of pollutants at an existing source; or

3. The production or Wastewater generating processes of the building, structure, facility, or installation are substantially independent of an existing source at the same site.

(31) “PASS THROUGH” shall mean a discharge which exits the Wastewater Treatment Plant into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the District’s WPDES permit including an increase in the magnitude or duration of a violation.

(32) “PERSON” shall mean any individual, firm, company, partnership, municipality, association,

private or public corporation, cooperative, society, institution, enterprise, government agency, or other entity.

(33) “PRETREATMENT” shall mean the reduction of the amount of pollutants, the elimination of pollutants or the alteration of the nature or characteristics of the pollutant properties of the Wastewater of a User prior to or in lieu of discharge to a public sewerage system.

(34) “RECEIVING WATERS” shall mean the body or bodies of water to which the treated water from the District’s Wastewater Treatment Plant is discharged.

(35) “REPRESENTATIVE SAMPLE” shall mean a sample of the appropriate Wastewater stream that is representative of daily operations, collected using 24-hour flow proportional composite sampling techniques where feasible, unless another sampling technique or sample type is specified by the District. If compositing of grab samples is specified, compositing shall be consistent with protocols identified in Wis. Admin. Code ch. NR 219 and EPA or DNR guidance.

(36) “RESPONSIBLE CORPORATE OFFICER” shall mean a person as defined in Wis. Admin. Code § NR 211.15(10).

(37) “SEPTAGE” shall mean the scum, liquid, sludge or other waste in a septic tank, soil absorption field, holding tank, grease interceptor, privy, or other component of a private on-site wastewater treatment system.

(38) “SEWER” shall mean a pipe or conduit that carries Wastewater or drainage water.

(39) “SEWERAGE SYSTEM” shall mean all facilities used for the collecting, transporting, pumping, metering, sampling treating and disposing of Wastewater discharged to the District.

(40) “SIGNIFICANT INDUSTRIAL USER (SIU)” shall mean Industrial User meeting the requirements in Chapter 6.

(41) “SLUG LOAD” or “SLUG DISCHARGE” shall mean any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge, which has a reasonable potential to cause Interference or Pass Through, or in any other way violates conditions in the District’s Sewer Use Ordinance, or WPDES Permit conditions.
(42) “TOTAL SUSPENDED SOLIDS (TSS)” shall mean total suspended matter that either floats on the surface of, or is in suspension in, water, Wastewater, or other liquids, and that is removable by laboratory filtering as prescribed in 40 C.F.R. pt. 136 and Wis. Admin. Code ch. NR 219.

(43) “TOTAL KJELDAHL NITROGEN (TKN)” shall mean the quantity of organic nitrogen and ammonia as determined in accordance with 40 C.F.R. pt. 136 and Wis. Admin. Code ch. NR 219.

(44) “TOTAL PHOSPHORUS (TP)” shall mean the quantity of total phosphorus as determined in accordance with 40 C.F.R. pt. 136 and Wis. Admin. Code ch.NR 219.

(45) “TREATMENT PLANT” shall mean the District’s arrangement of devices and structures for treating domestic Wastewater and industrial discharges.

(46) “USER” shall mean any person who discharges, or causes to be discharged domestic Wastewater, industrial discharges, or any other Wastewater into the public sewerage system.

(47) “WASTEWATER” shall mean water and water-carried wastes discharged to the District sewerage system including but not limited to Sanitary Sewage or process water from commercial or Industrial Users other than Sanitary Sewage.

(48) “WASTEWATER PARAMETERS” shall include volume, carbonaceous biochemical oxygen demand, Total Suspended Solids, Total Kjeldahl Nitrogen, Total Phosphorus, Actual Users, Equivalent Meters, and such additional parameters as may from time to time be determined by the District.

(49) “WPDES PERMIT” shall mean the District’s permit to discharge pollutants, obtained under the Wisconsin Pollutant Discharge Elimination System (WPDES) pursuant to Wis. Stat. ch. 283.

CHAPTER 3 - TERRITORY OF THE DISTRICT

Section 3.1. Territory.
The territory of the District includes the original boundary established in 1930 and all lands annexed into the District. A current map of the District's territory shall be maintained by the District. Only territory within the District may be served by the District.

Section 3.2. Annexation of Territory Upon Notice of Communities Within the District.
3.2.1. Any city, village, or town sanitary district which is wholly or partially within the District may seek to annex additional territory into the District upon notice to the Commission and the regional planning commission pursuant to Wis. Stat. § 200.15(1)(a).

3.2.2. A city, village or town sanitary district seeking an annexation under this Section, shall provide a written notice from the City or Village Clerk to the Chief Engineer of the District, a copy of the notice that was sent to the regional planning commission in accordance with Wis. Stat. § 201.15(1)(a) and any response from the regional planning commission to such notice. Written notice can be sent via hard copy or electronically.

3.2.3. The Commission may object to a request for annexation under this Section within thirty (30) days after receipt of the written notice in accordance with Wis. Stat. § 200.15(1)(b). If the Commission objects to annexation, the community may petition for annexation under Wis. Stat. § 200.15(2) and Section 3.3 of this Ordinance. If the Commission does not object to the annexation within thirty (30) days, the annexation is deemed approved.

3.2.4. Failure of the Commission to disapprove the addition of the territory under this Subsection is subject to review under Wis. Stat. ch. 227.

Section 3.3. Annexation of Territory Upon Petition or Motion.
3.3.1. The addition of territory to the District may also be initiated by petition from a municipal governing body or upon motion of the Commission under Wis. Stat. § 200.15(2).

3.3.2. Upon receipt of the petition or upon adoption of the motion, the Commission shall hold a public hearing preceded by a class 2 notice under Wis. Stat. ch. 985. The party proposing the annexation shall have the burden of proof.

3.3.3. The Commission may approve the annexation upon a determination that the following standards are met:

(a) The formation of the District will promote sewerage management policies and operation and will be consistent with adopted plans of municipal, regional and state agencies; and

(b) The formation of the District will promote the public health and welfare and will effect efficiency and economy in sewerage management, based upon current generally accepted engineering standards regarding prevention and abatement of environmental pollution and federal and state rules and policies in furtherance thereof.

3.3.4. Approval actions by the Commission under this Section shall be subject to review under Wis. Stat. ch. 227.

Section 3.4. Costs.

3.4.1. Annexation Charge.

Annexations under this Chapter are subject to an "annexation charge" in such amount as the Commission may determine, to cover the cost associated with the proposed annexation. Unless the Commission determines to waive such payments, the payment of the annexation charge shall be made at such time as the Commission determines. The Commission reserves the right to adjust from time to time, the amount of the foregoing annexation charge, by resolution duly adopted by the Commission.

3.4.2. Annexation Fee.

Territory which is annexed to the District in accordance with the provisions of Wis. Stat. § 200.15, may be subject to reasonable requirements as to participation by newly annexed areas toward the cost of existing or proposed District facilities as the Commission may determine. Such annexation fees shall be billed to and paid by the municipality in which the added territory is located, at such time or times as the Commission may determine.

3.4.3. Additional Charges for Delinquent Annexations.

If the District determines that territory outside of the District is receiving service from the District, annexation of such area shall be required and the District may impose additional fees or penalties for such annexations.

CHAPTER 4 – CONSTRUCTION AND OPERATION OF COMMUNITY SEWERS

Section 4.1. Applicability.
This Chapter sets forth the obligations of Community Customers to the District related to the construction and operation of Community Sewers.

Section 4.2. Approval of Community Sewers.
Prior to constructing, reconstructing, altering or extending a Community Sewer, a Community Customer shall receive approval of the District under this Chapter.

4.2.1. Plans and Specifications.

(a) At least two (2) sets of plans and specifications shall be provided for any construction, reconstruction, alteration or extension of a Community Sewer.

(b) All construction plans shall be in conformance with Wis. Admin. Code Ch. NR 108.

(c) The plans submitted to the District shall be on 11” x 17” high grade paper and shall be clear and legible. The pages shall be numbered and the plans drawn to a suitable scale. Reductions of full-scale plans shall be to a suitable, conveniently useable scale.

(d) All elevations given on plans submitted to the Commission shall be based on the North American Vertical Datum of 1988 (NAVD88). All bearings shown shall be referred to a boundary line of a government lot or quarter section, monumented in the original survey or resurvey of Wisconsin. Every plan submitted shall bear a sign showing the direction of the true north in relation to the plan.

4.2.2. Community Sewer Plan Approval.
Any community that plans to construct, reconstruct, alter or extend a Community Sewer shall submit an application to the District including the following:

(a) Two (2) complete sets of plans, specifications, and required DNR forms for sewer extensions in accordance with Section 4.2.1. An electronic copy of the required plans and specifications shall be included with the submittal per the DNR’s requirements.

(b) Map(s) showing: the location of the work, the ultimate tributary drainage basin(s) and the immediate service area of the proposed sewer extension for sewers eight inches in diameter or larger.

(c) The size, type, and grades of proposed sewers.

(d) The elevations of sewer inverts and the manhole tops.

(e) The distance between manholes.

(f) Complete details of all appurtenances.

(g) The plans shall be accompanied by complete and signed DNR Sanitary Sewer Extension Submittal Forms, as amended from time to time.

(h) Plans shall be reviewed by the Capital Area Regional Planning Commission as required pursuant to Wis. Admin. Code § NR 110.08(4). A copy of the Capital Area Regional Planning Commission 208 review letter and an approval letter from the Community Customer shall accompany the plans.

(i) No extensions shall be approved unless the area served is within the territory of the District.

4.2.3. Incomplete Applications.
Incomplete applications shall not be processed and considered for Commission approval until all of the required information is provided by the applicant. Plans not approved by the Commission shall be returned to the applicant with a letter describing the reason(s) for denial of the application.

Section 4.3. Approval of Connections.

4.3.1. Approval of Connections to Community Sewers.

(a) Community Customers shall require that any Person seeking to connect a Building Sewer or private sewer to a Community Sewer obtain the approval of the Community Customer. At the time of connection, each Building Sewer shall be inspected by a competent inspector of the municipality in which the connection is being made.

(b) Copies of all industrial waste discharge permit applications shall be provided to the Director; and such applications must first be approved by the Director prior to connection to any Community Sewer, subject to such conditions as the Director may require.

(c) The Community Customer shall no less than annually send a list of new businesses and institutions that have connected to Community Sewers, including addresses, to the attention of the District’s Pretreatment and Waste Acceptance Coordinator.

4.3.2. Approval of Community Sewer Connections to District Interceptor Sewers.

(a) A Connection Permit shall be obtained from the District before any connection is made from a Community Sewer into a District Interceptor Sewer. This includes connections made as part of new sewer extensions, new connections made as part of replacement or reconstruction projects, and existing connections which are reinstated or altered in any way as part of regular maintenance activities or during replacement or reconstruction projects.

(b) A Community Customer shall give the District written notice at least five (5) business days prior to any connection of a Community Sewer to an Interceptor Sewer to allow the District to inspect the connection.

4.3.3. Approval of Direct Connections to District Interceptors.

(a) No connections of a Building Sewer or private sewer directly to an Intercepting Sewer of the District shall be made, without the approval of the District under this Section. Approvals shall not be given unless special circumstances or conditions require such connection.

(b) Applications for permission to connect directly to an Intercepting Sewer shall be made in writing to the Director by a master plumber or utility contractor licensed by the State of Wisconsin and authorized by the owner or operator of the premises for which such connection is desired. The application shall include a statement giving the exact location of the premises, the purposes for which the connection is to be used, the time when the work is to be done, the special circumstances or conditions requiring such direct connection, and such other information that may be required by the Director. The application shall constitute an agreement by the owner or operator and said licensed master plumber or licensed utility contractor that they will be bound by and subject to the rules and regulations of the Commission.

(c) The Director shall determine whether to approve such connection. Upon approval of the application, the Director will issue a permit granting the right to make the connection, specifying special conditions which must be met prior to connection, and such additional conditions as it may require. A nonrefundable permit fee shall be paid to the District prior to the issuing of the permit.

(d) No connection shall be made directly with any Intercepting Sewers without the inspection and approval of such connection by the Director. Only the connection to an Intercepting Sewer shall be inspected by the Director or his representative at the time of the connection. The Building Sewer or private sewer shall be inspected by a representative of the Community Customer in which the connection is made.

(e) No work of laying the Building Sewer or private sewer shall be commenced or continued without the required connection permit being on the premises and in the hands of the licensed master plumber or licensed utility contractor or one employed by him/her.

4.3.4. Connection Charges.

For each sewer connection made to a Community Sewer or a District sewer, a connection charge shall be paid to the District. Such connection charge shall be billed to and paid by the Community Customer in which the sewer connection is made. The connection charge shall be in such amount as the Commission may set as part of a fee schedule adopted by resolution of the Commission and shall be payable at such time or times as the Commission may require. The failure to pay the connection charge at or before the time the connection is made shall be subject to additional fees or penalties as the Commission shall determine. Additional rules implementing District connection charges shall be set forth in District Regulations for Conveyance Facility Connection Charges and Treatment Plant Connection Charges.

Section 4.4. Prohibited Connections.

4.4.1. Septic Tank Connections.

No connection shall be made to any sanitary sewer within the District if the connection pipe is carrying any contents from a septic tank, unless said septic tank is serving as a pretreatment process which has been required or permitted pursuant to Chapter 8.

4.4.2. Building Foundation Drains.

No connections shall be made to any sanitary sewer within the District if the connection pipe is carrying flow from a building foundation drain, unless the District has determined that no feasible alternative exists and that the connection would not materially impair the functioning of District sewers.

4.4.3. Combined Sewers.

No sewer intended to serve as a sanitary sewer and a storm sewer, also known as a combined sewer, shall be connected to any sanitary sewer within the District.

4.4.4. Backwater Protection.

No connection of a building drain subject to backflow or backwater shall be made to any sanitary sewer within the District unless it is protected with a backwater valve or sump with pumping equipment as specified in the Wis. Admin. Code § SPS 382.30(11)(a)(2).

Section 4.5. Mandatory Connections.

4.5.1. Connections Required.

Each Community Customer shall require by ordinance that every owner of a parcel of land within its corporate limits to connect to a public sewer whenever all of the following conditions exist:

(a) The parcel of land is adjacent to a public sewer;

(b) There is located upon such parcel a building or other structure used or usable for human habitation or occupancy or for the conduct of any trade, business or industry; and

(c) Such building or structure is being served by a private sewage disposal system or treatment works.

4.5.2 Timing of Connection.

Such connection shall be made no later than twelve (12) months after the installation of the public sewer adjoining such parcel.

Section 4.6. Maintenance of Community Sewers.

4.6.1. CMOM and Infiltration/Inflow Requirements.

(a) All Community Customers shall comply with the requirements of Wis. Admin. Code § NR 210.23 to establish and implement a capacity, management, operation and maintenance program (CMOM) for its Community Sewers by August 1, 2016. Community Customers shall prepare written documentation of the CMOM program components and provide a copy of such documentation to the District on request. Community Customers shall provide the District with a copy of their compliance maintenance annual report (CMAR) by June 30th of the calendar year for each year following August 1, 2016.

(b) All Community Customers are required to control excessive infiltration and inflow (I/I). Excess inflow and infiltration is defined as any sewer having an hourly wet weather flow peak greater than four (4) times the average daily dry weather flow or hourly peaks greater than four (4) times the typical daily wastewater-only flow anticipated for the served area based on water meter records. The District may also identify excess inflow and/or infiltration as determined by a professional engineer during the conduct of an I/I study. Any Community Customer having excessive infiltration and inflow will be required to submit a corrective action plan to the District that identifies steps that they will take to timely reduce I/I to acceptable levels.

4.6.2. Reporting of Community Sewer Overflows.

In the event of a bypass or spill of Wastewater from any Community Sewer, the Community Customer owning the sewer shall notify the District and the Department of Natural Resources immediately upon becoming aware of the situation. The notification shall include the location of the bypass/spill, the reason for the bypass/spill, when the situation is expected to be corrected, and an estimate of the volume or rate of the bypass/spill in accordance with Wis. Admin. Code § NR 210.21.

Section 4.7. Community Sewer Operational Requirements.

4.7.1. Sand and Grease Trap installations.

All Community Customers shall require the installation of grease, oil and sand interceptors at repair garages, gasoline stations, car washes, and other industrial or commercial establishments, where necessary in the opinion of the Director to prevent discharge of sand, flammable wastes, oil or grease in amounts exceeding the limits of Chapter 5. All such traps shall be constructed and maintained by the User at his expense, in accordance with the Wisconsin Plumbing Codes and the specifications of the Community Customer; and shall be readily accessible for cleaning and inspection. No separated solids, oil or grease from such traps shall be disposed of in the sewerage systems, but such waste may be allowed at the Treatment Plant in accordance with the provisions of Chapter 8.

4.7.2. Chloride Reduction.

(a) All Community Customers shall undertake efforts to reduce chlorides into the Community Sewers including the source reduction measures set forth in Wis. Admin. Code § NR 106.90 as appropriate, measures to reduce inflow of road salt laden water into Community Sewers and measures to reduce the direct drainage of road salt laden water from storage or truck loading into Community Sewers. Each Community Customer shall notify the District annually of measures taken.

(b) All Community Customers that own groundwater supply wells shall analyze at least one sample from each well annually for chloride and shall report the results to the District by March 1, for the preceding year.

(c) All Community Customers that hold a municipal separate storm sewer system (MS4) permit from the DNR, and report on deicing activities as part of their MS4 reporting requirements, shall send a copy to the District at the same frequency and at the same time that a report is submitted to DNR. Submittal may be in electronic form as a PDF.

4.7.3. Pharmaceuticals Reduction.

Consistent with the District's effort to eliminate the intentional discharge of unused pharmaceuticals to Community Sewers, all Community Customers shall take reasonable steps to encourage hospitals, nursing homes and other medical facilities within their community to manage and dispose of unused pharmaceuticals in a manner that does not result in intentional discharges of pharmaceuticals to Community Sewers.

4.7.4. Hauled Wastes.

All Community Customers shall take reasonable steps to prevent Hauled Wastes from being discharged into Community or District Sewers except as authorized under Chapter 8.

4.7.5. Restrictions on Storm Drainage and Groundwater.

All Community Customers shall take reasonable steps to prevent Users from direct discharges of stormwater, groundwater, rain water, street drainage, roof runoff, and subsurface drainage into Community Sewers without prior approval of the community and the District, or into Intercepting Sewers without prior approval of the District.

4.7.6. Restrictions on the Discharge of Clear Water.

(a) All Community Customers shall take reasonable steps to prevent Users from directly discharging process water or blow down from processes as such cooling towers into Community Sewers without prior approval of the community and the District, or into Intercepting Sewers without prior approval of the District. Such approval may be granted upon payment of applicable charges and fees and upon compliance with conditions as required by the community and District.

(b) All Community Customers shall take reasonable steps to prevent Users from directly discharging non-contact cooling water or condensate into Community Sewers unless there are no reasonable alternatives and the User has obtained prior approval of the Community Customer and the District. Such approval shall be granted upon payment of applicable charges and fees and upon compliance with conditions as required by the Community Customer and District.

4.7.7. Abandonment of Connections.
All Community Customers shall take reasonable steps to prevent the direct connection of Building Sewers or private sewers to a Community Sewer or Intercepting Sewer and shall require that sewers proposed for abandonment must be plugged according to District and Community Customer standards. The Community Customers shall require that the User of the Building Sewer or private sewer obtain an approval from the Community Customer prior to disconnecting the sewer from the public sewerage system and/or demolishing any buildings or structures which its serves. Community Customers shall provide written documentation to the District for each abandoned connection to a District Intercepting Sewer.

Section 4.8. Record Keeping.
4.8.1. Records of Connection to the Community Sewers.
Records of Building Sewer connections or other connections to Community Sewers shall be kept by the Community Customer in which such connections are made; and information regarding the same shall be furnished to the Director at such times as he/she may require. Community Customers shall notify the District of any new connection when made. Community Customers shall also notify the District of any existing but previously unknown connections when discovered. Information to be furnished regarding Building Sewer connections shall consist of the number of connections for the reporting period, the size of such connections, the nature or character of the Wastewater, and such additional information as the Director may require.

4.8.2. Record Drawings.
Record drawings of a Community Customer's collection system, including Lateral, wye, and tee connections, shall be retained in Community Customer files and updated as needed to reflect changes. A copy of a current plan of the Community Customer's collection system showing all sewers that are tributary to the District shall be submitted by each Community Customer to the District annually at no cost to the District. The plan shall show Lateral, wye and tee connections, manhole inverts, available rim elevations, distances between manholes, pipe sizes, and pipe grades to the extent that this information is available in conformance with the record drawings. Plans shall be submitted electronically in a format that is compatible for use with the District's current Geographic Information System (GIS) software or in a format agreed to by the District. Where plans are not available in said electronic format, written plans shall be of a scale not smaller than one (1) inch = two hundred (200) feet unless otherwise approved.

<u>4.8.3.</u> Community Service Area.

Upon request of the District, each Community Customer within the District shall provide the Director with an accurate real estate description of their respective corporate limits and a map. Thereafter, whenever territory becomes annexed for municipal purposes to a city or village, such municipality shall provide to the Director the following:

(a) The official notice that the municipal annexation has occurred;

(b) The real estate description of the newly annexed areas; and

(c) A map of the newly annexed area.

CHAPTER 5 - LIMITATIONS ON DISCHARGES TO THE SEWERS APPLICABLE TO ALL USERS

<u>Section 5.1. General Limitations on Discharge Characteristics.</u>
All Users shall comply with the limitations in this Chapter.

<u>5.1.1.</u> Limitations Related to Adverse Impacts.
Discharges to the public sewerage system of substances, materials, waters or waste shall be limited to concentrations or quantities, which will not harm the sewers, Wastewater treatment process or equipment; will not have an adverse effect on receiving streams; will not have an adverse effect on the District's biosolids management program; will not endanger persons or property; will not cause adverse environmental effects; and will not constitute a public nuisance.

<u>5.1.2.</u> Limitations Related to the District's WPDES Permit.
No Person shall discharge pollutants into the sewerage system which pass through or interfere with the operation or performance of the District's Treatment Plant and thereby cause or significantly contribute to a violation of the District's WPDES permit and any modification or re-issuance thereof.

<u>5.1.3.</u> Best Management Practices.
Users shall follow Best Management Practices (BMPs) developed or cited by the District for the discharge of any constituents, substances, materials, waters, or waste where the District determines that following these BMPs is necessary to meet the objectives of this Ordinance or the conditions of the District's WPDES permit. Where a BMP is required to implement prohibited discharges under Section 5.2, such BMP shall be considered a specific prohibited discharge under Section 5.2 and pretreatment standards for the purpose of Wis. Stat. § 283.21(2).

<u>Section 5.2. Prohibited Discharges.</u>
<u>5.2.1.</u> General Prohibitions.
No Person shall discharge wastes to a Community Sewer or Intercepting Sewer which cause, or are capable of causing either alone or in combination with other substances:

(a) Obstruction of flow or damage to the Wastewater facilities;

(b) Danger to life or safety or welfare of any persons;

(c) Prevention of effective maintenance or operation of the Wastewater facilities;

(d) Any product of the District's treatment processes or any of the District's residues, biosolids, to be unsuitable for reclamation and reuse or to interfere with reclamation processes;

(e) A Detrimental Effect, a public nuisance, or any condition unacceptable to any public agency having regulatory jurisdiction over the District;

(f) Any sanitary sewer or the District's Wastewater facilities to be overloaded;

<u>5.2.2.</u> Specific Prohibitions.
Prohibited discharges shall include, but not be limited to the following:

(a) Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas which create or contribute to a fire or explosion hazard at the Treatment Plant including, but not limited to, waste streams with a closed cup flashpoint of less than 140°F or 60°C using the test methods in Wis. Admin. Code § NR 66.21.

(b) Pollutants which result in the presence of gases, vapors or fumes within the Sewerage System in a quantity which may cause acute worker health or safety problems.

(c) Any waters or wastes having a pH lower than 5.5 or higher than 11.0 or having any other corrosive property capable of causing damage or hazard to structures, equipment, or treatment works personnel.

(d) Solids or viscous substances which will cause or contribute to obstruction to the flow in sewers or have a Detrimental Effect on the operation of the Treatment Plant.

(e) Petroleum oil, non-biodegradable cutting oil or products of mineral oil origin in amounts that will cause a Detrimental Effect.

(f) Any Wastewater which contains organo-sulfur or organo-phosphate pesticides, herbicides or fertilizers.

(g) Heat in amounts which will inhibit or contribute to the inhibition of biological activity in the Treatment Plant resulting in Interference or causing damage to the Treatment Plant but in no case heat in such quantities that the temperature exceeds 40°C (104°F) at the influent to the POTW Treatment Plant unless the DNR at the request of the District, has approved alternate temperature limits.

(h) Radioactive wastes which, alone or with other wastes, result in releases which violate rules or regulations of any applicable state or federal agency.

(i) Wastewater containing more than 50 milligrams per liter of non-polar petroleum oil, non-biodegradable cutting oils, or products of mineral oil origin as measured by the silica gel treated hexane extractable material (SGT-HEM) analytical method.

(j) Wastewater containing more than 300 mg/l of polar oil or grease of animal or vegetable origin as determined by subtraction of non-polar (SGT-HEM) analytical results from hexane extractable material (HEM) analytical results.

(k) Wastewater containing polychlorinated biphenyls.

(l) Wastewater which in concentration of any given constituent or in quantity of flow exceeds for any period of duration longer than fifteen (15) minutes more than five (5) times the average twenty-four (24) hour concentration or flows during normal operation.

(m) Any substance with objectionable color not removed in the treatment process, such as, but not limited to, dye wastes and vegetable tanning solution.

5.2.3. Additional Prohibitions for Industrial Users.
In addition to the requirements that are applicable to Significant Industrial Users in Chapter 6, all Industrial Users shall be subject to the following prohibitions:

(a) Wastewater which contains in excess of any of the following constituents in a twenty-four (24) hour flow proportionate sample made up of an aggregate of the total discharge from all of the outfalls of an Industrial User:

0.25	mg/l cadmium
0.5	mg/l hexavalent chromium
10.0	mg/l total chromium
1.5	mg/l copper
5.0	mg/l lead
0.02	mg/l mercury
0.3	mg/l selenium
3.0	mg/l silver
8.0	mg/l zinc
2.0	mg/l nickel
0.1	mg/l cyanide

Samples shall be collected over the period of discharge if the discharge is less than twenty-four (24) hours in duration and in accordance with the requirements of Section 6.4.2.

(b) Industrial discharges exceeding applicable National Categorical Pretreatment Standards, or State Standards.

(c) Dilution of an industrial discharge for purposes of reducing the pollutant characteristics or concentrations to meet the limitations established in this Chapter, or to meet or exceed the Applicable Pretreatment Standards is prohibited.

<u>5.2.4.</u> Responses by the Director.
If any waters or wastes are proposed to be discharged to the public sewers, in excess of those limitations enumerated in this Chapter, the Director may in the exercise of his reasonable discretion:

(a) Reject the wastes;

(b) Require pretreatment;

(c) Control the quantities and rates of discharge; and/or

(d) Recover the increased costs of handling and treating such wastes from the Person discharging the wastes.

<u>Section 5.3. Obligation to Report Accidental Discharge.</u>
Any Person who accidentally discharges into the public sewerage system wastes or Wastewater prohibited under this Ordinance shall immediately report such a discharge to the Director; and shall report the location of the discharge, the time, the volume, and the type of waste or Wastewater so discharged. Within fifteen (15) days of such discharge, a detailed written statement describing the cause of the discharge and the measures taken to prevent a future occurrence shall be submitted to the Director. Such reporting shall not relieve the Person causing the accidental discharge from any penalties imposed by this Ordinance. Where the Director deems necessary, Industrial Users shall provide facilities to prevent accidental discharges or spills of wastes or Wastewaters prohibited under this Ordinance.

CHAPTER 6 - PRETREATMENT AND OTHER OBLIGATIONS FOR SIGNIFICANT INDUSTRIAL USERS

Section 6.1. Determination of Significant Industrial Users.

6.1.1.

The following Industrial Users shall be considered a Significant Industrial User unless otherwise designated by the Director under Wis. Admin. Code § NR 211.15(4)(d):

(a) All Industrial Users subject to National Categorical Pretreatment Standards and are subject to applicable provisions in Wis. Admin. Code Ch. NR 211.

(b) Any Industrial User that discharges an average of 25,000 gallons per day or more of process Wastewater to the Wastewater Treatment Plant (excluding sanitary, non-contact cooling, and boiler blowdown Wastewater); contributes a process waste stream which makes up five percent or more of the average dry weather hydraulic or organic capacity of the Treatment Plant shall be considered a significant Industrial User under this Ordinance.

(c) Other Industrial Users may be considered a significant Industrial User under this Ordinance by the District on the basis that the Industrial User has a reasonable potential for adversely affecting the Wastewater Treatment Plant's operation or for violating any pretreatment standard or requirement.

6.1.2.

All new Industrial Users and all other Industrial Users shall upon request of the Director submit to the District a Baseline Monitoring Report Form and/or an Industrial Request to Discharge Form that provides information on volume and constituents of the Wastewater.

6.1.3.

All Industrial Users shall notify the Director in advance of any change in its industrial operations which may have an effect upon the waste and Wastewaters generated or of any substantial change in the volume or character of pollutants in their discharge that could affect their status as a Significant Industrial User.

6.1.4.

The District may determine that an Industrial User subject to categorical pretreatment standards is a non-Significant Industrial User (NSCIU) rather than a Significant Industrial User if the conditions in Wis. Admin. Code § NR 211.15(4)(d) are met.

Section 6.2. Permit Requirements for Significant Industrial Users.

6.2.1. Permit Application.

Significant Industrial Users shall make written application to the Director for the issuance of a Permit to Discharge.

<u>6.2.2.</u> Permit Provisions.

The Director has the authority to issue a permit to the Significant Industrial User, and impose necessary conditions which shall include, but not be limited to:

(a) The name, address and telephone number of the Industrial User; and the identity of an authorized representative to act on its behalf.

(b) A description of the Industrial User's permitted connection or connections to the public sewer system and its location.

(c) The average and/or maximum limits of various Wastewater constituents which may be discharged by such user.

(d) Any limit on the maximum rate of industrial discharge or the time of the discharge.

(e) A requirement for a monitoring manhole or some other means to collect a Representative Sample of the Industrial User's discharge.

(f) A description of both the frequency of self-monitoring that is required and of the method of sample collection.

(g) Reports which must be submitted to the District and the frequency of report submittal.

(h) A compliance schedule for construction of pretreatment facilities if required.

(i) The requirements for records retention.

(j) The notification procedure to be followed if the Industrial User intends to change the characteristics of its Wastewater discharge.

(k) A statement concerning the District's right to inspect the industry's facilities.

(l) The agreement of the holders of the permit to indemnify the District from and against any and all liability for injury or damage arising out of or related to the activities of the holder in discharging Industrial Waste.

(m) A statement of the Applicable Pretreatment Standards or National Categorical Pretreatment Standards that the User must abide by.

(n) A statement that a violation of pretreatment requirements as specified in Chapter 6 shall be subject to various penalties as listed in this Ordinance.

(o) A summary of BMPs required to be implemented if applicable. User maintained documentation of BMP activities that demonstrate the compliance status of the User shall be considered compliance records. Such records must be retained by the User in accordance with industrial pretreatment program requirements.

6.2.3. Effect of New National Standards.
Upon promulgation of National Categorical Pretreatment Standards for a particular Industrial User subcategory, the Federal standards (if more stringent than the limitations imposed under this Ordinance) shall immediately supersede the limitations imposed under this Ordinance; and each Industrial User shall comply with the applicable Federal standards. The District shall notify all affected Users of the applicable requirements using the procedures specified in 40 C.F.R. § 403.12.

6.2.4. Permit Implementation.

(a) Any permit issued under this Chapter shall be effective for a period not to exceed five (5) years. Any User holding a permit shall apply for a permit reissuance or renewal at least one hundred eighty (180) days prior to the expiration date of the User's existing permit.

(b) Upon issuance of such permit, the Significant Industrial User shall faithfully comply with all provisions of the permit and as contained in this Ordinance, as amended from time to time.

(c) Any existing Significant Industrial User shall notify the Director in writing of the following changes at least ninety (90) days prior to initiating such a change: (i) any proposed discharge of pollutants, previously not being discharged by said User; or (ii) any proposed increase in existing discharges of pollutants, where the increase is greater than twenty-five percent (25%) of existing pollutant levels.

(d) The District reserves the right to amend from time to time any such permit so issued by adding or deleting therefrom such provisions, requirements and conditions as it deems appropriate. The District shall notify the Industrial User of any changes in the permit at least thirty (30) days prior to the effective date of such change. Any change or new condition to the permit shall allow for a reasonable period of time for compliance by the User.

(e) Any permit issued under this Chapter shall be revocable by the Commission summarily for violation of its terms or conditions. In addition, any violation of the conditions of any such discharge permit or this Ordinance shall be subject to the enforcement provisions of Chapter 11.

(f) Permits issued under this Chapter are personal as to the User/holder; and may not be subsequently assigned or transferred by operation of law or otherwise, to any successor or assignee, without the prior written approval of the District.

(g) Dilution of an industrial discharge for purposes of reducing the pollutant characteristics or concentrations to meet the limitations established in Chapter 5 or to meet or exceed the Applicable Pretreatment Standards is prohibited.

(h) The District in its discretion may impose mass limitations on Industrial Users or grant a request for mass limitations by the Industrial User in accordance with Wis. Admin. Code § NR 211.11(3) where the Director determines the imposition of mass limitations is appropriate.

(i) The District may convert mass limitations of categorical pretreatment standards in Wis. Admin. Code Chs. NR 233, NR 235 and NR 279 into equivalent concentrations limits in accordance with Wis. Admin. Code § NR 211.11(3) where the Director determines that imposition of concentration limitations is appropriate.

(j) The District in its discretion may impose concentration limitations on Industrial Users or grant a request for concentration limitations by the Industrial User in accordance with Wis. Admin. Code § NR 211.11(3) where the Director determines the imposition of concentration limitations is appropriate. Dilution to meet a concentration limitation is prohibited.

(k) When the limits in a categorical pretreatment standard are expressed only in terms of pollutant concentrations, the District may convert concentration limits to mass limits in accordance with Wis. Admin. Code § NR 211.11(3).

6.2.5. General Discharge Permit.
The Director may issue and utilize General Permits in accordance with the provisions in Wis. Admin. Code § NR 211.235(1). General Permits may include limitations on concentration and mass of pollutants, may specify Best Management Practices and include other conditions necessary to ensure compliance with applicable limits.

Section 6.3. Pretreatment Facilities.

6.3.1.
Users shall provide Wastewater treatment as necessary to comply with these rules and shall, at the User's expense, achieve and maintain compliance within the time limitations specified by the District. Detailed plans showing the pretreatment facilities and operating procedures shall be submitted to the Director. The review of such plans and operating procedures will in no way relieve the User from the responsibility of modifying the facility as necessary to produce an effluent that will not violate any provision of these rules.

6.3.2.
Any subsequent modification in the pretreatment facilities or operating procedures shall be reported to the Director prior to the User's proposed modification.

Section 6.4. Monitoring and Inspection.

6.4.1. Monitoring Facilities.

(a) The District may require a Significant Industrial User to construct a sampling manhole or other monitoring facility to facilitate collection of a Representative Sample of Wastewater being discharged to the public sewerage system. Construction of such facility must be completed within ninety (90) days after the User has been notified of the requirement, unless the District grants an extension of time. In the event that the Industrial User fails to construct such a facility, the District may do so and shall assess the cost to the Industrial User.

(b) All monitoring facilities shall be constructed at the User's expense, in accordance with the plans approved by the Community Customer and the District. The monitoring facility shall contain the necessary flow monitoring and sampling equipment to facilitate the observation, sampling, and measurement of wastes; and shall be maintained by the User so as to be safe and accessible at all times.

6.4.2. Sampling.

(a) The Director may require the Significant Industrial User to collect Representative Samples of its Wastewater discharge, to analyze the sample for parameters specified by the Director, and to report the results to the District in a timely manner.

(b) The District may elect to independently monitor the discharge of any Industrial User to assess compliance with applicable standards.

(c) Upon finding a violation based on District sampling performed in lieu of the Industrial User, the District will perform repeat sampling and analysis unless the Industrial User is notified of the violation and is required by the District to perform repeat sampling and analysis. Repeat sampling conducted by the Industrial User must be consistent with the requirements under Section 6.5.4(b).

(d) Any samples collected during such monitoring shall follow a strict chain of custody procedure to insure security of the samples and anonymity during analysis.

(e) All measurements and test analyses of the characteristics of Wastewater shall be determined in accordance with methods established by the EPA and contained in 40 C.F.R. pt. 136 and amendments thereto or with any other test procedures approved by the EPA. Sampling shall be performed in accordance with the techniques approved by the EPA. Where 40 C.F.R. pt. 136 does not include a sampling or analytical technique for the pollutant in question, sampling and analysis shall be performed in accordance with the procedures set forth in the EPA publication, "Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants, April 1977," and amendments thereto, or with any other sampling and analytical procedures approved by the EPA.

<u>6.4.3.</u> Inspection.

(a) Agents of Community Customers or of the District shall be allowed access to all monitoring facilities at any time.

(b) District inspectors bearing proper credentials and identification shall be allowed access to all property serviced by the District, for the purpose of inspection, observation, measurement, sampling, and testing of discharges to the Wastewater facilities; or for the purpose of inspection and copying of records kept by Industrial Users relating to pretreatment requirements or reporting.

<u>6.4.4.</u> Request for Information.

The District may require a Significant Industrial User to provide additional information concerning, but not limited to:

(a) Volume, time and peak rate of discharges.

(b) Chemical analysis of discharges.

(c) Raw materials, processes and products relevant to discharge characteristics.

(d) Discharges of specific wastes such as sludge, oil, solvent, or incompatible pollutants.

(e) Plot plans of sewers on the User's property showing locations of sewers, monitoring facilities and pretreatment facilities.
Details of pretreatment facilities.

(f) Details of systems to prevent losses of materials through spills to the municipal sewers.

(g) Documentation of Best Management Practices.

<u>Section 6.5. Reporting Requirements.</u>

<u>6.5.1.</u> General Reporting Obligations.

(a) Any Significant Industrial User shall comply with the reporting requirements of its Industrial Discharge Permit.

(b) All reports required by the Industrial Wastewater Discharge Permit shall be based upon data obtained through appropriate sampling and analysis performed during the period covered by the report, which data is representative of conditions occurring during the reporting period. Where the Industrial User is subject to standards that require compliance with BMP or pollution prevention alternatives, the User shall submit documentation that demonstrates its compliance status.

(c) Reports pertaining to the compliance schedule for any required pretreatment facilities. The discharge permit will specify the type of reports required and the dates when they are due.

(d) A Responsible Corporate Officer, as defined in this Ordinance, shall sign any reports required to be submitted by an Industrial User pursuant to the provisions of this Ordinance.

(e) All reports required by Section 6.6 shall include the following certification statement:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(f) Any effluent data submitted or supplied to the District by any Person or User is a public record within the meaning of Wis. Stat. § 19.21. All other information submitted to the District shall be a public record unless the information is entitled to confidential treatment pursuant to Wis. Stat. § 283.55(2)(c) and Wis. Admin. Code § NR 2.19 as a trade secret. The District may require any Industrial User to provide information about industrial processes which may have an effect on the nature or composition of the industrial discharge; and such information will be kept confidential if the requirements of the aforesaid statute and administrative rule are satisfied. Any information or data obtained by the District which is confidential or constitutes a trade secret shall not be disclosed to unauthorized persons.

6.5.2. Periodic Compliance Report.
Any permittee shall comply with the requirements of its Industrial Discharge Permit for preparing a periodic report of compliance. The report requirements are provided in the permit and may contain outfall average and maximum flow rate data, the volume and fate of any regulated Wastewater hauled off-site, the signed certification statement, and any other certification statements contained in the permit.

6.5.3. Reporting Following National Pretreatment Standard Changes.
(a) 180-Day Baseline Monitoring Report. Industrial Users subject to National Categorical Pretreatment Standards shall submit to the Director this report within one hundred eighty (180) days of the effective date of a National Categorical Pretreatment Standard.

(b) 90-Day Final Compliance Report. In accordance with Wis. Admin. Code § NR 211.15(3) existing Industrial Users subject to National Categorical Pretreatment Standards, must submit a final compliance report to the Director within ninety (90) days following the date for final compliance with the applicable Categorical Pretreatment Standard. For new Industrial Users subject to National Categorical Pretreatment Standards, as well as for Industrial Users subject only to local standards, this report must be submitted within ninety (90) days following the introduction of Wastewater into the public sewer system.

6.5.4. Discharge Monitoring Report.

(a) Permittees with monitoring requirements shall submit Discharge Monitoring Reports (DMR) summarizing outfall analytical data within thirty (30) days of the receipt of the analytical data. Each report shall include the certification statement and the signature of the responsible officer or designee. The DMR shall include the Wastewater flow data from the sampling period. The DMR shall provide the laboratory analysis report. The discharge permit will indicate what parameters must be analyzed and what frequency of sample collection should be followed.

(b) If sampling performed by a permittee indicates a violation, the User shall notify the District within twenty-four (24) hours of becoming aware of the violation. The User shall also repeat the sampling and analysis for the parameters showing violation and submit the results of the repeat analysis to the District within thirty (30) days.

(c) If a permittee monitors any pollutant more frequently than required by the District, using analytical methods specified in the permit, the results of this monitoring shall be included in reports and submitted to the District.

(d) As part of an SIU permit, the Director may authorize a monitoring waiver for individual pollutants or reduce the frequency of reports for certain discharges in accordance with Wis. Admin. Code § NR 211.15(4).

6.5.5. Reports of Upsets, Spills, Slugs, and Bypasses.

(a) Each Industrial User shall notify the Director, the EPA Regional Waste Management Division Director, and the Wisconsin Department of Natural Resources Bureau of Solid Waste Management in writing of any discharge into the District’s treatment system of a substance which, if otherwise disposed of, would be a hazardous waste under 40 C.F.R. pt. 261. Notification is not complete until the Director or its designee personally responds and acknowledges receipt of the notification. The initial notice of a hazardous waste discharge shall be followed by a written notice to the Director from the Industrial User within five (5) business days.

(b) In accordance with Wis. Admin. Code § NR 211.15, each Significant Industrial User shall notify the Director immediately in the event of a slug discharge of waste, an upset of either the User's industrial process or its pretreatment facilities, or a period of noncompliance with general prohibitions. Such Significant Industrial User shall provide a written or oral notification within twenty-four (24) hours after the occurrence of such event and shall provide the detailed written statement referred to in Section 5.3 to the Director within the time period established therein.

Section 6.6. Slug Control.

In accordance with Wis. Admin. Code § NR 211.235, the District will evaluate whether each Significant Industrial User needs a plan to control slug discharges. For Significant Industrial Users new to the District pretreatment program, this evaluation shall occur within one (1) year of issuance of the industrial Wastewater discharge permit. If the District determines that a slug control plan is needed, the industrial Wastewater discharge permit will contain requirements to prepare and implement a slug control slug plan.

6.6.1. Slug Control Plan.

The slug control plan shall contain at a minimum the following elements:

(a) A description of discharge practices, including non-routine batch discharges.

(b) A description of stored chemicals.

(c) Procedures for immediately notifying the District of Slug Discharges, including any discharge that would violate a general prohibition or specific prohibited discharge standard, with procedures for follow-up written notification within five (5) days.

(d) The necessary procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transferals, loading and unloading operations, control plant site runoff, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants including solvents, and/or measures and equipment of emergency response.

6.6.2. Changes in Slug Load Potential.

In accordance with Wis. Admin. Code § NR 211.15, each Significant Industrial User is required to notify the District immediately of any changed circumstances at its facility affecting the potential for a Slug Discharge. The permittee shall provide notification to the District at least forty-five (45) days prior to any planned changes to chemical storage facilities. Based on these changes, the District may determine that a slug control plan is needed. If so, the plan shall at a minimum contain the elements listed in Section 6.6.1. The District, at any time, based on inspection or responses to events, may determine that a slug control plan shall be prepared by a Significant Industrial User. The industrial Wastewater discharge permit will be revised to contain requirements to control Slug Discharges.

Section 6.7. Bypass Provisions.

6.7.1.

An Industrial User may allow a bypass of its pretreatment facilities to occur which does not cause pretreatment standards or requirements to be violated, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Sections 6.7.2, 6.7.3 and 6.7.4.

6.7.2.

If an Industrial User knows in advance of the need for a bypass it shall submit prior notice to the District, if possible, at least ten (10) days before the date of the bypass.

6.7.3.

An Industrial User shall submit oral notice of an unanticipated bypass that exceeds Application Pretreatment Standards to the District within twenty-four (24) hours from the time the Industrial User becomes aware of the bypass. A written submission shall also be provided within five (5) days of the time the Industrial User becomes aware of the bypass. The written submission shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times, and, if the bypass has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

6.7.4.

Bypass of pretreatment facilities is prohibited and the District may take enforcement action against an Industrial User for a bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There was no feasible alternative to the bypass, such as the use of auxiliary treatment facilities retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The Industrial User submitted notices as required under Section 6.7.2 or Section 6.7.3.

Section 6.8. Records Retention.
6.8.1.
Significant Industrial Users shall retain and preserve for no less than three (3) years any records, books, documents, memoranda, reports, correspondence, and all summaries relating to monitoring, sampling, and chemical analyses made by, or on behalf of, a Significant Industrial User in connection with its discharge. Included in this requirement is the preservation of documentation of Best Management Practices employed as a result of Ordinance or permit requirements.

6.8.2.
Significant Industrial Users shall retain and preserve all records that pertain to matters that are the subject of special orders or any other enforcement or litigation activities brought by the District until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

Section 6.9. Violations of Pretreatment Requirements.
6.9.1.
Each Industrial User shall strictly comply with all provisions of this Ordinance. A violation of this Ordinance may lead to enforcement actions by the District.

6.9.2.
Without limiting the foregoing, the following events related to pretreatment shall constitute a violation of this Ordinance and may cause enforcement proceedings to be commenced by the District under Chapter 11.

(a) Failure to notify the District of a new or increased discharge.

(b) Failure to submit the reports required under 40 C.F.R. § 403.12 in a timely manner.

(c) Failure to submit self-monitoring reports in a timely manner.

(d) Failure to meet the dates specified in the compliance schedule for construction and operation of pretreatment facilities.

(e) Failure to meet applicable local (including, but not limited to the District), state or federal pretreatment standards for discharge quality.

(f) Failure to notify the District of an accidental discharge or Slug Load.

(g) Untruthfully reporting results on any report submitted to the District or Director.

(h) Any other failure to comply with the provisions of this Ordinance or of any conditions in a permit.

CHAPTER 7 - REQUIREMENTS FOR CERTAIN COMMERCIAL AND INDUSTRIAL USERS

Section 7.1. Discharges from Dental Clinics.

7.1.1.

This Section applies to discharges from dental clinics where amalgam is placed or removed. For the purpose of this Section, a dental clinic is a non-mobile facility dedicated to the examination and treatment of patients by health care professional specializing in the care of teeth, gums and other oral tissue. This Section does not apply to orthodontics, periodontics, oral and maxillo-facial surgery, endodontics, prosthodontics or other practices that do not place or remove amalgam, or which are identified by the District as *de minimis* contributors.

7.1.2.

Dental clinics that place or remove amalgam shall implement Best Management Practices for amalgam as established by the Wisconsin Dental Association.

7.1.3.

