

Department of Natural Resources and Park Wastewater Treatment Division

Regional I/I Control Program

Presented to MWPAAC Engineering & Planning Subcommittee January 7, 2016

Regional I/I Program History

- ▶ 1999: Program created as part of RSWP.
- 2001-2002: Current levels of I/I defined for each local agency.
- > 2003-2004: 10 pilot projects in 12 local agency jurisdictions.
- 2004: Developed final draft standards, procedures, policies, and guidelines for long-term I/I control
- > 2005 2006: Executive's Recommended I/I control program developed and approved by Council
- 2011 2013: Initial I/I reduction project in Skyway Water and Sewer District constructed
- > 2015: MWPAAC I/I Task Force

"If We Could Reduce I/I, We Could Reduce, Delay, or Eliminate the Need for Expensive Capital Projects."

- Regional Wastewater Services Plan

RWSP Direction

- Work Cooperatively with Component Agencies to Reduce I/I in Local Conveyance Systems
- Define current levels of I/I
- Select and construct pilot projects
- Develop uniform regional standards, procedures, policies, and guidelines
- Identify cost-effective options to remove I/I
- Explore cost-effectiveness of removing 30% of I/I in the region
- Develop a long-term regional I/I control plan

Current Levels of I/I Defined

 Mini basin flow monitoring



Flow Monitoring Results

Mini basin
 Peak Hour I/I
 Rates





Pilot Project Overview Rehabilitation Technologies Tested:

- <u>Manholes</u>: Grouting, Manhole Pans, Replacement, CIP Liners, Grade Adjustments
- <u>Mains</u>: Pipe Bursting, CIP Pipe, Spot Repairs
- Laterals and Side
 Sewers:
 Pipe Bursting, Dig and
 Replace

I/I Removal Effectiveness Summary

Pilot Basin	Mains	Manholes	Laterals	Side Sewers	% of Basin Improved	% Reduction
Auburn Pilot A	•	•	•	•	11	NAR
Skyway		•	•	•	100	87
Redmond Pilot	•	•	•		38	NAR
Kirkland	•	•	•		25	28
Brier		•			23	54
Lake Forest Park		•			35	69
Mercer Island					70	32
Auburn Pilot B		•			19	NAR
Coal Creek		•			52	NAR
Northshore		•			64	23
Val Vue		•			45	NAR
Kent					100	73
Ronald				•	72	74

Pilot Project Lessons Learned

- We Can Find Areas with I/I
- We Can Isolate and Target Specific I/I Sources
- Highest I/I Reduction From Private Property
- We Can Repair Leaks and Reduce I/I Flows
- We Can Estimate Costs and I/I Reduction Rates
- Degradation and Increases in I/I Will Continue Without Long-Term Management

Final Draft Standards, Guidelines, Procedures, and Policies

- Developed Jointly with MWPAAC
- Intended to augment existing standards, procedures, and policies
- Three categories
 - Planning
 - Public Facilities
 - Private Facilities

Design Standards & Guidelines

- Developed
 Cooperatively with
 MWPAAC
- Intended to augment and emphasize existing standards, procedures, and policies.
- Three categories:
 - Planning
 - Public Facilities
 - Private Facilities

Regional	1/1	Control	Program
		••••••••	eg.a

Summary of Listed Design Standards & Guidelines

Standard/Guideline Number & Title	Standard	Guideline	New Projects ONLY	Rehabilitation Projects ONLY	Both New & Rehabilitation Projects
PS-1: Storm Drainage Connections to the Sanitary Sewer	1				1
PS-2: Design Capacity for Pipeline Rehabilitation Projects	1			1	
PS-3: Visual Inspection of Manholes for SSES Investigations		V		4	
PS-4: Closed Circuit Television (CCTV) Inspection of Sewers for SSES Investigation		1		1	
PS-5: Smoke Testing for SSES Investigations		7		•	
PS-6: Dye Testing for SSES Investigations		،		1	
PS-7: Modeling and Engineering Analysis		7			•
PUB-1: Connections to Existing System	1				4
PUB-2: Pipe Anchoring	1				1
PUB-3: Manhole Location	1				1
PUB-4: Manhole Size	1				1
PUB-5: Manhole Joints	1				1
PUB-6: Side Sewer Connection Location and Taps	1				4
PUB-7: Sewer System Design	1				1
PUB-8: Abandonment Requirements	1				1
PUB-9: Pipe Rehabilitation Methods	1			1	
PUB-10: Manhole Rehabilitation		1		1	
PUB-11: Spot Repairs		1		1	
PUB-12: Manhole Leveling Rings	1				1
PUB-13: Manhole Lids/Inserts	1			1	
PUB-14: Root Intrusion	1			1	
PUB-15: Pipeline Leak Testing	1				-
PUB-16: Manhole Leak Inspection	5				1
PUB-17: CCTV Inspection	1				5
PUB-18: Inspection of Pipe Installation and Backfill	1				1
PUB-19: Product Specific Inspection	1				1
PUB-20: Certification, Warranty and Qualifications		1			1
PRV-1: Pipe Protection – Depth of Cover		1			7
PRV-2: Allowable Connections to Side	7				1

