



King County

Department of Natural Resources and Parks

Wastewater Treatment Division

Contract P00208P16

**Professional Services for Evaluation of Inflow and Infiltration
Reduction Concepts**

Phase 1: Evaluation of Concepts

Task 430

**Approach to Achieve Common Sewer and Side Sewer/Lateral
Standards**

Technical Memorandum

February 2019

Project 150258

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1.0 Background and Purpose

This introductory section presents the background and purpose for this Task 430, Approach to Achieve Common Sewer and Side Sewer/Lateral Standards technical memorandum (TM).

Background

Inflow and infiltration (I/I) is rainwater, surface water, and groundwater that flows directly and indirectly into sanitary sewers. Although sewer design guidelines include a reasonable allowance for I/I, excessive rates of I/I in a sanitary sewer system can lead to basement backups, sanitary sewer overflows, and unnecessary conveyance and treatment costs. Excessive I/I flows in King County's (KC's) regional separate sanitary sewer system impact both capital and operational costs.

KC Wastewater Treatment Division's (WTD) Conveyance System Improvement (CSI) Program assesses the hydraulic capacity of the regional wastewater system with projected 20-year peak flows. This information is used to plan and size future capacity-related improvement projects.

Findings from CSI Program analysis show that as much as 70 percent of the peak flow in the separate sanitary sewer system is rain-derived I/I. An estimated 27 percent of the annual wastewater system volume treated by KC's wastewater treatment plants can be attributed to I/I.

This I/I results in higher capital program costs by accelerating the need and scale of capacity improvement projects. Operational costs are increased because of the need to transport and treat higher rates of flow. The additional capital costs associated with increasing the capacity of the collection system, pump stations, and wastewater treatment plants to handle excessive I/I flows are currently spread across all customers through WTD's sewer rates.

WTD implemented an I/I Control Program in 1999 as part of the Regional Wastewater Services Plan. Currently, the I/I Control Program efforts are focused on portions of the sanitary sewer system experiencing flow capacity shortages. Specifically, the I/I Control Program has developed a regionally accepted method to assess where pursuing I/I reduction might be more cost-effective than increasing pipe and/or pump station capacity. Thus far, the I/I Control Program has been effective in reducing I/I experienced in some areas of the regional wastewater system; however, no comprehensive program is currently in place to address I/I throughout the regional wastewater system.

The Phase 1: Evaluation of I/I Reduction Concepts project has been developed to assist KC WTD and Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) member agencies in the exploration of new elements for the Regional I/I Control Program. This project will build on the work that WTD has done previously and explore more comprehensive and system-wide I/I reduction. WTD selected Brown and Caldwell (Consultant) per the P00208P16 Professional Services Contract to assist with this project. The Consultant has been tasked with the following activities:

- Collect and share existing I/I Control Program information with MWPAAC.
- Review sewer and side sewer standards, assess existing local agency standards compared to best management practices (BMPs), and develop an approach to achieve common standards in the region.
- Evaluate current city and utility district inspection programs for sewers and side sewers to identify BMPs and develop an outline for a regional inspection training program.
- Identify the types of private side sewer programs commonly used in the United States, and evaluate private side sewer programs within KC service areas for side sewer inspection and certification, grants or loans, and regional I/I support.
- Develop a framework for implementing private side sewer programs within the KC service areas, specifically for side sewer inspection and certification, grants or loans, and regional I/I support.

Purpose

As part of the Task 410 Verify 2004 King County Final Draft Regional I/I Control Standards, Procedures, and Policies TM, the 2004 KC standards, procedures, and policies for I/I were reviewed. For the Task 420 Assessment of Existing Local Agency Sewer and Side Sewer Standards TM, the current standards for the local agencies were compared with national BMPs. The findings of these assessments showed that many of the local agencies have evolved their I/I standards since the 2004 KC standards were drafted and have since adopted practices that are in alignment with current national BMPs. Although most agencies are in alignment with national BMPs, the practices employed are not consistent or common within the regional service area and some agencies are going above and beyond national BMPs. MWPAAC has expressed interest in developing a mechanism for sharing information and a move toward every local agency employing a consistent minimum level of BMPs, through reducing the potential for I/I and/or mitigating I/I that enters WTD's regional separate sewer system.

The purpose of this TM is to document a potential approach to sharing information on BMPs and achieving common sewer, side sewer, and lateral standards throughout the regional wastewater service area.