Dental clinics shall install, operate and maintain an amalgam separator meeting the criteria of the International Standards Organization (ISO 11143) for every vacuum system receiving amalgam waste. Amalgam separators shall be installed, operated, and maintained according to instructions provided by the manufacturer. The amalgam separator shall have a design and capacity appropriate for the size and type of vacuum system.

7.1.4.

Dental clinics will annually submit reporting information to the District using forms provided by the District. Reporting information may include:

(a) Certification that the amalgam separator is operated and maintained in accordance with instructions provided by the manufacturer.

(b) Certification that Best Management Practices for amalgam as established by the Wisconsin Dental Association are being implemented.

(c) Any other information deemed relevant by the District.

7.1.5.

Dental clinics shall obtain recycling records for each shipment showing the volume or mass of amalgam waste shipped, the name and address of the destination, and the name and address of the contractor. Dental clinics shall maintain these records for a minimum of three (3) years. Dental clinics shall make these records available to the District for inspection and copying upon request by the District.

7.1.6.
Dental clinics shall allow the District to inspect the vacuum system, amalgam separator, amalgam waste storage areas, and other areas deemed necessary by the District to determine compliance with this Section. Inspections shall occur during the normal operating hours of the dental clinic.

Section 7.2. Special Permits for Commercial or Industrial Users.
7.2.1.
The District may require a permit under this Section for Commercial or Industrial Users to regulate the discharge wastes and Wastewater to a community or Intercepting Sewer that have the potential individually or cumulatively to impact the ability of the District to meet its WPDES Permit requirements or impact the ability of the sewer system to convey Wastewater to the Wastewater Treatment Plant. Such wastes and Wastewaters include but are not limited to:

(a) Chloride.

(b) Stormwater, groundwater, rain water, street drainage, roof runoff, and subsurface drainage.

(c) Unpolluted water, including but not limited to, cooling water, process water or blow down from cooling towers or evaporative coolers, or swimming pool waters.

(d) Temperature or thermal loads.

(e) Pharmaceuticals.

(f) Mercury or other toxic chemicals.

7.2.2. Permit Process.
(a) The District shall notify a Commercial or Industrial User if the District determines that a permit is necessary.
(b) The District shall specify the information required to be submitted to process the permit application. The User shall provide such information with sixty (60) days of the information request.

(c) The provisions of Section 6.2.4 apply except as modified by the permit.

7.2.3.
Permits under this Section may require the following provisions:

(a) A written application containing the name, address and telephone number of the User; and the identity of an authorized representative to act on its behalf.

(b) The imposition of average and/or maximum limits of various Wastewater constituents which may be discharged by such User.

(c) The requirement to use Best Management Practices, source reduction or treatment as appropriate.

(d) The description of any sampling, monitoring or reporting requirements.

(e) A compliance schedule for construction of pretreatment facilities if required.

(f) A statement concerning the District's right to inspect the industry's facilities.

(g) Other terms and conditions deemed necessary by the District to effectively regulate the discharge of concern.

(h) A time limit for the permit not to exceed five (5) years.

7.2.4.

The District may utilize a General Permit to address a category of commercial or industrial dischargers with similar discharge characteristics. General Permits may include limitations on concentration and mass of pollutants, may specify Best Management Practices and include other conditions necessary to ensure compliance with applicable limits.

CHAPTER 8 - LIMITATIONS ON DISCHARGES OF SEPTAGE AND OTHER HAULED WASTES

Section 8.1. Discharge into Sewers Prohibited.
Except as provided in this Chapter, no Person shall discharge Septage or any other Hauled Waste into a Community Sewer or Intercepting Sewer.

Section 8.2. Discharge at the District's Receiving Facilities.
8.2.1.
Discharges of Septage and other Hauled Wastes by a licensed disposer may be allowed at a District receiving station but only in such manner and at such place as may be designated by the Director and subject to the provisions of this Chapter.

8.2.2.
The Hauler desiring to discharge such wastes shall first make application to the Director for a permit to discharge under this Chapter.

8.2.3.
The Hauler making the discharge shall pay to the District all applicable fees and sewer service charges based on the characteristics of the discharge; and any additional costs or expenses associated with the provision of additional facilities or personnel necessary to accept such waste at the point of introduction into the District's Wastewater Treatment Plant.

Section 8.3. Permits to Discharge Septage and Other Wastes.
8.3.1.
No discharge of Septage or Hauled Wastes shall be made unless the Hauler making the discharge has been issued a permit under this Section.

8.3.2.
All applications for a permit shall be in writing; shall contain such information as the Director deems appropriate. No permit once issued shall be assignable or transferable and no holder of any permit shall acquire any vested right or privilege in the permit.

8.3.3.
A Hauler seeking a permit shall apply to the District prior to September 1 for a permit. A permit shall be valid for a period of one (1) year, beginning on September 1, and expiring on August 31 of each year unless the District decides to issue a permit for a longer period not to exceed five (5) years.

8.3.4.
The District may require the applicant to pay an annual fee in such reasonable amount as it may determine as a condition precedent to the issuance of such.

8.3.5.
Any permit shall be revocable by the Director summarily for violation of the terms or conditions the permit.

8.3.6.
Any Person discharging Hauled Waste in violation of this Chapter shall be subject to enforcement under Chapter 11.

Section 8.4. Permit Requirements.
If the Director determines to issue a permit, such permit may be issued upon such terms and conditions including but not limited to the following:

8.4.1.
The District shall have the right to reject and refuse to accept Septage or other wastes from the Hauler if:

(a) Treatment of the waste would cause the District's Sewerage System to exceed its operating design capacity or to violate any applicable effluent limitations or standards, water quality standards or any other legally applicable requirements, including court orders or state or federal statutes, rules, regulations or orders;

(b) The waste is not compatible with the District's Sewerage System or contains wastes otherwise prohibited under this Ordinance;

(c) The Hauler fails to comply with waste disposal rules promulgated by the District from time to time or fails to pay the appropriate sewer service charges in a timely manner.

8.4.2.
The Director may impose reasonable terms and conditions for Septage or other Hauled Waste disposal into the Wastewater Treatment Plant relating to the following:

(a) Specific quantities, locations, times and methods for discharge of such wastes into the District's Sewerage System;

(b) Requirements to report the source and amount of such wastes placed in the District's Sewerage System; and

(c) Requirements that the Hauler analyze Representative Samples of the waste placed in the District Sewerage System in order to determine the characteristics of the waste and the compatibility of the waste with the District's Sewerage System.

8.4.3.

If the District's Sewerage System can accept some, but not all, of the Septage or other Hauled Wastes offered for disposal, the Director may accept such waste which is generated within the geographic boundaries of the District before accepting such wastes which are generated outside of the boundaries of the District.

8.4.4.

The District reserves the right to sample Hauled Waste loads and inspect truck log books at any time without prior notice. The District may request copies of the Hauler's invoices to its clients as documentation of the content of Hauled Waste loads.

8.4.5.

The agreement of the Hauler to indemnify the District from and against any and all liability for injury or damage arising out of or related to the activities of Hauler in exercising the rights granted. The District may require the Hauler to post a bond written by a bonding company licensed to transact business in Wisconsin, to guarantee performance.

8.4.6.

The agreement of the Hauler to have in full force and effect sufficient worker's compensation insurance, public liability and property damage insurance.

Section 8.5. Permit Exceptions.

8.5.1.

Upon notice and approval of the Director, a permit under this Chapter is not required for the following:

(a) The temporary transfer of sewage from a Community Sewer or a District Interceptor to allow for maintenance or repair of a Community Sewer or District Interceptor sewer.

(b) Emergency response actions as determined by the Director

(c) Temporary actions resulting from analytical activities.

8.5.2.

The Director may utilize a General Permit to address a category of waste haulers with similar discharge characteristics.

CHAPTER 9 - SERVICE CHARGES

Section 9.1. District Service Charges.
Sewer service charges to each Community Customer shall be based on Wastewater parameters established from time to time by the Commission. The sewer service charge rates shall consist of the sum of the District's User charge rates and the District's debt service rates.

Section 9.2. User Charge Rates.
The District shall determine, from time to time, User charge rates based on the District's annual operations and maintenance expense, the annual administrative budget, the quantity and quality of Wastewater received at the District's Wastewater Treatment Plant, the total number of Equivalent Meters in service in the District and the total number of actual Users as determined by the Director. Such rates shall reflect the unit costs for administration and for transporting and treating the quantity and quality of Wastewater discharged to the District's Wastewater facilities.

Section 9.3. Debt Service Rates.
The District shall determine debt service rates based on the District's annual debt service, and/or capital improvement budget, the quantity and quality of Wastewater received at the District's Wastewater Treatment Plant, and the total number of actual Users and Equivalent Meters in service in the District, as determined by the Director. Such rates shall reflect the unit costs for construction of facilities funded with the indebtedness being retired, and for capital improvement projects funded directly from revenues raised by the District from other sources.

Section 9.4. Measurement.
The unit of volume measurement for Wastewater discharged into the District's Wastewater collection and treatment facilities shall be gallons, United States liquid measure. The unit for assessing costs with respect to strength Wastewater parameters shall be pounds.

Section 9.5. Annual Review.
The District's sewer service charge rates shall be reviewed at least annually by the Commission for purposes of establishing appropriate rates so as to generate sufficient revenues to pay for the debt service, administrative, and the operation and maintenance expenses (including replacement costs) of the District's Wastewater facilities.

Section 9.6. Sewer Service Charge Calculations.
Sewer service charges for each of the Community Customers shall be calculated based on the quantity and quality of the Wastewater contributed by such Community Customer as determined by the District; and on the number of actual Users and Equivalent Meters in service within the boundaries of each Community Customers as determined by the District; and such additional Wastewater parameters as may be established by the Commission from time to time. The form of the service charge calculation shall be:

SC = (V x VR) + (B x BR) + (S x SR) + (N x NR) + (P x PR) + (AU x AUR) + (EM x EMR)

Where:	SC	=	total service charge
	V	=	volume of wastewater discharged
	VR	=	service charge volume rate
	B	=	quantity of CBOD discharged
	BR	=	service charge CBOD rate
	S	=	quantity of TSS discharged
	SR	=	service charge TSS rate
	N	=	quantity of TKN discharged
	NR	=	service charge TKN rate
	P	=	quantity of TP discharged
	PR	=	service charge TP rate
	AU	=	number of actual users
	AUR	=	service charge Actual User rate
	EM	=	number of Equivalent Meters
	EMR	=	service charge Equivalent Meter rate

The Commission reserves the right to adjust, amend, repeal or modify the above calculation by resolution at any time hereafter. Sewer service charges shall be billed quarterly as hereinafter provided, upon the approval of the Commission.

Section 9.7. Special Charges.

Whenever any User discharges wastes into any public Sewerage System which cause physical damage to the District's Wastewater facilities and/or which cause the District to incur unusual additional costs, the District may assess a special charge against such User for the work required to repair the facilities and/or to recover the unusual additional costs. Special charges shall be in addition to the service charges specified herein; and shall be billed directly to the User.

Section 9.8. Special Assessments.

Nothing contained in this Article or elsewhere in this Ordinance shall be construed as prohibiting or precluding the Commission from assessing and levying special assessments against property, pursuant to Wis. Stat. § 200.13, as amended from time to time.

Section 9.9. Municipal Service Charge Rates for Individual Sewer System Users.

Each Community Customer shall adopt and maintain in effect rates and rules associated with municipal service charge rates for individual Sewerage System Users in compliance with Wis. Stat. § 281.58(14)(b), and any administrative rules promulgated thereunder.

CHAPTER 10 - BILLING AND COLLECTION

Section 10.1. Billing and Payment.
Sewer service charges shall be billed to each Community Customer on a quarterly basis, unless circumstances require a delayed billing. Such charges shall be payable by the Community Customer to the District on or before the fifteenth day of the month after the month of such billing, unless the District has extended the time for payment.

Section 10.2. Delinquent Payments.
Sewer service charges, connection fees or other charges due from any Community Customer or User shall be deemed to be a debt due to the District from that Community Customer or User and shall be deemed to be delinquent if not paid in accordance with the provisions of this Ordinance. Interest shall be paid on any such amounts that have been delinquent at the rate of 1.0% per month until paid, or at such rate or rates as the Commission may set by Resolution. If such sewer service charges, connection fees or other charges remain delinquent for thirty (30) days, the Commission may, on behalf of the District, commence an action in a court of competent jurisdiction, and recover from such Community Customer the amount of such delinquency and any damages sustained by the District as a result of the Community Customer's or User's failure to pay, and such costs and expenses as may be allowed by law. Any Community Customer or User which receives sewerage service without paying sewer service charges when due shall be deemed to have waived any statutory or ordinance requirement that the District first file with such Community Customer notice of claim and a claim for monies due, as a condition precedent to the commencement of any such action.

Section 10.3. Alternative Remedies.
As an alternative to collection of delinquent sewer service charges, connection fees or other charges as provided in Section 10.2, the District may require any such Community Customer to levy and collect sewer service charges in the manner provided for in Wis. Stat. §§ 66.0821(4) and (7) and 200.13(3)(b), as amended from time to time.

Section 10.4. Remedies Cumulative.
All remedies provided for in this Ordinance are distinct and cumulative to any other right or remedy under this Ordinance or afforded by law or equity; and may be exercised by the District concurrently, independently, or successively.

CHAPTER 11 - ENFORCEMENT AND ABATEMENT

Section 11.1. Violations Constituting Public Nuisances.

11.1.1.

Any violation by any person of the provisions of this Ordinance or any other rule, regulation or special order promulgated by the Commission or District shall constitute a public nuisance, pursuant to the authority and provisions of Wis. Stat. § 200.11(l)(d),. As such a public nuisance, the same shall be enjoined and this Ordinance, rule, regulation or special order shall be enforced, all as provided for in Wis. Stat. § 823.02, as amended from time to time.

11.1.2.

Any person found in violation of this Ordinance or any other rule, regulation or special order, shall pay to the District such damages, losses or expenses as may be sustained by the District as a result of the violation, together with such costs as may be collectible by law.

11.1.3.

The Commission may proceed to enforce this Ordinance or any other rule or regulation promulgated by it, by the commencement of an action for enforcement under Wis. Stat. § 823.02, or by the issuance of a special order under Section 11.3. Any remedies or rights of the District as provided for in this Ordinance with respect to violation or of any rule, regulation, or special order, are deemed to be cumulative, and in addition to those provided for by any other law.

Section 11.2. Notice of Violation.

Any person found by the Commission or the Director to be in violation of any provision of this Ordinance or any rule or regulation promulgated by the Commission, shall be given written notice stating the nature of the violation. In the event the Commission or Director decides to issue a special order under Section 11.3 for the remedy of such violation, the special order shall contain the notice of violation.

Section 11.3. Special Orders, Appeals and Penalties.

11.3.1.

In the event of any violation of the provisions of this Ordinance, or any other rule or regulation promulgated by the Commission or District, the Commission may issue a special order in the name of the District directing the person causing the violation to comply with such Ordinance, rule or regulation within a specified time. All special orders shall be in writing and shall specifically state what action is required to comply with the order. The order may specify the duration of the order. Service and proof of service of any special order shall be made in the manner provided for service of summons and proof.

11.3.2.
The Director of the District is hereby authorized and empowered to issue special orders in the name of the District in an emergency to prevent damage to the District's Sewerage System from misuse or injury to employees of the District; Interference with the process of sewage treatment or disposal; or substantial risk to the public health and welfare. Any special order issued by the Director is effective and enforceable upon service as provided for in Section 11.3.1 above. Such order shall be in writing and shall specifically state what action is required to comply with the order.

11.3.3.
Any person aggrieved by a special order issued by the Commission or Director, which order directly affects the rights or duties of the person may secure a review of such order by the Commission. Such review shall be in accordance with the requirement of Wis. Stat. § 200.45(2)(b).

11.3.4.
A person is declared to be creating a public nuisance enjoinable under Wis. Stat. § 823.02, if such person:

(a) Fails to comply with a special order of the Commission or Director within the time period specified, or

(b) Fails to comply within twenty (20) days after the determination becomes final, or

(c) Fails to begin in good faith to obey such order.

11.3.5.
For each day the failure continues, such person shall forfeit to the District the sum of $10,000 per day; and in addition, the District may pursue all remedies provided for in Wis. Stat. §§ 283.91(2) and (5).

Section 11.4. Emergency Actions Regarding Industrial Discharges.
The Director may suspend the Wastewater treatment service to an Industrial User, whenever it appears to the Director that an actual or threatened industrial discharge presents or threatens an imminent or substantial danger to the health or welfare of persons; a substantial danger to the environment; an Interference with the operation of the District's Wastewater Treatment Plant; or violates any pretreatment limits imposed by the Ordinance. The Director shall notify such an Industrial User in the event of a determination to suspend Wastewater treatment service hereunder; and such User shall cease all such discharges immediately. Actions of the Director under this Section shall be implemented by means of the issuance of a special order under Section 11.3.

Section 11.5. Appeals From Determinations of the Director.

11.5.1.

Any person having a substantial interest which is adversely affected by an administrative determination of the Director may have such determination reviewed as provided for herein. Only administrative determinations described in Wis. Stat. § 68.02 are subject to review. Such person shall make written request to the Director within thirty (30) days of the administrative action complained of. The request for review shall state the grounds upon which such person contends that the determination should be modified or reversed. Upon receipt of such request, the Director shall review the determination in accordance with the requirements of Wis. Stat.ch. 227.

11.5.2.

If such person desires to appeal from the final determination of the Director under Subsection (a), such person shall file with the Commission a written notice of appeal. Such notice must be filed within fifteen (15) days of the Director's final determination. Upon the filing of such notice, the Commission shall provide such person with a hearing, to be held in accordance with the provisions of Wis. Stat. §§ 227.48 through 227.48, except as otherwise provided for herein.

11.5.3.

Any appeal to the Commission shall be accompanied by an appeal fee of $50. Said fee may be refundable to the Appellant if the Commission decides in favor of the Appellant. In the event the Appellant desires the hearing proceedings to be taken by a stenographer or by a recording device, the expense of which shall be paid by the Appellant.

Section 11.6. Falsification of Information or Tampering With Facilities.

No person shall knowingly make any false statement, representations, record, report, plan or other document filed with the District or falsify, tamper with, or knowingly render inaccurate any metering device, collected sample or method required under this Ordinance. Any Person who violates this provision, shall be subject to the penalties imposed under this Chapter.

Section 11.7. Publication of Violations.

11.7.1.

In accordance with the requirements of 40 C.F.R. § 403.8(f)(2)(viii) and Wis. Admin. Code § NR 211.23, the District shall publish annually in a newspaper that provides meaningful public notice within the District, a notice identifying those Industrial Users which, at any time during the previous twelve (12) months, were in significant noncompliance with applicable pretreatment requirements.

11.7.2.

A Significant Industrial User has been in significant noncompliance if any of the criteria in (a) through (h) apply. A non-Significant Industrial User has been in significant noncompliance if any criteria in (c), (d), or (h) apply:

(a) Chronic violations of Wastewater discharge limits defined here as those in which sixty-six percent (66%) or more of all the measurements of the Industrial User's Wastewater for the same pollutant parameter taken during a six (6)-month period exceeded (by any magnitude) any numeric pretreatment standard or requirement including an instantaneous limit.

(b) Technical Review Criteria (TRC) violations, defined here as those in which thirty- three percent (33%) or more of all the measurements of the Industrial User's Wastewater for the same pollutant parameter taken during a six (6)-month period equaled or exceeded the numeric pretreatment standard or requirement, including an instantaneous limit, multiplied by the applicable TRC factor (TRC=1.4 for BOD, TSS, fats, oil and grease, and 1.2 for all other pollutants except pH), or in the case of pH exceeded a limit by 0.4 standard units.

(c) Any other violation of a pretreatment standard or requirement that the District determines the Industrial User has caused alone, or in combination with other discharges, Interference, Pass Through, or endangerment of the health of sewer maintenance or Treatment Plant personnel, or the general public.

(d) The Industrial User has discharged any pollutant that has caused imminent endangerment to human health, welfare, or to the environment or has resulted in the District's exercise of its emergency authority under Section 11.4 to halt or prevent such a discharge.

(e) The Industrial User has failed to meet within ninety (90) days of the scheduled date a compliance schedule milestone contained in an industrial Wastewater discharge permit or enforcement order for starting construction, completing construction, or obtaining final compliance.

(f) The Industrial User has failed to provide within forty-five (45) days of a deadline a required report containing all monitoring results and other information such as a baseline monitoring report, ninety (90)-day compliance report, periodic self-monitoring report, or report on compliance with a compliance schedule.

(g) The Industrial User has failed to accurately report noncompliance.

(h) The District has determined that any other violation or group of violations, which may include a violation of required Best Management Practices, by the Industrial User has adversely affected the operation or implementation of the District's pretreatment program.

Sewer Use Ordinance Initial Adoption and Revision History

Action	Date	Effective
Adoption	September 10, 1984	
Revised	December 10, 1991	
Revised	February 12, 1996	
Revised	February 26, 2007	
Revised	June 14, 2010	
Revised	July 30, 2015	
Revised	July 27, 2017	August 18, 2017
Typographical Edits Revised	January 22, 2021	January 22, 2021

APPENDIX E – MADISON METROPOLITAN SEWERAGE DISTRICT INTERCEPTOR MAINTENANCE PROGRAM GUIDELINES (2009)

MADISON METROPOLITAN SEWERAGE DISTRICT

Protecting Public Health and the Environment

INTERCEPTOR MAINTENANCE PROGRAM GUIDELINES

Original: July, 1999
1st Revision: January, 2000
2nd Revision: April, 2008
3rd Revision: November, 2009

Table of Contents

List of Tables

Introduction

MMSD's wastewater collection system currently includes 17 regional pumping stations, 95 miles of gravity interceptors, 44 miles of forcemains (which includes 15 miles of effluent forcemains and 29 miles of raw wastewater forcemains), and 1,594 manholes. The statistics of the MMSD collection system are summarized on the following page.

The MMSD collection system is an important part of the public works infrastructure in the metropolitan area, and is continuously responsible for transmitting over 40 mgd of raw wastewater to the Nine Springs Wastewater Treatment Plant. The collection system also represents a large investment, with an estimated replacement value over $200 million for the pipeline facilities and over $100 million for the pumping stations.

The purpose of this document is to present a set of guidelines for the maintenance of MMSD's 139-mile system of interceptors and forcemains. These guidelines represent an updated version of the MMSD Interceptor and Forcemain Maintenance Plan that was originally prepared in November of 1992. These guidelines incorporate much of the original plan, but also reflect various changes and strategies that have occurred at MMSD since 1992. Updated aspects of these guidelines include improved methods for systematic workflow & recordkeeping, availability of computerized maintenance management, contracted field locating services, Diggers Hotline membership, development of MMSD's GIS program, and promotion of cross-training.

MMSD Collection System Statistics

Note that statistics apply only to active structures and main segments

Number of Pumping Stations 17 **Today's Date: 10/30/2009**

Length of Main Segments

	Feet	Miles
Gravity	501,667	95.01
Forcemains	234,625	44.44
All Mains	736,292	139.45

	Feet	Miles
Badfish Creek Effl Diversion Forcemain	26,269	4.98
Badgermill Creek Effl Diversion Forcemain	53,765	10.18
Total All Effluent Diversion Forcemains	80,034	15.16
Total All Forcemains w/o Effluent Diversion	154,591	29.28
Total All Mains w/o Effluent Diversion	656,258	124.29

Number of Structures

Gravity Manholes	1,501
Forcemain Manholes	93
All Manholes	1,594
Shut-off Valves	23
Air-Release w/ Automatic Valve	43
Air-Release w/o Automatic Valve	9

Print This Form

Close

As of October 30, 2009

Table 1: Interceptor Maintenance Program At-A-Glance							
	1 Interceptor Evaluations (TV & Cleaning)	**2** Forcemain Gate Valve Exercising	**3** Air Valve Inspection & Maintenance	**4** Siphons	**5** Stoplog & Flapgate Structures	**6** Special Projects, Events and Repairs (Individual items)	**7** Program Coordination & Management
Scope	• Locate MHs • Evaluate flow • Prepare specs • Bid & award • Monitor work • Review inspection results • Log condition into database	Exercise each isolation valve on MMSD forcemains	Inspect each air valve location twice per year. More often if an active valve is problematic. Clean & repair active air release valves as needed.	Clean each siphon via contracted services and inspect access structures on each end of siphon.	Inspect each stoplog, flapgate, structure, etc. Repair as needed.	• MH repairs • Emerg. repairs • High flow events • I/I work • Complaints • Utility coordination • Inspections • Field measurements • Surface Route Insp.	• Planning • Budgeting • Inventories • Contract services • Diggers & Locator • Cross-training • UTILITY log • Preparedness
Quantity	95 miles total in gravity system	21 isolation valves currently in-service (as of Nov. 2009)	• 52 locations total: • 36 active • 11 manual valve only (not auto). • 2 removed • 3 vent pipe only	11 active siphons	• 20 locations total: • 16 active • 4 removed	As needed. Create individual w/o for each specific event	Involves numerous people from different Departments.
Frequency	Approx. 10% of system each year = 8 to 10 miles/yr.	Each valve twice per year	Each active valve twice per year	Each location twice per year	Each active location twice per year	As needed	As needed and on-going
Lead Responsibilities	• CS Supervisor • Sewer Maint. Crew for field work	Sewer Maint. Field Crew, w/direction from CS Supervisor	Sewer Maint. Field crew, w/direction from CS Supervisor	Contracted services, w/direction from CS Supervisor	Sewer Maint. Field crew, w/direction from CS Supervisor	CS Supervisor. & Sewer Maint. Crew as needed. Additional help from Engr. and O&M as required.	Diggers Hotline, Locating Services & UTILITY log managed by Engr. Dept.
Estimated Crew Time	240 manhours, assuming 2 men for 3 weeks, once/yr.	160 manhours, assuming 2 men for 2 hours per valve, twice/yr.	300 manhours, assuming 2 men for 2 hours per valve, twice/yr.	Work bid on a 2 or 3 year basis. Sewer Maint. Crew to assist as req'd.	120 manhours, assuming 2 men for 2 hrs per valve, twice/yr.	480 manhours. Rough estimate. Individual projects and events will vary from year to year.	Budgeting by CS Supervisor, O&M Dir. & Engr. Dir. Other tasks by CS Sup. & staff as needed.
Work Order Comments	• One WO each year for all work related to TV'ing and Cleaning.	• Two WO's each year. • 21 tasks on each WO. • See Table 2	• Two WO's each year. • 36 tasks on each WO. • See Table 3	• One WO each year • 11 tasks on each WO • See Table 4	• Two WO's each year • 16 tasks on each WO • See Table5	• Create WO's for each event. • Track costs to asset • Costs and time will vary from year to year.	• Create WO's for each task. • 9901005 UTILITY screening • 9901006 Diggers Hotline & Locating

Scope of the Work

Table 1 is a summary of the overall interceptor maintenance program at a glance. As shown, the program has been divided into seven areas or subprojects. Each of these areas is outlined below. Program staffing and recordkeeping are discussed in later sections of this document.

Area 1: Interceptor Evaluations

- MMSD formalized its annual Interceptor Evaluation program in the early 1990's.
- The purpose of the evaluations is to keep MMSD current on the physical condition and hydraulic adequacy of its individual gravity interceptors, and to allow informed decisions regarding the need for significant rehabilitation or replacement projects.
- The program includes televising, cleaning, manhole inspection, flow documentation, and various other work. See the detailed work outline attached as an appendix to this document.
- Interceptor evaluations have been performed on roughly 10% of MMSD's gravity mileage each year (i.e. an average of about 9 miles per year).
- The program has been successful in identifying system needs prior to their becoming emergencies, and has allowed MMSD to more efficiently plan, budget and carry out the necessary repairs and rehab projects.
- Project examples have included MMSD's East Interceptor Replacements Phase III and IV, East Interceptor Rehab/Relining Phase V, South Interceptor Replacement, West Interceptor Replacement at UW Campus, PS2 Forcemain Replacement, Crosstown Forcemain Replacement, North Basin Interceptor, and numerous cured-in-place lining projects.
- The interceptor evaluation program seems to work for MMSD, and should be continued at the rate of approximately 10% per year. An average evaluation interval of about 10 years is a reasonable time frame for a gravity interceptor facility.
- The main new strategies are aimed at the systematic recordkeeping and organization of the work. See program staffing and recordkeeping sections of these guidelines.

Area 2: Forcemain Isolation Valve Exercising

- Table 2 summarizes the exterior isolation valves which formerly existed or which currently exist in MMSD's collection system (not including valves located inside pumping stations). Of the 27 valves listed, 6 have been abandoned/removed and 21 are active (i.e., in-service).
- Some MMSD forcemains were designed with isolation valves just outside of the station, with the primary function to limit possible pumproom flooding in the event of a burst header inside the station.
- In other special cases, isolation valves were added at specific forcemain junction points to allow diversion of flow as part of a construction project.

- Many of the older MMSD isolation valves are double-disc gate valves. As discussed in Sanks and MMSD's Technical Memo, the double disc gate valve is not a particularly good choice for wastewater, since the seating area can become filled with grit and solids, preventing full seating of the valve. At their time of installation, however, double disc valves were the accepted standard for water and wastewater.
- Newer isolation valves (those typically installed after the mid-1990's) are either resilient wedge gate valves or plug valves. These are designed to close better in the presence of grit and solids contained in wastewater.
- Each valve should be regularly exercised and inspected by twice per year.
- Valve exercising verifies that the stem and gearing remain accessible and the valve is in working order.
- Note that valve exercising does not automatically verify that the valve is fully sealing off the flow. Some valves may leak, even though their valve stem exercises freely to closure, and may require additional work to fully close the valve.
- In 1998, MMSD purchased a hydraulic valve operator that is permanently mounted on one of MMSD's trucks. Most buried MMSD valves are accessible by this truck-mounted valve operator, thus allowing the valve to be exercised via power. However, a few valves still require manual operation (i.e., turning by hand).

Table 2: Force Main Isolation Valves

#	Forcemain	MH Station	Comments	Map Sheet
1	Old PS2 FM (30") at Brittingham Park	2-0207 ("Valve 1")	30" double disc gate valve, 1963. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	23.3 Madison
2	Crosstown FM at Brittingham Park	2-0035 ("Valve 2")	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.3 Madison
3	Crosstown FM at Brittingham Park	XT-0095R ("Valve 3")	20" resilient wedge gate valve, 1997. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.3 Madison
4	Crosstown FM at Bedford Street	XT-3420	20" double disc gate valve, 1914. **ABANDONED DURING CROSSTOWN FM REPLACEMENT IN 2003.**	23.4 Madison
5	Old PS3 FM before junction with old 30" PS2 FM	2-17010	8" hand-operated gate valve. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	30.3 Bl. Grove
6	Old PS4 FM before junction with old 30" PS2 FM	4-0120	16" gate valve, 1967. **ABANDONED DURING PS2FM REPLACEMENT IN AUGUST 2001.**	25.3 Madison
7	PS5 FM near PS5	5-22885	16" Val-Matic plug valve in valvebox, 1996. Normally open. Closes cw, 20 turns.	18.4 Madison
8	PS5 FM at junction with PS15FM	5-22384	16" double disc gate valve, 1959. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.	18.4 Madison
9	PS7 FM (1963) in vault in front of PS7	7-8526	36" double disc gate valve, 1963. Normally open. **Closes ccw**.	20.3 Bl. Grove

Table 2: Force Main Isolation Valves... continued				
#	**Forcemain**	**MH Station**	**Comments**	**Map Sheet**
10	PS7 FM (1963) at NSWTP near Storage Building No. 1.	7-1551	36" double disc gate valve, 1963. Normally open. Closes cw.	30.3 Bl. Grove
11	PS7 FM (1948) at NSWTP near Storage Building No. 1.	7-1546A	36" double disc gate valve, 1963. Normally open. Closes cw.	30.3 Bl. Grove
12	PS9 New FM (1987) in valve box at PS9	9-20582	14" double disc gate valve, 1987. Normally open. Closes cw, 43 turns.	3.2 Dunn
13	PS9 Old FM (1961) in manhole at PS9	9-20594	10" double disc gate valve, 1961. Normally closed. Opens ccw, 28 turns.	3.2 Dunn
14	PS15 Old FM (to West Interceptor/PS8) at Allen Blvd.	15-1360	24" double disc gate valve, 1974. Keep valve open for flow to WI / PS8. Close valve to divert flow to PS16. Closes cw, 74 turns.	12.4Middleton
15	PS15 New FM (diversion to PS16) at Allen Blvd.	15-5587	30" double disc gate valve, 1982. Open for flow to PS16. Closes cw, 70 turns. Note: this valve can be left open even when pumping to WI / PS8.	12.4Middleton
16	New PS2 FM. Behind PS2, closest to bldg. (Valve 1)	10+00	24" Val-Matic plug valve, 2001. Normally open. Closes cw, 60 turns.	23.3 Madison
17	New PS2 FM. Behind PS2, further from bldg. (Valve 2)	10+00	24" Val-Matic plug valve, 2001. Normally closed. Opens ccw, 60 turns.	23.3 Madison
18	PS4 to PS2 bypass. SW of PS2, near air release MH.	11+32	16" Val-Matic plug valve, 2001. Normally closed. Opens ccw, 20 turns.	23.3 Madison
19	New PS2 FM, prior to PS4 tee (behind PS4, near RR).	109+25	36" Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.	25.3 Madison
20	New PS2 FM, after PS4 tee (behind PS4, near RR).	109+41	36" Val-Matic plug valve, 2001. Normally open. Closes cw, 87 turns.	25.3 Madison
21	PS4 FM, prior to connection with new 36" PS2 FM.	109+33	16" Val-Matic plug valve, 2001. Normally open. Closes cw, 20 turns.	25.3 Madison
22	PS3 FM, prior to connection with new 36" PS2 FM.	173+28	8" resilient wedge gate valve, 2001. Normally open. Closes cw, 26 turns.	30.3 Bl. Grove
23	New XTFM. Behind PS2, furthest from bldg. (Valve 3)	0+20 (On connection)	30" Val-Matic plug valve, 2003. Normally open. Closes cw, 80 turns.	23.3 Madison
24	New XTFM. At SW corner of PS1.	9+69	24" resilient wedge gate valve, 2000. Normally open. Closes cw, 73 turns.	6.3 Bl. Grove
25	PS15 FM at junction with PS 5 FM	15-7264	24" resilient wedge gate valve. Normally open. **Closes ccw**, 78 turns. NOTE: This valve is broke in the open position. It is not routinely exercised.	18.4 Madison
26	PS10FM drain valve (at low-point of forcemain)	10-23080	6" plug valve with blind flange. ¼ -turn to open or close.	9.1 BlGr.
27	BM Creek Effluent Return	305+05	6" Waterous resilient wedge gate valve, 19 turns. Used for golf course irrigation trial.	3.3 Fitchburg

Area 3: Air Valve Inspection and Maintenance

- Table 3 summarizes the air valves previously within or currently active within the MMSD collection system. These include 52 valves total: 36 "active" locations with automatic air valves; 11 "active" locations with manual gates valves (not automatic); 2 locations that have been removed; and 3 locations with standpipes (vents) that are open all the time.
- Most of MMSD's air valves are "combination" valves, i.e. they perform both a vacuum breaking function and an air release function.
- The vacuum breaking function admits air into the forcemain during low pressure conditions (such as during pump shutdowns), thus preventing possible vapor cavity formation & water column separations which could lead to waterhammer failures.
- The air release function prevents air pockets from accumulating and potentially restricting the flow at forcemain high points.
- To ensure that each valve remains in working order, each air valve should be inspected and cleaned twice each year. In some cases it may be possible to clean and repair the valve in the field. In most cases, the valve should be removed and returned to the shop where it can be inspected and cleaned prior to reinstallation at the site.

Table 3: Air Valve Locations

#	Forcemain	MH Station	Location & Comments	Map Sheet
1	PS02	2-17710	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and valve removed during 10th addition.***	30.3 BlGr.
2	PS07 (1963)	7-6750	Engel St. near WPS. ***MH with 2" gate valve and ARI automatic valve. 2" gate valve N.C. Opened only as-needed.***	29.2 BlGr.
3	PS08	8-4009	Under Beltline Nob Hill viaduct. ***Manual valve only. No automatic valve at this site.***	36.1 Mad.
4	PS08	8-8079	Bram St. near Coliseum. ***Removed in 2008. Manual valve only. No automatic valve.***	25.3 Mad.
5	PS08	8-11264	1722 Kenward St. ***Removed in 2008. Manual valve only. No automatic valve.***	26.4 Mad.
6	PS09	9-1500	Between Paulson Road & Railroad	34.3 BlGr.
7	PS10	10-24760	Hwy 51 East R.O.W. south of Robertson Rd.	4.4 BlGr.
8	PS11	11-1073	NSWTP near Metrogro Storage Tank odor beds. ***No air valve at this site. MH and standpipe removed during 10th addition.***	30.3 BlGr.
9	PS15 (to West Int.)	15-1525	2045 Allen Blvd. near Univ. Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	12.4 Midltn
10	PS15 (to West Int.)	15-2411	Thorstrand Rd. @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	13.1 Midltn
11	PS15 (to West Int.)	15-4827	Capital Drive @ University Ave. ***No automatic air valve at this site. 2" gate valve in MH for manual air release.***	18.2 Mad.
12	PS15 Diversion to PS16	16-106	St. Dunstan's Drive. ***MH with 2" gate valve and automatic valve. 2" gate valve N.C. Opened only as-needed.***	13.1 Midltn

Table 3: Air Valve Locations… continued				
#	Forcemain	MH Station	Location & Comments	Map Sheet
13	PS17	17-2050	Bruce Street	22.3 Ver.
14	PS17	17-3050	Locust Drive	22.3 Ver.
15	PS17	17-4113	Hwy. M east of Locust Drive	22.4 Ver.
16	PS17	17-8900	South of Verona Rd. and West of Hwy PB	14.3 Ver.
17	BM Creek Effluent	6650	Near Goose Lake. South of USH 18/151 and West of Fitchrona Road.	12.4 Ver.
18	BM Creek Effluent	10200	4' Dia MH. 2" ball valve and 2" galvanized steel ***standpipe***. There is also a 1" corporation stop in the MH. No automatic air valve.	7.3 Fitch
19	BM Creek Effluent	12900	4' Dia MH. 2" ball valve and 2" galvanized steel ***standpipe***. There is also a 1" corporation stop in the MH. No automatic air valve.	7.2 Fitch
20	BM Creek Effluent	29050	Longford Terrace	4.4 Fitch.
21	BM Creek Effluent	42000	McCoy Rd. near RR	2.4 Fitch.
22	BM Creek Effluent	44450	McCoy Rd. near Hwy 14	1.2 Fitch.
23	BM Creek Effluent	46500	Clayton Road	1.2 Fitch.
24	BM Creek Effluent	53720	NSWTP north of Moorland Road	30.3 BlGr.
25	Effluent 54"	2300	NSWTP north of Moorland Road	30.3 BlGr.
26	Effluent 54"	7090	North of Meadowview Road	31.3 BlGr.
27	Effluent 54"	11800	North of Goodland Park Road	6.3 Dunn
28	Effluent 54"	13478	Lalor Road south of Goodland Park Road	7.2 Dunn
29	Effluent 54"	16575	Lalor Road	7.3 Dunn
30	Effluent 54"	20250	Lalor Road	18.2 Dunn
31	Effluent 54"	25808	Back of 2399 White Oak Trail. ***Standpipe only. No air valve at this site.***	19.1 Dunn
32	New 36" PS02	11+24	50' SW of PS2	23.3 Mad.
33	New 36" PS02	69+36	Corner of Van Deusen & Rowell Streets	26.1 Mad.
34	New 36" PS02	111+81	South of PS4, along RR tracks. ***Trial in-progress in 2009 to determine if automatic valve can be removed. Gate valve only. Inspected for air every two weeks.***	25.3 Mad.
35	New 36" PS02	151+52	South of Nob Hill Road, near bike path	36.1 Mad.
36	New 30" XT	7+41	Brittingham Park at bike path intersection	23.3 Mad.
37	New 30" XT	33+26	Next to Boathouse at Bedford Street	23.4 Mad.
38	New 30" XT	38+17	Between bike path and North Shore Drive	23.4 Mad.
39	New 30" XT	45+27	Near tennis courts, south of Broom Street	24.2 Mad.
40	New 30" XT	103+61	RR embankment north of Monona Terrace	24.2 Mad.
41	New 30" XT	113+90	Median of E. Wilson, in front of Essen Haus	13.3 Mad.
42	New 30" XT	117+43	Between MG&E and RR tracks, north of Blair	13.3 Mad.
43	New 30" XT	121+61	MG&E parking lot south of Blount Street	13.3 Mad.
44	New 30" XT	127+13	Bike path, between Blount & Livingston	13.4 Mad
45	New 30" XT	135+72	Bike path, between Livingston & Patterson	13.4 Mad.
46	New 30" XT	139+60	Bike path, between Patterson & Brearly	13.4 Mad.
47	New 30" XT	146+75	Bike path, between Brearly & Ingersol	13.1 Mad.
48	New 30" XT	157+29	East Wilson Street at Few Street	13.1 Mad.

Table 3: Air Valve Locations… continued				
#	Forcemain	MH Station	Location & Comments	Map Sheet
49	New 30" XT	179+85	Median of E. Wash. Ave, south of Thornton	7.2 BlGr
50	New 30" XT	174+98	Between E. Wash. Ave. and Dickinson St.	7.2 BlGr
51	PS07 (1948)	7-5385	Automatic 6" Air Release Valve installed 2002. Adjacent to 7-6750 MH. ***6" gate valve and Vent-O-Mat automatic valve. 6" gate valve N.C. Opened only as-needed.***	29.2 BlGr.
52	PS01	09300 +/-	30"x 4" tapping sleeve, 4" companion flange, 2" SS nipple, and 2" ball valve installed in 2006. East Wash Ave @ 2nd Street. ***No automatic valve. Manual air release only.***	6.3 BlGr.

Area 4: Siphon Cleaning

- Table 4 summarizes the 11 active inverted siphons currently owned by MMSD.
- As of 2009, nine of the eleven MMSD siphons are cleaned twice per year. Due to its' length, the WI West Point Extension siphon at Pheasant Branch Creek is not routinely cleaned (i.e., it is classified as a forcemain). The WI Campus Relief siphon on Randall Avenue is also not routinely cleaned.
- The purpose of a siphon is to carry the wastewater flow beneath an obstacle (such as a streambed or a major utility line) which would otherwise block the interceptor's gravity profile.
- One disadvantage of a siphon is that it typically carries a lower velocity (since it always flows full) and thus creates greater potential for solids deposition. Newer siphons with multiple barrels are designed to minimize the potential for solids deposition.
- MMSD has generally not experienced significant problems with its siphons, except for the Shorewood Hills siphon. That siphon has needed numerous cleanings over the years due to grease accumulation, and has been the responsibility of the City of Madison since it was constructed in conjunction with a City storm sewer project.
- MMSD began contracting out the regular cleaning of its siphons in 1998. Prior to 1998, siphons were cleaned only if specific problems occurred. These services are typically contracted for a two or three year period.
- It is recommended that MMSD continue its' current program of contracted siphon cleaning. This should help to catch any problems before they become serious.
- The contractor's cleaning operations should be observed, and the adjacent siphon manholes should be visually inspected at the time of cleaning to determine if any additional work is needed.

Table 4: Siphons

#	Interceptor	Location	Manholes	Year	Comments	Map Sheet
1	WI West Point Ext.	Pheasant Branch Creek at Hwy. M	5-116 to 5-115A	1966 & 1957	2094 ft. of 14" AC pipe. ***Due to length, classified as a forcemain. Not routinely cleaned.***	1.4 Middleton
2	West Int. Relief	Walnut Street Underpass at Campus Drive	2-517 to 2-516	1959	105 ft. of 36" RCP	21.1 Madison
3	Old West Interceptor	Midvale Blvd. at University Ave.	2-054A to 2-053B	1958	31 ft. of 16" CI pipe installed in 1958 to clear new storm sewer box conduit	20.1 Madison
4	Old West Interceptor	Shorewood Blvd. north of University Ave.	2-047B to 2-047A	1972	21 ft. of 15" RCP installed in 1972 to clear City storm sewer. City agreed to maintain siphon.	20.1 Madison
5	West Int. Replacement at UW Campus	Randall Avenue at Wendt Engineering Library	No manholes	1999	120 ft. of 30" DI installed in 1999 to clear twin UW chilled water lines and MGE gas line. ***No manholes…not routinely cleaned.***	22.1 Madison
6	West Int. Spring Street Relief	Brooks Street at College Court	2-309B to 2-309A	1975	46 ft. of 24" CI pipe installed in 1975 to clear 5'x12' storm box	22.1 Madison
7	West Int. Spring Street Relief	Brooks Street at Regent Street	2-309 to 2-308	1940	91 ft. of 24" CI pipe	22.1 Madison
8	West Int. Spring Street Relief	Brooks Street at Milton Street, near Meriter Hospital	2-307 to 2-306	1965	63 ft. of 24" CI pipe	23.3 Madison
9	South Int. Baird Street Relief	Wingra Creek at Baird Street	4-312 to 4-311	1995	Two barrels, 156 ft. of 14" and 10" DI pipe inside of 36" steel casing, grouted in place.	26.4 Madison
10	Southeast Int.	Siggelkow Road underpass at USHwy 51	7-218A21 to A20 to A19	1961 & 1992	185 ft. of 8" DI and CI pipe (145 ft. replaced with DI in 1992)	34.3 Bl. Grove
11	East Monona Interceptor	Fair Oaks Avenue at Starkweather Creek	6-108F to 6-108E	1925	85 ft. of 14" CI pipe, crossing Starkweather Creek	5.4 Bl. Grove
NA	INACTIVE: Old West Int.	Regent Street at Murray Street	2-005A to 2-005	1968	50 ft. of 24" CI pipe. Flow diverted to City sewer in 1995	23.3 Madison

Area 5: Stoplog & Gate Structures

- Table 5 lists the 20 stoplog and gate structures located within the MMSD collection system. Of these, 16 are currently in-service and 4 have been removed/abandoned.
- Some of these structures are overflows to nearby streams or lakes. These should be inspected during high flow events to make sure the nearby waterway is not overflowing into the collection system.
- Some of these structures were constructed at junction points between adjacent interceptor projects and are used to divert flow from one interceptor to another.
- Others were originally constructed as flushing manholes (no longer used) for the purpose of periodic flushing of the interceptor with adjacent surface water.

To ensure that the stoplog and flapgate structures remain in good condition, are at the correct elevation, and not leaking, MMSD should inspect each structure twice per year and provide any stoplog or gate replacements or repairs that are needed.