Design Standards & Guidelines (cont.)

Standard/Guideline Number & Title	Standard	Guideline	New Projects ONLY	Rehabilitation Projects ONLY	Both New & Rehabilitation Projects
Sewers					
PRV-3: Pipe Zone Bedding and Trench Backfill		~			~
PRV-4: Pipe Materials		~			v
PRV-5: Inspection Wyes/Cleanouts	1				√
PRV-6: Lateral and Side Sewer Rehabilitation Methods		•		•	
PRV-7: Spot Repairs	-			•	
PRV-8: Root Intrusion	-			•	
PRV-9: Side Sewer/Lateral Leak Testing	•				~
PRV-10: Sanitary Side Sewer CCTV Requirements	•				~
PRV-11: Product Specific Inspection	1				√
PRV-12: Product Specific Certification	1		5		~
PRV-13: Bonding and Warranty Inspection	•				~
TOTAL ITEMS:	28	12	0	13	27

Table of Contents: Standards

B-8: Individual Design Standards: Planning Standards (PS)
B-19: Public Facilities (PUB) Standards
B-42: Private Facilities (PRV) Standards
B-60: Standard Detail Drawings

Example Standard



Benefit/Cost Analysis (Nov. 2005)

- Analysis done jointly w/Local Agencies
- Analysis done conservatively
 - Cost-effective I/I reduction is uncertain
 - Conservative approach best means of identifying most cost effective projects for implementation
 - Allows refinement over time as experience is gained
- Analysis focused on:
 - Identifying cost effective I/I reduction projects
 - Identifying reduction projects necessary to reduce peak I/I by 30-percent

Cost Effectiveness Defined

- Benefit/Cost Ratio = (CSI Project Savings After I/I Reduction) /(Cost of Proposed I/I Reduction Project)
- Example applying benefit cost/ratio:

Original CSI project cost:	\$30 million
Cost to do I/I reduction work	\$10 million (cost)
Savings to CSI project through downsizing project due to I/I reduction	\$15 million (benefit)
Benefit/cost ratio:	1.5

Cost Effective Project List

CSI No.	ltn.	Project (Facility)	I/I Available (mgd)	l/l Reduction (mgd)	Benefit: Capital Facility Cost Reduction	Cost: I/I Rehab	B/C Ratio	No. of Private Properties
60	1.60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	\$7,270,000	\$2,217,645	3.3	119
58	1.60	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	\$2,410,000	\$999,123	2.4	101
55	1.60	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	\$22,990,000	\$11,362,511	2.0	1,176
59	1.60	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))	5.4	1.05	\$5,770,000	\$3,964,850	1.5	395
33	1.60	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	\$8,510,000	\$6,018,534	1.4	557
47	1.60	Lk Hills Trunk 3 rd Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	\$14,438,000	\$11,307,052	1.3	1,086
41	1.60	Eastgate Storage and Trunk (Eastgate Tube Storage)	8.7	3.55	\$16,629,000	\$14,459,862	1.2	1,163
35	1.60	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	\$12,058,000	\$10,550,378	1.1	976
46	1.60	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	\$13,660,000	\$12,013,489	1.1	1,275

Summary of B/C Assumptions

Technique	Proposed Cost Assumptions	Final Cost Assumptions
Direct Disconnect (DD)	\$768 ea	\$3,000 ea
Replace Everything + DD	Main: \$69/If MH: \$2,150 ea Lateral: \$2,994 ea Side Sewer: \$2,150 ea DD: \$768	Main: \$110/If MH: \$3,600 ea Lateral & Side Sewer: \$6,800 ea. DD: \$1,000
Public + DD	Main: \$69/If MH: \$2,150 ea Lateral: \$2,994 ea DD: \$768	Main: \$110/If MH: \$3600 ea Lateral \$3,900 DD: \$1,000
Pvt. Property. + Some Laterals + DD	Lateral: \$2,994 ea Side Sewer: \$2,150 ea Lateral &Side Sewer: \$4,800 ea DD: \$768	Lateral: \$3,900 ea Side Sewer: \$3,500 Lateral & Side Sewer: \$6,800 ea. DD: \$3,000

