Executive Summary

May 2004
The mission of the Metropolitan Council is to develop, in cooperation with local communities, a comprehensive regional planning framework, focusing on transportation, wastewater, parks and aviation systems, that guides the efficient growth of the metropolitan area. The Council operates transit and wastewater services and administers housing and other grant programs.

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Introduction

Metropolitan Disposal System (MDS)

Metropolitan Council Environmental Services (MCES) owns and operates extensive interceptor systems, as shown in Figure 1. The largest system conveys wastewater flow to the Metro Wastewater Treatment Plant and serves 65 communities. Smaller systems convey flow to the Council’s plants in Shakopee (Blue Lake), Eagan (Seneca), Empire and Stillwater (St. Croix). There is no interceptor system for the Hastings and Rosemount plants and the interceptor system to the new Eagles Point Plant is under construction.

More than 100 communities own and operate local sewer systems that are connected to the MCES regional interceptor system. Through these local systems, wastewater service is extended to residents, commercial establishments, industry, and public agencies. These end users are charged for this service by the local community, which typically charges for wastewater on the basis of metered water use. MCES, as a wholesaler of the regional services, bills each community on the basis of its metered wastewater flow into the interceptor system. Only industries with high strength waste are billed individually by MCES.

Each community bills its customers to recapture the cost charged by MCES and the costs to maintain and operate the local sewers. Because MCES bases its charge for service on the volume of wastewater received, these charges reflect clear water entering the sewer system as well as the wastewater generated by the customers. This includes rain induced clear water that enters the local sewer system through leaks in the publicly owned sewer and manholes and the private property sources: rain leaders, sump pumps, foundation drains, and leaking house laterals. MCES flow records show a direct correlation between precipitation and the volume of clear water flow from many communities served by the regional wastewater system.

The addition of clear water into the local sewer systems creates two problems. First, the additional flow takes capacity that was originally designed for growth and, in some cases, the additional flow exceeds the available sewer system capacity. When the capacity of the sewer is exceeded, the wastewater backs up into basements or spills out of a manhole. These occurrences are not allowable under federal and state regulations. Second, MCES charges communities the same rate for its clear water as it does for the sewage. Communities, therefore have a fiscal as well as a public policy reason for assuring that the total system functions effectively and conforms to federal and state regulations.
Interceptor Master Plan Findings

A comprehensive master plan for these interceptor systems was completed in December 2002. One of the more significant findings of the study was that uncontaminated groundwater and rainfall runoff were entering the local collection systems at rates that could overload the interceptor system. This uncontaminated clear water, called Infiltration/Inflow (I/I), is consuming interceptor and treatment plant capacity originally designed to serve future development. During significant rainfall events, portions of the interceptor system are at risk of causing a backup of wastewater into a basement or spilling wastewater into the environment. Under state and federal regulations, any spill or backup is not allowable and is subject to fines.

When a sewer system is overloaded, the sewer becomes pressurized and wastewater can flow back up a house lateral into a basement. Even though the overloading may last only an hour or two, enough time has passed to cause damage and create a health hazard in the low-lying basements that essentially relieve the overloaded system. On occasion, the system becomes so pressurized, the wastewater rises up in manholes and flows out the top of the manhole. The overflow of untreated wastewater into the environment can cause a health hazard and, in some cases, adversely affect the aquatic environment.

Task Force Creation

On April 8, 2003, the Metropolitan Council appointed individuals to serve on the Infiltration and Inflow Task Force, which was chaired by a Council Member. The task force included representatives from 15 communities from across the region as well as a representative from the Association of Metropolitan Municipalities.

The task force was charged with reviewing the I/I issues and formulating and proposing implementation strategies to reduce excessive Infiltration and Inflow (I/I) in local and regional wastewater collection systems. Reporting back to the Environment Committee, the task force met monthly and reviewed information presented by Environmental Services Division staff, who provided facilitation and administrative support. The recommendations and conclusions were arrived at by consensus of the task force members.
Sewers, pump stations and treatment plants are designed to convey and treat wastewater. The capacity or size of the facilities is dependent on the flow rate of the wastewater. For conveyance facilities, the flow rate is usually the maximum rate expected for a one-hour duration. For treatment plants, the structures must pass not only the maximum rate, but the processes are designed to meet permit limits, usually specified as a peak month condition. Consequently, the maximum 30 day average flow is important for sizing treatment plants.

