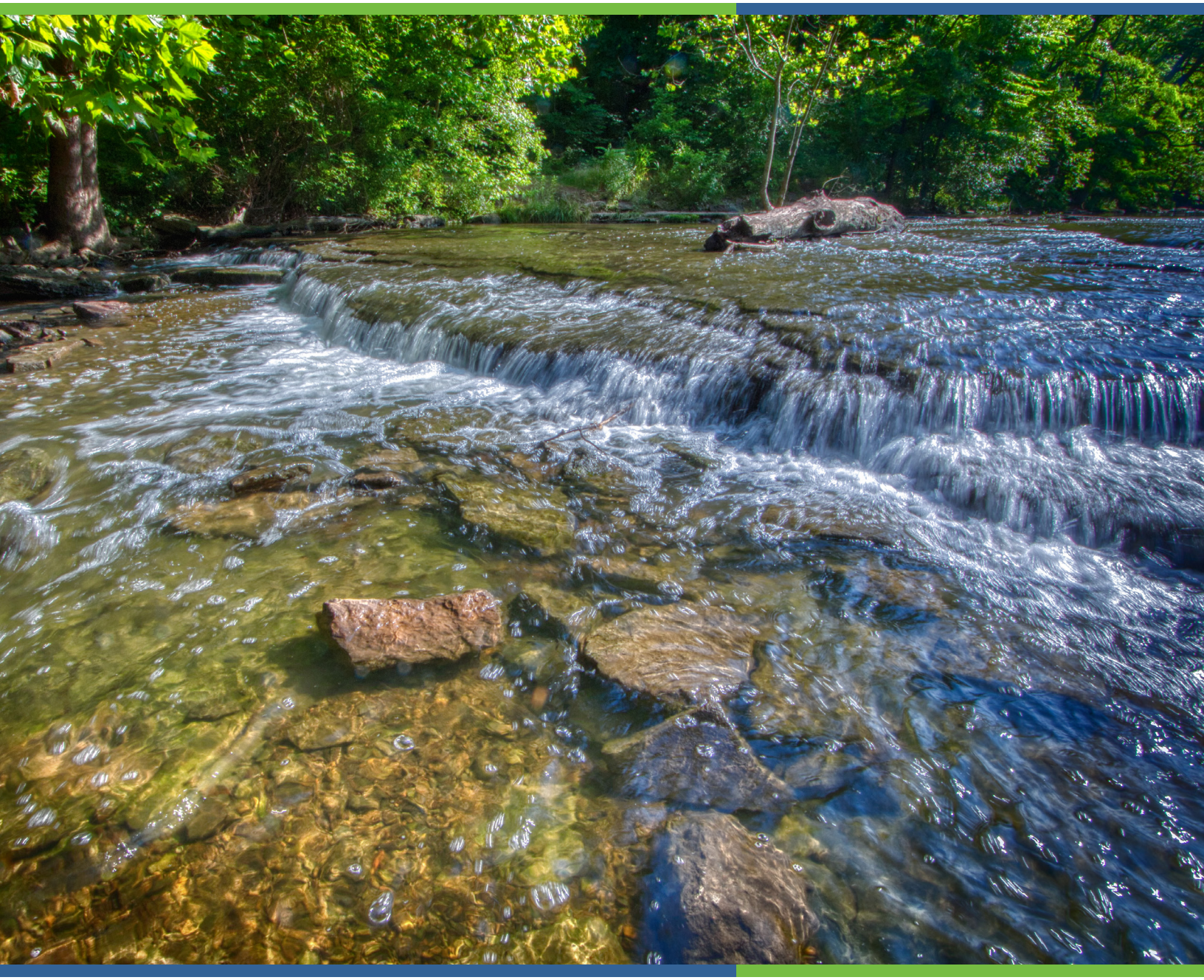
Louisville and Jefferson County
Metropolitan Sewer District

INTEGRATED OVERFLOW ABATEMENT PLAN

2021 Modification
April 2021, Volume 1 of 3



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April 30, 2021

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Subject: 2021 Integrated Overflow Abatement Plan (IOAP) Modification
Amended Consent Decree, Civil Action No. 3:05-cv236-S

Attention Director and Chiefs:

Please find enclosed, MSD's transmittal of the 2021 Integrated Overflow Abatement Plan (IOAP) for your review and approval. This IOAP reflects our collaborative discussion with US Environmental Protection Agency and Kentucky Department of Environmental Protection representatives concurrent to the second Amended Consent Decree (ACD) negotiations and describes the strategy and schedule for completing critical system improvement projects that will benefit the environment and reduce health and safety infrastructure risks for Louisvillians. This request represents the second major modification to the IOAP, builds on successful implementation that started in 2009, describes the changed circumstances due to infrastructure challenges, and outlines the collaborative process that MSD and our regulatory partners navigated to maximize benefits to the community and environment.

Building on Consent Decree Program's Success

MSD has continued to make progress with implementation of all requirements of the Amended Consent Decree. So far MSD has accomplished the following:

- Development of Programs and Plans for the Comprehensive Performance Evaluations, Composite Correction Plans, Sewer Overflow Response Protocol, Interim Sanitary Sewer Discharge Plan, Interim Long-Term Control Plan, and Sanitary Capacity Assessment Plan
- MSD has completed 24 of the 25 Long-Term Control Plan (LTCP) projects required by the Consent Decree. The last remaining project is the Waterway Protection Tunnel – which is currently under construction.
- MSD has completed 42 of the 57 Sanitary Sewer Discharge Plan (SSDP) projects required by the Consent Decree. Sixteen projects remain to be completed.

These projects have demonstrated tremendous benefits to water quality in Louisville, with ORSANCO data showing a decrease in Ohio River median fecal coliform concentrations of 76% since 2007, and with grab sample data of Middle and South Fork of Beargrass Creek showing a decrease in E-Coli concentrations of approximately 70% since 2010.

Changed Circumstances due to Infrastructure Challenges

As MSD was implementing the Amended Consent Decree, a series of unanticipated circumstances occurred beyond MSD's control. These circumstances resulted in significant infrastructure impairments. For example, in 2015 the Morris Forman WQTC experienced a lightning strike that resulted in $50M in damage in addition to the challenges of the aging biosolids systems which have prohibited the ability for the WQTC to consistently meet the plant effluent standards for total suspended solids and biological oxygen demand.

The duration of permit non-compliance for TSS and BOD, led the State Regulators to request MSD develop a Corrective Action Plan that was incorporated into an Agreed Order with the State. The Corrective Action Plan included specific projects with deadlines to be completed throughout the facility. MSD has committed to investing $170M for improvements to be constructed under this State Agreed Order. The projects included in the Agreed Order are not associated with the Consent Decree; but were referenced to demonstrate the breadth of infrastructure challenges MSD continues to address for the Morris Forman WQTC.

In addition to the challenges at the Morris Forman WQTC, MSD continues to experience high profile breaks on large diameter and critical sewers. In 2014, the Ohio River Force Main failed; in 2018 the Ohio River Interceptor failed; in 2019 the Harrods Creek Force Main failed; in 2020 after inspection of the Broadway Interceptor rehabilitation work was accelerated to avert a high profile failure.

Finally, beginning in 2018 the United States Army Corps of Engineers (USACE) initiated a preliminary feasibility assessment for the infrastructure associated with the Ohio River Flood Protection System. This critical system was constructed in the 1950's and 1970's and much of the assets remain original; have become outdated; and spare parts are no longer available. The USACE is requesting federal funding for 65% of the estimated total $188M project cost, which covers reliability improvements. MSD will be required to pay the USACE for 35% of the project costs, totaling approximately $66M.

Collaborative and Proactive Consent Decree Renegotiations

Given the significant impact these changed conditions have on MSD's infrastructure, MSD proactively approached the federal and state Regulators to renegotiate the timing for completing the remaining LTCP and SSDP projects. The nature of MSD's challenge was clearly understood and it was agreed that staggering completion of the remaining work was a reasonable approach in order to reprioritize limited capital dollars for needs at the Morris Forman WQTC and Paddy's Run Pump Station. In exchange for the time extension, MSD has agreed to commit to firm project completion dates and penalties for delayed performance. MSD also agreed to incorporate rehabilitation of $70M of critical sewers into its 5-year CIP and to commit to spending $25M per year for additional asset management needs through the 15-year time extension.

With these proposed additional projects, flexibility is also needed for determining the asset management priorities each year. The $25M commitment – combined with all the other mandated project spending noted herein – is achievable within the MSD Board's rate increase authority of 6.9% per year.

Concurrently with negotiation of the Second Amendment to the Consent Decree, MSD has prepared the enclosed modification to the IOAP that contains the approved CSO Long-Term Control Plan and the approved SSO Sanitary Sewer Discharge Plan. This 2021 IOAP Modification encompasses the existing project schedule modifications along with the addition of the projects addressing the changed circumstances. MSD is confident the requirements

included in the Second Amendment to the Consent Decree and the 2021 IOAP Modification are reasonable; address the District's greatest asset needs; and continue to address the intent of the Consent Decree.

Certification

I certify under penalty of law that this document and all attachments were prepared under our 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 persons directly responsible for gathering such 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.

If you have questions or need additional information, please contact me at (502) 540-6136.

Sincerely,

Angela Akridge, PE
Louisville MSD Chief Strategy Officer for Business Transformation and Regulatory Compliance

cc: James A. Parrott
Jacquelyn Quarles
File

APRIL 30, 2021

2021 IOAP MODIFICATION

EXECUTIVE SUMMARY

METROPOLITAN SEWER DISTRICT

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SECTION ES: INTRODUCTION

In August 2005, the Louisville and Jefferson County Metropolitan Sewer District (MSD) entered into a Consent Decree with the Commonwealth of Kentucky by and through its Environmental and Public Protection Cabinet (Cabinet), as Plaintiff, and the United States of America, on behalf of the United States Environmental Protection Agency (EPA), as Plaintiff-Intervener. The first amendment to the Consent Decree became official in April 2009 (hereafter referred to as the ACD). The ACD requires MSD to "eliminate SSOs and Unauthorized Discharges from MSD's SSS, CSS and WWTPs, and to address discharges from MSD's CSO locations identified in its Morris Forman Water Quality Treatment Center (WQTC) Kentucky Pollutant Discharge Elimination System (KPDES) permit."

Recognizing the long-term nature of the IOAP, MSD committed to an approach of adaptive management, intending to make mid-course corrections as more information is learned about the performance of projects and the related response in the sewerage systems. Adaptive Management offers MSD an opportunity to continue collecting more data to recalibrate and revalidate its hydraulic model. As projects are completed and system improvements come on-line, MSD's model is updated to reflect current conditions. In some cases, the level of control for a particular location has already been met based upon flow monitoring data and modeling.

Based on the need to spend nearly $1 billion over the next 5 years, MSD is requesting a time extension for completion of the remaining ACD responsibilities. Much of the spending forecasted for the 5-Year CIP is required for new priorities not known when the ACD was executed. MSD remains committed to completing all projects, and requests additional time to construct the remaining mandated projects in order to allow MSD to continue to invest in its infrastructure.

After more than a year of discussion and exchange of extensive information, the parties agreed to a second ACD, the purpose of which is to extend some of the existing Final Sanitary Sewer Discharge Plan (SSDP) and Final Long-Term Control Plan (LTCP) milestones to enable MSD to prioritize significant additional environmentally beneficial spending.

Under the Second ACD, MSD is requesting a time extension for completion of the remaining SSDP projects in order to facilitate construction of: 1) improvements at the Morris Forman (WQTC) required to meet permit conditions and mitigate combined sewer overflows (CSOs); 2) improvements at the Paddy's Run Pump Station required to mitigate CSOs and enhance the reliability of public safety; 3) rehabilitation of MSD"s most critical interceptors; and 4) a focus on asset management for MSD's existing wastewater assets. A summary of the Second ACD requirements is provided in Table ES.0.1-1.

Table ES.0.1-1 Summary of Second ACD Provisions

SECOND ACD COMPONENT	IOAP/SECOND ACD CRITERIA	COMPLIANCE MEASURES
Integrated Overflow Abatement Plan (IOAP) Modification **Volume 1**	Reporting Frequency (Volume 1, Chapter 1)	• Semi-Annual and Annual Reporting
	Specific Remedy Projects (Volume 1, Chapter 4)	• Construct Morris Forman New Biosolids Facility by December 31, 2030 • Construct Paddy's Run Pump Station Capacity Upgrade by December 31, 2026

SECOND ACD COMPONENT	IOAP/SECOND ACD CRITERIA	COMPLIANCE MEASURES
	Critical Interceptors Program (Volume 1, Chapter 4)	• Complete rehabilitation and replacement work for nine critical interceptors: 1) Large Diameter Interceptor Rehabilitation Program, 2) Broadway Interceptor; 3) Western Outfall, 4) Rudd Avenue Sewer, 5) I-64 & Grinstead Interceptor, 6) Harrod's Creek Force Main, 8) Buechel Branch, and 9) Prospect Area Sewers totaling approximately $70 million during FY21 through FY25 for completion by December 31, 2026.
	Asset Management Program (Volume 1, Chapter 4)	• Submit Strategic Asset Management Plan no later than June 30, 2021 • Complete an average of $25 million per year of work for asset management projects • Document spending of $125M for asset management projects during FY21-FY25 • Document spending of $125M for asset management projects during FY26-FY30 • Document spending of $125M for asset management projects during FY31-FY35
Final LTCP Modification Volume 2	Waterway Protection Tunnel (Volume 2, Chapter 4, Executive Summary Table ES1.1-3)	• Substantial Completion to be achieved no later than December 31, 2022 for the remaining LTCP project
	System-Wide Modeled Level of Control for CSOs (Volume 2, Chapter 4)	• Achieve modeled system-wide 85% or greater capture or elimination of CSS volume
Final SSDP Modification Volume 3	Remaining SSDP Projects (Volume 3, Chapter 4, Executive Summary Table ES1.1-5)	• Substantial Completion of seven SSDP projects no later than December 31, 2025 (Idlewood In-Line Storage, Kavanaugh Road PS Improvements, Raintree & Marian PS Eliminations Phase 1, Monticello PS Elimination, Cinderella PS Elimination, Leven PS Elimination, and Gunpowder PS In-Line Storage).
		• Substantial Completion of six SSDP projects no later than December 31, 2030 (Bardstown Road PS Improvements, Dell Rd & Charlane Parkway interceptor, Raintree & Marian PS Elimination Phase 2, Middle Fork Relief Interceptor & PS, Sutherland Rd Interceptor, and Mellwood System Improvements).
		• Substantial Completion of three SSDP projects no later than December 31, 2035 (Little Cedar Creek Interceptor, Goose Creek Interceptor, and Camp Taylor Rd Improvements Phase 4).

ES.1.1. CONSENT DECREE CURRENT STATE

Since 2005, pursuant to the Consent Decree and subsequent ACD, MSD has spent nearly $0.9 billion (of the $1.2 billion ACD/IOAP total) for mitigating combined sewer overflows (CSOs) and eliminating

sanitary sewer overflows (SSOs) and unauthorized discharges. This section provides an update on MSD's progress related to the IOAP, Final SSDP, and Final LTCP requirements.

ES.1.1.1. IOAP PROGRESS

The programmatic IOAP requirements are summarized in Table ES.1.1-1 along with the progress MSD has made through December 31, 2020.

Table ES.1.1-1 Summary of IOAP Program

REQUIREMENT	PROGRESS
Engage Stakeholders	MSD's community input, outreach and notification program were approved and is ongoing. In 2006, MSD initiated a Wet Weather Team Stakeholder Group which is still in existence and active today. Details regarding this Group are provided in Volume 1, Chapter 3.
	MSD exceeded the original commitments made to the community by spending 35% more for community benefits including: expanded system monitoring and rain gauge networks to improve model calibration and discharge reporting; increased system storage capacity over original commitments by 25%; increased sanitary pump station capacity over original commitments by 50%; and improved community engagement and created neighborhood green spaces. Details regarding this investment are provided in Volume 2, Chapter 4.
Plumbing Modification Program	Since the program's inception, MSD has completed over 17,992 projects totaling approximately $21.7 million dollars. The countywide program is now available to all MSD customers experiencing basement backups. MSD will pay up to $4,000 per residence for plumbing modifications. Generally, installations average about $2,500.
Supplemental Environmental Projects	MSD certified completion of all required supplemental environmental projects.
Consent Decree Reporting	MSD submitted 60 quarterly Consent Decree reports and 15 Annual Consent Decree reports. Reports are available to the public on MSD's Project WIN website.
Interim and Final LTCP	MSD completed all Interim projects and has completed 24 of 25 of the Final LTCP projects. Refer to section ES.1.1.2
Interim and Final SSDP	MSD completed all Interim SSDP projects and has completed 41 of the 57 Final SSDP projects. Refer to section ES.1.1.3

ES.1.1.2. IMPROVED OHIO RIVER & BEARGRASS CREEK WATER QUALITY

Although not required by the Presumption Approach, water quality sampling and modeling (described in Volume 1, Chapter 5) supports that both Beargrass Creek and the Ohio River would be in compliance with existing water quality standards if all background loads were removed. The measured reductions of Beargrass Creek and ORSANCO Ohio River bacteria levels during wet weather compared to pre-construction support the environmental and health benefits of IOAP implementation.

The general water quality trend since 2000 has demonstrated an improvement for bacteria trends. MSD received ORSANCO sampling data on the Ohio River indicating significant reductions in median fecal coliform levels downstream of Louisville, Kentucky (refer to Figure ES.1.1-1). Graphical representation of wet weather sampling performed by MSD along Beargrass Creek is provided in Figure ES.1.1-2.

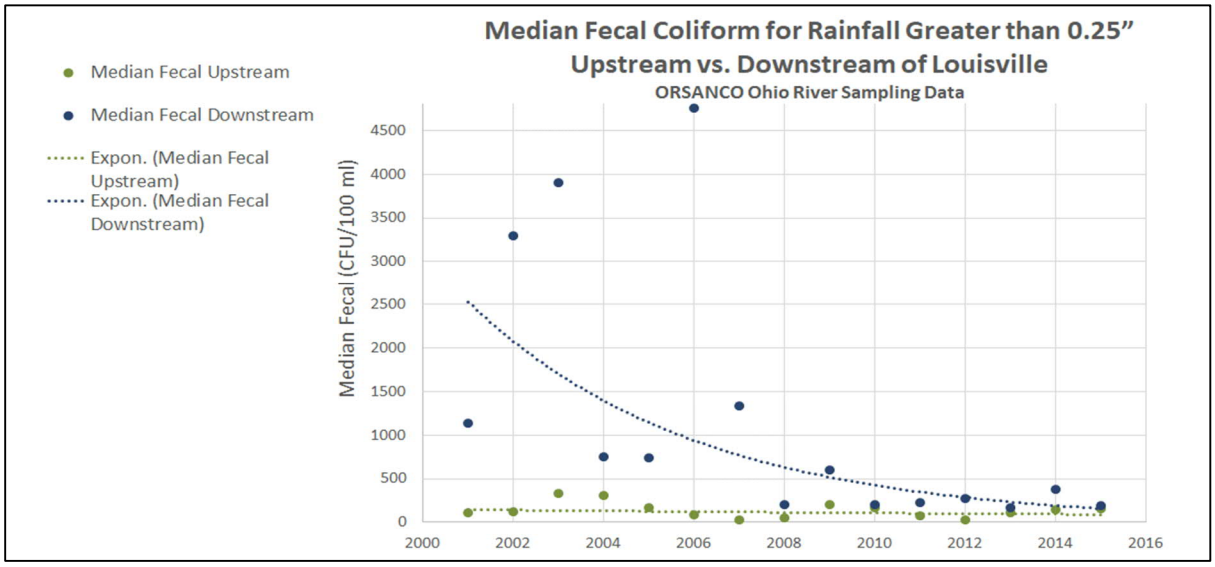

Figure ES.1.1-1 Ohio River Bacteria Trends as Published by ORSANCO in 2018

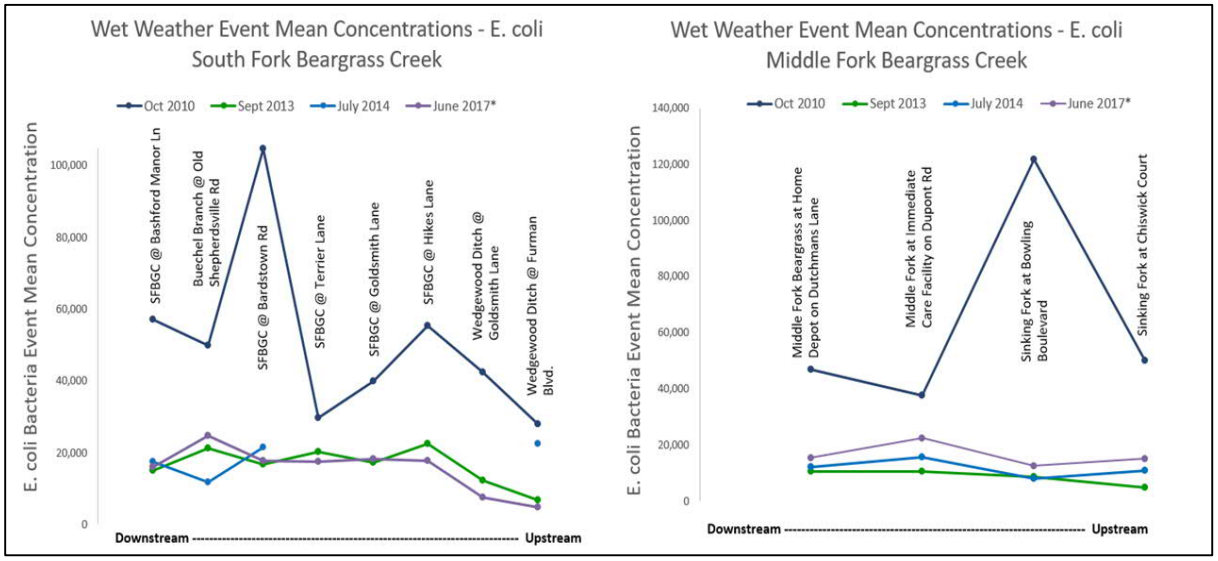

Figure ES.1.1-2 Beargrass Creek Bacteria Trends as Published by Louisville MSD

ES.1.1.3. FINAL LTCP PROGRESS

The IOAP requirements related to CSOs are summarized in Table ES.1.1-2 along with the progress MSD has made through December 31, 2020.

Table ES.1.1-2 Summary of Final LTCP Program

REQUIREMENT	ACCOMPLISHMENT
Construct 25 LTCP projects	MSD certified completion of 24 CSO LTCP projects to-date, reducing overflows to local waterways by approximately 5 billion gallons per Typical Year. The Waterway Protection Tunnel remains under construction and is scheduled to be completed December 31, 2022. The CSOs that have been mitigated through the LTCP projects are listed in Table ES.1.1-3
Construct 19 green infrastructure demonstration projects	MSD completed all green infrastructure demonstration projects as well the other green infrastructure program elements, totaling nearly $40 million for an incremental system benefit. Details regarding these projects are provided in Volume 2, Chapters 3 and 4.
Achieve 85%or greater capture throughout the combined sewer system (CSS)	The IOAP projects, when fully implemented, are modeled to achieve 95 percent capture of the wet weather combined sewage generated in the service area, which greatly exceeds EPA's Presumption Approach requirement of 85 percent. Compliance with the 85 percent capture will be achieved with completion of the Wateway Protection Tunnel. MSD expects to achieve 95 percent modeled performed by December 31, 2026 upon completion of the Morris Forman WQTC Sedimentation Basin Rehabilitation Project per the State Agreed Order Number 150220 Corrective Action Plan.
Nine Minimum Controls (NMC) Program	MSD's NMC Plan was submitted and approved by Regulators. MSD continues to implement its NMC Program. Through December 2020, MSD constructed 126 MG of system storage. The Phase 1 Real Time Control (RTC) Program provided a total of 41.05 MG of this storage. The rest of the storage volume was attributed to the basins listed in Volume 2, Chapter 4, Table 4.1-6. By December 2022, the Waterway Protection Tunnel will provide an additional 52 MG of system storage. Upon completion of the LTCP, MSD will have 178 MG of total storage available to better manage wet weather.

MSD has certified completion of 24 Final LTCP projects. The projects are listed in order of completion in Table ES.1.1-3 located at the end of the chapter.

Table ES.1.1-3 CSO Mitigations by Projects Completed under the LTCP Program
Table is located at the end of the Executive Summary

The remaining Final LTCP project is the Waterway Protection Tunnel as summarized in Table ES.1.1-4. This work will be substantially complete no later than December 31, 2022 per the Second ACD.

Table ES.1.1-4 Remaining LTCP Project

2021 FINAL LTCP PROJECT & IOAP PROJECT ID	2012 LTCP PROJECT	ESTIMATED REMAINING COST[1]	SECOND ACD DEAD-LINE[2]	CSOS MITIGATED & LEVEL OF CONTROL
Waterway Protection Tunnel Suite L_OR_MF_020_S_09B_B_A_8 L_MI_MF_127_M_09B_B_A_8 L_SO_MF_083_M_09B_B_A_8 L_OR_MF_155_M_09B_B_B_4	Story Ave. & Main St. Storage Basin	$64,437,300	12/31/2022	8 overflows per TY for CSO 020, 022, 023, 050, 051, 052, 053, 054, 055, 056, 150, 155 4 overflows per TY for CSOs 125, 126, 127, 166 0 overflows per TY for CSOs 082, 084, 118, 119, 120, 121,141, 153
	I-64 and Grinstead CSO Basin			
	Lexington Rd. and Payne St. Storage Basin			
	13th St & Rowan St Storage Basin			

[1]This table only shows the remaining forecasted project costs and does not include the total estimated cost at completion of the projects. [2]Consent Decree Completion date represents Substantial Completion of construction.

ES.1.1.4. FINAL SSDP PROGRESS

MSD is required to construct SSDP projects to eliminate sewer overflows (SSOs) for the 2-year, 5-year, or 10-year storm event. The level of control (LOC) storm event was selected for each modeled SSO location. The LOC selection and modeling referenced herein was performed in accordance with the approved IOAP, as required by the Amended Consent Decree. The IOAP requirements related to SSOs are summarized in Table ES.1.1-5 along with the progress MSD has made through December 31, 2020. Detailed information regarding the SSDP projects is provided in Volume 3.

Table ES.1.1-5 Summary of Final SSDP Program

REQUIREMENT	PROGRESS
Construct 57 SSDP projects of varying scopes to eliminate SSOs including six projects noted in the Interim SSDP	MSD certified completion of 41 (SSDP) projects through December 2020, that have eliminated 307 SSO occurrences. These locations are noted in Table ES.1.1-6.
For the 2-year storm, eliminate 100% modeled SSO volume and 100% modeled overflow locations	For the 2-year storm, eliminated 82% modeled SSO volume and 67% modeled overflow locations
For the 5-year storm, eliminate 13% modeled SSO volume and 35% modeled overflow locations	For the 5-year storm, eliminated 72% modeled SSO volume and 45% modeled overflow locations
For the 10-year storm, eliminate 10% modeled SSO volume and 18% modeled overflow locations	For the 10-year storm, eliminated 54% modeled SSO volume and 37% modeled overflow locations
Comprehensive Performance Evaluation-Composite Correction Plan (CPE-CCP) projects	Each of the small WQTCs that had SSOs in their watersheds were eliminated as part of MSD's long-term strategic plan to eliminate small WQTCs in its service area. The Jeffersontown WQTC was eliminated in 2015. Expansion of the Derek R. Guthrie WQTC to 60 MGD average day and 300 MGD peak day (for short durations) was completed in 2018 and the State approved is rerating in 2020. Similarly, expansion of the Floyd's Fork WQTC to 6.5 MGD was completed in 2012. The Hite Creek WQTC is under construction to expand its capacity to 9 MGD ADF and 24 MGD peak flow. Construction is scheduled for completion in FY22.
Capacity, Maintenance, Operation, and Management (CMOM) Program	MSD's CMOM Self-Assessment Program was submitted and approved in 2006. MSD continues to implement CMOM related capital projects.
Sewer Overflow Response Program (SORP)	MSD's SORP was submitted and approved in 2006. MSD completely revised the SORP in 2011. Final approval of the updated SORP document was received February 21, 2012. Modifications were made to the document in 2016 to reflect the elimination of the Jeffersontown WQTC and were approved on July 21, 2017. A new format was presented for the SORP in 2020 to reflect the software configuration.
Sewer Capacity Assurance Program (SCAP)	MSD's SCAP was submitted and approved in 2006. MSD submitted a revised SCAP dated November 2014 to EPA and KDEP on December 9, 2014. MSD received a letter approving that plan and acknowledging the November 2014 document superseded the 2008 SCAP on February 5, 2015

MSD certified completion of 41 SSO SSDP projects to-date and eliminated 87% of the SSOs identified in the SSDP (refer to Table ES.1.1-6 at the end of the chapter). Twelve of the projects were certified complete 1 year or more ahead of schedule. In addition, MSD has completed the 6 Interim SSDP projects listed in the ACD. More detailed regarding the Interim SSDP projects are provided in Volume 3, Chapter 1, Section 1.3.4.

Table ES.1.1-6 SSO Eliminations Under SSDP and other Programs
Table located at the end of the Executive Summary

The remaining SSDP projects are listed in Table ES.1.1-7 along with the Second ACD revised compliance dates. Although MSD is requesting a time extension through 2035, seven of the 16 remaining SSDP projects will be substantially complete by December 31, 2025. Six projects will be completed through 2030 and the remaining three projects will be completed through 2035. MSD desires to retain flexibility with scheduling this work to balance known and unknown critical capital needs.

Table ES.1.1-7 Remaining SSDP Projects

IOAP PROJECT ID		REMAINING SSDP PROJECT	ESTIMATED COST	SECOND ACD COMPLETION DATE[1]	LEVEL OF CONTROL STORM EVENT
1	S_JT_JT_NB03_M_01_C	Raintree & Marian Ct Phase 1	$125,000	12/31/2025	2-Year
2	S_CC_CC_70158_M_09A_C	Idlewood Inline Storage	$4,807,400	12/31/2025	2-Year
3	S_JT_JT_NB04_M_01_A	Monticello PS Elimination	$464,000	12/31/2025	10-Year
4	S_HC_HC_MSD1085_S_03_A	Kavanaugh Road Pump Station	$4,300,000	12/31/2025	10-Year
5	S_PO_WC_PC10_M_01_C	Leven Pump Station Elimination	$720,000	12/31/2025	2-Year
6	S_PO_WC_PC04_M_01_C	Cinderella PS Elimination	$1,500,000	12/31/2025	2-Year
7	S_HC_HN_NB02_S_09A_C_B	Gunpowder Pump Station ILS	$800,000	12/31/2025	2-Year
8	S_CC_CC_67997_M_01_C	Little Cedar Creek Interceptor	$2,400,000	12/31/2025	2-Year
9	S_CC_CC_MSD1025_S_03_B	Bardstown Road PS	$3,400,000	12/31/2030	5-Year
10	S_JT_JT_NB03_M_01_C	Raintree & Marian Ct Phase 2	$1,800,000	12/31/2030	2-Year
11	S_JT_JT_NB02_M_01_C	Dell Road & Charlaine Pkwy Int.	$8,800,000	12/31/2030	2-Year
12	S_MISF_MF_NB01_M_01_C_A1	Middle Fork Relief Interceptor, Wet Weather Storage, & Diversion Phase 2: Upper Middle Fork PS & Interceptor	$86,408,000	12/31/2030	2-Year
13	S_OR_MF_NB01_M_01_B	Mellwood System Improvements & PS Eliminations Phase 2: Mockingbird Valley PS	$2,516,100	12/31/2030	5-Year
14	S_SD_MF_NB05_M_01_A	Sutherland Interceptor	$1,065,300	12/31/2030	10-Year
15	S_SF_MF_30917_M_09_A	Camp Taylor Improvements Phase 4: Offline Storage	$23,972,300	12/31/2035	10-Year

IOAP PROJECT ID		REMAINING SSDP PROJECT	ESTIMATED COST	SECOND ACD COMPLETION DATE[1]	LEVEL OF CONTROL STORM EVENT
16	S_MI_MF_NB04_M_03_B	Goose Creek PS Improvements & Wet Weather Storage Phase 2 – Goose Creek PS Improvements	$6,978,600	12/31/2035	2-Year
Remaining Costs for SSDP Projects			**$150,056,700**		

[1]Consent Decree Completion date represents Substantial Completion of construction. The Lucas Lane Project Minor Modification was submitted in February 2021 indicating refined hydraulic modeling has demonstrated the LOC is currently met without further investment.

ES.1.1.5. MODELED SSO VOLUME AND LOCATIONS

When the CD was lodged, MSD had an estimated 218 modeled SSOs occurrences. The CD/ACD required MSD to eliminate all SSOs for the 2-year storm event. SSO occurrences are required to be reduced to a level of control for the 5-year and 10-year storm events. Under the Final SSDP MSD is required to eliminate 197 modeled SSO occurrences. A forecast of the number of modeled SSOs per the revised Second ACD compliance dates is presented in Table ES.1.1-8.

Table ES.1.1-8 Modeled Performance of SSO Occurrences

CLOUDBURST STORM EVENT	2007 NUMBER OF MODELED SSOS	2020 NUMBER OF MODELED SSOS	2025 NUMBER OF MODELED SSOS	2035 NUMBER OF MODELED SSOS	NUMBER OF MODELED SSOS AT REQUIRED LEVEL OF CONTROL
2-Year Cloudburst Storm Event	197	65	55	0	0
5-Year Cloudburst Storm Event	211	117	109	75	137
10-Year Cloudburst Storm Event	218	137	129	108	178

Sixteen (16) SSDP projects remain to be completed and these projects will eliminate 65 remaining SSOs occurrences during the 2-year storm event. When all SSDP projects are completed no later than 2035, MSD will have eliminated a total of 197 SSO occurrences for the 2-year storm. The remaining SSDP projects and SSO locations are noted in Table ES.1.1-7.

The series of graphs shown below demonstrates MSD's progress with eliminating the SSOs identified in the Final SSDP. Figure ES.1.1-3 shows the forecasted elimination schedule based upon the Level of Control agreed upon in the ACD reflecting the Final SSDP time extension associated with the Second ACD. Separate lines are shown on the graph for each cloudburst storm event level of control. This information shows the general trend to reduce 2-year storm event SSOs from nearly 200 to 0 upon completion of the Final SSDP. Similarly, the 5-year storm SSOs were agreed to be reduced from nearly 210 overflows to approximately 140 SSO occurrences; and the 10-year storm event SSOs were agreed to be reduced from approximately 220 overflows to approximately 180 SSO occurrences.

Figure ES.1.1-3 SSO Eliminations Over Time Based on Level of Control

MSD modeled the system improvements constructed through August 2020 and those forecasted to be built with the remaining SSDP projects (through 2035). The resulting modeled system performance with respect to SSO eliminations is shown in Figure ES.1.1-4. The scope of work for several of the constructed SSDP projects was revised which subsequently achieved a higher level of control and greater environmental benefit.

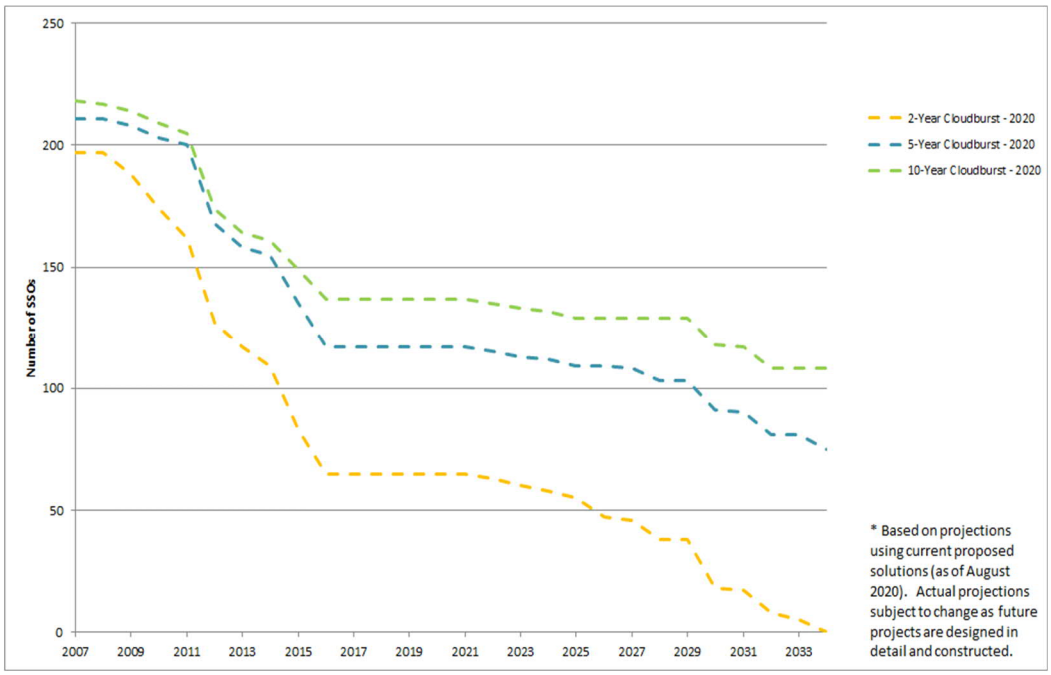

Figure ES.1.1-4 SSO Eliminations Over Time Based on Model Projections

For example, the modeled performance results at the conclusion of the Final SSDP indicates MSD will reduce the 2-year storm event SSOs from approximately 200 to 0 occurrences; 5-year storm event SSOs from approximately 210 to 75 occurrences ; and 10-year storm event SSOs from approximately 220 to 110 occurrences.

