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To: Madison Metropolitan Sewerage District
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Subject: 50-Year Master Plan
TM-4: Planning Variables (Final)
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1. Purpose

This memorandum documents a workshop held with the Technical Advisory Committee (TAC) and key MMSD staff to identify and discuss major planning variables that will govern or impact MMSD's available options for continuing to provide high quality services over the 50-year Master Planning period.

2. Workshop Description

The workshop was held on May 19, 2008 at MMSD headquarters. The workshop agenda, attendance sheet, and handout are included as Appendices A, B and C respectively. The workshop was designed to identify the major planning variables that will govern or impact MMSD's ability to continue to provide high quality services over the planning period. These services include: wastewater conveyance; wastewater treatment and the return of clean water to the environment; and biosolids management. The planning variables and driving forces identified in this workshop will serve as the basis for the subsequent planning process.

The workshop participants represented a broad range of experiences and perspectives, including:

- Staff from MMSD management and operations.
- Area planning staff from the Wisconsin Department of Natural Resources (WDNR).

- Water resource experts from University of Wisconsin – Madison.
- Experts from governmental agencies of the State of Wisconsin and Dane County.
- Consultant staff from Malcolm Pirnie and Strand & Associates, Inc.

The workshop began with a presentation of the preliminary list of planning variables identified by the consultants and MMSD staff. A discussion was then held to identify additional planning variables and their impacts on the master planning process.

3. Identified Planning Variables

The following planning variables were identified and discussed:

Location of Treatment Plants

Based upon a preliminary analysis of the current treatment capacities and anticipated future loadings, the existing wastewater treatment facilities at the Nine Springs WWTP will not have adequate capacity for the 50-year planning period. Capacity could be addressed by expanding the current plant, and or constructing satellite treatment facilities. The following issues pertaining to expanded and new facilities were discussed:

- New satellite treatment facilities should be close to population centers.
- Proximity to wetlands for the use of effluent polishing could be desirable.
- Effluent reuse could be a major initiative in the future. An example of this could be the use of effluent as cooling water at a power plant. In this case, treatment facilities could be strategically placed near the intended reuse applications.
- Is there enough land available for construction of the new facilities at the Nine Springs plant site? The land requirements for new facilities will be highly dependent on the level of treatment required to comply with water quality regulations and resulting effluent limitations in place at the time of construction.
- Future wastewater treatment systems may consist of many smaller, decentralized treatment facilities that operate on a local or neighborhood level. These systems have the potential to save on conveyance system infrastructure costs because they use smaller pipes. They may also provide better opportunities for local water reuse applications such as irrigation.
- With the TMDL being developed for the Rock River, there may be opportunities for effluent credit trading with local farmers.

- Water quantity and hydrology within the watershed will likely be a major issue in the future. Following its use, all groundwater used in the District's service area is currently pumped to a single central location for treatment. The treated wastewater effluent is then diverted around the Madison lakes by pumping most of it to Badfish Creek. Future treatment systems could provide a higher level of treatment, allowing the cleaned water to be used to provide a sustainable water flow to the lakes, rivers and aquifers in the upper part of the Yahara River watershed.

Biosolids Management

The District currently uses anaerobic digestion to produce biosolids that are recycled to agricultural land. An initiative is underway to add flexibility by developing a soil like product that can be used in non-agricultural settings. Accepting solid waste such as manure for treatment was discussed. It was indicated during the workshop that the January, 2007 MMSD issue paper on Agricultural Waste Management recommended the District not be involved in day-to-day manure management. Doing so is not considered a core business for the District and may not be a permissible function of a metropolitan sewerage district under state statutes. However, the District could provide technical assistance if on-farm or regional manure digestion is utilized within the county. The issue paper does state that future evaluations of biosolids management options, including evaluations conducted as part of the Master Plan, should include at least a cursory look at the feasibility of enhancing the District's biosolid products using animal waste. The following issues were also discussed:

- Many obstacles exist if the District was interested in accepting agricultural waste. Regulatory concerns and the affect on rates are two such obstacles.
- The biosolids currently contain significant levels of phosphorus. There is already an excess level of phosphorus within certain portions of the Yahara watershed. For this reason, there may be a need in the future to export biosolids from the watershed.
- If biosolids are produced at separate satellite plants, there may be a difference in quality from varying sources.
- Attention could be paid to the internal distribution of phosphorus within the watershed. Areas that are hypersensitive to phosphorus, such as areas close to the lakes, might not receive any biosolids, while areas poor in phosphorus might receive increased amounts.
- Changing agricultural practices may reduce the amount of fertilizer used by farmers and decrease the demand for biosolids.