The introduction of non-contaminated, clear water (I/I) into the collection system increases the flow of the wastewater and consumes capacity of sewers, pump stations and treatment plants. Whenever the rate of I/I exceeds the initial basis of the design (some allowance of I/I is included in the design), the capacity allocated for growth is no longer available. Therefore, larger facilities need to be constructed, growth needs to be curtailed, or I/I reduced to acceptable design levels.

**Characterization of I/I**

The sewer system that conveys wastewater to the treatment plants can be characterized as the publicly owned system, typically located in public right-of-way (under streets or backyard easements), and the private system, typically the house lateral that extends from the building to the publicly owned sewer. As depicted in Figure 2, there are several ways for I/I to enter the collection system.

Infiltration occurs when groundwater enters the sanitary sewer system through defects in the system. Inflow occurs when stormwater/rainwater enters the sanitary sewer system through defects and illegal connections in the system. Both infiltration and inflow are characterized as clear water that does not require treatment prior to discharge.

Sources of infiltration are typically cracks in pipes, leaky joints and deteriorated manholes. Groundwater can enter these defects whenever the collection system lies beneath the groundwater table or the soil above the sewer nears saturation. Typically, the rain infiltrating through the ground can cause an increase in wastewater flow if there are defects in the sewer.

Sources of inflow are typically direct connections to the sanitary sewer system: cross connections with the storm sewer system, building rain leaders, building foundation drains and sump pumps. These connections occur with both homes and businesses. Inflow typically occurs in direct proportion to rainfall. Soon after the rain stops, the inflow from most sources also stops. The exception is the response of a foundation drain or sump pump that can
continue for extended periods of time as the water percolates through the overlying soil. These sources come from private property. Since the late 1960s the law has not allowed connections of sump pumps, foundation drains and rain leaders from houses to the local sanitary system. However, many homeowners are still connected via these sources to the sanitary sewer system. Communities have found that reducing I/I from private property sources is politically difficult even though it is not legal for these sources to exist.

**Impact of I/I on MCES Facilities**

The Metropolitan Council has projected significant growth in the metropolitan area by 2030. These population and employment projections were used to predict wastewater flows throughout the interceptor system and at each treatment plant. For the interceptor system, peak hour flows were projected; and for the treatment plants, annual average, peak month, and peak hour flows were projected. The infiltration/inflow component of peak hour flow rates was estimated based on a computer model simulation of how rainfall generates infiltration/inflow in areas tributary to the interceptor system.

Results of simulating the projected conditions in 2030 using current levels of I/I indicate the need for a significant investment in relief sewers and pump stations. As shown in Exhibits ES-1, ES-2, ES-3, ES-4, and ES-5 at the end of this document, segments of the interceptor system would require extensive parallel sewers and many pumping stations would require expansion.

Peak hour flows to each plant in 2030 were projected with the interceptor model using 25- year and 100-year storm events. The peak flow to the Metro plant could reach over 1.3 billion gallons per day if enough relief sewers were constructed. This is nearly twice the rate that the twin barrel joint interceptor can carry into the plant today. The feasibility of doubling the hydraulic capacity of the Metro plant is not possible because of site constraints. MCES staff has concluded that simply adding more capacity to convey and treat I/I is not a feasible option.

**Impact of I/I on Local Sewer Systems**

I/I is currently causing backup problems in several communities, independent of the interceptor system capacity. In these communities the peak I/I is so significant, the local collection system is overloaded and raw sewage is backing up into low-lying basements. Where the local collection system is overloaded by I/I, the Minnesota Pollution Control Agency (MPCA) can prohibit additional connections to the local sewers. This overload condition essentially stops growth or redevelopment that increases wastewater flow.