Figure ES.1.1-5 shows the comparison of SSO eliminations based upon both level of control and model predictions. The line representing the 2-year storm event is the same as the level of control shown in Figure ES.1.1-3 and Figure ES.1.1-4. However, the lines for the 5-year and 10-year storm events are lower than those in Figure ES.1.1-3 – indicating fewer SSOs are occurring compared to the IOAP/ACD requirements.

Figure ES.1.1-5 SSO Eliminations Based on Level of Control and Model Projections

MSD's investments have resulted with 65 fewer SSOs during 5-year storm events and 70 fewer SSOs during 10-year storm events as compared to the agreed upon ACD level of control. This represents **an additional 30% reduction of SSO occurrences during larger storm events than was agreed upon with the IOAP/ACD**.

In addition to having fewer SSO occurrences during larger storms, MSD has already achieved (through August 2020) a better performance than originally envisioned with the IOAP/ACD. Figure ES.1.1-6 presents a graphical depiction of the forecast for eliminating the SSOs as envisioned during 2012. All three lines showing each level of control storm (2-year, 5-year, and 10-year) indicate MSD achieved SSO eliminations faster than anticipated. For example, the original 2012 forecast that was incorporated into the IOAP/ACD estimated approximately 77 SSOs occurring for the 2-year storm event during 2020. Whereas, both the level of control line and modeled performance line in Figure ES.1.1-6 indicate MSD has already reduced SSOs to approximately 65 occurrences for the 2-year storm.

The difference for the 5-year and 10-year storm events are more pronounced. The 2020 values indicate the 2012 forecast estimated 169 SSO occurrences for the 5-year event vs. the modeled performance for the completed SSDP projects of 117 SSO occurrences. In 2012, it was assumed by 2020 MSD would have reduced the 10-year storm SSOs to 195 occurrences as compared to the 2020 modeled performance of 165 occurrences. This data suggests **MSD is achieving SSO eliminations and subsequent environmental benefits at a higher rate than required in the IOAP/ACD**.

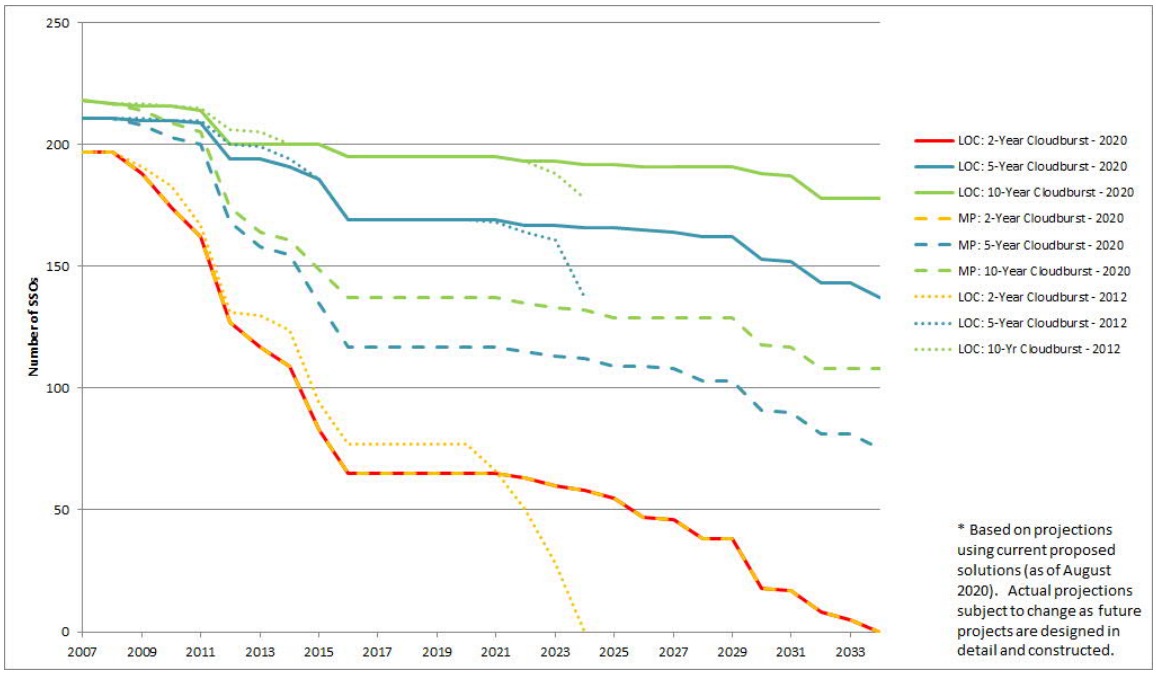

Figure ES.1.1-6 SSO Eliminations Compared to Original Compliance Schedule

ES.1.2. MSD'S CHANGED CIRCUMSTANCES SINCE ACD LODGING

Major investments in other infrastructure rehabilitation, renewal, and replacement were limited as capital and operating spending increased to meet ACD requirements. The result of deferred investment on infrastructure renewal and replacement is that MSD now must confront a rapidly aging system of pipes, pumps, treatment plants, and flood control systems in urgent need of rehabilitation if those existing assets are to continue protecting public health and safety.

MSD's changed circumstances have resulted in critical reprioritization of needs for MSD's infrastructure, as contemplated by USEPA's 2012 Integrated Planning Framework and the passage of the Water Infrastructure Improvement Act. **These changed circumstances have added approximately $1B** to MSD's Capital Improvement Program (CIP), including $700M to the 5-year CIP as summarized in Table ES.1.2-1. A summary of each changed circumstance is provided herein.

Table ES.1.2-1 Projects Necessary to Address Changed Circumstances

MSD BUDGET ID	PROJECT	ESTIMATED COST AT COMPLETION	ESTIMATED COST IN 5-YEAR CIP
H09133	Waterway Protection Tunnel Extension – *Estimated cost represents the additional cost only. The total project cost = $151,788,400*	$30,000,000	$55,000,000
Multiple	Morris Forman WQTC Lightning Strike Repair[1]	$50,000,000	$0
Multiple	Morris Forman WQTC Corrective Action Plan	$171,771,000	$96,018,900
D18116	Morris Forman WQTC Biosolids Facility Replacement[2]	$197,800,000	$175,072,800
F21084,85	USACE FPS Reliability Improvements Program	$58,664,300	$58,664,300
F18515	Paddy's Run Pump Station Capacity Upgrade	$115,000,000	$115,000,000
Multiple	Critical Interceptor Rehabilitation Program	$70,000,000	$70,000,000
Multiple	Wastewater System Asset Management Program	$375,000,000	$125,000,000
		$1,068,235,500	**$694,756,000**

[1]All funds have already been paid for this changed circumstance. [2]Approximately $175M is forecasted to be spent during the 5-year CIP with the remaining $23M to be spent in the 6th year (FY26).

ES.1.2.1. MORRIS FORMAN WQTC LIGHTNING STRIKE OUTAGE

In April 2015, the Morris Forman WQTC experienced a catastrophic mechanical failure due to a lightning strike. As a result, there was significant damage to the primary treatment, secondary treatment, and electrical systems. The damaged infrastructure subsequently contributed to permit exceedances in the effluent for Biological oxygen Demand (BOD) and Total Suspended Solids (TSS). MSD invested $50M to repair the damage to the Morris Forman WQTC. These costs are not included in in the Estimated Cost for the 5-Year CIP because additional capital funds are not required to complete the repairs. However, it is important to realize that MSD was required to defer other Asset Management needs in order to fund this unforeseen $50M effort.

ES.1.2.2. WATERWAY PROTECTION TUNNEL UPGRADES

The Waterway Protection Tunnel is comprised of four projects consolidated from the 2009 LTCP to help control CSOs and other unauthorized discharges from MSD's sewer system. When completed, the approximate 55 million gallon storage facility will accommodate wet weather flows within the project area to limit the number of overflows to eight (8) times in a Typical Year for the Downtown area, zero (0) times in a Typical Year for the Irish Hill area, and four (4) times in a Typical Year for the Grinstead Road area. The Waterway Protection Tunnel project comprises the largest component of the remaining LTCP projects with $55M worth of work to be completed in FY21-FY25. The completion date for the tunnel was extended to December 31, 2022 (from December 31, 2020) with the Second Amendment to the Consent Decree.

In June 2018, MSD decided to extend the tunnel approximately 7,800 linear feet east to the I-64 & Grinstead CSO Basin project location to eliminate the need for this basin. A new retrieval/drop shaft was constructed at the I-64 & Grinstead location to collect flows from the nearby CSO locations. The necessary change order resulted in a price adjustment of over $30M and extended the contractor's schedule by 156 days. In addition to the tunnel extension, MSD's contractor was granted additional time for differing site conditions (35 days). MSD's contractors experienced issues with the tunnel crown

at STA 102, 108 and 162. Through December 31, 2020, MSD granted 48 days for these issues, but MSD expects further notices regarding these issues. These delays do not represent all delays associated with the project. MSD's contractors provided a revised substantially complete date of September 4, 2021. However, MSD believes they are approximately 27 days behind that schedule. For example, the contractor encountered issues with the first tunnel concrete lining pours in the bifurcation.

In addition to the delays explained above, MSD's contractor requested 73 days for weather related delays; delays related to the delivery of the tunnel boring machine; and delays associated with relocations. However, MSD is disputing these days. Finally, to date, there are approximately 99 days of delay that are unaccounted for by MSD's contractor.

ES.1.2.3. MORRIS FORMAN WQTC CORRECTIVE ACTION PLAN

MSD has agreed to spend an additional $175M to reduce effluent BOD and TSS and take measures to prevent another catastrophic failure at the Morris Forman WQTC. MSD entered into an Agreed Order with the Kentucky Energy and Environment Cabinet (KDEP) and agreed to complete the $175M Corrective Action Plan (CAP) for mitigating permit non-compliance.

MSD has been working on the Morris Forman WQTC CAP projects since 2015. Many of the projects completed from 2015 – 2020 were related to providing redundancy for critical units/systems or improving the plant's resilience to avoid a similar fate. The complete list of CAP projects is provided in Table ES.1.2-2. As shown, MSD has completed several of these projects and all remaining projects are in-progress. This information is provided for informational purposes to demonstrate the level of investment MSD is making to improving the Morris Forman WQTC. This work is not part of the Second ACD.

Table ES.1.2-2 Morris Forman WQTC Corrective Action Plan

MSD BUDGET ID	PROJECT	ESTIMATED COST AT COMPLETION	ESTIMATED COST IN 5-YEAR CIP
H14108	Morris Forman WQTC Rubbertown Flow Sampling	$50,500	$0
D15022	Morris Forman WQTC MEB Leak Repair	$373,000	$0
F14179	Morris Forman WQTC Wet Cake Pump	$984,500	$0
D15127	Morris Forman WQTC Process Water Line	$365,500	$0
F13013	Morris Forman WQTC Condenser Upgrades	$395,200	$0
D15017	Morris Forman WQTC Centrifuge Electrical Controls	$1,091,900	$0
F14183	Morris Forman WQTC FEPS Generator	$3,275,500	$0
D18359	Morris Forman WQTC Delta Transformer	$98,500	$0
D18360	Morris Forman WQTC Air Dryer	$39,500	$0
D18362	Morris Forman WQTC FEPS Substation	$596,800	$0
F13016	Morris Forman WQTC High Yard Electrical Mod	$7,396,900	$0
F13023	Morris Forman WQTC Headworks Replacement	$14,940,600	$0
F09510	Morris Forman WQTC OGA Plants 1 and 2	$7,306,600	$0
D19044	Morris Forman WQTC Primary Sludge Pump Comp	$83,500	$0
D20249	District-Wide Biosolids Master Plan	$250,000	$0
F14182	Morris Forman WQTC FEPS Pump & Motor Repair	$450,000	$0

MSD BUDGET ID	PROJECT	ESTIMATED COST AT COMPLETION	ESTIMATED COST IN 5-YEAR CIP
D15020	Morris Forman WQTC Cake Pump Phase 2	$1,802,400	$0
D19227	Morris Forman WQTC Primary Sludge Line	$762,800	$0
D19237	Morris Forman WQTC Arc Flash Update	$102,700	$0
D19307	Morris Forman WQTC FEPS VFD Replacement	$813,200	$319,400
D20167	Morris Forman WQTC East Headworks HVAC	$101,900	$97,600
D20228	Morris Forman WQTC Centrifuge Rehabilitation	$1,100,000	$388,000
D18130	Morris Forman WQTC FEPS MCC Replacement	$500,000	$500,000
D20291/84	Derek R. Guthrie WQTC Dewatering Facility	$47,282,200	$34,324,300
D20285	Morris Forman WQTC LG Dryer Replacements	$49,305,200	$23,388,500
D19045	Morris Forman WQTC Sodium Hypochlorite Relocation	$3,471,000	$4,447,000
D17042	Morris Forman WQTC Sedimentation Basin Rehab	$32,514,000	$32,554,100
	Total	**$175,453,900**	**$95,042,900**

- The primary driver for the Morris Forman WQTC CAP is related to MSD's inability to process solids which led to permit exceedances for TSS and BOD. MSD initiated actions to expedite permit compliance. MSD offloaded regional biosolids from the Morris Forman WQTC by constructing a new dewatering facility at the Derek R. Guthrie WQTC. Dewatered biosolids are transported from the Derek R. Guthrie WQTC to the landfill. In addition to reducing the loading and stress on the Morris Forman WQTC, MSD expedited a project to construct two state-of-the-art dryers to replace the four broken and non-repairable dryers that completely failed in 2019.
- The Morris Forman WQTC CAP also includes a project to rehabilitate the four primary sedimentation basins. The WQTC is limited to a max wet weather flow of 240 MGD due to capacity constraints with the sedimentation basins. Each rectangular basin is approximately 275 feet long, 70 feet wide, 17 feet deep, was designed with a capacity of nearly 90 MGD for a total treatment capacity of 360 MGD. The Primary Sedimentation Basins were originally constructed in the 1950s. Most equipment serving the basins has exceeded the expected service life, and equipment performance has become unreliable. The timing for implementing this project is dependent upon Ohio River elevations and the associated impact on the sedimentation basins. MSD anticipates being able to rehabilitate one basin per year upon completion of the design phase of this project.
- Treating ≈330 MGD of wet weather flows will reduce potential discharges from the Main Diversion Structure (CSOs 210, 211, 016) and the Southwest Pump Station (CSOs 015 and 191). This will reduce the level of pollutants discharged into the Ohio River. This project is required in order for the plant to meet the total wet weather treatment capacity identified in the Final LTCP.

ES.1.2.4. MORRIS FORMAN WQTC BIOSOLIDS

In 2015, the Morris Forman WQTC began receiving higher solids loading from sewer discharges received from local distilleries. These loadings increased the level of TSS processed through the solids management system. This increase coupled with the substantial grit loading in the combined sewer

system served to sandblast the centrifuges and dryers in use at the Morris Forman WQTC, which led to an accelerated level of deterioration for the biosolids equipment.

The Morris Forman WQTC is not able to consistently meet effluent permit limits for BOD and TSS due to outdated and aging biosolids processes and increased pollutant loading received from regional distilleries. MSD is proposing to invest $197.8M to replace the existing biosolids processing system with a modern facility. This project will provide MSD with the ability to fully comply with permit limits, thereby reducing the level of pollutants discharged into the Ohio River. Details regarding this project are provided in Volume 1, Chapter 4, Section 4.7.

ES.1.2.5. USACE FLOOD PUMP STATION IMPROVEMENTS

In 2018-2019, MSD partnered with United States Army Corps of Engineers (USACE) to complete the Preliminary Feasibility Study for the Ohio River Flood Protection System (ORFPS). The study identified projects needed to ensure flood protection levels meet today's standards. USACE has indicated federal funds may be available to address reliability improvements. However, capacity upgrades and back-up power needs are not eligible for USACE funding. The USACE will fund and lead the reliability improvement projects. MSD anticipates having a cost-share responsibility of approximately $58.7M but will have limited input regarding the timing of when the work is performed. USACE initially stated design will advance in FY21 with construction to begin in FY23.

ES.1.2.6. PADDY'S RUN PUMP STATION REPLACEMENT

The original station remains in operation. Additional capacity is needed to support operation of the Bells Lane Facility and to direct flow to the MFWQTC. Constructed in 1953 by USACE, the Paddy's Run Pump Station is beyond its useful life and critical infrastructure to replace. In addition to providing regional flood protection along the Ohio River, the station uniquely assists with wet weather treatment. When the Ohio River flood stage exceeds 58 feet on the lower gage, MSD relies on Paddy's Run Station to pump 50 MGD from the Bells Lane Wet Weather Treatment Facility. Without the station in operation, flow would discharge untreated through CSO 015, resulting in combined sewage ponding in upstream residential areas, including streets, basements, and first floors, before ultimately discharging to the Ohio River. This $115M project will protect the public from flooding and will prevent unauthorized discharges of combined sewage. Details regarding this project are provided in Volume 1, Chapter 4, Section 4.7.

ES.1.2.7. CRITICAL INTERCEPTOR REHABILITATION PROJECTS

MSD continues to experience an increased occurrence of critical sewer interceptor failures. Since most of the interceptors were constructed in the same era, the timing and rate for failures is not anticipated to lessen. For example, the Ohio River Interceptor was constructed 1958-1960. In August 2018, hydrogen sulfide corrosion caused a failure at the intersection of 4th and Main Streets. This was a catastrophic failure impacting multiple businesses and residents. Repair of this failure cost nearly $20M. MSD must proactively address similar interceptors having a risk score of 20 or higher. As such, $70M of critical sewer projects have been incorporated into to the 5-Year CIP as noted in Table ES.1.2-3. Details regarding these sewers are provided in Volume 1, Chapter 4, Section 4.7.

Table ES.1.2-3 Summary of Critical Interceptor Program

MSD BUDGET ID	CRITICAL INTERCEPTOR PROJECTS	ESTIMATED FY21-FY25 SPENDING
E17053	Buechel Trunk Sewer Rehabilitation	$3,000,000
A20280	Harrods Creek Force Main Repair	$8,400,000
H16075	Prospect Phase II Area Sewers Rehabilitation	$3,000,000
A19208	Broadway Interceptor Infrastructure Rehabilitation	$10,000,000
H18503	I-64 and Grinstead Infrastructure Rehabilitation	$16,000,000
A20244	Large Diameter Sewer Rehabilitation	$8,300,000
H21019	Rudd Ave Sewer Infrastructure Rehabilitation	$2,300,000
H20147	Western Outfall Infrastructure Rehabilitation	$16,000,000
H16074	Nightingale Sewer Rehabilitation	$3,000,000
	Total	**$70,000,000**

ES.1.2.8. ASSET MANAGEMENT PROGRAM

As MSD implemented the ACD and constructed new assets to mitigate unauthorized discharges, investment was diverted from management of existing assets. The level of underinvestment for Asset Management over the past 10 years has led to accelerated deterioration for multiple critical assets. If these conditions were present when the Consent Decree, ACD, and IOAP were being developed, these projects would likely have been addressed at that time. Under the Second ACD, MSD has agreed to invest an average of $25M per year for 15 years, for a total of $375M. MSD will report annually on the projects completed, in-progress, and forecasted for the next fiscal year under this program. If MSD does not satisfy the $125M spending amount during each 5-year period, the Second ACD stipulates penalties based upon the level of underperformance. Refer to Volume 1, Chapter 4, Section 4.7 for more information related to the Asset Management Program.

ES.1.2.9. CHANGED FINANCIAL CONDITIONS

MSD has experienced changed financial conditions since the ACD was executed, including the following:

- **Debt Profile**: In addition to the changed conditions with critical asset risks, financial risks have also surfaced. MSD's Board's authority to raise rates is limited to 6.9% annually. MSD's overall debt currently exceeds $2 billion as MSD continues to borrow faster than paying off debt each year. Today, MSD's debt profile has reached the point of a potential downgrade from the rating agencies. A downgrade would jeopardize MSD's ability to finance projects and would result with higher financing costs.
- **COVID19 Impact:** The COVID19 pandemic is impacting MSD's operating and capital budgets. The impacts so far have been less than initially feared but MSD continues to experience revenue reductions, delayed supplier deliveries, and volatility in the short-term municipal debt market. Revenue reductions are a direct result of rate payers not being able to pay their utility bills due to job loss and other COVID19 impacts. A few capital projects were extended into FY21 because equipment manufacturers were not able to build and ship equipment due to shortages of materials/labor attributed to the COVID19 pandemic. So far, these impacts are

not being experienced on Consent Decree projects. Finally, the pandemic brought extreme volatility in the short-term municipal debt market due to the social and economic realities. MSD is working closely with the commercial paper dealers to maintain its program. The length of the pandemic could shift investor's concerns to credit quality as municipal revenues and cash flows become impacted. MSD is moving forward with its planned 2020A Revenue Bond to refund outstanding commercial paper and notes. MSD is prepared for additional disclosure and conversation with investors to provide reassurance that MSD does not have prolonged credit concerns.

Due to these changes circumstances, the Cabinet, EPA and MSD have agreed to enter into a Second Amendment to the Consent Decree which shall continue some of the measures set forth in the Amended Consent Decree, reprioritize some specific remedial projects set forth in the 2021 IOAP Modification and add new measures to further the objectives of the Amended Consent Decree and the achievement of the levels of control for CSOs and SSOs as set forth in the approved IOAP Modification.

ES.1.3. ENVIRONMENTAL BENEFIT ANALYSIS

An environmental benefit analysis was prepared to confirm addressing the current infrastructure priorities would provide an equivalent or better environmental benefit than constructing the remaining SSDP projects by 2024.

MSD is required to construct SSDP projects to eliminate SSOs for the 2-year, 5-year, or 10-year storm event. The level of control (LOC) storm event was selected for each modeled SSO location. The LOC selection and modeling referenced in this analysis was performed in accordance with the approved IOAP, as required by the ACD. The 2012 IOAP requires MSD to achieve the following related to modeled SSOs by 2024:

- Construct 57 Final SSDP and 6 Interim SSDP projects of varying scopes to eliminate SSOs
- For 2-year storm, eliminate 100% modeled SSO volume and 100% modeled overflow locations
- For 5-year storm, eliminate 13% modeled SSO volume and 35% modeled overflow locations
- For 10-year storm, eliminate 10% modeled SSO volume and 18% modeled overflow locations

Through 2020 MSD has already over performed the expected environmental benefit for the bigger storms per the IOAP requirements by achieving the following:

- Constructed 41 of the Final SSDP and all six of the Interim SSDP projects (74% of the number of required projects).
- For 2-year storm, eliminated 82% modeled SSO volume and 67% modeled overflow locations.
- For 5-year storm, eliminated 72% modeled SSO volume and 45% modeled overflow locations.
- For 10-year storm, eliminated 54% modeled SSO volume and 37% modeled overflow locations.
- For the Ohio River, reduced median fecal coliform concentrations by 76% since 2007 based on data from ORSANCO collected 2001-2015.
- For Middle Fork and South Fork Beargrass Creek, reduced wet weather mean E-Coli concentrations an average of 70% since 2010 based on grab sample data collected in October 2010, September 2013, July 2014, and June 2017.

ES.1.3.1. ENVIRONMENTAL IMPACT OF 2-YEAR STORM

Table ES.1.3-1 summarizes the modeled performance for the 2-year storm events. As of August 2020, for the 2-year storm, MSD has reduced modeled SSO volumes from 20.8 MG in 2007 to 3.7 MG (82% reduction). Per the requested time extension, MSD will eliminate 98% of the modeled SSO volume by 2030 and achieve 100% SSO volume elimination for the 2-year storm event in 2035. The progressive performance for eliminating modeled SSO volume is shown in Figure ES.1.3-1.

Table ES.1.3-1 Two-Year Storm Event LOC and Modeled Performance

YEAR	MODELED VOLUME (MG)	% VOLUME ELIMINATED	MODELED SSO LOCATIONS	% LOCATIONS ELIMINATED
2007	20.8	0%	197	0%
2020	3.7	82%	65	67%
2030	0.4	98%	18	91%
2035	0,0	100%	0	100%
Required LOC	**0**	**100%**	**0**	**100%**

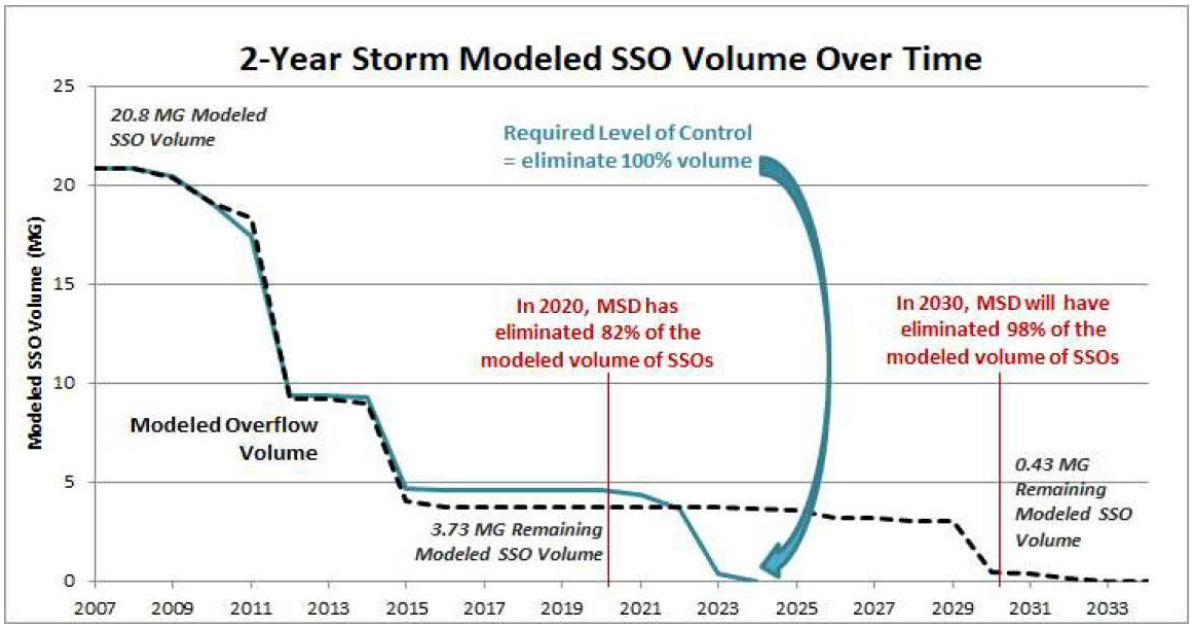

Figure ES.1.3-1 Two-Year Storm Event Modeled SSO Volumes

MSD is able to eliminate 98% of modeled SSO volume by 2030 by constructing the largest remaining SSDP project - the Upper Middle Fork (UMF) Phase 2 Project *(IOAP Project ID: IS_MISF_MF_NB01_M_01_C_A*). This project involves replacing the existing 9 MGD UMF Pump Station with a 30 MGD Pump Station; constructing 10,200 feet of 30-inch force main and 14,000 feet of 24-inch to 36-inch relief interceptor parallel to the existing UMF Interceptor; and constructing a flow diversion structure on the existing UMF Interceptor and UMF Relief Interceptor with modulating control

gates to integrate with MSD's real time control system. This project will eliminate 2.6 MG, 7.8 MG, and 13.6 MG of modeled SSO volume for the 2-year, 5-year and 10-year storm events, respectively.

With the time extension requested, the UMF Phase 2 Project will begin design in 2025 and be substantially complete in 2030. When the UMF Phase 2 Project is completed, modeled SSO volumes for the 2-year storm will be reduced by 98% and the number of modeled overflow locations by 91%. The progressive performance related to eliminating the number of SSO locations over time is shown graphically in Figure ES.1.3-2.

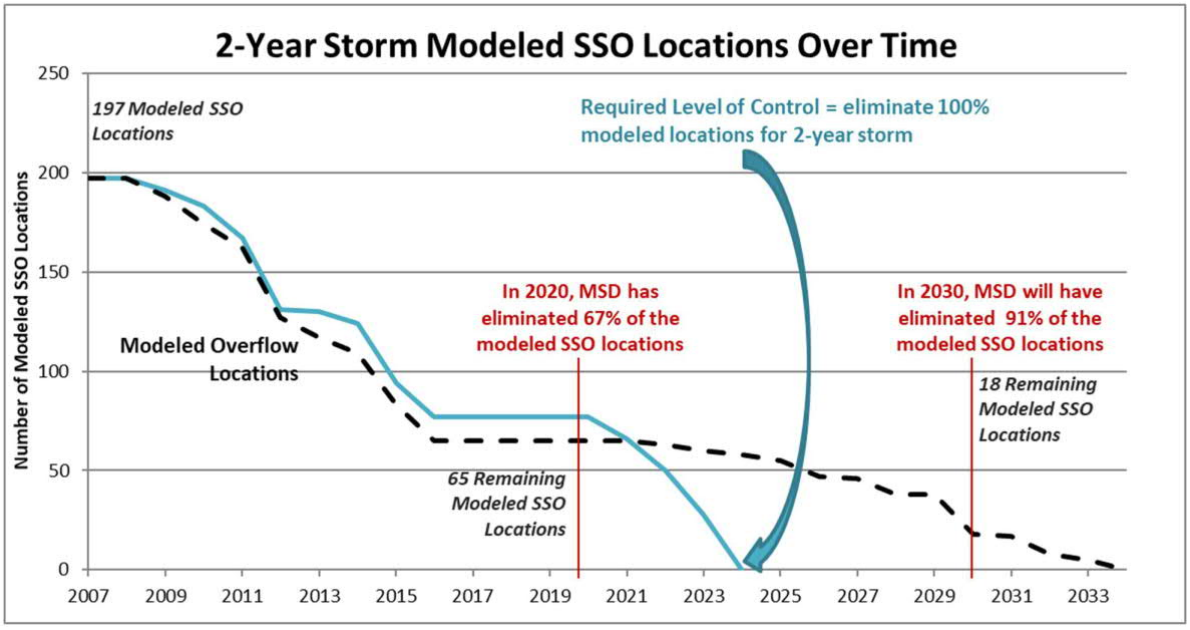

Figure ES.1.3-2 Two-Year Storm Modeled SSO Locations

The potential environmental impact of delaying completion of the UMF Phase 2 Project from 2024 to 2030, is an estimated 2.6 MG of SSO volume could occur during the 2-year storm, and approximately the same amount would overflow during the Typical Year. The Typical Year model simulation generally includes one storm event slightly larger than the 2-year storm. Therefore, for the time period of 2025 through 2030, an estimated SSO volume of 13 MG could theoretically occur assuming a 2-year storm event occurs every year.

ES.1.3.2. ENVIRONMENTAL IMPACT FOR 5-YEAR AND 10-YEAR STORMS

Many of the projects already constructed by MSD have achieved a higher level of control than required by the IOAP for the larger storm events. Through August 2020, MSD has eliminated 72% of the modeled SSO volume and 45% of the modeled SSO locations for the 5-year storm event as noted in Table ES.1.3-2. This exceeds the required minimum LOC for the 5-year storm event (14% of modeled SSO volume and 35% of modeled SSO locations). Similarly, through August 2020, MSD has eliminated 54% of the modeled SSO volume and 37% of the modeled SSO locations for the 10-year storm event; exceeding the minimum LOC of 10% of modeled SSO volume and 18% of modeled SSO locations (refer to Table ES.1.3-3).

Table ES.1.3-2 Five-Year Storm Event LOC and Modeled Performance

YEAR	MODELED VOLUME (MG)	% VOLUME ELIMINATED	MODELED SSO LOCATIONS	% LOCATIONS ELIMINATED
2007	47.7	0%	211	0%
2020	13.4	72%	117	45%
2030	6.1	87%	91	57%
2035	4.7	90%	75	64%
Required LOC	**41.5**	**14%**	**137**	**35%**

Table ES.1.3-3 Ten-Year Storm Event LOC and Modeled Performance

YEAR	MODELED VOLUME (MG)	% VOLUME ELIMINATED	MODELED SSO LOCATIONS	% LOCATIONS ELIMINATED
2007	75.4	0%	218	0%
2020	34.5	54%	137	37%
2030	23.5	69%	118	46%
2035	21.0	72%	108	50%
Required LOC	**68.2**	**10%**	**178**	**18%**

As MSD continues to construct the remaining SSDP projects, the LOC achieved during the larger storm events will continue to increase. Upon completion of Final SSDP projects, MSD will have eliminated approximately 90% of the modeled 5-year SSO volume and 72% of the modeled 10-Year SSO volume. MSD will achieve six times the required minimum IOAP LOC for the larger storm events. This is a drastically improved environmental benefit in that the projects are capturing more flow during large storms.

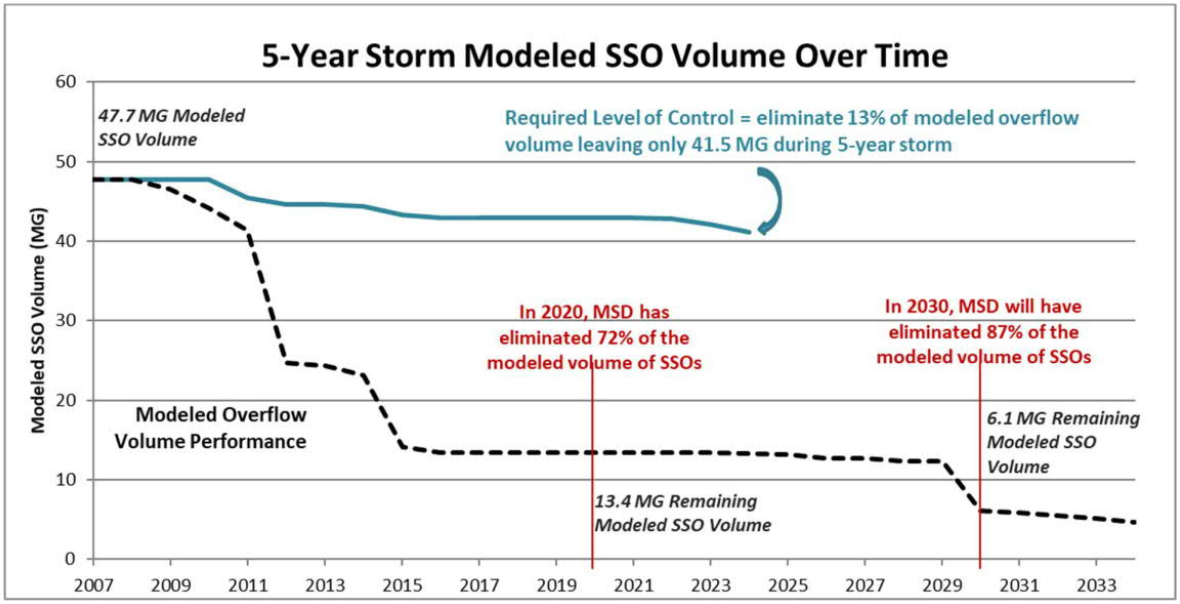

Figure ES.1.3-3 Five-Year Storm Event Modeled SSO Volumes

The progressive performance related to the 5-year storm modeled SSO volume reduction is presented in Figure ES.1.3-3. The similar figure for the 10-year storm event is provided in Figure ES.1.3-4.

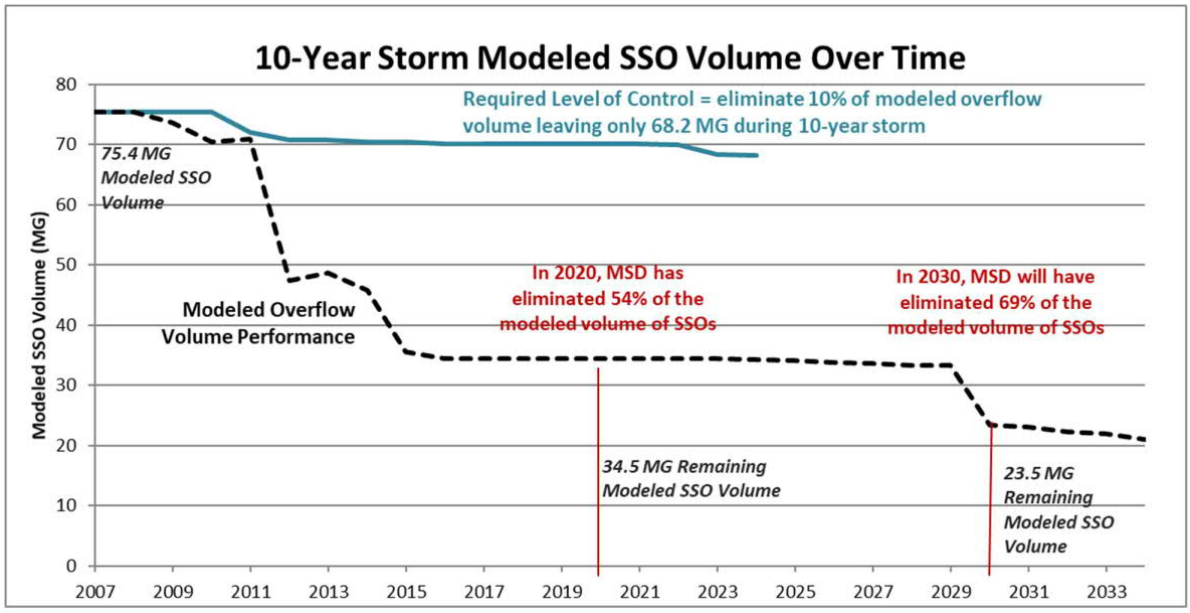

Figure ES.1.3-4 Ten-Year Storm Event Modeled SSO Volumes

Graphs showing the progressive elimination of modeled SSO locations over time for the 5-year, and 10-year storm events are provided in Figure ES.1.3-5 and Figure ES.1.3-6, respectively.