Table 5: Stoplog and Gate Locations

#	Facility	MH	Location & Comments	Map Sheet
1	Bedford Street Stoplogs.	CT-3420	Northshore Drive at end of Bedford Street, adjacent to Monona Bay.	23.4 Mad.
2	Burke Outfall Stoplog for diversion to 30"	93+10	Pennsylvania Ave south of Commercial Ave. ***Abandoned/removed during North Basin Interceptor project.***	31.3 Burke
3	PS5 Stoplog	5-403	Mendota Drive across from PS5	18.4 Mad.
4	PS6 Flapgate	6-102	Drainage ditch near PS6	5.4 Bl. Gr.
5	PS7 Stoplog	PS7	Entrance chamber behind PS7	20.3 Bl. Gr.
6	PS8 Stoplog at Wingra Creek	8-100	North side of Wingra Creek across from PS8	26.3 Mad.
7	SWI Junction MH for emergency diversion from PS2 to PS8.	8-106	Haywood Street at Wingra Drive, near entrance to Arboretum. ***Slide gate normally removed, allowing overflow to PS2. Gate stored in MH.***	26.2 Mad.
8	SEI Flushing Valve (upstream of PS9)	9-108	East side of Hwy. 51, north of Yahara River, south of Yahara Drive. ***Gate valve to remain closed always.***	3.2 Dunn
9	NEI Flapgate upstream of PS10	10-114	At Starkweather Creek, south of Sycamore Ave and west of Walsh Rd. ***Removed in 2009 during NEI-PS10 to Lien Road Project.***	33.4 Burke
10	PS11 Flapgate	PS11	PS11 near entrance chamber	31.3 Bl. Gr.
11	NSVI MP Ext. Flapgate upstream of PS12	12-113	Along Badger Mill Creek, north of Nesbitt Road and west of Maple Grove Road. ***Flap gate removed in 2004 during City Greenway Modification Project. MH remains.***	12.3 Verona

Table 5: Stoplog and Gate Locations… continued				
#	Facility	MH	Location & Comments	Map Sheet
12	NEI Truax Ext Flapgate upstream of PS13	13-105	Along drainage ditch, west of Hwy 51 at Dane County Airport access road. ***Inside airport perimeter fence.***	20.1 Burke
13	PS15 Slidegate with hole for gravity diversion to PS5	5-102A	130 feet south of PS15 along Allen Blvd., in Marshall Park.	12.4 Middl.
14	WI Relief junction with Old WI, allowing overflow to old WI d/s	2-513	South side of Campus Drive across from Veterinary Science ***Abandoned/removed during WI-Campus Relief Phase 4 Project***	22.2 Mad
15	WI Campus Relief Phase 1 junction with WI Relief.	8-207	At UW Met. Engineering Bldg. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	22.1 Mad
16	WI Campus Relief Phase I junction with Old WI	8-206	Randall Ave just south of RR. Stopgates allow stopping either leg d/s. ***Gates normally removed and open to flow both ways.***	22.1 Mad
17	WI Relief junction with Old WI	2-014A	Randall Ave. south of Dayton St. Slide gate blocks flow to Old WI d/s. ***Gate always in-place and flow is always blocked to Old WI.***	22.1 Mad
18	WI Randall Relief cross-connect with Old WI at MH 2-012B	8-122	Randall Ave. between Spring Street and Regent Street. ***Gate always in-place, but if flow is 2.5' +/- above invert of MH 8-122 it will overflow to MH02-012B in the Old WI.***	22.1 Mad
19	WI Spring Street Relief cross-connect with Old WI	2-316B	Randall Ave. south of Monroe Street. ***Gate always in place. Diverts flow from Old WI (Monroe Street) into the WI Spring Street Relief.***	22.1 Mad
20	PS16 Overflow to Gammon Extension	5-230	Gammon Road, just west of PS16. ***Brick dam to divert gravity flow from PS16 to PS5 via the WI Gammon Ext.***	13.2 Middl.

Area 6: Special Projects, Repairs and Events

- Areas 1 through 5 above represent the regular planned maintenance activities.
- Area 6 includes the numerous specific projects, repairs and events that occur every year in the operation and maintenance of interceptors and forcemains.
- Examples include high flow events, emergency repairs, connection inspections, odor complaints, backup events, I/I work, specific manhole repairs, surface route inspections, and other events.

- As discussed later under the Recordkeeping section, a separate workorder should be created for each specific event as it comes up.
- These specific events are an important aspect of an interceptor maintenance program, and maintaining a record of these events will be helpful for future decisions and management of the MMSD program.

Area 7: Coordination and Management Functions

Coordination and management of the interceptor maintenance program includes numerous functions needed to make the program successful. Examples include the following.

- Preparing annual program budget and tracking it during the year. This is typically performed by the Collection System Supervisor and Director of O&M.
- Tracking and documenting work performed and work outstanding. This is typically performed by the Collection System Supervisor.
- Updating interceptor GIS database and maps. This is typically performed by GIS personnel in the Engineering Department.
- Managing inventory. This is typically performed by the Collection System Supervisor.
- Managing annual siphon cleaning and TV & Clean contracts. This is typically performed by the Collection System Supervisor.
- Managing Diggers' Hotline membership and locating services. This is typically performed by the Engineering Department.
- Organization of emergency preparedness. This is typically performed by the Collection System Supervisor
- Screening projects being done by other utilities and municipalities via the UTILITY log (spreadsheet). This is performed by the Engineering Department.
- Organizing cross-training activities.
- Recommending periodic improvements to the program.

Program Staffing

The proposed staffing plan outlined below is a team approach, and a joint effort of several departments, employees and outside resources.

Collection System Supervisor

- The interceptor maintenance program is to be managed primarily by the Collection System Supervisor. Oversight of the program will be provided by the Director of Operations & Maintenance and Director of Engineering. Assistance will be provided by the Engineering Department staff whenever necessary.
- Planning, budgeting, prioritizing, tracking, and management of the program will be accomplished via a joint effort between the Collection System Supervisor, Director of O&M, Director of Engineering, and Engineering Department staff. Work will be tracked and documented through the Computerized Maintenance Management System.
- The role of Collection System Supervisor focuses on organizing and supervising the day-to-day field operations and seeing that they are successfully carried out.
- The Collection System Supervisor personally conducts much of the field "reconnaissance" work, i.e. monitoring contractors, attending preconstruction meetings, inspecting connections, addressing complaints, meeting with property owners, etc.
- The Collection System Supervisor should consult with the Director of O&M, the Director of Engineering, and Engineering Department staff on a regular basis to keep others informed of day-to-day operations, decisions, and observations made in the field.
- The Collection System Supervisor should schedule work for the field crew, monitor the results of the field work, hire outside contractors, and other transfer knowledge to MMSD staff as needed. All are essential to the program's success.
- The Collection System Supervisor will organize the work, create the necessary workorders, and recruit help as required from the Buildings & Grounds Supervisor.

Field Crew

- Personnel from the Monitoring Services/Sewer Maintenance Crew will carry-out the day-to-day field work needed for specific interceptor maintenance activities.
- If necessary, the Building and Grounds Crew will provide members to assist the Monitoring Services/Sewer Maintenance Crew when needed for specific interceptor maintenance activities.
- Regular planned activities requiring field crew participation are as follows:
  a) Manhole field locations prior to annual televising/cleaning.
  b) Semiannual gate valve exercising.
  c) Semiannual air valve inspection & maintenance.
  d) Semiannual inspection and maintenance of special structures.
  e) Various special projects and emergencies, as required.

- Per Table 1, the anticipated Field Crew commitment is estimated at roughly1300 manhours/yr., but this may vary from year to year.
- Through cross-training, involving different personnel, and assigning hands-on projects to different people, it is desired to build up a significant knowledge of the MMSD interceptor system in members of the Monitoring Services/Sewer Maintenance field crew.

Outside Services

- Heavy construction work, major repairs, excavation, and specialty services should typically be contracted out to private firms. The Collection System Supervisor or Engineering Department will coordinate this work.
- Contracting out such work frees MMSD from the cost of owning and maintaining extensive specialty equipment (i.e., backhoes, vactor trucks, etc.) and allows MMSD to focus on what is does best: Managing the overall collection system.
- Examples of efficient outside services for MMSD's interceptor maintenance have included televising & cleaning work, surveying work, field marking, excavation work, emergency excavation & repairs, significant construction work, etc.

Other Staff Resources

- The Collection System Supervisor should recruit the participation of other MMSD staff whenever needed for specific advice, engineering evaluation, emergencies, etc.
- Examples include map updates by the GIS/CAD specialist, UTILITY project screening, assistance by the Engineering Department during emergency events, etc.
- Major projects that become identified through interceptor maintenance will need to be budgeted and assigned to a project manager. This will be done by the Director of Engineering though the annual capital budgeting process.

Recordkeeping and CMMS

General Organization

- The overall interceptor maintenance program has been packaged as "INT MAINT" within the Project module of MMSD's CMMS system.
- The Project "INT MAINT" is subdivided into seven Subprojects corresponding to the seven work areas shown on Table 1.

Creating Workorders

- When creating an interceptor maintenance workorder, it should typically be linked to one of the seven subprojects under "INT MAINT".
- When entering the work order description, the name of the facility involved, e.g. NEI, PS8 Forcemain, etc., should typically be included in the description.
- **Subproject 1: Interceptor Evaluations**. One work order should be created each year for all work associated with the TV/Clean/Evaluation project that year.
- **Subproject 2: FM Gate Valve Exercising.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each valve location that requires valve exercising.
- **Subproject 3: Air Valve Inspections.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each air valve location that requires inspection.
- **Subproject 4: Siphons.** A semiannual activity, one work order should be created for the entire year (both cleanings). The workorder should be "tied" to the purchase order for the contractor hired to clean the siphons. The workorder should have eleven tasks, one for each siphon location.
- **Subproject 5: Stoplog & Flapgate Structures.** A semiannual activity, two work orders should be created each year. Each work order should have tasks for each structure that requires inspection.
- **Subproject 6: Special Projects, Events and Repairs.** Most of the workorder activity will take place in this subproject. Individual work orders should be created for each significant project, event or repair. If a specific event will involve more than a few hours of time, or if it's simply an event that's worth documenting, a separate work order should be created to track the work.
- **Subproject 7: Program Coordination & Management.** For work not related to one specific event or asset (i.e., the overall collection system) or work that takes less than a few hours to complete, the standing workorders shown in Table 1 should be used. These include for General Coordination, UTILITY Log and Diggers Hotline/Locating Services. Note: These should be used as little as possible. Specific workorders related to the event or asset should be created and used whenever possible.

Finishing and Closing Workorders

- The Collection System Supervisor should frequently search through the list of all active "INT MAINT" workorders and all workorders related to the collection system maintenance to determine what work is outstanding and to guide daily workflow.
- Whenever an item has been completed, the Sewer Maintenance Crew and/or Collection System Supervisor should enter a comment under the "Notes" field. The Note should briefly indicate what was done, who did it, and the date it took place. These "Notes" are one of the main benefits of having a CMMS and are a great way to document observations, problems, and fixes.
- After the work is finished and "notes" have been entered, the Collection System Supervisor should change the TASK to "finished".
- After all tasks on a work order have been finished (most work orders will have just one task), the Collection System Supervisor should change the work order to "closed". Note: The CMMS will not allow the work order to be "closed" until the day following the "finishing" of the last task.

Generating Lists and Reports

- Various reports and search capabilities are available or are being developed within the CMMS.
- The CMMS Work Order Selection Search provides on-screen lists of work orders. The user can designate desired workorders by status (active, closed, etc.), by Account No., by Subproject, by date, etc.
- The ACCESS database "Employee Timekeeping" report shows staff hours and $ amounts for a specified calendar year.
- The ACCESS database "Total Cost of WO's by Crew" is a departmental report listing all workorders in chronological order, along with total costs for each.
- The ACCESS database "Employee Hours by WO" shows each individual employee's time charged for a specific selected workorder.
- The ACCESS database "WO Total Cost w/ Hours & Mtls" report shows detailed costs for a specific selected workorder.
- The CMMS report writing and usage is still a developing area at MMSD. Personnel should look for the reports that are most useful to Interceptor Maintenance Program, and provide suggestions for any modifications that would be helpful.

Reference Documents for Interceptor Maintenance

Numerous documents and sources of information are available for reference when working with the MMSD interceptor system. Some of the most useful references are listed below.

- MMSD Collection System Map Book (hard copies)
- MMSD GIS and Mapping
- MMSD Collection System Database. This database provides valuable information concerning the details of the MMSD collection system.
- MMSD Collection System Inspection Database. This database provides detailed results of the annual televising and cleaning of MMSD interceptors
- MMSD Emergency Response Manual provides important emergency contacts, phone numbers, and forcemain emergency repair information
- MMSD Forcemain Profiles. These drawings provide detailed profiles at-a-glance for each forcemain. (Electronic files are located on the network and hard copies are located in the maintenance files. Numerous personnel also have hard copies of the profiles).
- Interceptor Maintenance Files (hard copy) are in the file room maintenance section, organized by interceptor and pumping station. These include hard copies of correspondence, memos, etc.
- Original as-built project construction plans (hard copy) are located in the file room on the plan racks.
- The Computerized Maintenance Management System (CMMS) database (see discussion above).
- Shared network drives, which include project documentation and various documents related to maintenance, including these guidelines.
- The "MMSD Collection System Evaluation", prepared by the staff of the Capital Area Regional Plan Commission. This was last completed in 2008.
- The MMSD "Collection System Facilities Plan". This includes a comprehensive look at the entire MMSD Collection system, from both a capacity and condition aspect. The original plan was completed in 2002, with an update scheduled for completion in 2010.

As paper copies become superseded by electronic information, an ongoing goal will be to consolidate the relevant information in the most effective way for easy access. The document management system, CMMS reporting system, GIS mapping, and databases will be warehouses for much of the interceptor maintenance information. Use of the network drives and OnBase should also be encouraged to store key spreadsheets, documents, tables, etc. for easy access and sharing.

Summary

This document provides guidelines for MMSD's interceptor maintenance program. It is an updated version of MMSD's original 1992 Interceptor Maintenance Plan. The interceptor maintenance program has been organized as a separate project called "INT MAINT" within MMSD's CMMS system, and is divided into seven main work areas as summarized in Table 1. The program is staffed as a team effort of several departments and employees, including the Collection System Supervisor, the Monitoring Services/Sewer Maintenance Crew, personnel from Buildings and Grounds as required, outside contractors, and other MMSD staff as needed. The program is intended to be a flexible and cost-efficient approach to interceptor maintenance. The program managers are encouraged to look for opportunities to improve the program whenever possible.

APPENDIX NO. 1

Work Sequence Guidelines
For
Interceptor Evaluations

Appendix No. 1

Interceptor Evaluations

Detailed Work Sequence Guidelines

a) Budget. Recommend and budget for the particular interceptor system(s) desired to be evaluated in the following year. Aim for an overall average of about 10% per year, but allow this to vary from year to year in order to evaluate entire interceptor systems as a unit wherever possible.

b) Pre-inspect. Pre-inspect the entire route of the proposed evaluation project. Identify any manhole access problems, special property issues or other conditions that might affect the proposed contractor televising and cleaning operations.

c) Document actual flows. The two main objectives of the interceptor evaluations are to evaluate the *physical condition* and the *hydraulic adequacy* of the interceptor system. To address hydraulic adequacy, it is important to document actual measured flow rates in the key branches of the system. In some cases, flow information may be directly available from an upstream or downstream pumping station flow meter. Due to multiple interceptor branches, however, pumping station records alone will often be insufficient to determine the desired interceptor flows. Contracted installation of temporary flow vs. time meters has been used successfully by MMSD and should be considered for key interceptor branch locations. One week contracted installations are fairly inexpensive and have provided both the average and the time distribution of flow, depth and velocity.

Use the documented *average* flow and the Greeley and Hansen formula to compute the peak flow. Compare this to the nominal pipe capacity (based on the Manning equation) to determine the hydraulic adequacy of the interceptor. Also use the measured flow information to determine whether or not special flow control measures (for example, diversion pumping, night-time televising) will be needed for proper cleaning and televising.

d) TV and Cleaning Specs. Prepare specifications for contracting the cleaning and televising of the interceptor system to be evaluated. Use MMSD's standard format, and keep this standard spec up-to-date with desired new features (for example, pan and tilt camera technology). In preparing the specs, give special consideration to any access problems or easement issues. Also, specifically indicate any flow control or diversion requirements and any night-time work requirements.

e) Advertise, Bid and Award. Advertise, bid and award the televising and cleaning contract work.

f) Contractor's Field Work. Prior to the start of the field work, notify any property owners and municipal public works departments that may be affected by the work. Monitor the contractor's field operations to ensure that the work is proceeding in accordance with the specifications.

g) Map Edits. Review MMSD's collection system maps during the pre-inspection and during the field work. Do the MMSD maps correctly show the interceptor? Is the information shown on the maps accurate? Make note of any changes or corrections needed (for example, sewer lengths, incoming connections, etc.) and route these to MMSD's GIS/CAD specialist for incorporation.

h) Tape review and Pipe Condition Log. Review the contractor's completed televising tapes and summarize the pipe condition using MMSD's pipe rating log. Enter the rating data into the Collection System Inspection database (see attached).

i) Evaluation memo. Prepare a summary evaluation memo which documents the results of the above items and which provides specific recommendations for any follow-up action. The memo should be concise, but should cover each of the following:

- Is the interceptor pipe structurally adequate? Or does rehabilitation or replacement need to be considered?
- Document the average interceptor flows and address the interceptor's hydraulic adequacy.
- Are the manholes in satisfactory condition, or are specific repairs needed?
- Document the estimated total gpm of clearwater infiltration, and recommend whether or not the specific sources are cost effective to repair.
- Note any corrections or additions to be made to the GIS collection system maps or data. Attach marked-up map copies and forward to the GIS/CAD Technician for incorporation.
- Provide recommendations for any action and/or work required.

Interceptor Condition Evaluation Form

Date Evaluated: ______________

Recorded by: ______________

Ranking System (Choose One)
- N: None
- I: Insignificant
- M: Moderate
- S: Severe

Type of Pipe
- (RCP) Reinf. Concrete Pipe
- (CI) Cast Iron Pipe
- (DI) Ductile Iron Pipe
- (VC) Vitrified Clay Pipe
- (AC) Asbestos Cement Pipe
- (PVC) Plastic Pipe

Pipe Defects
- (BP) Broken Pipe
- (CP) Cracked Pipe
- (CO) Corrosion
- (FO) Flow Obstructions
- (GA) Gasket Problems
- (GR) Grease Buildup
- (IB) Iron Buildup
- (JB) Joint Buildup
- (OJ) Offset Joint
- (R) Roots (before cleaning)

I / I (gpm)
Estimate the total gpm of leakage in the entire pipe section

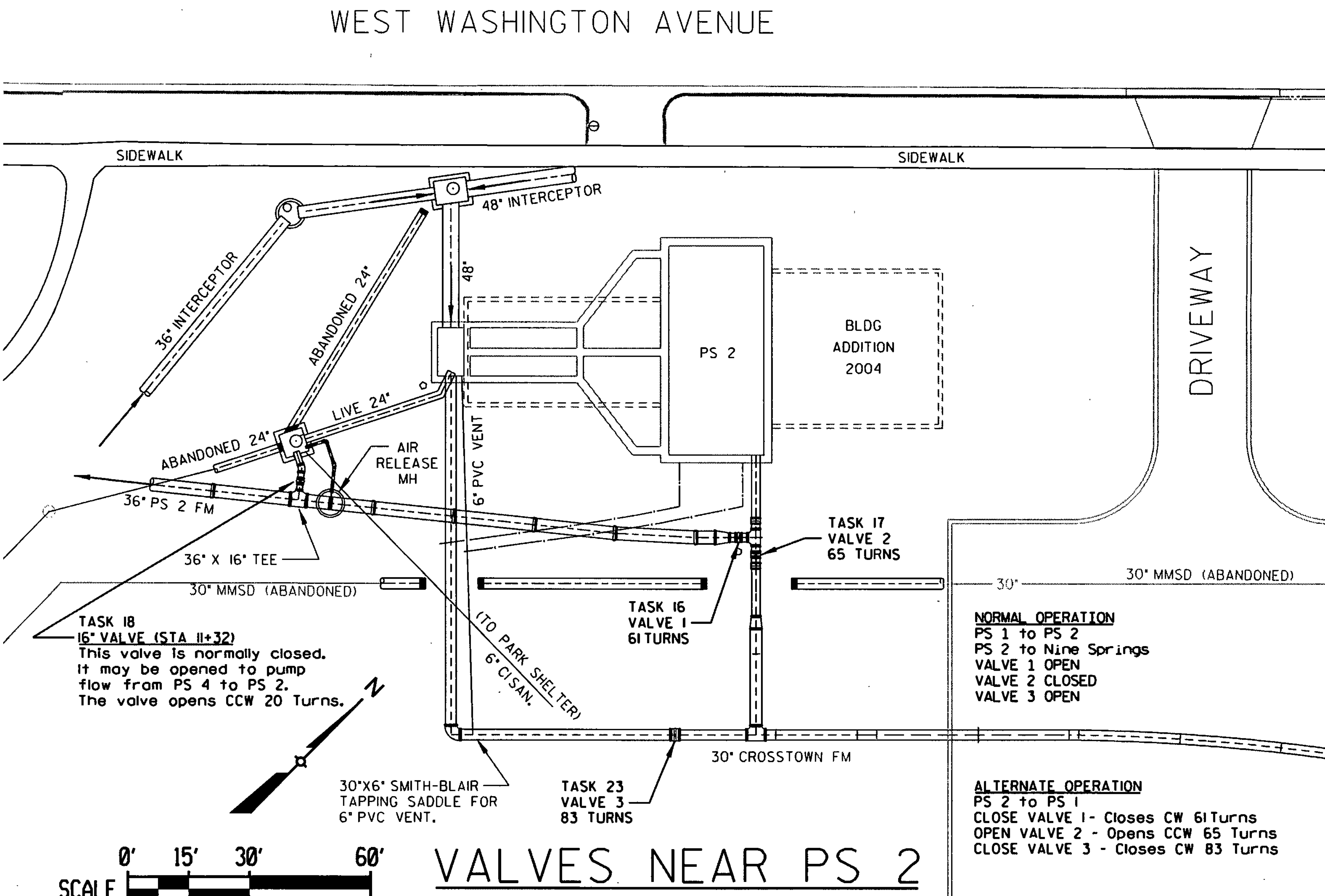
MH Defects
Using N, I M, S system, rank the Manhole at the *Downstream end of each pipe section*

Interceptor Name	Pipe Section		Date	Pipe	Pipe Defects										I / I	MH	Other Remarks
	From	To	Televised	Type	BP	CP	CO	FO	GA	GR	IB	JB	OJ	R	gpm	d / s	

Interceptor Reporting Form

APPENDIX NO. 2

Maps of Certain Valve Clusters



VALVES NEAR PS 2

TASK NOS. 16, 17, 18, & 23

NORMAL OPERATION

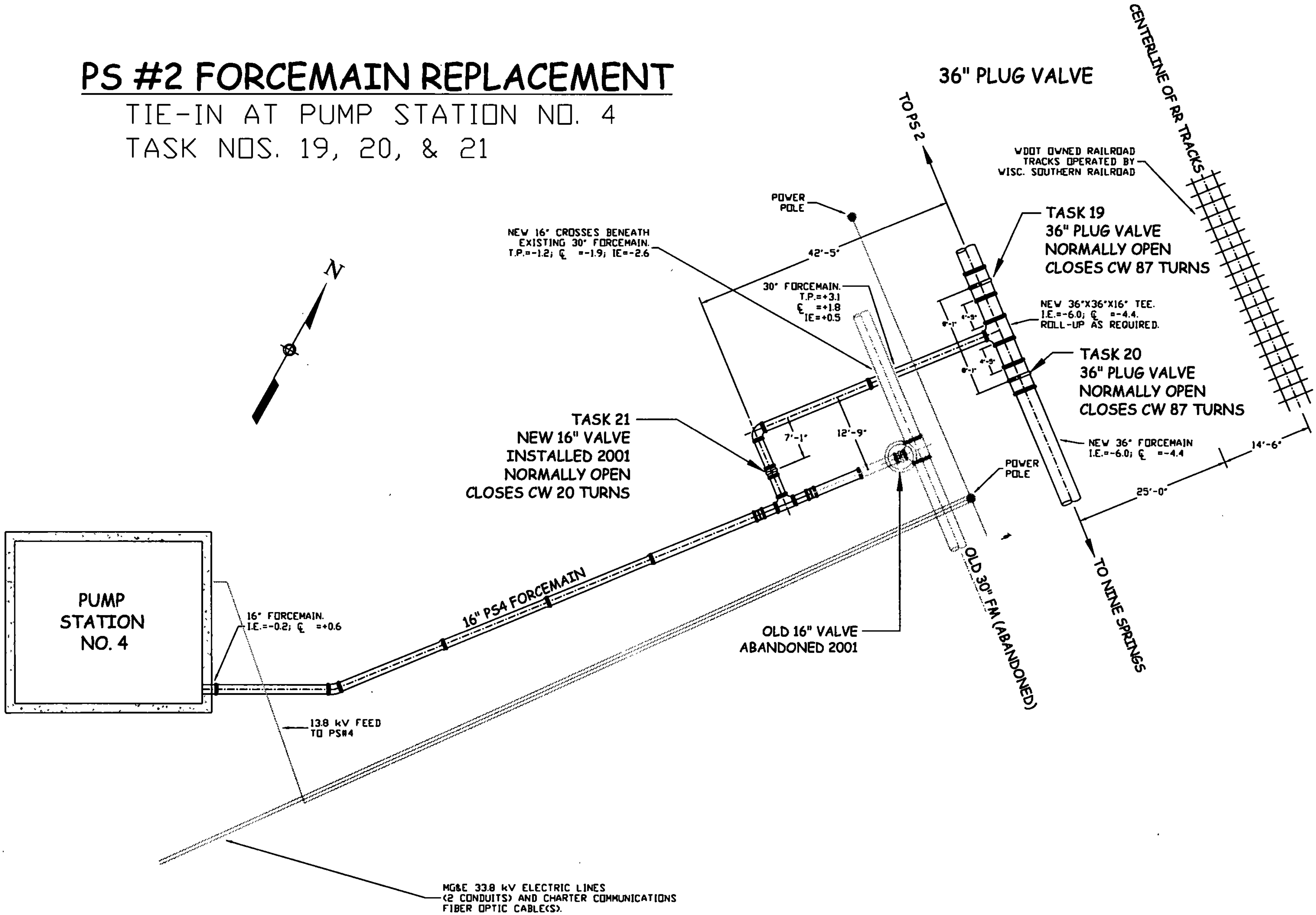
PS 1 to PS 2
PS 2 to Nine Springs
VALVE 1 OPEN
VALVE 2 CLOSED
VALVE 3 OPEN

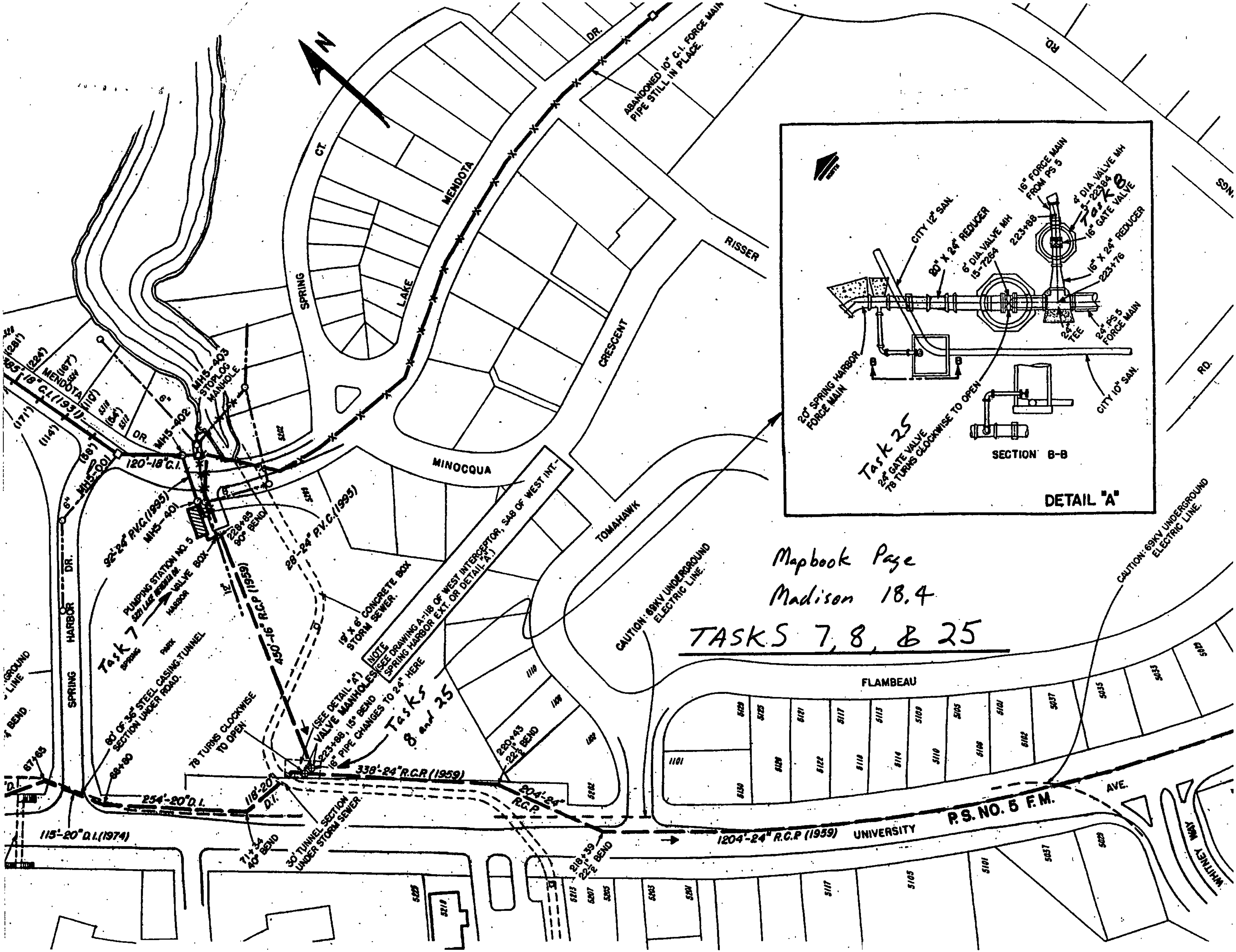
ALTERNATE OPERATION

PS 2 to PS 1
CLOSE VALVE 1 - Closes CW 61 Turns
OPEN VALVE 2 - Opens CCW 65 Turns
CLOSE VALVE 3 - Closes CW 83 Turns

PS #2 FORCEMAIN REPLACEMENT

TIE-IN AT PUMP STATION NO. 4
TASK NOS. 19, 20, & 21





Mapbook Page
Madison 18.4
TASKS 7, 8, & 25
DETAIL "A"
SECTION B-B
16" FORCE MAIN FROM PS 5
4' DIA. VALVE MH 5-22384
Task 8
16" GATE VALVE
16" X 24" REDUCER 223+76
20" X 24" REDUCER
6' DIA. VALVE MH 15-7264
223+88
CITY 12" SAN.
24" TEE
24" PS 5 FORCE MAIN
20" SPRING HARBOR FORCE MAIN
CITY 10" SAN.
Task 25
24" GATE VALVE
78 TURNS CLOCKWISE TO OPEN
ABANDONED 10" C.I. FORCE MAIN PIPE STILL IN PLACE.
MENDOTA
LAKE
SPRING CT.
DR.
RISSER
CRESCENT
MINOCQUA
TOMAHAWK
FLAMBEAU
UNIVERSITY
AVE.
WHITNEY WAY
RD.
SPRING HARBOR DR.
MH5-403 STOPLOG MANHOLE
MH5-402
MH5-401
MH5-001
120'-18" C.I.
18" C.I.(1931)
92'-24" P.V.C.(1995)
28'-24" P.V.C.(1995)
228+85 90° BEND
PUMPING STATION NO. 5
VALVE BOX
Task 7
SPRING HARBOR PARK
450'-16" R.C.P (1959)
12' x 6' CONCRETE BOX STORM SEWER.
NOTE
SEE DRAWING A-118 OF WEST INTERCEPTOR, SA8 OF WEST INT.-SPRING HARBOR EXT. OR DETAIL "A")
(SEE DETAIL "A") VALVE MANHOLES
223+88, 15° BEND
16" PIPE CHANGES TO 24" HERE
Tasks 8 and 25
78 TURNS CLOCKWISE TO OPEN
60' OF 36" STEEL CASING TUNNEL SECTION UNDER ROAD.
338'-24" R.C.P (1959)
220+43 22½° BEND
204'-24" R.C.P.
218+39 22½° BEND
1204'-24" R.C.P (1959)
P.S. NO. 5 F.M.
254'-20" D.I.
118'-20" D.I.
115'-20" D.I.(1974)
67+65
68+80
71+34 40° BEND
30' TUNNEL SECTION UNDER STORM SEWER.
CAUTION: 69KV UNDERGROUND ELECTRIC LINE.

APPENDIX F – MADISON METROPOLITAN SEWERAGE DISTRICT FINAL SUSTAINABLE ASSET MANAGEMENT FRAMEWORK (2016)

Madison Metropolitan Sewerage District

Madison Metropolitan Sewerage District

Final Sustainable Asset Management Framework

May 2015

Table of contents

Table index

Figure index

Appendices

1. Introduction

This document presents the framework for implementing sustainable asset management (SAM) within the Madison Metropolitan Sewerage District (MMSD). This framework has been developed collaboratively with staff from MMSD and builds upon the District's previous SAM efforts.

The SAM framework is based upon the asset management framework developed by GHD for the US Environmental Protection Agency (EPA) that is the most widely used asset management framework in the US. The US EPA framework is based on answering five Core Questions of infrastructure asset management using a process that is comprised of 10 steps (or elements). This document presents the structure for the SAM framework that is appropriate for MMSD based on staff input and forms the basis of the SAM framework implementation plan. It is anticipated that this document will evolve and ultimately become the Asset Management Implementation Plan (AMIP) once the details of the framework are developed and agreed upon.

1.1 Definition of Asset Management

Asset management is often defined as a framework, which is a way of thinking that is built around a body of leading practices. This way of thinking and the body of leading practices focus on seeking the lowest total lifecycle cost of ownership for infrastructure assets while delivering services at a level customers and stakeholders require and are willing to pay for at an acceptable level of risk to the community. While asset management is a strategic-level framework that embraces the primary function of the organization, it is only fully effective when also practiced day-to-day at the asset level – that is, when individual capital investments that support growth, augmentation, or renewal are the right solutions, for the right reasons, at the right time, and when maintenance investment is cost-effective in extending asset life, sustaining performance, and enhancing reliability.

One of the foundational asset management reference sources, the ***International Infrastructure Management Manual***, 2011 Edition, describes the key elements of asset management as:

- Taking a lifecycle approach to managing assets
- Developing cost-effective management strategies for the long-term
- Providing a defined level of service and monitoring performance
- Understanding and meeting the impact of growth through demand management and infrastructure investment
- Managing risks associated with asset failures
- Using of resources (physical, natural, human, etc.) sustainably
- Achieving continuous improvement in asset processes.

The goal of infrastructure asset management is to meet a required level of service, in the most cost effective manner, through the management of assets for present and future customers. A formal approach to the management of infrastructure assets that takes a long term view and incorporates Triple Bottom Line (TBL) considerations is essential in order to provide services in a cost-effective manner, and to demonstrate this to customers and other stakeholders.

In short, asset management is an integrated set of processes that minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service.

In addition to being based on the EPA asset management framework, MMSD's asset management framework and approach must also fit MMSD's specific organizational circumstances. In this vein, the elements of MMSD's SAM Framework, must consider the following:

- MMSD's corporate objectives and strategic planning initiatives
- Integrated and holistic management approaches;
- Triple Bottom Line (TBL) impacts and benefits
- Short, medium and long term sustainability components

To describe MMSD's SAM Framework, this document is presented in the following sections:

- Section 2 – Asset Management Current State
- Section 3 – Sustainable Asset Management Framework
- Section 4 – MMSD SAM Framework Elements
- Section 5 – Asset Management Governance and Leading Change
- Section 6 – Data and System Support Requirements

1.2 List of acronyms

Acronym	Phrase
AM	Asset Management
AMIP	Asset Management Implementation Plan
AMP	Asset Management Plan
BRE	Business Risk Exposure
CCTV	Close Circuit Television
CIP	Capital Improvement Plan
CMMS	Computerized Maintenance Management System
CoF	Consequence of Failure
DSS	Decision Support System
EPA	Environmental Protection Agency
FIS	Financial Information System
GIS	Geographical Information Systems
IIMM	International Infrastructure Maintenance Manual
LOS	Levels of Service

Acronym	Phrase
MMI	Maintenance Managed Item
MMSD	Madison Metropolitan Sewerage District
O&M	Operations and Maintenance
OWAM	Oracle Work and Asset Management
PdM	Predictive Maintenance
PoF	Probability of Failure
SAM	Sustainable Asset Management
SIMPLE	Sustainable Infrastructure Management Program Learning Environment
TBL	Triple Bottom Line
WERF	Water Environment Research Foundation

2. Asset Management Current State

As part of the development of the SAM Framework, it is important to understand the current state of practice at MMSD regarding asset management. MMSD first began thinking in terms of asset management in 2001 with the development of the first draft of the Sewer Collection System Facilities Plan. While not called such at the time, this document was the first asset management plan developed for the District. Since then, there have been several updates to the Collection System Facilities Plan, and two internal asset management practices gap assessments completed. Reference is made to the 2008 and the 2014 gap assessment reports which identified several areas of needed improvements.

Within the last year, MMSD has completed the WERF SIMPLE best practice guide and the SAM GAP assessment to identify the gaps within the organization. The main gaps identified in the most recent assessment in 2014 are associated with Data & Knowledge of the assets; People and Processes; and Information Systems. From the completed assessment, MMSD determined the following three findings:

1. There are few, if any, queries, reports, or other tools that support asset management activities.
2. There are several data sources that contain asset data as primary or secondary sources that are currently not integrated or readily accessible, such as: Oracle Work and Asset Management (OWAM), GIS, Manhole Inspection Database, Pipelogix, various spreadsheets, (including those for the most recent addition) and the easement data. There are significant barriers to the integration due to the fact that different definitions and asset ID’s are used.
3. While there is an inventory of assets and data about the assets is plentiful, the data lacks standardization and some key elements/attribute data are missing.

Below are a few of the 2014 implementation goals that MMSD set upon proceeding with the asset management program.

- Establish an asset management program. MMSD will begin to address the findings of the gap assessment. The team was able to complete an initial assessment to determine improvement activities. The primary focus is to further develop the program so that activities related to the management of the life cycle of an asset can be shared across the organization
- Improve data for asset management. MMSD is in the process of developing a standard practice for collecting and using data within the asset management program. As part of MMSD’s early discussions regarding the asset management program, it was determined that the collection system would be the initial area of focus. As MMSD begins to look at the collection system, the team decided that there was a need to develop the methodology, procedures and processes to collect, update and complete base data.
- Integrate data, develop needed interfaces, reports, queries and/or custom applications.
- Research secondary and tertiary asset management systems. To be able to fill the gap, MMSD will need to research and assess available solutions from a Triple Bottom Line perspective.

During February 2015, a series of workshops and interviews were conducted with MMSD staff. These interviews focused on understanding the current state of asset management functional areas within MMSD. These interviews and workshops confirmed the results of the of the previous SAM Gap assessments and identified a few other areas of focus. In addition to Data and Knowledge; People & Practices; and Information Systems, the following additional areas were identified:

- Business Case Evaluations do not consider full life cycle costs analysis nor risk reduction metrics.
- The majority of the levels of service performance measure are internally focused.
- Business risk exposure (BRE) is not used in infrstructure management decision making.
- There is no Asset Management Plan (or equivalent document) for the Nine Springs Wastewater Treatment Plant.
- Existing organizational structure for asset data governance and analysis is not within the asset management group.

Key summary outputs from these interviews are presented in Table 1.

Table 1 Summary of February workshop/meetings

AM Process Element	Process Owner	Description	Challenges
Business Case Evaluations	Planning	A business case is developed for each project as part of the capital program development.	Does not incorporate full life cycle cost. Does not consider risk. Does not consider Triple Bottom Line cost and benefits.
Geographic Information Systems (GIS)	Engineering	GIS software used by MMSD for tracking assets in the field, as well as helping technicians and operators locate assets when needing to repair, rehab or replace.	GIS does not work well with other MMSD software or other common industry software packages. GIS is not accessible to all. GIS maintains mostly pipelines, manholes and associated features. Other features provided externally
Creating CIP/Budgeting Process	All Departments	The development of capital improvements program and the need to identify projects.	Time commitment for directors on an annual basis is significant. Finalization process of the budget is not streamlined. The mechanism for making sure there is sufficient personnel resources available to be able to deliver the projects that are approved is inadequate.

AM Process Element	Process Owner	Description	Challenges
Carrying out Maintenance of Assets	Operations	Performing routine maintenance of MMSD assets	Failure modes are not utilized well. Written documentation of maintenance activities is not standardized. The process for commissioning assets needs to be better defined and implemented
Condition Assessment	Operations	Assessing the condition of both vertical and linear assets	A condition assessment protocol is not established for vertical assets. Condition inspection data is available for some linear assets but needs to be translated into AM condition scores to use within the SAM program.

3. Sustainable Asset Management Framework

Sustainable Asset Management (SAM) is about determining the mix of management investment in maintenance, operations, and capital that sustains organizational performance over a long term horizon while minimizing lifecycle costs. It is about building confidence in decision-making – guiding investment in the right work, on the right projects, at the right time. Ultimately, MMSD's SAM Framework provides the means for effective management of assets by finding the right balance between levels of service, cost of service and some acceptable risk as shown in Figure 1. Also shown in Figure 1 are the concepts of other sustainable aspects that are also considered part of finding this right balance at MMSD. These additional considerations are:

- Institute of Sustainable Infrastructure (ISI) Envision™ Rating System.
- Triple Bottom Line (TBL) parameters.
- Integrated and holistic management approaches.

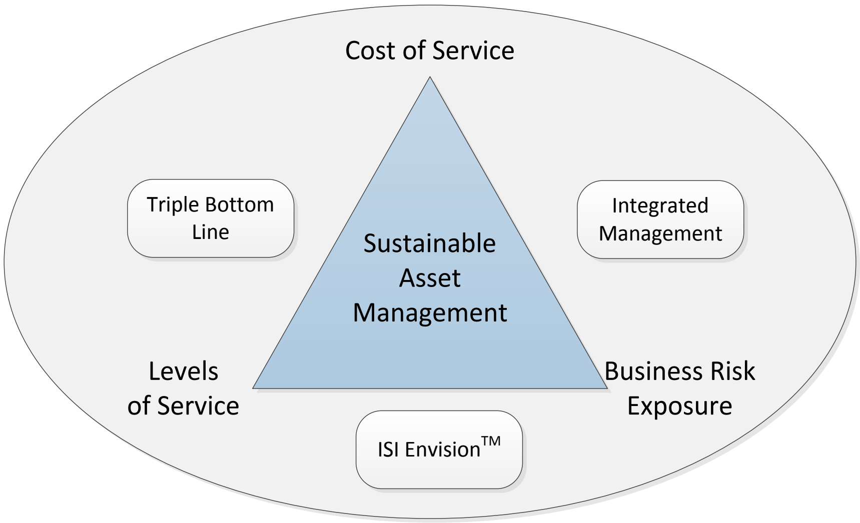


Figure 1 MMSD's asset management core elements

The SAM Framework is based on the US EPA's 5 Core Questions of Asset Management.

This framework poses five questions about assets that all managers of infrastructure should pose on a regular basis to their management teams. These questions are presented below:

Question 1: What is the current state of my assets?

- What do I own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its remaining economic value?

Question 2: What is my required level of production or service?

- What is the demand for my services by my stakeholders/customers?
- What do the regulators require?
- What is my actual performance?
- What are the physical capabilities of my assets?

Question 3: Which assets are critical to sustained performance?

- How can assets fail?
- How do assets fail?
- What are the likelihoods (probabilities) and consequences of asset failure?
- What does it cost to repair the asset?
- What are the other costs (social, environmental, etc.) that are associated with asset failure?

Question 4: What are my best O&M and CIP investment strategies?

- What alternative strategies exist for managing O&M, personnel, and capital budget accounts?
- What strategies are the most feasible for my organization?
- What are the costs of rehabilitation, repair, and replacement for critical assets?

Question 5: What is my best long-term funding strategy?

- Do we have enough funding to maintain our assets for our required level of service?
- Is our rate structure sustainable for our system's long-term needs?

Leading practice in asset management that has evolved over the past two decades points to the development of asset management plans as key to answering the questions and telling the story. Asset management plans (AMPs) are developed by organizations and updated on a periodic basis as central, living documents that help articulate to the organization and to stakeholders how assets are managed.

An asset management plan will systematically:

- Characterize the state of the assets
- Identify levels of service expected from the assets
- Identify critical assets (assets with both high probability and high consequence of failure)
- Identify a set of cost effective maintenance, operations, and capital investment strategies based on the above
- Define a funding strategy

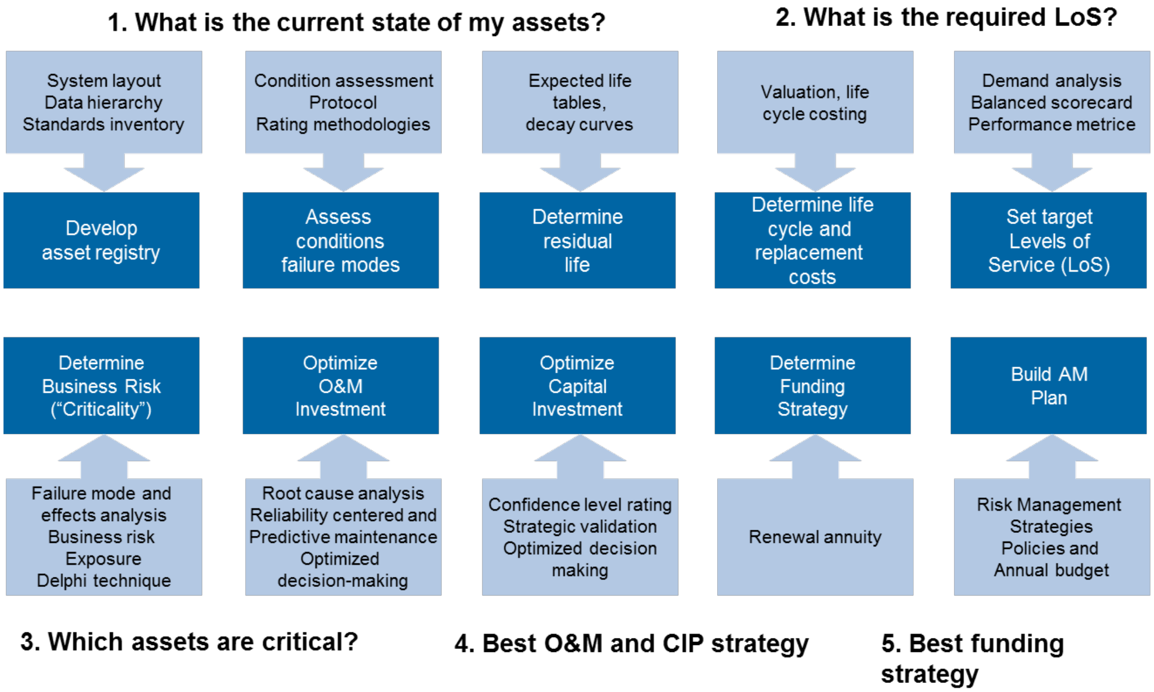


Figure 2 10 elements of asset management plan development

Implementing improved asset management practices and building an asset management plan is comprised of ten steps or elements that are directly related to the five Core Questions discussed above. Note that certain leading practice processes and techniques are necessary for the execution of each of these steps. To successfully execute the steps, an organization must master the basics of the associated practices and processes. Figure 2 shows the five Core Questions, the ten elements, and the primary asset management work processes that support them.

4. MMSD SAM Framework Elements

4.1 SAM Framework Overview

The SAM Framework is the context within which asset management activities and initiatives will occur at MMSD. Figure 3 provides an overview of the key elements of the AM framework from an organizational structure and service delivery perspective. The framework combines key business management concepts that, when implemented, collectively facilitate the effective delivery of services.