- Emerging compounds of concern in biosolids may drive future regulations and limit the ability to beneficially reuse biosolids. This may also apply to WWTP effluent.
- Can biosolids be exported for alternate uses in the future? Using biosolids as compost or an add mixture to other products or for producing manufactured goods could become possible. If so, what type of capital infrastructure would be needed for these alternate uses?

Effluent Discharge and Reuse

Increasing regulatory pressure and energy costs may limit the long term viability of pumping all treated effluent to Badger Mill Creek and Badfish Creek. Also, as noted earlier, water conservation within the watershed is considered a primary issue to address in the future. The volumes and locations at which the District discharges its effluent will be a major factor in sustaining water levels in streams and aquifers throughout the watershed. The following issues on effluent discharge and reuse were discussed.

- The most apparent variable is the ability to discharge effluent into the Madison Lake system. This will depend heavily on effluent quality limits, regulatory judgement and public perception. Legislative changes may also be required.
- Decentralized local treatment plants could be a direction in the future. These facilities could reduce inter-basin water transfers by reusing effluent within the basin that it was generated. They also would eliminate the need to pump effluent long distances, thereby reducing energy costs associated with pumping.
- An area near St. Louis, Missouri has employed a decentralized treatment system to supplement base flow in a local stream. It was not the lowest cost solution, but the community still decided to go in that direction. Obtaining more information on this effort would be helpful.
- Who would ultimately be responsible for running the decentralized facilities? If operational responsibilities remain with the District, there may be workforce availability issues associated with operating multiple facilities. Greater levels of automation may be necessary in response to a shrinking workforce, and workers' skills will have to adapt to dealing with more remote automated control systems.
- Conservation of water on the intake side of the water system will be essential to achieve sustainability. Current pumping of groundwater is lowering the groundwater table and reducing baseflow to streams and springs.
- Energy conservation and water conservation should be considered equally important.
- Augmenting low water flow areas with treated effluent is an option, but the ability is needed to divert or manage the effluent in some other manner during high flow events. Nine Springs WWTP can utilize its lagoons for storage, but they can only

- hold 66 million gallons, a volume of water equal to approximately one and one-half days worth of dry-weather plant influent volume.
- Reintroduction of treated effluent back into the groundwater through infiltration or recharge could be a viable option to address water quantity concerns.
 - Microconstituents found in treated effluent such as pharmaceuticals, disinfection byproducts and viruses may be subject to increased regulation and create public perception issues that could limit the viability of using effluent for groundwater recharge.
 - Would there be enough available land area to implement effluent reuse options involving infiltration to an extent that it would have a significant impact on groundwater quantity?
 - From an ecological perspective it may be better to augment existing base flows than to recharge aquifers.
 - Use of wetlands for effluent polishing and use of effluent in reclaiming wetlands need to be further investigated.
 - The reuse of 'grey water' in non drinking applications appears to be a sensible option for the reduction of water consumption. How to go about implementing and integrating such systems remains an issue.
 - Major water consumers such as industrial parks and golf courses should be targeted first for instituting water reuse systems.
 - Public perception can influence the ability to institute water reuse options, and information/education efforts will need to be undertaken to impact public perception. The discussion in 2003 related to using effluent for cooling water at the new co-gen facility on campus highlighted the need for information/education activities. Staff from the University of Wisconsin expressed concerns related to reusing effluent because of perceptions that use could impact human health.
 - The majority of wastewater flow is generated by residential sources. The residential capacity to take on new grey water systems needs to be investigated.

Regulatory Trends

Jane Carlson summarized the regulatory issues that could impact the master planning process. These issues were summarized in a draft technical memorandum that was distributed to the advisory committee in advance of the meeting.

Higher concentrations of organic waste in plant influent will not greatly affect the plant operations. What will greatly affect plant operations is the lowering of effluent discharge limits on phosphorus and nitrogen, and/or imposition of limits for chlorides or emerging contaminants.