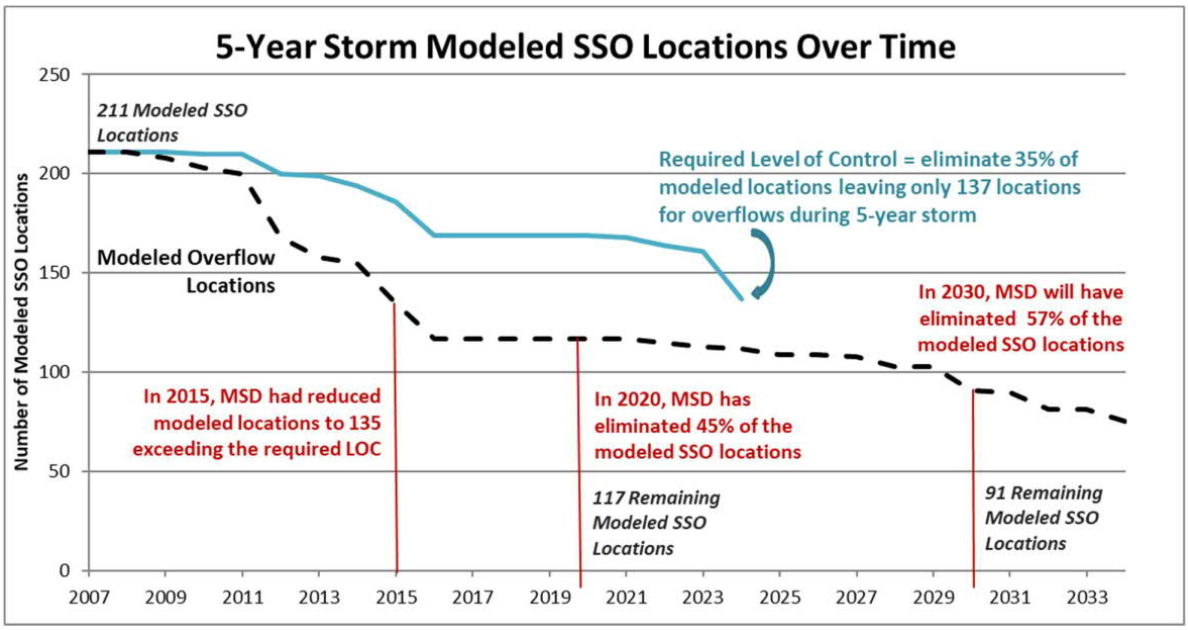

Figure ES.1.3-5 Five-Year Storm Modeled SSO Locations

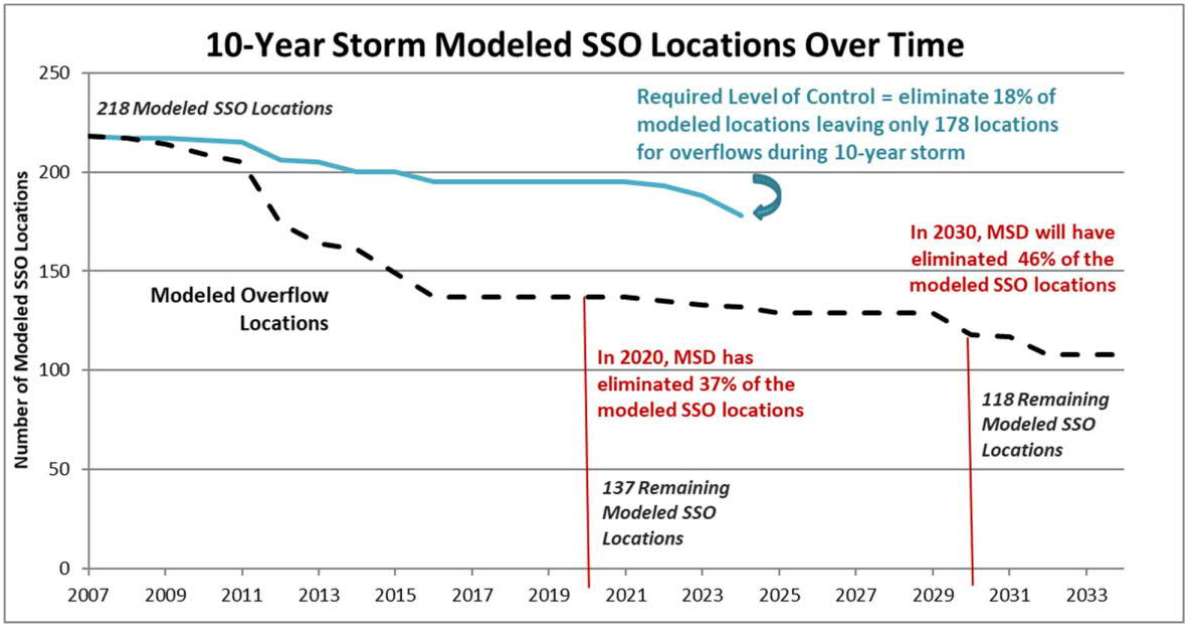

Figure ES.1.3-6 Ten-Year Storm Modeled SSO Locations

ES.1.3.3. ENVIRONMENTAL IMPACT OF MORRIS FORMAN WQTC

The Morris Forman WQTC is the largest wastewater treatment plant in the State and discharges an average of 100 MG per day of effluent. The plant treats combined sewage and discharges approximately 37 billion gallons of treated effluent annually. The wet weather capacity of the Morris Forman WQTC is 330 MGD when all treatment units are fully operational. The current condition and treatment capacity of the four Sedimentation Basins limits peak wet weather flow capacity to 240 MGD. MSD is currently designing improvements to the Sedimentation Basins that should restore peak treatment capacity to 330 MGD in 2026. Flows in excess of 240 MGD are discharged through CSOs. MSD completed model runs to assess the potential environmental impact of Morris Forman's reduced wet weather capacity.

MSD evaluated the modeled result for AAOV (annual average overflow volume) impacts to compare the environmental benefit of the UMF Phase 2 Project with the Morris Forman WQTC Sedimentation Basin Project.

- According to the model, the Upper Middle Fork Phase 2 Project mitigates approximately 45 MG of modeled CSO volume, in addition to the 2.6 MG of modeled SSO volume for the 2-year storm event.
- Having the capacity of the Morris Forman WQTC limited to 240 MGD, results in an increase of approximately 275 MG of additional AAOV.
- The additional 275 MG is primarily discharged through CSO015, CSO016, CSO191, CSO210, and CSO211.
- Therefore, the environmental impact with respect to total overflow volume of Morris Forman operating at capacity is approximately 6 times that of the UMF Phase 2 Project.

The Morris Forman WQTC Sedimentation Basin Rehabilitation Project is proposed to be added to the IOAP. Larger storm events require more capacity to treat greater flow volumes. Therefore, the environmental benefit of improving the Morris Forman WQTC outweighs the collection system benefit achieved by the UMF Phase 2 Project.

ES.1.3.4. ENVIRONMENTAL IMPACT OF PADDY'S RUN PUMP STATION

The environmental impact associated with reliable operation of the Paddy's Run Pump Station relates to 1) CSO mitigation and 2) community flood protection. The Bells Lane Wet Weather Treatment Facility has a capacity of 50 MGD. Without Bells Lane operating, CSO015 would discharge an additional 50 MGD every event for the duration of the event. However, when the Ohio River elevation is high, the Bells Lane Facility cannot operate unless the Paddy's Run Pump Station is operating. Failure of the Paddy's Run Pump Station would not allow CSOs to occur for events larger than the LOC event, resulting in combined sewage ponding in upstream residential areas, including streets, basements, and first floors.

In addition to CSO mitigation, there would be huge environmental implications if the Paddy's Run Pump Station were not fully operational during a high river or flood event. The 925 MGD Pump Station protects 214,500 people, 70,000 homes, 6,000 businesses, and 40 neighborhoods. The extent of land that would be impacted by the Paddy's' Run Station not operating as intended is shown in the inundation map provided in Figure ES.1.3-7. The map shows the results of modeling a breach in the system just north of Paddy's Run in 1937 flood conditions as determined by the USACE[1]

According to the US Department of Homeland Security[2], flooding in this area would impact the environment due to the industrial activity and the major petro-chemical industries within the Rubbertown area of Louisville. Critical chemical products such as calcium carbide (source of acetylene gas – Carbide Industries is the only manufacturer of carbide in North America), the sole source in the United States for binding materials used in solid rocket fuels (American Synthetic Rubber Company) and chlorinated polyvinyl chloride (CPVC) critical for manufacturing and construction industries in the United States. The facility managers noted a 1937-like flood at Rubbertown would result in significant loss of packaged inventory, catastrophic equipment loss, and unrecovered fixed costs for companies such as Dow Chemical, Hexion, American Synthetic Rubber Company, Arkema, Chemours, DuPont, Eckart, Carbide Industries, Zeon, Lubrizol and PolyOne.

The list of chemicals used by various industries within Rubbertown includes: Butadiene, Anhydrous Ammonia, Nitrogen, Calcium Carbide, Vinyl Fluoride, Anhydrous Hydrogen Fluoride, Difluoroethane, Hydrogen Fluoride, Hydrofluoric Acid, Chlorine, Chloroform, Aluminum Powder and Paste, Zinc Paste, Vinyl Acetate Monomer, Vinylidene Chloride, Vinyl Chloride, Phenol, Formaldehyde. If flood waters were to come in contact with these chemicals, the health and safety of the public would be affected in addition to the environment and quality of local waterways.

[1]"Preliminary Risk Characterization at Paddy's Run and Western Parkway Flood Pump Stations". TetraTech, June 30, 2017.
[2] "Resiliency Assessment, Louisville Metro Catastrophic Urban Flood Planning". The Regional Resiliency Assessment Program (RRAP). Department of Homeland Security, US Army Corps of Engineers (Louisville Metro Silver Jackets). 2019.

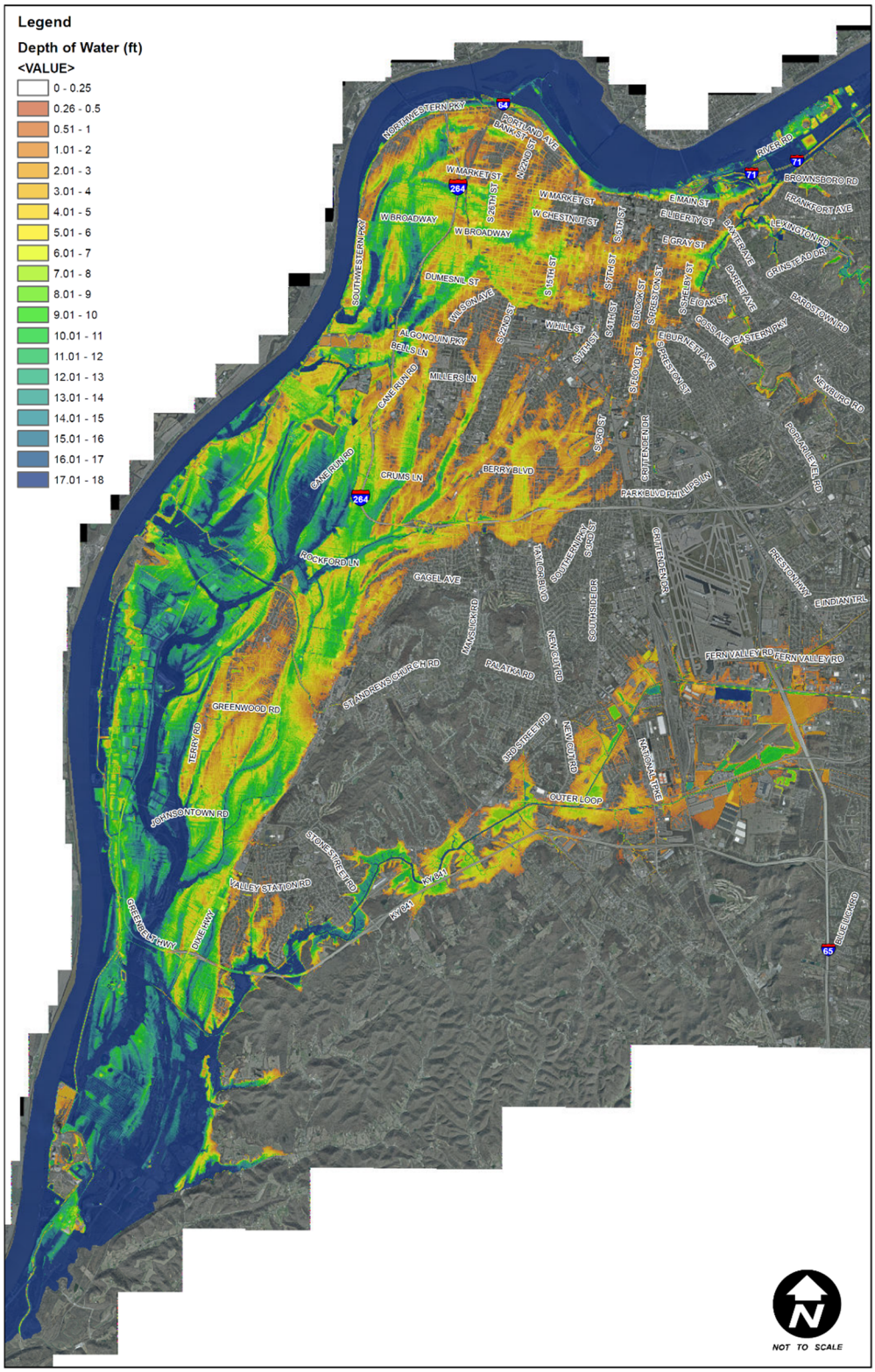

Figure ES.1.3-7 Inundation Map for 1937-Like Flood Condition Without Paddy's Run Pump Station

ES.1.3.5. ENVIRONMENTAL ANALYSIS CONCLUSION

Comparing the potential modeled volumes, suggests a greater environmental benefit is associated with the Morris Forman WQTC and Paddy's Run Pump Station projects as compared to the UMF Phase 2 Project for the following reasons:

Modeled Conditions:

- As of August 2020, MSD has eliminated 82% modeled SSO volume with only 3.73 MG remaining during the 2-year storm event.
- The SSOs are not continuous and their occurrence is solely driven by weather.
- The larger CSO modeled volume (275 MG) poses significantly more environmental impact than the smaller SSO modeled volume associated with the remaining SSDP projects (3.73 MG)

SSDP – UMF Phase 2 Project:

- The project will eliminate approximately 45 MG of modeled CSO volume (Typical Year) and 2.6 MG of modeled SSO volume (2-year storm) by 2030, just six years into the requested 10-year SSDP extension.
- Any SSOs associated with the UMF Phase 2 Project would be directed to Beargrass Creek (which discharges to the Ohio River upstream of the Morris Forman WQTC), which already has demonstrated an improved water quality compared to pre-IOAP conditions.

Morris Forman WQTC Project:

- The Morris Forman WQTC discharges approximately 100 MGD of effluent, equivalent to nearly 37 BG per year.
- The Morris Forman WQTC effluent will not comply with permit conditions for TSS and BOD until the new Biosolids Facility is constructed and on-line.
- The WQTC's limited capacity (240 MGD vs. 330 MGD) results in an additional 275 MG of modeled CSO volume during the Typical Year.

Paddy's Run Pump Station Project:

- The Bells Lane Wet Weather Treatment Facility cannot operate if the Ohio River it at high elevation and the Paddy's Run Pump Station is not operating as intended. This situation will result in an additional 50 MGD of overflow ultimately discharged to CSO015. Furthermore, the CSO discharge would be temporarily stored in streets, basements and potentially houses upstream until river floodwaters recede.
- The Pump Station protects 214,500 people, 70,000 homes, 6,000 businesses, and 40 neighborhoods from potential exposure to floodwaters containing industrial chemicals and combined sewage.

ES.1.4. INTEGRATED OVERFLOW ABATEMENT PLAN REPORT ORGANIZATION

As described previously, the IOAP is a three-volume document. Each volume details distinct aspects of the comprehensive program.

ES.1.4.1. VOLUME 1 – INTEGRATED OVERFLOW ABATEMENT PLAN

The first volume describes overarching, programmatic aspects that are common to all parts of the IOAP as well as the requirements, processes, and factors influencing the development of the Final LTCP (Volume 2) and Final SSDP (Volume 3).

- **Chapter 1 – Introduction**: The Introduction provides a general description of wet weather overflows; the history of the Consent Decree Amendments and IOAP Modifications; and the requirements of the Consent Decree. MSD's use of the Presumption Approach is highlighted in this Chapter.
- **Chapter 2 - IOAP Approach**: This chapter describes MSD's organizational vision and the watershed approach as it relates to the IOAP. Chapter 2 also describes the Waterway Improvements Now (Project WIN) program and elaborates on its strategic character. The IOAP's supporting methods, programs, and initiatives, including the role of community values in the values-based risk management process are detailed. This process provides input to the benefit/cost analysis that is the basis for the structured decision-making process used to evaluate and select which projects are priorities and will be implemented to achieve the IOAP goals.
- **Chapter 3 - Public Participation and Agency Interaction**: The Consent Decree requires that MSD assemble a Wet Weather Team (WWT) to, among other things, "develop a program for public information, education, and involvement." These three components are collectively referred to as public participation. Chapter 3 describes the role of the public participation program with engaging Louisville Metro's citizens to assist in developing, evaluating, and selecting the projects that comprise the IOAP. Chapter 3 also describes the ongoing public notification, education, and outreach program enhancements to maximize customer reach.
- **Chapter 4 - Integrated Overflow Abatement Program**: This chapter describes the overall action plan for addressing all the Consent Decree requirements. Included in these requirements is the Early Action Plan (EAP) implementation. The EAP includes an update of the compliance report for the Nine Minimum Controls (NMC) program, Sewer Overflow Response Protocol (SORP) revisions and implementation, completion of specified capital projects, and development and implementation of a CMOM program. In addition, the chapter includes an overview discussion of the development and implementation of the Interim LTCP, the Updated Sanitary Sewer Overflow Plan (SSOP), and the Interim SSDP. Many of these activities occurred in parallel to preparation of the IOAP, and in many cases, the implementation precedes completion of the IOAP; however, these activities are considered an integral part of the overall plan to achieve the required control of overflow and unauthorized discharges from the combined and sanitary sewer systems. Finally, Chapter 4 provides details related to the specific remedial projects and asset management program added to the IOAP via the Second ACD.
- **Chapter 5 - Regulatory Compliance**: This chapter describes the framework of regulatory requirements that the IOAP must satisfy in accordance with the Presumption Approach. This chapter also draws a roadmap showing how the IOAP achieves compliance with these regulations and creates an approvable LTCP and SSDP.

- **Chapter 6 - IOAP Implementation**: This chapter was replaced for the 2021 IOAP Modification. This chapter presents an implementation plan that outlines operational, financial, and post-construction compliance methodologies necessary to advance and sustain the recommendations of the IOAP. This chapter also addresses the impact of the IOAP capital and operating costs on MSD's rates.

ES.1.4.2. VOLUME 2 FINAL LTCP

The second volume of the IOAP focuses on the control and mitigation of the CSOs.

- **Chapter 1 – Introduction**: This chapter includes a history of EPA's Control Policy for CSOs and a summary of the policy's key elements. This chapter also provides general descriptions of the current CSO control efforts, control processes, and criteria for success.
- **Chapter 2 - System Characterization**: This chapter provides extensive analysis of CSO areas. Analysis includes existing baseline conditions of the CSO area, monitoring of CSO flows, CSO quality sampling, and combined modeling of the sewer system and receiving waters.
- **Chapter 3 - Development and Evaluation of Alternatives for CSO Control**: This chapter discusses the approach and factors used to identify, develop, evaluate, and select projects that make up the recommended projects and programs in the Final LTCP.
- **Chapter 4 - Selection of the Final CSO Long-Term Control Plan**: This chapter generally describes the procedures used to select the level of control, prioritize projects, and develop the Final LTCP. An overview describing LTCP progress to-date and modifications made is provided at the beginning of this chapter.
- **Note: In the 2012 IOAP, a Chapter 5** was included that provided a summary of project modifications to the IOAP between 2009 and 2012. The 2012 project modifications, in addition to schedule modifications as part of this submittal, have been incorporated into Chapters 3 and 4 of the 2021 Final LTCP. Therefore, Chapter 5 has been removed from the 2021 Final LTCP.

ES.1.4.3. VOLUME 3 FINAL SSDP

The third volume of the IOAP focuses upon control and mitigation of SSOs.

- **Chapter 1 – Introduction**: This chapter presents summaries of previous projects and programs and describes their relationship to the IOAP planning process. Previous projects and programs include the Updated SSOP, the CMOM program, the SORP, and the Interim SSDP. The final section of this chapter describes in general terms the approach used to evaluate the projects and programs of the 2021 Final SSDP.
- **Chapter 2 – System Characterization**: This chapter defines the goals of the system characterization program and provides an extensive compilation and analysis of unauthorized discharges in the SSS. This chapter includes service area maps of the unauthorized discharge areas, associated WQTCs, collection system modeling, and system monitoring. This chapter also includes a description of the computer models used to simulate the SSS areas.
- **Chapter 3 – Development and Evaluation of Alternatives for SSO Elimination**: This chapter presents the methodologies used to evaluate the various discharge elimination

solutions. It also defines and discusses strategies and technologies available to control and eliminate unauthorized discharges in the SSS. Based on these strategies and technologies, alternatives were developed for elimination of the unauthorized discharge. Finally, this chapter provides a summary of each discharge abatement alternative and the general basis for changes made to the initially selected measure(s) for projects through 2020. The evaluation criterion included feasibility screening, computer modeling, quality control, level of protection, cost estimates, and a benefit/cost analysis.

- **Chapter 4 – Selection of the Final Sanitary Sewer Discharge Plan**: This chapter includes an explanation of the values-based risk management process used to select and prioritize the Final SSDP alternatives. The final section examines the various issues associated with implementation of the alternative(s) selected as integral to the Final SSDP. Issues discussed include community values, benefit/cost analysis, environmental impact, technical concerns, prioritization of projects, and implementation schedules compatible with the Consent Decree requirements. This chapter presents a summary of the Final SSDP projects including changes made since 2009, project completion dates, technologies, and the level of protection.
- **Note: In the 2012 IOAP, a Chapter 5** was included that provided a summary of project modifications to the IOAP. The 2012 project modifications, in addition to schedule modifications as part of this submittal, have been incorporated into Chapters 3 and 4 of Volume 3. Therefore, Chapter 5 has been removed from the Final SSDP.

ES.1.5. 2021 IOAP MODIFICATIONS

A crosswalk summarizing the changes to all three IOAP volumes is provided Table ES.1.5-1.

- **Projects:** The status of the names LTCP and SSDP projects was updated including minor modification approval dates, project certification dates, and new requirements under the Second ACD.
- **New Information:** Information regarding the status of MSD's wastewater system has been updated throughout all the volumes to reflect current conditions as of December 31, 2020, where appropriate. Some information from the 2009 and 2012 documents remains to provide historical context related to the overall IOAP.
- **Presumption Approach:** Information was revised to clarify MSD is using the Presumption Approach for determining Consent Decree compliance.
- **Consolidated Information:** Information related to the Consent Decree history, public outreach/participation programs, and the Plumbing Modification Program was deleted from Volumes 2 and 3 and consolidated into Volume 1.

Table ES.1.5-1 2021 IOAP Modification Crosswalk

CRITERIA	DESCRIPTION	VOLUME 1 CHAPTERS OR SECTIONS	VOLUME 2 CHAPTERS OR SECTIONS	VOLUME 3 CHAPTERS OR SECTIONS	2012 IOAP SUBMITTAL	2021 IOAP MODIFICATION
Projects	Work Progress	Table 1.1-1 modifications	1.3.1.4 LTCP activities 4.1, LTCP revised dates Table 4.1-6 storage	1.1.1SSOP, ISSDP 2.2.1 WQTC Elims Table 4.0-1 projects	Work through 2012 was noted	Added summary of work performed 2009 - present
	Minor Project Modifications	Table ES1.1-3 Final LTCP Table ES1.1-6 Final SSDP 6.1 IOAP Schedule	Table 4.0-1 Appendix 4.0-1 Appendix 4.0-2	Table 4.0-1 Appendix 4.0-1 Appendix 4.0-2	Information was accurate through 2012.	Revised LTCP and SSDP tables to include all project modifications and provide copies of letter modifications and certifications.
	New Requirements	4.7 Second ACD requirements	Table ES1.1-3	Table ES1.1-6	N/A	New early action projects for Morris Forman WQTC and Paddy's Run Pump Station, Critical Interceptors, and Asset Management Program. LTCP & SSDP time extensions.
New Information Since 2012 IOAP Submittal	Clarified which information is from 2009, 2012, 2021	Multiple places throughout Chapters 1, 2, 3, 4, 5 and 6	Multiple places throughout Chapters 1, 2, 3, and 4. Information from the 2012 Chapter 5 was incorporated into Chapters 3 and 4.	Multiple places throughout Chapters 1, 2, 3, and 4. Information from the 2012 Chapter 5 was incorporated into Chapters 3 and 4.	Process and data remain valid and accurate. Chapter 5 was added for Volumes 2 and 3 in 2012.	New note added at the front of each chapter. Chapter 5 from Volumes 2 and 3 was deleted in 2021.
	Document Naming Nomenclature	1.1.6 Second ACD 1.4 CD requirements	1.1.2 Final LTCP	1.1.1 Final SSDP	N/A	The terms IOAP, Final LTCP, and Final SSDP refer to the 2021 versions. The amendments are referred to as the First ACD and Second ACD.

Table ES.1.5-1 2021 IOAP Modification Crosswalk

CRITERIA	DESCRIPTION	VOLUME 1 CHAPTERS OR SECTIONS	VOLUME 2 CHAPTERS OR SECTIONS	VOLUME 3 CHAPTERS OR SECTIONS	2012 IOAP SUBMITTAL	2021 IOAP MODIFICATION
	Progress since the 2012 IOAP Submittal	1.2 system information 1.1.5 minor modifications 2.2 water quality 3.5 current/future program 3.6.1 ACD reporting 3.6.2 regulatory meetings 4.1.4.2 fixed generators 4.1.4.3 revised SCAP 4.1.4.4 revised SORP 4.4. WQTC eliminations 4.5.1 source control 5.4 approvable Final LTCP 5.5 approvable Final SSDP 6.2 financial plan 6.3.1.1 rain gauge map	1.3.1.4 LTCP activities 1.3.4.2 ORSANCO 2.4.3.1 rain gauges 2.4.4 model 2.4.4.4 flow monitors 2.4.4.5 water quality 2.4.6.4 model 2.4.6.5 model 2.9.1 water quality 3.2.3.1 RTC Phase 1 3.2.5.9 dry well projects 3.2.5.10 green projects 4.1.2.1 green projects	1.3.2 CMOM Report 1.3.3 Hansen system 1.3.3 SORP 1.3.4 ISSDP 2.1.8 small WQTCs 2.2.3.1 flow monitoring 2.2.3.2. rain gauges 2.3.1. modeling 2.3.5.11 model 2.4.3 model regions 3.3 all tables 3.3.1.1 screening 3.3 benefit-cost analyses	Relevant information in 2012 Tables were labeled as outdated and referred to Volume 2, Chapter 5. In Volume 3, the tables in section 3.3 were updated or removed and the red screening box was removed that stated “SSDP information outdated refer to Chapter 5”.	New information added to reflect work or pertinent information since the 2012 IOAP submittal
	Verb Tense	Multiple places throughout Chapters 1, 2, 3, 4, 5 and 6	Multiple places throughout Chapters 1, 2, 3, and 4	Multiple places throughout Chapters 1, 2, 3, and 4	No change to content	Verb changed to past tense for work that been performed
Presumption Approach	Clarification	3.7 effectiveness 5.1.1 key findings 5.2.1approaches 5.2.2, 5.2.3 water quality 6.3 compliance monitoring	2.9 receiving waters Chapter 3 Introduction 3.1.1 approach 4.4 measures of success	N/A	Both Presumption and Demonstration Approaches discussed	Added language clarifying the 2021 Final LTCP exceeds the requirements of the Presumption Approach. Deleted language not Presumption Approach.
Consolidated Information	Consent Decree Background	1.1 background	1.1 background	1.1.1 background	Background information was dispersed among three IOAP Volumes	Consolidated information from all volumes into Volume 1, Chapter 1
	Plumbing Modification Program	4.5.1 basement backups 4.5.2 private sources	1.3.1.2 LTCP Activities	1.3.1.4 PMP Program	Reduced text added reference to Volume 1	Consolidated information from all volumes into Volume 1, Chapter 4, section 4.5.1

Table ES.1.5-1 2021 IOAP Modification Crosswalk

CRITERIA	DESCRIPTION	VOLUME 1 CHAPTERS OR SECTIONS	VOLUME 2 CHAPTERS OR SECTIONS	VOLUME 3 CHAPTERS OR SECTIONS	2012 IOAP SUBMITTAL	2021 IOAP MODIFICATION
	Public Information	3.5 public program 3.7 customer survey 5.6 regulatory meetings	1.3.2 public participation 1.3.4 NMC-8 3.1.1.3 public participation 4.2 public participation	1.3.3.3 public notification, 4.3 public participation	Reduced text added reference to Volume 1	Consolidated information from volumes into Volume 1, Chapter 3, and expanded text for program through 2035.

A summary of the new projects incorporated into the Second ACD not part of the Final LTCP or Final SSDP are listed in Table ES.1.5-2.

Table ES.1.5-2 Summary of New Work Added to the Second ACD

PROJECT NAME AND IOAP ID	PROJECT DESCRIPTION	2021 TECHNOLOGY	2021 ESTIMATED COST	2021 SCHEDULE COMPLETION DATE
Morris Forman WQTC New Biosolids Facility *L_OR_MF_A*	Construct new thermal hydrolysis treatment process to be used in tandem with a combination of repurposed and new systems components.	Thermal Hydrolysis Process (THP)	$197,800,000	12/31/2030
Paddy's Run Pump Station Capacity Improvements *L_OR_MF_B*	Construction of a new 5,250, sq foot Pump Station rated at 1,900 MGD to replace the existing outdated facility.	New Pump Station	$115,000,000	12/31/2026
Buechel Trunk Sewer Rehabilitation *C_SF_MF_B*	Rehabilitation of approximately 20,500 feet of 12-inch to 30-inch sewers.	Sewer Lining & Point Repair	$3,000,000	12/31/2026
Harrods Creek Force Main Repair *C_HC_HC_A*	Repair of 3,200 feet of 18-inch to 30-inch force main.	Sewer Lining & Point Repair	$8,400,000	12/31/2026
Prospect Phase II Area Sewers Rehabilitation *C_HC_HC_B*	Rehabilitation of approximately 2,000 feet of 6-inch to 15-inch sewers.	Sewer Lining & Point Repair	$3,000,000	12/31/2026
Broadway Interceptor Infrastructure Rehabilitation *C_OR_MF_A*	Rehabilitation of approximately 5,4000 feet of 84-inch to 96-inch sewers.	Sewer Lining & Point Repair	$10,000,000	12/31/2026
I-64 and Grinstead Infrastructure Rehabilitation C_MI_MF_A	Rehabilitation of approximately 13,700 feet of 8-inch to 123-inch sewers.	Sewer Lining & Point Repair	$16,000,000	12/31/2026
Large Diameter Sewer Rehabilitation *C_OR_MF_B*	Program including the inspection, pre-design services, design work to the 60% design level and construction phase professional services.	Sewer Lining & Point Repair	$8,300,000	12/31/2026
Rudd Ave Sewer Infrastructure Rehabilitation *C_OR_MF_C*	Rehabilitation of approximately 4,020 feet of 120-inch to 138-inch sewers,	Sewer Lining & Point Repair	$2,300,000	12/31/2026
Western Outfall Infrastructure Rehabilitation C_*OR_MF_D*	Rehabilitation of approximately 18,350 feet of 108-inch to 141-inch sewers.	Sewer Lining & Point Repair	$16,000,000	12/31/2026
Nightingale Sewer Rehabilitation *C_SF_MF_A*	Rehabilitation of approximately 49,500 feet of 6-inch to 18-inch sewers.	Sewer Lining & Point Repair	$3,000,000	12/31/2026
Strategic Asset Management Plan (SAMP) *C_DW_DW_A*	Submittal of a draft plan outlining how MSD will prioritize and perform asset management.	Report	N/A	06/30/2021
Asset Management Program FY21 – FY25 *C_DW_DW_B*		Various	$125,000,000	12/31/2025

PROJECT NAME AND IOAP ID	PROJECT DESCRIPTION	2021 TECHNOLOGY	2021 ESTIMATED COST	2021 SCHEDULE COMPLETION DATE
Asset Management Program FY26 – FY30 *C_DW_DW_C*	Improvements to existing WQTC, Pump Station, Flood Pump Station, sewers, and related assets serving the wastewater system.	Various	$125,000,000	12/31/2030
Asset Management Program FY31 – FY35 *C_DW_DW_D*		Various	$125,000,000	12/31/2035

Notes regarding IOAP Naming Nomenclature *First Letter_Second Grouping_Third Grouping_ Fourth Grouping*

- First letter represents the Program: L = LTCP; S = SSDP; C = combined LTCP & SSDP
- Second grouping of letters represents the major basin the project is located in: CC = Cedar Creek; DW = District-Wide; FF = Floyds Fork; GC = Goose Creek; HC = Harrods Creek; MC = Mill Creek; MI = Middle Fork Beargrass Creek; MU = Muddy Fork Beargrass Creek; OR = Ohio River; PE = Pennsylvania Run; PO = Pond Creek; SF = South Fork Beargrass Creek
- Third grouping of letters represents the wastewater treatment plant that receives the flow from the project sewers: CC = Cedar Creek WQTC; DW = District-Wide; FF = Floyds Fork WQTC; HC = Hite Creek WQTC; MF = Morris Forman WQTC; WC = West County (DRG) WQTC
- Fourth grouping of letters represents a unique identifier to differentiate between projects of the same project that are located in the same basin and WQTC. These letters begin with “A” and continue as needed.

ES.1.5.1. IOAP 2021 MODIFICATION TO VOLUME 1

The revisions incorporated into Volume 1 of the IOAP provide context for the Second ACD finalized in 2021. In some places, the order which background information was presented was revised to be chronological. The 2021 updates and programmatic compliance status related to the Final LTCP are summarized herein.

- **Current System Information**: Information regarding the status of MSD's wastewater system has been updated to reflect current conditions as of December 31, 2020 where appropriate throughout all chapters.
- **Historical Context**: Some information from the 2009 and 2012 documents remains to provide historical context related to the overall IOAP. A crosswalk summarizing the Volume 1 changes between the 2012 and 2021 IOAP documents was provided in Table 1.0-1.
- **Water Quality**: As acknowledged in the ACD, bacteria levels have decreased in the Ohio River and Beargrass Creek since the IOAP was started according to ORSANCO and MSD wet weather sampling data.
- **Public Participation & Agency Interaction**: Since 2015, MSD's Community Engagement Strategy has been expanded for significant capital projects, enhancing advertising and marketing strategies, developing social media platform messaging, ramping up earned media opportunities, pursuing additional education programs and partnerships, and overall re-branding to promote safe, clean waterways. A foundational component of the future program will be one of continuous improvement, striving to ultimately advance customer behavior objectives of the IOAP.
- **Regulatory Reporting**: MSD shall submit to the Cabinet and EPA a Mid-Year Status Report summarizing the first 6 months of its fiscal year, July 1st through December 31st. The Mid-Year Status Report summarizing the final 6 months of the fiscal year will be captured as a component of the Annual Report as set forth below. The first Mid-Year Status Report shall be submitted by February 28, 2022 and will reoccur annually by February 28th of each year. MSD shall submit an Annual Report for the preceding fiscal year period of July 1st through June 30th by September 30th of each year.
- **Comprehensive Performance Evaluation**: Each of the small WQTCs that had SSOs in their watersheds were eliminated as part of MSD's long-term strategic plan to eliminate small WQTCs in its service area. Expansion of the Derek R. Guthrie WQTC to 60 MGD average day and 300 MGD peak day (for short durations) was completed in 2018 and the State approved is rerating in 2020. Similarly, expansion of the Floyd's Fork WQTC to 6.5 MGD was completed in 2012. The Hite Creek WQTC is under construction to expand its capacity to 9 MGD ADF and 24 MGD peak flow. Construction is scheduled for completion in FY22.
- **Plumbing Modification Program**: Since the program's inception, MSD has completed over 17,992 projects totaling approximately $21.7 million dollars. The countywide program is now available to all MSD customers experiencing basement backups. MSD will pay up to $4,000 per residence for plumbing modifications. Generally, installations average about $2,500.
- **Specific Remedial Projects and Programs**: A new Section 4.7 was added to Chapter 4 to document the work MSD agreed to incorporate into the Second ACD related to the Morris

Forman WQTC New Biosolids Facility, Paddy's Run Pump Station Capacity Upgrade, Critical Interceptors Projects, and the Asset Management Program.