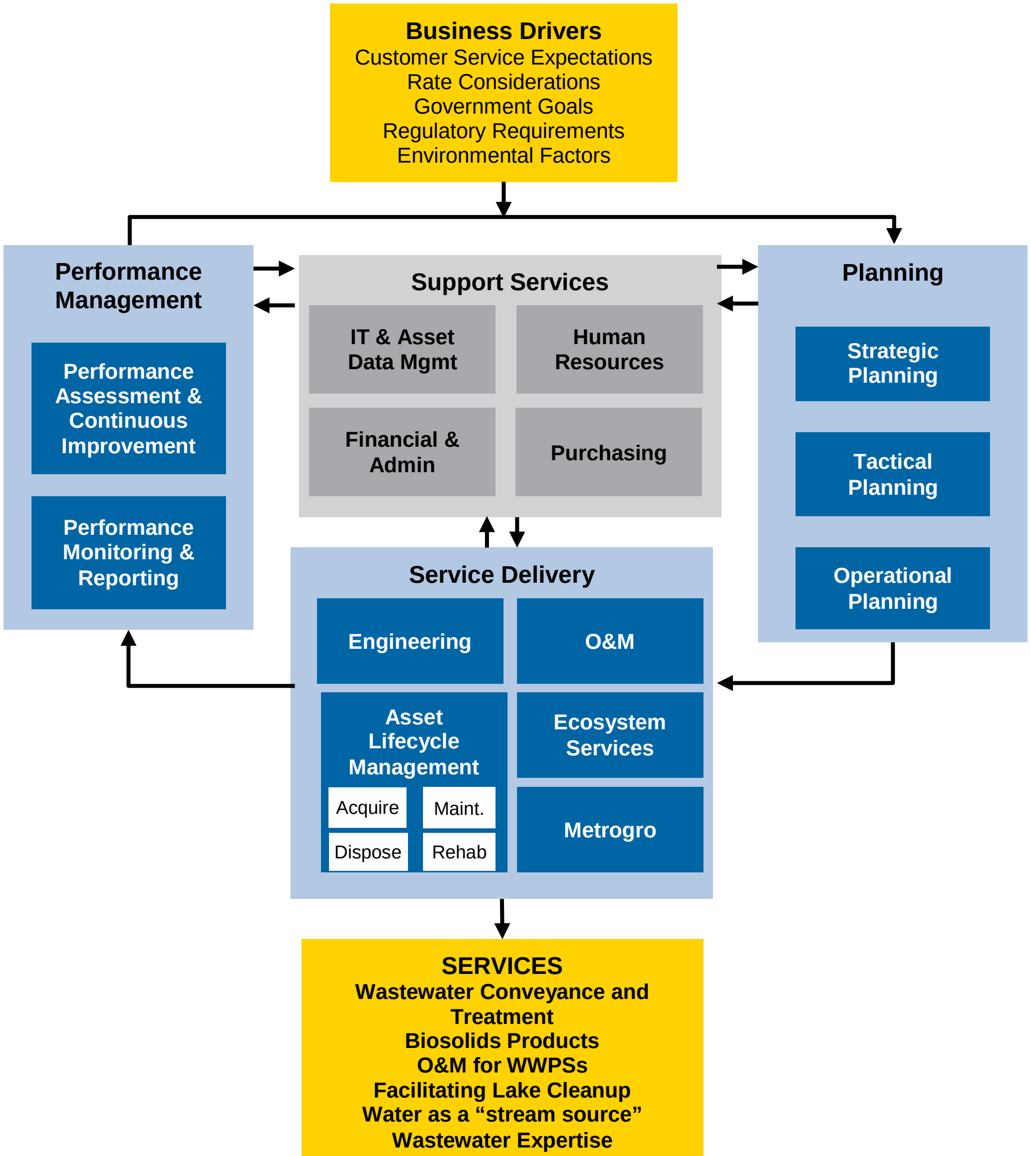


Figure 3 SAM key framework elements

The framework presented above has several major elements as described below:

Business drivers and services – (shown in yellow) provide the boundaries or 'book ends' to the framework. Business drivers are both external and internal influences to MMSD's business and include service requirements such as customer expectations, strategic goals, regulatory requirements, environmental factors, aging infrastructure, knowledge loss through staff retirement, technology improvements, and political and social priorities.

Customers

- Cities, Towns, Villages, and Sanitary Districts
- Property owners connected to the sewer system
- Septic customers
- Users of downstream receiving waters
- Schools (for educational tours of MMSD facilities)
- Industrial customers
- Towns with pump stations
- Farmers
- Ostara

Services

- Wastewater collection and treatment
- Expertise in Wastewater
  - Education and tours
  - Emergency Response
  - Technical Associations
- Production and distribution of biosolid products – Metrogro, Metro Mix, and Crystal Green
- Delivery of water as stream source
- Operations and Maintenance service for pump stations owned by others
- Facilitation of lake clean-up initiatives
  - Recreational
  - Quality of life

Core Processes - (shown in blue) contribute directly to the delivery of services to program areas and cover the entire lifecycle of the assets, with individual practices required for different asset types, and include planning, service delivery, and performance management.

a. **Planning** converts the business drivers into a set of operational plans that describe how MMSD will deliver services: the scope and quality of services, the programs (or processes) that will be used to deliver the defined services and the inputs required, including financial resources, human resources, and technology resources. The levels of planning include:

- Strategic/Long Term Planning which converts regulatory and customer requirements into service outcomes and overall long-term strategies (e.g., corporate/departmental strategic plans, organizational policies, long term funding strategy, demand forecasting, facility planning)
- Tactical/Medium Term Planning which develops sub-plans to allocate resources (natural, physical, financial, human, etc.) to achieve the strategic goals, while meeting defined levels of service (e.g., Master Plans, Performance Management, Asset Management Plans, Human Resources Plan, Business Continuity Plans)
- Operational/Short Term Planning which converts tactical, medium term plans into short term executable plans and budgets (e.g., Capital Programs, Annual Operating Budgets,

Emergency Preparedness & Response Plans, and Operational Standards and Specifications).

b. **Service Delivery** implements the short term executable plans including the following:

- Operations and programming (including Metrogro)
- Engineering and Capital Project Delivery
- Lifecycle asset management
- Asset performance and reliability maintenance - to retain an asset as near as practicable to its original condition, but excluding rehabilitation or renewal
- Asset renewal (rehabilitation and disposal) - to rebuild or replace an asset to restore it to a required functional condition and/or extend its life, using available techniques and standards
- Ecosystem Services
  - Laboratory services.
  - Environmental programs.
  - Work and resource management.
  - Community service and outreach.

c. **Performance Management** checks that MMSD is doing what it intended to do. This occurs at multiple levels: meeting program area's needs (the ultimate outcome), delivering the defined scope and quality of services (the key output), delivering the defined programs through the efficient and effective use of infrastructure, financial, human and technology resources (interim outputs). Activities associated with performance management include:

- Developing and reviewing Levels of Service targets
- Monitoring actual results and reporting against targets over time
- Conducting results based benchmarking (over a multi-year time horizon)
- Assessing gaps
- Adapting existing processes and/or creating new processes to effect continuous improvement

Support Services - (shown in grey), include administration, information technology and data management, human resources, finance and administration, and purchasing.

4.2 Vision of the SAM Program

MMSD's SAM Program aligns with MMSD's overall Vision, Mission and Strategic Plan as shown in Figure 4.

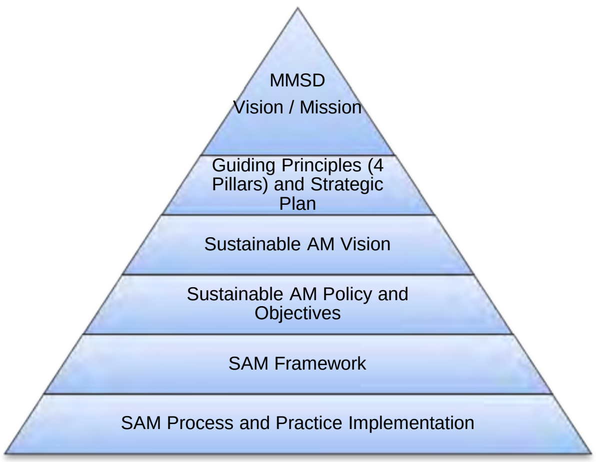


Figure 4 Alignment of MMSD SAM Program within the context of MMSD's overall organizational strategic plan

MMSD's Vision is "Enriching life through clean water and resource recovery." Our Mission is "To protect public health and the environment." The vision and mission are supported by guiding principles and strategic priorities as shown in Figure 5.

Figure 5 MMSD vision, mission, and guiding principles (4 pillars)

The proposed Vision of the SAM Program as determined in the March 2015 workshops is:

We will manage infrastructure to meet community expectations at the lowest cost of ownership.

4.3 Policy and Objectives for the SAM Program

To meet the SAM Program Vision, the following are objectives and guiding principles for the program:

Understand and manage the current state of our assets, including condition and remaining life.

- Know what assets MMSD owns and for which assets we have responsibility or legal liability. MMSD will record these assets in an asset register down to a maintenance-managed item (MMI) level.
- Monitor the condition, performance, use and cost of infrastructure assets down to the appropriate level and against prescribed service levels and regulatory requirements.

Understand and manage our level of service (LOS) to our customers.

- Understand and record the current levels of service with which we provide our customers. We will define target future levels of service required in order to continue to serve our customers for the long term.
- Understand customer expectations including the regulatory (e.g., compliance, water quality, public health, etc.) and non-regulatory aspects of our business (e.g., noise, customer service, appearance, cleanliness, customer outreach).

Understand and manage our business risk exposure (BRE).

- Focus emphasis on those infrastructure assets that are critical to our service levels and prioritize their management to prevent their failure. (This is not to imply that non-critical assets are ignored.)
- Identify, understand, and manage the risks associated with running the utility.

Prepare asset management plans for capital and operational strategies.

- Prepare an asset management plan for the Nine Springs WWTP and an asset management plan for the Collection System. Together, these two asset management plans will constitute the asset management plan for the organization.
- Create the asset management plans as living, active documents. Investment projections from the asset management plans should be reviewed and validated on an annual basis. The asset management plan is intended to be updated as needed on a periodic basis every 5 to 10 years.
- Understand the total cost of service delivery, including financial, social and environmental costs.

Embed sustainable asset management practices throughout the organization and develop a long-term sustainable funding strategy.

- Develop funding strategies to sustainably manage the utility. MMSD will monitor and report in Triple Bottom Line terms (financial, environmental, social/community/organizational).
- Link MMSD's organizational and asset management strategic goals to asset related investments and action plans.
- Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).
- Establish an appropriate governance model with defined roles and responsibilities to sustain asset management practices.

- Provide information technology (IT) and data management support.
- Review progress to continuously improve our asset management performance.
- Allocate resources to effect the continued development and implementation of an asset management program.
- Provide training as needed on asset management processes and procedures.

Appendix A provides the SAM Program Policy and Objectives as a stand-alone document for MMSD to use as a communication tool.

4.4 SAM Key Elements

The SAM vision, objectives and policy will be implemented within MMSD as a key element in MMSD's SAM Framework. The other key elements of MMSD's SAM Framework are shown in Figure 5. MMSD already is implementing several asset management related functions across the organization such as assessing asset condition, developing business cases for new capital projects, and tracking performance. Figure 6 shows both existing and new SAM key elements needed for implementation and their relationships to each other.

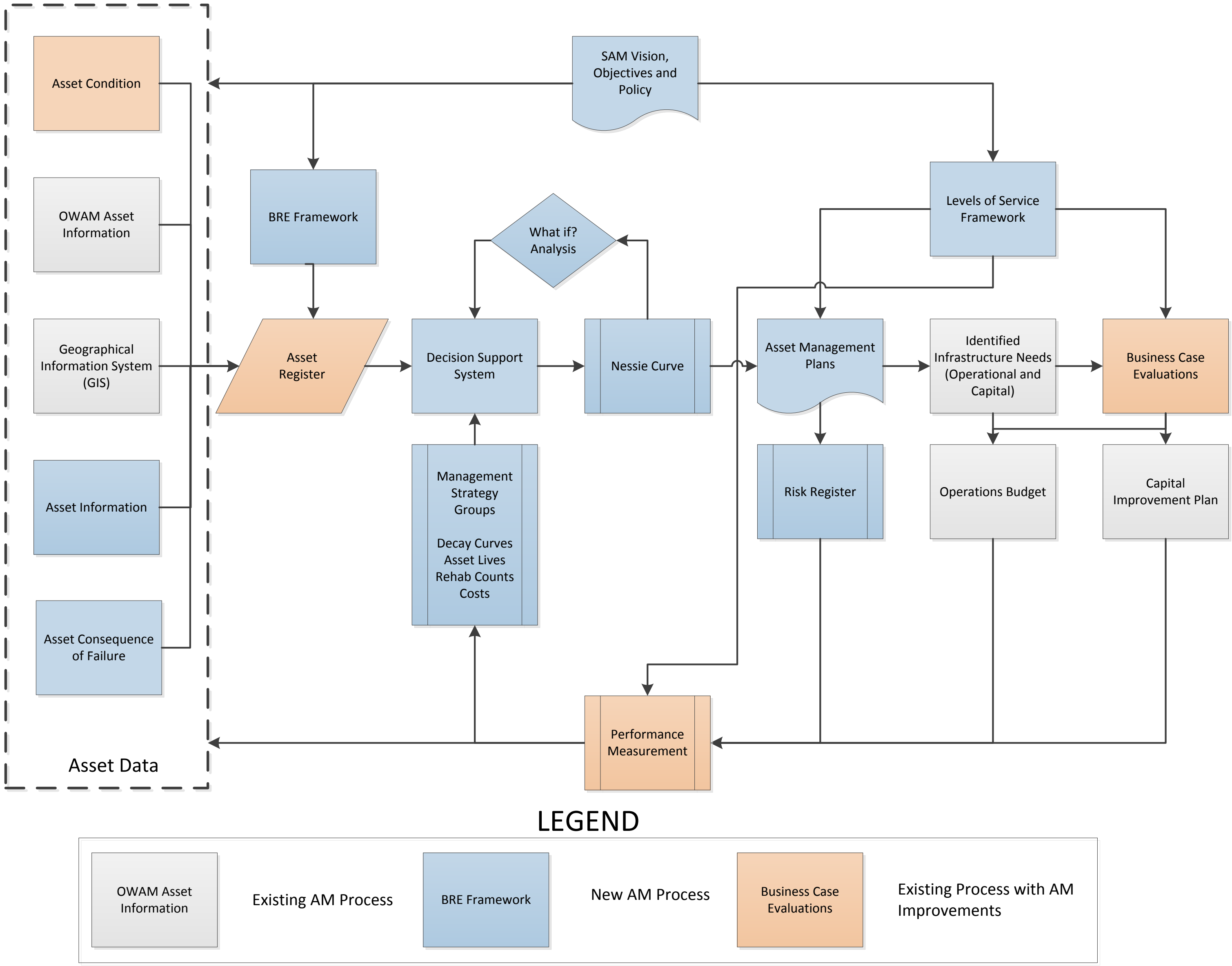


Figure 6 SAM key elements needed for implementation

Existing key SAM elements are shown in grey and include:

- Determining asset condition (though not currently done for all assets).
- Administration of the Oracle Work and Asset Management (OWAM) work order system.
- Geographical Information Systems (GIS).
- Identification of capital and operational needs.
- Development of business cases.
- Development of the annual Operations Budget and Capital Improvements Plan.
- Performance measurement.

For the implementation of the SAM Framework additional key elements will be required as well as improving some of the existing key elements. The new or to be improved key elements include:

- SAM Policy and Objectives (see Section 4.3)
- Levels of Service Framework
- Business Risk Exposure Framework
  - Asset Consequence of Failure
- Risk Register
- Decision Support System.
  - Management Strategy Groups (that incorporate decay curves, asset lives, rehabilitation approaches, and costs)
  - Annual "Nessie" curve (investment forecasting)
- Development of asset management plans.
- Improvements to the Business Case Evaluation process.
- Determining and tracking SAM asset information and information systems, including maintenance and further development of MMSD's asset register (see Section 6).

Each of the new SAM key elements needed for implementing the SAM Framework are described in more detail in the following sections.

4.5 Levels of Service Framework and Performance Measurement

Policy Statement -We will understand and manage our level of service (LOS) to our customers.

Objectives:

Understand and record the current levels of service with which we provide our customers. We will define target future levels of service required in order to continue to serve our customers for the long term.

Understand customer expectations including the regulatory (e.g., compliance, water quality, public health, etc.) and non-regulatory aspects of our business (e.g., noise, customer service, appearance, cleanliness, customer outreach).

An effective LOS Framework connects the strategic direction of MMSD and the SAM Vision, Mission and Objectives to the performance requirements established within the various parts of the organization.

As stated in the International Infrastructure Management Manual 2011, Levels of Service “are a key business driver and influence all Asset Management decisions. Levels of Service statements:

- Describe the outputs the organization intends to deliver to customers;
- Commonly relate to service attributes such as quality, reliability, responsiveness, sustainability, timeliness, accessibility and cost;
- Should be written in terms the end user can understand and relate to; and
- Should drive the selection of performance measures.

LOS and performance measures provide the linkage between assets and technical and organizational objectives, by articulating how the management of assets contributes to MMSD’s overall vision, mission and guiding principles.

LOS define a product or a set of service characteristics that identify the minimum level of performance expected to be generated by the assets. These characteristics typically include aspects such as *how much* and *how frequently* the service will be delivered.

Related to LOS, performance measures are the specific indicators that are used to demonstrate how the organization is doing with respect to delivering services. Performance measures define what needs to be monitored and measured to evaluate MMSD’s performance.

As shown in Table 2, the following are the existing performance measures used by MMSD, including the organizational owner as well as targets, goals and actuals from 2014. This list was derived from the 2015 Operations Budget and Capital improvements Plan. Within the list of LOS parameters, some are external in that they are those LOS directly experienced by MMSD’s customers. Some LOS’ are internal performance measures important to the functional areas of the organization. Finally, some are regulatory permit driven measures that are technical in nature and have direct impact to the environment.

Table 2 Existing MMSD performance measures

Key result measure	Target	FY14 Actual	FY15 Projected	LoS Type
Days to fill a vacancy	40	43	40	Internal
Lost time accidents	0	1	0	Internal
Connect in person with each City, Town, or Village administrator at least once per year	15	8	15	External
5 sustainable activities/projects completed (Mpower)	5	2	TBD	Internal
Number of bypass events	0	0	0	External
Number of spill events	0	0	0	External
Number of basement backup events	0	0	0	External
Percent of time BOD limit is met	100%	100%	100%	Permit
Percent of time TSS limit is met	100%	100%	100%	Permit
Percent of time Ammonia limit is met	100%	100%	100%	Permit
Percent of time Phosphorus limit is met	100%	100%	100%	Permit
Percent of time Fecal Coliform limit is met	100%	100%	100%	Permit
Percent of time Chlorides limit is met	100%	100%	100%	Permit
Tons of struvite produced	2	1.3	1.5	Internal
Purchased electricity per gallon treated (kwh/gal)	1400	1643	1500	Internal
Percent of preventative work orders completed within allowable time frame	90%	Pending	90%	Internal
Keep capital improvement construction project contract modifications below 5%	<%5	Varies by project	<5%	Internal
Keep total non-construction costs for projects below 20% of the final construction contract amount	<20%	Varies by project	<20%	Internal
Percent of time laboratory turn around times are met	>=93.8%	95.8%	>=98%	Internal
Reduction in chloride mass	15% by permit	4%	7%	Permit
Achieve a rating of proficient or better for mandatory criteria for the GFOA Budget Presentation Award	100%	100%	100%	Internal
Achieve a rating of proficient or better on optional criteria for the GFOA Budget Presentation Award	80%	92%	100%	Internal
Maintain 98% availability for our network servers	98%	99%	98%	Internal

Additional performance measures identified in the March 2015 workshops that will be considered in the implementation of the SAM Framework are presented in Table 3. These new measures are based on the experience of other similar utilities and are also derived from the Infrastructure Sustainability Institute's Envision Rating System (see Appendix B for Envision™ rating descriptions).

Table 3 Additional MMSD performance measures

Based on other utilities	Based on Envision™ rating system
% of assets in intolerable risk zone	RA2.1 Reduce energy consumption
% length of miles of sewer pipe inspected via closed circuit television and cleaned vs. budgeted length	QL2.1 Enhance public health and safety
Periodic survey showing that (x) % of customers are satisfied they have been adequately informed about water and wastewater issues and given the opportunity to provide input.	CR1.2 Reduce air pollutant emissions
% program driven maintenance hours vs. total (reactive and program driven) maintenance hours	RA3.1 Protect fresh water availability
% assets with applied PdM vs. the total number of assets with recommended PdM	LD1.4 Provide for stakeholder involvement
Number of verified odor complaints	LD2.1 Pursue by-product synergy opportunities
Confidence Level Rating of Enterprise AMP exceeds X%	QL2.2 Minimize noise and vibration

4.6 Business Risk Exposure Framework

Policy Statement - We will understand and manage our business risk exposure (BRE).

Objectives:

Focus emphasis on those infrastructure assets that are critical to our service levels and prioritize their management to prevent their failure. (This is not to imply that non-critical assets are ignored.)

Identify, understand, and manage the risks associated with running the utility.

Business Risk Exposure (BRE) is an advanced asset management methodology used to focus management teams on high-risk assets and issues. The BRE Framework as a key element for MMSD is shown in Figure 7. There are multiple inputs and outputs with ownership of different elements of the process predominantly in Planning, Engineering and Operations & Maintenance. Inputs include condition assessment data, staff knowledge and understanding of what happens if an asset fails, and geo-spatial proximity analysis using GIS. Outputs are used in the development of asset management plans (including development of the risk register) and in business case evaluations.

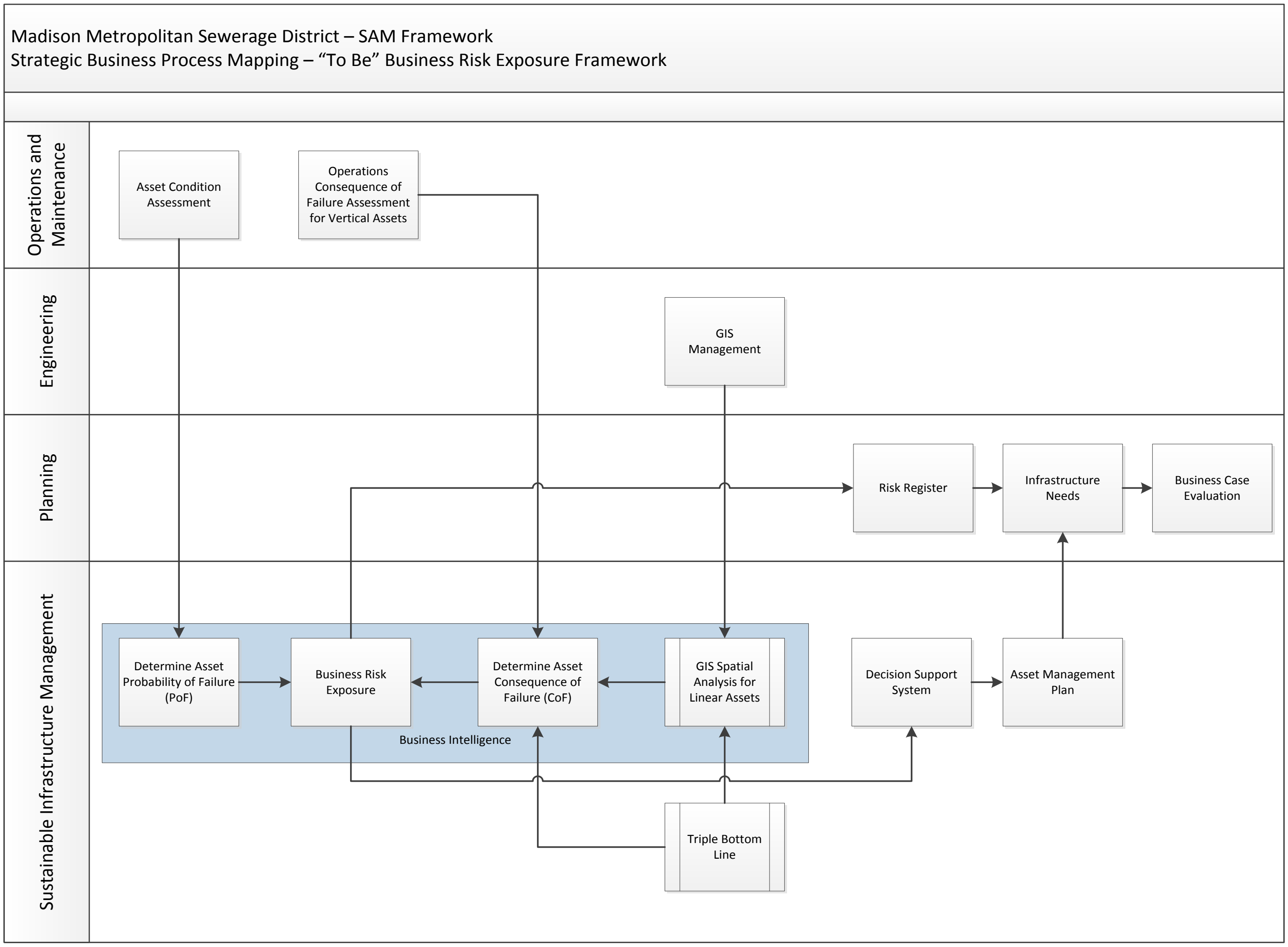


Figure 7 Strategic business process mapping - Business Risk Exposure

The BRE for an asset is the product of the consequence and probability of a possible failure, adjusted for risk mitigation measures currently in place. Risk mitigation are those practices applied to an asset on a case by case basis to either reduce the probability of failure (by adding "resistance" to the asset) or the consequence of failure (improving resiliency of the asset). Figure 8 is a schematic representation of the key variables of business risk exposure with components that address each variable.

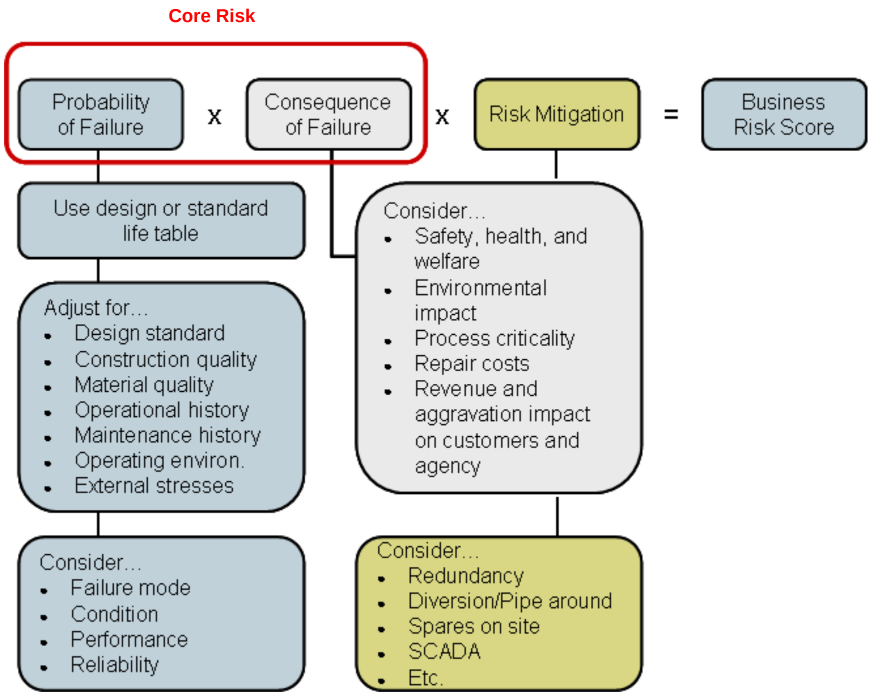


Figure 8 Business risk exposure elements

"Core Risk" is defined as the product of full consequence of failure (CoF) and the probability of failure (PoF) adjusted only for current risk mitigation measures in place for the asset/system. Once the core risk is available as a base line measurement, risk mitigation strategies can be developed that can reduce the level of risk, in turn impacting the level and cost of service.

The probability of failure aspect of BRE is directly related to the asset's condition and is further discussed in Section 4.7 Asset Condition and Remaining Life.

The consequence of an event can be expressed in Triple Bottom Line (TBL) categories. Triple bottom line categories used for the MMSD SAM Framework are as follows:

Table 4 Triple Bottom Line categories and elements

Category	Example Elements
Strong Community (Social)	Customers Affected, Loss of Service, Health and Safety
Vital Economy (Financial)	Financial Impact (total cost to fix and mitigate including indirect costs), Rates
Healthy Environment (Environmental)	SSOs, Basement Backups and Regulatory (permit) Compliance

Table 5 presents the consequence of failure scoring matrix for the SAM Framework. The scoring system is based on a 1 to 5 score, with 1 being a low consequence and 5 being a high consequence.

Table 5 MMSD SAM consequence of failure scoring table

Strong Community					
Customers Affected	Less than 10	< 100	<1,000	<10,000	> 10,000
Loss of Service	Can be out of service for more than one month	Can be out of service for less than one month	Can be out of service for one day	Can be out of service for four hours	Critical - cannot lose service
Health & Safety	No impact	Minor injury	Moderate injury and some sickness	Major injury, sickness	Potential for fatalities
Score	1	2	3	4	5
Vital Economy					
Financial impact	Less than $5,000	< $50,000	< $500,000	< $5,000,000	> $5,000,000
Score	1	2	3	4	5
Healthy Environment					
SSOs and Basement Backups	None	< 50,000 gallons < 3 locations	< 500,000 gallons < 10 locations	< 5,000,000 gallons < 100 locations	> 5,000,000 gallons > 100 locations
Regulatory (permit) compliance	No consequence	Regulatory sanction possible	Regulatory sanction likely; damage reversible in less than one year	Regulatory sanctions	Severe sanctions - damage
Score	1	2	3	4	5

Depending on asset type, there are different attributes that help measure the impact associated with each of the elements shown in Table 5 The hierarchical relationship between categories, elements, and attributes is shown in Figure 9.

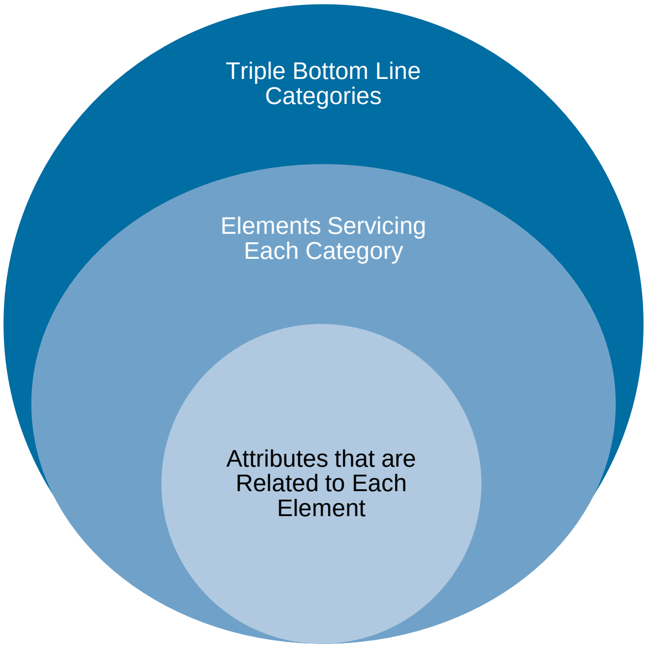


Figure 9 Hierarchical relationship between Consequence of Failure terms (categories, elements, and attributes)

The consequences based on each of the attributes that are applicable to an asset type (e.g., interceptors, force mains) are added in order to develop a comprehensive consequence rating for that asset. The consequence of an event is calculated based on a 1 to 5 score for each TBL category and associated elements. The minimum consequence of failure score is three and the maximum is 15.

Table 6 presents example attributes for each element.

Table 6 Example Triple Bottom Line attributes and elements

Attributes	LoS Elements					
	Loss of Service	Public Health & Safety	Customers Affected	Financial Impact	SSOs and Basement Backups	Regulatory Compliance
Number of customers connected to the segment	•		•		•	
Critical customer category	•	•				
Proximity to roads		•		•		
Proximity to railroads		•		•		
Proximity to environmentally sensitive areas				•		•
Proximity to buildings		•		•		
Repair costs				•		
Zoning and land use	•		•		•	

Example data requirements for the consequence of failure analysis are summarized in Table 7.

Table 7 Example data requirements for pipe CoF assessment

Data Type	Attributes	Source
Asset attributes	Date of installation	GIS / Record drawings
	Material	GIS / Record drawings
	Size	GIS / Record drawings
	Length	GIS / Record drawings
	Customer count	GIS / Customer Billing database
	Critical customer type	GIS / Customer Billing database
	Repair costs	Contract Data
Geospatial parameters	Proximity to roads	GIS
	Proximity to other utilities	
	Proximity to railway lines	
	Proximity to environmentally sensitive areas (e.g., wetlands, open water)	
	Proximity to high risk institutions (hospitals, etc.)	
	Proximity to buildings	

The likelihood and consequence of events are used to develop the BRE chart. An example BRE chart is shown in Figure 10. The BRE chart is divided into five risk management zones. Each zone is described as follows:

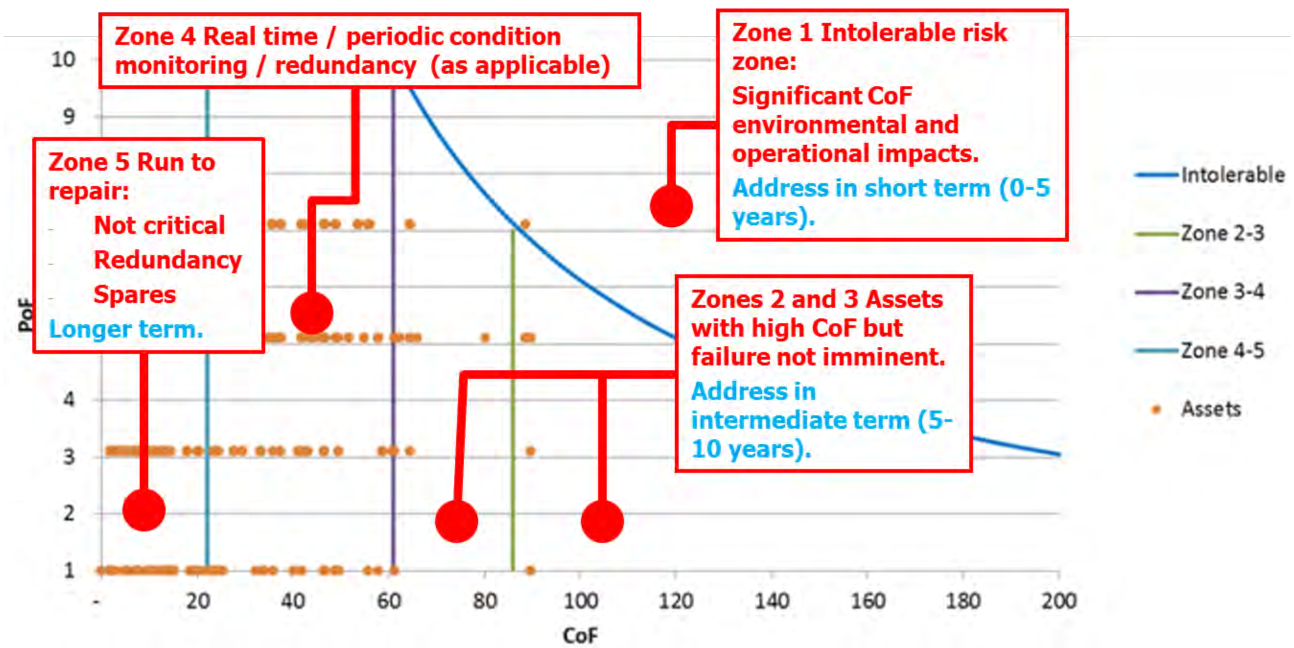


Figure 10 Example BRE chart (with example assets)

Zone 1: Contains assets that represent significant risk to the organization. In general, these assets are approaching the end of their useful life and upon failure, may cause significant social, financial, and environmental impacts.

Zone 2: Contains assets that have high consequence of failure but have not deteriorated enough to be included in the significant risk zone (Zone 1). Increased visual and/or predictive condition assessments (thermal scanning, oil analysis, etc.) may be justified as their condition deteriorates and they move vertically in the graph approaching Zone 1.

Zone 3: Contains assets that would experience failure consequences that are tolerable because they may be being managed through designed redundancy and operational mitigation such as spares and condition monitoring. Zone 3 assets can also migrate into Zone 1 and as such require additional focus by management.

Zones 4 & 5: Contains assets with lower consequences of failure. Applicable management strategies for these assets may be run to fail and maintenance optimization.

4.7 Asset Condition and Remaining Life

Policy Statement -We will understand and manage the current state of our assets, including condition and remaining life.

Objectives:

Know what assets MMSD owns and for which assets we have responsibility or legal liability. MMSD will record these assets in an asset register down to a maintenance-managed item (MMI) level.

Monitor the condition, performance, use and cost of infrastructure assets down to the appropriate level and against prescribed service levels and regulatory requirements.

The likelihood of an asset failing may be the result of physical mortality (structural integrity), capacity, changes in levels of service or because of inefficient operations. Example influences of physical mortality include material type, age, construction methods, operational environment and external influences among others. Table 8 presents examples of data source requirements needed for asset condition and determining remaining life.

Table 8 Data requirements for pipe condition assessment

Data Type	Attributes	Source
Asset attributes	Date of installation	GIS / Record drawings
	Material	GIS / Record drawings
	Size	GIS / Record drawings
	Length	GIS / Record drawings
	Lining/Rehab status	GIS / Contract data
Geospatial parameters	Proximity to roads	GIS
	Proximity to other utilities	
	Proximity to railway lines	
	Groundwater elevation	
	Soil type	
Work order data, when available	Type of work order (structural failure vs operational failure)	Maintenance records
	Date of work order	
Inspection records, when available	CCTV inspections	Inspection records
	Leak detection	Contract data
	Condition assessment technologies	Contract data

A condition rating system using a scoring range of 1 to 5 (Table 9) is recommended for use by MMSD. This type of rating system is simple and it matches the scales used by NASSCO[1] for PACP[2] scoring.

[1] NASSCO stands for National Associations of Sewer Service Companies.
[2] PACP stands for Pipeline Assessment and Certification Program.

Table 9 Condition rating system for pipes

Condition Score	Description
1	New or Excellent
2	Minor Defects Only
3	Moderate Deterioration
4	Significant Deterioration
5	Virtually Unserviceable

An example approach for the determination asset condition score for linear assets is illustrated in Figure 11.

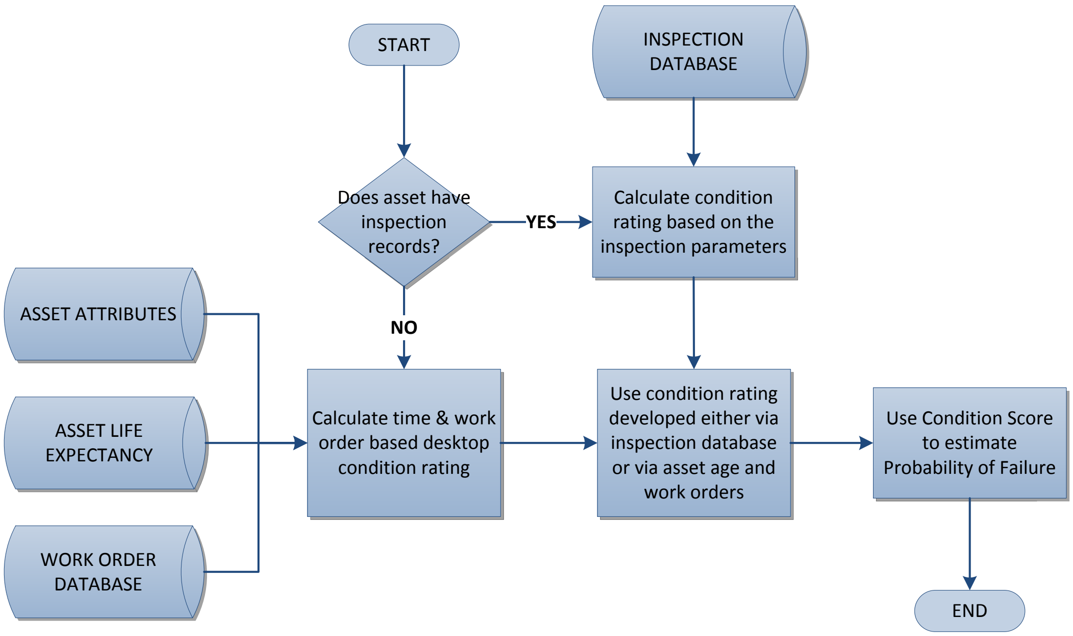


Figure 11 Process flow diagram for estimating asset condition

4.8 Decision Support System and Asset Management Plans

Policy Statement - We will prepare asset management plans for capital and operational strategies.

Objectives:

Prepare an asset management plan for the Nine Springs WWTP and an asset management plan for the Collection System. Together, these two asset management plans will constitute the asset management plan for the organization.

Create the asset management plans as living, active documents. Investment projections from the asset management plans should be reviewed and validated on an annual basis. The asset management plan is intended to be updated as needed on a periodic basis every 5 to 10 years.

Understand the total cost of service delivery, including financial, social and environmental costs.

As described in Section 3, a critical element of the SAM Framework is the development of asset management plans (AMPs). An AMP systematically tells the story of the state of MMSD's infrastructure and provides both capital and O&M management strategies. The AMP answers the 5 Core Questions and an additional question focused on challenges in implementing the AMP. The list below provides an initial content outline for MMSD's AMP development. The content sections are organized directly around each of the 5 Core Questions (+1 additional).

Q1 – What is the State of our Assets?

- Asset Description
- Asset Statistics
- Management Strategy Groups
- Management Strategies
- Condition Assessment
- Probability of Failure
- Consequence of Failure

Q2 – What is Required Level of Service?

- Levels of Service Targets and Calculations
- Levels of Service Measures and Performance
- Demand and Need Forecasting

Q3 – What Assets are Critical to Sustained Performance?

- Business Risk Exposure

Q4 – What is Our Infrastructure Improvement Plan?

- CIP Information and Integration
- Operations and Maintenance
- Needed Projects

Q5 – What will it Cost to Implement the Asset Management Plan?

- Cost Estimates
- Year-by-Year Cost Projections

Q6 – What Business Improvement Opportunities Should be Pursued?

- Areas of Evaluation
- Areas of Implementation

Ultimately, the AMP identifies needs and recommended management strategies that are an input into the capital and operational budgeting process.

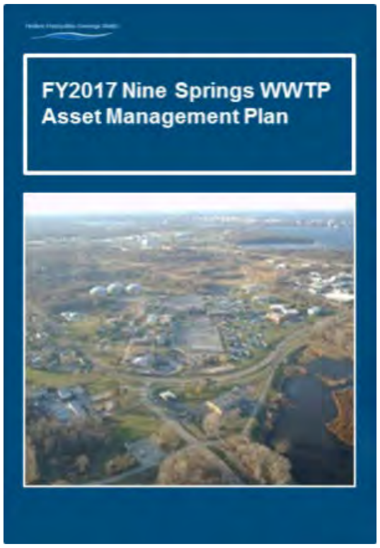


Figure 12 Example: Nine Springs WWTP AMP

For MMSD it is recommended that two separate AMPs be developed. The first would be for the Nine Springs Wastewater Treatment Plant and the other would be to build upon the work already completed on the Collection System AMP by developing updated version. The Collection System AMP would include interceptors, pumping stations and force mains.

Developing an AMP can be effectively supported through the use of a Decision Support System (DSS). A DSS allows for the analysis of the application of different infrastructure management strategies and their resultant future investment requirements. A main output of the DSS is the "Nessie Curve" or future capital and O&M investment profile as shown in Figure 13

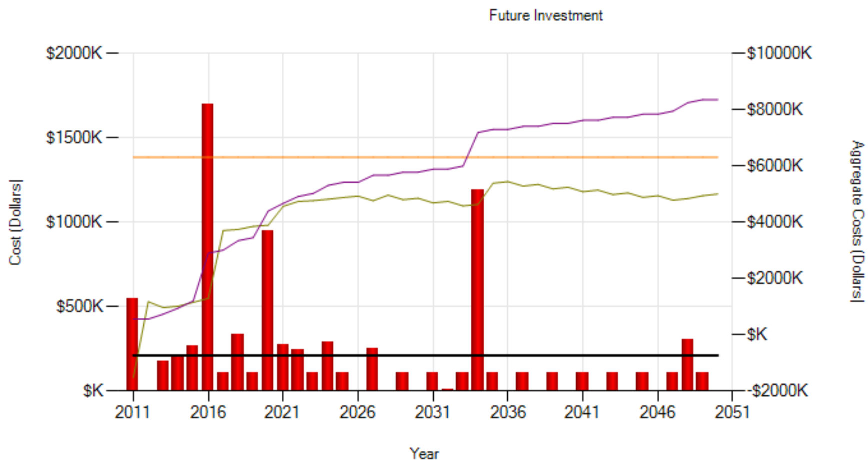


Figure 13 Example Nessie Curve from DSS analysis

The DSS is a major "tool" used by managers to make better decisions. While the DSS is data driven, it is important to note that there are other inputs into the process. For example, data driven DSS analysis may indicate that an asset should be rehabilitated due to physical mortality in the next 5 years. However, a new regulatory requirement (Levels of Service) may result in the need for an asset to be replaced earlier (eg permit change). There are also Triple Bottom Line (TBL) inputs that are not data driven such as social/community considerations.

The backbone of a DSS is a set of business rules used to model the rehabilitation, renewal and replacement schedule for assets. Each total predicted annual expenditure is based on life cycle analysis and management strategies for each asset. A DSS allows asset managers to build the AMP "bottom up" from the data and information at the asset level. The DSS inputs include asset condition data, consequence of failure data, physical effective lives, rehabilitation strategies (including costs), replacement strategies (including costs) and intervention triggers. Outputs from the DSS primarily are an input into the AMP, but it can also be used as a decision tool to inform various aspects of MMSD outside of the AMP process as shown graphically in Figure 14.