In a few communities served by an MCES pump station, the peak flows during a significant rain exceed the firm capacity of the MCES pump station. These problems are severe and frequent enough for the Council to advise these communities that either I/I must be reduced or local sewer connections must be halted.

Excessive I/I rates can put the regional conveyance system at risk of being overloaded, consuming capacity that should be available for downstream communities. In some cases, the excessive I/I from one community can cause an overflow to occur in an adjacent community in either direction. To reduce the risk of this occurrence, MCES (as the regional wastewater
agency) must advise the non-compliant community of its liability and work with the community to reduce the excessive I/I.
Regulatory Environment

On January 5, 2001, the United States Environmental Protection Agency (U.S. EPA) signed the long-awaited draft rule on sanitary sewer overflows. As with other regulations, the 120-day public comment period will not begin until the proposed rule is published in the Federal Register. That publication was delayed on January 24 when EPS withdrew the SSO regulations from the Office of the Federal Register to give the Bush Administration an opportunity to review the draft. Since January 2001, EPA has received hundreds of comments to the original draft, resulting in a directive to the Office of Water Management to do the following:

1. Propose regulations consistent with those originally recommended.
2. Summarize all comments received since and incorporate them into the preamble to the regulations.
3. Provide preamble discussion regarding the comments.

Publication in the Federal Register is still delayed. The draft rule has been removed from the U.S. EPA Web site as of March 1, 2004 and its status remains uncertain. Meanwhile, as municipalities await formal regulations, the fact remains that roughly 22,000 cities in the U.S. experience SSO during wet weather conditions. Despite the lack of formal SSO regulations, these unpermitted/untreated discharges are still prohibited under the Clean Water Act and subject to enforcement action. This is a serious concern in areas where wastewater flow increases significantly because of rainfall. Even infrequent rain events will not be a valid excuse for an SSO.

At this time, MCES is the only National Pollution Discharge Elimination System (NPDES) permit holder for the wastewater system. The draft rule addressed the role of the “satellite” communities and their collection systems as well as the regional system. Satellite communities may well become joint permittees and subject to the same NPDES regulatory requirements.

If subject to an enforcement action as a co-permittee, the community could receive administrative orders to be part of a Consent Decree, as is currently happening to Duluth, Minnesota. The City of Duluth is a co-permittee of the collection system with the Western Lake Superior Sanitary District. In 2002, the City and District negotiated with MPCA to finalize the terms of a new five-year permit to operate the collection system. As part of the permit conditions, Duluth agreed to a compliance schedule to control and eliminate SSOs where inflow and infiltration from the city’s collection system was the primary cause. Unfortunately, SSOs actually increased in 2003 versus the prior two years, partly attributable to mechanical and operational failures on the District’s system, and not just wet weather flow. This caught the attention of the U.S. EPA and on January 12, 2004 the city of Duluth and the Western Lake Superior Sanitary District received an administrative order requiring the city and the district to furnish information and develop a plan of action relative to eliminating SSOs. The city and the district must submit the plan of action to the U.S. EPA by May 14, 2004 as the starting point for entering into a Consent Decree to eliminate SSOs.
Regional Cost Estimates

Expanding the conveyance and treatment facilities enough to eliminate the risk of an overflow is not practical or feasible. The primary limitation is the need to double the capacity of the Metro Plant where peak flow rates could reach over 1.3 billion gallons per day. To understand the relative cost of conveying and treating excessive I/I, capital costs were estimated based on assuming a 25-year storm event occurred with the forecasted development of 2030. Technically, the interceptor system must not be overloaded for any rainfall condition so using a 25-year event is for comparative purposes only. Capital cost for treatment plant capacity was also estimated. The cost of increasing the hydraulic capacity of each plant was not estimated because of the limitations of space at each site.