- **Morris Forman WQTC New Biosolids Facility**: MSD will construct a modern biosolids processing facility at the Morris Forman WQTC that utilizes a thermal hydrolysis pretreatment process (THP) to create a useable biogas. Benefits of the new facility include improved effluent quality; production of 4 MW of power; decreased consumption of natural gas; and reduced landfill utilization capacity. This project will be substantially complete no later than December 31, 2030.
- **Paddy's Run Pump Station Capacity Upgrade**: MSD will construct a new 5,250 sq foot pump station rated at 1,900 MGD, install the associated discharge piping system over the existing levee to a new outfall structure on the Ohio River, and demolish the existing pump station. This project will be substantially complete no later than December 31, 2026.
- **Morris Forman WQTC Sedimentation Basins Rehabilitation**: The Morris Forman WQTC is limited to a max wet weather flow of 240 MGD due to capacity constraints with the sedimentation basins. When the four sedimentation basins have been fully rehabilitated, they will enable the WQTC to process up to 330 MGD. This will reduce the level of pollutants discharged into the Ohio River. This project will be substantially complete no later than December 31, 2026 as required in the Agreed Order with the State. This project is not part of the Second ACD but is referenced given its relevance to restoring wet weather treatment capacity to the Morris Forman WQTC.
- **Critical Interceptors Projects**: MSD has agreed to complete nine critical sewer rehabilitation projects totalling an estimated $70 during FY21 through FY25 (by December 31, 2026).
- **Asset Management (AM) Program**: MSD agreed to invest an average of $25M per fiscal year on wastewater AM improvements totaling no less than $125M in five-year increments through 2035. As such, MSD will invest $125M from FY21 to FY25 for existing wastewater collection system and WQTC assets; $125M from FY26 to FY30; and $125M from FY31 to FY35. This time frame coincides with the time extension granted for the remaining SSDP projects. MSD will document annual and 5-year progress in its Consent Decree Annual Report. MSD will submit its Strategic Asset Management Plan to the Regulators no later than June 30, 2021.
- **Presumption Approach**: The Presumption Approach requires a program to meet any of the following three criteria: elimination or capture for treatment of 85 percent of the combined sewer flow generated during a wet weather event; allow no more than an average of four overflows per year; or a reduction of not less than the mass of pollutants that were identified as causing water quality impairments. The 2021 IOAP will be compliant with the Presumption Approach.
- **Financial Plan**: MSD updated the information in Volume 1, Chapter 6, Section 6.2 to reflect current financial criteria as of December 31, 2020 including the 5-year CIP forecast for FY21 through FY25.

ES.1.5.2. LTCP 2021 MODIFICATION TO VOLUME 2

The second volume describes MSD's planning approach and implementation of the 25 LTCP projects. The revisions incorporated into Volume 2 of the IOAP provide context for Second ACD. In some places,

the order which background information was presented was revised to be chronological. The 2021 updates and programmatic compliance status related to the Final LTCP are summarized herein.

- **Second ACD**: The initial Final LTCP initially included 28 gray projects and 19 green demonstration projects. Through the adaptive management process 27 of the 28 gray projects were modified. Some projects were consolidated, and others were split into multiple projects. The result was 25 Final LTCP projects, of which MSD has certified completion for 24. The Waterway Protection Tunnel remains under construction and will be completed by December 31, 2022. All green demonstration projects were constructed by MSD.
- **Current System Information**: Information regarding the status of MSD's wastewater system has been updated to reflect current conditions as of December 31, 2020 where appropriate throughout all chapters.
- **Historical Context**: Some information from the 2009 and 2012 documents remains to provide historical context related to the overall IOAP. A crosswalk summarizing the Volume 2 changes between the 2012 and 2021 IOAP documents was provided in Table 1.0-1.
- **Public Participation**: Information regarding MSD's public outreach and participation programs was deleted from Volume 2, Chapters 3 and 4, and updated and consolidated into Volume 1, Chapter 3.
- **Ohio River Water Quality Monitoring**: MSD continues to receive Ohio River water quality data from ORSANCO. During the contact recreation season, ORSANCO regularly samples for E-coli and fecal coliforms. On a weekly basis ORSANCO samples for river conditions and E-coli. On a bimonthly basis, ORSANCO samples for various water quality parameters to evaluate attainment of established water quality criteria. Every two years, ORSANCO completes the Ohio River Water quality Conditions 305(b) Report to confirm the river is of sufficient quality for its intended uses. Every ten years, ORSANCO evaluates water quality trends including ecological conditions. Information and result of ORSANCO's water quality programs is found at www.ORSANCO.org.
- **Beargrass Creek Water Quality Monitoring**: MSD continues to collect water quality samples from 16 sites along Beargrass Creek. MSD staff compiled bacteria and flow data collected near the Big 4 sites used to compute Event Mean Concentrations (EMCs) for 4 wet weather sample events: October 2010; September 2013; July 2014; and June 2017. It was determined that the June 2017 event too much antecedent rain to be considered a qualifying event.
- **Flow Monitoring:** MSD has greatly expanded its long-term flow monitoring network, including monitors on the combined sewer outfalls. MSD has been utilizing data from this network to recalibrate the hydrologic and hydraulic models used to size overflow abatement projects and refine individual project approaches and sizes based on an improved understanding of the sewer system operation and the relationship of certain overflows to one another.
- **In-Stream Monitoring**: MSD's program has an extensive in-stream monitoring effort for tributary streams and emergency spill responses, including ambient monitoring at 28 Long Term Monitoring Network (LTMN) locations across Jefferson County to monitor multiple physical and biological parameters in accordance with the MS4 permit. Recreational contact monitoring is conducted seasonally from May through October at 27 of the 28 ambient monitoring sites for E. coli.

- **Green Infrastructure**: Through December 2020, MSD has completed all green infrastructure demonstration projects as well the other green infrastructure program elements, totaling nearly $42 million for an incremental system benefit. MSD's commitment to capture and treat or remove 95 percent of the systemwide CSO volume exceeds the requirements of the CSO Policy Presumption Approach. Additional or future green infrastructure projects are not necessary to achieve the required LOC. The approach presented throughout Chapter 3 to develop and implement the program remains accurate.
- **System Storage**: Through December 2020, MSD had constructed or developed 126 MG of system storage. The Phase 1 Real Time Control Program provided a total of 41 MG of this storage. The remainder of the storage volume was attributed to the basins listed in Table 4.1-6, or additional RTC/ILS projects. By December 2022, the Waterway Protection Tunnel will provide an additional 52 MG of system storage. Upon completion of the LTCP, MSD will have 178 MG of total storage available to help manage wet weather.

ES.1.5.3. SSDP 2021 MODIFICATION TO VOLUME 3

The third volume describes MSD's planning approach and implementation of the 60 Sanitary Sewer Discharge Plan (SSDP) projects. The revisions incorporated into Volume 3 of the IOAP provide context for Second Amended Consent Decree (ACD) negotiated in 2021. In some places, the order which background information was presented was revised to be chronological. The 2021 updates and programmatic compliance status related to the Final SSDP are summarized herein.

- **Second ACD**: The Final SSDP initially included 60 projects. Through the adaptive management process, three projects have bene deleted. Of the 57 Final SSDP projects, 41 have been completed and 16 projects remain (refer to Table ES.1.1-6 respectively). The dates for completing the remaining SSDP projects were extended to 2025, 2030, or 2035. and Table ES.1.1-7
- **Current System Information**: Project modifications due to improved system characterization data, hydraulic model recalibration and other changed conditions are described in Chapters 3 and 4 to reflect current 2021 conditions.
- **Historical Context**: Some information from the 2009 and 2012 documents remain to provide historical context related to the overall IOAP. A crosswalk summarizing the Volume 3 changes between the 2012 and 2021 IOAP documents was provided in Table 1.0-1 of Volume 3.
- **Public Participation**: Information regarding MSD's public outreach and participation programs was deleted from Volume 3, Chapters 1 and 4, and updated and consolidated into Volume 1, Chapter 3.
- **Sanitary Sewer Overflow Plan (SSOP)**: MSD prepared and submitted the Updated Sanitary Sewer Overflow Plan (SSOP) on February 10, 2006. Activities required under the Updated SSOP have been completed.
- **Plumbing Modification Program (PMP):** Information regarding the PMP was deleted from Volume 3, Chapter 1 and updated and consolidated into Volume 1, Chapter 4, Section 4.5.1.
- **Capacity, Management, Operations, and Maintenance (CMOM) Program**: The CMOM Self-Assessment Report was submitted to EPA and KDEP on February 10, 2006. MSD

received a letter of approval on August 22, 2006. Although the program implementation deadlines from the CMOM Self-Assessment Report were previously met, MSD continues to enhance the activities. Highlights of the CMOM program implementation are provide annually in the Consent Decree Annual Report.

- **Sewer Overflow Response Protocol (SORP):** MSD initially submitted the Sewer Overflow Response Protocol (SORP) to EPA and KDEP on February 10, 2006, received comments on March 13, 2006, resubmitted on May 12, 2006 and received an approval letter for the SORP on August 22, 2006. MSD completely revised the SORP in 2011. Final approval of the updated SORP document was received February 21, 2012. Modifications were made to the document in 2016 to reflect the elimination of the Jeffersontown WQTC and were approved on July 21, 2017.
- **Interim Sanitary Sewer Discharge Plan (ISSDP)**: MSD submitted an Interim Sanitary Sewer Discharge Plan (ISSDP) for approval on September 30, 2007. Comments were received on January 8, 2008. MSD resubmitted the revised ISSDP on March 7, 2008 and received an approval letter for the ISSDP on July 24, 2008. All projects required by the ISSDP have been completed and certified.
- **Elimination of Small WQTCs**: During the development of the 2009 IOAP, MSD operated fifteen small WQTCs in addition to six regional plants. All fifteen of the small WQTCs, and one regional WQTC, have been eliminated and the flow has been rerouted to MSD's regional WQTCs.
- **Flow Monitoring**: As of December 2020, MSD has approximately 35 meters installed in long-term locations and 60 temporary meters that can be moved to validate/calibrate targeted areas of specific models. These values will continue to fluctuate as new meters are purchased and older meters are retired, but MSD is committed to maintaining a sufficient quantity of meters to monitor large system changes and reviewing targeted areas in detail.
- **Rain Gauge Network**: MSD has since expanded its rain gauge network, and rainfall data is gathered at 46 rain gauge sites. Some of the sites are outside of MSD's service area to better predict incoming rain events and to analyze rainfall patterns.
- **Rainfall Derived Infiltration/Inflow**: Since the 2009 IOAP, RDI/I have been evaluated in areas where rehabilitation was targeted. In some cases, rehab successfully reduced the RDI/I substantial amounts, and in other cases reductions were less successful. Prior to final design of an SSDP project, models are calibrated to their current condition, and future RDI/I reduction is removed from the model for final project sizing.
- **Hydraulic Models**: In 2010, each model was updated, and calibration was verified, and the results were used in the 2012 SSDP. Since the 2012 SSDP, each modeled area is generally reviewed every two years to determine if an update to the model is necessary. Models in rapidly growing areas are sometimes updated more frequently.

Table ES.1.1-3 Final LTCP Projects Including Project Modifications

	FINAL LTCP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 CSO(S) CONTROLLED & LEVEL OF CONTROL	2009 TECHNOLOGY AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 CSO(S) CONTROLLED & LEVEL OF CONTROL	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 CSO(S) CONTROLLED & APPROVED LEVEL OF CONTROL	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
1	CSO108 Dam Modification, *L_SO_MF_108_S_09A_B_A_4*	Beargrass Creek South Fork	4 overflows per TY for CSO 108	CSO Structure Improvements	$150,000	2010	4 overflows per TY for CSO 108	CSO Structure Improvements	No Change	No Change	2018. Project remains the same, based on additional calibration of the hydraulic model, the level of control was changed from 4 to 8 overflows per Typical Year.	8 overflows per TY for CSO 108	CSO Structure Improvements	$107,600	2010
2	Adams Street Sewer Separation (*formerly Storage Basin*), *L_OR_MF_172_S_09B_B_A_0*	Ohio River	0 overflows per TY for CSO 172	0.12 MG Storage Basin	$983,000	2012	0 overflows per TY for CSO 172	Sewer Separation	$20,000	2012	2012. Sewer separation replaced 0.12 MG storage basin. Upon inspection of the sewer system, all but two catch basins were separated already during recent redevelopment. MSD completed remaining separations.	0 overflows per TY for CSO 172	Sewer Separation	$92,300	2012
3	CSO 123 Downspout Disconnection, *L_MI_MF_123_S_08*	Beargrass Creek Middle Fork	CSO 123	Downspout Disconnection	$315,000	2012	No Change	Downspout Disconnection	No Change	No Change	No Change	CSO 123	Downspout Disconnection	Costs included under Green Program	2012
4	34th Street Flood Pump Station DWO Elimination, *L_OR_MF_019_S_03_A_B*	Ohio River	CSO019	Flow Control	$541,000	2012	No Change	Flow Control	No Change	No Change	No Change	LOC and CSOs Controlled Not Relevant	Flow Control	$646,000	2012
5	4th Street Flood Pump Station DWO Elimination, *L_OR_MF_022_M_03_A_A*	Ohio River	CSOs 022, 023	Flow Control	$944,000	2012	No Change	Flow Control	No Change	No Change	No Change	LOC and CSOs Controlled Not Relevant	Flow Control	$986,400	2012
6	27th Street Flood Pump Station DWO Elimination, *L_OR_MF_019_S_03_A_A*	Ohio River	CSO019	Flow Control	$476,000	2013	No Change	Flow Control	No Change	No Change	No Change	LOC and CSOs Controlled Not Relevant	Flow Control	$726,700	2013
7	Shawnee Flood Pump Station DWO Elimination, *L_OR_MF_189_M_03_A_A*	Ohio River	CSOs 104, 105, 189	Flow Control	$411,000	2013	No Change	Flow Control	No Change	No Change	No Change	LOC and CSOs Controlled Not Relevant	Flow Control	$1,065,100	2013
8	CSO 206 Sewer Separation, *L_MI_MF_206_S_08_A_A_0*	Beargrass Creek Middle Fork	CSO 206	Sewer Separation	$3,842,000	2013	No Change	Sewer Separation	No Change	No Change	No Change	0 overflows per TY for CSO 206	Sewer Separation	$577,300	2013
9	CSO058 In-Line Storage & Green Infrastructure, *L_OR_MF_058_S_08_A_A_0*	Ohio River	0 overflows per TY for CSO 058	Sewer Separation	$1,361,000	2014	8 overflows per TY for CSO 058	Sewer Separation	No Change	No Change	2014, 2020. In 2014 project changed to weir modifications to address surcharging in lieu of ineffectual sewer separation. In 2020 project incorporated into 13th & Rowan remedy.	8 overflows per TY for CSO 058	Sewer Separation	Costs included in Waterway Protection Tunnel LTCP Project #25	2014
10	17th Street Flood Pump Station DWO Elimination, *L_OR_MF_190_S_03_A_A*	Ohio River	CSO 190	Flow Control	$625,000	2014	No Change	Flow Control	No Change	No Change	No Change	LOC and CSOs Controlled Not Relevant	Flow Control	$756,500	2014
11	CSO140 In-Line Storage & Green Infrastructure Controls, *L_MI_MF_140_S_08_A_A_0*	Beargrass Creek Middle Fork	0 overflows per TY for CSO 140	Sewer Separation	$3,150,000	2015	0 overflows per TY for CSO 140	CSO Structure Improvements	$574,000	2015	2012. Reconstructed the CSO structure to increase the low flow line to a 42-inch diameter opening which increased the conveyance capacity in lieu of sewer separation.	0 overflows per TY for CSO 140	CSO Structure Improvements	$54,700	2015

Table ES.1.1-3 Final LTCP Projects Including Project Modifications

	FINAL LTCP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 CSO(S) CONTROLLED & LEVEL OF CONTROL	2009 TECHNOLOGY AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 CSO(S) CONTROLLED & LEVEL OF CONTROL	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 CSO(S) CONTROLLED & APPROVED LEVEL OF CONTROL	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
12	CSO160 In-Line Storage & Green Infrastructure, *L_OR_MF_160_S_08_A_A_0*	Ohio River	0 overflows per TY for CSO 160	Sewer Separation	$237,000	2015	0 overflows per TY for CSO 160	In-Line Storage and Sewer Separation	$231,000	2015	2012. In-line storage provided by a combination of raising the existing overflow weir and installing 88 feet of 72-inch diameter pipe.	0 overflows per TY for CSO 160	In-Line Storage and Sewer Separation	$248,200	2015
13	CSO093 Structural Modifications & Green Infrastructure, *L_SO_MF_093_S_08_A_A_0*	Beargrass Creek South Fork	0 overflows per TY for CSO 093	Sewer Separation	$952,000	2015	0 overflows per TY for CSO 093	CSO Structure Improvements	$488,000	2015	2012. Reconstruction of the CSO structure replaced the existing leaping weir with a more conventional overflow weir in lieu of sewer separation.	0 overflows per TY for CSO 093	CSO Structure Improvements	$1,693,200	2015
14	Story Avenue & Spring Street Green Infrastructure (*formerly Storage Basin*), *L_SO_MF_130_S_09B_B_A_8*	Beargrass Creek South Fork	8 overflows per TY for CSO 130	0.01 MG Storage Basin	$1,077,000	2016	8 overflows per TY for CSO 130	Green Projects	$896,000	2016	2012. Construction of a suite of green infrastructure projects in lieu of the storage basin.	8 overflows per TY for CSO 130	Green Projects	$1,070,000	2016
15	CSO190 Green Infrastructure Solution *(formerly 18th & Northwestern Pkwy Storage Basin)*, *L_SO_MF_190_S_09B_B_A_8*	Ohio River	8 overflows per TY for CSO 190	1.31 MG Storage Basin	$4,514,000	2017	8 overflows per TY for CSO 190	1.24 MG Storage Basin	$5,039,000	2017	2015. Green infrastructure solutions for CSO 190 replaced the storage basin at 18th and Northwestern Parkway.	8 overflows per TY for CSO 190	Green Infrastructure	$6,418,200	2017
16	Bells Lane Wet Weather Treatment Facility *(formerly Paddy's Run)*, *L_OR_MF_015_M_13_B_B_8*	Ohio River	8 overflows per TY for CSO 015, 191	50 MGD Treatment Facility	$24,940,000	2014	8 overflows per TY for CSO 015, 191	50 MGD Treatment Facility, 25 MG Storage via Real Time Control Optimization of Main Diversion Structure	$68,472,000	2016	2012, 2016. Optimization of flow through Morris Forman's Main Diversion Structure and MSD's Real Time Control strategy added storage volume. Additional time for construction was requested due to size increase, moving the site, offline storage, and integration of Southwestern Pump Station. Changed completion deadline from December 31, 2016 to September 30, 2017.	8 overflows per TY for CSOs 015 and 191	50 MGD Treatment Facility, 25 MG Storage via Real Time Control Optimization of Main Diversion Structure	$51,761,000	2017
17	Nightingale Pump Station Replacement & Storage, *L_SO_MF_018_S_03_A_A*	Beargrass Creek South Fork	0 overflows per TY for CSO 018	60 MGD Pump Station, 0 MG Storage	$15,710,000	2016	0 overflows per TY for CSO 0180 overflows per TY for CSO 018	33 MGD Pump Station with 7.7 MG Storage	$22,123,000	2016	2012, 2016. In 2012 reduced pumping capacity from 60 MGD to 33 MGD and added a 7.7 MG Storage Basin. In 2016, changed completion deadline from December 31, 2016 to June 30, 2017.	0 overflows per TY for CSO 018	33 MGD Pump Station with 7.7 MG Storage	$38,032,000	2017
18	Logan & Breckenridge Street Storage Basin, *L_SO_MF_092_M_09B_B_D_8* *(includes former Beargrass Creek Parallel Interceptor Project)* *(includes former Calvary - Creekside Storage Basin Project)*	Beargrass Creek South Fork	8 overflows per TY for CSOs 091, 113, 117, 146, 149, 152	Logan 11.83 MG Basin Calvary 3.46 MG Basin Combined 15.29 MG	Logan $30,320,000 Calvary $13,720,000 Combined $44,040,000	2017	8 overflows per TY for CSOs 091, 097, 106, 110, 111, 113, 117, 137, 146, 148, 149, 151, 152	Calvary Creekside Basin & Beargrass Parallel Interceptor eliminated and consolidated with 16.6 MG storage at the Logan Street Basin	$48,243,000	2018	2016. Technical functionality of project remained the same. Modified project to bury the basin and allow community-accessible open space above it.	8 overflows per TY for CSOs 091, 097, 106, 110, 111, 113, 117, 137, 146, 148, 149, 151, 152	16.6 MG Storage Basin	$92,821,600	2017

Table ES.1.1-3 Final LTCP Projects Including Project Modifications

	FINAL LTCP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 CSO(S) CONTROLLED & LEVEL OF CONTROL	2009 TECHNOLOGY AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 CSO(S) CONTROLLED & LEVEL OF CONTROL	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 CSO(S) CONTROLLED & APPROVED LEVEL OF CONTROL	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
19	Southern Outfall In-Line Storage at 43rd Street (SOR1) (*formerly Algonquin Parkway Storage Basin*), *L_OR_MF_211_M_13_B_A_8*	Ohio River	*former project subsequently eliminated and replaced in 2012: 8 overflows per TY for CSO 016, 210, 211*	*former project subsequently eliminated and replaced in 2012: 4.84 MG Storage Basin*	*former project subsequently eliminated and replaced in 2012: $17,300,000*	*former project subsequently eliminated and replaced in 2012: 2018*	8 overflows per TY for CSO 016, 210, 211	11.4 MG In-Line Storage	$3,544,000	2018	2012. Optimized operating rules between the Bells Lane Wet Weather Treatment Facility and the Morris Forman WQTC's Main Diversion Structure demonstrated that only inline storage was needed at SOR1 and SOR2. Eliminated the Algonquin storage basin portion of the project.	8 overflows per TY for CSOs 016, 210. 211	11.4 MG In-Line Storage	$2,999,500	2018
20	Central Relief Drain CSO In-Line Storage, Green Infrastructure & Distributed Storage, *LOR_MF_155_M_09B_B_B_4-1*	Ohio River	N/A	N/A	N/A	N/A	8 overflows per TY for CSOs 028, 029, 034, 036, 178, 181, 193, 195, 196, 197, 199, 200X, 202	Diversion, Weir Modifications, Green Infrastructure	$2,184,000	2020	2012. Project was added to the IOAP in order to split the Central Relief Drain work from the 13th Street & Rowan Project.	8 overflows per TY for CSOs 028, 029, 034, 036, 178, 181, 193, 195, 196, 197, 199, 200X, 202	Diversion, Weir Modification, Green Infrastructure	$569,572	2018
21	Morris Forman WQTC Headworks Improvements *(formerly Algonquin Parkway Storage Basin and formerly SOR2), L_OR_MF_160_S_08_A_A_0*	Ohio River	*former project subsequently eliminated and replaced in 2012: 8 overflows per TY for CSO 016, 210, 211*	*former project subsequently eliminated and replaced in 2012: 4.84 MG Storage Basin*	*former project subsequently eliminated and replaced in 2012: $17,300,000*	*former project subsequently eliminated and replaced in 2012: 2018*	8 overflows per TY for CSOs 016, 210, 211	In-Line Storage at two locations SOR1, SOR2	$3,544,000	2018	2012. In 2012, eliminated SOR2 project and replaced with flow control improvements at the Main Diversion Structure and rehabilitation of Morris Forman WQTC Headworks in order to increase maximum sustainable treatment capacity to 330 MGD.	8 overflows per TY for CSOs 016, 210, 211	Flow Control, Treatment Improvement	$13,175,805	2018
22	Clifton Heights Storage Basin, *L_MU_MF_154_M_09B_B_A_8*	Beargrass Creek Muddy Fork	8 overflows per TY for CSOs 132, 154, 167	6.55 MG Storage Basin	$13,870,000	2018	4 overflows per TY for CSOs 132, 154, 167	4.28 MG Storage Basin	$14,166,000	2018	2012, 2014. In 2012 revised basin from 6.55 MG to 4.28 MG and level of control from 8 overflows per Typical Year to 4. In 2014, revised basin size to 7.0 MG.	4 overflows per TY for CSOs 088, 131, 132, 154, 167	7.0 MG Storage Basin	$33,390,500	2018
23	Portland CSO Basin, *L_OR_MF_019_S_13_B_A_8*	Ohio River	8 overflows per TY for CSO 019	6.37 MG Storage Basin	$20,000,000	2019	No Change	6.37 MG Storage Basin	No Change	No Change	2015. Increased basin size from 6.37 MG to 6.7 MG. The larger size does not reduce CSO occurrences significantly but does provide a reduced residual AAOV.	8 overflows per TY for CSO 019	6.7 MG Storage Basin	$37,894,500	2019

Table ES.1.1-3 Final LTCP Projects Including Project Modifications

	FINAL LTCP PROJECT NAME AND IOAP ID		RECEIVING STREAM	2009 CSO(S) CONTROLLED & LEVEL OF CONTROL	2009 TECHNOLOGY AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 CSO(S) CONTROLLED & LEVEL OF CONTROL	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 CSO(S) CONTROLLED & APPROVED LEVEL OF CONTROL	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
24	Southwestern Parkway Storage Basin, *L_OR_MF_105_M_13_B_A_0*		Ohio River	0 overflows per TY for CSOs 104, 105, 189	5.08 MG Storage Basin	$17,620,000	2018	0 overflows per TY for CSOs 104, 105, 189	11.07 MG Storage Basin	$30,937,000	2018	2012, 2015, 2018. In 2012, increased basin size form 5.08 MG to 11.07 MG. In 2015, increased basin size from 11.07 MG to 20 MG, with a level of control of 8 overflows per Typical Year and no net system-wide increase in AAOV. In 2018, Revised project deadline to June 30, 2019 and corrected inline storage volume submitted with 2015 minor modification fact sheet to 6.3 MG.	8 overflows per TY for CSOs 104, 105, 189	20 MG Storage basin, 6.3 MG In-Line Storage	$80,623,100	2019
25	Waterway Protection Tunnel	*(formerly I-64 & Grinstead CSO Basin), L_MI_MF_127_M_09B_B_A_8)*	Beargrass Creek Middle Fork	8 overflows per TY for CSOs 125, 126, 127, 166	2.74 MG Storage Basin	$12,950,000	2014	4 overflows per TY for CSOs 125, 126, 127, 166	8.5 MG Storage Basin + Storm water Diversions	$48,591,000	2020	2012, 2015, 2016, 2018.In 2012, basins sizes were adjusted based on re-calibration. In 2015, basin sizes were adjusted as part of Basin Balancing Modification. In 2016, revised design to a 31.8 MG tunnel solution that consolidates CSO controls for 13th Street and Rowan Street, Story Avenue and Main Street, and Lexington and Payne Street Storage Basins. In 2018, changed project name to "Waterway Protection Tunnel" and revised design to a 52.2 MG tunnel solution that consolidates CSO controls for Ohio River Tunnel and I-64 & Grinstead Drive Storage Basin.	8 overflows per TY for CSOs 020, 022, 023, 050, 051, 052, 053 ,054, 055, 056, 058, 062, 150, 155 4 overflows per TY for CSOs 125, 126, 127, 166 0 overflows per TY for CSOs 082, 083, 084, 118, 119, 120, 121, 141, 153	52.2 MG CSO Storage Tunnel	$253,401,700	2022
		(formerly 13th Street & Rowan Street Storage Basin), L_OR_MF_155_M_09B_B_B_4)	Ohio River	4 overflows per TY for CSOs 022, 023, 050, 051, 052, 053 ,054, 055, 056, CRD, 150, 155	14.44 MG Storage Basin	$49,680,000	2020	8 overflows per TY for CSOs 022, 023, 050, 051, 052, 053 ,054, 055, 056, 058, 150, 155	4.36 MG Storage Basin	$27,863,200	2020					
		(formerly Story Avenue & Main Street Storage Basin), L_OR_MF_020_S_09B_B_A_8)	Ohio River	8 overflows per TY for CSO 020	0.13 MG Storage Basin	$1,580,000	2013	8 overflows per TY for CSO 020	5.42 MG Storage Basin	$12,576,000	2020					
		(formerly Lexington Road & Payne Street Storage Basin), L_SO_MF_083_M_09B_B_A_8)	Beargrass Creek South Fork	8 overflows per TY for CSOs 082, 084, 118, 119, 120, 121,141, 153	7.31 MG Storage Basin	$25,200,000	2020	0 overflows per TY for CSOs 082, 084, 118, 119, 120, 121,141, 153	8.18 MG Storage Basin	$25,904,000	2020					

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
CEDAR CREEK AREA															
1	Running Fox PS Elimination *S_CC_CC_MSD1080_S_01-C*	Little Cedar Creek	2-yr, 3-hr storm for MSD1080-LS	Flow Diversion	$99,000	2023	No change	Flow Diversion	$59,700	2023	No change	2-yr, 3-hr storm for MSD1080-LS	Flow Diversion	$59,700	2010
2	Fairmount Rd PS Off-line Storage *S_FF_CC_81316_M_03_C_A*	Big Run	N/A	N/A	N/A	N/A	2-yr, 3-hr storm for 81316, 97362	Off-Line Storage	$13,439,000	2015	2012. Project added to send the flows from eliminated Jeffersontown WQTC to the Cedar Creek WQTC.	2-yr, 3-hr storm for 81316, 97362	Off-Line Storage	$14,753,500	2015
3	Idlewood Inline Storage *S_CC_CC_70158_M_09A_C*	Cedar Creek	2-yr, 3-hr storm for 28998, 28984, 63094, 63095, 70158	Inline Storage	$2,921,000	2023	No change	Inline Storage	$2,317,000	2023	2021.Revised completion date to December 31, 2025.	2-yr, 3-hr storm for 28998, 28984, 63094, 63095, 70158	Inline Storage	$4,087,400	2025
4	Bardstown Rd PS Improvements *S_CC_CC_MSD1025_S_03_B*	Big Run	5-yr, 3-hr storm for 88545	PS Upgrade	$401,000	2021	No change	PS Upgrade	$401,000	2021	2021.Revised completion date to December 31, 2030.	5-yr, 3-hr storm for 88545	PS Upgrade	$3,400,000	2030
5	Little Cedar Creek Interceptor Improvements *S_CC_CC_67997_M_01_C*	Little Cedar Creek	2-yr, 3-hr storm for 67997, 67999, 86423, 86424, 89195, 89196, 89197	Pipe Upgrades	$2,921,000	2024	No Change	Pipe Upgrades	$2,921,000	2024	2021.Revised completion date to December 31, 2025. Future. Modeling on-going, project may be eliminated.	2-yr, 3-hr storm for 67997, 67999, 86423, 86424, 89195, 89196, 89197	Pipe Upgrades	$2,400,000	2025
HITE CREEK AREA															
6	Floydsburg Rd SSES, Rehabilitation and PS Upgrade *S_HC_HC_MSD1086_M_07_C_A*	Floyds Fork, South Fork Harrods Creek	2-yr, 3-hr for MSD1086-PS, 90776, 108956, 108957, 108958	I/I Reduction	$59,000	2016	No change	I/I Reduction	$59,000	2010	No change	2-yr, 3-hr for MSD1086-PS, 90776, 108956, 108957, 108958	I/I Reduction	$50,200	2010
7	Meadow Stream PS & Force Main Upgrade *S_HC_HC_MSD1082_S_09A_C*	Floyds Fork	2-yr, 3-hr storm for 91087, MSD1082-PS	0.5 MG Storage Basin	$1,198,000	2010	10-yr, 3-hr storm for 91087, MSD1082-PS	3.89 MGD PS, new 18-inch FM	$1,011,900	2012	2012. Project changed from small storage basin to PS upgrade and new FM due to capacity needs of Crestwood. Changed LOC from 1.82 inch to 2.6 inch.	10-yr, 3-hr storm for 91087, MSD1082-PS	3.89 MGD PS, new 18-inch FM	$1,011,900	2012
8	Kavanaugh Rd PS Improvements *S_HC_HC_MSD1085_S_03_A*	Hite Creek	10-yr, 3-hr storm for MSD1085-PS	PS & FM Upgrades	$1,729,000	2024	No change	PS & FM Upgrades	$1,729,000	2024	2021.Revised completion date to December 31, 2025.	10-yr, 3-hr storm for MSD1085-PS	PS & FM Upgrades	$4,300,000	2025
FLOYDS FORK AREA															
9	Woodland Hills PS Diversion *S_FF_FF_NB01_S_01_C_A*	Pope Lick	2-yr, 3-hr storm for 33003, 65531	Flow Diversion	$21,000	2011	No change	Flow Diversion	$19,400	2011	No change	2-yr, 3-hr storm for 33003, 65531	Flow Diversion	$19,400	2010
10	Eden Care PS SSO Investigation *S_FF_FF_NB02_S_13_C*	Floyds Fork	N/A storm for Eden Care PS (MSD1105-PS)	Monitoring	N/A	2012	N/A	Monitor	N/A	2012	2012. One overflow documented at this location. MSD cleaned sewers in the vicinity and had no documented overflows for more than 3 years.	N/A	Monitoring Complete	N/A	2012

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
11	Ashburton PS Improvements and Diversion *S_FF_FF_NB03_M_01_C_A*	Floyds Fork	2-yr, 3-hr storm for Olde Copper Court PS (MSD0165-PS), Ashburton PS (MSD0166-PS)	FM & Pipes Upgrade	$168,000	2021	No change	FM & Pipes Upgrade	$30,300	2009	No change	2-yr, 3-hr storm for Olde Copper Court PS (MSD0165-PS), Ashburton PS (MSD0166-PS)	FM & Pipes Upgrade	$30,300	2009
JEFFERSONTOWN AREA															
12	Jeffersontown WQTC Elimination *S_JT_NB01_M_01_C_A*	Chenoweth Run	2-yr, 3-hr storm for 28390, 28391, 28392, 28395, 28551, 31733, Jeffersontown WQTC (28173, 64505, MSD0255, ISO28-SI)	Offline Storage, Pipe Upgrades, WQTC Eliminations	$28,386,000	2015	No change	Offline Storage, Pipe Upgrades, WQTC Eliminations	$38,773,700	2015	2010. Modified elimination plan to move new PS to Municipal Yard and divert portion of service area to Cedar Creek WQTC.	2-yr, 3-hr storm for 28390, 28391, 28392, 28395, 28551, 31733, Jeffersontown WQTC (28173, 64505, MSD0255, ISO28-SI)	Offline Storage, Pipe Upgrades, WQTC Eliminations	$38,773,700	2015
13	Chenoweth Hills WQTC Elimination and PS Improvements *S_JT_JT_NB01A_M_03_C*	Chenoweth Run	2-yr, 3-hr storm for Chenoweth Run PS (MSD0196-PS, 86052, 64096), Chenoweth WQTC PS (MSD0263A-PS), Chenoweth Hills WQTC (MSD0263)	Flow Diversion, WQTC Eliminations	$3,749,000	2015	No change	Flow Diversion, WQTC Eliminations	$3,749,000	2015	2015. Eliminated Pump Stations and WQTC via gravity to Cedar Creek.	2-yr, 3-hr storm for Chenoweth Run PS (MSD0196-PS, 86052, 64096), Chenoweth WQTC PS (MSD0263A-PS), Chenoweth Hills WQTC (MSD0263)	Flow Diversion, WQTC Eliminations	$3,011,700	2015
14	Dell Rd & Charlane Parkway Interceptor *S_JT_JT_NB02_M_01_C*	Beatty Brook	2-yr, 3-hr storm Charlane Pkwy (28250, 28249, 28340, 28336, 104289,) Dell Rd (28413, 28414, 28415, 28416, 28417)	Pipe Upgrades	$1,347,000	2022	No Change	Pipe Upgrades	$1,347,000	2022	2021.Revised completion date to December 31, 2030.	2-yr, 3-hr storm Charlane Pkwy (28250, 28249, 28340, 28336, 104289,) Dell Rd (28413, 28414, 28415, 28416, 28417)	Pipe Upgrades	$8,800,000	2030
15	Raintree and Marian Court PS Eliminations Phase 1 *S_JT_JT_NB03_M_01_C*	Beatty Brook	2-yr, 3-hr storm for Marian Ct PS (28729), Raintree PS (MSD0149-PS)	Flow Diversion	$371,000	2021	2-yr, 3-hr storm for Marian Ct PS (28729), Raintree PS (MSD0149-PS)	Flow Diversion	$371,000	2021	2021.Revised completion date to December 31, 2025.	2-yr, 3-hr storm for Marian Ct PS (28729), Raintree PS (MSD0149-PS)	Flow Diversion	$165,700	2025
16	Raintree and Marian Court PS Eliminations Phase 2 *S_JT_JT_NB03_M_01_C*		2-yr, 3-hr storm for 28719, 28711	Pipe Upgrades	$1,062,000	2021	2-yr, 3-hr storm for 28719, 28711	Pipe Upgrades	Cost combined with Phase 1	2021	2021.Revised completion date to December 31, 2030. Future: Lag in schedule allows flow monitoring for Phase 1 PS eliminations.	2-yr, 3-hr storm for 28719, 28711	Pipe Upgrades	$1,800,000	2030
17	Monticello PS Elimination *S_JT_JT_NB04_M_01_A*	Fern Creek	10-yr, 3-hr storm for Monticello Place PS (MSD0151-PS, 27969)	Flow Diversion	$304,000	2022	10-yr, 3-hr storm for Monticello Place PS (MSD0151-PS, 27969)	Flow Diversion	$207,000	2022	2021.Revised completion date to December 31, 2025. Future: Flow monitoring and calibration underway – project may not be necessary.	10-yr, 3-hr storm for Monticello Place PS (MSD0151-PS, 27969)	Flow Diversion	$464,000	2025