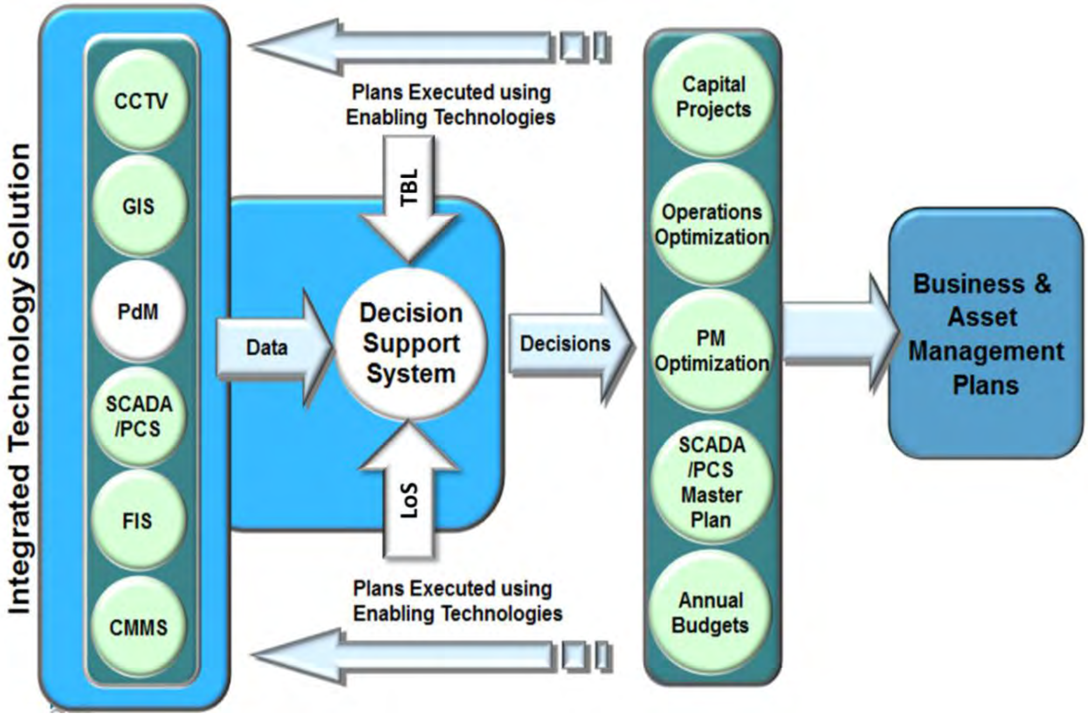


Figure 14 Decision Support System schematic

Initially, a DSS for MMSD could simply be a spreadsheet (or a set of spreadsheets) used to analyze the inputs described above and to develop "what-if" scenarios for different management and investment strategies. Longer term implementation considerations for a DSS include:

- Desired functionality.
- Reporting requirements.
- Integration with other planning tools, such as contract packaging

The "To Be" Strategic Business Process mapping for implementing DSS and AMP development within MMSD is presented in Figure 15. Please note the following:

- The DSS analysis function and development of AMPs resides in the Sustainable Infrastructure Management function of Planning.
- Outputs of the DSS and AMP process reside primarily in Planning (e.g., business case development), however, other functional areas will have inputs and outputs to the process.
- GIS data management resides in Engineering, however, the SAM functional element of GIS Spatial Analysis is recommended to reside in the Sustainable Infrastructure Management organizational group.
- The development of the financial forecasting and modelling (including debt service impacts, etc.) reside in the Administration Group.

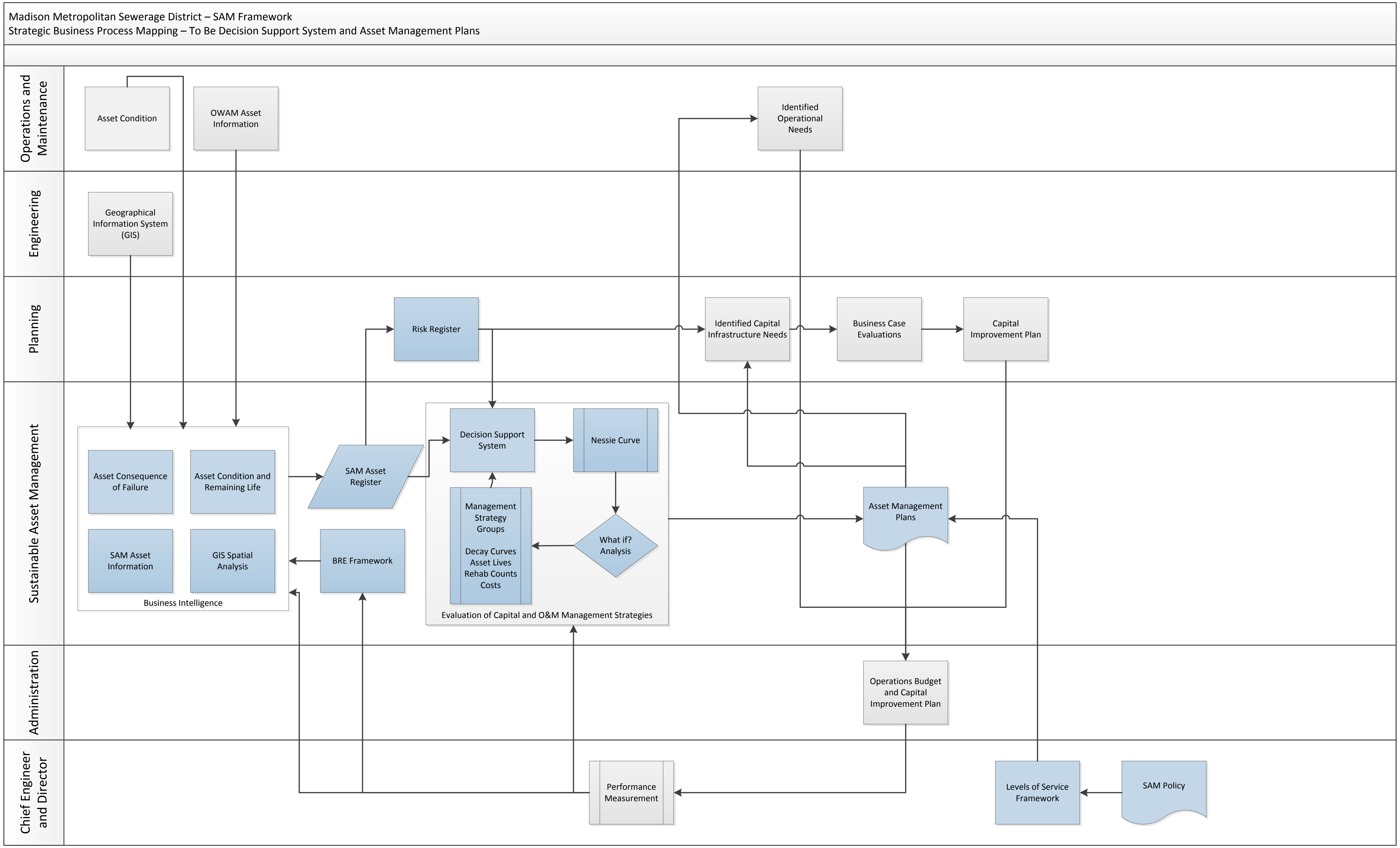


Figure 15 Strategic Business Process Mapping - To Be DSS and AMP

4.9 Business Case Evaluation Process

Policy Statement -We will embed sustainable asset management practices throughout the organization and develop a long-term sustainable funding strategy.

Objectives:

Develop funding strategies to sustainably manage the utility. MMSD will monitor and report in Triple Bottom Line terms (financial, environmental, social/community/organizational).

Link MMSD's organizational and asset management strategic goals to asset related investments and action plans.

Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).

A Business Case is a methodology for documenting and presenting a solution to an identified infrastructure need as a result of the asset management planning process and or through other ad-hoc processes. The final solution to addressing the need could be a capital project, an operational program or changes to O&M strategies. A Business Case discusses the supply and demand issues, documents the range of alternatives analyzed, reasons for accepting and rejecting each option, makes a recommendation on how the project should proceed, and provides the documented justification for proceeding with the project.

An important component of Asset Management is validating the Capital Improvement Program (CIP). MMSD uses a Business Case process for all projects that are included in the CIP. The existing MMSD process thoroughly documents the reason for the identified need, evaluates multiple alternatives, and includes many aspects of life cycle costs analysis, however, it does not consistently include all life cycle costs, TBL considerations nor is there a common methodology to asses risks and risk reductions by each alternative as part of the evaluation.

The following is the basis for the improved Business Case Evaluation Process at MMSD. The main elements include: Need Identification and Validation, Life Cycle Cost Analysis, Risk Reduction, and Benefit Cost Analysis, which are summarized in a Business Case and then prioritized by the CIP Committee. The main elements are shown in Figure 16.

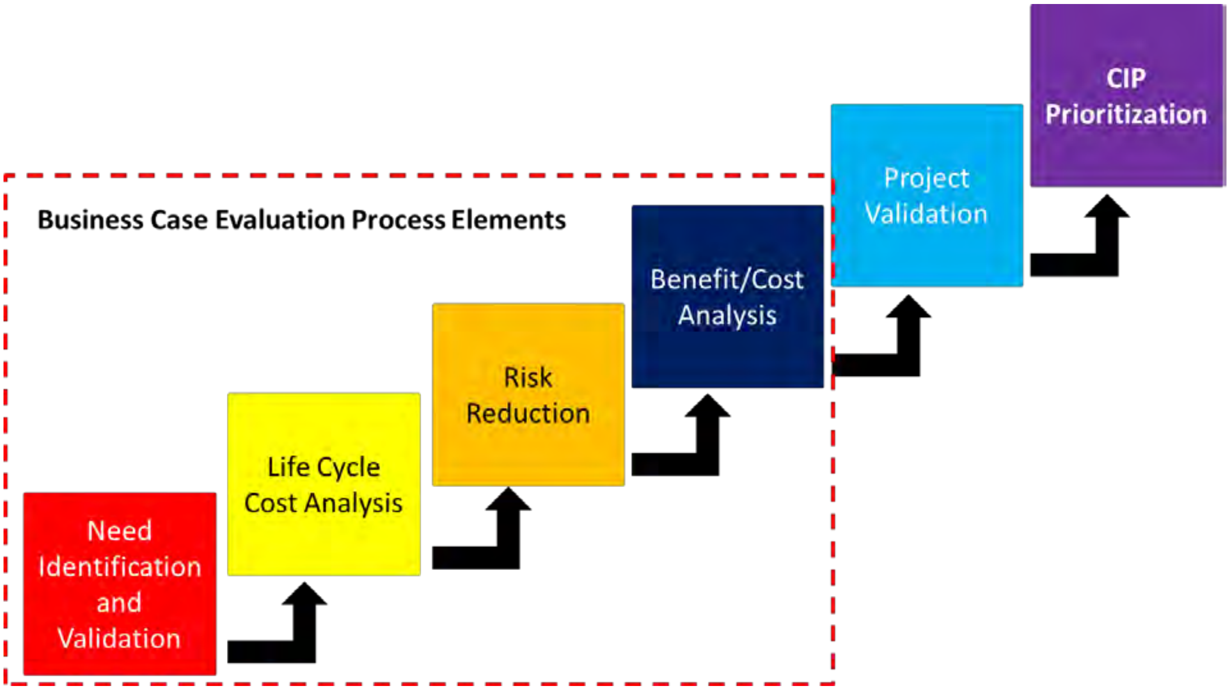


Figure 16 Business case evaluation process for CIP development

The Business Case provides the following benefits:

- A record of the issues and analysis done to prepare and justify a project;
- A framework for summarizing and reporting on the results of the Project Validation, Risk Reduction, the Life Cycle Cost, and the benefit cost for each project option considered;
- A basis for selecting the appropriate treatment option for a project;
- A structured way of presenting a project's justification to stakeholders;.
- A consistent way of receiving projects for consideration;
- A consistent way of considering and analyzing projects at a committee level, allowing comparison between projects more easily;
- Improved decision making based on improved project data;
- Improved basis for justifying decisions made to the District's Commissioners.

The Business Case makes a recommendation on how a CIP project should proceed and presents a concrete case for the project justification. It discusses and documents the supply and demand issues for the project, the Project Validation score in the analysis completed for the project, the risk reduction value that the project represents to the business, the range of alternatives analyzed, the reasons for accepting or rejecting each option, and documents the project metrics justifying project approval.

A Business Case is required for all capital projects under consideration for the Capital Improvements Program (CIP). A separate Business Case "Light" Process is required for Operational and other Ad-Hoc needs.

A business case for a need can be developed either in-house by MMSD or outsourced to a consulting firm for development. The outsourcing option can be exercised if the effort associated with a business case is anticipated to exceed the availability of the in-house resources.

The definitions of terms used in the Business Case Development are listed in Table 3.

Table 10 Main business case components and definitions

Term	Definition
Project Initiation	The process of validating and documenting that an identified failure or impending failure (physical mortality, level of service, capacity, financial efficiency) requires a capital project solution that warrants development into a project for consideration in the CIP (Capital Improvements Program) or other Operational, regulation-driven and Ad-hoc investments.
Initial Project Validation	The Initial Project Validation rating is a percentage score that reflects an assessment of the process, data and knowledge associated with identifying renewal, level of service, capacity, or financial efficiency failures/needs.
Need Prioritization	A need can be identified by anyone in the organization. Once a need is identified to remedy an existing or an anticipated failure and validated with the Initial Project Validation, the need is prioritized with respect to other identified needs to assess which need goes through the business case development process.
Project Development (Initial Planning)	The process of developing an initiated project into an initially planned (or developed) project with a business case for consideration in the CIP. This step includes the development of alternatives prior to the business case development.
Engineering Studies	Studies required to identify alternatives to address an infrastructure need. Studies required to improve the Initial Project Validation score to the hurdle amount to enable a project to progress through to RR/LCC and business case development. Studies to improve the level of understanding of factors impacting asset life and performance.
Life Cycle Cost	The sum of all outgoing costs associated with the ownership and operation of the infrastructure installed or constructed through the project. Cost components are planning, design, construction, operations, maintenance, decommissioning, and rehabilitation.
Risk Reduction	An estimate of the likelihood that an asset will fail multiplied by the consequences that will likely result from that failure taking into account the current level of risk mitigation.
Benefit / Cost	Benefit/Cost ratio is an expression of the total estimated benefits and costs associated with a project assessed on a triple bottom line basis and including organizational and community (indirect and intangible) benefits and costs.

Figure 17 presents the Strategic Business Process Flow for developing business cases at MMSD.

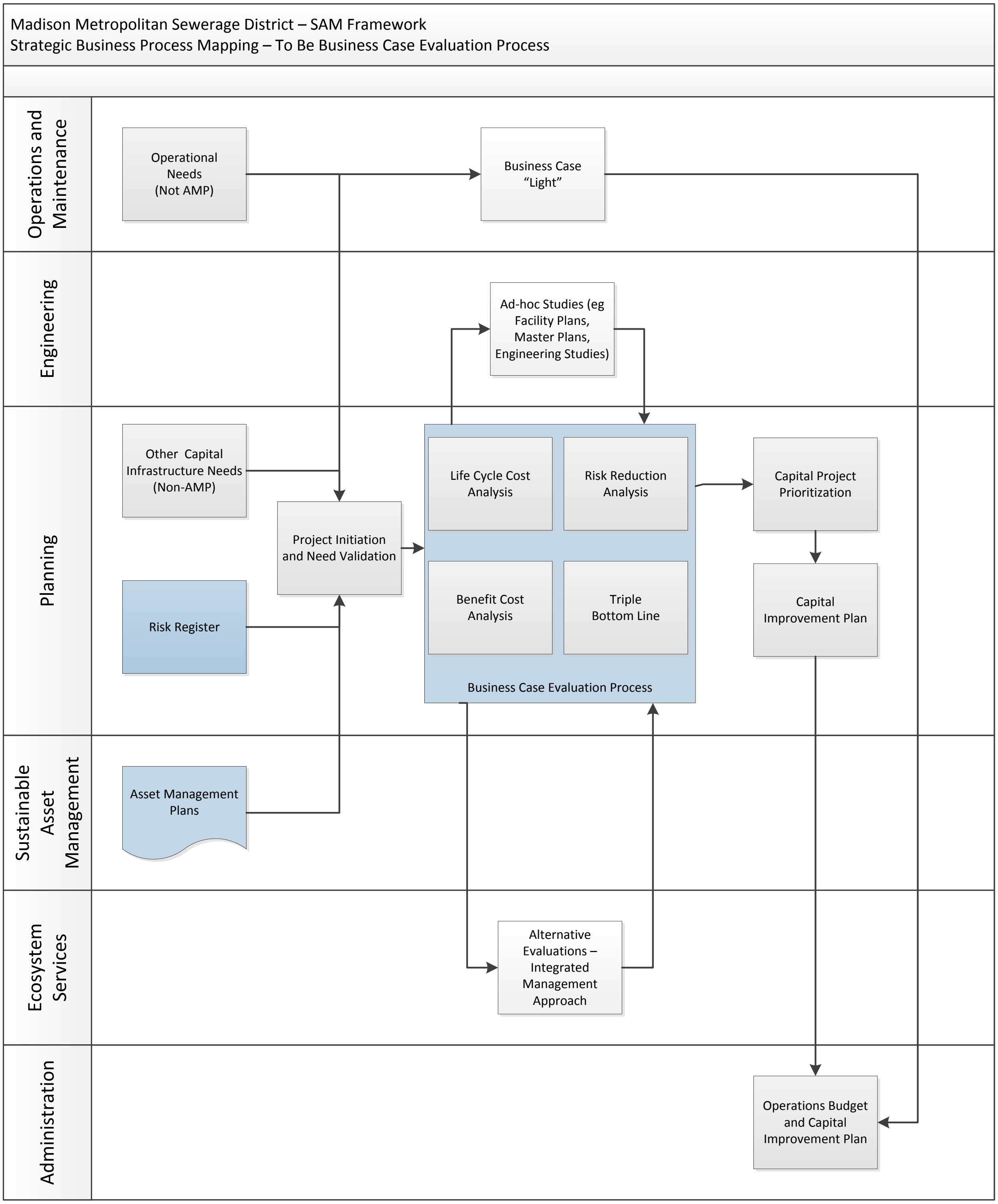


Figure 17 Strategic Business Process Flow for developing business cases

5. Asset Management Governance and Leading Change

Policy Statement -We will embed sustainable asset management practices throughout the organization and develop a long-term sustainable funding strategy.

Objectives:

Establish an appropriate governance model with defined roles and responsibilities to sustain asset management practices.

Review progress to continuously improve our asset management performance.

Allocate resources to effect the continued development and implementation of an asset management program.

To realize the full benefit and value of enhanced asset management, the right organizational structure with the right people in the right roles with the right expertise needs to be in place.

One definition of governance is:

The establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members (with the associated accountability), and their primary duty of enhancing the success and viability of the organization (source: BusinessDictionary.com).

Developing an appropriate governance model (or organization design) that supports work management, maintenance management, and enhanced asset management practices and the understanding that with enhancing asset management practices comes the need to be mindful and intentional about how real change comes about is an important element for the SAM Framework. Governance activities include: overseeing strategy, creating policies and practices to achieve the strategy, overseeing the implementation of the strategy, monitoring and measuring the implementation, and reporting and communicating regularly.

Specifically, governance models promote improved coordination and effectiveness in the following areas:

- Work Management and Maintenance Management
  - Service request management
  - Asset data entry at the front line
  - Work planning and scheduling
- Materials Management
  - Inventory
  - Purchasing
- Physical Asset Management
  - Setting direction, including strategy, policy and SAM Framework

  - Levels of service and performance management
  - Risk management and project options analysis
  - Asset renewal and replacement planning
  - Project prioritization
  - Developing and managing asset management plans
  - Strategic and tactical SAM implementation
- Technology Asset Management
  - General technology support
  - CMMS support, maintenance and upgrade
  - Integration and coordination with other core systems
  - System development and lifecycle management
- Skills and Competency Development
  - Support of new or revised roles and responsibilities for asset management
  - Driving leading practices
  - Effective use of technology enablers

Good governance also includes characteristics like:

- Creates the right environment for individuals and groups within an organization to work together
- Fosters communication and removes barriers to it
- Minimizes silos and reduces barriers to collaboration
- Organizes an efficient, moderately lean organization structure suitable to the task (i.e., overly lean organizations can be taxing on personnel trying achieve asset management goals)
- Generates energy and momentum (including recognizing when energy is flagging and doing something about it)
- Provides an appropriate forum for raising conflict and resolving them (e.g., manages the 'healthy tension' and minimizes the other more destructive kinds of conflict)
- Sets priorities
- Creates focus in the organization

5.1 Organizational Design Principles (Leading Practices)

The structural configuration of an organizational design should reflect the way work is divided and how the organization wants to achieve coordination among its various work activities. An organizational design structure resolves the two basic tasks of getting work done by: (1) Dividing up the work in the organization into logical units (this enables performance management); and (2) ensuring the work gets done by providing the coordination and control of work.

The organizational and governance model for asset and work/maintenance management should focus on effectiveness as defined in Figure 18 where effectiveness is a function of an organization's inherent capability and delivered execution.

Figure 18 Model of Organizational Effectiveness

Understanding the assets that MMSD manages and the work needed throughout the full lifecycle (plan, design, create, operate, maintain rehabilitate/replace and dispose) of these assets to provide the required customer service is fundamental to the organizational design process.

In general, organization structures can be designed to achieve the desired outcomes based on functional responsibilities, geographic boundaries, service departments, or a matrix approach as shown in Table 11.

Table 11 Main business case components and definitions

Organizational Structure Type	Description
Functional	Logical reflection of the organization's activities. Based on specialization that is efficient.
Service-Based Focus	Adaptable and flexible to meeting the needs of managers as they use assets to deliver a set of related services.
Territorial (or Geographic)	Establishes work groups based on a geographic area.
Matrix	Composed of managers and project teams who are employees from different functional units.

Successful and effective AM governance models most commonly:

1. Reflect the strategic vision, mission and values of the organization and the department as well as the vision for AM strategy implementation.
2. Allocate and balance human resources and workload across positions within existing and vacant positions and provide for appropriate critical functions.
3. Acknowledge and leverage the existing skill and expertise areas of management and staff; acknowledge the strengths of management and staff involved and identify and create opportunities for further enhancing skills (gap and skills analysis – development and succession planning).
4. Reflect the organization's current Human Resources policies and practices.
5. Foster a decision-making process that considers the best interests of the organization, customers and staff.
6. Define clearly roles, responsibilities, communication links and decision making rights.

7. Support the integration of asset management across the organization and the necessary interdepartmental relationships required for moving the organization towards its vision so that activities that need to be coordinated fall within program boundaries.
8. Foster an environment and culture that enables the organization to attract and retain the right people/skills.
9. Provide for performance measurement of asset management program implementation.
10. Demonstrate flexibility in supporting and adapting to future evolving asset management needs.

5.2 Current Organizational Structure

The current organization structure for MMSD has six departments (Operations & Maintenance, Planning, Human Resources, Engineering, Ecosystem Services and Administration) reporting to the District Chief Engineer/Director and Commissioners. Figure 19 shows the primary organization structure for the department and work groups. Operations & Maintenance is the largest part of the organization and has work groups that include: Reliability Engineer, Buildings and Grounds, Collection System, Electrical and Mechanical Maintenance, Purchasing, Metrogro, Operations, and Asset Information.

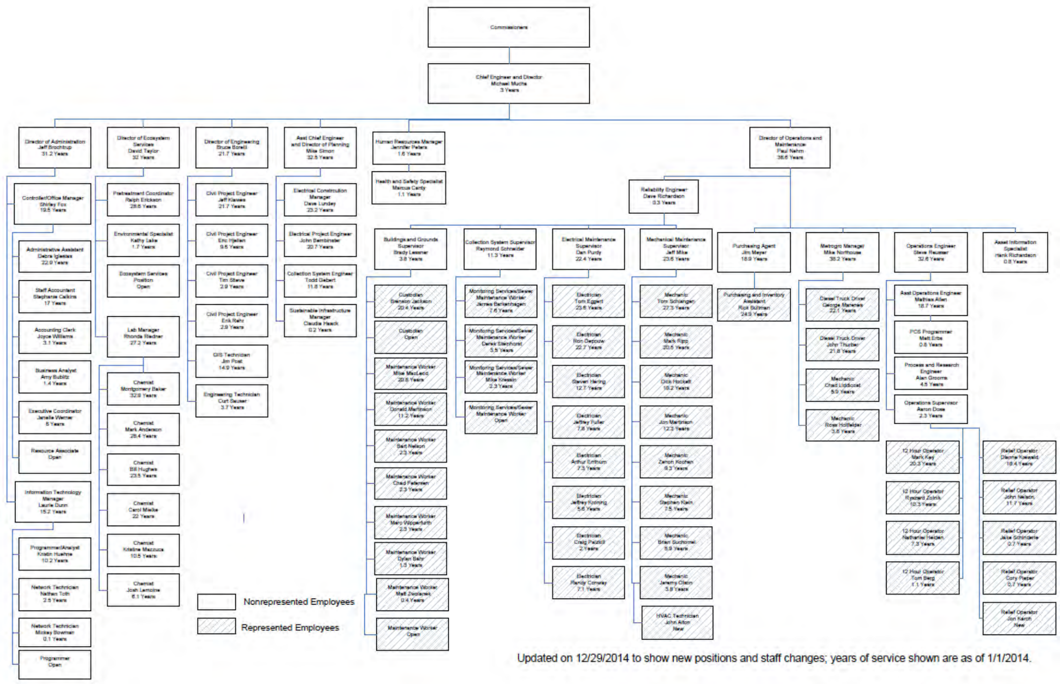


Figure 19 Current MMSD Organizational Structure

Formal Sustainable Infrastructure Management, where the SAM Framework is led, is part of the Planning Department in the organization. In addition, informal support and responsibility for Strategic Asset Management is provided from each of the other primary departments and work groups reflecting MMSD's approach that asset management integrates with all aspects of the organization.

Of the different types of governance models discussed during the March 2015 workshops, MMSD's current Sustainable Asset Management governance structure is most closely described as: Departmental AM Steering Team (Facilitation and Advisory), Centralized AM Work Group and

Formal Decentralization Departmental Delivery (referred to as Model 1 during the workshops and shown in Figure 20). At MMSD, there is a designated position for a Sustainable Infrastructure Manager, an informal AM Steering Team (as part of the Executive Team) has been formed and is convening on a regular and as-needed basis, and a Core Sustainable Infrastructure Management Team are all in place. In addition some of the Departments (operating units) of MMSD have begun to participate in certain AM related task initiatives.

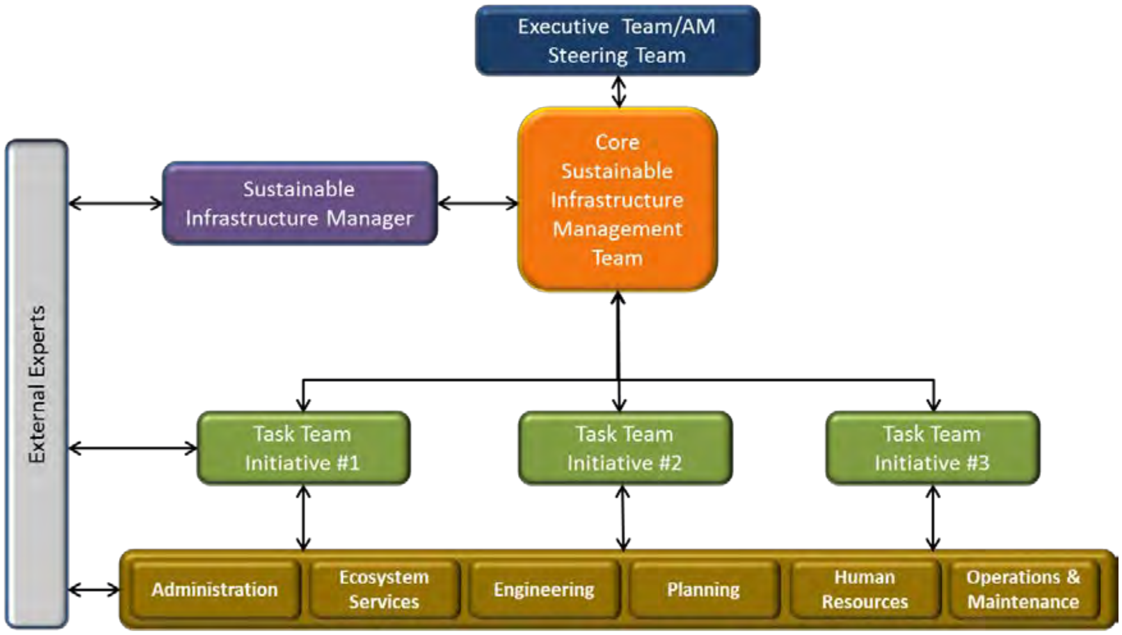


Figure 20 MMSD Current Sustainable Asset Management Governance Model

During the March 2015 workshops, the three primary elements of organizational effectiveness were discussed: communication, coordination, and task control. Current strengths and challenges of the current organizational structure were discussed and are summarized in Table 12.

Table 12 Current MMSD organizational strengths and challenges

Element	Current Strengths	Current Challenges
Communication	Communication within each department, division or function. One-way directional communication for giving instruction or directing tasks. Lots of data is available to staff. Opportunities for group discussions to decide collectively on needs.	Communication across multiple departments, divisions, or functions. Receiving feedback on instructed or directed tasks. Mining and analysis of the volume of data available. Crafting the right message for the right audiences. Too much jargon being used and not enough plain English explanation. Insufficient explanation of 'What's in it for

Element	Current Strengths	Current Challenges
		me?' and 'What's in it for MMSD?" Asset management job responsibilities insufficiently defined in current job descriptions.
Coordination	Interaction between Planning and Design functions. Construction phase execution. Sewer maintenance coordination. Coordination with Metrogro. Waste acceptance. Opportunities for staff to meet with supervisors. Maintenance scheduling using Oracle WAM.	Hand-off between Engineering and Operations & Maintenance. Maintenance notifying Operations when requested repairs are completed. Performing condition assessment. Waste acceptance (both strength and challenge) Asset valuation and connection of asset financial data to other asset information. IT advanced planning and different software platforms. Entering new assets into Oracle WAM.
Control	No rivalry between Operations and Maintenance	Inertia to move initiatives forward. Functioning of the AM Steering Committee (more can be done). Embedding SAM accountability and responsibility beyond the AM Steering Committee. Personnel resources are limited and people have little additional availability. Communicating time availability and task overload situations. Culture emphasizes getting things done through individual work relationships.

The SAM Framework defines the organizational functions that relate either formally (through direct supervision under the Planning Department) or informally (through coordination and collaboration with other MMSD departments). Table 13 provides a list of SAM functions that under the SAM Framework are aligned either formally under the Planning Department, Informally through dotted-line relationships between Planning and other MMSD departments, or 'Either'.

Table 13 Formal and informal SAM functions

Formal SAM Functions	Either Formal or Informal	Informal SAM Functions
Provide SAM leadership and direction	Update and maintain the asset inventory, asset hierarchy and asset register	Implement SAM vision, policies, framework and procedures
Develop and communicate SAM vision, policies, framework and procedures	Define procedures for collecting, validating, analyzing, storing and retrieving data	Procure, implement, and support IT systems that support SAM
Define Levels of Service	Perform asset life cycle cost analyses and asset remaining life analyses	Perform reliability evaluations to enhance maintenance and operational asset performance
Establish, implement and maintain the SAM Program	Identify and communicate needed and potential asset investment projects	Perform condition assessment and collect required asset data
Provide input to the Capital Program	Perform business case analyses and resulting project prioritization	Implement work management processes and procedures, including work order prioritization
Drive SAM continuous improvement	Identify database system user requirements	Report on asset performance
Establish and implement risk-based decision-making practices	Provide wide access across the divisions to asset data and analysis tools	Manage asset inventory and spare parts
Develop and update Asset Management Plans (AMPs)	Manage the handover of assets from design to construction to operation	Research and report on alternative project approaches
Define SAM technology requirements	GIS data entry and other asset data source management	
Provide SAM training and skill development		
Communicate SAM progress to the Executive Team & Commission		

At the current stage of MMSD's asset management program evolution, the Asset Management function is led through the position of the Sustainable Infrastructure Manager within the Planning Department of the organization structure.

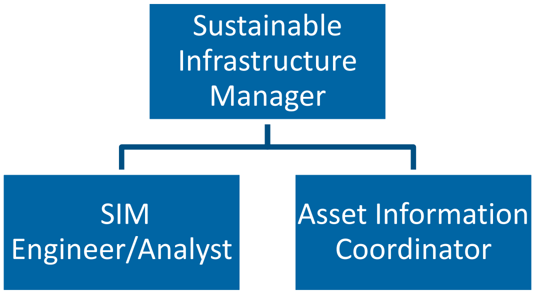
As MMSD's asset management program develops, the functions of the Sustainable Infrastructure Manager should have ownership and direct responsibility for the following key primary programmatic functions:

- SAM Asset Register
  - Establishment of the asset hierarchy
  - Definition of asset data fields to be collected, including asset naming and numbering conventions

    - Direction to the rest of the organization on the population and maintenance of the data in the asset register
    - Development of quality review systems to periodically evaluate the asset data quality of the organization
- Business Intelligence
    - Definition of the categories, types, and formats of asset data to be collected in the SAM asset register
    - Analysis of asset condition and determination of asset remaining life for each asset
    - Determination and recording of asset consequence of failure for each asset
    - Integration and analysis of available GIS spatial data with asset attribute information and visualization of asset management analysis using GIS tools
    - Lead the technical requirements development process for asset management database systems implementation and upgrade
- Risk Framework
    - Review and have input to the Planning division's risk register development
    - Leadership and implementation of MMSD's Business Risk Exposure (BRE) process
    - Identification of MMSD's critical assets
- Capital and O&M Strategies
    - Define Management Strategy Groups (MSGs)
    - Analyze legacy and current information to determine MMSD specific asset decay patterns and compare the decay patterns to industry standards
    - Implement and manage MMSD's Decision Support System (DSS)
    - Develop and evaluate capital investment options and decisions
    - Provide input to O&M procedures with the aim of optimizing asset life
    - Participate in Business Case Evaluation activities of the Planning division
- Asset Management Plans (AMPs)
    - Perform asset life cycle cost analysis
    - Develop the content requirements for MMSD's AMPs
    - Develop draft AMP content based on asset data analysis
    - Develop and review asset management–related processes and procedures, and communicate these to the rest of the organization
    - Communicate AMP content and recommendations to the rest of the organization for input and refinement
- Business Case Evaluation (BCE) Process
    - Establish standards and guidelines.
    - Provide analytical support to the BCE process

- Performance Measurement
  - Provide input to the Chief Engineer and Director on the development of appropriate key performance indicators
  - Provide input to the development of Levels of Service targets
  - Provide input to the procedures for measuring progress against Levels of Service targets
  - Analyze asset life performance and cost information and compare to MMSD's applicable Levels of Service targets
  - Lead asset management training activities for all staff according to their role
  - Recommend asset management related roles and responsibilities to MMSD's Human Resources division for inclusion in job descriptions and performance evaluation processes.
- Asset Management Governance
  - Facilitate and coordinate the Core Sustainable Infrastructure Management Team
  - Lead the development of the asset management vision, policies, and framework elements
  - Facilitate and coordinate the asset management functions and practitioners from across the operation

The above responsibilities are substantial and require sufficient resources in order to execute properly. GHD recommends that at this time in MMSD's Sustainable Asset Management development process, two roles should report to the Sustainable Infrastructure Manager to support the above listed primary programmatic functions. These two roles are a Strategic Infrastructure Management (SIM) Engineer/Analyst and an Asset Information Coordinator.



GHD's recommendation for general (not comprehensive) roles and responsibility division for each of the three positions are shown in Table 14.

Table 14 Description of Office of Sustainable Infrastructure Management Roles

Role	Description
Sustainable Infrastructure Manager	• Provide asset management leadership formally and informally. • Develop and communicate the asset management vision, policies, framework, and procedures. • Establish and maintain a sustainable asset management program. • Participate in levels of service targets development. • Champion and communicate asset management and asset data

Role	Description
	processes and procedures. • Lead risk-based decision processes for managing assets. • Develop and maintain MMSD's Asset Management Plan. • Participate in the development of MMSD capital program. • Drive asset-related continuous improvement and communicate asset management performance results to MMSD leadership. • Define technology requirements for asset database systems. • Track and report benefits and value of the asset management program.
Sustainable Infrastructure Management Engineer/Analyst	• Develop and implement asset management framework procedures for asset register development and risk evaluation. • Perform asset life cycle cost analyses. • Perform business case analysis for robust identification of project alternatives selection that provide the greatest overall benefit and risk reduction to the organization. • Engage the front-line workforce in asset management approaches appropriate to operations, maintenance and field activities. • Make asset knowledge available widely across MMSD through effective communication and delivering asset management training. • Support asset reliability analyses. • Identify potential capital investment projects based on asset data analysis. • Develop and implement performance measures that can demonstrate asset management benefit to MMSD. • Define the asset management skill requirements required for MMSD employees. • Develop, implement and coordinate an asset management training program. • Support the development of the division capital program based on asset management principles. • Develop procedures for prioritizing work tasks, projects and programs. • Develop the framework for managing the division's relationships with consultants and contractors for planning, design, construction and operation of assets.
Asset Information Coordinator	• Develop and maintain asset inventory, hierarchy and asset register. • Develop and support the implementation of asset data standards

Role	Description
	including procedures for adding and retiring assets from the asset register. • Be responsible for data accuracy and completeness. • Coordinate with Operations, Engineering and Planning regarding asset register data and information for use in an AM decision making, including providing data to support analyses such as asset management plan development and business case evaluations. • Develop and implement procedures for data collection, asset condition assessment and collection of asset failure/performance information. • Support and contributed to O&M reliability studies including developing strategies and techniques to enhance the effectiveness and efficiencies of operations and maintenance efforts. • Based on management strategies developed in the AM program, assist in the development of maintenance procedures, job procedures and tracking preventative vs corrective work orders. • Support the establishment and tracking of O&M related key performance indicators.

In addition to these direct programmatic functions, all departments within the MMSD organization participate in and contribute to asset management activities. GHD recommends that MMSD establish informal coordination relationships between the Core Sustainable Infrastructure Management Team the six departments as shown in Figure 22. Please note that the model presented in Figure 22 is for a sustainable asset management governance model and does not represent a proposed change to the organizational structure as shown in Figure 19 above. An individual from each of these departments should be identified to serve as the asset management champion for their department (or Work Group.in some cases). These individuals would be the point persons for implementing asset management practices and procedures developed by the Sustainable Infrastructure Manager and the Core Sustainable Infrastructure Management Team. The asset management unit champions would also participate significantly in training MMSD staff on asset management procedures as well as be responsible for leading or overseeing other asset management related functions such as data collection.

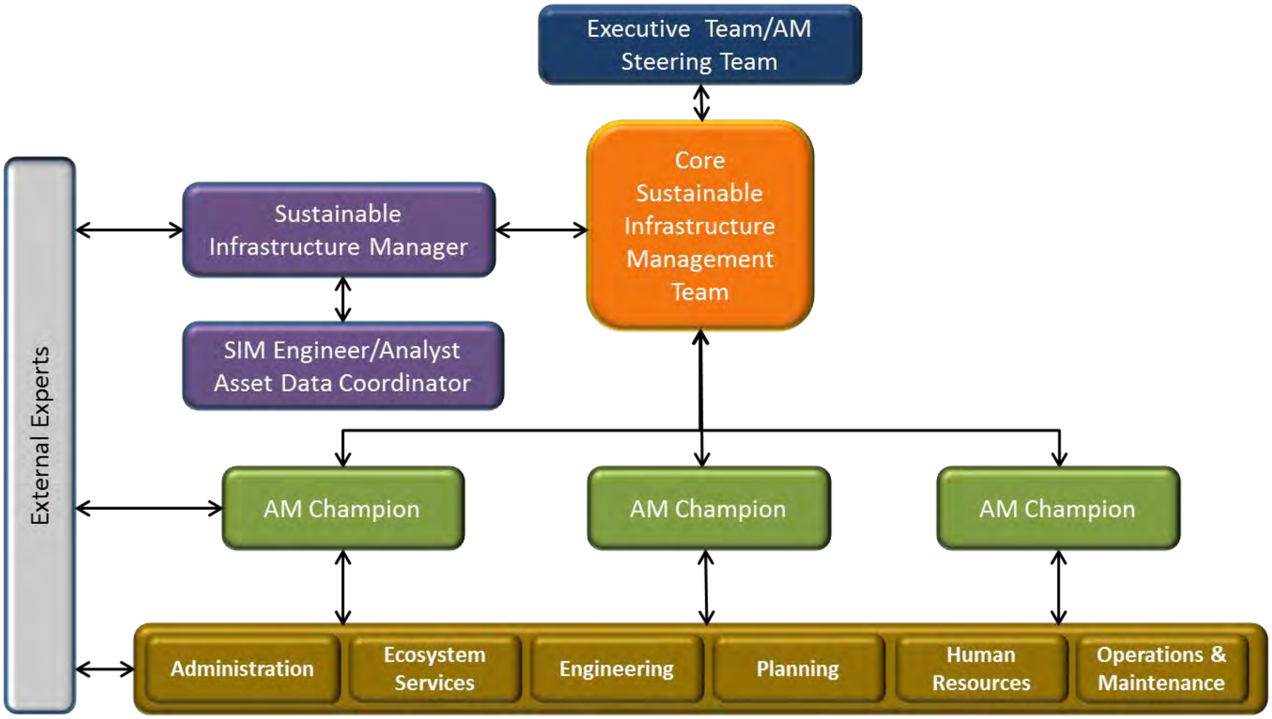


Figure 21 MMSD Recommended Sustainable Asset Management Governance Model

5.3 Leading Organizational Change Considerations

A key to a successful SAM implementation program is the incorporation of organizational change management principles. Effective change management drives successful transformation of strategy to process, technology, and performance improvements in ways that allow people to contribute meaningfully and feel part of the action. One effective model is Jeff Hiatt's recognized ADKAR model for organizational change. The model is simple and proven and illustrates how people move through change in a predicable way. ADKAR stands for:

- **A**wareness of the need for change
- **D**esire to participate and support the change
- **K**nowledge on how to change
- **A**bility to implement required skills and behaviours
- **R**einforcement to sustain the change

Table 15 shows some of the key elements for each of the five areas.

Table 15 Key elements of ADKAR change model

Awareness	Desire	Knowledge	Ability	Reinforcement
Effective communications	Effectively sponsor change with employees	Effective training and education	Day-to-day involvement of supervisors	Celebration and recognition
Executive sponsorship	Equip managers to be change leaders	Job aides, checklists, templates	Access to subject matter experts	Rewards
Coaching by managers and supervisors	Assess risks and anticipate resistance	One-on-one coaching	Performance monitoring	Feedback from employees
Ready access to information	Engage employees in the change process	Knowledge groups and forums	Hands-on exercises during training	Reviews and performance measurement systems
	Align incentive programs			Accountability systems

There are several effective change models that have been developed and used successfully within the utility sector. The ADKAR model is just one of these. MMSD may elect to use this model or a different model as part of implementing technical, operational, procedural, or organizational changes associated with the SAM Program. An intentional and planned approach to enacting change has a much higher probability of success than doing so without.

All change models include emphasis on effective communication. The following are key elements of effective communication that should be implemented as part of the organizational change and alignment efforts.

- Visible, active and frequent leadership engagement.
- Frequent communications directed appropriately to managers, supervisors, foremen, and front line staff with the intention of make these enhancement topics regularly talked about by the staff.
- Emphasis that some business, technical, and operational processes will be different going forward with explanation for the reasons and benefits for the changes.
- Clear communication to all levels of the organization of answers to 'What's in it for me?' type questions.
- Effective and sustained training opportunities to drive awareness and to be a catalyst for change, including a strong train-the-trainer program.
- Frequent updated communication to stakeholders such as Human Resources, IT, and Purchasing divisions so they are aware of potential support they can provide personnel, systems and projects.
- Frequent update communication with union representatives with the aim of enable proposed adjustments to roles and responsibilities to be understood and embraced.
- Frequent progress updates at various levels (including full department communication) with candid status updates (both positive and less positive progress information).

As each District SAMFIP activity is planned and executed, attention to these change principles and clear communication should be applied. In addition, identifying and fostering those in the organization who can act as champions for asset management will yield accelerated results over the case where asset management is only implemented top-down from the leadership or governance committee. As respected and credible individuals within the organization visibly demonstrate support for and early adoption of asset management, the pace of embedment of the new processes will increase. Conversely, attention should be paid to monitoring for pockets of resistance and intervening with the help of champions quickly and effectively to minimize the chance of a significant roadblock and to demonstrate leadership commitment to moving forward with the new approaches.

6. Data and Information Technology Support Requirements

In order to implement the SAM Framework presented in Section 4, MMSD will need to make some modifications and improvements to its data management and information technology (IT) systems. Business process improvement as described in Section 4 is ideally done as a precursor to any technology development and changes to organization design or governance models.

MMSD is beginning the process of developing an IT and a GIS Strategic Plan. In an effort to inform those planning processes MMSD should develop an Asset Management Information Systems (AMIS) requirements document as part of the development of the AMIP.

6.1 Technology and Data Management

Policy Statement -We will embed sustainable asset management practices throughout the organization and develop a long-term sustainable funding strategy.

Objectives:

Provide information technology (IT) and data management support.

Allocate resources to effect the continued development and implementation of an asset management program.

Provide training as needed on asset management processes and procedures.

Technology assets (hardware, connectivity and software) are enablers of the key business processes at MMSD. They allow staff to improve their productivity and capture key asset knowledge to support daily activities. Making the right choices in technology assets requires a focus on the following:

- Developing functional requirements that are consistent with desired business processes and workflows
- Developing technical requirements that meet corporate standards (e.g., operating systems, databases, etc.)
- Following a rigorous standard for selecting the right system and vendor partners to meet MMSD's needs

An AMIS requirements document is critical and helps enable a rigorous implementation process and systems that are properly configured to the redesigned business processes discussed above. The AMIS requirements document considers workflows, business rules, and value lists with choices that reflect leading practices (e.g., condition rating grades). Standard and specialized queries and reports are developed as part of the system configuration process. Attention to system testing, training and managing the overall change process is essential to successful implementation.

Implementation also requires the development of a data model that provides input on:

- Fixed asset register content
- Asset hierarchies/parent-child relationships (satisfying budget and cost roll up, capital planning, system monitoring and LOS reporting)
- Interface requirements that help minimize duplication of data entry and maximize automated data analysis and reporting
- Database rationalization

System integration is also a key implementation activity. The need to enter data once and provide access to others who need the data to support their work activities requires definition and development of system interfaces based on acceptable system architecture. System integration also provides the platform where business intelligence software can enable performance management and allow decision makers to leverage data for value creation. This will help MMSD achieve the goal of becoming both data and knowledge rich.

6.2 SAM Information Technology Considerations

As part of the March 2015 workshops, a discussion with IT stakeholders at MMSD was conducted to better understand SAM IT considerations for implementation. The following is a summary of this discussion, which is also presented in the minutes included in Appendix B.

The project team used the Five Core Questions in the discussion to identify the IT solution needs for MMSD Asset Management Program.

Question 1 – What is the current state of my assets?

- Need a better process for adding and retiring assets in WAM (including commissioning).
- Need a tool(s) to collect condition assessment data at the plant/facility. Identifying a data storage process is key for others to be able to access the data. There is also a need to translate PACP/MACP to a standard Condition Rating System.
- Need to collect PCS/DARC data into the WAM. (DARC pulls PCS data and then summarizes those data according to procedures created within DARC. WAM then pulls summarized data. I am mentioning this because issues with DARC data stewardship are currently resulting blocks to getting good data into WAM. Efforts needed to improve data management and processing would be helpful in generating good data for the related assets.)
- Need to have improved processes for asset management data such as physical effective life, failure cause, remaining life, decay curve, and replacement costs.
- Access to asset data is needed through the GIS platform.
- There needs to be availability and easy access to asset record documentation (e.g., as-built drawings, O&M manuals, easements).
- Reporting functionality needs to include exportability of the content and flexible format configuration to match needed output objectives
- Training for new and updated processes is needed.

Question 2 – What are my required levels of service?

- Important metrics needs to be reported out via a dashboard.

- Within Level of Service Data Management, there needs to be the ability to identify the data sources that contribute to the LOS and there needs to be consistent processes for updating data.

Question 3 – Which assets are critical to sustainable performance?

- A COF scoring tool (BI) and data management for COF attributes are needed.
- Spatial analysis tools (GIS) are needed.
- Risk BI/ tool is needed.

Question 4 – What are our best O&M and Capital Strategies?

- A planning level renewal, replacement, and forecasting tool is needed that has what-if analysis capability.
- A business case evaluation tool is needed
- A project packaging and prioritization/ rating tool is needed.

Question 5 – What are our funding requirements?

- There needs to be an efficient way of presenting and reporting on financial requirements.
- The ability to forecast operational and not just capital costs is needed.
- The ability to aggregate data into Nessie Curves is needed.

The above IT solution needs will be considered in the development of the AMIS requirements document and should be an input into the development of the IT and GIS Strategic Plans.