Total capital costs based on the 25-year I/I event, for MCES conveyance and treatment facilities needed for ultimate development, would approach a half billion in 2002 dollars. If sized for the ultimate service area, the cost of these facilities would be even greater. The high cost of expansion to convey I/I only provides a measure of how important I/I reduction is as it is not feasible to construct facilities large enough to prevent an SSO.
Alternatives Considered

Regional versus Local Solutions

Metropolitan Council Environmental Services, as the NPDES permit holder, must take action to reduce the risk of an overflow from its interceptor system. The two basic options considered by the Council were 1) to increase the system capacity, or 2) require that satellite communities reduce the I/I rates entering their collection systems. Information presented to the I/I Task Force supported the Council staff position that increasing system capacity to handle I/I was not a viable option. The task force members agreed that reduction of I/I is the only long-term option that allows for efficient accommodation of regional growth and reduces the risk of sanitary sewer overflows.

Means of Enforcement

Several strategies on how to reduce I/I in the region were discussed by the I/I Task Force. One of the key issues discussed was how prescriptive MCES should be regarding I/I reduction. The task force agreed that MCES should simply set I/I reduction goals and allow each community to select the measures that would best meet those goals. The role of MCES in this approach is to provide technical assistance and serve as a focal point for communicating lessons gained from customer communities as they implement their programs to reduce I/I.

Enforcement of the I/I goals could be accomplished through the existing Comprehensive Planning Process. MCES currently reviews and approves local comprehensive plans and those plans could include the community’s plan for meeting the I/I goal.

Other Options

MCES also could modify the Sewer Discharge Rules that currently address industrial pretreatment. These rules could be expanded to address excessive I/I and prohibit excessive I/I from each community.

Other regional sewer districts use community contracts to limit the peak flows from customers. Such contracts could establish a plan for reduction of peak flows over time to meet the I/I goals.

As the new federal regulations are implemented, MCES could require customer communities to become co-permittees under the NPDES permit program. Under the permit conditions, the permittees would commit to eliminating excessive I/I. A permit violation could lead to a fine and multiple violations could result in a court ordered consent decree that mandates corrective action.
Financial Incentives

Funding of the programs to reduce I/I is a significant concern for local government. The option of collecting additional revenue from all communities under the current rate charge and distributing it under a surcharge program was judged by the task force to be unfair to those communities now meeting the I/I goal. Council staff formulated an approach to collect additional revenue from communities with excessive I/I and then use this revenue to support a 50/50 match program for I/I reduction. This approach, labeled as a Community Assistance “Surcharge,” establishes a minimum account in these communities for I/I reduction.

An alternative financial program was suggested by task force members; rather than pay MCES the additional funds and receive them back under a matching program, some communities could choose to "Opt-out" (undertake voluntary I/I reduction programs that are funded at the same or greater level). Under this approach, a community would obligate local funds to undertake the same or greater effort for I/I reduction.

A financial penalty or “Demand Charge” for not meeting the I/I goals within a specified time was discussed as another means of assuring compliance. Communities that continue to have excessive I/I could not continue to discharge the excessive peak flows into the interceptor system. The cost to MCES to control the peak flow and provide flow attenuation at the point of connection would be assigned back to the community as a Demand Charge.
Authority, Conclusions and Recommended Actions

Authority

The Metropolitan Council is directed by Minnesota Statutes, Section 473.145 to prepare a comprehensive development guide for the metropolitan area. The development guide, as currently implemented, consists of the 2030 Development Framework and four “system plans” dealing with transportation, aviation, wastewater, and regional recreation open space. Minnesota Statutes, Section 473.146 provides direction to the Council to adopt these comprehensive policy plans for transportation, airports, parks and open space, and wastewater treatment as chapters of the development guide. The development guide legislation also allows for the Council’s adoption of related policy statements, goals, standards, programs and maps describing how it will achieve its charge. It is within this context that the Council is preparing the update to its existing Water Resources Management Policy Plan that was adopted in December 1996. The revised Plan will contain the wastewater “system plan,” plus policies in overall water quality, non-point source pollution control, and water supply.

Legislation related to metropolitan land-use planning (Minn. Stat. Sec 473.858) suggests that comprehensive plans of local governments cannot be in conflict with the metropolitan system plans for airports, transportation, wastewater, and regional recreation open space. The system plan for metropolitan wastewater service will occur within the updated Water Resources Management Policy Plan.