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
MIDDLE FORK AREA															
18	Middle Fork Relief Interceptor, Wet Weather Storage, Upper Middle Fork LS Diversion Phase 1: Buechel Basin *S_MISF_MF_NB01_M_01_C_A1*	Middle Fork Beargrass Creek	2-yr, 3-hr storm for 02932, 02932, 02933, 02935, 08537, 23211, 23212, 27005, 51221, 51160, 51161, 45835, 47583, 47593, 47596, 47603, 47604, 90700, IS021A-SI, 08935-SM	Storage Basin	$15,170,000	2023	No Change	Storage Basin	$33,684,200	2013	No Change	2-yr, 3-hr storm for 02932, 02932, 02933, 02935, 08537, 23211, 23212, 27005, 51221, 51160, 51161, 45835, 47583, 47593, 47596, 47603, 47604, 90700, IS021A-SI, 08935-SM	Storage Basin	$33,684,200	2013
19	Middle Fork Relief Interceptor, Wet Weather Storage, Upper Middle Fork LS Diversion Phase 2: UMFLS & Relief Interceptor *S_MISF_MF_NB01_M_01_C_A1*			1.6 MG Offline Storage, PS & FM Upgrades	$19,889,000	2023	No Change	1.6 MG Offline Storage at UMFLS, PS & FM Upgrades	$19,889,000	2023	2018. Replaced offline storage at UMFLS with new 30 MGD PS at UMF Site. 2021.Revised completion date to December 31, 2030.		New 30 MGD PS, Pipe & FM Upgrades	$86,408,000	2030
20	Goose Creek PS Improvements and Wet Weather Storage Phase 1: Devondale PS *S_MI_MF_NB04_M_03_B*	Goose Creek	5-yr, 3-hr storm 46891, 62418, 91629, 91630, 10593, 43472, 21628-W	Offline Storage, PS & FM Upgrades	$2,775,000	2023	No Change	Offline Storage, PS & FM Upgrades	$2,775,000	2016	2015. Combined project with Bancroft WQTC elimination. Moved storage and PS to Bancroft site instead of Devondale PS.	5-yr, 3-hr storm 46891, 62418, 91629, 91630, 10593, 43472, 21628-W	Offline Storage, PS & FM Upgrades	$5,242,800	2016
21	Goose Creek PS Improvements and Wet Weather Storage Phase 2: Goose Creek PS Improvement *S_MI_MF_NB04_M_03_B*			PS & FM Upgrades	$1,676,000	2023	No Change	PS & FM Upgrades	$1,676,000	2023	2021.Revised completion date to December 31, 2035.		PS & FM Upgrades	$6,978,600	2035
22	Anchor Estates PS Elimination Phase 1: Anchor PS Elimination *S_MI_MF_NB06_M_01_A_A_1*	Middle Fork Beargrass Creek	10-yr, 3-hr storm for 0056-W, 00746, MSD0057-LS	Flow Diversion	$66,000	2016	No Change	Flow Diversion	$66,000	2016	No Change	10-yr, 3-hr storm for 0056-W, 00746, MSD0057-LS	Flow Diversion	$83,200	2016
23	Anchor Estates PS Elimination Phase 2: Vannah Way PS Elim. *S_MI_MF_NB06_M_01_A_A_1*		10-yr, 3-hr storm for 01106	, Flow Diversion	$2,275,000	2011	No Change	, Flow Diversion	$3,878,900	2011	No Change	10-yr, 3-hr storm for 01106	, Flow Diversion	$3,878,900	2011
24	Hurstbourne I/I Investigation & Rehabilitation *S_MI_MF_NB07_S_07_C*	Hurstbourne Creek	2-yr, 3-hr storm for 01793	I/I Reduction	$569,000	2011	No Change	I/I Reduction	$773,200	2011	No Change	2-yr, 3-hr storm for 01793	I/I Reduction	$773,200	2011
SOUTHEASTERN DIVERSION AREA															
25	Parkview Estates I/I Investigation & Rehabilitation *S_SD_MF_NB03_S_07_C*	South Fork Beargrass Creek	2-yr, 3-hr storm for 47250	I/I Reduction	$302,000	2011	No Change	I/I Reduction	$29,600	2011	No Change	2-yr, 3-hr storm for 47250	I/I Reduction	$29,600	2011
26	Klondike Interceptor *S_SD_MF_NB04_S_01_B_A*	South Fork Beargrass Creek	5-yr, 3-hr storm for 25676, 26650, 26651	Pipe Upgrades	$666,000	2014	No Change	Pipe Upgrades	$2,231,000	2014	No Change	5-yr, 3-hr storm for 25676, 26650, 26651	Pipe Upgrades	$2,231,000	2014
27	Sutherland Interceptor *S_SD_MF_NB05_M_01_A*	South Fork Beargrass Creek	10-yr, 3-hr storm for 16649	Pipe Upgrades	$623,000	2023	10-yr, 3-hr storm for 16649	Pipe Upgrades	$623,000	2023	2021.Revised completion date to December 31, 2030.	10-yr, 3-hr storm for 16649	Pipe Upgrades	$1,065,300	2030
28	Beargrass Interceptor Rehabilitation Phase 2 *S_SD_MF_NB06_S_13_C*	South Fork Beargrass Creek	2-yr, 3-hr storm for 51594	Pipe Rehabilitation	$59,000	2010	2-yr, 3-hr storm for 51594	Pipe Rehabilitation	$29,700	2010	No Change	2-yr, 3-hr storm for 51594	Pipe Rehabilitation	$29,700	2010
POND CREEK AREA															

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
29	Charleswood Interceptor Extension *S_PO_WC_PC03_M_01_C*	Fishpool Creek	2-yr, 3-hr storm 25477, 25478, 25480, MSD0130-PS	Pipe Upgrades	$886,000	2015	2-yr, 3-hr storm 25477, 25478, 25480, MSD0130-PS	Pipe Upgrades	$1,213,400	2015	No Change	2-yr, 3-hr storm 25477, 25478, 25480, MSD0130-PS	Pipe Upgrades	$1,213,400	2015
30	Cinderella PS Elimination *S_PO_WC_PC04_M_01_C*	Fishpool Creek	2-yr, 3-hr storm 60679, MSD1013-PS, 35309	Flow Diversion	$3,395,000	2025	2-yr, 3-hr storm 60679, MSD1013-PS, 35309	Flow Diversion	$1,500,000	2025	2021.Revised completion date to December 31, 2025.	2-yr, 3-hr storm 60679, MSD1013-PS, 35309	Flow Diversion	$1,500,000	2025
31	Lantana PS I/I Investigation & Rehabilitation *S_PO_WC_PC05_M_07_C*	Pennsylvania Run	2-yr, 3-hr storm 25484, 93719, MSD0101-PS	I/I Reduction	$21.000	2011	2-yr, 3-hr storm 25484, 93719, MSD0101-PS	Investigation Complete	$164,000	2011	No Change	2-yr, 3-hr storm 25484, 93719, MSD0101-PS	Investigation Complete	$164,000	2011
32	Government Center PS Elimination *S_PO_WC_PC06_M_01_C*	Pennsylvania Run	10-yr, 3-hr storm for MSD0180-PS	Flow Diversion	$1,909,000	2011	10-yr, 3-hr storm for MSD0180-PS	Flow Diversion	$353,600	2011	No Change	10-yr, 3-hr srm for MSD0180-PS	Flow Diversion	$353,600	2011
33	Avanti PS Elimination *S_PO_WC_PC07_M_01_A*	Little Cedar Creek	2-yr, 3-hr storm for 21229-W	Flow Diversion	$32,000	2009	2-yr, 3-hr storm for 21229-W	Flow Diversion	$32,000	2009	No Change	2-yr, 3-hr storm for 21229-W	Flow Diversion	$32,000	2009
34	Lea Ann Way System Improvements *S_PO_WC_PC08_M_01_C*	Fern Creek	2-yr, 3-hr storm 19360, 19369, 29933, 29948, 29943, 31083, 31084, 79076, MSD1010-PS	Pipe Upgrades	$987,000	2015	2-yr, 3-hr storm 19360, 19369, 29933, 29948, 29943, 31083, 31084, 79076, MSD1010-PS	Pipe Upgrades	$4,863,900	2015	2012. Combined SSES projects and performed additional sewer inspection and rehabilitation.	2-yr, 3-hr storm 19360, 19369, 29933, 29948, 29943, 31083, 31084, 79076, MSD1010-PS	Pipe Upgrades	$4,863,900	2015
35	Caven Ave PS Elimination & Offline Storage Phase 1: Caven Ave PS Elimination *S_PO_WC_PC09_M_09B_C*	Fishpool Creek	2-yr, 3-hr storm for 27116, MSD0133-PS	Offline Storage	$1,672,000	2016	2-yr, 3-hr storm for 27116, MSD0133-PS	Flow Diversion	$2,923,000	2016	2012. Elimination of nearby WQTC allowed for PS elimination instead of offline storage.	2-yr, 3-hr storm for 27116, MSD0133-PS	Flow Diversion	$2,923,000	2016
E	Caven Ave PS Elimination & Offline Storage Phase 2: Outer Loop Storage *S_PO_WC_PC09_M_09B_C*		2-yr, 3-hr storm for 70212, 17724	Offline Storage	Cost combined with Phase 1	N/A	2-yr, 3-hr storm for 70212, 17724	Project Eliminated	N/A	N/A	2012. Project eliminated due to new flow monitoring and model re-calibration.	2-yr, 3-hr storm for 70212, 17724	Project Eliminated	N/A	N/A
36	Leven PS Elimination *S_PO_WC_PC10_M_01_C*	Pennsylvania Run	2-yr, 3-hr storm for 36419, MSD1019-PS	Flow Diversion	$352,000	2022	2-yr, 3-hr storm for 36419, MSD1019-PS	Flow Diversion	$352,000	2022	2021.Revised completion date to December 31, 2025.	2-yr, 3-hr storm for 36419, MSD1019-PS	Flow Diversion	$720,000	2025
37	Edsel PS I/I Investigation & Rehabilitation *S_PO_WC_PC11_M_07_C*	Fern Creek	2-yr, 3-hr storm for 92098, MSD1048-PS	I/I Reduction	$389,000	2011	2-yr, 3-hr storm for 92098, MSD1048-PS	I/I Reduction	$1,289.800	2011	No Change	2-yr, 3-hr storm for 92098, MSD1048-PS	I/I Reduction	$1,289.800	2011
OHIIO RIVER FORCE MAIN (ORFM) AREA															
38	Mellwood System Improvements, PS Eliminations, Phase 1: Mellwood PS *S_OR_MF_NB01_M_01_B*	Muddy Fork Beargrass Creek	5-yr, 3-hr storm 26752, 41374, 41416, MSD0007-PS, MSD0010-PS, 24472, MSD0023-PS, 24152-W, MSD0024-PS	PS Replacement	$2,369,000	2012	5-yr, 3-hr storm 26752, 41374, 41416, MSD0007-PS, MSD0010-PS, 24472, MSD0023-PS, 24152-W, MSD0024-PS	Flow Diversion, PS and Pipe Upgrades	$2,369,000	2012	No Change	5-yr, 3-hr storm 26752, 41374, 41416, MSD0007-PS, MSD0010-PS, 24472, MSD0023-PS, 24152-W, MSD0024-PS	PS Replacement	$3,275,800	2012
39	Mellwood System Improvements, PS Eliminations, Phase 2: Mockingbird Valley & Winton PS *S_OR_MF_NB01_M_01_B*			Flow Diversion, PS and Pipe Upgrades	$1,302,000	2024		Flow Diversion, PS and Pipe Upgrades	$1,302,000	2024	2021.Revised completion date to December 31, 2030.		Flow Diversion, PS and Pipe Upgrades	$2,516,100	2030

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
40	Leland Road SSO Investigation *S_OR_MF_NB02_A_13_C*	Cherrywood Creek	N/A storm for 96020	Condition Assessment	N/A	N/A	N/A	Condition Assessment	N/A	N/A	2012. One overflow documented at this location. MSD cleaned sewers in the vicinity and had no documented overflows for more than 3 years.	N/A	Assessment Completed	N/A	2012
41	Derington Ct. PS I/I Investigation & Rehabilitation *S_OR_MF_NB03_S_07_C*	Goose Creek	2-yr, 3-hr storm for MSD0095-PS	I/I Reduction	$290,000	2012	2-yr, 3-hr storm for MSD0095-PS	I/I Reduction	N/A	2012	No Change	2-yr, 3-hr storm for MSD0095-PS	I/I Reduction	Included in FY12 I/I Budget	2012
42	Prospect WQTC Elimination, Harrods Creek PS, ORFM System Improvements Phase 1: WQTC Eliminations *S_OR_MF_NB04_M_3_B_B*	Little Goose Creek	5-yr, 3-hr storm 40870, 40871, 40872, 42680, 65633, 65635, 22436, MSD0123-PS, MSD1044-PS, MSD0183-PS, MSD0192-PS, MSD0193-PS, MSD1063-PS, MSD0292	WQTC Elimination	$34,062,000	2015	5-yr, 3-hr storm 40870, 40871, 40872, 42680, 65633, 65635, 22436, MSD0123-PS, MSD1044-PS, MSD0183-PS, MSD0192-PS, MSD0193-PS, MSD1063-PS, MSD0292	WQTC Elimination	$34,062,000	2015	No Change	5-yr, 3-hr storm 40870, 40871, 40872, 42680, 65633, 65635, 22436, MSD0123-PS, MSD1044-PS, MSD0183-PS, MSD0192-PS, MSD0193-PS, MSD1063-PS, MSD0292	WQTC Elimination	$1,941,900	2015
43	Prospect WQTC Elimination, Harrods Creek PS, ORFM System Improvements Phase 2: HCPS & FM *S_OR_MF_NB04_M_3_B_B*			PS and Pipe Upgrades		2015		PS and Pipe Upgrades		2015	No Change		PS and Pipe Upgrades		2015
44	Prospect WQTC Elimination, Harrods Creek PS, ORFM System Improvements Phase 3: ORFM System Improvements *S_OR_MF_NB04_M_3_B_B*			Flow Diversion, PS and Pipe Upgrades		2016		Flow Diversion, PS and Pipe Upgrades		2016	2015. Replaced Muddy Fork Interceptor Upsizing with Muddy Fork Offline Storage Basin.		Flow Diversion, PS Upgrade, Offline Storage Basin		2016
MILL CREEK AREA															
45	Shively Interceptor *S_MC_WC_NB01_M_01_A*	Lynnview Ditch	10-yr, 3-hr storm 04498, 04542, 81814-W, MSD0047-PS, MSD0050-PS	Pipe Upgrades	$19,034,000	2012	10-yr, 3-hr storm 04498, 04542, 81814-W, MSD0047-PS, MSD0050-PS	Pipe Upgrades	$11,473,500	2012	No Change	10-yr, 3-hr storm 04498, 04542, 81814-W, MSD0047-PS, MSD0050-PS	Pipe Upgrades	$11,473,500	2012
46	East Rockford PS Relocation *S_MC_WC_NB02_S_03_C*	Mill Creek	2-yr, 3-hr storm for 04699-W	PS Replacement and Relocation	$1,488,000	2012	2-yr, 3-hr storm for 04699-W	PS Replacement and Relocation	$541,300	2012	No Change	2-yr, 3-hr storm for 04699-W	PS Replacement and Relocation	$541,300	2012
SMALL WQTC AREA															
E	Lucas Lane PS Inline Storage *S_FF_NB01_S_09A_C_A*	Goose Creek	2-yr, 3-hr storm for MSD0199-LS	Inline Storage	$261,000	2021	2-yr, 3-hr storm for MSD0199-LS	Inline Storage	$320,000	2021	2021. Project eliminated due to more detailed model calibration.	2-yr, 3-hr storm for MSD0199-LS	Project Eliminated	N/A	N/A
47	Riding Ridge PS Improvements *S_HC_HN_NB02_S_03_C_A*	Harrods Creek	2-yr, 3-hr storm for MSD1060-LS	PS Upgrades	$31,000	2014	2-yr, 3-hr storm for MSD1060-LS	PS Upgrades	$31,000	2014	No Change	2-yr, 3-hr storm for MSD1060-LS	PS Upgrades	$19,200	2014
48	Gunpowder PS Inline Storage *S_HC_HN_NB02_S_09A_C_B*	Harrods Creek	2-yr, 3-hr storm for MSD1055-LS	Inline Storage	$251,000	2021	2-yr, 3-hr storm for MSD1055-LS	Inline Storage	$251,000	2021	2021.Revised completion date to December 31, 2025.	2-yr, 3-hr storm for MSD1055-LS	Inline Storage	$800,000	2025
E	Fox Harbor Inline Storage *S_HC_HN_NB03_S_09A_A_A*	Harrods Creek	10-yr, 3-hr storm for 62769	Inline Storage	$468,000	2021	10-yr, 3-hr storm for 62769	Inline Storage	$468,000	2021	2019. Project eliminated due to more detailed model calibration.	10-yr, 3-hr storm for 62769	Project Eliminated	N/A	N/A

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
49	Fairway View PS Improvements *S_FF_LF_NB01_S_03_C_A*	Harrods Creek	2-yr, 3-hr storm for MSD1065-PS	PS Upgrades	$101,000	2014	2-yr, 3-hr storm for MSD1065-PS	PS Upgrades	$101,000	2014	No Change	2-yr, 3-hr storm for MSD1065-PS	PS Upgrades	$359,500	2014
50	Lake Forest PS SSO Investigation *S_FF_LF_NB01_S_13_C_A*	Chenoweth Run	N/A storm for MSD1169-LS	Monitor	$650,000	2012	N/A storm for MSD1169-LS	Monitor	$650,000	2012	No Change	N/A storm for MSD1169-LS	Monitor	$650,500	2012
51	St. Rene Rd PS Inline Storage *S_FF_CH_NB01_S_09A_C_A*	Chenoweth Run	2-yr, 3-hr storm for 94187	Inline Storage	$43,000	2014	2-yr, 3-hr storm for 94187	Inline Storage	$43,000	2014	2015. Project changed to PS Elimination	2-yr, 3-hr storm for 94187	Flow Diversion	Included in Jeffersontown WQTC Elimination	2014
COMBINED SEWER SYSTEM AREA															
52	Sonne PS I/I Investigation *S_OR_MF_42007_S_07_C*	Paddy Run	2-yr, 3-hr storm for MSD0042-PS	I/I Reduction	$281,000	2011	2-yr, 3-hr storm for MSD0042-PS	I/I Reduction	$846,500	2011	No Change	2-yr, 3-hr storm for MSD0042-PS	I/I Reduction	$846,500	2011
53	Camp Taylor System Improvements, Phase 1: SSES *S_SF_MF_30917_M_09_A*	Muddy Fork Beargrass Creek	10-yr, 3-hr storm 08717, 13931, 13943, 36763, 44396, 44397, 66349, 104223, 104231	SSES	$37,927,000	2014	10-yr, 3-hr storm 08717, 13931, 13943, 36763, 44396, 44397, 66349, 104223, 104231	SSES		2011	2012. Modification combined Phases 2 & 3 and expanded overall area	10-yr, 3-hr storm 08717, 13931, 13943, 36763, 44396, 44397, 66349, 104223, 104231	SSES	$12,367,100	2011
54	Camp Taylor System Improvements, Phase 2: Replace & Rehabilitate Sewers *S_SF_MF_30917_M_09_A*			Sewer Replacement & Rehabilitation				Sewer Replacement & Rehabilitation		2017			Sewer Replacement & Rehabilitation	$29,345,500	2013
55	Camp Taylor System Improvements, Phase 3: Replace & Rehabilitate Sewers *S_SF_MF_30917_M_09_A*			Sewer Replacement & Rehabilitation											2017
56	Camp Taylor System Improvements, Phase 4: Offline Storage *S_SF_MF_30917_M_09_A*			Offline Storage				Offline Storage		2024	2021.Revised completion date to December 31, 2035. Future: Monitoring on-going – project may not be necessary		Offline Storage	$23,972,300	2035
57	Hazelwood PS I/I Investigation & Rehabilitation *S_MC_MF_55665_S_07_C*	Manslick Branch	2-yr, 3-hr storm for 55665	I/I Reduction	$184,000	2011	2-yr, 3-hr storm for 55665	I/I Reduction	$382,000	2011	No Change	2-yr, 3-hr storm for 55665	I/I Reduction	$382,100	2011
INTERIM SSDP															
1	Hikes Lane Interceptor and Highgate Springs	South Fork Beargrass Creek and Wedgewood Ditch	2-yr, 3-hr storm for 18134, 18298, 18302, 18483, 18595, 49224, 49236, 49672, 49673, MSD0012-PS	New Sewer	$23,183,000	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$13,821,500	2012
2	Southeastern Diversion Structure & Interceptor	South Fork Beargrass Creek	8426, 8427, 8430, 8431, 18654, 30680, 30681, 30701, 30702, 30704, 49647, 63779, 72571-X	Diversion Structure	$1,906,000	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$8,589,600	2012
3	Northern Ditch Diversion Interceptor	Northern Ditch	MSD0271	New Sewer	$21,639,000	2011	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$14,104,600	2011

Table ES.1.1-6 Final SSDP Projects Including Project Modifications

	FINAL SSDP PROJECT NAME AND IOAP ID	RECEIVING STREAM	2009 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2009 TECH AND SIZE	2009 COST ESTIMATE	2009 FINISH DATE	2012 SSO(S) ELIMINATED & LEVEL OF PROTECTION	2012 TECH AND SIZE	2012 COST ESTIMATE	2012 FINISH DATE	MODIFICATION APPROVAL YEAR AND DESCRIPTION	2021 SSO(S) ELIMINATED & APPROVED LEVEL OF PROTECTION	2021 TECH AND SIZE	2021 COST ESTIMATE	2021 COMPLETION SCHEDULE DATE OR CERTIFIED YEAR
4	Sinking Fork Relief Sewer	Middle Fork Beargrass Creek, Upper Sinking Fork	21103, 25012, 63319	New Sewer	$1,741,000	2010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,437,300	2009
5	Beechwood Village Sanitary Sewer Replacement	Upper Sinking Fork	2-yr, 3-hr storm for 21061, 21089, 21101, 21153, 21156	Sewer Replacement, Rehab	$12,519,000	2011	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$7,982,100	2010
6	Derek R. Guthrie WQTC	Ohio River, Black Pond Creek, Alvey Ditch, Mendora Branch, Mill Creek	10-yr, 3-hr storm for wet weather SSOs	100 MGD High Rate Treatment Facility	$122,000,000	2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$96,358,900	2012

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Appendix A Acronyms and Abbreviations

AACE	Association for the Advancement of Cost Engineering
ACD	Amended Consent Decree
AM	Asset Management
AO	Agreed Order
AAOV	Annual Average Overflow Volume
BG	Billions of Gallons
BGC	Beargrass Creek
BMP	Best Management Practice
BOD	Biological Oxygen Demand
CAH	Cold Water Aquatic Habitat
CAP	Morris Forman WQTC Action Plan
CD	Consent Decree
CDS	Continuous Deflection Separator
CFU	Coliform Forming Unit
CHP	Combined Heat and Power
CIP	Capital Improvement Plan
CMMS	Computerized Maintenance Management System
CMOM	Capacity, Management, Operation, and Maintenance Program
CPE-CCP	Comprehensive Performance Evaluation-Composite Correction Plan
CRCC	Customer Relations Call Center
CRRP	Critical Repair and Replacement Plan
CSO	Combined Sewer Overflow
CSOP	Combined Sewer Operational Plan
CSS	Combined Sewer System
CSSA	Continuing Sanitary Sewer Assessment
CWA	Clean Water Act
D/T	Dilution to Threshold
DAFT	Dissolved Air Flotation Tanks
DMR	Discharge Monitoring Report
DRGWQTC	Derek R. Guthrie Water Quality Treatment Center

DRI	Drainage Response Initiative
DTPD	Dry Tons Per Day
DWF	Dry Weather Flow
DWS	Domestic Water Supply
EAP	Early Action Plan
EPA	United States Department of Environmental Protection
FEPS	Morris Forman WQTC Final Effluent Pump Station
FM	Force Main
FOG	Fats, Oils, and Grease
FPSs	Flood Pump Stations
FY	Fiscal Year
GIS	Geographical Information System
GPM	Gallons Per Minute
I/I	Infiltration and Inflow
IBI	Index of Biotic Integrity
IOAP	Integrated Overflow Abatement Plan
ISSDP	Interim Sanitary Sewer Discharge Plan
JCPS	Jefferson County Public Schools
KDEP	Kentucky Energy and Environment Cabinet
KDOW	Kentucky Department of Water
KPDES	Kentucky Pollution Discharge Elimination System
LF	Linear Feet
LOC	Level of Control
LOJIC	Louisville and Jefferson County Information Consortium
LOP	Level of Protection
LS	Lift Station
LTCP	Long Term Control Plan
LTMN	Long Term Monitoring Network
M	Millions of Dollars
MCC	Motor Control Center
MG	Millions of Gallons
MGD	Millions of Gallons per Day

ML	Milliliter
MOPs	Modeled Overflow Points
MSD	Louisville-Jefferson Metropolitan Sewer District
MS4	Municipal Separate Storm Sewer System
MW	Megawatt
NASSCO	National Association of Sewer Service Companies
NMC	Nine Minimum Controls
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
ORFM	Ohio River Force Main
ORFPS	Ohio River Flood Protection System
ORSANCO	Ohio River Valley Water Sanitation Commission
OSRW	Outstanding State Resource Water
PACP	Pipeline Assessment and Certification Program
PCCM	Post Construction Compliance Monitoring Program
PCR	Primary Contact Recreation
PLC	Programmable Logic Controller
POTW	Publicly Operated Treatment Works
PS	Pump Station
QAPP	Quality Assurance Project Plans
QA/QC	Quality Assurance/Quality Control
R&R	Renewal & Replacement
RAS	Return Activated Sludge
RCP	Reinforced Concrete Pipe
ROW	Right-of-Way
RTC	Real Time Control
S&F	Solids and Floatables
SAMP	Strategic Asset Management Plan
SCAP	Sewer Capacity Assurance Plan
SCR	Secondary Contact Recreation
SEP	Supplemental Environmental Projects

SIU	Significant Industrial User
SOPs	Standard Operating Procedures
SORP	Sewer Overflow Response Protocol
SSDP	Sanitary Sewer Discharge Plan
SSES	Sanitary Sewer Evaluation Studies
SSO	Sanitary Sewer Overflow
SSOP	Sanitary Sewer Overflow Plan
SSS	Sanitary Sewer System
SWMM	Stormwater & Wastewater Management Model
TAMP	Tactical Asset Management Plan
TDH	Total Dynamic Head
THP	Thermal Hydrolysis Process
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
UMF	Upper Middle Fork
UofL	University of Louisville
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UV	Ultraviolet Radiation
VFD	Variable Frequency Drive
WAH	Warm Water Aquatic Habitat
WAS	Waste Activated Sludge
WASP5	Water Quality Analysis Simulation Program Version 5
WDRs	Wastewater and Stormwater Discharge Regulations
WEF	Water Environment Federation
WIFIA	Water Infrastructure Finance and Innovation Act
WIN	Waterway Improvements Now
WQT	Water Quality Tool
WQTC	Water Quality Treatment Center
WWT	Wet Weather Team
WWTPs	Wastewater Treatment Plants

APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 1

METROPOLITAN SEWER DISTRICT

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APPENDICES

Note: Appendices shown in italic text were not revised for the 2021 IOAP and remain the same as the 2012 IOAP Modification. All appendices have been provided on a separate USB flash drive and are not included in this report.

Chapter 1: INTRODUCTION

Special Note – 2021 IOAP Modification: The revisions incorporated into Chapter 1 of the IOAP provide context for the Second Amended Consent Decree (ACD) negotiated in 2021. The order in which background information is presented in this Chapter was revised to be chronological. A new section was added to describe the 2021 Second ACD. A crosswalk summarizing the Volume 1 changes between the 2012 and 2021 IOAP documents is provided in **Error! Not a valid bookmark self-reference.**. Information regarding the status of MSD's wastewater system has been updated to reflect current conditions as of December 31, 2020, where appropriate. Some information from the 2009 and 2012 documents remains to provide historical context related to the overall IOAP. The Volume 1, Chapter 1 appendices remain the same as those provided with the 2012 IOAP. A new Appendix 1.1.3 was added in 2021 for the Draft Second ACD.

Table 1.0-1 2021 IOAP Modification Volume 1 Crosswalk

CRITERIA	DESCRIPTION	VOLUME 1 CHAPTERS OR SECTIONS	2012 IOAP SUBMITTAL	2021 IOAP MODIFICATION
Projects	Minor Project Modifications	Table 1.1-1 modifications Table ES1.1-3 Final LTCP Table ES1.1-5 Final SSDP 6.1 IOAP schedule	2012 IOAP suite of projects listed	Deleted text and referred to Volume 2 and Volume 3 for updated project information.
	New Requirements	4.7 Second ACD requirements	N/A	New early action projects added for the Morris Forman WQTC Biosolids Facility, Paddy's Run Pump Station Capacity Upgrade, rehabilitation of nine Critical Sewers, and inclusion of a new Asset Management Program
New Information Since 2012 IOAP Submittal	Document Naming Nomenclature	1.1.6 Second ACD 1.4 CD requirements	N/A	The terms IOAP, Final LTCP, and Final SSDP refer to the 2021 versions. The amendments are referred to as the First ACD and Second ACD.
	Clarified which information is from 2009, 2012, 2021	Multiple places throughout Chapters 1, 2, 3, 4, 5, and 6	Process and data remain valid and accurate	New note added at the front of each chapter
	Progress since the 2012 IOAP Submittal	1.2 system information 1.1.5 minor modifications 2.2 water quality 3.5 current/future program 3.6.1 ACD reporting 3.6.2 regulatory meetings 4.1.4.2 fixed generators 4.1.4.3 revised SCAP 4.1.4.4 revised SORP 4.4. WQTC eliminations 4.5.1 source control 5.4 approvable Final LTCP 5.5 approvable Final SSDP 6.2 financial plan 6.3.1.1 rain gauge map	Relevant information in 2012	New information added to reflect work or pertinent information since the 2012 IOAP submittal

Table 1.0-1 2021 IOAP Modification Volume 1 Crosswalk

CRITERIA	DESCRIPTION	VOLUME 1 CHAPTERS OR SECTIONS	2012 IOAP SUBMITTAL	2021 IOAP MODIFICATION
	Verb Tense	Multiple places throughout Chapters 1, 2, 3, 4, 5 and 6	No change to content	Verb changed to past tense for work that been performed
Presumption Approach	Clarification	3.7 effectiveness 5.1.1 key findings 5.2.1 approaches 5.2.2, 5.2.3 water quality 6.3 compliance monitoring	N/A	Deleted language not applicable to the presumption approach or clarified information related to presumption approach
Consolidated Information	Consent Decree Background	1.1 background	Background information was dispersed among three IOAP Volumes	Information about Consent Decree deleted from Volumes 2 and 3 and consolidated into Volume 1, Chapter 1.
	Public Information	3.5 public program 3.7 customer survey 5.6 regulatory reporting	Information provided through 2009	Expanded description for activities through 2035 and consolidated information about public education and outreach into Volume 1, Chapter 3

1.1. BACKGROUND

A Second ACD is currently being negotiated and requires the Louisville and Jefferson County Metropolitan Sewer District (MSD) to address additional work. Furthermore, the Second ACD requires MSD to create a second modification to the IOAP ("2021 IOAP Modification"), to set forth schedules for the remaining Sanitary Sewer Discharge Plan (SSDP) projects, add Long Term Control Plan (LTCP) projects, and incorporate an asset management program. This section provides background information and an overview of MSD's Consent Decree, First ACD, and the Second ACD. Additional information related to the Final LTCP and MSD's measures to mitigate combined sewer overflows (CSOs) is provided in Volume 2, Chapter 1, Section 1.1. Similarly, additional background information related to the Final SSDP and MSD's measures to eliminate sanitary sewer overflows (SSOs) and unauthorized discharges is provided in Volume 3, Chapter 1, Section 1.1.

1.1.1. 1972 CLEAN WATER ACT (CWA)

The CWA of 1972, as amended, is the law governing for most of MSD's operations, and is the basis for the Consent Decree that led to this IOAP. The overall goal of the CWA is to restore our nation's waters to a condition that is "fishable and swimmable." This seemingly simple objective resulted in a large body of regulations, policies and guidelines, managed by the United States Environmental Protection Agency (EPA) and the states (such as Kentucky) with delegated authority in this area.

One important policy that impacts the LTCP development is EPA's National CSO Control Policy, which outlines expectations and approaches for management of CSOs, and establishes the regulatory compliance Presumption Approach MSD is using for addressing CSOs. There is no comparable policy relative to unauthorized discharges from the combined sewer system (CSS) or sanitary sewer system (SSS), so the approach for addressing unauthorized discharges is based on establishing design conditions for the level of protection intended for the sewer system, and then eliminating any unauthorized discharges that fall within that design condition. Volume 1 Chapter 5 details the IOAP regulatory framework and compliance approaches.

1.1.2. 2005 CONSENT DECREE

On August 12, 2005, MSD entered into a Consent Decree in Federal Court with EPA and the Kentucky Environmental and Public Protection Cabinet. The Consent Decree was developed in response to an enforcement action taken by EPA and Kentucky Department of Environmental Protection (KDEP) alleging violations of the CWA primarily related to sewer overflows and unauthorized discharges. The Consent Decree is a legally binding agreement between all parties that represents a settlement of the enforcement action in exchange for a commitment to take on specified actions within a specified period. A copy of the Consent Decree is included in Appendix 1.1.1.

Appendix 1.1.1 2005 Consent Decree
This appendix is the same as provided in the 2012 IOAP and is provided on an external USB drive.

The purpose of the Consent Decree is to further the objectives of the CWA to eliminate unauthorized discharges from MSD's SSS, CSS, and water quality treatment centers (WQTC) and to address discharges from MSD's CSO locations identified in the Kentucky Pollutant Discharge Elimination System (KPDES) discharge permit for the Morris Forman WQTC. The Consent Decree also outlines the compliance program and schedules to achieve specific objectives, two of which are the submittal of a Final LTCP to control CSOs, and a Final SSDP to eliminate unauthorized discharges.

The Consent Decree identified specific remedial projects and measures associated with compliance including:

- **Implement Interim SSDP**: provided a program to 1) eliminate specific unauthorized discharges in the Beechwood Village area, the Hikes Point area, the Highgate Springs Pump Station, and the Southeastern Diversion and 2) update of the Sanitary Sewer Overflow Plan (SSOP).
- **Implement Interim LCTP**: provided a program to mitigate specific CSOs.
- **Develop Final SSDP & Final LTCP**: required MSD to develop and submit a Final LTCP and a Final SSDP.

1.1.3. 2009 FIRST AMENDMENT TO THE CONSENT DECREE

On December 1, 2008, a draft ACD was released for public comment. The draft ACD addressed alleged violations of the CWA primarily related to WQTC performance, record-keeping, and reporting. The public comment period closed on the draft ACD December 31, 2008. The ACD was entered into Federal Court on April 15, 2009. A copy of the First ACD is included in Appendix 1.1.2

Appendix 1.1.2 2009 First Amendment to the Consent Decree
This appendix is the same as provided in the 2012 IOAP and is provided on an external USB drive.

The 2009 Consent Decree required a number of Early Action Items, along with a requirement to develop a Final LTCP to control CSOs from the CSS, and a Final SSDP to eliminate unauthorized discharges from the SSS and CSS. Both plans were submitted for approval prior to the December 31, 2008, requirement of the original Consent Decree. The ACD included the 2009 IOAP that was prepared in accordance with the requirements of the Consent Decree.

1.1.4. 2009 IOAP SUBMITTAL

MSD consolidated the requirements for the Final LTCP and Final SSDP into one comprehensive program referred to as the Integrated Overflow Abatement Plan (IOAP). The IOAP presents MSD's comprehensive plan

to reduce and mitigate the effects of wet weather CSOs, and to eliminate SSOs and other unauthorized discharges. The IOAP consists of three volumes and each volume details distinct mitigation strategies.

- **Volume 1 Integrated Overflow Abatement Plan**: provides a program overview and refers the reader to other volumes for more detailed discussion.
- **Volume 2 Final CSO Long Term Control Plan**: provides a program that defines the long-term objectives of MSD's CSO control objectives, the analyses undertaken to arrive at the appropriate CSO control solution, a detailed description of the various measures recommended for implementation, and a schedule of implementation.
- **Volume 3 Final Sanitary Sewer Discharge Plan**: provides a program of specific remedial projects and measures to eliminate unauthorized discharges from the separate sanitary sewer system not previously addressed in the Interim SSDP.

The first submittal of the IOAP recognized the potential need to update and resubmit the IOAP after the ACD was finalized. MSD initially submitted the 2009 IOAP to the Regulators on December 19, 2008 followed by the final submitted on September 30, 2009. The 2009 IOAP was approved by EPA and KDEP on October 23, 2009.

1.1.5. 2012 IOAP MODIFICATION

In 2014, MSD, EPA and KDEP informed the Court of a non-material modification to the ACD regarding a number of adjustments to projects in the 2009 IOAP which MSD believed were necessary to achieve approved overflow reduction levels identified in the 2009 IOAP. These adjustments were set forth in a revised IOAP (the "2012 IOAP Modification") submitted by MSD and approved by the Cabinet and EPA on June 19, 2014.

1.1.6. MINOR MODIFICATIONS SINCE 2012 IOAP SUBMITTAL

Subsequent to the approval of the 2012 IOAP Modification, the conditions and circumstances regarding MSD's wastewater infrastructure changed for the CSS, SSS, and WQTCs. MSD submitted requests to modify or eliminate various SSDP and LTCP projects from the IOAP. A summary of modifications made since the 2012 IOAP was approved are noted in the following table in chronological order.