2.0 Status of Sewer and Side Sewer Standards

This section presents a summary of the current side sewer standards.

Legal Authorities Currently in Place

As described in the December 2005 KC I/I Control Program Recommendations report, federal and state regulations, KC Code, and agreements between KC and local agencies recognize the importance of controlling I/I in wastewater systems.¹ KC's wastewater disposal agreements address I/I control through references to Section 28.84.050 of the KC Code. These references effectively establish an I/I threshold for sewers constructed after January 1, 1961, of 1,100 gallons per acre per day and a corresponding surcharge penalty for exceedance of the threshold. They also require local sewers to be constructed and maintained in accordance with the rules and regulations of Metro (King County).

The 2005 KC report references a legal review illustrating that I/I reduction-related improvements, such as private property repairs, could be cost-effective (i.e., advantages to the public outweigh the cost) and that the public benefit is demonstrated to outweigh the cost of other I/I management approaches. The expenditure of public funds for this purpose would be legally defensible and would not be a violation of the Washington State Constitution provisions. This could be relevant if practices such as rehabilitating private laterals when rehabilitating sewer mains are adopted. For example, when using cured-in-place pipe (CIPP) for rehabilitation, it is often cost-effective to use a longer lateral liner that would go past the point of connection or right-of-way (ROW)/easement limit and into the private side sewer. If the local agency did not have authority to spend money on private property, the liner could not go past the public/private transition point.

The current legal authorities for rights-of-entry onto private property, as well as the ability of local agencies to inspect side sewers and require property owners to repair defects, were not reviewed as part of this contract. Consequently, it is not known whether each individual agency has the proper authority to undertake all the I/I-related BMPs discussed in subsequent sections of this TM. For example, some local agencies are not responsible for plumbing inspections conducted on upper laterals and are not necessarily notified when modifications (remodels and demolitions) are made to existing structures. Therefore, it is important to recognize that it is not feasible for all local agencies to adopt all regional sewer and side sewer standards and that, in some instances, not all standards

¹ For more information, see Sections 2.2.2–2.2.5 of the *Executive's Recommended Regional Infiltration/Inflow Control* report dated December 2005.

will be applicable or appropriate. If a decision is made to adopt this approach to achieve common sewer and side sewer standards, further review of the appropriate legal authorities will be required.

Current Standards Status

The set of draft design and construction standards to reduce and control I/I presented to local agencies in 2004 were based on sound judgments of BMPs at the time, and addressed the following:

- Established proper construction practices and materials for I/I repair and rehabilitation projects
- Encouraged appropriate inspection and testing prior to acceptance of new, or rehabilitated, sections of sewer
- Developed inspection and repair standards for new and existing structures on private property
- Encouraged appropriate system maintenance
- Provided appropriate predesign, investigation of I/I conditions, inspection of construction, and enforcement of standards

Recognizing that MWPAAC consists of cities and sewer districts that vary in size and demographics, a scalable approach to achieving common side sewer standards is presented.

3.0 Approach to Achieving Common Sewer and Side Sewer Standards

This section provides a potential approach for achieving common sewer and side sewer standards.

Approach

Recognizing that not all BMPs are suitable for all agencies to the same degree, a list of potential BMPs should be developed and reviewed with each entity separately. The BMPs that are common to all agencies, and appear to have the highest potential to reduce I/I, should be identified. It is expected that BMPs that meet these criteria will focus on side sewers. The top 4–5 BMPs should move forward for recommendations to be included as common sewer and side sewer standards. This approach will ensure that each local agency can commit to implementing BMPs for sewer and side sewer standards that are right for that agency but are also in alignment with the goals of the regional wastewater service area. The following steps are suggested to develop common sewer and side standards:

1. Develop a comprehensive list of potential regional sewer BMPs
2. Identify BMPs that can be implemented by all agencies
3. Select the 4 - 5 BMPs that appear to have the greatest I/I reduction potential
4. Develop selected BMP standards and materials
5. Share and consider for adoption the common sewer standards

Step 1. Develop a comprehensive List of potential regional sewer BMPs

The first step in the process is to identify a comprehensive list of BMPs that focus on sewer and side sewer function, performance, and evaluation methods. The list would be developed using existing information from the 2004 KC Standards, current national BMPs, and local BMPs identified during the recent review of each agency standards. The following lists potential BMPs that could be included:

- I/I program definition:
 - Goals and objectives established (policy)
 - Responsibilities established
 - Funding established

- Program established
- Prioritization of activities
- Mapping/inventory of public and private sewer assets
- Legal authorities determined for private asset inspection and corrections
- I/I prevention:
 - Sewer system design guidelines that address flood-prone areas
 - Watertight manhole specifications
 - Watertight mainline specifications, standard drawings, and proper construction methods
 - Side sewer specifications, standard drawings, and proper construction methods
 - New construction, repair/rehabilitation, and replacement inspection and product-specific inspections
 - Contractor prequalification
 - Private property owner/occupant educational materials
 - Sewer system component maintenance BMPs
- Identifying and quantifying I/I flows and locating I/I sources:
 - Flow monitoring
 - Manhole inspections
 - Closed-circuit television (CCTV) inspections of mainlines, side sewers, and lateral sewers
 - Smoke testing
 - Rainfall simulation
 - Illicit storm drain/cross-connection dye tracing
 - Illicit private property I/I source connections
 - Satellite altimetry/thermography, Light Detection and Ranging (LiDAR) data, radar rainfall data, aerial photography, and other remote sensing resources
 - Assessment of stormwater conveyance system performance and condition
- Addressing I/I sources:
 - Illicit source disconnection requirements and standard drawings
 - Best available technologies for mainline sewer, side sewer, and lateral repair and replacement
 - Appropriate inspection requirements for mainline, side sewer, and lateral repairs
- Private property owner occupant resources:
 - Side sewer maintenance BMPs (including backflow valves and low-pressure system components)
 - I/I source disconnection guidelines
 - Plumber/utility contractor prequalification

There are several ways for the list of sewer BMPs to be developed initially. Two possible methods include:

1. Contract with a consultant to develop the initial list of BMPs. Send the list of BMPs to agencies via the Engineering & Planning MWPAAC representative for review and comment.
2. Collaboratively develop the list of BMPs using a facilitated workshop consisting of engineering, maintenance, and inspection personnel from a cross-section of agencies. As with Option 1, this BMP list would then be sent to agencies for review and comment.

Step 2. Identify BMPs that can be implemented by all Agencies

Not all agencies have the same level of authority when it comes to sewer regulations. Therefore, to develop standards that are common to all agencies, the list developed from Step 1 needs to be reviewed and commented on by each member agency to identify whether or not they have the legal authority to implement each BMP. The potential list of BMPs will then be reduced to the standards that every agency has the authority to implement.

Step 3. Select 4–5 BMPs that appear to have the greatest I/I reduction potential

The list of implementable BMPs then needs to be refined to identify which BMPs have the greatest potential to reduce/minimize either future I/I (new construction) and/or existing I/I (existing infrastructure). When selecting the BMPs, more focus could be given to certain portions of the sewer system, like private side sewers. The list can be refined in several ways, two of which are listed below.

1. Contract with a consultant to review the list of BMPs to identify the top 4–5 programs the consultant assumes to have the greatest I/I reduction potential. Send the list of 4–5 BMPs to agencies for review and comment.
2. Collaboratively develop the top 4–5 BMPs using a facilitated workshop consisting of engineering, maintenance, and inspection personnel from a cross-section of agencies. As with Option 1, this BMP list would then be sent to agencies for review and comment.

Step 4. Develop selected BMP standards and materials

Once 4–5 BMPs are selected, the wording of each BMP and supporting materials can be developed. The developed materials would be specific and commensurate in nature to each BMP. For example, if the BMP was to specify pipe standards, the standard could be as simple as stating the various types of acceptable pipe materials. If the BMP was how to complete rainfall simulation to assess I/I potential, materials could include step-by-step procedures supported with instructional videos. Where possible, a member agency example would be included if it was widely regarded as meeting the standard established by the WTD. WTD would provide the standards on the KC regional I/I program website for access by member agencies.

Step 5. Share and consider for adoption the common sewer standards

KC will provide the common sewer standards to local agencies. Each agency will determine whether to adopt the BMP standards once they have been developed. WTD and MWPAAC should review the BMPs at a minimum of every 6 years to ensure that the BMPs are still relevant, or determine if revision is necessary because of new regulations, practices, and/or technologies. Revisions would be incorporated into the templates and tools and distributed to local agencies.