Appendices

Appendix A – Sustainable Asset Management Policy

Madison Metropolitan Sewerage District

Sustainable Asset Management Policy

The Madison Metropolitan Sewerage District (MMSD)'s guiding principles for sustainable asset management are the following:

1. Understand and manage the current state of our assets, including condition and remaining life.

- Know what assets MMSD owns and for which assets we have responsibility or legal liability. MMSD will record these assets in an asset register down to a maintenance-managed item (MMI) level.
- Monitor the condition, performance, use and cost of infrastructure assets down to the appropriate level and against prescribed service levels and regulatory requirements.

2. Understand and manage our level of service (LoS) to our customers.

- Understand and record the current levels of service with which we provide our customers. We will define target future levels of service required in order to continue to serve our customers for the long term.
- Understand customer expectations including the regulatory (e.g., compliance, water quality, public health, etc.) and non-regulatory aspects of our business (e.g., noise, customer service, appearance, cleanliness, customer outreach).

3. Understand and manage our business risk exposure (BRE).

- Focus emphasis on those infrastructure assets that are critical to our service levels and prioritize their management to prevent their failure. (This is not to imply that non-critical assets are ignored.)
- Identify, understand, and manage the risks associated with running the utility.

4. Prepare asset management plans for capital and operational strategies.

- Prepare an asset management plan for the Nine Springs WWTP and an asset management plan for the Collection System. Together, these two asset management plans will constitute the asset management plan for the organization.
- Create the asset management plans as living, active documents. Investment projections from the asset management plans should be reviewed and validated on an annual basis. The asset management plan is intended to be updated as needed on a periodic basis every 5 to 10 years.
- Understand the total cost of service delivery, including financial, social and environmental costs.

5. Embed sustainable asset management practices throughout the organization and develop a long-term sustainable funding strategy

- Develop funding strategies to sustainably manage the utility. MMSD will monitor and report in Triple Bottom Line terms (financial, environmental, social/community/organizational).
- Link MMSD's organizational and asset management strategic goals to asset related investments and action plans.
- Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).
- Establish an appropriate governance model with defined roles and responsibilities to sustain asset management practices.
- Provide information technology (IT) and data management support.
- Review progress to continuously improve our asset management performance.
- Allocate resources to effect the continued development and implementation of an asset management program.
- Provide training as needed on asset management processes and procedures.

Appendix B - (Envision^{TM} Rating Tables)

RA2.1 REDUCE ENERGY CONSUMPTION

INTENT:

Conserve energy by reducing overall operation and maintenance energy consumption throughout the project life cycle.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(3) 10% to 30%. During the planning and design phases of the project, the owner and the project team conduct one or more planning or design reviews to identify and analyze options for reducing energy consumption in the operation and maintenance of the constructed works. Operational energy reductions are estimated at 10% to 30% as compared to industry norms. (A, C)	**(7) 31% to 50%.** During the planning and design phases of the project, the owner and the project team conduct one or more planning or design reviews to identify and analyze options for reducing energy consumption in the operation and maintenance of the constructed works. Operational energy reductions are estimated at 31% to 50% as compared to industry norms. (A, B, C)	**(12) 51% to 70%.** During the planning and design phases of the project, the owner and the project team conduct one or more planning or design reviews to identify and analyze options for reducing energy consumption in the operation and maintenance of the constructed works. Operational energy reductions are estimated at 51% to 70% as compared to industry norms. (A, B, C)	**(18) Greater than70%.** During the planning and design phases of the project, the owner and the project team conduct one or more planning or design reviews to identify and analyze options for reducing energy consumption in the operation and maintenance of the constructed works. Operational energy reductions are estimated at greater than 70% as compared to industry norms. (A, B, C)	

RA3.1 PROTECT FRESH WATER AVAILABILITY

INTENT:

Reduce the negative net impact on fresh water availability, quantity and quality.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(2) No immediate negatives. The design team determines how much fresh water will be used by the project both during construction and operations. Look for opportunities for reuse, and its effects on local surface water and groundwater including groundwater flows and quality. Consider peaks in short-term usage. Some estimates regarding long term impacts, but mostly extrapolations of current estimated usage. (A, B)	**(4) Good water management.** Design the project to access and control water usage over average maximum conditions, with plans to offset peak withdrawals during lower water need periods. Institute water reuse. More comprehensive assessment of long term needs. (A, B, C)	**(9) Wise water management.** Design the project to solely access water that can be replenished in quantity and quality. Control water usage over average maximum conditions, with plans to offset peak withdrawals during lower water need periods. Determine impacts of fresh water withdraw on receiving waters current and historic aquatic species. (A, B, C)	**(17) Total water management.** Design delivery and operations maintained such that there is no net impact on water supply volumes, including managing runoff to recharge local groundwater and surface water supplies in a manner that offsets withdrawals. Freshwater supplies are replenished at source. Discharges to receiving waters meet quality and quantity requirements of historic high value aquatic species. Methods may include closed loop recycling of water within the project. (A, B, C)	**(21) Positive impact.** Replenishes the quantity and quality of fresh water surface and groundwater supplies to an agreed upon undeveloped, native ecosystem condition. Discharges to surface waters of fresh water after use, meets historic pre-development seasonal cycles of quality and quantity, including temperature. (A, B, C, D)

CR1.2 REDUCE AIR POLLUTANT EMISSIONS

INTENT:

Reduce the emission of six criteria pollutants; particulate matter (including dust), ground level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead, and noxious odors.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(2) Improved air quality standards. California's standards are more stringent than NAAQS, and address additional pollutants beyond the six common air pollutants. Meet CAAQS standards for all project activities. Create a maintenance program to ensure that these standards remain met throughout the life of the project. (A)	**(6) Enhanced air quality standards.** Meet SCAQM rules in section XI and XIV, as applicable, for Source Specific Standards and Toxics and Other Non-Criteria Pollutants. (B)		**(12) Negligible air quality impact.** Project has only negligible air pollution impacts or net zero impacts from criteria pollutants. (C)	**(15) Air quality improvement.** Project not only achieves zero net production of criteria pollutants but implements measures to improve existing air quality to a level higher than pre-development. (C)

LD1.4 PROVIDE FOR STAKEHOLDER INVOLVEMENT

INTENT:

Establish sound and meaningful programs for stakeholder identification, engagement and involvement in project decision making.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(1) Information transfer. A limited program established for stakeholder communication and information transfer. Programs provide a basic exchange of information about the project. Lines of communication established. Some but limited community involvement. Feedback to the community, but essentially a summary of community input. Some planning and commitment to action, actions taken based on input received. (A, B)	**(5) Active engagement and dialog.** Communication with and feedback from project stakeholders and the affected public are important elements of the project. Lead person works with stakeholder groups to understand communication needs, potential for involvement. Active engagement and dialog is planned. Feedback received is compared against impacts to the project. Actions taken are based on practical project considerations tilted toward less project disruption than community/ stakeholder feedback. (A, B)	**(9) Open to a wider community.** Engagements expand to a wider community, people and relevant groups that are affected by or have an interest in the project. Frequent communication with the public and stakeholders, through significant project phases. Feedback obtained through solid, credible programs for obtaining stakeholder and community feedback. Feedback is assessed and applied to project decisions. Actions taken are based on community/stakeholder feedback, modified by feasibility. Public and stakeholder groups see sufficient and credible opportunities for involvement in project decision-making. Demonstration to stakeholders and the public that the public participation process is transparent and that they have an opportunity to provide meaningful input. (A, B, C)	**(14) Community relationship building.** Communication programs and exercises are designed to develop relationships with the key stakeholders, involvement in the project decision-making processes. Solid, credible programs for soliciting feedback from the public and key stakeholders regarding communications and public involvement in the project decision-making processes. Project can demonstrate specific and significant case(s) where changes were made based on feedback. Given the likely broad array of issues and positions, the project team focuses on not only obtaining meaningful input, but also buy-in that the process for making project decisions is fair and equitable. Built properly, these relationships can assist in breaking project logjams. Feedback programs are designed to give complete, credible feedback regarding the communications and public involvement processes. Project decisions incorporate fairness and equity. (A, B, C, D)	

LD2.1 PURSUE BY-PRODUCT SYNERGY OPPORTUNITIES

INTENT:

Reduce waste, improve project performance and reduce project costs by identifying and pursuing opportunities to use unwanted by-products or discarded materials and resources from nearby operations.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(1) Casual search and diversion. Identification and characterization done on a limited set of nearby facilities, waste streams. Candidate facilities and by-product possibilities identified but little work done in assessing the potential. Availability of excess resources and/or energy unclear. Assessment done but limited in depth, and only if by-product synergy possibilities seem obvious. Mostly a paper assessment. Studies and assessments are made, and managers of nearby facilities may be contacted. However, identification and screening efforts are limited. (A, B)	**(3) Affirmative program.** Owner and project team management demonstrate an appetite and inclination to address by-product synergy opportunities. Efforts to identify candidate facilities and by-product possibilities are broad and reasonably comprehensive. More aggressive searching and screening of opportunities. Assessment done in some depth. Facilities and possibilities identified. Contact with facility decision-makers to assess the potential is spotty. (A, B, C)	**(6) Opportunity foresight and pursuit.** Broad and comprehensive efforts to identify managers of facilities nearby who may have by-products or discarded materials that can be used on the project. Assessment done in sufficient depth to determine possibilities. Decision-makers contacted and pursued. Systematic assessment. Knowledge of the availability of excess resources and/or energy, other possible synergies is clearly identified. Research into regional by-product synergy projects. Aggressive searching and screening of opportunities. (A, B, C)	**(12) Opportunity pursuit and capture.** Aggressive searching for by-product synergy possibilities is a significant project element. Owner and project team understand the principles of industrial ecology. Facility decision-makers identified and contacted to assess the potential. Relationships developed. Active discussions with managers of nearby facilities to pursue by-product synergy opportunities. Constructive discussions with regulatory agencies, policy or standard-setting organizations regarding potential conflicts with regulations, policies and standards. Considerations in forming relationships with nearby facility managers to implement industrial ecology practices, i.e., long term supply of facility by-products for use in the operation of the constructed works. One successful by-product synergy application. (A, B, C, D)	**(15) Additional synergy opportunity captures.** Successful negotiation with managers of nearby facilities for securing two or more of their unwanted by-product supplies. Material supplies can be for short-term project construction or for long-term operation of the constructed works. (A, B, C, D)

QL2.1 ENHANCE PUBLIC HEALTH AND SAFETY

INTENT:

Take into account the health and safety implications of using new materials, technologies or methodologies above and beyond meeting regulatory requirements.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(2) Assessment of new requirements. In addition to the health and safety plans and programs put in place as required by law and regulation, the owner and the project team identify, assess and institute new standards, methods and procedures to address any additional risks and exposures created by the application of new technologies, materials, equipment and methodologies. Requirements are passed down to the construction contractor in the form of construction specifications. (A, B, C)			**(16) Excellence in all categories.** The project team puts in place health and safety plans and programs that substantively exceed all applicable regulations. Explicit and comprehensive consideration given to the application of new technologies, materials, equipment and methodologies, and the corresponding new and health and safety requirements and considerations. (A, B, C)	

QL2.2 MINIMIZE NOISE AND VIBRATION

INTENT:

Minimize noise and vibration generated during construction and in the operation of the constructed works to maintain and improve community livability.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(1) Studies, predictions. Conduct baseline studies of existing levels of noise and vibration specified in the project for construction and operations. Predictions of levels of noise and vibration based on proposed project siting and design are produced. (A)			**(8) Achieving acceptable levels.** Proposals for mitigation of air-borne and ground-borne noise and vibration to acceptable levels in the affected community are created based on studies and determination of the noise goals of the affected communities. Proposals are presented, approved and incorporated into the project designs. Project team sets construction specifications for noise and vibration limits. Programs to monitor noise and vibration during operation are established. (A, B, C)	**(11) Creating quieter communities.** The project is designed in such a way as to reduce ambient noise in the area. As a result of the project and the completed works, noise levels in the community have been substantially reduced below previous levels, and at least to affected community noise objectives. Specifications set for noise and vibration during construction take into account community needs. (A, B, C)

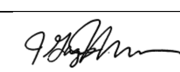
GHD Inc.

16701 Melford Boulevard
Suite 330
Bowie MD 20715

T: 1 240 206 6810 F: 1 240 206 6811 E: bowmail@ghd.com

N:\US\Bowie\Projects\86\18577\WP\GHD Report_MMSD AM Framework Doc_Final May 2015.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	Gage Muckleroy	Seth Yoskowitz	On File			
2	Gage Muckleroy	Seth Yoskowitz	On File	Gage Muckleroy		5/21/2015

www.ghd.com

APPENDIX G – STANDARD OPERATING PROCEDURE FOR USING GPS NAVIGATION AND STARTUP

USING GPS NAVIGATION AND STARTUP

SOP #: 3-05 **REV DATE:** 1-8-2014

ASSET #'S IF APPLICABLE: GPS0004

PURPOSE/SCOPE: To learn basic startup of the GPS and how to set the navigation up on GPS.

TOOLS/EQUIPMENT REQ: Trimble Geoexplorer 6000 Series

CAUTIONS/WARNINGS: Handle the GPS with care.

ESTIMATED TIME TO COMPLETE: 2-5Minutes

SOP INSTRUCTIONS:

- The first step in starting up the GPS is to hold the green button down for couple second and then let go. (see picture1)
- Then you need to connect to GNSS, and that is located on the bottom of the screen. Using the attached pen touch the screen where it says GNSS in the bottom corner of the screen. (see picture2)
- Next you will see a drop down arrow in the upper left hand corner, using the pen click the down arrow and you will see 5 options to choose from, you want to choose Setup. Then once you do that using the pen again click the GNSS button again that will be located towards the upper right hand side of the screen. If done correctly you will see two cable plugs on the top of the screen connecting and then a little grey box will appear flashing and that's the GPS searching and connecting to the satellites. (see picture3&4)
- Now once you have connected to the satellites go back to the drop down arrow next to where it says Setup and this time choose Data. You then will see the word New with a drop down arrow below Data, you want to click on that down arrow and choose Existing file. (see picture5&6)
- There will be a list of files to choose from, so let's say you are out looking for a certain Manhole, you are going to want to choose the ColSys2013 file. This file is going to bring up the entire collection system on a map and allow you to see where you are compared to the MH you are looking for. (see picture7)
- So once you click on that file I said in the previous step click open on the bottom of the screen and a little box will appear, click ok for that box.
- Now go back up to the left hand corner where it says data and click down arrow using the pen and this time you want to choose Map. This is where it will show all of the lines of our Collection System. (see picture8)
- Once you see the picture of the map on the back ground, click on the options down arrow and make sure there is a little black filled in dot next to Auto Pan to GNSS Position. Once you have done that you should eventually see a little red X flashing on the map and that is where your location is. (see picture 9&10)
- Using the zoom in and out and arrows on the bottom of the screen you should be able to zoom into your location and see the MH's and walk towards them and find them. The more you zoom in

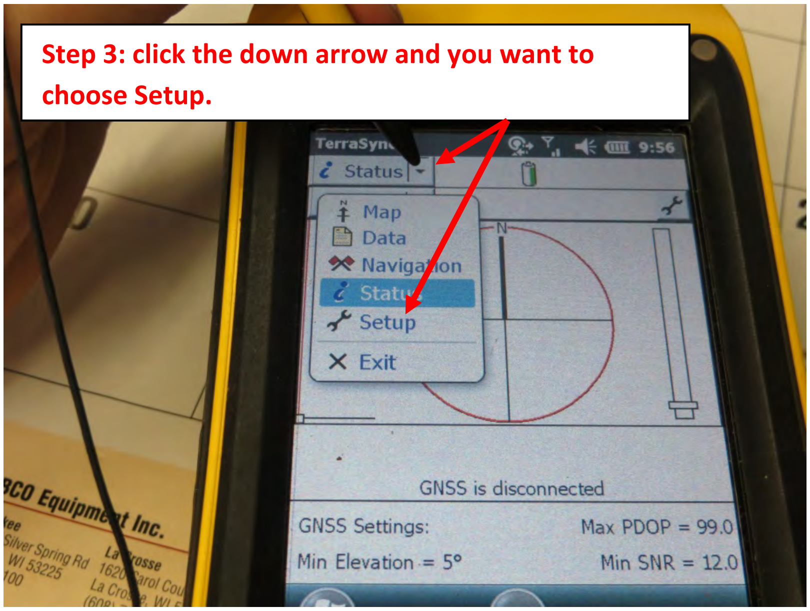
the more accurate the locating will be, but keeping in mind if you zoom to close your little X marking your position will start jumping around really fast and will throw you off little. We usually zoom into 20to50ft and you can tell that by seeing the little bar in the bottom hand left corner. (see picture11)

- So now you are set on being able to find a Manhole at the location you are at by following these steps. Member once you get the map up and the little red X that is where you are standing. Zoom in and you will see all the MH's that are surrounding you, start walking and you will be able to tell which way you need to walk because the little red X will start moving as you move.

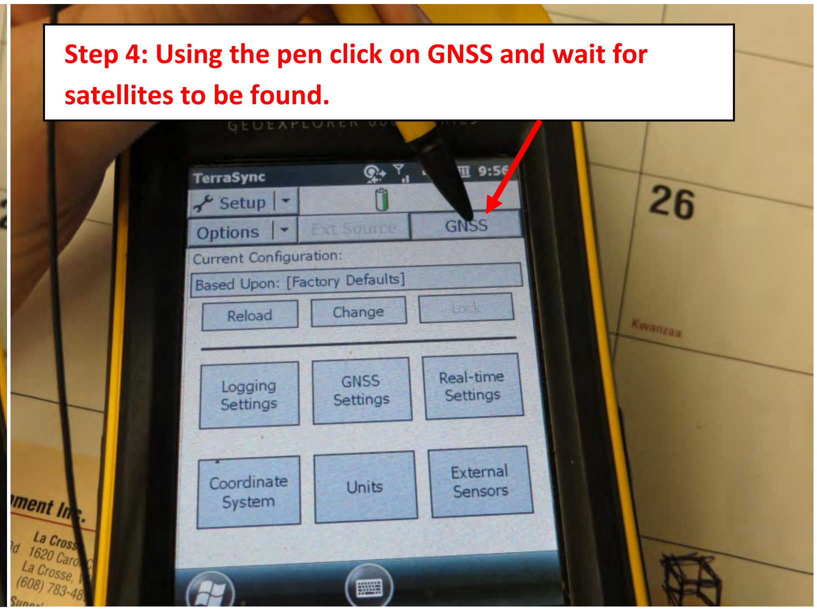
Step 1: Powering on your GPS device.

Step 2: Connecting to GNSS

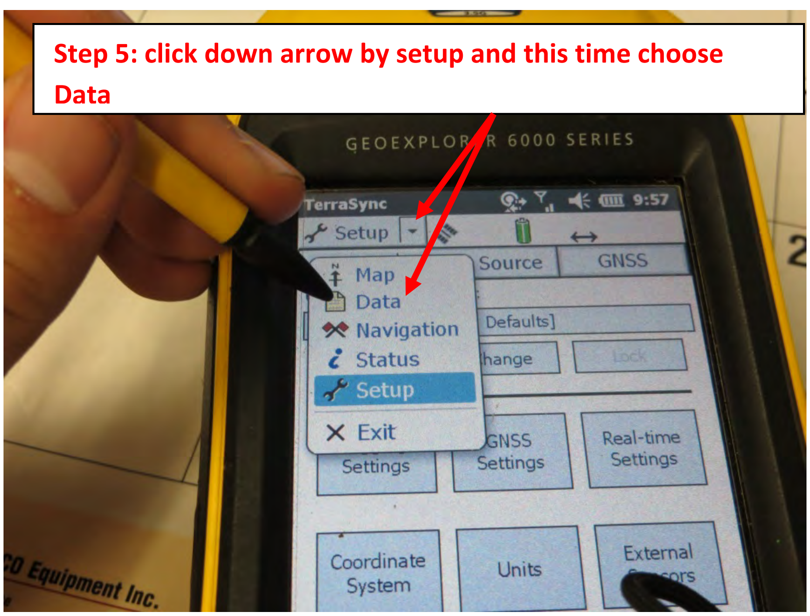
Step 3: click the down arrow and you want to choose Setup.



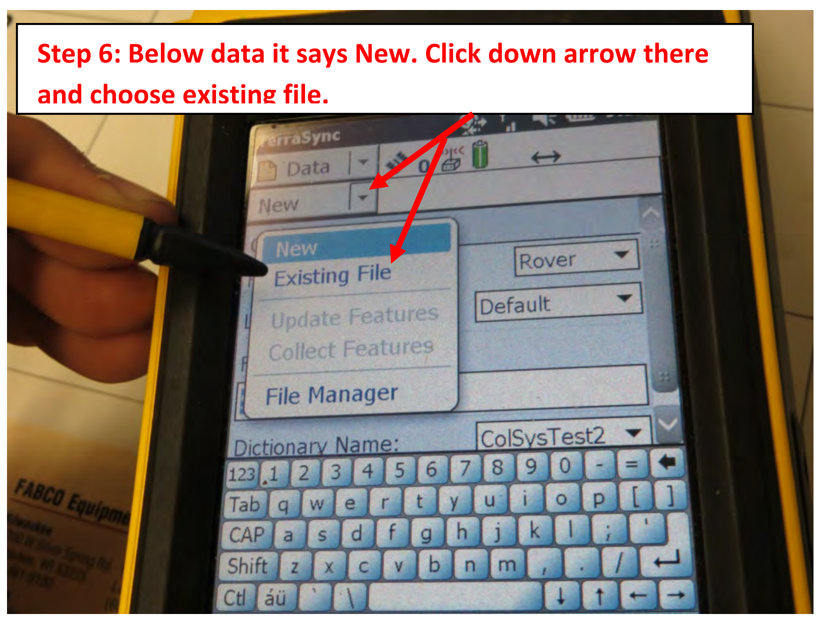
Step 4: Using the pen click on GNSS and wait for satellites to be found.



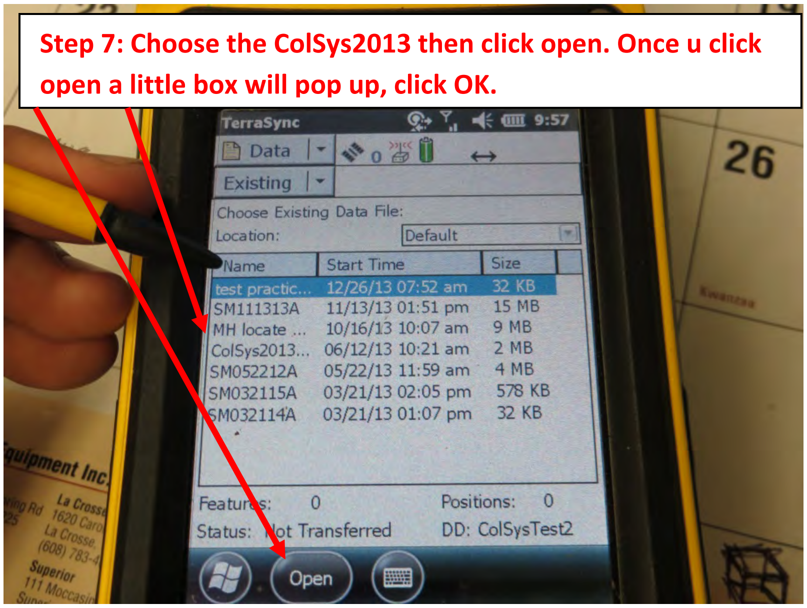
Step 5: click down arrow by setup and this time choose Data



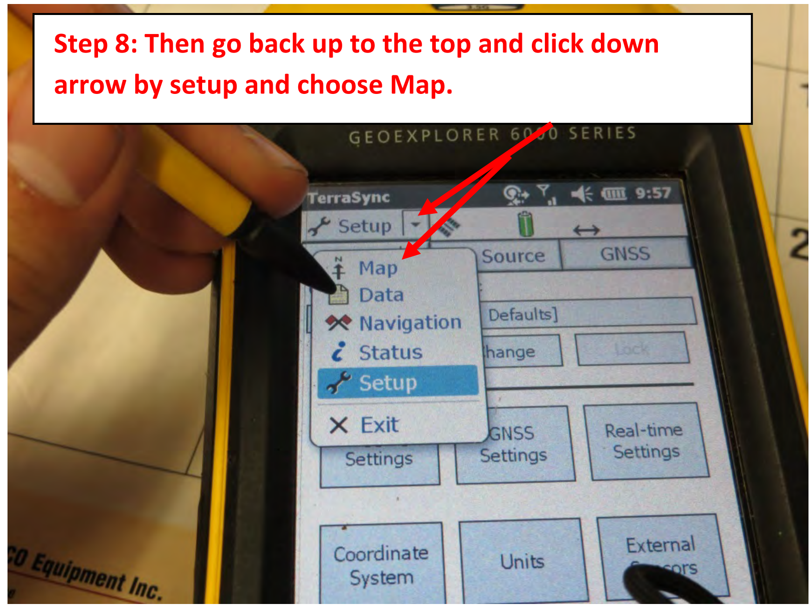
Step 6: Below data it says New. Click down arrow there and choose existing file.



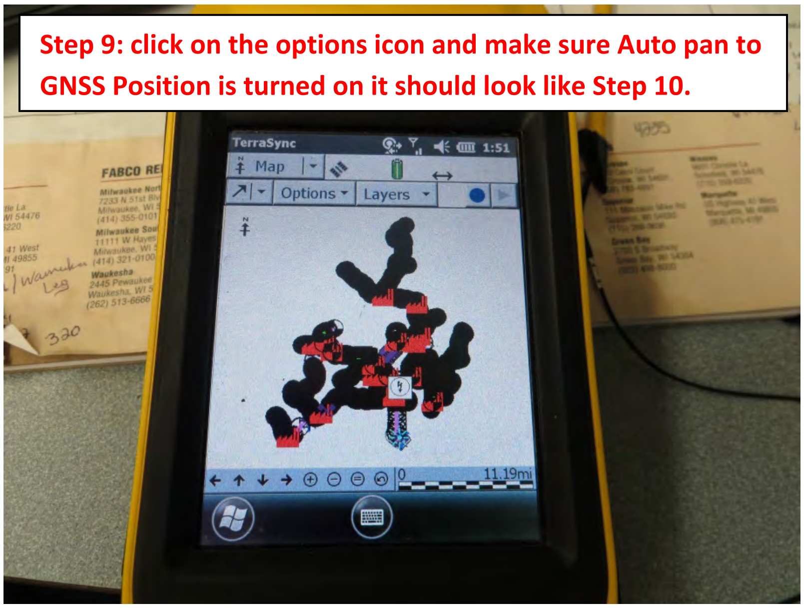
Step 7: Choose the ColSys2013 then click open. Once u click open a little box will pop up, click OK.



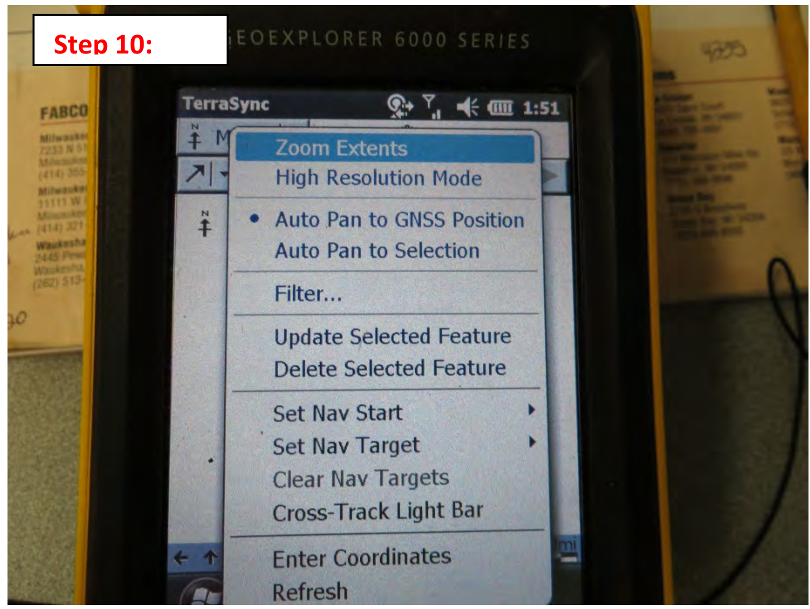
Step 8: Then go back up to the top and click down arrow by setup and choose Map.



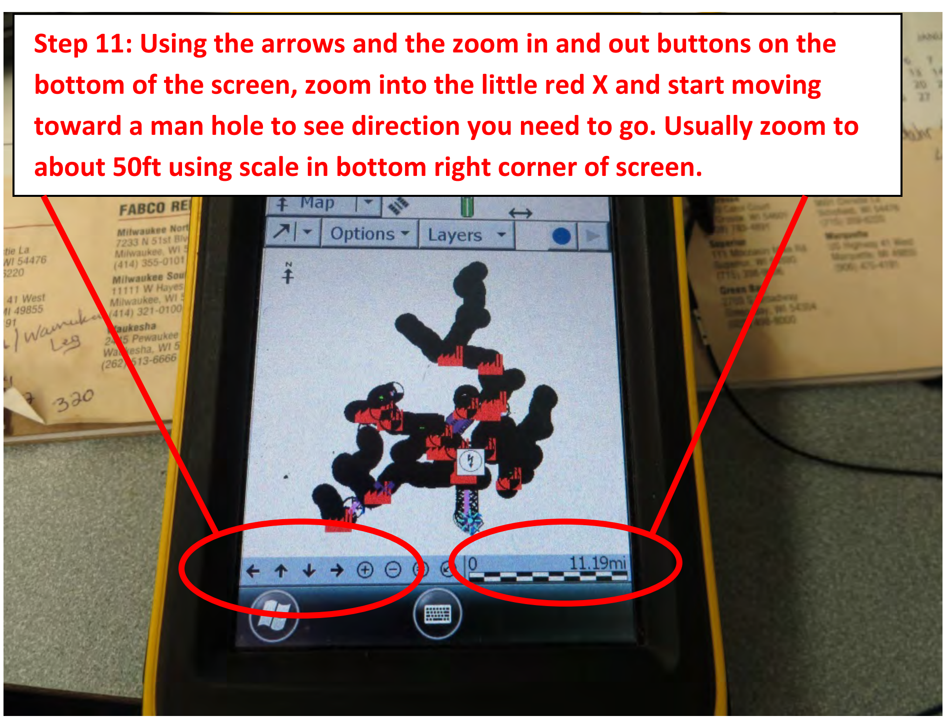
Step 9: click on the options icon and make sure Auto pan to GNSS Position is turned on it should look like Step 10.



Step 10:



Step 11: Using the arrows and the zoom in and out buttons on the bottom of the screen, zoom into the little red X and start moving toward a man hole to see direction you need to go. Usually zoom to about 50ft using scale in bottom right corner of screen.



APPENDIX H – INFILTRATION AND INFLOW REDUCTION PROGRAM PLAN (2021)

Infiltration and Inflow Reduction Program Plan

Prepared for
Madison Metropolitan Sewerage District
Madison, WI
March 8, 2021

Madison Metropolitan Sewerage District

Infiltration and Inflow Reduction Program Plan

Prepared for

Madison Metropolitan Sewerage District, Madison, WI

March 8, 2021

Brown AND Caldwell

250 E. Wisconsin Avenue, Suite 1600
Milwaukee, WI 53201
T: «414.273.8800

Acknowledgements

Brown and Caldwell acknowledges the valuable contributions made by the District in conducting the Infiltration and Inflow Program Plan

Specifically, the project team recognizes the following personnel for their efforts:

- Jen Hurlebaus
- Michael Mucha
- Bruce Borelli
- Todd Gebert
- I/I Advisory Committee members

The project team members included:

- Andy Lukas
- Julie McMullin
- David Perry
- Nina Fricano

Table of Contents

Brown AND Caldwell

List of Figures

List of Tables

List of Abbreviations

ADDWF	average daily dry weather flow
CMAR	Compliance Maintenance Annual Report
CMOM	Capacity, Management, Operation, and Maintenance
cfs	cubic feet per second
DCRA	Dane County Regional Airport
District	Madison Metropolitan Sewerage District
EORP	Emergency Overflow Response Plan
gpd	gallons per day
gpm	gallons per minute
I/I	Infiltration and Inflow
MG	million gallons
mgd	million gallons per day
NSWWTP	Nine Springs Wastewater Treatment Plan
PF	peaking factor
PPII	Private Property I/I
Q_{avg}	average dry weather flow
RCFA	root cause failure analysis
SSO	sanitary sewer overflow
SUO	sewer use ordinance
WDNR	Wisconsin Department of Natural Resources

Executive Brief by District Staff

Recent years have seen intense storms with flooding that has resulted in stormwater (inflow) and groundwater (infiltration) getting into the sanitary sewer system. The August 20-21, 2018 storm event, while an extreme event, identified that the Madison Metropolitan Sewerage District (District) and its Community Customers are vulnerable to the impacts of inflow and infiltration (I/I) as basement backups and sanitary sewer overflows (SSOs) occurred in some areas where the sanitary sewers were inundated with excessive clear water.

The District's sewer use ordinance (SUO) requires all Community Customers to control excessive clear water from entering sanitary sewers. Excess inflow and infiltration is defined as any sewer having an hourly wet weather flow peak greater than four times the average daily dry weather flow (ADDWF) or hourly peaks greater than four times the typical daily wastewater-only flow anticipated for the served area based on water meter records.

The goal of Capacity, Management, Operation, and Maintenance (CMOM) Programs according to Wisconsin state statute NR210.23(3)(c) is to eliminate excessive I/I and cease SSOs. In their review of the District's CMOM program, the Wisconsin Department of Natural Resources (WDNR) identified that the District needed to develop a private property I/I control program to comply with CMOM requirements.

The District and Community Customers have been working on reducing I/I through periodic rehabilitation projects such as lining or replacing leaking public sewers. However, quantifying the benefits has been difficult due to limited flow monitoring, and these types of projects often have little to no impact on private property I/I.

Embarking on a Regional I/I Reduction Program allows the District the ability to get ahead of the looming problem related to the continued aging of private sewer laterals. Inspections are rare, and deteriorated private sewer laterals are significant sources of I/I. By year 2030, 25 percent of private sewer laterals in Dane County will be at least 70 years old. The expected increase in I/I from these laterals poses a threat to the capacity of the District's regional sewer system if their condition is not addressed.

Now is the time to be proactive and plan for these infrastructure improvements and I/I reduction projects. I/I reduction provides value to the District and Community Customers over time by increasing resilience to changing weather patterns, deferring needs for capacity increases, improving system performance, and meeting regulatory requirements.

What has been our process?

Customer community meetings held in 2019 identified I/I reduction as a top priority for the District. I/I reduction is included in the District strategic plan and aligns with the Commission outcome policies.

In 2020, the District hired Brown and Caldwell to begin work on an I/I reduction program plan and formed a technical advisory committee comprised of six representatives from the Community Customers to provide input on developing an overall I/I reduction program framework.

An important result of the technical advisory committee's work regards allocation of spending. Regional programs typically look to optimize solutions and target areas that will yield the greatest net benefit for the cost. However, the technical advisory committee raised concerns with money contributed by a community being used to fund work in another community. The program will need to balance these issues to provide appropriate regional benefits while respecting local control of funds. The program will use compliance with the I/I standards in the District's sewer use ordinance to do this.

I/I Reduction Program Framework

The overall goal for the District's I/I reduction program is to maintain the flow standards defined by the District's sewer use ordinance. To accomplish this vision, the District will:

- Administer the regional I/I reduction program.
- Provide technical support and education resources to our Community Customers with an emphasis given to reducing private property I/I sources.
- Update the District's sewer use ordinance to refine program metrics.
- Monitor for compliance with the sewer use ordinance standards.
- Review and approve work plans for areas that are non-compliant.

How to meet compliance will be decided by the community in developing their work plan. A Work Plan Value will be calculated to provide an estimate for planning I/I reduction projects in a customer community's budget. It is in a customer community's best interest to determine the optimal solutions to reduce I/I to comply with the standards. If compliance is not achieved within a specified timeframe, a new work plan with additional spending requirements must be developed and approved.

Next Steps

It will take some time before the I/I program reaches the implementation stage and work plans are issued. In the next year or two, more work is needed to develop the work plan requirements and a Flow Monitoring Plan to measure compliance. These efforts will benefit from continuing work with the technical advisory committee. District staff, with help from consultants, will also begin developing education resources and plan for public outreach.

Once the program requirements are further defined, work will begin on updating the sewer use ordinance to establish the I/I reduction program. Up to five years may be required for program formation efforts to be completed, making the program effective by year 2027.

Executive Summary

As a regional sewerage district, the Madison Metropolitan Sewerage District (District) has responsibility for the collection, treatment, and disposal of wastewater generated within its service area. Similar to many other regional sewer entities, the District owns and operates sewer infrastructure downstream of other municipally-owned and privately-owned sewer infrastructure.

All buried sewer infrastructure can be the source of extraneous water from the ground surface runoff (inflow) and groundwater (infiltration). The amount of I/I present in the District system varies over time, but is significantly more in rain events than in dry weather. Over time, buried sewer infrastructure is prone to degrade, providing the opportunity for I/I to increase. During particularly significant storm events, saturated ground conditions, and high area lake levels, the amount of I/I conveyed for treatment by the District system can be in excess of its capacity to do so. Without a program to reduce current I/I and reduce the risk of future additional I/I, the problems associated with insufficient capacity in wet weather events will occur more frequently. It is both this existing amount of wet weather I/I and the potential for future additional I/I that is the context for the District considering the establishment of a regional I/I reduction program.

This Executive Summary document provides a high-level overview of the Regional I/I Reduction Program developed by District staff and consultants. The District received extensive input from an Advisory Committee comprised of six Community Customer organization representatives.

PURPOSE OF REGIONAL I/I REDUCTION PROGRAM

The District is establishing this Regional I/I Reduction Program to accomplish the following important purposes:

- **Protect Constructed Capacity of District Conveyance and Treatment Facilities:** District facilities currently convey and treat significant amounts of I/I which, at times, can exceed the constructed capacity. Implementing this program would eventually protect this infrastructure from capacity exceedances that may be a violation of state permits.
- **Provide Motivation for Targeting High I/I-Generating Areas with Investigations and Remediation:** The Program, as envisioned, would motivate Community Customers to pursue I/I reduction in areas that have been found to generate I/I in excess of design and operating standards for the District's system.
- **Provide a Mechanism for Evaluating Benefits of Pursuing Long Term I/I Reduction Activities:** With additional tools at the disposal of District engineering staff, it will be possible to evaluate how this program will derive benefits to the region over time in terms of reduced capital costs, improved system performance, and reduced regulatory risks.
- **Provide Opportunities for the District to Technically Support Efforts by Community Customers:** Aspects of complying with this I/I Reduction Program will pose challenges for some Community Customers with limited experience in reducing I/I. This Program would establish educational and technical support mechanisms for the District to help those seeking assistance with compliance activities.

OVERVIEW OF REGIONAL I/I REDUCTION PROGRAM

The Regional I/I Reduction Program will be based on core elements as articulated below:

- **Standard for Peak Flow and Volume:** Expressed limits on peak flow and volume will be used to determine if an area tributary to the District system requires I/I reduction actions by the Community Customer within that tributary area.
- **Work Plan Required:** The program would require Community Customers to develop and implement Work Plans for investigating and addressing I/I sources in tributary areas found to exceed one or both standards. The Work Plan would be reviewed and approved by the District. Each approved Work Plan would need to be completed within five years of approval.
- **Work Plan Value:** Each Work Plan will be designed to result in the Community Customer expending funds in proportion to how much measured I/I flows and volumes exceed the I/ standards. The value of the Work Plan may have both a peak flow and volume component.
- **Funds Expended on Work Plans Must Meet Specific Criteria:** Only qualifying activities would be eligible for satisfying the Work Plan Value. The District I/I reduction program manager will be responsible for maintaining the list of qualifying activities in the categories of inspection, engineering, and construction. If the tributary area regularly exceeds either peak flow or volume standards, only 10 percent of Work Plan Value can be satisfied with investigations and other non-construction cost.
- **Monitoring Program for Support of I/I Program:** The District will establish a flow monitoring program to identify non-compliant areas and determine progress toward compliance after Work Plans are completed by Community Customers. Flow monitors will need to be placed in community sewers in order to measure flows before entering the District's regional system. The program will prioritize the location of monitors based on an improved version of the District's collection system model that will help determine areas most likely to be exceeding the established peak flow and volume standards.
- **Timeline for Implementation:** This will be a long-term program and will not go into effect until the collection system model has been updated, flow monitoring locations and priorities have been established and monitors have been installed, the District's SUO has been updated to reflect existence of the Program, and necessary Program Guidelines have been established. Up to 5 years may be required for Program formation efforts to be completed, making the program effective by year 2027.

OVERVIEW OF IMPLEMENTATION STRATEGY

The I/I Reduction Program Implementation Strategy describes the major steps to be taken by the District and the approximate Program timeline. An outline of these steps are:

- **Monitoring Program:** Starting in 2021, the District will develop and implement a flow monitoring plan to support the Program. This effort will begin with an upgrade to the District's collection system hydraulic model so that it better reflects dynamic I/I conditions and can be used to identify high priority flow monitoring of tributary areas suspected of exceeding the I/I Reduction Program standards. This effort will also result in a flow monitoring plan that recommends phased locations for installing and maintaining monitors.
- **Adopt Changes to SUO:** Implementation of the recommended I/I Reduction Program may require some modifications to the District's existing SUO. Changes include reference to the I/I Reduction Program, the requirement for Community Customer Work Plans, and an expressed limit on I/I daily volume. The timing of this effort would occur after District Commission approval of the

I/I Reduction Program Plan and several years in advance of when any Community Customer would need to begin development of a Work Plan.

- **Establish Technical Support Capabilities:** The District will establish technical support capabilities for Community Customers seeking to comply with the I/I standards or otherwise reduce I/I in their collection systems. Support could include providing general technical information useful to all communities, such as investigation and design guidelines, or specific to a single community that has requested assistance. In the case of an individual community request, the District would pass on the costs associated with that assistance to that community. The timing of this activity would be such that technical support would be available in time for assistance with developing a Customer Community's Work Plan, if so requested.
- **Establish Education Support Capabilities:** The District will develop and/or provide general and targeted educational materials concerning I/I reduction in the form of web page material, templates for direct contact mailers, and informational brochures. The District may also provide access to a regional contract for I/I public outreach, with any direct community engagements paid for by that community. The timing of this activity would be such that educational support would be available in time for assistance with developing a Customer Community's Work Plan, if so requested.
- **Begin Enforcement Process:** The commencement of enforcement would not occur until after data have been collected to confirm an area exceeds the I/I standards and any changes to the District's SUO have taken effect. It is likely that this would not occur until Year 2027, or the seventh year of the program.

Section 1

Purpose of I/I Reduction Program

This section presents an overview of the Madison Metropolitan Sewerage District (District) and its service area, details concerning the extent of existing Infiltration and Inflow (I/I) and its impact on District facilities, and the potential for future I/I to further increase risks to the District's operations and permit. There are several possible sources of I/I in a sanitary sewer system. Figure 1 below depicts the two main ways I/I can enter the sanitary sewer system. One way is through inflow, which is rainwater that enters the system at a direct connection, such as a downspout directly connected to a foundation drain that is directly connected to a lateral pipe. The other way is through infiltration, which occurs when a crack forms in a pipe, manhole, or connection that allows groundwater, runoff, or flow from a storm sewer to seep into the sanitary sewer. Tree roots are a common way for cracks to form in pipes and can also cause flow blockages. Figure 2 is a graphical depiction of I/I compared to other components of flow in a sewer.

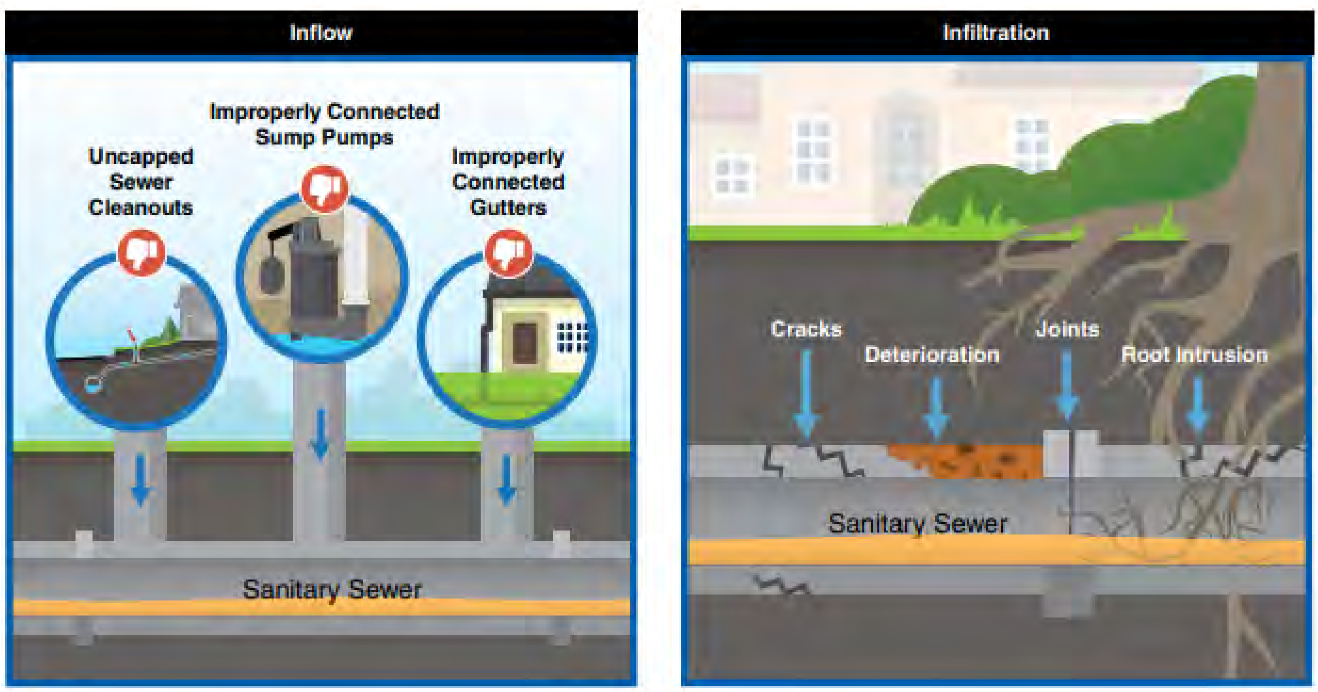


Figure 1. Common sources of I/I

source: Metropolitan Council, St. Paul, MN

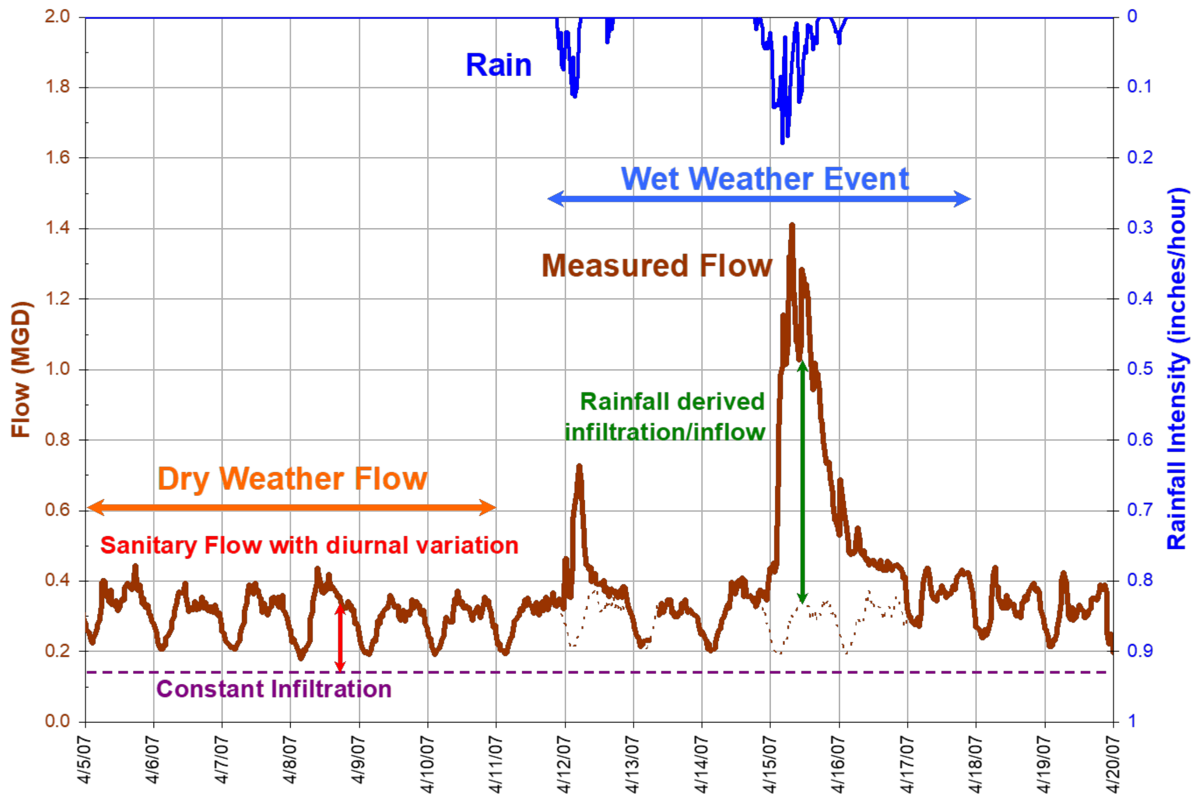


Figure 2. Components of sewer flow

1.1 District Service Area Overview

The Madison Metropolitan Sewerage District was formed in 1930 to provide area-wide wastewater collection and treatment for the communities around Lakes Mendota and Monona. Currently, the District's service area is 186 square miles, which the District serves through its network of 96 miles of gravity sewer interceptors, 18 regional pumping stations, and 47 miles of pressurized force mains.