Table 1.1-1 Summary of Minor Modifications Since 2012

PROJECT TYPE	IOAP PROJECT & NUMBER	MINOR MODIFICATION APPROVAL DATE	DESCRIPTION OF MINOR MODIFICATION
Final LTCP	Clifton Heights Storage Basin, *L_MU_MF_154_M_09B_B_A_8*	2014	In 2014, revised basin size to 7.0 MG.
Final LTCP	CSO058 In-Line Storage & Green Infrastructure, *L_OR_MF_058_S_08_A_A_0*	2014, 2020	In 2014 project changed to weir modifications to address surcharging in lieu of ineffectual sewer separation. In 2020 project incorporated into 13th & Rowan remedy.
Final LTCP	CSO190 Green Infrastructure Solution *(formerly 18th & Northwestern Pkwy Storage Basin)*, *L_SO_MF_190_S_09B_B_A_8*	2015	Green infrastructure solutions for CSO 190 replaced the storage basin at 18th and Northwestern Parkway.

Table 1.1-1 Summary of Minor Modifications Since 2012

PROJECT TYPE	IOAP PROJECT & NUMBER	MINOR MODIFICATION APPROVAL DATE	DESCRIPTION OF MINOR MODIFICATION
Final LTCP	Portland CSO Basin, *L_OR_MF_019_S_13_B_A_8*	2015	Increased basin size from 6.37 MG to 6.7 MG. The larger size does not reduce CSO occurrences significantly but does provide a reduced residual AAOV.
Final LTCP	Southwestern Parkway Storage Basin, *L_OR_MF_105_M_13_B_A_0*	2015, 2018	In 2015, increased basin size from 11.07 MG to 20 MG, with a level of control of 8 overflows per Typical Year and no net system-wide increase in AAOV. In 2018, Revised project deadline to June 30, 2019 and corrected inline storage volume submitted with 2015 minor modification fact sheet to 6.3 MG
Final LTCP	Waterway Protection Tunnel *(formerly I-64 & Grinstead CSO Basin), L_MI_MF_127_M_09B_B_A_8)* *(formerly 13th Street & Rowan Street Storage Basin), L_OR_MF_155_M_09B_B_B_4)* *(formerly Story Avenue & Main Street Storage Basin), L_OR_MF_020_S_09B_B_A_8)* *(formerly Lexington Road & Payne Street Storage Basin), L_SO_MF_083_M_09B_B_A_8)*	2015, 2016, 2018	In 2015, basin sizes were adjusted as part of Basin Balancing Modification. In 2016, revised design to a 31.8 MG tunnel solution that consolidates CSO controls for 13th Street and Rowan Street, Story Avenue and Main Street, and Lexington and Payne Street Storage Basins. In 2018, changed project name to "Waterway Protection Tunnel" and revised design to a 52.2 MG tunnel solution that consolidates CSO controls for Ohio River Tunnel and I-64 & Grinstead Drive Storage Basin.
Final SSDP	Chenoweth Hills WQTC Elimination and PS Improvements *S_JT_JT_NB01A_M_03_C*	2015	Eliminated Pump Stations and WQTC via gravity to Cedar Creek.
Final SSDP	Goose Creek PS Improvements and Wet Weather Storage Phase 1: Devondale PS S_MI_MF_NB04_M_03_B	2015	Combined project with Bancroft WQTC elimination. Moved storage and PS to Bancroft site instead of Devondale PS.
Final SSDP	Prospect WQTC Elimination, Harrods Creek PS, ORFM System Improvements Phase 3: ORFM System Improvements *S_OR_MF_NB04_M_3_B_B*	2015	Replaced Muddy Fork Interceptor Upsizing with Muddy Fork Offline Storage Basin.
Final SSDP	St. Rene Rd PS Inline Storage *S_FF_CH_NB01_S_09A_C_A*	2015	Project changed to PS Elimination
Final LTCP	Bells Lane Wet Weather Treatment Facility *(formerly Paddy's Run), L_OR_MF_015_M_13_B_B_8*	2016	Additional time for construction was requested due to size increase, moving the site, offline storage, and integration of Southwestern Pump Station. Changed completion deadline from December 31, 2016 to September 30, 2017.
Final LTCP	Nightingale Pump Station Replacement & Storage, *L_SO_MF_018_S_03_A_A*	2016	In 2016, changed completion deadline from December 31, 2016 to June 30, 2017.
Final LTCP	Logan & Breckenridge Street Storage Basin, *L_SO_MF_092_M_09B_B_D_8*	2016	Technical functionality of project remained the same. Modified project to bury the basin and allow community-accessible open space above it.
Final LTCP	CSO108 Dam Modification, *L_SO_MF_108_S_09A_B_A_4*	2018	Project remained the same, based on additional calibration of the hydraulic model, the level of control was changed from 4 to 8 overflows per Typical Year.

Table 1.1-1 Summary of Minor Modifications Since 2012

PROJECT TYPE	IOAP PROJECT & NUMBER	MINOR MODIFICATION APPROVAL DATE	DESCRIPTION OF MINOR MODIFICATION
Final SSDP	Middle Fork Relief Interceptor, Wet Weather Storage, Upper Middle Fork LS Diversion Phase 2: UMFLS & Relief Interceptor *S_MISF_MF_NB01_M_01_C_A1*	2018	Replaced offline storage at UMFLS with new 30 MGD PS at UMF Site.
Final SSDP	Fox Harbor Inline Storage S_HC_HN_NB03_S_09A_A_A	2019	Project eliminated due to more detailed model calibration.
Final SSDP	Lucas Lane PS Inline Storage *S_FF_NB01_S_09A_C_A*	2021	Project eliminated due to more detailed model calibration.

1.1.7. 2021 SECOND AMENDMENT TO THE CONSENT DECREE

A reprioritization of the timing for completing the remaining ACD work along with new work is necessary to maximize MSD's compliance with the Clean Water Act and KDEP permit conditions. The additional work is focused on rehabilitating portions of the Morris Forman WQTC, Paddy's Run Pump Station, critical and high-risk sewers/interceptors, and MSD's asset management program.

A Second ACD requires MSD to create a second modification to the IOAP ("2021 IOAP Modification"), to set forth schedules for the remaining SSDP projects, add new IOAP projects, and incorporate an asset management program.

In response to this action, and also to address informal questions and requests for clarifications from EPA and KDEP, the IOAP has been revised and resubmitted for continued consideration by the appropriate regulatory agencies.

For the purposes of the IOAP, except where specifically noted otherwise, the term "Consent Decree" will be understood to mean the Second ACD and the terms IOAP, Final LTCP, and Final SSDP, will refer to the 2021 versions of the IOAP, Final LTCP, and Final SSDP, respectively. When referencing to prior versions of Consent Decree, IOAP, LTCP, and SSDP documents are necessary, submittal years are included to provide specific references. The Consent Decree amendments have been negotiated over several months, and the terms of the draft second amendment were known to MSD during the final stages of development of this 2021 IOAP Modification. A copy of the final draft Second ACD is included in Appendix 1.1.3.

Appendix 1.1.3 Draft 2021 Second Amendment to the Consent Decree
This is a new appendix added for the 2021 IOAP and is provided on an external USB drive.

The ancillary information provided by MSD that is not related to overflow abatement projects or the specific requirements of the Consent Decree is provided and should be considered as supplemental, background information. It is not being submitted in response to any requirements, obligations or commitments to any specific actions or time frames that are required under the provisions of the Consent Decree. This supplemental information should not be considered as a commitment by MSD to any project not required by the Consent Decree. To ensure information is accurate and representative of MSD's 2021 systems and programs, for the purposes of this IOAP, specific sections and data in IOAP Volumes 1, 2, and 3 were updated as appropriate.

1.2. WASTEWATER SYSTEM SUMMARY

MSD has approximately 720 employees whose mission is to build, maintain, and operate the wastewater stormwater, and flood projection facilities for the people of the Louisville Metro, Kentucky area. Louisville Metro has over 3,200 miles of sewers, approximately 500 miles being over 100 years old. The oldest sewers in the system are primarily in the CSS built between the 1860s to the 1950s. Beginning in 1955, all of the sewer systems built in the Louisville Metro area have been separate sanitary sewers.

MSD owns, operates and maintains the wastewater and stormwater facilities servicing approximately 700,000 residents of the Louisville Metro area. Geographically, the MSD service area includes 11 watersheds, all of which are part of the Ohio River Watershed. MSD also owns, operates and maintains the Ohio River Flood Protection System that includes 16 flood pump stations and 29 miles of floodwall or levee. The 385 square mile service area managed by MSD includes Jefferson County and extends into portions of Oldham County. Geographically, the MSD service area encompasses 11 watersheds, all of which are part of the larger Ohio River Watershed.

Currently, MSD serves approximately 220,000 customer accounts and 700,000 people. Refer to Figure 1.2-1 for an illustration of the major components of MSD's wastewater system including the following:

- 5 regional water quality treatment centers
- More than 79,000 manholes
- 257 sanitary sewage pumping stations
- 162 miles of force mains

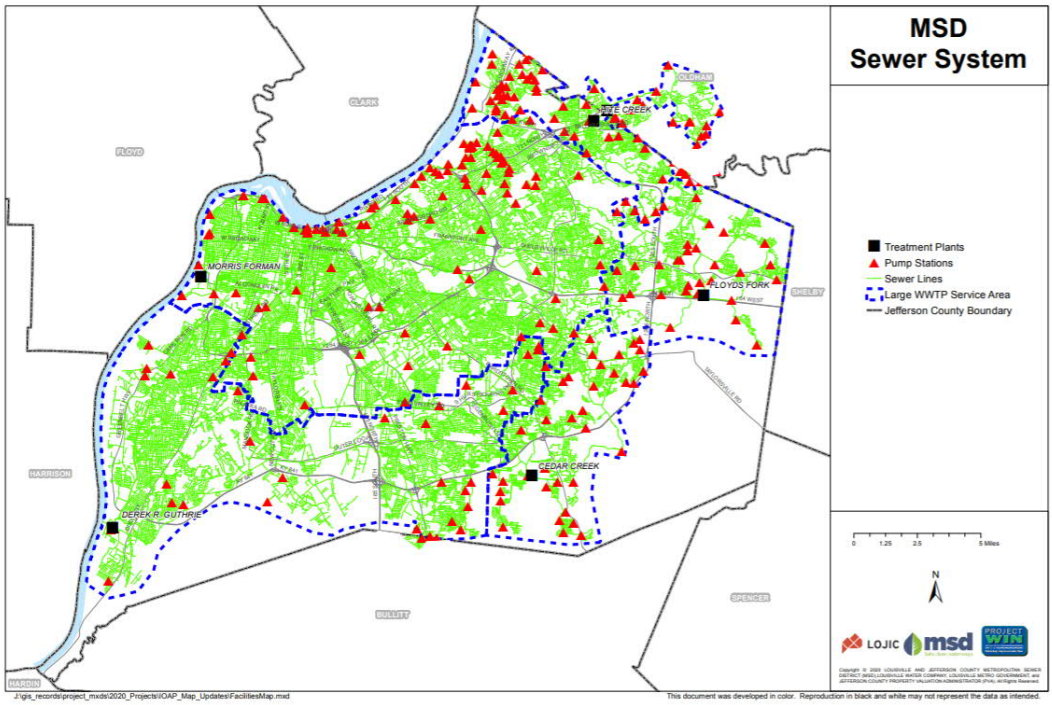

Figure 1.2-1. MSD's Sewer System

1.3. WET WEATHER OVERFLOWS DESCRIPTION

The IOAP addresses two types of active sewer systems within the MSD system: the CSS and the SSS. CSSs collect and transport both sanitary sewage and stormwater runoff through a single-pipe system. SSSs collect and transport only sanitary sewage to MSD's WQTCs. In general, the discharge or release of wastewater from either type of system into the environment before it reaches a WQTC is commonly referred to as an overflow. The following sections discuss when the overflow is a permitted authorized discharge, or a non-permitted unauthorized discharge.

1.3.1. COMBINED SEWER SYSTEM (CSS) AND OVERFLOWS

During dry weather, CSSs collect and convey domestic, commercial, and industrial wastewaters directly to a WQTC. During wet weather events such as precipitation or snowmelt, the resulting stormwater enters the system along with the dry weather flow. As a result, the stormwater is "combined" with the sanitary sewage. Generally, combined sewers are large enough to carry both sanitary sewage plus the stormwater for a specific wet weather event or condition. During wet weather, the design conditions determine the volume of stormwater that can enter the CSS and not exceed the CSS and wastewater treatment capacity. CSSs discharge excess water beyond that which can be conveyed or treated directly, through a permitted overflow, to a surface water body such as a river or stream. Such an event is called a CSO.

A CSO is an authorized discharge if it occurs through a permitted outfall and is due to wet weather. Louisville Metro's CSOs are addressed in the Morris Forman WQTC KPDES permit number KY0022411. The Bells Lane Wet Weather Treatment Facility (completed in 2017 as part of the LTCP) is expected to be covered under the same permit number. Though wet weather CSO events are permitted, they must be controlled, and resultant water quality impacts mitigated under the requirements of the CWA and the Consent Decree.

The Consent Decree requires MSD to reduce the frequency and volume of wet weather CSO events, thus reducing receiving system impacts in accordance with CSO policy and the CWA. Dry weather overflows, and overflows from the CSS at locations other than permitted outfalls, are unauthorized discharges. MSD is also required to eliminate unauthorized discharges from the CSS regardless of impact.

1.3.2. SANITARY SEWER SYSTEM (SSS) AND OVERFLOWS

Modern standards of practice require the construction of a separate SSS for urbanized communities. A separate SSS collects and conveys domestic, commercial, and industrial wastewater. A separate SSS is not intended to collect or convey stormwater runoff from precipitation or snowmelts, although it is virtually impossible to prevent some stormwater from entering an SSS. Inflow and Infiltration (I/I) are inherent and some groundwater and stormwater will find its way into the system. Therefore, reasonable quantities of I/I are predicted and accounted for in modern sewer system design practices. However, a variety of factors can affect the performance of a sanitary sewer and cause problems. Examples include blockage of the sewer by tree roots, excessive I/I beyond that accounted for in the design, or sewer pipe breaks and mechanical failures at pump stations.

An SSO is a discharge of untreated or partially treated sewage through a point source not authorized by a KPDES permit. An SSO may include releases of untreated or partially treated sewage from the SSS to public or private property that do not reach the Waters of the United States, such as overflows out of manholes and onto city streets, sidewalks, and other terrestrial locations. Although an SSS can back up into buildings, including private residences and basements, the backup must be caused by problems in the publicly owned portion of the SSS to be considered an SSO. For example, wastewater releases and backups into buildings

caused by blockages, flow conditions, malfunctions in a building lateral or other piping and conveyance systems not owned or operationally controlled by MSD are not SSOs.

1.4. CONSENT DECREE REQUIREMENTS

Special Note: References to "Final LTCP" and "Final SSDP" within this 2021 IOAP Modification refer to the project and program components described in the 2021 LTCP and 2021 SSDP, respectively. When referencing prior versions of Consent Decree, IOAP, LTCP, and SSDP documents, submittal years are provided for reference.

1.4.1. FINAL LTCP REQUIREMENTS

The Consent Decree specifies that the Final LTCP is required to meet the following goals:

- Ensure that if CSOs occur, they are only due to wet weather (this goal is required to address those discharges resulting from MSD's compliance with the requirements of the United States Army Corps of Engineers' (USACE) "Ohio River Flood Protection System Pumping Operations Manual," dated 1954 and revised 1988).
- Bring all wet weather CSO discharge points into compliance with the technology-based and water quality-based requirements of the CWA.
- Minimize the impacts of CSOs on water quality, aquatic biota, and human health.

As specified by the Consent Decree, the Final LTCP is required to include, at a minimum, the following elements:

- The results of characterization, monitoring, modeling activities, and design parameters as the basis for selection and design of effective CSO controls (including control to address those discharges resulting from MSD's compliance with the requirements of the USACE' "Ohio River Flood Protection System Pumping Operations Manual," dated 1954 and revised 1988).
- The results of an evaluation of WQTC peak flow treatment capacity for any treatment facility, other than the Morris Forman WQTC, that will receive additional flow based on any LTCP project. Such evaluation is required to be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach," (EPA CERI, October 1984), and "Retrofitting POTWs," (EPA CERI, July 1989).
- A report on the public participation process.
- Identification of how the Final LTCP addresses sensitive areas as the highest priority for controlling overflows.
- A report on the cost analysis of the alternatives considered.
- Operational plan revisions to include agreed-upon long-term CSO controls.
- Maximization of treatment and evaluation of treatment capacity at the Morris Forman WQTC.
- Identification of an implementation schedule for the selected CSO controls.
- A post-construction compliance monitoring program adequate to verify compliance with water quality-based CWA requirements and ascertain the effectiveness of CSO controls.

The EPA has developed guidance documents to assist in preparing LTCPs in compliance with the CSO policy. The Consent Decree requirements generally follow the existing guidance documents, with some additional requirements to address specific MSD issues such as overflows from the flood pump stations.

1.4.2. FINAL SSDP REQUIREMENTS

Based upon the Consent Decree, the Final SSDP is required to identify remedial measures to eliminate unauthorized discharges from the SSS and CSS at locations other than those identified in the Interim SSDP.

Furthermore, the Final SSDP is required to include the following elements:

- The results of an evaluation of WQTC peak flow treatment capacity for any treatment facility that will receive additional flow based on any interim or Final SSDP project. Such evaluation is required to be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach," (EPA CERI, October 1984), and "Retrofitting POTWs," (EPA CERI, July 1989). The First ACD in 2009, required peak flow treatment capacity evaluations for the Lake Forest WQTC, the Timberlake WQTC, and any WQTC that may receive additional flow resulting from the elimination or modification of the Jeffersontown WQTC (these WQTCs were subsequently eliminated).
- A map that shows the location of all known unauthorized discharges. The map includes the areas and sewer lines that serve as a tributary to each unauthorized discharge. Smaller maps of individual tributary areas also may be included to show the lines involved in more detail.
- A description of each unauthorized discharge location that includes:
    - The frequency of the discharge.
    - The annual volume of the discharge.
    - A description of the type of discharge, such as, manhole, pump station, constructed discharge pipe, etc.
    - The receiving stream.
    - The immediate area and downstream land use, including the potential for public health concerns.
    - A description of any previous (within the last five years), current, or proposed studies to investigate the discharge; and
    - A description of any previous (within the last 5 years), current, or proposed rehabilitation or construction work to remediate or eliminate the discharge.
- A prioritization of the unauthorized discharge locations identified above, based upon the frequency, volume, and impact on the receiving stream and upon public health, and in coordination with the Capacity, Management, Operations, and Maintenance (CMOM) programs. Based upon this prioritization, MSD developed long-term SSDP projects including expeditious schedules for design, initiation of construction, and completion of construction. .
- A plan to involve stakeholders in the planning, prioritization and selection of projects.

Since there are no official EPA policies relative to unauthorized discharges, there is not a guidance document available to assist in developing the Final SSDP. The requirements of the Consent Decree for eliminating

unauthorized discharges from the SSS closely match the requirements for a LTCP, so that guidance document was used, where appropriate, to help in developing the Final SSDP.

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APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 2

METROPOLITAN SEWER DISTRICT

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APPENDICES

Note: Appendices shown in italic text were not revised for the 2021 IOAP and remain the same as the 2012 IOAP Modification. All appendices have been provided on a separate USB flash drive and are not included in this report.

Chapter 2: INTEGRATED OVERFLOW ABATEMENT PLAN (IOAP) APPROACH

Special Note – 2021 IOAP Modification: This chapter was developed in 2009. The statistical data for the CSO's reported, specifically related to individual CSO overflow volumes and frequency in a typical rainfall year, were derived from the CSS model calibrated in 2007. Since then, a more detailed calibration and validation effort has adjusted the average annual overflow volumes and frequencies in the Typical Year. Updates to LTCP and SSDP-specific data are in Volume 2, Chapter 4 and Volume 3, Chapter 4, respectively. The Volume 1, Chapter 2 appendices remain the same as those provided with the 2012 IOAP.

2.1. PROJECT WIN

The Louisville and Jefferson County Metropolitan Sewer District (MSD) initiated the Project WIN (Waterway Improvements Now) program to address the need for comprehensive planning, coordination, and reporting on Consent Decree response activities. Project WIN's mission is to provide oversight management of all the activities required to comply with the terms and conditions of the Consent Decree. Oversight management requires initiating, organizing, coordinating and managing a diverse set of elements, programs, and projects to successfully implement solutions to all Consent Decree obligations.

Implementation of Project WIN activities has allowed Louisville Metro to comply with Clean Water Act (CWA) regulations. The implementation of the Consent Decree program will continue for many years. Branding the Integrated Overflow Abatement Program (IOAP) as Project WIN has provided identification and distinction for MSD staff and the public. As the program progresses, the intent is for stakeholders to identify with the results. Branding the program as Project WIN identifies this as a special project with a beginning and an end that requires special attention and increased funding. The Project WIN branding also separates this program from the ongoing operations, maintenance, repair, and replacement programs.

Project WIN's goals are as follows:

- Identify, design, and implement projects and programs that reduce combined sewer overflow (CSO) events and mitigate their impact to comply with the CWA and the CSO Policy;
- Identify, design, and implement projects and programs that eliminate unauthorized discharges in both the separate sanitary sewer system (SSS) and the combined sewer system (CSS), providing the level of protection indicated by the selected design event;
- Select projects and programs that satisfy the Consent Decree requirements, and at the same time support and protect a broad spectrum of community values; and
- Implement the projects and programs in a manner that will efficiently use MSD's available resources while creating benefits related to Louisville's community values.

2.1.1. PROJECT WIN SCOPE

Project WIN is an umbrella program that manages both the operating programs and the overflow abatement capital programs required for Consent Decree compliance. Because of the overarching character of Project WIN, its scale encompasses a broad range, from small projects addressing specific overflow sites to strategic, area-wide projects and programs. A brief description of both programs follows:

2.1.1.1. OPERATING PROGRAMS

- **Sewer Overflow Response Protocol (SORP)** – MSD advanced the existing SORP program in accordance with requirements of the 2009 Amended Consent Decree (ACD). Project WIN also provided the initial framework for training MSD staff on SORP requirements and procedures. Project WIN provides the vehicle to monitor SORP activities, manage the SORP reporting functions, develop the annual updates to the SORP program, and assist MSD manage and deliver the ongoing SORP training program.
- **Nine Minimum Controls (NMC)** – MSD enhanced the existing NMC program in accordance with the requirements of the 2009 ACD. Project WIN continues to assist the impacted operating divisions in implementing the NMC program, tracks activities and performance of the NMC program, and provides quarterly and annual reporting to the Environmental Protection Agency (EPA) and the Kentucky Department of Environmental Protection (KDEP) in accordance with Consent Decree requirements.
- **Capacity, Management, Operations and Maintenance (CMOM)** – MSD developed a CMOM Self-Assessment in accordance with the requirements of the 2009 ACD. Project WIN assists MSD's impacted divisions with implementing the comprehensive CMOM program, tracks activities and performance of the CMOM program, and provides quarterly and annual reporting to EPA and KDEP in accordance with Consent Decree requirements.

2.1.1.2. OVERFLOW ABATEMENT CAPITAL PROGRAMS

- **Interim Long Term Control Plan (LTCP)** – MSD submitted an Interim LTCP in accordance with the requirements of the 2009 ACD. The Interim LTCP defined the short-term action plan for CSO abatement activities that continued during the development of the 2009 and 2012 Final LTCP. Project WIN monitored progress, managed the project completion certification process, and provided quarterly and annual reporting to EPA and KDEP in accordance with the Consent Decree. Activities required under the Interim LTCP have been completed.
- **Updated Sanitary Sewer Overflow Plan (SSOP)** – MSD submitted an Updated SSOP in accordance with the requirements of the 2009 ACD . The Updated SSOP defined the short-term action plan for sanitary sewer overflow (SSO) abatement activities that were continued during the development of the 2009 and 2012 Final Sanitary Sewer Discharge Plan (SSDP). Project WIN monitored progress, managed the project completion certification process, and provided quarterly and annual reporting to EPA and KDEP in accordance with the Consent Decree. Activities required under the Updated SSOP have been completed.
- **Interim SSDP** – MSD developed an Interim SSDP in accordance with the requirements of the 2009 ACD . The Interim SSDP defined the abatement plan for eliminating unauthorized discharges in the Beechwood Village area, the Hikes Point area, the Highgate Springs Pump Station, and the Southeastern Diversion. Project WIN managed the preliminary engineering and final design of some

of the elements of the Interim SSDP and monitored progress for those portions of the Interim SSDP managed by MSD's Engineering Division. Project WIN managed the project certification process upon completion of each project identified in the Interim SSDP. Activities required under the Interim SSDP have been completed.

- **Overflow Abatement Plans** – MSD developed the IOAP, which consolidates the Final LTCP and the Final SSDP. Project WIN will continue to monitor progress of the IOAP implementation, provide quarterly and annual reporting to EPA and KDEP in accordance with the Consent Decree, and manage the certification process following completion of each capital project. Volumes 2 and 3 of this 2021 IOAP submittal reflect completed projects and updates to the Final LTCP and Final SSDP that have occurred since the 2012 IOAP was approved in 2014.

2.1.1.3. BOUNDARY CONDITIONS

While Project WIN's scope is broad, the focus remains on Consent Decree compliance - primarily sewer overflow abatement. Project WIN does not address every facet of MSD's involvement in water quality and wet weather management. For instance, Project WIN does not address non-point source pollution, which is a result of stormwater runoff in the separate sewer system area. The non-point source pollution issue is addressed under Louisville Metro's Municipal Separate Storm Sewer System (MS4) stormwater permit. In Louisville Metro's MS4 stormwater permit, MSD is a co-permittee with several other government agencies, each with jurisdiction over specific elements of the MS4 system.

In addition, Project WIN is not directly responsible for stream restoration, aquatic and riparian habitat improvement, or development and maintenance of water-based recreation activities. However, during the development and implementation of Project WIN's activities that impact water quality and habitat conditions, stream restoration, habitat improvements, and recreation activities will be considered. Where practical, site restoration following construction will be targeted to improve the aquatic and riparian environment, under the general principal of "always leave the site better than it was before construction started."

2.2. INTEGRATED OVERFLOW ABATEMENT PLAN VISION

As noted above, the IOAP is a major component of Project WIN's responsibilities. The IOAP is a long-term plan to control CSOs and unauthorized discharges in both the CSS and SSS. Implementing the IOAP is expected to improve water quality in both Louisville Metro streams and the Ohio River. The expected water quality benefits of the IOAP include reductions in the peak levels of bacteria in the Ohio River and Beargrass Creek and a reduction in the number of days that bacteria levels exceed water quality standards during periods of wet weather. As acknowledged in the ACD, bacteria levels have decreased in the Ohio River and Beargrass Creek since the IOAP was started according to ORSANCO and MSD wet weather sampling data.

Sewer overflow control is essential for improving water quality, specifically for bacteria, pathogens and in some cases dissolved oxygen and metals, and is an important component of an overall approach to meeting water quality standards. Water quality monitoring and modeling clearly demonstrates that overflow control alone is not enough to consistently meet water quality standards. In light of this challenge, MSD plans to use the IOAP as one of its key contributions to broader water quality improvement efforts in the community. In particular, the IOAP will complement other wet weather and water quality programs managed by MSD and/or by other community partners. Complementary programs and efforts include; the Mayor's Green City Initiative, the Partnership for a Green City, Louisville Metro's Municipal Separate Storm Sewer System (MS4) stormwater permit, and initiatives of Jefferson County Public Schools (JCPS), private developers, and other entities.

The IOAP is a response to a Consent Decree negotiated with EPA and KDEP. As such, the IOAP will be a federally enforceable action plan for sewer overflow abatement. The IOAP must, therefore, limit its scope to commitments that directly relate to MSD programs and activities to address CSO and unauthorized discharge issues. Other community water quality programs, which may be partly or completely out of MSD's control, can provide synergistic benefits with the IOAP, but these programs do not fall under the same level of federal enforcement. On the other hand, these programs may have different mechanisms for ensuring accountability (for example, the KDEP oversees the MS4 stormwater permit that MSD and several other agencies hold as co-permittees).

2.2.1. VALUES-BASED EVALUATION PROCESS

In compliance with requirements of the Consent Decree, MSD formed a diverse Wet Weather Team (WWT) to assist in the development of the IOAP. The WWT vetted and agreed upon a values-based performance evaluation framework to evaluate and select alternatives for the IOAP. Volume 1, Chapter 3 provides more information about the WWT.

The WWT and a Stakeholder Group identified eleven community values to underpin the analysis and selection of alternatives for the IOAP as shown in Table 2.2-1.

Table 2.2-1 Wet Weather Team Community Values

PROJECT-SPECIFIC VALUES	PROGRAMMATIC VALUES
Environmental Enhancement	Economic Vitality
Public Health Enhancement	Financial Stewardship
Regulatory Performance	Education
Asset Protection	Environmental Justice and Equity
Eco-friendly Solutions	Customer Satisfaction
	Financial Equity

Using this structured decision-making process as framed by the WWT, MSD developed and evaluated overflow abatement control options for the IOAP based on managing risks according to these community values. In particular, MSD analyzed each IOAP project alternative in terms of potential benefits and costs. Benefits are quantified based on the anticipated reduction in risks to the community values, and costs reflect the total of both capital and operational costs of the alternative. As a result, the benefit-cost analysis influences the selection of site-specific abatement approaches or technologies, site-specific levels of protection (within the boundary conditions for CSOs and unauthorized discharges), and the relative priority of projects for implementation.

Several of the WWT's community values relate to financial considerations. These include the cost-effectiveness of individual solutions and the program as a whole (financial stewardship), the affordability of the program's total costs for the community (economic vitality), and how the costs are allocated among different segments of the population (financial equity). MSD and the WWT used the results of the values-based benefit-cost analysis of project alternatives to support informed discussions with the Stakeholder Group and the public about the appropriate level of investment in the IOAP.

As directed in EPA's CSO Control Policy, discussions about total program costs and the selection of projects for the IOAP consider a "knee of the curve" analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. A further discussion of the knee of the curve concept is contained in Section 2.5.7 of this chapter. A presentation of the results of the IOAP knee

of the curve analyses can be found in Volume 1, Chapter 5, Section 5.2.3. In addition to this analysis, the community's level of investment in the IOAP has also been considered in the context of anticipated future requirements and other needs for MSD services. These requirements include stormwater compliance needs associated with Louisville Metro's MS4 stormwater permit, and requirements to meet the forthcoming total maximum daily load (TMDL) allocations for Beargrass Creek. The consideration of various water quality investment needs is important since sewer overflow control alone will not be sufficient to meet water quality standards.

2.2.2. LEVELS OF CONTROL

Under the CWA, CSOs are permitted discharges in wet weather, as long as they are managed to avoid degradation of water quality in the receiving streams. EPA's CSO Control Policy sets specific abatement targets for CSOs. To be permitted, wet-weather CSOs must be controlled so that either water quality standards are achieved, or the permit-holder can show that the CSO discharges do not cause or contribute to exceedances of water quality standards. Under the CSO Policy, controlling overflows to four events per year or less, or capturing and treating 85 percent or more of wet weather flows is "presumed" to achieve the target water quality standard exceedances. Volume 1, Chapter 5 of the IOAP discusses in detail the MSD's regulatory compliance strategy for CSO control.

MSD's strategy for unauthorized discharges reflects the fact that unauthorized discharges must be eliminated under the CWA. From a practical perspective no sewer system can be designed to avoid all possibility of overflows during extreme weather events. A design event must be defined that reflects the level of protection consistent with community values and cannot be shown to cause or contribute to water quality exceedances.

The IOAP used the values-based benefit/cost evaluation framework to determine design events that reflect an appropriate level of control of sewer overflows for the Louisville Metro community. The decision to develop site-specific levels of control based on benefit/cost evaluations was made by MSD in consultation with the Stakeholder Group that is a part of the WWT. While site-specific levels of control were determined to best meet the objectives of the community, the WWT Stakeholder Group strongly supported the identification of boundary conditions representing the minimum level of protection acceptable to the community, and the maximum level of protection determined to be reasonable, given competing demands on environmental protection community resources.

- **Minimum Level of Protection**: A storm event with a 50 percent probability of occurring in any given year (commonly referred to as a two-year storm) was identified as the minimum level of protection acceptable to the community. The cities of Atlanta and Knoxville set the precedent for selecting a design storm with a 50 percent probability of being exceeded in any given year as the minimum protection level for unauthorized discharges. Using the values evaluation framework approach to determine the design storm control level means that solutions to address an individual unauthorized discharge location would be designed to protect against larger storms (for example, a 2.25-inch cloudburst storm instead of a 1.82-inch cloudburst storm) if that would yield a higher benefit-cost ratio in the analysis of project alternatives.
- **Maximum Level of Protection**: A storm event with a ten percent probability of occurring in any given year (commonly referred to as a 10-year storm) was selected as the maximum level of protection considered reasonable. A storm of this severity happens infrequently, but when it does occur, it often causes high levels of non-point source pollution that overwhelms the potential impacts of SSOs. The WWT Stakeholder Group understood the need to focus environmental protection community resources on the pollution sources that give the greatest return on invested dollars. Protecting against SSOs in a

storm with a ten percent probability of occurring in any year was identified as the upper limit of protection that the community believes is reasonable, given the potential for other, more cost-effective controls on other sources of pollution.

Based on an analysis of over 60 years of historical weather patterns for Louisville Metro, MSD determined that a three-hour high-intensity cloudburst storm reflected the most appropriate storm pattern to use in overflow control evaluation. This was based on the analysis previously referenced, and observations that hydraulic modeling conducted using the cloudburst storm more closely correlated with historically documented overflow locations throughout the system. To evaluate different levels of control, MSD evaluated a 1.82-inch cloudburst storm, a 2.25-inch cloudburst storm, and a 2.60-inch cloudburst storm. The 1.82-inch cloudburst storm has a 50 percent probability of being exceeded in any given year. The 2.25-inch cloudburst storm has a 20 percent probability of being exceeded, and the 2.60-inch cloudburst storm has a 10 percent probability of being exceeded in any given year.

2.2.3. COMPONENTS OF MSD'S INTEGRATED OVERFLOW ABATEMENT PLAN TOOLKIT

Control options in the IOAP "toolkit" include source control, storage, conveyance and transport, treatment, and sewer separation. As stated above, MSD used a benefit-cost analysis approach to compare the project alternatives and program elements considered for inclusion in the IOAP. The specific mix of control options for individual CSO or unauthorized discharge locations is driven by the benefit-cost analysis of how the project alternatives affect the community values identified by the WWT, and site-specific considerations. Therefore, project alternatives are built around MSD's existing infrastructure (for example, large diameter pipes and water quality treatment centers [WQTCs]) and draw on synergistic benefits from other MSD projects.

Driven by the values-based benefit-cost analysis, the IOAP has reflected a balanced mix of "green infrastructure" and "gray" facilities to prevent and control sewer overflows. Green infrastructure includes options such as green roofs, rain gardens, rain barrels, porous pavement, and bioretention. Green infrastructure reduces CSOs by providing pathways for stormwater to soak into the ground, rather than run off to the CSS. Gray facilities control CSOs using storage basins, treatment plants, conveyance and transport through sewers and pump stations, and sewer separation. In addition to site-specific green infrastructure projects, the IOAP has included investments that reduce flow at multiple sites (for example, a rain barrel program) and involve partnerships with other public and private entities.

MSD analyzed potential options to control private sources of infiltration and inflow (I/I) into the SSS including from laterals, downspouts, sump pumps, and foundation drains. Private-side I/I control will be an important part of the IOAP. In 2012, the MSD Board adopted changes to the Wastewater and Stormwater Discharge Regulations (WDRs) clarifying the prohibition of clear water discharges to the SSS, and providing for MSD's right of entry to inspect for illicit connections and authorizing the imposition of penalties for violations of the WDRs specifically related to illicit connections of clear water sources of infiltration and inflow. The next steps in implementing a private source I/I reduction program include the development of enforcement policies and standard operating procedures for consideration by the Board, and ultimately, Metro Council. The MSD Board may also choose to continue or even expand the existing Plumbing Modification Program to provide incentives, a fee-based approach, point-of-sale requirements, and/or financial assistance to property owners who need to reduce clear water discharges to the SSS. Any changes to implementation actions relative to MSD's WDRs, or MSD's incentives and assistance programs will be accompanied by a proactive outreach and education program to maximize the benefits of those changes.

As a guiding principle, MSD's IOAP has used front-end consideration of source control and green infrastructure. Overall, this means that more traditional gray infrastructure in the IOAP was "right-sized" after considering both

the anticipated flow-reduction benefits of programmatic and site-specific green infrastructure solutions, and the anticipated effectiveness of other source control approaches, including reduction of private sources of I/I. As part of the adaptive management process, prior to final design of supporting gray solutions, the actual flow reduction performance was documented and compared against estimated targets, where applicable. The final right-sizing of the gray solutions was based on actual documented performance of the green infrastructure solutions previously implemented. Green infrastructure solutions in the IOAP were implemented early in the schedule, to allow data to be gathered on the flow reduction benefits that occur.

MSD's IOAP will continue to use an adaptive management implementation approach based on monitoring and evaluation efforts. MSD's post-construction compliance monitoring and evaluation plan for the IOAP will include water quality monitoring, sewer flow monitoring, overflow events analysis, gray and green infrastructure project performance monitoring, and measurement of the effectiveness of source control and behavior-change efforts. In coordination with EPA and KDEP, MSD has adapted its CSO management and unauthorized discharge elimination approaches based on the monitoring and evaluation results within the values-based evaluation approach and using the Level of Protection criteria supported by the WWT. This has included right-sizing gray solutions, re-evaluating the effectiveness of green solutions, optimizing real-time control of in-line storage, infrastructure rehabilitation projects for I/I reduction, and adjusting the types and characteristics of projects planned for later phases of implementation. Adaptive management continues to be a logical approach for managing IOAP projects in order to meet system-wide Presumption Approach guidelines in the CSO Policy as well as achieving level of protection goals within the separate system. MSD will continue to monitor developments and adjust plans as more data becomes available. The 2012 IOAP Modification was the first global adaptive management revision to be made to the approved 2009 IOAP and this 2021 IOAP Modification is the second. Minor modifications to individual projects have also been made and coordinated to revise the IOAP. The final version of approved minor project modifications is incorporated into this revision in both the Final SSDP (Volume 3) and Final LTCP (Volume 2).