Stormwater Management

Currently communities served by the District have separate storm and sanitary sewer systems. Stormwater is captured in dedicated storm sewers and discharged to detention basins or directly into adjacent water bodies. Currently the District has no involvement in stormwater management. The following issues were discussed:

- Under its current policy, the District will not get involved in stormwater management unless the following three conditions are met:
 - a. A stormwater problem with water quality implications requires a regional solution;
 - b. The involved municipalities are unable to implement a coordinated plan; and
 - c. There is consensus that the District is the appropriate agency to deal with the issue.
- The District has to indirectly deal with stormwater flow because of inflow and infiltration into the sanitary collection system. The District generally has sufficient capacity to treat increased flows resulting from I/I, but has limited capacity to pump treated effluent away from the plant. The lagoon system is currently used for effluent equalization purposes.
- A white paper produced by NACWA on climate change and potential impacts on precipitation events will be sent out to the group. Are there any plans to adapt to possible environmental change that brings larger storms and potentially higher flows at the treatment plant?

Environmental Impacts

The overall environmental impact of the District's facilities and operations will be considered in the planning efforts. Carbon footprints, air quality and generation of hazardous materials are examples of the kinds of items to be examined under this variable as summarized in the Planning Variables Descriptions document that was distributed before the meeting.

Future Flow Projections

Future flow projections have significant impacts on capacity requirements for both the collection system and treatment facilities. The following items were discussed:

- Different means of transporting wastewater could reduce wastewater flows.
- Water conservation efforts could have a major impact on future flows.
- Conservation efforts may be offset by population growth.

- What has been the accuracy of population projections in the past? Is there a tendency to over or under estimate?
- Flow projections developed by MMSD in the past have proven to be fairly accurate, usually within $\pm 5\%$ of the actual flows.
- Should MMSD consider using a more conservative peaking factor when designing interceptor sewers and pumping stations? The current “Madison Design Curve” is based on data from fifty years ago. Do the public’s current expectations on level of service (frequency of sanitary sewer overflows) require a more conservative approach? Will climate change result in more intense storm events with resulting higher peak flows?
- The population growth rates could drastically change in the future. Climate change could lead to major migration patterns. There could also be a decrease in population as is the case in more highly developed regions such as Western Europe.
- Inflow and infiltration of groundwater into the collection system is a major cause of peak flows to Nine Springs.
- Exfiltration from the District’s interceptor system is unlikely because they are generally located below the groundwater level. Exfiltration from local collection systems and building laterals may be an issue since viruses have been detected in the deep aquifer used as the area’s drinking water source. The master plan will have a section assessing the general condition of the District’s interceptors.

Construction/Operational Costs

- Construction and operational costs will be major drivers for all scenarios and alternatives.
- Availability of skilled manpower will impact the ability to implement new services using multiple small-sized satellite treatment plants.

Public Acceptance

Phase 1 of the public involvement initiative has been completed. Strand is developing a memo on the topic of Phase 1 activities and results. The following items were discussed:

- A two-pronged method was used involving surveys and public presentations.
- Surveys were mailed to 260 stakeholders in the Madison area. The response rate was approximately 70%, which is excellent. The survey asked responders what level of acceptance they had for various water reuse applications and the additional monthly service charge amount they would be willing to pay to implement new water reuse alternatives.

- From February to April, 14 presentations were given in various communities, primarily to public works committees/boards. The purpose of the presentations was to introduce the District, introduce the master plan and to introduce some of the major water issues facing the area.
- Most attendees at the presentations were supportive of the introduction and public relations efforts and also supportive of water conservation and the concept of wastewater reuse. Groundwater appeared to be a bigger concern than surface water. In general the opinions and ideas expressed at the presentations were similar to those brought up in the earlier workshops.
- One disappointment was that there was only one response from the 40 environmental groups that were contacted to set up a presentation, and no group requested a presentation. Any ideas on how to engage these groups is welcome.
- It was suggested that MMSD should be put on the list of parties to be contacted as part of the Yahara Clean initiative and other related local initiatives.
- More public involvement efforts should be extended to average citizens rather than public works personnel.
- A comment was made during the planning variables meeting that many people might not know who MMSD is and may think that they are part of the City of Madison.

Miscellaneous

- System flexibility, maintainability, and similar operational characteristics shall be evaluated as part of the planning efforts.