Each dry weather day, the District receives and treats approximately 40 million gallons per day (mgd) of wastewater from the following "Community Customers": the Cities of Fitchburg, Madison, Middleton, Monona and Verona; the Villages of Cottage Grove, Dane, DeForest, Maple Bluff, McFarland, Shorewood Hills, Waunakee and Windsor; and from sanitary and utility districts and other areas in the Towns of Blooming Grove, Burke, Dunn, Madison, Middleton, Pleasant Springs, Verona, Vienna and Westport. A map of the current sewer service area that contributes to the District is shown in Figure 3.

All of the wastewater generated in the District service area is collected and transmitted to the Nine Springs Wastewater Treatment Plant (NSWWTP). Most of the treated effluent is discharged to Badfish Creek to avoid discharging treated wastewater directly to the Yahara River lakes. Some treated effluent is returned to Badger Mill Creek to offset the effects of inter-basin transfer on the base flow of Badger Mill Creek. The Badger Mill Creek outfall has a design capacity of 3.6 mgd. During wet weather, the diversion to Badger Mill Creek is not utilized and all treated effluent is either discharged to Badfish Creek or stored onsite if treated flows exceed the capacity of the effluent disposal system.

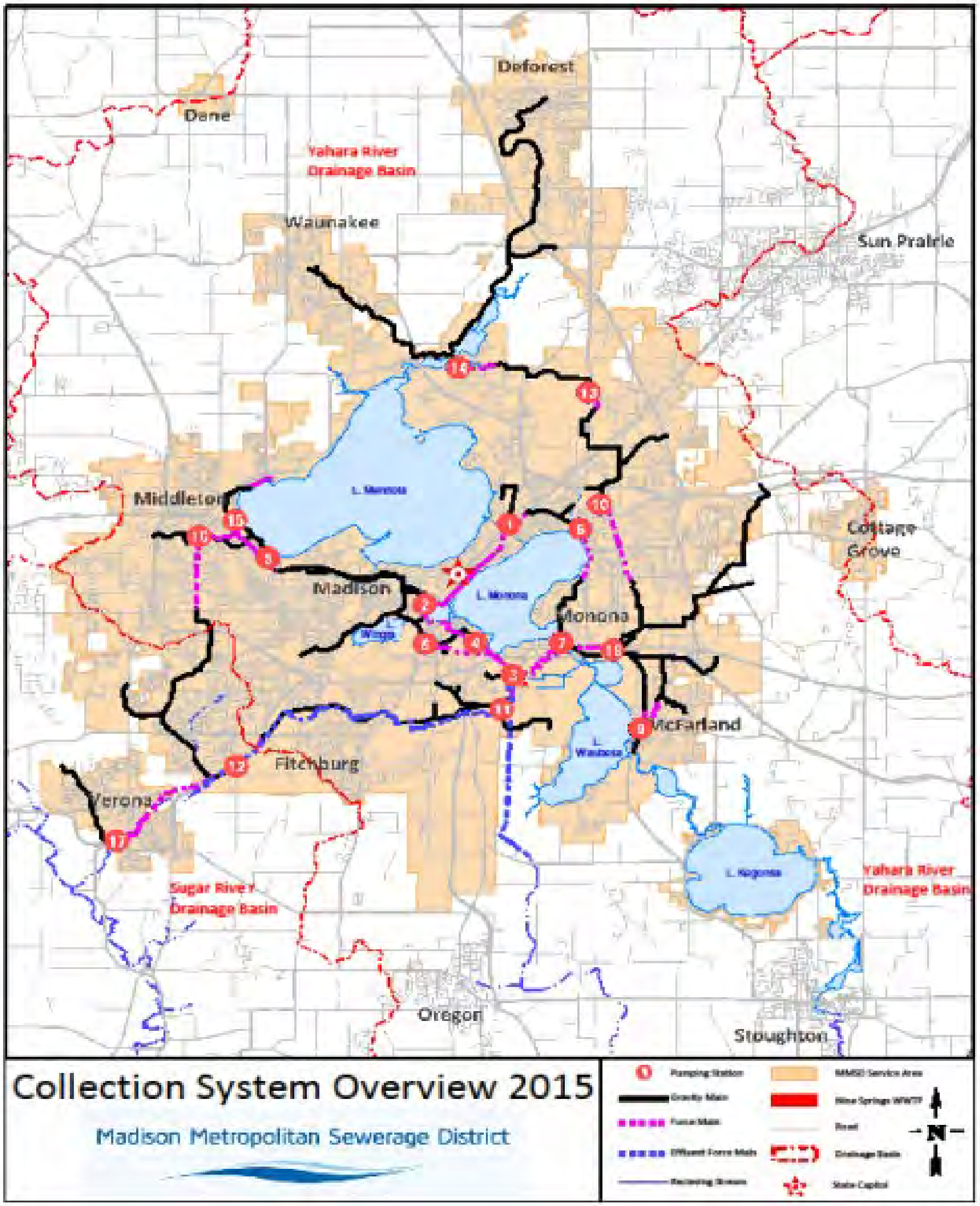


Figure 3. District service area and facilities

1.2 Concerns Related to Current I/I Conditions

The District is embarking on an effort to define a Regional I/I Reduction Program, through a planning process that considers the District's objectives and current and future I/I conditions. The plan resulting from this process will be informed by stakeholder input from Community Customers, District staff, and other interested parties.

Most I/I reduction programs are initiated because of a pressing issue like basement backups, sanitary sewer overflows (SSOs), or treatment plant compliance issues. While these circumstances can happen in the District service area, for the most part, they are rare and isolated to a few problem areas during extreme wet weather events.

District wet weather flows do certainly show an increase in significant storm events. The District's regional sewer use ordinance (SUO) provides performance objectives for community sewer flows, requiring peak hourly flows to not exceed four times the average daily flowrate. Exceeding this standard would trigger the requirement for an I/I plan to reduce flows in the affected community.

Another consideration for embarking on a regional I/I reduction program now is that it allows the District the ability to get ahead of the looming problem related to the continued aging of private sewer laterals. As most communities, and even fewer lateral owners, do little to address these sewer pipes this situation represents a significant future threat to the District's regional sewer system.

A high-level characterization of I/I conditions in the District service area provides an understanding of current conditions that can be compared to several different performance metrics. These comparisons may lead the District toward a particular vision for the I/I Reduction Program, particularly when the current conditions are extrapolated to future conditions that occur if a program were not implemented.

1.2.1 I/I Conditions of Interest

There are multiple ways to quantify I/I. One way is to evaluate the cumulative volume of flow over time. Another way is to identify the peak or maximum flow that occurred during a given event at a chosen time interval. This I/I assessment focuses on peak flow as the preferred metric for assessing the I/I impact on District conveyance facilities, but also considers total volume due to impacts on the downstream NSWWTP.

After considering several events and discussions with District staff, October 2019 was selected for evaluating I/I conditions across the service area. All flow monitoring sites had reasonable data for this event which made it an ideal event for calculating peaking factors. In addition, it showed a consistent flow response among the different sites and stressed the system enough to activate all pump stations.

1.2.2 Peak Flow Concerns (Design Curve)

Figure 4 presents a schematic of the pump stations showing how they interact. The arrows between pump stations indicate the flow path. Black arrows represent the flow path during normal operating conditions, red arrows represent the flow path during certain wet weather conditions, and gray arrows represent flow paths that are only used if the normal flow path is not available.

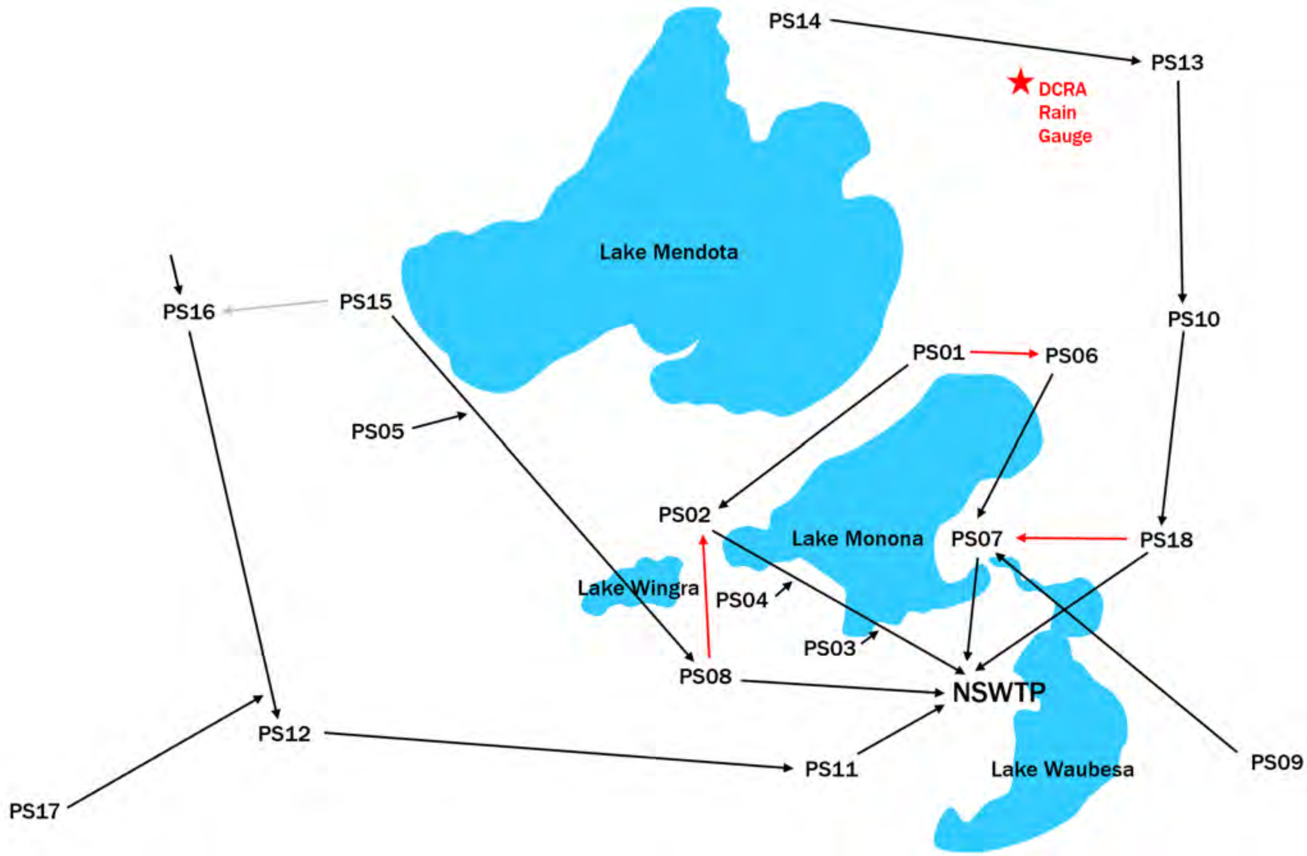


Figure 4. System schematic with monitoring locations

The peak hour wet weather flow and average hourly dry weather flow values for the October 2019 wet weather event are listed in Table 1. The dry weather flows represent the average flow at each site during a 6-day period in May 2019 in which no rain was measured at the Dane County Regional Airport (DCRA) rain gauge. This dry weather period from May 10–16, 2019, was selected because all monitoring sites had consistent data at the same time.

Because the peak wet weather flows occurred at different times during the October 2019 event, the overall NSWWTP influent peak flow of 106 mgd is less than the sum of individual peak flows directly entering the NSWWTP.

The third column in Table 1 lists the peaking factors, calculated by dividing the peak hour wet weather flow by the average dry weather flow. Larger peaking factors may correspond to a higher likelihood of I/I, but the size of the tributary area must be taken into consideration as smaller areas typically experience greater peaking factors than larger areas. Within the table, the pump stations are grouped and ordered from upstream to downstream.

Table 1. Peaking Factor Summary

Site Name	Pump Station(s)	Average Hourly Dry Weather Flow (mgd) (May 2019)	Peak Hour Wet Weather Flow (mgd) (Oct 2019)	Peaking Factor (Oct 2019)
Northeast Side Group				
PS14_Flow	14	6.1	16.3	2.7
PS13_Flow	13	8.1	19.3	2.4
PS10_Flow	10	10.4	22.6	2.2
PS18-Total_Flow	18	14.8	33.8	2.3
East of Lake Monona Group				
PS6-Venturi_Flow	6	2.0	7.4	3.7
PS9_Flow	9	1.0	2.2	2.1
PS7-Venturi_Flow	7	14.8	24.2	1.6
Central Isthmus Group				
PS1 to PS2_Flow	1	3.3	14.4	4.4
PS3_Flow	3	0.3	0.6	2.2
PS2+3&4-Venturi_Flow	2, 3, 4	8.8	34.6	3.9
Near West Side Group				
PS15_Flow	15	1.5	3.5	2.4
PS5_Flow	5	1.0	2.2	2.2
PS8-Venturi_Flow	8	7.3	17.4	2.4
Far West Side Group				
PS16-Flume_Flow	16	1.9	5.8	3.0
PS17_Flow	17	1.2	3.7	3.1
PS12-Venturi_Flow	12	6.6	15.6	2.4
PS11-Venturi_Flow	11	10.1	21.5	2.1
NSWWTP		46.2	106.2	2.3

The peaking factors in Table 1 are plotted in Figure 5 versus average flows. On this figure is a reference curve for peaking factor based on the equation $PF=4/(Q_{avg})^{0.158}$ where PF is the peaking factor and Q_{avg} is the average dry weather flow. This is the District's Design Curve developed by Greeley and Hansen in 1961. A second reference line is the dotted red line that represents a PF of 4 to 1 that is referenced in Section 4.6.1 in the District's SUO as an excessive I/I standard. Using this constant peaking factor standard for all sites is one method for determining which peaking factors are high.

The equation peaking factor curve (navy blue) is the basis for sizing the capacity of District conveyance facilities. This curve creates a peaking factor reference line that varies depending on the size of the basin. Peaking factors that fall above this curve may be considered large and represent an amount of I/I in excess of what District facilities are sized to convey.

There are three data points in Figure 5 above the peaking factor curve. These include PS1 to PS2, PS2+3&4-Venturi, and PS6-Venturi. The flows during this event for PS01 to PS02 are also above the 4:1 Peaking Factor Standard curve. If the collected data in the District system demonstrate an exceedance of these flow standards, then there are certainly smaller areas tributary to these locations that exceed the standard as well.

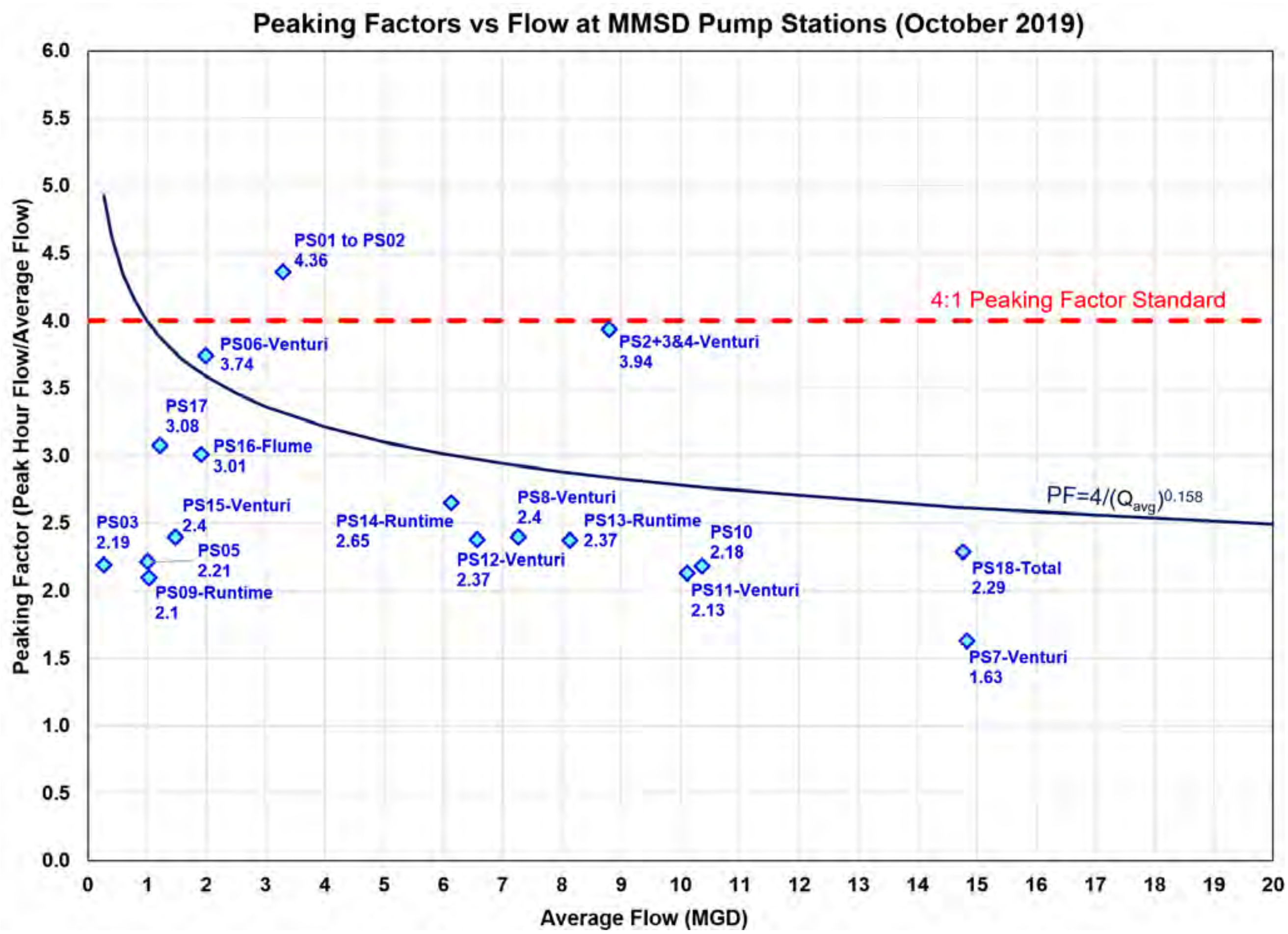


Figure 5. Peaking Factor vs. Average Flow Curve – October 2019

1.2.3 Treatment Plant Capacity Conditions

Another consideration for I/I generated in the service area is the impact these flows can have on the downstream wastewater treatment plant. Figure 6 is a schematic of the Nine Springs Wastewater Treatment Plan (NSWWTP), operated by the District. Each of the unit processes at the NSWWTP has a capacity limit, and these values have been documented in several previous studies.

The effluent pumping capacity is the limiting value for the NSWWTP flow, and storage is needed when the influent flow exceeds the effluent pumping capacity of the NSWWTP. Effluent can be pumped to both Badfish Creek and Badger Mill Creek, but during large events the pumps to

Badger Mill Creek are often turned off when the total flow in the creek is greater than 1,000 cubic feet per second (cfs). In general, it is prudent to assume the pumps are only discharging to Badfish Creek at a rate of 75.5 mgd due to pressure limitations in the effluent piping system and accounting for recycle flows. Flow in excess of this limit is diverted and stored in the on-site storage tanks or the lagoon. At some point after a wet weather event is over, the stored flows are diverted to the secondary treatment system before effluent disposal. The average dry weather flow at NSWWTP is approximately 39 mgd. Deducting this flow from the effluent capacity results in a daily capacity of 36.5 million gallons for wet weather flow.

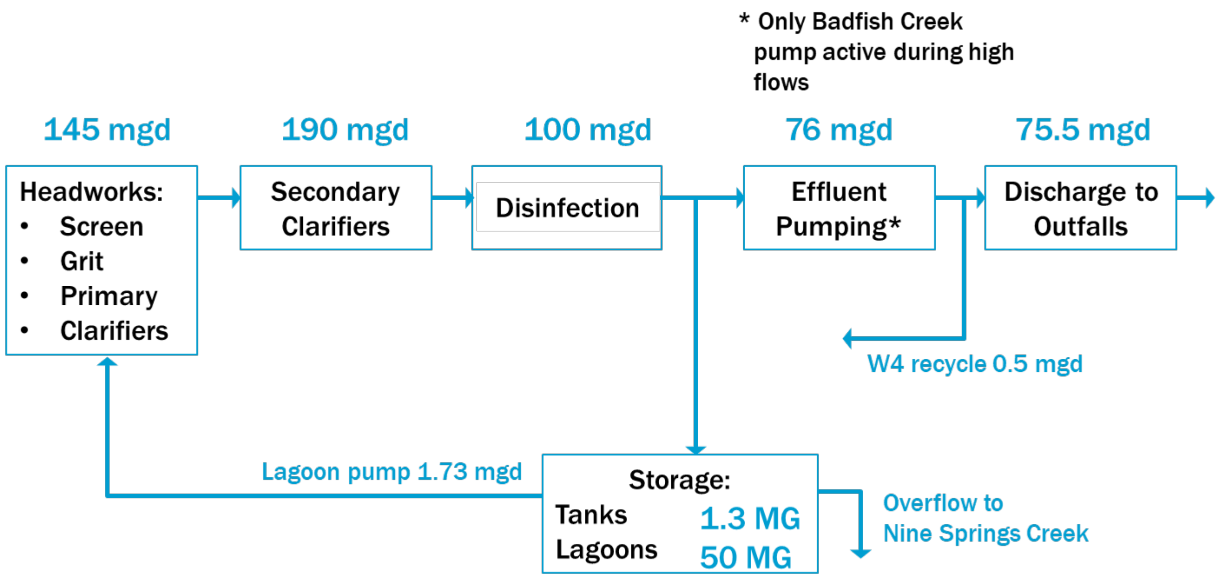


Figure 6. NSWWTP process schematic and capacity limits

Peak flows in the plant were reported to exceed the effluent pumping capacity 19 times in the 23-year period from 1993 to 2015, which is a diversion frequency of nearly 1 event per year. The largest reported diversion was 83 MG in the 6/8/2008 event. This is greater than the maximum volume of the lagoon, so this event caused an overflow to the Nine Springs Creek.

Table 2 is a summary of the maximum daily volume in wet weather compared to the average dry weather daily volume during the October 2019 event. This volume ratio can be used to identify pump station areas that have I/I characteristics with larger volumes. The Isthmus area served by pump stations 1, 2, 3, and 4 have the greatest I/I volumes; the ratios are in the range of 2.5 to 2.9. Any areas generating more than 1.9 times dry weather during a wet day represent a risk to the NSWWTP.

The results in Table 2 are plotted in Figure 7, showing the maximum day volume ratio versus the average dry weather daily flow volume. For reference, this figure also has the peaking derived from dividing the effluent pumping system limit by the daily average plant flow. If all areas tributary to the NSWWTP contributed flows in excess of this standard, plant capacity would be exceeded and treated effluent would need to be stored until influent flows receded, at which point this volume could be pumped back to the headworks for treatment.

Table 2. Maximum Daily Volume Summary				
Site Name	Pump Station(s)	Average Dry Weather Daily Volume (MG) (May 2019)	Max Wet Weather Daily Volume (MG) (Oct 2019)	Max Wet/Average Dry Volume Ratio (Oct 2019)
Northeast Side Group				
PS14_Flow	14	6.1	10.9	1.8
PS13_Flow	13	8.1	14.2	1.8
PS10_Flow	10	10.4	18	1.7
PS18-Total_Flow	18	14.8	27	1.8
East of Lake Monona Group				
PS6-Venturi_Flow	6	2	3.8	1.9
PS9_Flow	9	1	1.6	1.6
PS7-Venturi_Flow	7	14.8	20.2	1.4
Central Isthmus Group				
PS1 to PS2_Flow	1	3.3	9.7	2.9
PS3_Flow	3	0.3	0.4	1.3
PS2+3&4-Venturi_Flow	2, 3, 4	8.8	21.6	2.5
Near West Side Group				
PS15_Flow	15	1.5	2.4	1.6
PS5_Flow	5	1	1.6	1.6
PS8-Venturi_Flow	8	7.3	13.6	1.9
Far West Side Group				
PS16-Flume_Flow	16	1.9	2.7	1.4
PS17_Flow	17	1.2	2.5	2.1
PS12-Venturi_Flow	12	6.6	10.5	1.6
PS11-Venturi_Flow	11	10.1	17.1	1.7
NSWWTP		46.2	86.6	1.9

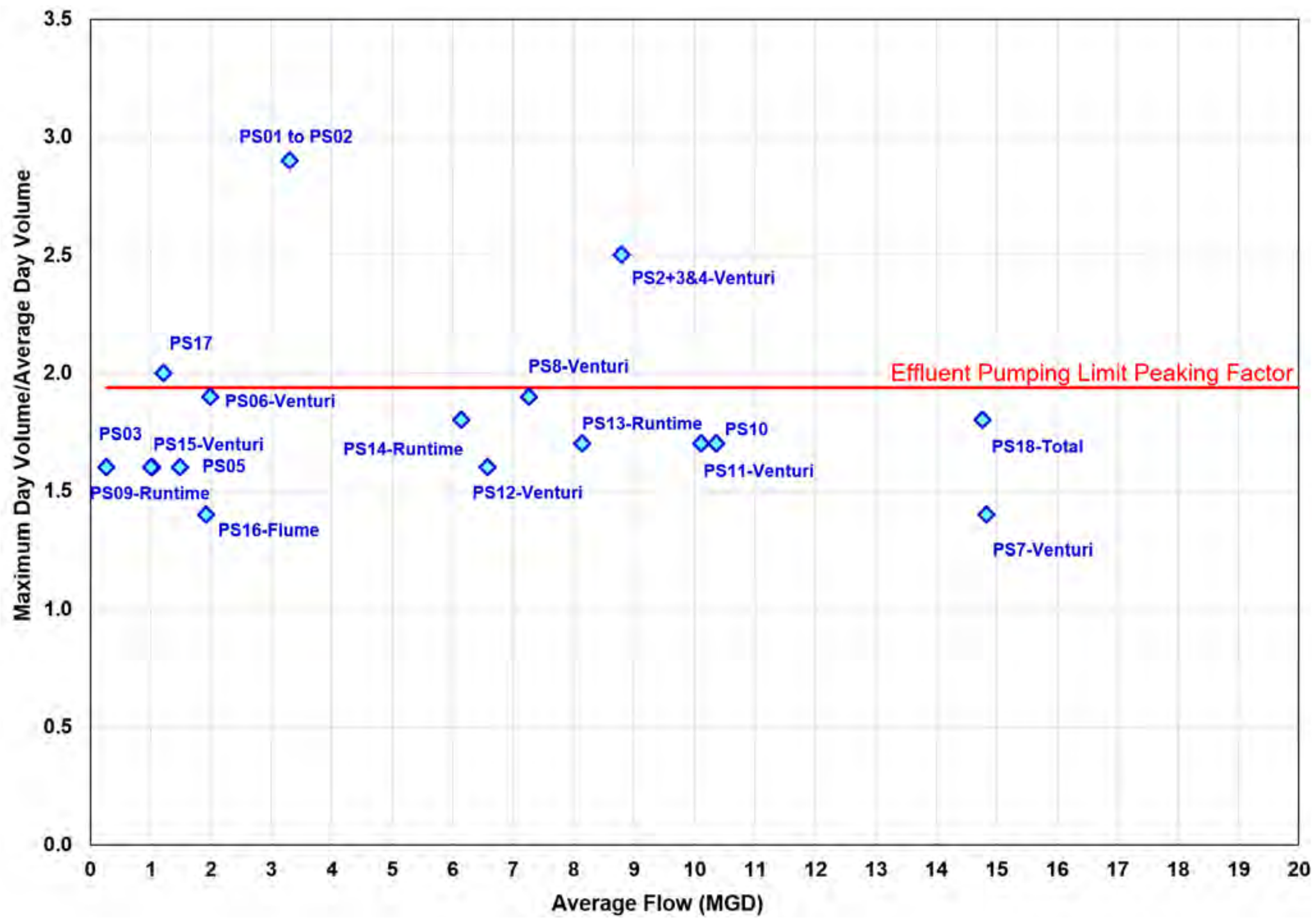


Figure 7. Maximum day volume ratio

1.3 Future I/I Concerns

Additional concerns related to future conditions provide further justification for establishing an I/I Reduction Program based on an excess I/I standard. These concerns include expansion of the service area, degradation of the sewer system in general, the lack of attention to and aging of private sewer laterals, potential climate change impacts, and energy/sustainability concerns associated with conveying and treating excess water.

In an analysis in support of the 2016 Liquid Processing Improvements Facilities Plan, future flows were estimated to increase 29 percent by 2040, as a result of a 29 percent increase in service area population projected to occur from 2015 to 2040. Under these conditions, the analysis determined that the effluent pumping capacity would be exceeded more than once per year, an event that requires the District to store treated effluent in the storage lagoons. Currently, this does not happen every year. As the frequency of effluent storage events increases, so does the risk of using all of the storage in larger events or extended periods of wet weather. When storage is full, the District is forced to discharge to the Yahara River, a practice that is not allowed by permit except in emergencies. The plan analysis indicated that the likelihood of exceeding the storage volume would increase by three times without I/I management or increasing the capacity of the effluent pumping system. The Liquid Facilities Plan estimated the 2015 cost of expanding the effluent pumping system for future flows to be $75 million for an additional 100 mgd.

The 2016 Liquid Facilities Plan analysis cited above does not account for I/I increases due to system degradation that could occur without a Regional I/I Reduction Program. It is difficult to predict how much or how soon I/I increases from sewer degradation could occur. Without such a program, the dependency on effluent storage and the risk of exhausting that storage would certainly increase.

One important factor involved in system degradation-related I/I increases is the condition of private sewer laterals. Currently, there is no regional standard for these pipes, and property owners typically only fix them when experiencing a service disruption, such as tree roots or a collapse. Rarely, if ever, will a private sewer lateral owner fix a lateral to address infiltration issues that would matter to the downstream public sewer system owners. One estimate can be made for the magnitude of this problem by considering the age of housing in Dane County, according to Capital Area Reginal Planning Commission (CARPC). While the District does not serve all of Dane County, if one assumes that the housing stock age for the county is comparable to that of laterals in the District, the ageing of housing stock, and therefore laterals, can be estimated. Figure 8 shows how housing stock and lateral age will change over time. Using 70 years as an indicator of laterals at an age of concern, by Year 2050 over 50 percent of the laterals will be at that state. Industry guidance varies regarding the useful life of a sewer pipe, but it is not uncommon to assume 75 years for purposes of planning replacements of such infrastructure.

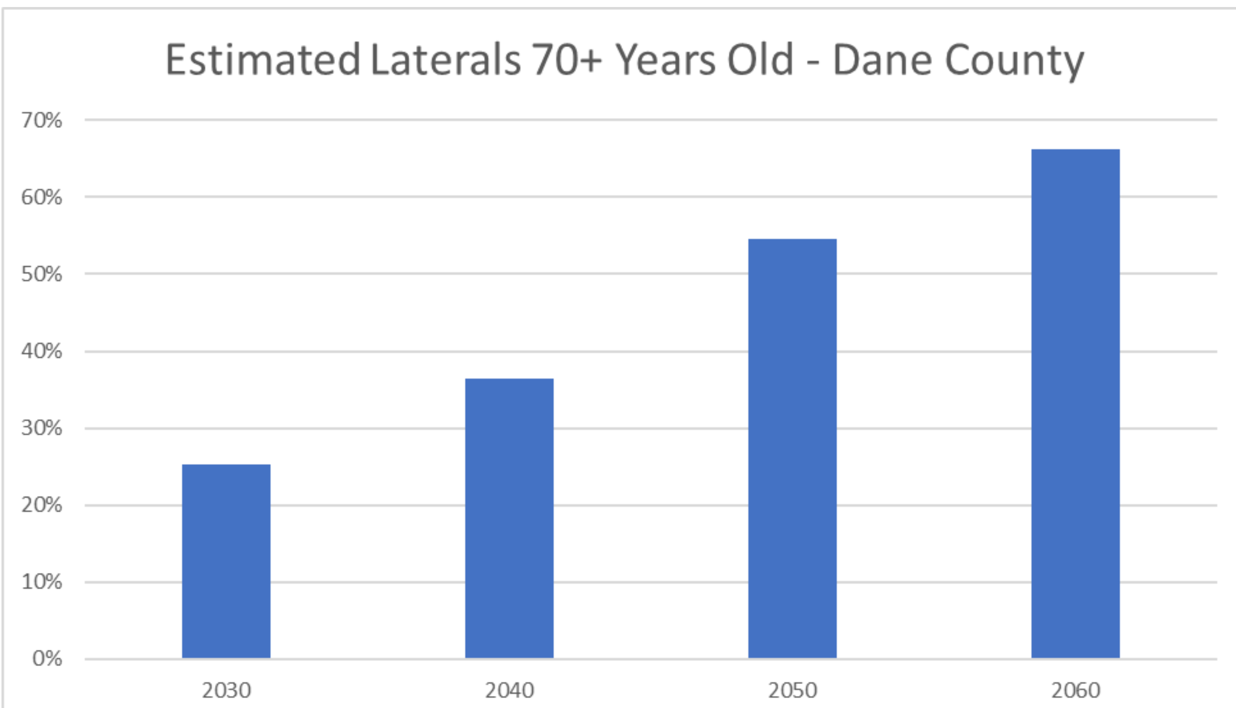


Figure 8. Forecasted lateral age in Dane County based on year of development

Climate change is of growing concern to the District and its service area customers. While there are no specific standard approaches for factoring such risks into this program, having a Regional I/I Reduction Program would help mitigate risks against potential impacts such as larger, more frequent, or more intense rainfall events.

For many years, the District has had considered and implemented strategies for improving and reducing energy use. Wastewater and I/I sent to the District system can be pumped as many as 5 times in order to get to NSWWTP. This situation comes with obvious extra cost and energy usage.

While energy reduction is not directly considered in this Regional I/I Reduction Program, any I/I reduction that is achieved will translate into less energy usage and cost savings.

A final future consideration for the I/I Reduction Program pertains to sustainability. When any treated flows are stored in lagoons, they must be pumped back to the front of NSWWTP after a wet weather event to be re-treated by the plant. While this is preferable to an unpermitted emergency discharge, it would not be considered a sustainable practice since the same water is treated twice. As future flows increase, whether from additional wastewater or I/I, this practice would be required more frequently and for larger volumes of flow. Relying on this practice would be in conflict with one aspect of the District's Vision statement:

> *"By making small changes and respecting every drop of water we have today, we can set the tone for a resource conscious and sustainable community tomorrow."*
> District's 2019 Annual Report

1.4 Recommended Metrics for the I/I Reduction Program

The I/I assessment performed in support of developing the I/I Reduction Program focused on two approaches. First, the relationship between peak flow and average dry weather flow observed at each flow monitoring site was evaluated; results are given for the total flow (not the incremental flow). The ratio of peak flow to average flow is known as the peaking factor and is the recommended metric for this review. Second, the volume of wet weather flow during a specified event as compared to dry weather flow at each monitored location was determined and compared. This volume evaluation looked at independently monitored locations and the cumulative volume in the system at the NSWWTP.

Both methods have merit for supporting a Regional I/I Reduction Program. Peak flow is directly referenced in the District's sewer use ordinance, and it has been used for sizing District conveyance facilities for many years. Event volume, and more specifically, daily volume, is better linked to the most pressing concern to the District's system operations at NSWWTP, and it is a more reliable method for estimating contributions from different portions of the service area. As exceedances of both metrics occur at District facilities, there will be areas tributary to the District system that also exceed these metrics. A regional I/I program that imposes peak flow and volume limits on tributary areas would certainly reduce risks that District facilities would have insufficient capacities to convey, treat, and dispose of wet weather flows in the future.

Section 2

I/I Program Description

Section 1 establishes the need for a Regional I/I Reduction Program and recommends objective metrics for achieving desired outcomes. Section 2 details the Regional I/I Program description, including the establishment of excessive I/I standards, requirements for Customer Community Work Plans, the role of the District in approving and overseeing Work Plans, and processes for determining whether implementation of a Work Plan has achieved compliance with the established standards.

2.1 I/I Program Development Process

The Regional I/I Reduction Program described in Section 2 was the result of extensive review of other programs across the United States, focusing heavily on those lessons learned, and regular dialog with an Advisory Committee (AC) made up of representatives from the following Community Customers:

- Mark Moder, City of Madison
- Theran Jacobson, City of Verona
- Robert Anderson, Town of Westport
- Jim Hessling, City of McFarland
- Davis Clark, Town of Windsor
- Ben Kollenbroich, Town of Dunn

The AC met regularly throughout 2020, using both in-person and virtual meeting formats, on the following dates:

- January 22, 2020 (in-person)
- May 27, 2020 (virtual)
- July 22, 2020 (virtual)
- September 23, 2020 (virtual)
- December 9, 2020 (virtual)

The conclusion of this process was the following tenets for formulating the I/I Program:

- The purpose for the I/I program is for:
  - Addressing wet weather flow and impact to District facilities
  - Complying with WDNR Capacity, Management, Operation, and Maintenance (CMOM) program requirements
  - Mitigating deterioration due to aging of neglected private infrastructure
- The District's I/I program should:
  - Require participation in 5 to 10 years
  - Include baseline requirements, but with flexibility for implementation
  - Not have the District be the "big banker"
  - Allow administration of private property work at the local customer community level

2.2 Sewer Use Ordinance Considerations

Most, if not all, communities have ordinances that prohibit clear water from entering the sanitary sewer system. Wisconsin state statute NR210.23 CMOM Programs details the required components for a CMOM Program, including paragraph 210.23(4)(c) Legal authority which states:

> *Legal authority*. Legally binding authorities, such as sewer use ordinances and service agreements, shall ensure the following:
>
> 1. Infiltration and inflow sources, including infiltration and inflow into building sewers, private interceptor sewers, or other such sources on private property, are subject to oversight and control, as necessary…
>
> 4. If applicable, sewage flows from municipal satellite or other privately owned sewage collection systems are, as necessary, monitored, and controlled. Notwithstanding all other provisions of this chapter, any publicly owned treatment works may establish specific requirements to regulate sewage flows from satellite sewage collection systems.

State statute NR162.08(4) includes similar sewer use ordinance requirements related to I/I for municipal sewer systems that receive loans for the construction of sewage works. The District's July 27, 2017 *Sewer Use Ordinance* includes the following with regards to I/I:

> Section 4.6. Maintenance of Community Sewers.
>
> 4.6.1. CMOM and Infiltration/Inflow Requirements.
>
> (b) All Community Customers are required to control excessive infiltration and inflow (I/I). Excess inflow and infiltration is defined as any sewer having an hourly wet weather flow peak greater than four (4) times the average daily dry weather flow or hourly peaks greater than four (4) times the typical daily wastewater-only flow anticipated for the served area based on water meter records. The District may also identify excess inflow and/or infiltration as determined by a professional engineer during the conduct of an I/I study. Any Community Customer having excessive infiltration and inflow will be required to submit a corrective action plan to the District that identifies steps that they will take to timely reduce I/I to acceptable levels.

The District's current ordinance defines excessive I/I as an hourly wet weather flow peak that is greater than four times the average daily dry weather flow (ADDWF).

2.3 Excessive I/I Standards

Section 1 described the current state of I/I in the District service area and recommended standards for excessive I/I from two perspectives: peak flow and wet weather volume. The limitation for peak flow is supported by SUO language. The limitation for wet weather volume is not expressly referred to in the SUO but can be supported by the impact that extended wet weather flows can have on the NSWWTP. The established standards will apply at discretely monitored locations, and assessment of compliance with the standards will be based on the collected monitoring data.

Peak I/I Flow Standard The recommended peak I/I flow standard is taken directly from the SUO and the historical Design Curve used by the District. As noted above, the SUO states excess I/I causes peak flows to exceed four times the ADDWF. The Design Curve used by the District results in a lower peaking factor when the ADDWF is greater than 1.0 mgd or 694 gallons per minute (gpm) and a higher peaking factor when ADDWF exceeds these values. For the I/I Program, the Design Curve would set the peaking factor limit for ADDWFs above 1 mgd, and the SUO limit of 4 would apply when dry weather flows are below 1 mgd. Figure 9 illustrates the concept for the Peak Flow Standard. This standard would apply to any discretely defined tributary area to the District system that could be directly monitored.

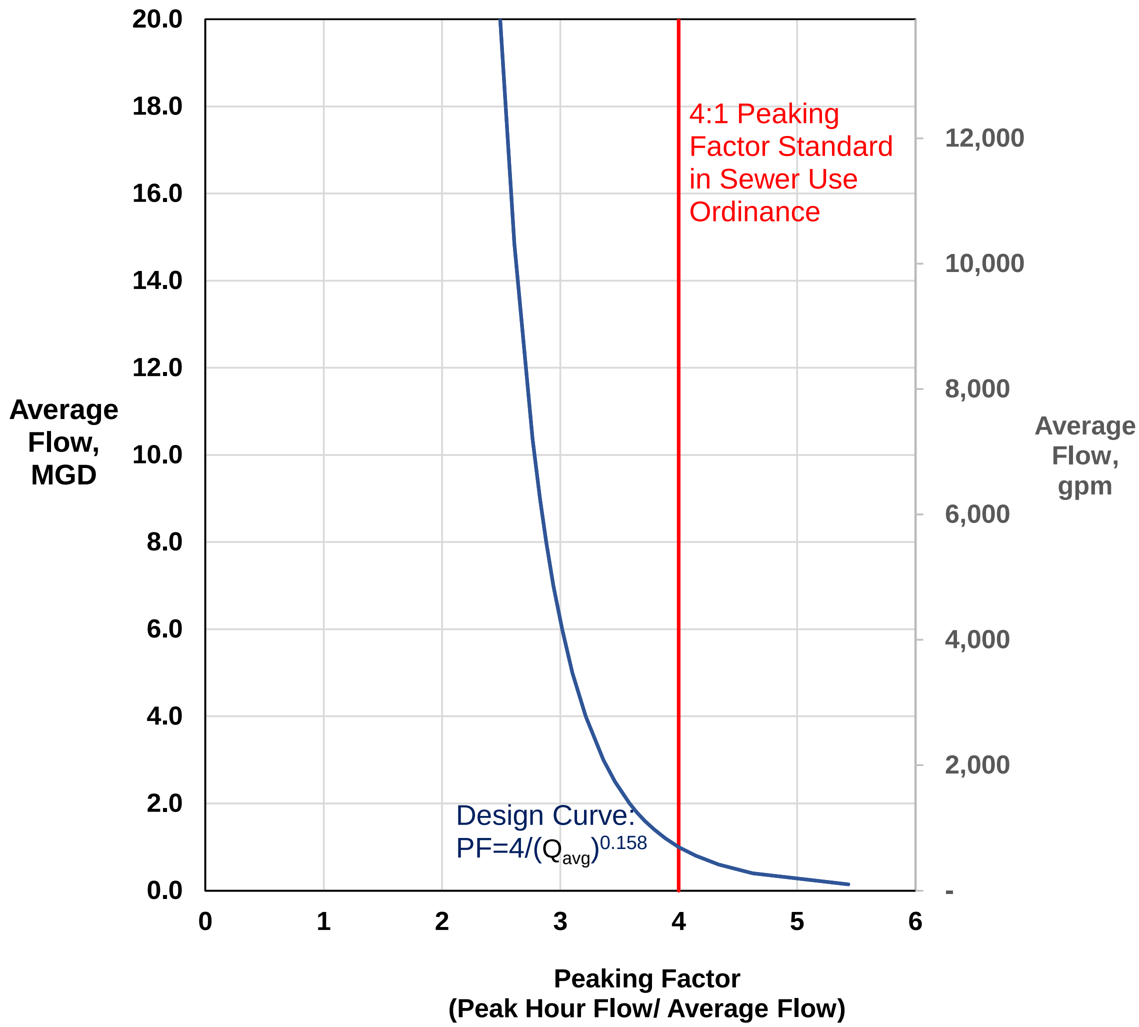
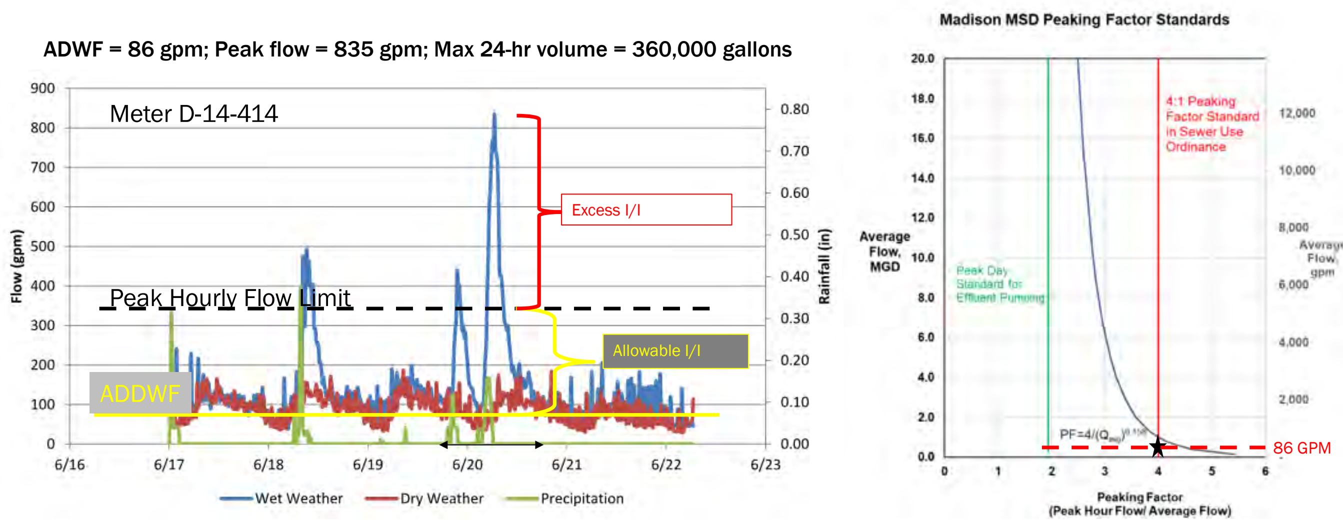


Figure 9. Peak Flow Standard for I/I Program

An example is provided from a prior District I/I study performed in 2015 for the PS14 service area. For the event shown in Figure 10, the ADDWF at meter 14-414 was determined to be approximately 86 gpm, or 0.124 mgd. Because ADDWF is less than 1 mgd, the design curve peaking factor does not apply, and the limit is 4.0 according to the SUO. This sets the peak hour flow limit to 4 times 86 gpm or 344 gpm. The actual peak hourly flow during this event was 835 gpm, meaning this area generated 491 gpm of excess I/I flow.