2.2.4. PUBLIC INFORMATION AND OUTREACH

Public information and outreach is critical to the success of the IOAP. The IOAP education plan will accomplish three objectives:

- Generate a sense of personal ownership and responsibility required for the sustainability of critical voluntary programs in the IOAP.
- Promote public acceptance and support for the financial investments required to achieve consent decree and CWA compliance.
- Encourage support for other agency programs or legislation that supports overflow abatement efforts.

Education is particularly important to promote and sustain participation in green infrastructure programs (for example, rain gardens and rain barrels) and in efforts to control private sources of I/I into the sewer system. IOAP Volume 1, Chapter 3 focuses on public participation and agency interaction.

2.2.5. FUTURE DEVELOPMENT CONSIDERATIONS

Solutions in the IOAP have considered future development or build-out based on the community's long-term land use plans, Cornerstone 2020. The IOAP is not in itself a land use planning document, however, and MSD does not have jurisdiction over land use planning. MSD will work with existing land use plans developed and administered by the Louisville Metro Planning and Design Services Department.

IOAP solutions accommodate the projected impacts of population growth and land use development. Solutions consider the effects of growth on connections to existing infrastructure that is upstream from existing overflow points. Cases where the growth outlined in Cornerstone 2020 would logically provide new infrastructure and is not hydraulically dependent on or connected to the IOAP solution are not part of the IOAP projects. Moreover, the solutions in the IOAP account for the impacts of anticipated growth on existing infrastructure; nevertheless, the IOAP itself will not build the capacity needed for growth.

2.2.6. FUNDING PLAN

The IOAP funding plan is based on the principle that rates and fees must pay MSD's operating costs and debt service and must adequately maintain a satisfactory bond rating. Furthermore, MSD's rates and fees must allow for continued economic development in the community. In particular, a strong local economy will be important to sustain the affordability of the IOAP. These principles for the funding plan affect the amount of money MSD may borrow at any one time and the level of increases in rates and fees needed to fund capital and operating expenses for IOAP implementation.

2.2.7. ACTION PLAN

MSD created in the IOAP an action plan that considered both the requirements of the Consent Decree and the goals and objectives of the surrounding community. MSD recognizes that a program, not a project, is needed to control CSOs and unauthorized discharges.

MSD has chosen to implement a comprehensive, integrated, and long-term program that will abate CSOs and unauthorized discharges, improve Louisville Metro's water quality, protect public health, enhance the overall environment, all while considering financial constraints, other water quality programs, and the need to continue to provide sewer service to meet the community's future population and economic growth objectives. The following sections describe in more detail the approach used in developing the IOAP to maximize water quality benefits, protect important community values, and focus resources on the high-value and high-priority concerns and solutions.

As noted previously, the 2012 IOAP Modification represented the first general adaptive management revision to the approved 2009 IOAP, and this 2021 IOAP modification is the second. While projects and schedules are being revised, the approach to develop, evaluate, select, and prioritize projects and programmatic activities remain based on the same set of community values and the same risk management approach to protecting and enhancing those values in determining what revisions should be implemented.

2.3. WATERSHED APPROACH

For many years, MSD has promoted the use of a watershed approach for improving water quality. The watershed approach, as it is commonly defined, provides a holistic framework for managing all the factors that influence water quality with a specific drainage area. The watershed approach typically involves stakeholders in the watershed to coordinate projects, programs, and strategies into an integrated plan of action. The watershed approach is multi-scale ranging from a site-specific end-of-pipe solution, to a regional scale source reduction program, and from voluntary neighborhood action groups to massive public works facility construction. The watershed approach is inherently flexible, incorporating both gray and green infrastructure solutions, adaptable to developing conditions, and dependent on a wide range of interagency and other stakeholder partnerships. Figure 2.3-1 presents a map of the IOAP Watershed Boundaries/Model Areas.

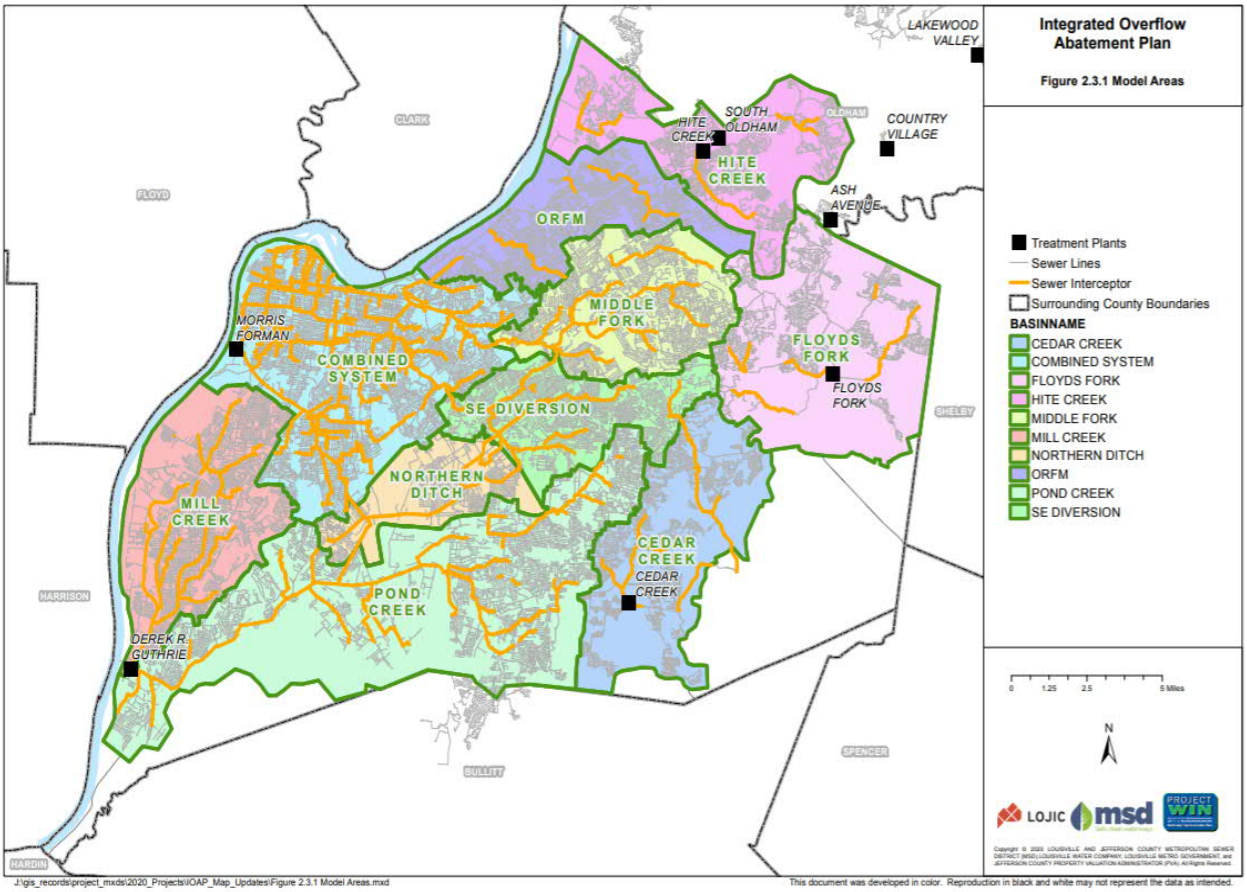

Figure 2.3-1 Watershed Boundaries

During the years of 1985 – 2005, MSD pursued an active watershed management program. MSD sewer system expansion programs resulted in the elimination of over 40,000 failing septic tanks, thereby addressing serious public health and water quality issues affecting both the groundwater and surface water resources of Louisville Metro. In addition, MSD eliminated over 300 small, poorly performing WQTCs constructed by others (mainly private developers), and consolidated those flows into modern, well-operated regional treatment plants thereby addressing widely distributed sources of surface water pollution. As the lead agency for drainage and flood control, MSD also developed requirements for stormwater runoff management and retention, which reduced stormwater pollution reaching the surface waters of Louisville Metro. In this role, MSD also took the lead role in developing and managing a comprehensive erosion prevention and sediment control ordinance to protect Louisville Metro surface waters from the impacts of construction-related runoff pollution.

While MSD fully embraces the watershed approach, MSD has modified the traditional watershed approach to accommodate the fixed schedules and firm commitments required by the Consent Decree. Given the nature of potential penalties for failure to perform, MSD is required to implement a response that keeps the vital activities under its direct control, thereby controlling its own destiny, and ensuring timely, consistent, and sustained compliance.

The ideal watershed approach to water quality improvement would allow consideration of both point and non-point sources of pollution, and coordinate efforts between the CSO and non-point source abatement efforts of

a wide variety of stakeholders. Since MSD is not the sole permittee included in the Louisville Metro MS4 stormwater permit, including MS4 issues into a Consent Decree response would either create federally-enforceable obligations for entities not named in the Consent Decree, or require MSD to rely on actions beyond its control, and potentially pay penalties resulting from the failure of other co-permittees to perform in accordance with strict schedules.

In developing a modified watershed approach, MSD recognized certain regulatory boundaries are not consistent with a traditional watershed approach. For example, in the CWA, pollutant loads originating from CSOs and pollutant loads resulting from unauthorized discharges are treated differently. CSO control is primarily driven by public health and water quality concerns, and CSO pollutant loads are usually well suited to the cost optimization offered through "load trading" that is central to the watershed approach. Control of unauthorized discharges, however, is driven primarily by regulatory permitting issues, with little or no direct connection to pollution loads or water quality. Unauthorized discharges, therefore, are not amenable to load trading concepts that maximize water quality benefits at the lowest practical cost.

MSD's modified watershed approach deals with these issues through adaptation and compromise. CSO abatement is accomplished through a combination of green and gray infrastructure that optimizes benefit/cost evaluations for those activities that MSD controls, and are related directly to overflow abatement. MSD will form partnerships with other government agencies and other stakeholders of all types and sizes but will rely on post-construction compliance monitoring to confirm the actual effectiveness of partner actions.

Elimination of unauthorized discharges will incorporate a combination of source control and gray control infrastructure. Effective source control will require a strong partnership with MSD's customers, to ensure that private property I/I sources are controlled to the same level as is implemented in MSD-owned facilities. Green infrastructure programs will also be implemented in the separate sewer system areas, recognizing that these programs can indirectly influence sewer system wet weather flows.

The final product of a typical watershed approach is a plan that prioritizes and coordinates a variety of participant's efforts to keep clean and protect the community's waterways consistent with the community values. The IOAP modified watershed approach provides this kind of plan, with some constraints on the type of commitments received from other community partners. The IOAP will provide watershed-based assessment and management information programs including analyses, project alternatives and schedules, criteria to measure progress, and resources for plan development and implementation.

2.4. OVERFLOW ABATEMENT TECHNOLOGY

In the development of overflow abatement strategies and alternatives, a wide range of technology approaches are available. These approaches include:

- Source control through:
    - I/I reduction or
    - Stormwater runoff reduction through implementation of green infrastructure,
- A wide variety of conventional constructed facilities commonly referred to as gray infrastructure, including:
    - Sewer separation (converting the CSS to a separated sewer system).
    - Peak flow storage (either with constructed tanks, or oversized pipes providing "in-line" storage);

- Increased conveyance capacity (through increased pipe sizes, parallel relief sewers, new or expanded pump stations);
- Flow diversions to other portions of the system that have available capacity; and
- Expanded wastewater treatment capacity, either provided at existing regional treatment facilities or provided remotely at high-rate wet weather treatment facilities.

Volumes 2 and 3 of the IOAP provide a detailed description of available technologies. While not a technology, an additional overflow abatement approach is modification of customer behaviors. This includes activities that reduce water usage during wet weather events and reduce pollutant loading in stormwater runoff. Behavior modification can reduce the discharge of conventional pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), and other pollutants of concern, including those from industrial, commercial, and household sources. Behavior modification is also one of the most important factors in reducing the introduction of materials into the sewer system (primarily fats, oils, and grease {FOG}) that can cause blockages in sewers.

2.5. PROJECT EVALUATION APPROACH

The IOAP used a structured decision-making process to provide a well-documented, fully auditable system for selecting overflow abatement alternatives. The Water Environment Federation's (WEF) document, "Guide to Managing Peak Wet Weather Flows in Municipal Wastewater Systems" (WEF 2006[1]) recommends this approach.

Figure 2.5-1 illustrates the general process followed in the development and evaluation of projects. As illustrated, the general process for alternative development and evaluation follows these steps:

Identify the potential control locations (CSOs and unauthorized discharges);

- Develop abatement concepts and test the concepts with stakeholders and the public;
- Develop alternative approaches to abate overflows;
- Evaluate each alternative using the project-specific values in a benefit cost analysis;
- Select the suite of preferred projects, and then evaluate that suite of projects against the programmatic community values; and
- Compare final list of projects to affordability guidelines and recommend a plan for consideration by the MSD Board.

[1] https://d3pcsg2wjq9izr.cloudfront.net/files/5306/articles/8735/083.pdf

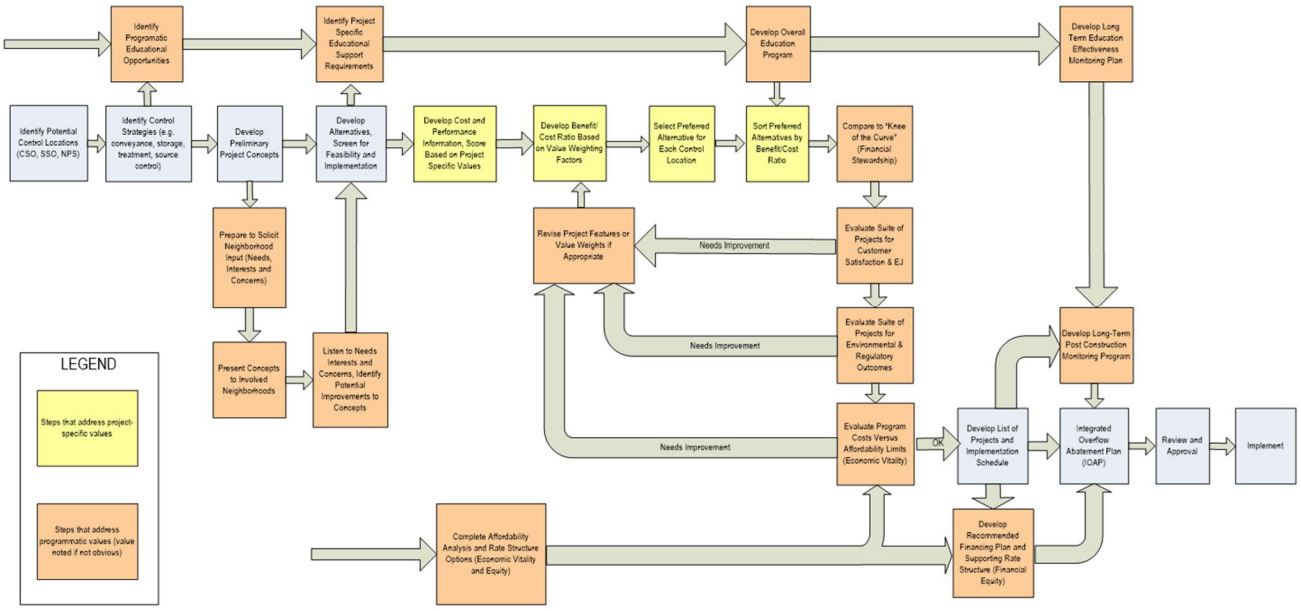

Figure 2.5-1 Project Development and Evaluation Process

2.5.1. VALUES-BASED RISK MANAGEMENT

To determine the benefits in a structured benefit/cost analysis, the approach recommended by the WEF guidance document involves the use of a risk-management approach designed to protect against threats to a set of values that the community wishes to protect. Risk management is a well-established process that recognizes the existence of risk and evaluates the ways to eliminate, reduce, and mitigate the consequences of those risks. In this context, a reduction in risk results in quantifiable benefits factored into the benefit cost evaluation for each alternative.

In a formal risk management approach, risk is defined as the product of the probability of a threat occurring times the consequence if that threat does occur:

Risk = Probability x Consequence

An important part of any risk management program is determining the measurement scales for consequence. The WEF guidance document recommends developing the consequence metric in the context of the potential threats to key community values.

A risk management program evaluates the level of risk associated with specific threats, and if the level of risk is unacceptable, determines actions to reduce the risk of a particular threat to an acceptable level. In other words, any action or effect that lowers the threat's probability, mitigates its impact, or both will reduce risk.

The field of risk management recognizes four general strategies to manage risk:

- Avoid the risk by eliminating it or reducing its probability of occurring;
- Mitigate the risk by reducing the probable consequence;
- Transfer or share the risk with another party; and
- Accept the risk and any related losses should the event occur.

The basis for any risk management program is identifying the threat and what must be protected. For the overflow abatement program, MSD, following the guidance of the WEF document, selected a wide range of community values as the elements to protect. Additionally, MSD used quantifiable risk reduction as the benefit score in the structured benefit/cost evaluation.

2.5.2. COMMUNITY VALUES

Protecting Louisville Metro's community values remains the focus of the IOAP and exerts influence through the entire program. Community values are issues of interest and concern that citizens want to protect and serve as program anchoring points and decision process inputs. Louisville Metro's community values influence the entire IOAP through the processes to set goals, define objectives, and evaluate alternatives. For these reasons, knowledge of community value characteristics, creation, and function is critical to understanding the IOAP.

Community values are categories of criteria used to assess threats and evaluate alternatives. Another way to define a community value is to consider it an outcome or goal. For example, the goal of a community value named Asset Protection would be to reduce basement backups due to sewer surcharging. The IOAP would evaluate this goal during alternative development using the percentage of sewers that surcharge to within six feet of the ground as a criterion. Therefore, reducing the percentage of surcharging sewers due to implementing an alternative is a measurable criterion for the Asset Protection goal.

The community values evaluation process allowed the WWT to quantify a wide range of dissimilar problems, calculate the risk that the problem may have associated threats, and evaluate the benefits of each alternative using a consistent scale of measurement. Values-based risk management is a decision and prioritization process that systematically considers multiple objectives. This process was the mechanism by which the WWT Stakeholder Group, acting as representatives of the public, advised MSD on the design and implementation of the IOAP. The IOAP Volume 1, Chapter 3 addresses in detail the WWT formation and the makeup of the Stakeholder Group. It also addresses how the WWT Stakeholder Group's composition and role has changed during the initial implementation phase of the IOAP, and how the overall WWT will be involved in ongoing implementation decisions. Chapter 3 describes the plans for continuing public information, education and outreach in response to changing needs as project and program implementation moves into different stages.

The creation of the community values began with consideration of MSD's vision, mission statement, and responsibilities. Using these as guides the stakeholders identified an initial, tentative list of issues deemed important to the community that may be affected by IOAP projects. These initial community values were refined with assistance from a technical team. Part of the refinement process included identifying and defining objectives for each community value. Essentially, a community value's objectives serve as both a practical definition, and as a measurable criterion for the risk management process. For example, reducing pathogen concentrations in streams is a measurable criterion related to the community value (goal) of Public Health Enhancement. The process of identifying, defining, and refining continued until the WWT reached a consensus regarding the content, wording, and meaning of each. The WWT produced a final list of eleven issues, which became the community values as outlined in Section 2.2.1.

Of the eleven community values, five values are considered to be project-specific values, and the remaining six are programmatic values. The difference between the two types of values is primarily in how they are used in the decision process. A project-specific community value affects a specific project, or problem site. The risk management evaluation process used project-specific values to select individual projects for overflow abatement. In contrast, a programmatic community value effects a specific neighborhood, the community, a watershed, or the entire project area.

The programmatic community values are a broader, all-encompassing group as opposed to the project–specific values. An alternative may produce both project specific effects, and programmatic effects. This dichotomy allows the evaluation of an alternative's effects and impacts at two levels simultaneously.

Every alternative is evaluated with respect to each community value. An initial evaluation uses the five project-specific values while a secondary evaluation uses the remaining six programmatic values to ensure that the entire suite of recommended projects supports the programmatic value set (see Table 2.5-1).

Table 2.5-1 IOAP Wet Weather Team Community Values

PROJECT-SPECIFIC VALUES
Environmental Enhancement: Protect and improve existing habitats, plant and animal species, and public enjoyment of its natural resources by reducing and preventing the discharge of pollutants into the environment. Criteria used to measure the goal's objectives include aquatic habitat protection, surface water dissolved oxygen, aesthetics, stream flow, and biochemical oxygen demand reduction.
Public Health Enhancement: Protect and improve the health and safety of neighborhoods by minimizing the potential for encountering waterborne pathogens. Criteria used to measure the goal's objectives include peak flow measurements and characteristics of the release.
Regulatory Performance: Achieve compliance with the Clean Water Act, Clean Air Act, and the Consent Decree. Criteria used to measure the goal's objectives include discharge frequency, discharge peak flow rates, average annual overflow volume, and release point characteristics.
Asset Protection: Prevent property damage and financial loss to property owners by reducing surface flooding due to stormwater drainage and reducing the number of basement backups resulting from sewer surcharging. Criteria used to measure the goal's objectives include flood damage and basement backups.
Eco-Friendly Solutions: Implement alternatives that minimize detrimental impacts on the community, its habitat, and energy use, while at the same time maximizing the environmental benefits derived from them. Emphasis is on solutions that provide multiple benefits and those that mimic or use natural processes and cycles. Criteria used to measure achievement of the goal's objectives include energy consumption, use of natural systems, multi-use facilities, pollutant control, construction techniques, land use, and permeable surfaces.

PROGRAMMATIC VALUES
Economic Vitality: Ensure that the community's total cost burden of implementing the IOAP is represented by affordable rates. While wastewater service rates and development fees should remain affordable, they must also provide adequate funds for continued development and growth. Factors considered in evaluating achievement of the objectives of this value include comparison of the resulting rates with EPA affordability criteria, which use residential and financial capability indicators. The evaluation will consider the costs for Consent Decree related costs, in addition to related costs for general sewer service, and drainage and flood protection costs. The likely burden of other utility services will also be addressed, even though these are not specifically considered in the EPA affordability criteria.
Financial Stewardship: Maximize the benefits gained from the IOAP's various alternatives by the efficient use of all available resources. The benefit-cost ratio used in conjunction with the values based risk management approach; provide a systematic process to ensure achievement of this community value. Criteria are based primarily on the cost-effectiveness of the solution set developed considering benefit cost evaluations of first cost and total present worth costs. The solution set will also consider other indicators of cost effectiveness, such as dollars per gallon of annual average overflow reduced.
Education: Enhance the community's knowledge, values, and opinions to the extent that they will promote and demonstrate pollution prevention behaviors. Example behaviors may include understanding and support of investments that address sewer overflows and water quality issues, the implementation of technologies such as a rain gardens and rain barrels, and voluntary disconnection of down spouts. Criteria include, but are not limited to, the number of people contacted by various means, their knowledge of issues, and number of pollution prevention devices installed.

PROGRAMMATIC VALUES
Environmental Justice and Equity: Ensure a fair, balanced, and impartial distribution of the IOAP's capital investments, facilities, and services. The socioeconomic status of a neighborhood should not influence the type of projects chosen for the area, nor the manner of their implementation. Criteria include, but are not limited to, the distribution of resources, project impacts and benefits, consistent application of project development criteria, improvements to the quality of life, and an equal adoption of responsibilities.
Customer Satisfaction: Respond quickly and efficiently to customer needs, concerns, and questions as necessary. Criteria include, but are not limited to, providing adequate sewer capacity, improving the reliability of sewer service, implementing response procedures to unauthorized overflows, and notifying customers regarding issues of concern.
Financial Equity: Distribute cost associated with the IOAP fairly and reasonably. The user's rate fees should be commensurate with the demands that user places on the system. Criteria include, but are not limited to, the fair assignment of cost, the volume and type of waste introduced into the system, and socio-economic status.

2.5.3. THREAT IDENTIFICATION AND CHARACTERIZATION

The first task in risk management is to identify and define the various threats. Threats are caused by a specific problem, typically a CSO or unauthorized discharge. The threats are characterized by analyzing the probability and consequence of each specific problem occurring, within the context of the community values. The products of this analysis are the completed performance measurement tables.

Performance measurement tables are worksheets used to evaluate an existing problem's risk as defined by the probability of occurrence and the severity of the consequence. The reduction in the risk is defined as the benefit created by each proposed alternative. The public health enhancement, regulatory performance, and asset protection performance measurement tables incorporate a two-dimensional matrix of a threat's probability and severity, illustrated by Table 2.5-2. This allows calculation of the risk score associated with each possible combination of probability and severity. Each project-specific community value is represented by its own corresponding performance measurement table.

Appendix 2.5.1 includes the complete set of performance measurement tables, along with instructions on how to use them.

Appendix 2.5.1 Benefit-Cost Model Instructions
This is the same appendix provided with the 2012 IOAP and is provided on the external USB drive.

In contrast to this, the eco-friendly solutions and environmental enhancements performance measurement tables are one-dimensional. Measuring alternatives against these values involves comparing alternative characteristics against a set of impact criteria. Since the analysis is based on fixed characteristics of the alternative, the probability of an effect is "1" which means there is always an effect. However, the magnitude of the effect is variable. Furthermore, the effect could be beneficial or detrimental. As a result, the one-dimensional community values have an impact scale ranging from negative "5" to positive "5."

Table 2.5-2 Performance Measurement Table for WQTC Regulatory Performance

Alternative #1														
Value:	Regulatory Performance - WWTP													
	Measure			Impact						Rationale	Measurement Method			
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 25 - 50%	Peak flow exceeds rated capacity by 10 - 25%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	Peak flow is less than 80% of rated capacity	WWTPs have ability to handle small short term peaks without exceeding discharge standards, but significant peak s may result in process washout and associated failure of discharge permit limits. Peak flows less than 80% of rated capacity allow plant to pe	Measurement will be from analyzing plant influent flows against pre-determined plant stress-test results and operating criteria.			
	Event Recurrence Interval			Most Severe Impact				Least Impact	No Impact					
				5	4	3	2	1	0	Assumptions	Base Case Score	Alternative Score	Total Score	
Frequency	6-10 per year	Most Likely	5	25	20	15	10	5	0				0	
	2 -5 per year		4	20	16	12	8	4	0				0	
	1-2 year recurrence interval		3	15	12	9	6	3	0				0	
	3-5 year recurrence interval		2	10	8	6	4	2	0				0	
	>5 year recurrence interval	Least Likely	1	5	4	3	2	1	0				0	
	Not possible	Not Possible	0	0	0	0	0	0	0	Average Total Score			0	
Note - This value sheet calculates the average benefit over the recurrence intervals. A correction calculation is included in order to obtain a maximum score of 25. Acronyms AADV - Average annual overflow volume; mf - Millifeet; WQS - Water quality standards; CSO - Combined sewer overflow; SSO - Sanitary sewer overflow; WWTPs - Wastewater treatment plants										Corrected Score			0	

Table 2.5-3 illustrates a one-dimensional measurement table as well as the rationale for the performance measures.

Table 2.5-3 One-Dimensional Measurement Table and Rationale for Performance Measures

L_OR_MF_172_S_08_A_A	Sewer Separation - Construct New Stormwater Sewer System												
Value:	Environmental Enhancement												
	Scoring												
Aspect	-5	-4	-3	-2	-1	0	1	2	3	4	5	Assumptions	Score Per Aspect
Aquatic and Terrestrial Habitat Protection	Elimination of habitat for rare or endangered species	Elimination of significant amount of common habitat	Elimination of minor amount of common habitat	Significant habitat impairment	Minor impairment to existing habitat	No impact on habitat	Minor enhancement of existing habitat	Significant enhancement of existing habitat	Creation of minor amount of common habitat	Creation of significant amount of common habitat	Creation of critical habitat for rare or endangered species	We utilize expertise of sub-consultants Redwing Ecological Services and/or LimnoTech to score Environmental Enhancement aspects.	0
Aesthetics - Solids and Floatables (S&F)	75%+ reduction in volume of flow with no S&F capture	50 - 75% of flow with no S&F removal	25 - 50% of flow with no S&F removal	10 - 25% of flow with no S&F removal	Reduces efficiency of existing S&F control device, 0 - 10% of flow with no S&F removal	No change in S&F removal	0 - 10% of discharged flow treated with positive S&F removal (screens)	10 - 25 % of discharged flow treated with positive S&F removal (screens)	25 - 50% of discharged flow treated with positive S&F removal (screens)	50 - 75% of discharged flow treated with positive S&F removal screens	75% + of discharged flow treated with positive S&F removal (screens)	Stormwater first-flush considered to be high in runoff pollutants	-5
Aesthetics - Odor and Air Emissions	Create annoying odor source affecting > 20 customers often	Create annoying odor source affecting <20 customers often, or >20 customers occasionally	Create annoying odor source affecting <20 customers occasionally	Create detectable odor source affecting > 50 customers often	Create detectable odor source affecting < 50 customers occasionally	No impact on odors	Eliminate detectable odor source affecting < 50 customers occasionally	Eliminate detectable odor source affecting > 50 customers often	Eliminate annoying odor source affecting <20 customers occasionally	Eliminate annoying odor source affecting <20 customers often, or >20 customers occasionally	Eliminate annoying odor source affecting >20 customers often	Sewer separation project has no impact on odor	0
Dissolved Oxygen Impacts	Reduction of in-stream DO by 2 mg/l + during critical flow periods	Continuous reduction of in-stream DO of 2 mg/l +	Continuous reduction of in-stream DO of 0 - 2 mg/l, possible reduction of in-stream DO 2 - 4 mg/l during critical conditions	Intermittent reduction of in stream DO 2 mg/l + possible during non-critical conditions, reduction of DO 0 - 2 mg/l during critical conditions	Intermittent reduction of in stream DO 0 - 2 mg/l possible during non-critical conditions	No DO impacts	Intermittent improvement of in-stream DO 0 - 2 mg/l	Intermittent improvement of in-stream DO 2 mg/l +, intermittent critical condition improvements 0 - 2 mg/l	Continuous improvement of in-stream DO 0 - 2 mg/l, intermittent critical condition improvements 2-4 mg/l	Continuous improvement of in-stream DO 2 mg/l +	Continuous improvement of critical condition in-stream DO 2 mg/l +	We utilize expertise of sub-consultants Redwing Ecological Services and/or LimnoTech to score Environmental Enhancement aspects.	0
Downstream Impacts	75%+ increase in annual BOD or nutrient loads	50 - 75% increase in annual BOD or nutrient loads	25 - 50% increase in annual BOD or nutrient loads	10 - 25% increase in annual BOD or nutrient loads (CSO + runoff)	Potential 0 - 10 % increase in annual average BOD or nutrient loads (CSO + runoff)	No impact on BOD or nutrient loads (CSO + runoff)	0 - 10% reduction in annual BOD or nutrient loads (CSO + runoff)	10 - 25% reduction in annual BOD or nutrient loads (CSO + runoff)	25 - 50% reduction in annual BOD or nutrient loads (CSO + runoff)	50 - 75% reduction in annual BOD or nutrient loads (CSO + runoff)	75%+ reduction in annual BOD or nutrient loads (CSO + runoff)	Storm water first-flush considered to be high in runoff pollutants	-5
Stream Flow Impacts (Peak flows)	25% + increase in peak flows	10% - 25% increase in peak flows	Up to 10% increase in peak flows	Frequent increase in flow during critical conditions	Possible increase in average flow, or minor increase in high flow peaks	No impact on peak flows	Minor reduction in flows - no significant peak reduction	Minor reduction in peak flows under some conditions	Up to 10% reduction in peak flows	10% - 25% reduction in peak flows	25%+ reduction in peak flows	Average annual flow rate is insignificant compared to annual stream flow rate.	0
Stream Flow Impacts (DWF only)	25%+ decrease in flow during critical conditions.	10% - 25% decrease in flow during critical conditions	0-10% permanent decrease in flow during critical conditions	Frequent decrease in flow during critical conditions	Possible decrease in average flow	No impact on average or base stream flow	Intermittent increase in stream flow - not tuned to critical conditions	Intermittent increase in stream flow - often improves critical conditions	0 - 10% permanent increase in stream flow during critical conditions	10 - 25 % permanent increase in stream flow during critical conditions	25%+ permanent increase in stream flow during critical conditions.	No impact on stream flow during critical conditions.	0
Instructions: (1.) Score each alternative for each of the seven aspects of the value. Scores can be positive or negative, depending on the impact of the alternative on the value. (2.) Total the scores for each aspect to get the total score for this alternative in this value. (3.) Shaded area represents "fatal flaw." Alternatives that score in this area should not be proposed.										Total Raw Score Calculated			-10
										Corrected Score			-10
										Note: The total score calculated may be more than 25. In the instances where this might occur, a default maximum score of 25 will be calculated.			

Aspect	Rationale	Measurement Method
Aquatic and Terrestrial Habitat Protection	Wet weather projects may affect both aquatic and terrestrial habitat through changes in base flow, peak flow, water quality, tree cover, channel shape, and characteristics etc. Predictive models used to evaluate wet weather control measures have a limited ability to predict biological diversity changes, erosion impacts etc., so surrogate metrics must be used to estimate future positive and negative impacts.	Project definition may specifically address changes in channel shape and configuration, tree cover etc. Predictive models will address DO and other water quality impacts. Flow models will predict base flow and peak flow rates to allow estimates of changes in erosion and water surface area.
Aesthetics - Solids and Floatables	Most CSOs have some form of solids and floatables control baffles. Improvements in capture rates can be expected with screening or other advanced treatment options. Storm water retention, constructed wetlands, and other control systems may provide solids and floatables removal as well. While reduction in solids and floatables removal efficiency is not likely, penalty points will be assessed if this is possible with any alternative.	Current solids and floatables removal efficiency has been estimated for all sites with control technology. Improvements in removal efficiencies will be estimated for all alternatives that add screening or other advanced treatment technologies. Where treatment is proposed for storm water discharges removals will be estimated based on published removal data.
Aesthetics - Odor and Air Emissions	Odors and air emissions can be generated in storage systems, pump stations, force mains, and long flat sewers. Odors are generally characterized by both the intensity and the quality of the odor. Detectable and annoying are two common descriptors of different intensities and qualities of odors from sewage handling facilities.	Odor emissions from sewage handling facilities can be modeled for intensity, quality, and geographic spread. For planning purposes this level of evaluation is not common, and will not be done except in very rare circumstances. The potential for odor and air emissions will be estimated based on typical applications and model predictions for storage time, number of events, average flow velocities etc.
Dissolved Oxygen Impacts	Dissolved oxygen in streams is dependent on a variety of factors including BOD load, nutrient load, stream flow velocity, water temperature, etc.	For BGC the Water Quality Tool will be used to estimate the impacts of various loading conditions, flows, temperatures, etc. Probable impacts of individual projects will be estimated based on comparisons to the various stream condition scenarios.
Downstream Impacts	Downstream impacts refer to conditions in the Ohio River below Louisville Metro. Nutrient loadings in the Ohio (not just Louisville metro) have been identified as the source of 30 - 45% of the total nutrient loads reaching the Gulf of Mexico. BOD is not likely to persist in the river long enough to get to the Gulf, but can have detrimental impacts far downriver.	Pollutant removals will be estimated based on reductions in annual average loads, since the downstream impacts are primarily long-term and cumulative.
Stream Flow Impacts (Peak flows)	Extremely high peak flows as are often caused by urbanization of a watershed can erode the streambed, damage aquatic and terrestrial habitat, make water based recreation unsafe or impractical.	Predictive models can estimate flow peaking factors from individual sources, and the Water Quality Tool has a hydraulic component to estimate stream flows during various storm events.
Stream Flow Impacts (DWF only)	Diversion of flows away from a stream due to abandonment of a treatment plant etc. can reduce base flows in a stream. Alternatively, other control measures such as groundwater pumping can increase base flows with beneficial results.	Predictive models can estimate flows from individual sources, and the Water Quality Tool has a hydraulic component to estimate stream flows during various dry weather events.

Acronyms

BGC - Beargrass Creek
BOD - Biological oxygen demand
CSO - Combined sewer overflow
DO - Dissolved oxygen
DWF - Dry weather flow
mg/l - Milligram per liter
S&F - Solids and floatables

2.5.4. BASELINE THREAT ESTIMATION AND RISK CALCULATION

Once a threat has been identified and its characteristics defined, it can be evaluated. For evaluation, it is necessary to estimate the threat's probability and severity. To do this, the event's frequency and the magnitude of its impact must be quantified. The values-based risk management process used probability and impact indices of "1" through "5." With regard to probability, a value of "1" represents low probability events that do not occur often while a value of "5" represents high probability events that occur frequently. On the impact, or severity index, a value of "1" is an event that produces a minimal effect, or impact. A value of "5" would be an event of significant impact. After a threat's frequency and impact have been quantified using the corresponding index, the two values are used to calculate the threat's risk score. The risk score is calculated or quantified as follows:

Risk Score = Probability × Severity

For example, a threat with a high probability of "5" and a medium severity of "3" would produce a base-line risk score of "15."