In a similar manner, the Council’s 2030 Development Framework establishes a growth management strategy that incorporates system plans into overall regional development. Both the update to the Water Resources Management Policy Plan and the 2030 Development Framework will be used to determine consistency of local government plans with those of the Metropolitan Council. Material contained in the plans can be used to determine whether there is a substantial impact or a substantial departure from the metropolitan systems plans.

The Council intends to adopt its peak hourly design standards as part of the Water Resources Management Policy Plan. These standards are the basis for the design of the Metropolitan Disposal System and will be used to establish I/I goals for each of the communities served by the Metropolitan Disposal System (MDS). Communities will be asked to develop an I/I reduction plan to reduce their peak hourly flows to meet these design standards. Those communities that discharge flows into the MDS at rates higher than the design standards put the system at risk of overflows and, therefore, have a substantial impact on the MDS.
Conclusions

The Council staff and the I/I Task Force members conclude that:

- The capacity of regional wastewater conveyance and treatment facilities is being exceeded during significant rainfalls because of excessive infiltration/inflow (I/I).
- Excessive I/I has used up existing capacity for future growth.
- Overloaded wastewater conveyance and treatment facilities have resulted in unacceptable conditions such as private property damage, spills and sanitary sewer overflows (SSOs).
- MCES, as the regional wastewater utility and NPDES permittee, must take action now to reduce the risk of overloading the regional wastewater facilities.
- It is not feasible to enlarge MCES’s facilities to accommodate all the I/I from tributary communities.
- MCES has a fiduciary responsibility to not expend funds to convey and treat clear water from illegal connections associated with private property sources such as sump pumps and rain leaders.
- The MCES design allowance for I/I in the interceptor system is reasonable as many local communities meet this standard.

Recommended Actions

The Task Force recommends that the Metropolitan Council adopt the following I/I policy statements and corresponding implementation strategies for inclusion in the next Water Resources Management Policy Plan.

I/I Policy Statements

*The Metropolitan Council will establish I/I goals for all communities discharging wastewater to the Metropolitan Disposal System. Communities that have excessive I/I in their sanitary sewer systems will be required to eliminate the excessive I/I within a reasonable time period.*

*The Metropolitan Council will not provide additional capacity within its interceptor system to serve excessive I/I.*

Implementation Strategies

The Metropolitan Council will:

1. Continue to use the current design standards for interceptors.
2. Require communities served by the MDS to include an I/I program within their next comprehensive plan.
3. Develop I/I goals for all communities as well as guidelines for the preparation of the local I/I programs.
4. Require the community to reduce its I/I to reach the design flow standard for each connection point to the MDS within a five-year period from the adoption of its comprehensive plan.
5. Measure peak inflow during wet weather conditions by either the MCES metering system or by temporary monitoring equipment installed in the sanitary sewer system.

6. A. Initiate an I/I financial assistance surcharge program, starting in 2008. This program will allow MCES to surcharge communities to collect revenue for the community to use for solving its I/I problem.

   B. Allow communities with I/I reduction in place to continue with their programs and not participate in MCES’s surcharge program. This will allow communities to undertake activities for I/I reduction using local funds, as long as those funds are equal to or greater than the surcharge program funds.

   MCES will work with communities with either option (A or B) to help solve their I/I problem on a case by case basis.

7. Limit increases in service within those communities where excessive I/I jeopardizes MCES’s ability to convey wastewater without an overflow occurring. MCES will work with those communities on a case by case basis.

8. Limit future increases in service within those communities that have not met their I/I goal(s), starting in 2015, until the problem is solved. MCES will work with communities not meeting goals on a case by case basis.

9. Institute a wastewater rate demand charge program, starting in 2015, for those communities that have not met their I/I goal(s), and are not actively working to do so, to help defray the cost of providing attenuation within the MDS to recover the capacity lost to their excessive I/I. MCES will continue to review communities and work with them on a case by case basis.

10. Work with the Public Facilities Authority to make funds available for I/I improvements.