Daily I/I Volume Standard. An additional standard for maximum 24-hour I/I volume is also established in support of this program. The limit is derived from the difference in capability of the plant to treat influent wastewater and the capacity to discharge that flow back to the environment through permitted discharge points. As explained in Section 1.2.3, any daily flow volumes that exceed 1.9 times ADDWF would require effluent storage and are of concern. This standard is not currently expressly written into the District's SUO.

Using the same example flow meter 14-414 and flow event of interest, the daily maximum volume limit for this area is 1.9 times 124,000 gallons, or 235,000 gallons. As illustrated in Figure 10, this tributary area generated a maximum 24-hour volume of 360,000 gallons, meaning an excess I/I volume of approximately 125,000 gallons.



For Peak Flow, Use PF curve up to 4:1 SUO Limit

Figure 10. Example application of Peak Flow and Volume Excessive I/I Standards

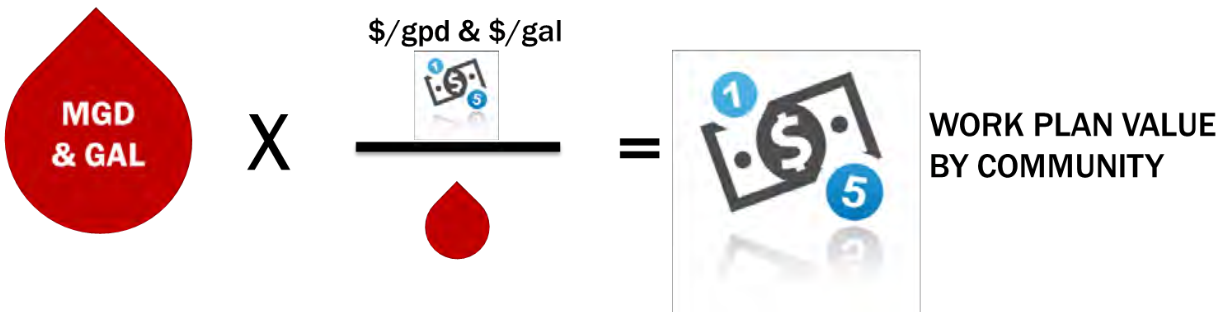
To determine compliance with the Excessive I/I Standards, the District will deploy flow meters to monitor specific tributary areas. Flow meters will be installed by March 1, and monitoring will continue for a period of 6 months, through August. Section 6 provides further details of the Flow Monitoring and Analysis activities required to support the program.

2.4 Customer Community Work Plans

Activity to reduce I/I reduction under this program would be driven through Work Plans implemented by the Community Customers. Any Customer Community with a tributary area found to have I/I that exceeds either the peak flow or daily volume standard would be required to develop an I/I Reduction Work Plan, and submit it to the District for review and approval. This section describes the construct for these Work Plans.

Work Plan Value

All Work Plans will need to consist of a minimum dollar value commitment by the Customer Community, referred to as the “Work Plan Value.” The minimum amount will be based on the amount of excessive I/I peak flow and volume determined for the tributary area. After determining that excess amount, the following formula will be used to derive the Work Plan Value:



Using the example from Figure 10, the Work Plan would be calculated as follows:

<u>Excess Peak Flow Component</u>
86 gpm Avg Flow -> PF = 4.0;
Peak Flow Limit = 86 gpm x 4.0 = 344 gpm
Excess peak flow = 835 gpm – 344 gpm =
<u>491 gpm or 707,000 gallons per day (gpd)</u>
$1/gpd x 707,000 gpd = <u>$707,000 for peak flow</u>

<u>Excess Daily Volume Component</u>
86 gpm Avg Flow -> PF = 1.9;
Daily Volume Limit = 86 gpm x 1.9 -> 0.236 Mgal
Excess daily volume = 0.360 Mgal – 0.236 Mgal =
<u>124,704 gallons</u>
$1/gal x 124,704 gallons = <u>$124,704 for volume</u>

Total Work Plan Value: $707,040 + $124,704 = $831,744

The basis for establishing $1 per gallon per day (gpd) comes from extensive evaluations of I/I reduction projects performed across the United States by Brown and Caldwell, according to an analysis standard published by the Water Environment Research Foundation in 2004. As illustrated in Figure 11, the results of these analyses indicate that $1 per gpd of peak flow has regularly been achieved and would serve as a realistic starting point for budgeting I/I reduction activities for areas targeted with this approach.

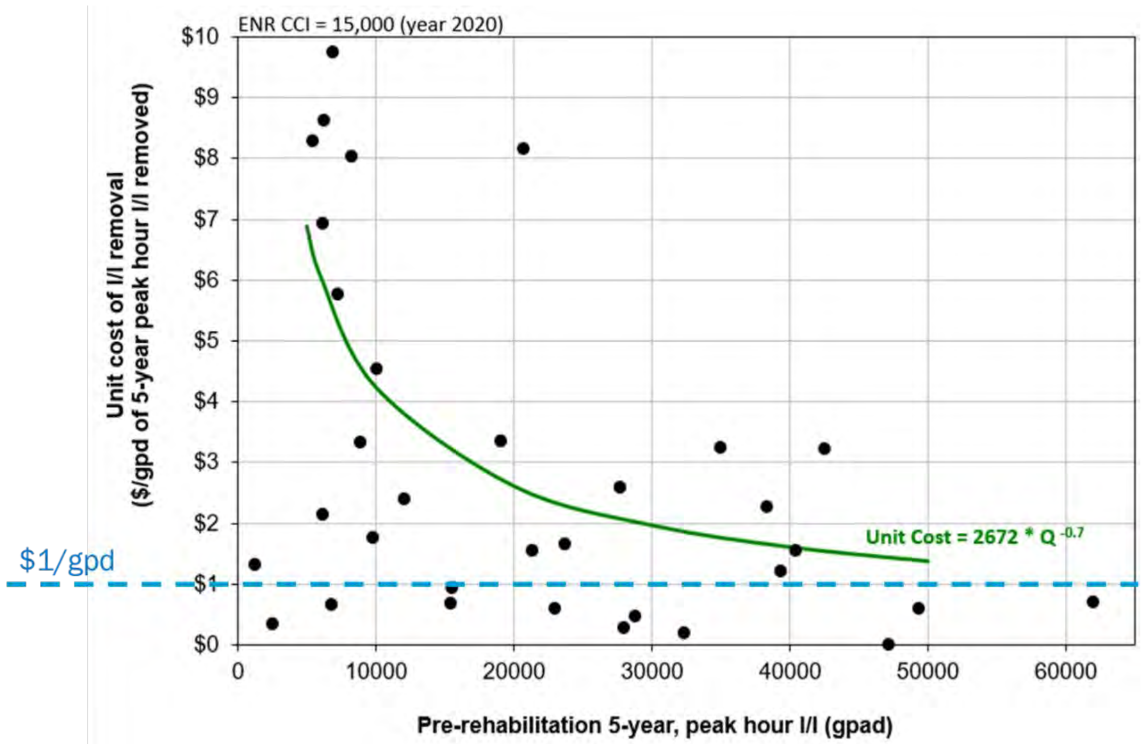


Figure 11. I/I Reduction unit costs achieved on previous projects

The basis for the $1 per gallon of excessive I/I volume is derived from the estimated cost for expanding effluent pumping at NSWWTP. The 2016 Liquid Facilities Plan estimate of $75 million for 100 mgd of capacity translates to $0.75/gallon for a full day of flow. By inflating those costs to 2036, a point 15 years into the I/I Reduction Program, this cost basis would scale to approximately $1 per gallon (20 years at 1.5 percent annual inflation).

Eligible Activities and Limits Toward Plan Value

Only certain activities would count toward the prescribed minimum Work Plan Value. As the District is interested in having the bulk of the value applied toward I/I reduction activities, the following criteria would be established:

- Maximum of 25 percent toward I/I investigations and other non-construction related costs, including flow monitoring upstream in the non-compliant tributary basin
- If the peak flows and event volumes are found to exceed the standard in more than 3 events during the monitoring period, only 10 percent can be applied toward I/I investigations and non-construction related costs

Plan Components

The District intends to provide latitude and flexibility to the Community Customers in developing Work Plans in support of the I/I Reduction Program. A minimum amount of information will be required for defining the activities expected to bring a tributary area into compliance with the I/I standard.

1. Overview of Tributary Area
2. Previous Efforts to Investigate and Address I/I Sources in Tributary Area
3. Scope of Proposed Work Plan
4. Budgetary Elements of Proposed Work Plan, including Statement of Financial Commitment

5. Schedule of Work and Expenditures for Proposed Work Plan

During 2021, the District will develop further guidance and templates in support of Work Plan development by Community Customers.

Duration of Plans

Each Work Plan is to be designed for a maximum 5 years of implementation.

2.5 District Approval and Oversight of Work Plans

The process for requiring and implementing a Work Plan under this program will follow these specific steps, as illustrated in Figure 12:

1. District identifies a tributary area for flow monitoring
2. District deploys flow monitors for 6 months by March 1
3. District collects and analyzes dry weather and wet weather data
4. District determines compliance status of the tributary area
5. District informs Customer Community of compliance status and requirements for a Work Plan
6. Customer Community develops Work Plan and submits for District review and approval
7. District approves Work Plan, or works with Customer Community to revise and reissue
8. Customer Community implements Work Plan and provides annual updates to the District
9. Upon completion of Work Plan, District monitors tributary area for compliance with Excessive I/I Standard

Prior to program initiation, the District will develop a Flow Monitoring Plan describing the methodology for prioritizing when and where flow monitoring will be performed in support of the program. Section 6 provides further details on the proposed approach for developing this plan.

Submittal Process

Upon receiving notification from the District that a monitored tributary area was determined to be non-compliant with excessive I/I standards, the Customer Community will be required to develop and submit a Work Plan for achieving compliance. The community will have 120 days to develop and submit a Work Plan that is consistent with guidelines developed by the District.

Review and Approval Process

The District will review any proposed Work Plans for consistency with District published guidelines. These Work Plan Guidelines will be developed in 2021. The District will provide feedback or approval on any submitted Work Plan within 90 days of submittal.

Oversight Process

The District will require annual progress updates on approved Work Plans, including expenditures on eligible activities compared to the schedule in the approved Work Plan.

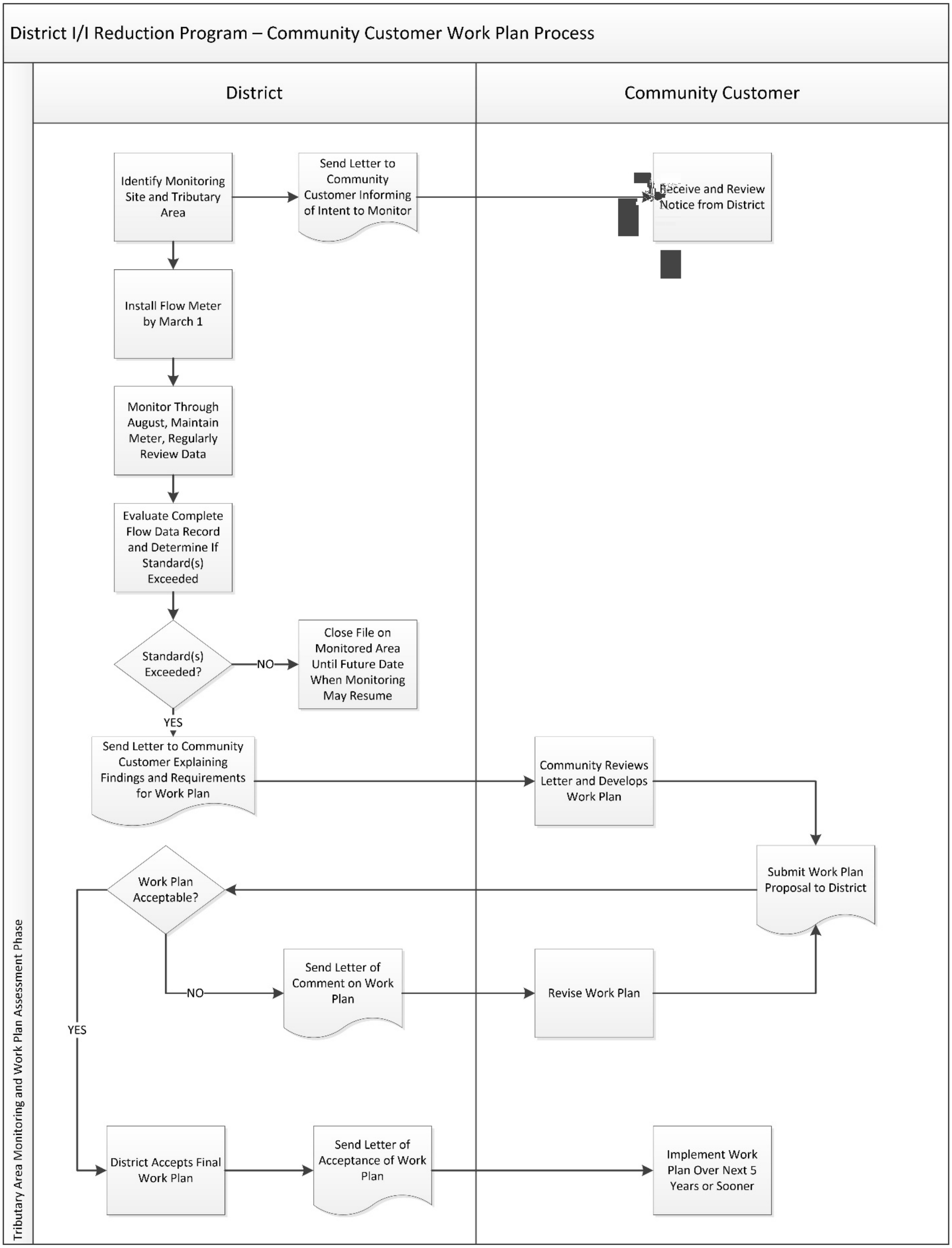


Figure 12. Work Plan development and approval process

2.6 Flow Assessments After Completion of Work Plans

At the conclusion of the Work Plan, the tributary area will be monitored to determine compliance status. The Customer Community can request that compliance monitoring commence earlier than the originally proposed Work Plan schedule if it believes and can provide support for the belief that significant I/I sources have been developed to the point of achieving compliance. The flow monitoring and analysis after Work Plan completion will be the same as that done to determine compliance prior to the Work Plan. Section 6 details the proposed approach for monitoring and analysis efforts to support the I/I Reduction Program.

Section 3

Incorporation Into District CMOM

The overall intention of a Capacity, Management, Operations and Management (CMOM) program is to define the operation and maintenance requirements for an organization's sewer collection system. The District's CMOM Plan was prepared to comply with the rule known as the "Sanitary Sewer Overflow (SSO) rule" which was adopted in the Wisconsin Administrative Code under Order WT-23-11 and is in the Register July 2013 No. 691 Code. The District's CMOM Plan was last revised on August 14, 2018, and is intended to be regularly updated as the goals and organization of the District change. With the adoption of the Regional I/I Reduction Program, the District's CMOM Plan will need to be updated. This section provides a summary of the most likely updates that could be made to reflect the purposes, goals, and structure of the I/I Reduction Program.

3.1 Chapter 2 – Management Plan

Chapter 2 of the CMOM Plan describes the Management Plan for oversight of the sewer collection system. Topics of this chapter include major elements needed to implement CMOM. Those elements that are most likely to be affected by adoption of the I/I Reduction Program include Goals, the Organizational Structure, Finances, Data Management and Documentation, Customer Service, Legal, Private Property Programs, and Performance Metrics. Suggested changes to these elements, if any, are described in this section.

Section 2.3 – Goals

The following CMOM Goals provide support for adoption of the Regional I/I Reduction Program.

- Goal 3: "Comply with regulatory requirements… including the 2013 Wisconsin 'SSO Rule'
- Goal 4: "Take all feasible steps to cease sanitary sewer overflows"
- Goal 8: "Reduce the potential threat to human health from sewer overflows"
- Goal 9: "Provide adequate capacity to convey peak flows"
- Goal 10: "Take all feasible steps to eliminate excess infiltration and inflow"
- Goal 13: "Assist satellite communities"

Section 2.4 - Organizational Structure

The purpose for the CMOM Management Plan to define the Organizational Structure is to clearly state what positions and individuals are responsible for ensuring CMOM activities are documented and followed by the organization. With the Regional I/I Reduction Program being adopted, the responsible position and individual responsible for program should be identified in this section.

Section 2.6 – Financial

The financial element of the CMOM Management Plan documents the specific budget items, whether from Capital or Operating funds, that are related to the collection system. It is recommended that this list also include funding activities in support of the Regional I/I Reduction Program.

Section 2.8 – Data Management and Documentation

The Regional I/I Reduction Program will generate a significant amount of additional flow monitoring data. These data in particular will require diligent review and storage to support the enforcement of the program. This section of the CMOM Management Plan should be updated to reflect the specific needs of the I/I Program once these are better defined by 2021 activities.

Section 2.9 – Customer Service

The District should update this section to reflect the adoption of the Regional I/I Reduction Program since it reflects a significant additional point of interface between the District and its Community Customers.

Section 2.10 – Legal

Adoption of the Regional I/I Reduction Program will prompt several updates to the 2.10 Legal section. Specifically, Program adoption will necessitate eventual changes to the District's Sewer Use Ordinance, discussed in Section 2.10.1. of the CMOM Program Management Plan, and the numerous points of interaction between the District and Community Customers should be reflected in updates to Section 2.10.3 Satellite Communities.

Section 2.14 – Private Property Programs

The Regional I/I Reduction Program does not specifically target Private Property I/I (PPII), but it will focus attention on areas where concerted PPII efforts may be necessary to achieve compliance with excessive I/I standards. As part of implementing the I/I Reduction Program, the District will partner with Community Customers in identifying technical support the District could provide to help with locally-driven PPII reduction efforts. Technical support could include drafting model PPII Program policy documents, standards for PPII investigations, and materials to support public education on PPII. This activity should be referenced in Section 2.14 of the CMOM Management Plan.

Section 2.15 – Performance Metrics

The Regional I/I Reduction Program will be driven by compliance status of monitored tributary area compared to the established excessive I/I standards. These standards effectively establish a new set of performance measures for municipal flows discharging to District system. Additional performance metrics for the program can include District activities related to oversight of the program including

- Number of monitoring sites implemented in a year
- Amount of time needed to review monitoring data and determine compliance status
- Percent of Work Plans reviewed within 90 days of receipt

3.2 Chapter 3 – Operation and Maintenance Plan

Section 3.18 – Flow Monitoring should be expanded to discuss the flow monitoring that will be done in support of the Regional I/I Reduction Program.

3.3 Chapter 4 – Asset Management Plan

The Asset Management Plan chapter in the District's CMOM document details activities related to Condition Assessment, Condition Assessment Recommendations, and Rehabilitation and Replacement performed by the District to ensure cost-effective operation and maintenance of District assets. The chapter notes that I/I reduction is a key consideration for management of District conveyance assets with respect to satisfying levels of service established for them. This chapter should be updated to reference the Regional I/I Reduction Program as a tool in protecting the established levels of service for conveyance capacity.

3.4 Chapter 5 – Capacity Plan

The Capacity Plan chapter of the CMOM Program document describes the District's practices that ensure sufficient capacity is provided to safely manage and convey both dry and wet weather flows. Numerous sections of this chapter should be modified to reflect the adoption of the Regional I/I Reduction program, including:

- **Section 5.2 Capacity** - references District activities to inspect for and address I/I
- **Section 5.3 Field Investigations** - includes flow monitoring among the list of activities
- **Section 5.4 Flow Modeling** – is an activity that relies upon flow monitoring data for accuracy
- **Section 5.5 Flow Monitoring** – is an activity that will be utilized heavily in implementation of the Regional I/I Reduction Program
- **Section 5.6 I/I Reduction** – this section would need to be substantially updated to reflect the existence of the Regional I/I Reduction program.

3.5 Chapter 6 – Emergency Overflow Response Plan

The Emergency Overflow Response Plan (EORP) documented in Chapter 6 is concerned with District activities before, during, and after the release of untreated wastewater from the District system. One important activity performed after an SSO is known as a Root Cause Failure Analysis (RCFA). The District RCFA process described in CMOM Section 6.8 can be updated to note that data from I/I Program monitors may be useful in some circumstances to diagnose the reasons for the release.

3.6 Chapter 7 – Communication Plan

The purpose of the Communications Plan chapter of the CMOM document is to describe the activities the District uses to communicate to stakeholders regarding actions taken or to be taken on the collection system. Specific activities described in Chapter 7 that should be updated after Regional I/I Reduction Program adoption include:

- **Section 7.2 – Satellite Community (Customer) Communication** – should be updated to reflect the I/I Program's existence and the communication activities anticipated, including notification of tributary area non-compliance with excessive I/I standards
- **Section 7.3 – CMOM Communication** – should be updated to include the most current list of tributary areas under active Work Plans

Section 4

District Support for Municipal Programs

The District recognizes that Community Customers will need different levels of support and assistance when developing and implementing I/I reduction Work Plans that may be required under this Regional I/I Reduction Program. This section discusses specific activities that the District is considering in this regard. Many of these were identified and discussed during the Advisory Committee meetings held during the development of the I/I Program.

4.1 Technical Support

It is in the best interest of both the District and affected Community Customers to initiate and complete Work Plans that are developed with the best technical basis possible. Some communities may have limited experience with I/I investigation and reduction. Others may have experience, but lack capacity to satisfy the prescribed 5-year duration. The following technical support activities have been defined by the District as potentially being offered at some point after program adoption:

- Develop a library of I/I investigation and repair best practices
- Systemwide contracts for flow monitoring, field investigations, and engineering support
- Guidance documents for establishing local private property I/I reduction programs
- Legal, policy, and model ordinances for private property I/I reduction programs

4.2 Funding of Private Property Pilot Projects

At some point in the future, the District may be interested in funding pilot I/I reduction projects. There are restrictions in state statutes for the District funding projects for improving local sewer systems, but these restrictions do not extend to private property. Some communities may not be ready to implement PPII until local pilot work has proven this as a successful strategy for reducing overall I/I. The District has expressed an interest in performing such pilots in the future, depending on funding available and having a willing Customer Community partner to assist with implementation.

4.3 PPII Policy and Program Advising

It may be necessary for some work plans to rely heavily on PPII reduction in order to achieve compliance in tributary areas found to exceed excessive I/I standards. In such cases, the community may want to consider establishing a PPII program, based on an established PPII policy. The District may establish a regional contract to provide consulting services to the Communities for the purpose of developing such policies and programs. Any direct assistance provided through this District contract would need to be reimbursed by that Community.

4.4 Public and Customer Education

Public and Customer Community education will be needed for explaining the Regional I/I Reduction Program in general and how it will apply to specific customers. In addition, many customers will need to develop educational materials for their rate payers, including those in non-compliant tributary areas that may need investigation and rehabilitation work to come into compliance. The District is interested in developing content on I/I and the program for use on its own web pages, and for use by Community Customers. Additionally, the District may set up regional consulting contracts in the future for assisting communities with private property owner outreach in targeted tributary areas. Any direct assistance performed through District contract would be paid for by the assisted community.

Section 5

Changes to District Sewer Use Ordinance

Implementation of the recommended Regional I/I Reduction Program will require several changes to the District's existing SUO.

5.1 Excessive I/I Standards

Section 4.6.1 CMOM and Infiltration/Inflow Requirements paragraph (b) already references an excessive I/I standard:

> *4.6.1.(b)*
> *All Community Customers are required to control excessive infiltration and inflow (I/I). Excess inflow and infiltration is defined as any sewer having an hourly wet weather flow peak greater than four (4) times the average daily dry weather flow or hourly peaks greater than four (4) times the typical daily wastewater-only flow anticipated for the served area based on water meter records. The District may also identify excess inflow and/or infiltration as determined by a professional engineer during the conduct of an I/I study. Any Community Customer having excessive infiltration and inflow will be required to submit a corrective action plan to the District that identifies steps that they will take to timely reduce I/I to acceptable levels.*
> *(Revised July 27, 2017 and Effective August 18, 2017)*

At a minimum, the District will want to make the following specific modifications to this section to establish the Regional I/I Reduction Program:

- Establish the Excessive Daily Volume Standard – the volume over a continuous 24-hour period that is more than 1.9 times the average daily dry weather volume over that same 24-hour period.
- Modify this paragraph to state that any Community Customer exceeding either standard will be required to develop, submit, and implement an I/I Reduction Work Plan consistent with the requirements of the Regional I/I Reduction Program.

5.2 Establish the Regional I/I Reduction Program

The District may wish to add a new paragraph 4.6.1.(c) that defines the Regional I/I Reduction Program, including the construct of a Work Plan, calculation of Work Plan values to apply to the excessive I/I flows and volumes, and reference to guidance to be published by the District concerning the administration of the program.

5.3 Additional Modifications in Support of the I/I Program

The District may wish to make additional specific changes in support of the long-term vision for the Program, such as a requiring Customer Communities to submit annual Compliance Maintenance Annual Report (CMAR) to the District.

Section 6

Flow Monitoring and Analysis Processes

A robust flow monitoring and analysis program will be required to support the Regional I/I Reduction Program. This section outlines the current concept for the District's approach to gathering and evaluating the data. Future efforts will further define these support efforts to meet the needs of the Program. A flowchart of expected activities is shown in Figure 13.

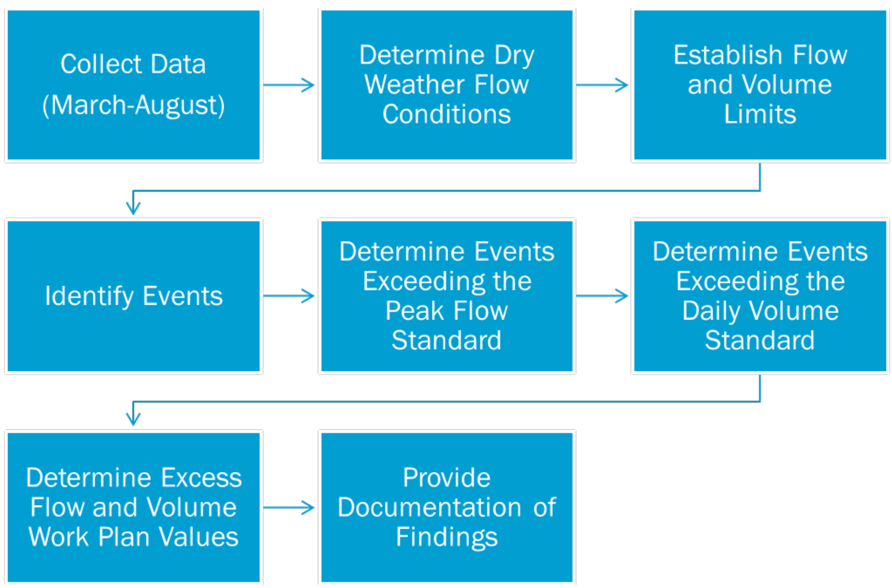


Figure 13. Flow data collection and analysis process for Regional I/I Reduction Program

6.1 Flow Monitoring

Flow monitoring will be performed on tributary areas with meters placed in Community Sewers in most cases. The District's SUO section 1.4.4 General Right to Entry allows the District access to local sewers for measurement.

Flow monitoring equipment will be temporarily installed, with most monitoring devices installed for 6 months, typically from March through August. This time frame of monitoring will normally provide the best chance of measuring a wide variety of I/I events, including spring events with saturated ground conditions and intense summer thunderstorms. Having a wide variety of events to evaluate will be important for assessing both the peak flow and volume characteristics of monitored tributary areas. The months of March through August were selected based on an analysis of rainfall event frequency each month from historical records at DCRA (1948 through 2013). Figure 14 shows the long-term average frequency of significant events (1 inch of daily rain or greater) for each month.

March is chosen instead of September in order to establish dry weather conditions before typical April rainstorms.

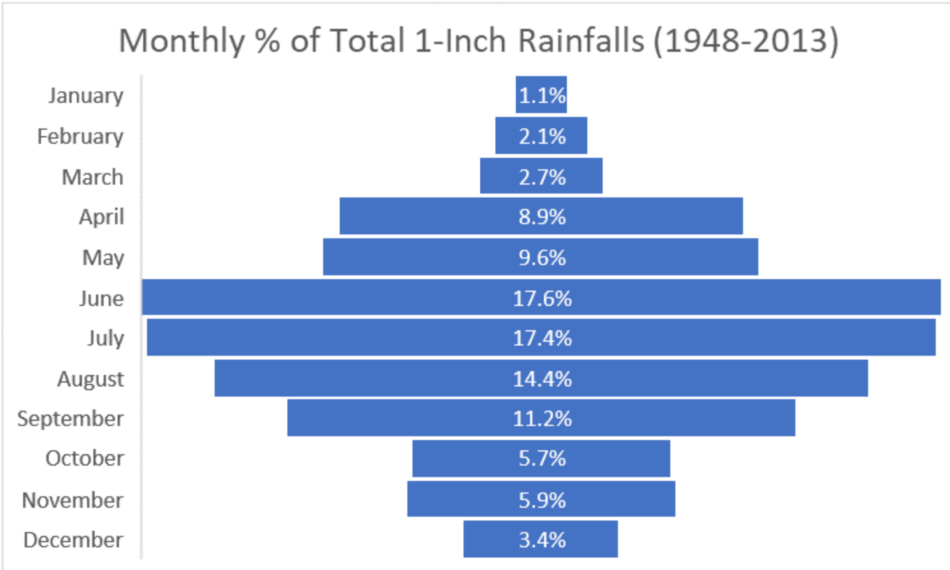


Figure 14. Percent of annual average 1-inch rainfall days each month at Dane County Airport

The number of sites the District will monitor each year is yet to be determined but will likely be on the order of 20. The District may consider out-sourcing the monitoring activities, including equipment installation and site maintenance. Outsourcing provides advantages of placing uptime and data quality requirements on the contractor, which should help improve the availability of timely and accurate data during important wet weather events. Alternatively, the District could perform some or all of the required monitoring with existing equipment and staff.

Flow monitoring sites will be prioritized, with the initial sites targeting areas suspected of exceeding the flow standards. In order to set these priorities, the District will improve the Collection System Model starting in 2021, so that dynamic flow responses during wet weather can be properly accounted for, making the inferring of where significant I/I enters the system more reliable. As flow data become available from the I/I Program, the Collection System Model can be further calibrated and improved as a system diagnostic tool.

In 2021, the District will develop a Flow Monitoring Plan in support of the Regional I/I Reduction Program. It will lay out the priorities for initial stages of monitoring and the approaches to be used for monitoring the first set of sites.

6.2 Flow Data Analysis

A standard process will be followed for analyzing the data in support of the Regional I/I Reduction Program. The major steps are detailed below:

Determine Dry Weather Flow Conditions: Dry weather flows will be captured within the monitoring period. If the analysis suggests that all dry weather during the monitoring period is significantly above or below average when compared to the nearest District pump station, the tributary area dry weather flows will be scaled accordingly in order to set a more accurate baseline for determining allowable peak flows and volumes.

Establish Flow and Volume Limits: After setting the tributary average dry weather flow, the peak flow limit will be determined by multiplying the allowable peak flow factor by the dry weather flow. The allowable peak flow factor will be the lower of 4 and the number derived from the District peaking factor curve equation. The 24-hour volume limit will be determined by multiplying the average dry weather flow by 1.9.

Identify Events: The monitoring data will be reviewed to identify potential wet weather events. The review will consider the monitoring data and the nearest rainfall data available.

Determine Events Exceeding the Peak Flow Standard: The measured data will be converted to hourly average flow for comparison to the Peak Flow Standard. The number of events with peak hourly flow exceeding the standard will be determined, as will the amount the Peak Flow Standard was exceeded in each event.

Determine Events Exceeding the Daily Volume Standard: The 24-hour running average flow time series will be calculated for each site. The maximum 24-hour running average value for each identified I/I event will be determined and compared to the standard. The volume exceeding the standard will be the difference between the event maximum 24-hour volume and the standard.

Determine Excess Flow and Volume Work Plan Values: Based on the largest exceedance of peak flow and volume during the monitored period, the total work plan value will be calculated. A rate of $1 per gallon per day hourly flow exceeding the Peak Flow Standard and $1 per gallon of 24-hour volume exceeding the volume standard will be used. The number of times either standard were exceeded will also be identified for purposes of determining how much work plan value may be satisfied with non-construction-related activities.

Provide Documentation of Findings: A brief written report will summarize the data collected and the findings of the analysis for use by the I/I Reduction Program Manager in communicating with the Community Customer.

Section 7

Program Implementation

Each of the major activities required for start-up and management of the Regional I/I Reduction Program is identified and described below. The total estimated or budgeted costs for either start-up or annual program costs associated with ongoing management activities are:

- Total for Start-up District Costs: $550,000
- Total for Annual Program District $500,000 by 2026

These costs are described below and summarized in Table 3. Figure 15 visually shows the schedule for these activities. This schedule is contingent upon Commission acceptance of this plan and subsequent authorization for the budgets identified.

Start-Up Costs

Fixed costs to start-up the program include the following.

Model Update (2021-2022) – The existing District collection system model requires updates to make it useful as a tool for defining the Regional I/I Reduction Program Flow Monitoring Plan. The updates will include adding dynamic I/I hydrology and calibrating the model to data collected at District pump stations. The model update will be complete before the end of 2022 for a budget of approximately $100,000.

Flow Monitoring Plan (2022) – The Flow Monitoring Plan will define the process for selecting sites, equipment, data collection and management processes, and analysis procedures. The plan will also identify the first set of monitoring sites for the program, based on the collection system model updates. The budget for this plan is $25,000, and the plan will be completed by the end of 2022.

Regional I/I Reduction Program Guidance (2021) – Guidance will be needed for helping Community Customers develop Work Plans and communicate with their own customers about the I/I program. Activities in 2021 will include preparing Work Plan Development Guidelines and a Template Work Plan, as well as collaborating with the I/I AC members during workshops every other month. Future guidance will be likely but has not been identified at this time. For 2021 activities, $25,000 has been budgeted.

Capacity and Cost-Effectiveness Evaluation (2022-23) – The District would like to better understand the cost-effectiveness of this program, as compared to constructing additional capacity to convey, treat, and discharge I/I. At this time, the tools are not available to perform this analysis. Specifically, the collection system model needs to be updated so that dynamic I/I conditions and their impact on District facilities can be better represented. This evaluation will also consider future I/I conditions that may result from not having a Regional I/I Reduction Program and what capacity investments the District may need as a result. The evaluation would be performed in 2022 and 2023 for a budget of $200,000.

Sewer Use Ordinance Change (2023-24) – The District's SUO will require updates in order for the program to be implemented as defined in this plan. These activities would begin in 2023, after the completion of the Capacity and Cost-Effectiveness Evaluation. The process is expected to take more than one year to complete. A budget of $50,000 is established for legal support during this process, provided by District outside counsel.

Develop Technical Guidance (2023-24) – Communities participating in the I/I AC meetings during development of this plan indicated a strong interest in having the District develop technical guidance that would support local I/I reduction work. Specific guidance has not been defined at this time. A budget of $100,000 is established for this start-up activity that is intended to benefit all Community Customers, regardless of status in the I/I Reduction Program.

Educational Materials (2023-24) – Like the technical guidance, the AC members indicated interest in the District developing educational materials that would help them with implementing local I/I reduction activities and public outreach. These materials could be useful for communicating with elected officials and the general public on I/I topics. A budget of $50,000 is established for this work, expected to occur starting in 2023.

Annual Program Costs

The following summarizes the annual costs for maintaining the I/I program, with an assumed escalation rate of 3 percent each year.

District Program Management (Starting 2023) – To support program start-up and implementation, District staff will need budget for management activities. This support will start during the SUO change effort and continue throughout the program. Specific activities are yet to be defined, but could include miscellaneous technical support by a consultant. A $50,000 per year budget is assigned to this support, starting in 2023.

Monitoring Program Implementation (Start 2024) – After adoption of the SUO changes, the first monitoring sites recommended in the Flow Monitoring Plan would be installed by March 1, 2024. These initial 20 sites would be installed for 6 months to characterize dry weather and wet weather flow responses in a variety of conditions for comparison to the excessive I/I standards. An annual budget estimate for monitoring 20 sites at a time is $240,000, which includes equipment installation, regular site maintenance, data retrieval, and initial data review. These costs assume the District would contract out this activity.

Technical and Education Support (Starting 2024) – Based on input received during I/I AC meetings during the development of the program, the District will establish technical and education support contracts for use by Community Customers. These efforts are intended to help customers develop and implement Work Plans required by the program. While the District would make contracts available, any Community Customer engagement would be reimbursed by the customer. Due to the on-demand nature of this assistance, no specific budget is assigned.

Analysis of Annual Flow Monitoring Data (Starting 2025) – At the conclusion of each annual I/I monitoring period, the District would have each site evaluated for compliance with the excessive I/I standards established in the SUO. A budget of $80,000 is estimated for having an outside contractor perform this activity annually.

Compliance Communication (Starting 2026) – After the flow monitoring data is complete, the District will begin the process of informing affected Community Customers of a tributary area exceeding I/I standards and the need to develop a Work Plan. It is expected that this communication activity would be performed by District staff, but contracted assistance would be required for reviewing any submitted Work Plans. An annual support budget for this activity is estimated at $50,000.

Table 3. I/I Reduction Program Costs							
Start Up Costs	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Model Update	$75,000	$25,000					$100,000
Flow Monitoring Plan		$25,000					$25,000
Regional I/I Reduction Program Guidance	$25,000						$25,000
Capacity and Cost-Effectiveness Evaluation		$100,000	$100,000				$200,000
Sewer Use Ordinance Change			$25,000	$25,000			$50,000
Develop Technical Guidance			$50,000	$50,000			$100,000
Education Materials			$25,000	$25,000			$50,000
Totals for Start Up by Year:	$100,000	$150,000	$200,000	$100,000	$0	$0	$550,000
Annual Costs	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	
District Program Management			$50,000	$51,500	$53,045	$54,636	$209,181
Monitoring Program Implementation				$240,000	$247,200	$247,200	$734,400
Technical and Educational Support							$0
Analysis of Annual Flow Monitoring Data					$80,000	$82,400	$162,400
Compliance Communication						$50,000	$50,000
Totals for Annual Costs by Year:	$0	$0	$50,000	$291,500	$380,245	$434,236	$1,155,981
Total Program Costs by Year:	$100,000	$175,000	$250,000	$391,500	$380,245	$434,236	$1,730,981
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	
	Current Year (existing budget)	Year 1	Year 2	Year 3	Year 4	Year 5	
Idea for Ramp-Up Plan Costs by Year:	$100,000	$175,000	$250,000	$400,000	$450,000	$500,000	$1,875,000

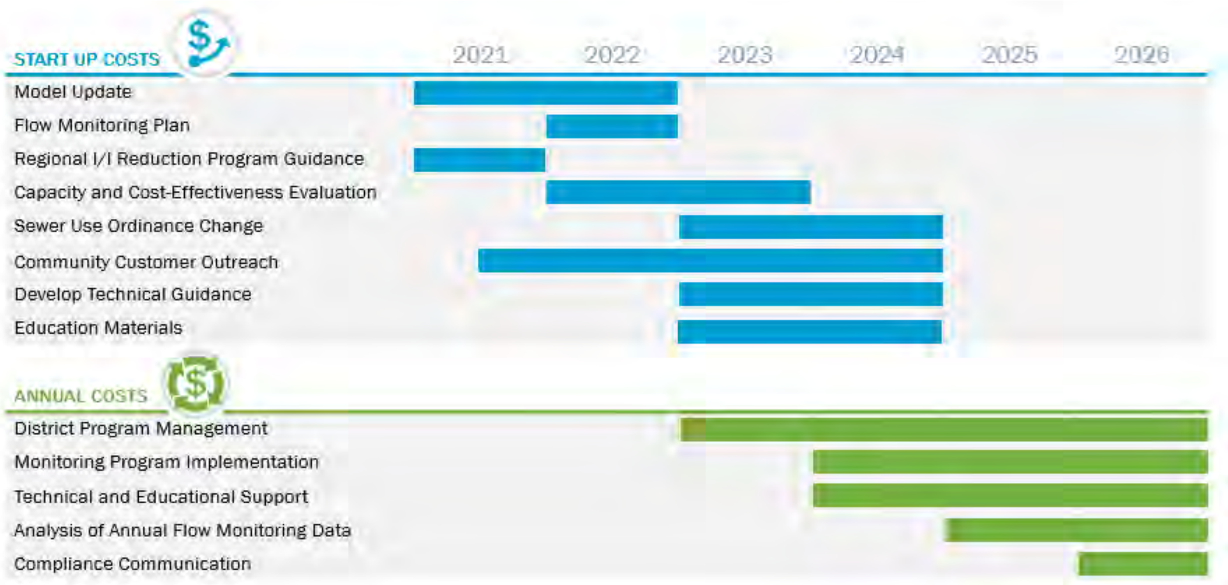


Figure 15. Schedule for I/I Reduction Program Implementation

Section 8

Limitations

This document was prepared solely for the District in accordance with professional standards at the time the services were performed and in accordance with the contract between the Madison Metropolitan Sewerage District (District) and Brown and Caldwell dated September 25, 2019. This document is governed by the specific scope of work authorized by the District; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the District and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

This document sets forth the results of certain services performed by Brown and Caldwell with respect to the property or facilities described therein (the Property). The District recognizes and acknowledges that these services were designed and performed within various limitations, including budget and time constraints. These services were not designed or intended to determine the existence and nature of all possible environmental risks (which term shall include the presence or suspected or potential presence of any hazardous waste or hazardous substance, as defined under any applicable law or regulation, or any other actual or potential environmental problems or liabilities) affecting the Property. The nature of environmental risks is such that no amount of additional inspection and testing could determine as a matter of certainty that all environmental risks affecting the Property had been identified. Accordingly, THIS DOCUMENT DOES NOT PURPORT TO DESCRIBE ALL ENVIRONMENTAL RISKS AFFECTING THE PROPERTY, NOR WILL ANY ADDITIONAL TESTING OR INSPECTION RECOMMENDED OR OTHERWISE REFERRED TO IN THIS DOCUMENT NECESSARILY IDENTIFY ALL ENVIRONMENTAL RISKS AFFECTING THE PROPERTY.

Further, Brown and Caldwell makes no warranties, express or implied, with respect to this document, except for those, if any, contained in the agreement pursuant to which the document was prepared. All data, drawings, documents, or information contained this report have been prepared exclusively for the person or entity to whom it was addressed and may not be relied upon by any other person or entity without the prior written consent of Brown and Caldwell unless otherwise provided by the Agreement pursuant to which these services were provided.

APPENDIX I – LEGAL NOTICE TEMPLATE

APPENDIX I: Legal Notice Template

NOTICE
MADISON METROPOLITAN
SEWERAGE DISTRICT

In accordance with its Wisconsin Pollutant Discharge Elimination System Permit, Madison Metropolitan Sewerage District reports there was a/n [incident description and location with address or locational reference] on [date]. [Additional description (if available).] [Mitigation/resolution information.] [Approximate release of wastewater if relevant.] Public Health and WI Department of Natural Resources [Update agency names as required] were notified of the incident. [Statement of impact to homes, businesses, environment or public access areas/infrastructure.]

BY D Michael Mucha
D Michael Mucha, CHIEF ENGINEER DIRECTOR

EXAMPLES

NOTICE
MADISON METROPOLITAN
SEWERAGE DISTRICT

In accordance with its Wisconsin Pollutant Discharge Elimination System Permit, Madison Metropolitan Sewerage District reports there was a sanitary sewer overflow of raw wastewater from a force main associated with Pumping Station 15, located at Marshall Park, 2101 Allen Blvd., Madison, on Friday, Oct. 5, 2023. The overflow was initially discovered discharging from a crack in the pavement in the east northbound lane of Allen Blvd. Sewage entered the storm sewer and Lake Mendota. The sewage was contained by 9 am that morning; the street was cleaned and storm sewer flushed. Site excavation revealed the overflow was a result of a hole that formed in the force main. The pipe was repaired by end of day. Approximately 5,000 gallons of wastewater were released. Public Health and the Department of Natural Resources were notified of the incident. No homes or businesses were impacted.

BY D Michael Mucha
D Michael Mucha, CHIEF ENGINEER DIRECTOR

NOTICE
MADISON METROPOLITAN
SEWERAGE DISTRICT

In accordance with its Wisconsin Pollutant Discharge Elimination System Permit, the Madison Metropolitan Sewerage District reports there was a sanitary sewer overflow of cleaned and treated wastewater from the Badger Mill Creek Effluent Force Main from a manhole alongside the Military Ridge Trail, near Dunn's Marsh, approximately 250 feet north of McKee Road. The discharge was discovered on September 18, 2023; the treated wastewater entered the nearby storm sewer and discharged to the neighboring wetland. Approximately 33,000 gallons were released. The Public Health Department and the Department of Natural Resources have been notified of the incident. There are no impacts on human health or the environment based on location and the discharge water being cleaned and treated wastewater. No homes, businesses, streets or pedestrian thoroughfares were impacted.

BY William D. Walker, Acting Chief
On behalf of D Michael Mucha, CHIEF ENGINEER DIRECTOR

APPENDIX J – MEDIA ADVISORY TEMPLATE

Madison Metropolitan Sewerage District

1610 Moorland Road • Madison, WI 53713-3398 • P: (608) 222-1201 • F: (608) 299-2129

APPENDIX J: Media Advisory Template

Note: Stick to known facts and provide updates as more information is known. Multiple advisories can be sent as the situation evolves.

MEDIA ADVISORY – FOR IMMEDIATE RELEASE
October 6, 2023

Contact:
Amanda Wegner, Communications & Public Affairs Director, 608-422-2727, amandaw@madsewer.org

Headline

[OWNER COMMUNITY] — Brief description of the emergency event. Include these details as relevant:

- Date and time
- Traffic impact, including location, anticipated duration, potential detour
- Known impacts to local residents, property owners or businesses
- Acknowledgement of District response and work to remedy the situation

###

We are a passionate and experienced resource recovery team that aims to protect public health and the environment. Established in 1930 to protect the lakes and streams of the upper Yahara watershed, Madison Metropolitan Sewerage District serves about 424,000 people in 25 Madison-area owner communities covering about 187 square miles. The District owns and operates 145 miles of pipe and 18 regional pumping stations that convey approximately 36 million gallons of wastewater to the Nine Springs Wastewater Treatment Plant daily. Organized as a municipal corporation, the District is a leader in sustainability and resource reclamation. Learn more at madsewer.org