Skyway I/I Reduction Project Objectives

- Estimated Removal of 1.8 to 2.2 MGD Peak I/I (60% to 75% Reduction)
- Goal to Eliminate Need for Downstream Storage



Skyway I/I Reduction Project

- Replace Laterals and Side Sewers on 332 Properties
- Replace Approximately 21,400 Feet of Sewer Main in Right-of-Way
- Replacement of Approximately 99 Manholes
- Pipe Bursting Was the Method of Pipe Replacement



I/I Removal Results

Modeled Pilot Project Effectiveness							
	Pre-Pilot Project Post- Pilot Project Peak						
Basin	Peak 20 yr I/I (mgd)	Peak 20 yr I/I (mgd)	Flow Reduction				
Pilot	2.15	0.25	89%				
BLS002	5.97	4.07	32%				
BLS43B	12.6	11.1	13%				

	Modeled Demonstration Project Effectiveness					
	Pre-Demonstration Project	Post- Demonstration	Peak			
Basin	Peak 20 yr I/I (mgd)	Peak 20 yr I/I (mgd)	Flow Reduction			
Pilot	0.25	0.25	N/A			
BLS002	4.07	3.29	19%			
BLS43B	11.1	11.4	-3%			

General Lessons Learned

- I/I can be successfully reduced
- In many basins, most I/I originates on private property
- SSES required to locate major culprits
- SSES won't identify all sources
- Cost of rehabbing mains not a big increase in cost if pipe bursting is used for laterals.

General Lessons Learned (cont.)

- Accurate flow data and rainfall data are required to evaluate effectiveness
- RDII Modeling a powerful tool to estimate peak flow reduction
- Good working relationships between contractor, local agency and residents is essential for private property work
- Right of Entry to Private Property is Achievable
- Collaborative process leads to success

Where we are today

- MPWAAC I/I Reduction Task Force established in 2015
 - Objective: Brainstorm I/I program activities
 - I/I Reduction concepts identified
 - Sewer and side sewer standards
 - Standardized sewer and side sewer inspection program
 - Private side sewer programs (inspection triggers, insurance, grant programs)
 - Local agency education/funding

Next Steps

- Evaluation of System Wide I/I Reduction Concepts
 - Sewer and side sewer standards
 - Standardized sewer and side sewer inspection program
 - Private side sewer programs
 - Local agency education/funding
- Potential scope of work
 - Cost to implement concept
 - Potential for short and long term I/I reduction
 - Options for regional and local roles and responsibilities
 - Consultant support anticipated
- MWPAAC will be consulted throughout the evaluation

I/I Program Information is available at: http://www.kingcounty.gov/services/environment/wa stewater/ii.aspx

Home » Services » Environment » Wastewater services » Infiltration and inflow control

Wastewater services

Infiltration and inflow King County home

control

What is I/I?

Why is I/I a problem?

Finding I/I

Fixing I/I

Program history

Library and resources

Click on library and resources to get to historical documents

Regional Infiltration and Inflow Control program

Need

The King County Wastewater Treatment Division (WTD) serves 34 local wastewater agencies in the regional service area. With the exception of the portions of the City of Seattle that have combined sewers, sewers in the regional wastewater system are designed to convey only wastewater.

However, many of these "separated" sewers also convey groundwater and

stormwater that enters through leaky pipes, improper storm drain connections, and other means.

This excess water, called infiltration and inflow (I/I):

- · Takes up capacity that could otherwise be used for wastewater alone
- Generates the need to build added capacity in pipelines, treatment plants, and other wastewater facilities
- Results in higher capital and operating costs to the regional system that are born uniformly by all agencies and passed on to ratepayers

Purpose

To explore the feasibility of regional I/I control, the King County Regional



What is infiltration and inflow (1/1)?

Related agencies

Wastewater Treatment Division

Department of Natural Resources & Parks

For more information, please contact:

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Contact your local sewer service provider for specific information about the sewer system in your neighborhood.

Information for...

Do more online





Questions/Discussion



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