2.5.5. EVALUATION OF THE ALTERNATIVES

The third stage was the evaluation of an alternative's benefits. Using the risk scores calculated by the performance measurement tables, it was possible to compare the risk reduction that would result from the implementation of each alternative relative to the existing base conditions. As discussed above, each alternative produces numerous effects of an economic, environmental, and regulatory nature. Consequently, each effect may cause a corresponding change to an event's associated risk. The evaluation begins by calculating the base risk associated with each aspect, or criteria, of the existing condition. A comparable calculation is performed for the risk associated with each aspect of conditions that would be created by implementing the

alternative. The extent of improvement or relative magnitude of the benefit of each effect is quantified by a performance score, which is the difference between the existing and alternative conditions.

The performance score is calculated as:

Performance Score = Base Risk Score – Alternative's Risk Score

Performance scores indicate the relative magnitude of the benefit generated by the alternative. For example, a Performance Score of "22" represents a significant risk reduction, while a score of "1" represents a slight risk reduction. In some cases, the Performance Score can be a negative value which indicates a detrimental effect. This method compares the benefits derived from each alternative against a standardized set of conditions and criteria - the community values. The sum of an alternative's performance scores for each of the community values is converted to one number called the Benefit Score.

To determine a Benefit Score, the relative importance of each community value must be considered. Each community value is assigned a weighting factor by the WWT Stakeholder Group indicating its relative importance. The higher the weighting factor, the more important the community value. While the theoretical range in weighting factors is from one – ten, the WWT Stakeholder Group determines which of the community values identified are important, so the effective range in weighting is from six – ten. Details of the weighting factor determination are in the Volume 1, Appendix 3.2.9.

The weighting factor acts as a multiplier either increasing or decreasing an alternative's Benefit Score. For example, if an alternative's regulatory compliance Benefit Score is calculated as "15" using its full performance measurement table, the alternative's weighted Benefit Score is 15 × 8 = 120 because the regulatory compliance value was given a weighting factor of eight.

The five final weighted Benefit Scores, one for each project-specific community value, are combined into a total weighted Benefit Score for each alternative. The total weighted Benefit Score is then divided by the cost of the alternative's implementation producing the Benefit/Cost Ratio. This process ranks alternatives by the benefits they generate per dollar of cost.

2.5.6. BENEFIT-COST ANALYSIS

The scope of the IOAP covers over 100 CSOs, and over 200 locations with documented or suspected unauthorized discharges. Often several alternatives were proposed for abating overflows at each of these locations. As a result, there are literally hundreds of potential alternatives that could be implemented. In addition, alternatives rarely have the same financial cost associated with them. Hence, choosing the best combination of alternatives can be difficult. Two essential questions are (1) how to prioritize the potential alternatives, and (2) to what extent or scope should MSD implement the alternatives? The benefit-cost analysis systematically answered these two questions, forming the basis for prioritizing potential alternatives and determining the scope of the IOAP.

A benefit/cost analysis considered the relationship of an alternative's benefits as defined by the values-based risk management evaluation to its implementation cost. The process required two components (1) the alternative's total weighted benefit score discussed previously, and (2) the implementation costs. Note that project costs were expressed in hundreds of thousands, to avoid the appearance of benefit/cost values well below one. Since the benefit/cost scores were used to compare alternatives, the units of expression were not a factor in the decision process, as long as they were consistent between all alternatives.

For the purpose of alternative selection, the cost of each alternative was estimated using a spreadsheet-based cost model. This cost model was originally developed for the Metropolitan Sewer District of Greater Cincinnati.

The cost model has subsequently been used as a standard in a number of other locations, with refinements and calibrations used to tailor the model for each specific location. The cost model considers several factors associated with implementing an alternative. Examples include construction cost, administrative cost, land purchases and easements, operation and maintenance, and salvage value. The cost model users guide, and an example of the input and output sheets, is contained Appendix 2.5.2. While the cost model example sheets show actual estimated dollars, for the purpose of developing the benefit/cost ratio, the costs were expressed in hundreds of thousands, as explained previously.

Appendix 2.5.2 IOAP Cost Model

This is the same appendix provided with the 2012 IOAP and is provided on the external USB drive.

Note that after projects were selected for implementation under the Final LTCP and the Final SSDP the project cost estimates were refined to provide a higher level of accuracy for budgeting. The process of evaluating and refining the estimates is described in Appendix 2.5.3.

Appendix 2.5.3 MSD Cost Model Review and Update

This is the same appendix provided with the 2012 IOAP and is provided on the external USB drive.

The ratio of the alternatives' benefit score to its cost is referred to as a benefit/cost ratio. Related alternatives are ranked in descending order according to their benefit to cost ratio. The alternative with the highest benefit to cost ratio is usually the preferred alternative for each problem site.

The benefit/cost analysis is a tool to support the decision process but is not the only factor considered. In some cases, an alternative that is not the highest ranked benefit/cost value may be selected due to other considerations. An example relates to the selection of storage or remote high-rate treatment systems in the combined sewer system. In most cases, storage alternatives have higher benefit cost scores than the remote high-rate treatment. Implementing a program that adds significant storage to the system without adding additional treatment capacity could result in a condition of inadequate treatment capacity that cannot ensure all storage systems can be emptied before storing the next storm. In this case, selecting remote high-rate treatment may be necessary at some sites, even if it is not the highest benefit/cost score for that particular location. It must be emphasized that the benefit/cost evaluation is a vital tool in the selection of alternatives, but it does not dictate decisions or priorities if other factors must be considered.

2.5.7. KNEE OF THE CURVE EVALUATION

In evaluating the alternatives for CSO control, the CSO Control Policy recognizes that projects developed to improve water quality often reach a point of diminishing returns. This is observed when evaluating individual projects at the same level of control (for example, four overflows per year) and even more importantly, when evaluating the benefits of higher or lower levels of control. A knee of the curve evaluation for different levels of CSO control was used to validate the level of control decisions made based on the Benefit-Cost analysis described previously.

The CSO Policy and EPA guidelines for development of LTCPs recognize this phenomenon and advocate the use of a knee of the curve evaluation. To develop a knee of the curve plot, the benefits of a project or suite of projects is plotted against the cumulative cost to implement them. The knee of the curve is the name given to a particular region of the benefit (or benefit-cost) vs. cumulative spending line graph. Figure 2.5-2 shows a knee of the curve plot from Volume 2, Chapter 4 that illustrates evaluating the cost to achieve different levels of wet weather capture. Data points on the curve represent costs and wet weather capture developed for system-wide implementation of controls to achieve eight, four, two, and zero overflows per year. The point of the curve noted

marks the point of diminishing returns. Beyond this point, implementing additional alternatives, and incurring the cost of those alternatives, does not produce a commensurate increase in benefits.

For SSDP evaluation, the level of control analysis is slightly different. Since there is no EPA policy guidance for SSO elimination, an optimization step was used to select levels of control based on Benefit-Cost ratio.

To validate these selections, the cost of SSO control to different design storms was plotted against the cumulative Benefit-Cost scores of all SSO elimination projects sized to that storm. A more detailed presentation of these concepts is in Volume 1, Chapter 5, Section 5.3.

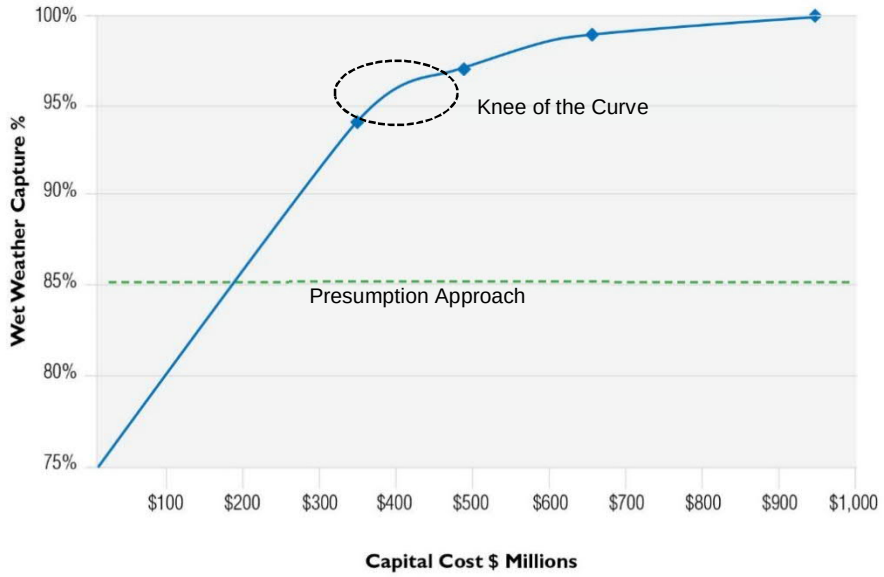

Figure 2.5-2 Example Knee of the Curve Graph

APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 3

METROPOLITAN SEWER DISTRICT

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APPENDICES

Note: Appendices shown in italic text were not revised for the 2021 IOAP and remain the same as the 2012 IOAP Modification. All appendices have been provided on a separate USB flash drive and are not included in this report.

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Chapter 3: PUBLIC PARTICIPATION AND AGENCY INTERACTION

Special Note – 2021 IOAP Modification: The intent of the Public Participation and Agency Interaction Program remains consistent with that developed in 2009. This chapter has been updated to reflect current program elements in Section 3.5 and an objective of continuous improvement. The enhancements support the 2021 Second Amended Consent Decree (ACD) and supplement an already robust IOAP. The Volume 1, Chapter 3 appendices remain the same as those provided with the 2012 IOAP. The attachments previously referenced have been moved into a new Appendix 3.3.2 for consistency.

Chapter 3 describes the Louisville and Jefferson County Metropolitan Sewer District's (MSD) strategy and planning process to facilitate stakeholder relationships among local community leaders, citizens, organizations, and regulatory agencies to develop a comprehensive Integrated Overflow Abatement Plan (IOAP). This chapter outlines the public participation and outreach program during the development of the IOAP as well as the ongoing program of public notification, education, and outreach that encourages sustainability of the program. The program focuses on four key components: Public Notification, Wet Weather Team (WWT) Engagement, General Programmatic Outreach and Educational Activities, and Regulatory Reporting and Agency Meetings.

The program implemented by MSD includes notification of the public, outreach, and education to the public and stakeholders, and engagement of specific stakeholders and the public to establish the priorities and make choices for the overflow abatement infrastructure program. The program is comprehensive and multifaceted. In the course of this chapter, this program will be referred to as the public program.

3.1. INTRODUCTION

Public participation and agency interaction are a vital component of MSD's Consent Decree response. An informed and involved public is essential to ensure that the response plan developed is consistent with the values of the community served and will be supported by the customers who will pay for implementation of the plan as part of their MSD service fees. Open communication with regulatory agencies is also vital to keep the plan development on-track, resulting in an approach to compliance that presents no surprises to the agencies that are facilitating plan review and approval. This chapter describes MSD's past, current, and proposed future program for public participation and agency interaction.

3.1.1. BRANDING OF PROJECT WIN

Project Waterway Improvements Now, or Project WIN, encompasses the MSD response to the Consent Decree, including the development of the integrated overflow abatement plans. These plans include the Final Long-Term Control Plan (LTCP) and Final Sanitary Sewer Discharge Plan (SSDP), as well as the implementation of the Nine Minimum Controls (NMC), Capacity, Management, Operations and Maintenance (CMOM), and the Sewer Overflow Response Plan (SORP). IOAP development also includes the construction of the Early Action Plan (EAP) projects and the public program to notify and engage the public in the MSD wet weather program.

The implementation of the Consent Decree program will continue for many years. Branding the overflow abatement program as Project WIN is intended to provide identification and distinction. With this branding, it is expected that the public will better understand the magnitude and long-term cost of the program and as the

program progresses be able to attribute the results to this program as well. Further, the branding of Project WIN separates this program from the regular sewer operations, maintenance, repair, and replacement program that are part of the ongoing programs of the utility. Additionally, the branding identifies this as a special project with a beginning and an end and that it requires special attention and increased funding.

The branding for Project WIN began on April 29, 2007, by an eight-page insert in the Louisville Metro newspaper The Courier-Journal to maximize the exposure of Project WIN initiatives throughout the MSD service area. The publication provided information on the proposed rate increase, Project WIN initiatives, and a discussion of the Consent Decree. Included in the insert was a list of scheduled public meetings, annotated diagrams and definitions of sanitary sewer overflows (SSO) and CSO; examples of activities that the typical homeowner can perform to help alleviate sewer overflow problems; and a general warning to avoid waterways during and for 48 hours after rainstorms.

3.1.2. CONSENT DECREE PUBLIC PROGRAM REQUIREMENT

The Consent Decree specifically discusses public programs only in the context of forming a WWT to develop a funding plan, and a program of public education, information, and outreach. Since the Consent Decree also requires preparation of a LTCP, an SSDP, and updates to the NMC Compliance Report and the SORP, the public program requirements of all those documents are also included in the Consent Decree response.

The public program, as required by the CSO policy and then adapted for the SSO program, is based on two concepts: public notification and public participation:

- **Public notification** of overflows is required by the CSO Policy (NMC 8) and the SORP because the public has a right to know if overflows are occurring or will occur, the location of the overflows and the potential public health, environmental, and recreational impacts of the overflows, thereby allowing them to make informed choices about their family's activities in and around potentially impacted waters, and
- **Public participation** includes engagement in the decisions and selection of long-term controls to meet the requirements of the Clean Water Act (CWA) with the intent to ensure long-term financial, political, and practical support of the implementation of the overflow abatement program.

In the public outreach components of the CSO Policy, NMCs, and the LTCP Guidance, public education is not specifically addressed; yet it is an essential component of an effective public program. In a public education campaign, obtaining meaningful engagement and participation requires educating the public so they understand the real impacts for their families, businesses, and overall quality of life.

In addition to the CSO Policy requirements, the MSD public program is essential to both CSO and SSO control programs. A public outreach and education program ensure public acceptance of the priorities and choices of the infrastructure program and the public willingness to pay for the infrastructure program and the cost of overflow abatement over a long period. Additionally, a public education and outreach program encourages behavior changes and explains how these changes will enhance the ability of the sewerage infrastructure to abate overflows, which is essential to sustainable overflow abatement.

The recommended overflow abatement program will not eliminate all overflows under all conditions nor will it guarantee that harmful pollutants do not reach the surface waters under some conditions. Therefore, behavior changes related to commercial and individual housekeeping are necessary. For instance, control of Fats, Oil and Grease (FOG), elimination of illegal clear water connections to the sanitary sewers, and gardening and drainage and consumer practices can maximize the potential for the sewerage infrastructure to abate overflows.

3.1.3. ESSENTIAL PUBLIC PROGRAM COMPONENTS

As noted in Section 3.1.2, the Consent Decree requires MSD to implement the NMCs, develop a LTCP for CSO control, an SSDP for control of unauthorized discharges, and a SORP. Each of these elements has public program components. For example, the seventh NMC requires pollution prevention, which often includes education and outreach. The eighth NMC requires public notification of overflows and the impacts of the overflows. The LTCP requires public participation in the development of the plan. The SORP is intended to ensure a timely and effective method of notifying the potentially impacted public of sewer overflows (both combined and separate).

Therefore, these essential program elements have been included in the Consent Decree for both the LTCP program and the development of the SSDP and are the basis of the requirements for the development and long-term implementation of a public program. Table 3.1-1 outlines the policy requirements and purpose for the various public programs.

Table 3.1-1 Purpose of Public Programs

POLICY OR CONSENT DECREE REQUIREMENTS	PURPOSE
CSO Policy - NMC 3 Modification of Pretreatment Program and NMC 7 Pollution Prevention	Keep contaminants from entering the combined sewer system (CSS) and thus the receiving waters including: • Source control • Recycling Many of the measures require housekeeping and behavior changes for industries, individuals, business, and governments. To realize behavior changes, education and outreach is necessary.
CSO Policy – NMC 8 Public Notification of CSO occurrences and impacts	Inform the public about the potential for overflows, actual overflows, locations and possible health and environmental impacts of overflows. The principal reason for notification is to reduce exposure to potential health risks. Public notification also educates the public about CSO and builds support for the overflow abatement program.
CSO Policy – LTCP Public Participation	Actively involve the affected public in the decision making to select long-term CSO controls. The expectation is that issues and expected conflicts will be identified and addressed in the planning process minimizing the potential for long delays or unforeseen costs. The expected benefit is financial, political, and practical support of the implementation of the long-term control plan.
Consent Decree – SORP – Notifying the potentially impacted public	Establish timely and effective methods and means of notifying the potentially impacted public about unauthorized discharges, including wet weather SSOs and dry weather CSOs. The principal reason for notification is to reduce exposure to potential health risks. This ensures that sanitary sewer overflows are included in notification plans described under NMC 8.
Consent Decree – Organize a WWT	Include entities who have a stake in the program outcome and the team should be sufficiently multidisciplinary to address a myriad of engineering, economic and environmental, and institutional issues that will be raised during the implementation of the remedial measures under the Consent Decree. The WWT will prepare a plan for funding the program and develop a program for public information, education, and involvement

Based on these requirements, MSD developed a comprehensive program, that continues to be implemented since August 2005. As noted in the Introduction, the four major components of this public program are as follows:

- Public Notification
- WWT Engagement
- Public Meetings During Overflow Abatement Planning and Implementation

- General Programmatic Outreach and Educational Activities

Coordinated together, these four components incorporate all aspects of the public program and account for the overlapping requirements of the NMC, the SORP, and the requirements of the LTCP and ACD as illustrated in Table 3.1-2.

Table 3.1-2 Relationship of Requirements and Program Components

PROGRAM COMPONENTS	NMC 3 & 7	NMC 8	LTCP PUBLIC PARTICIPATION	SORP PUBLIC NOTIFICATION	WWT
Public Notification		X	X	X	
WWT Engagement			X		X
Public Meetings During Overflow Abatement Planning and Implementation	X	X	X	X	X
General Programmatic Outreach and Educational Activities	X	X	X	X	

MSD has woven a comprehensive program that reaches a vast audience and covers the issues and requirements related to the wet weather overflow abatement program. Although the description of this overall program is broken down into the above components, in actual implementation, the components are interwoven for efficiency and delivery of the messages. Moreover, the comprehensive program is intended to ensure that the messages are all-inclusive, concise, and not repetitive.

The last component of the public program, required by the Consent Decree, is the regulatory reporting and the regulatory agency interaction. The purpose of the reporting is to show compliance with the wet weather overflow abatement program requirements. The expectation is that comprehensive reports and regular agency meetings will maximize the potential for the overflow abatement program to be fully compliant with Consent Decree and other regulatory requirements. Through December 2020, MSD has provided 60 quarterly and 15 annual Consent Decree reports.

3.2. PROGRAM IMPLEMENTATION BETWEEN AUGUST 2005 AND SEPTEMBER 2009

This section describes the public program activities that occurred during the development and approval of the IOAP.

3.2.1. PUBLIC NOTIFICATION

The purpose of public notification is to inform the public of potential sewer overflows, the location, and the possible public health and environmental effects of the overflows. The public notification of the potential or actual sewer overflows also advises the public to curtail recreational activities or commercial activities in areas directly or indirectly affected by overflows. Overall, the intent of notification is to reduce the public's exposure to potential health risks.

A secondary purpose of the public notification is to develop long-term support for overflow abatement programs. The notification serves to inform the public that overflows do exist and can interrupt the use of the waters. Over time, a concise message will bring about behavior modifications that should result in public support of investment in both concrete (gray) and natural (green) infrastructure that will reduce the occurrence of overflows

and interruption of use of the waters. Notification activities are both event-based and programmatic. Event notification, for both CSOs and SSOs, focuses on warnings, and delivering information about the potential public health impacts where the overflows occurred. Programmatic notification is a comprehensive approach to enhancing the public's knowledge and awareness of overflows. This awareness should include why, how, and where overflows occur, as well as solutions and mitigation techniques to abate these overflows.

MSD's public notification efforts implemented to-date include permanent CSO and SSO warning signs, overflow advisory signs, email notification of events (public and regulators), and web page notification. Electronic notification via the MSD website, list-serve e-mail list, and other electronic media broaden the opportunity for notification and awareness.

3.2.1.1. WARNING SIGNS

Bilingual Overflow Advisory Sign Installed by MSD

MSD has installed approximately 1,100 Overflow Advisory signs along the creeks and the Kentucky side of the Ohio River within both the combined and separate sanitary sewer systems as outlined in the NMC Compliance Report and the SORP. In the CSS area, approximately 300 signs were installed by September 30, 2006. In the separate sewer system (SSS) area, approximately 800 additional signs were installed by October 30, 2006. The installation criteria can be found in Table 9.2 of the NMC Compliance Report dated September 15, 2006. To enhance public participation, the signs are bilingual and contain internationally recognizable graphics for those who cannot read either English or Spanish. The signs are widely publicized in MSD's CSO and SSO brochures and have been discussed at numerous public presentations.

MSD conducted a Recreational Contact Survey to determine the extent of potential human contact to impacted waterways during the recreational season. The survey documented visual observations of recreational use in key locations along Beargrass Creek and the Ohio River within Louisville Metro. MSD analyzed the results of the survey to determine if additional signage, information, displays, or other public notification efforts are warranted at locations of high use. A further discussion of the Recreational Contact Survey can be found in Volume 2, Chapter 2, Section 2.7.

To ensure continued notification and recognition, MSD staff annually inspects the installed signs. Based on annual work orders, all signs are inspected, repaired, replaced, relocated, or cleaned as appropriate. To aid in the tracking of these signs, an inventory is maintained in MSD's Computerized Maintenance Management System (CMMS). Figure 3.2-1 shows the location for the signs, published in February 2007.

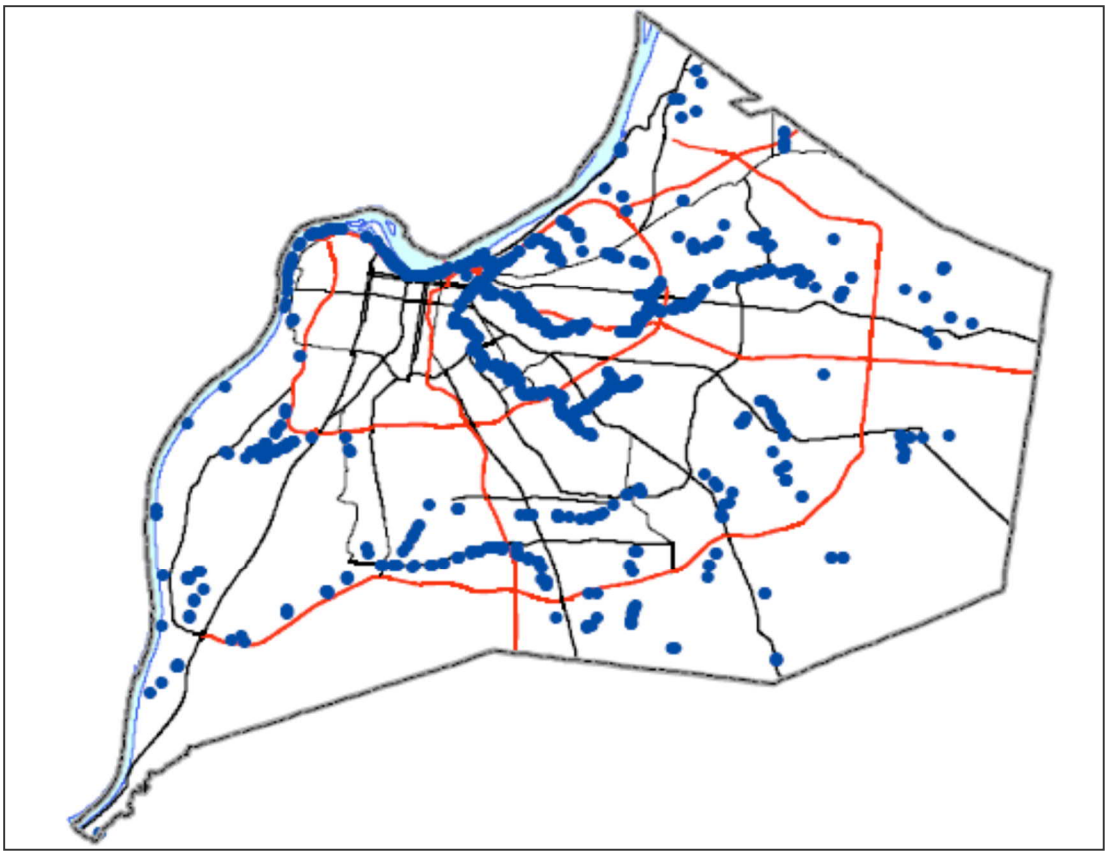

Figure 3.2-1 Overflow Advisory Sign Locations within Louisville Metro, KY

3.2.1.2. PROJECT WIN WEBSITE

The Project WIN website, available at **www.msdprojectwin.org**, contains a vast amount of information for the public and other interested parties. The Project WIN section is maintained so that the public has access to accurate and timely information. The Project WIN website includes the following:

- Information about Project WIN, the program history and background
- Tips & Resources describing what individuals can do on their own property
- FAQs (Frequently Asked Questions)
- Public Document Repository that contains the Consent Decree planning documents, approved submittals, and reports
- Water Quality Treatment Center Reports
- WWT Document Repository
- Project WIN E-mail Notification System
- Integrated Overflow Abatement Plan

The Project WIN website was significantly revised in 2012 to add content and make navigation more user-friendly.

3.2.1.3. ELECTRONIC NOTIFICATION

The programmatic approach to public notification includes a wide variety of electronic communication forms as documented below.

Website: From MSD's Home Page (www.louisvillemsd.org) there is a link to Project WIN. The Project WIN site includes a link to sign up for overflow advisory email that sends a warning when significant precipitation has caused overflows in MSD's system. Since it is electronic and contains "real time" information, the website is an important component of public notification. The Project WIN website provides important information on the condition of area streams and shows a warning if overflows are likely to happen or have happened in the past 48 hours. Section 3.2.1 describes the MSD and Project WIN website in more detail.

Web Page Stoplights and Supplemental Information: The Project WIN website maintains overflow alert messages in the form of screen crawls. The website's home page features a simulated traffic light to inform the public of the overflow advisory level current conditions:

- "Green" for conditions are normal
- "Yellow" when a dry weather overflow greater than 1,000 gallons has occurred
- "Red" when rainfall occurs and conditions for overflows is likely

MSD's rain gauge network is utilized to automatically trigger the "red" condition when any rain gauge tributary to the CSO area receives more than 0.1-inches of rain, or any other rain gauge in Louisville Metro receives more than 0.75 inches of rain. The notification alert lights remain on the website for 48 hours after the rainfall has ended to reinforce the message that the public should avoid water body contact. The screen crawl is located below the notification lights with up-to-date information about weather conditions and alerts about contact with waters.

Blending Events Notification: On February 12, 2008, MSD added a notification of blending events at the Jeffersontown WQTC to the Project WIN website. See example to the right. This notification was removed after the elimination of Jeffersontown WQTC.

Jeffersontown WQTC
Blended Flow Data

As of 2/12/08, MSD is providing near real time flow information on blended flow from this plant. Up to 60 days of historical data is presented below. You may also **view all historical data.**

Start Date/Time	End Date/Time	Amount (Gal.)

E-mail Notifications: The public can voluntarily sign up to receive automatic email alerts about the potential overflows. On the MSD Home Page, customers learn about the conditions that trigger alerts, and can register by clicking on the Stay Updated link for the notification message.

Press and Public Service Announcements: MSD offers the Project WIN e-mail notification messages to radio, TV, and other local media (if they sign up to receive them) for public service announcements.

3.2.1.4. WRITTEN NOTICES

MSD utilizes many forms of written notification to communicate with customers and regulatory agencies as documented in the most current version of the Sewer Overflow Response Protocol (SORP) available through the Project WIN website. Examples of the written notifications to customers are described below.

Door Hangers: MSD uses many types of door hangers for notification to residents. One of these door hangers is distributed to homeowners following a sewer backup that has the potential to cause basement or surface flooding. Another door hanger is distributed to neighborhoods that could be affected by dry weather overflows that reach receiving waters in significant quantities. Examples of the door hangers are included in Appendix 3.2.1

Appendix 3.2.1 Door Hanger Examples

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

Direct Mail Within 500 feet of Waterways: In September 2006, MSD initiated an annual public notification via a letter sent to each customer within 500 feet of Beargrass Creek and the Kentucky side of the Ohio River near the mouth of Beargrass Creek, as determined by GIS plot. The purpose of the notification is to provide general awareness and warning information about overflows and steps the public should take to protect its' health. The targeted notification focuses on the customers most impacted by the CSOs with messages such as to avoid full immersion in waters, not to swallow contaminated water and to wash hands thoroughly with soap and warm water. In 2006, MSD also developed a brochure titled Controlling CSOs in Louisville which was included with the initial notification. The updated brochure can be accessed at **https://www.msdprojectwin.org/how-you-can-help/**. The 2006 version is included in Appendix 3.2.2.

Appendix 3.2.2 Controlling CSOs in Louisville

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

Water Quality Warnings Prior to Onset of Recreational Season: In 2006, MSD began providing annual public notification in the form of bill inserts, newsletters, and newspaper advertisements. These notifications are targeted in the spring to coincide with the beginning of recreational season. This notification provides a general overview of the potential for sewer overflows and informs about water body contact and public health concerns. An example is included in Appendix 3.2.3.

Appendix 3.2.3 Water Quality Warning

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

Brochures: MSD also has created brochures on SSOs and CSOs. Brochures are distributed at public meetings; other public events and supplied to the Metro Council members for distribution at their District meetings. Both of these brochures define and describe CSOs and SSOs, warn about potential public health impacts, and advise against contact with either the overflows or the surface waters after an overflow. Additionally, the brochures include a graphic depicting the warning signage to reinforce the recognition of the signs. The brochures direct the public to the MSD website for up-to-date information about overflows and include the MSD customer service phone number. Examples of the 2006 brochures are included as Appendix 3.2.4 and Appendix 3.2.5. Updated versions can be accessed at **https://www.msdprojectwin.org/how-you-can-help/**.

Appendix 3.2.4 CSO Brochure

Appendix 3.2.5 SSO Brochure

These appendices are the same as the 2012 IOAP submittal and are provided on the external USB drive.

Newsletters and Other MSD Publications: MSD has three regular publications that have been used to disseminate Project WIN information. These publications are MSD's "Update," "Crosscurrents," and the MSD Annual Report. The "Update" is a monthly publication with a regular feature section on Project WIN and progress to-date on the overflow abatement program. The "Update" is distributed to over 2,000 subscribers plus 1,000 more that download it from MSD's website. The "Crosscurrents" is a quarterly newsletter that also includes up-to-date information about CSOs and SSOs in a Project WIN section. The Annual Report provides an overview of MSD operations for the year. While these publications are not real time notification in the same sense as the website, signs, or email notifications, they provide consistent reminders about important issues relative to health impacts of sewer overflows and are an integral part of the notification process. All of these newsletters and publications are available for download on MSD's main website at www.louisvillemsd.org.

Public Meetings: MSD promotes a robust public information program and participates in numerous public meetings that are setup around the Louisville Metro region and at other public events. Public meetings are held on a variety of topics. The MSD spokesperson typically presents information about MSD operations, highlights issues of wet weather overflows, focuses on the warning signs, and provides instructions for using MSD's website. As with the newsletters, public meetings do not typically provide real time notification, but do serve as another outreach opportunity to inform the public about sewer overflow impacts.

Media and Newspaper Articles: As part of the general media coverage of MSD, or in response to specific Project WIN press releases, the media has printed articles about overflows and public meetings. MSD has no control over whether outreach or a press release to the media will result in a news story because other events can get the attention of the media. MSD has been fortunate that many articles about the overflow abatement program are generally printed with a notice and warning included. (See Appendix 3.2.6 for an example list of some of these articles.)

Appendix 3.2.6 Newspaper and Magazine Articles regarding the Consent Decree
Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

3.2.2. THE WET WEATHER TEAM

The Consent Decree contains a provision for stakeholders to participate in the development of the Final LTCP and the Final SSDP through inclusion in the WWT. MSD engaged Ross & Associates Environmental Consulting, Ltd., from Seattle WA to facilitate the WWT process (See Appendix 3.2.7 for Ross and Associates Qualifications).

Appendix 3.2.7 Ross and Associates Qualifications
Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

The Consent Decree states that the WWT "will prepare a plan for funding the program, and will develop a program for public information, education and involvement." MSD subsequently expanded the role of the WWT to assist in developing a framework for decision-making that includes consideration of community values, priorities, and level of service in determining community investments required. The WWT has become the first line of the public involvement and participation for the development of the Discharge Abatement Plans (as required by the Consent Decree).

The two Discharge Abatement Plans are the Final SSDP and the Final LTCP. The Consent Decree, founded on the CSO Policy and other regulatory policy and guidance, requires that each of these discrete plans engage stakeholders in the planning, prioritization, and selection of projects for the plans. The WWT Stakeholder Group has proven to be a valuable part of this public process.

3.2.2.1. WWT CHARTER

In July 2006, the WWT Stakeholder Group was chartered to assist with the development of an integrated overflow abatement program that complies with the CWA requirements and addresses the community's problems with sewer overflows that occur during wet weather conditions. Appendix 3.2.8 provides a copy of the adopted WWT Stakeholder Group Charter.

Appendix 3.2.8 WWT Charter

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

The Charter states that the WWT Stakeholder Group is expected to provide guidance on the development of an integrated Wet Weather Program (now referred to as the IOAP) that will comply with applicable regulatory requirements and will minimize the impacts of wet weather discharges on water quality, aquatic biota, and human health. The WWT Stakeholder Group is charged with preparing a plan for funding MSD's Wet Weather Program, and developing a program for public information, education, and involvement.

Other objectives of the WWT Stakeholder Group are to advise MSD on the overall investment, policy, and performance choices in the development and implementation of the Wet Weather Program. As MSD has developed Discharge Abatement Plans, it has called upon the WWT Stakeholder Group for input regarding the components of the discharge abatement plans, asset management activities, water quality monitoring, and related wet weather control efforts.

3.2.2.2. LIST OF PARTICIPANTS

The Stakeholder Group of the WWT are community opinion leaders associated with diverse interest groups, including environmental advocacy, business, and industry, elected officials; local government; community neighborhood; recreation public health; environmental justice, and organized labor. MSD is fortunate to have a dedicated and diverse complement of personnel, community representatives (see **Table 3.2-1**), and local elected officials who participated in the WWT since 2006.

Table 3.2-1 Original Wet Weather Team Membership

NAME	ORGANIZATION
Stakeholder Representatives	
Steve Barger	Labor
Susan Barto	Mayor of Lyndon
Stuart Benson	Louisville Metro Council, District 20
Charles Cash	Louisville Metro Planning and Design Services Department
Allan Dittmer	University of Louisville
Laura Douglas	E.ON US. LLC
Faye Ellerkamp	City of Windy Hills
Arnita Gadson	KY Environmental Quality Commission / W. Jefferson County Community Task Force
Mike Heitz	Louisville Metro Parks Department
Tom Herman	Zeon Chemicals
Rick Johnstone	Deputy Mayor, Louisville Metro Mayor's Office
Bob Marrett	CMB Development Company, LLC

Table 3.2-1 Original Wet Weather Team Membership

NAME	ORGANIZATION
Kurt Mason	Jefferson County Soil and Water Conservation District
Judy Nielsen	Louisville Metro Health Department
Lisa Santos	Irish Hill Neighborhood Association
Bruce Scott	Kentucky Waterways Alliance
David Tollerud	University of Louisville, School of Public Health & Information Sciences
Tina Ward-Pugh	Louisville Metro Council, District 9
David Wicks	Jefferson County Public Schools
Louisville & Jefferson County Metropolitan Sewer District Personnel	
Angela Akridge	Project WIN Program Manager
Brian Bingham	Regulatory Management Services Director
Derek Guthrie/Mark Johnson	Director of Engineering/Operations & Chief Engineer
Bud Schardein	Executive Director
Technical Support	
Gary Swanson	CH2M HILL
Reggie Rowe	CH2M HILL
Facilitation Support (not part of the WWT)	
Rob Greenwood	Ross and Associations Environmental Consulting Ltd
Jennifer Tice	Ross and Associations Environmental Consulting Ltd
Kate Weinberger	Ross and Associations Environmental Consulting Ltd

3.2.2.3. RULES OF ENGAGEMENT

The WWT stakeholders do not formally represent their specific affiliated organizations but were asked to provide input that reflects the broad interest area of which they are experts and leaders. The WWT members listed above participated in the entire process. The Charter was clear that the values-based risk management process supported by third party facilitation would be employed to obtain input from the WWT Stakeholder Group for the development of the IOAP.

3.2.2.4. CONSENSUS SEEKING PROCESS

The WWT structured values-based decision-making process that the WWT helped develop allowed the systematic consideration of potentially competing values as they related to technical and management options. The WWT process was completely open and consensus seeking. However, the schedule to complete the overflow abatement plans, as required by the Consent Decree, did not provide enough time for the facilitator to guarantee a full consensus on all issues. In areas where full consensus was not achieved, the range of views was documented. A statement of support for the IOAP from the WWT Stakeholder Group was presented to the MSD Board in October 2008 and then again in December 2008. The MSD Board, as the governing body of the agency, made the ultimate decisions.

The WWT Stakeholder Group was the backbone of the public participation process to ensure that MSD developed an IOAP that would comply with the requirements of the Consent Decree for the Final LTCP and the Final SSDP. All WWT stakeholders were expected to do the following:

- Participate fully and honestly in meetings, act in good faith, and strive for consensus.
- Reach out to constituencies whose interests they reflect and as appropriate to other stakeholders to communicate about the project status and gather input and ideas for the projects; and
- Participate in the identification, review, and analysis of options.

3.2.2.5. APPROACH TO MEETING AND USE OF FACILITATOR AND CONSULTANTS

The WWT Stakeholder Group was a critical component in the development of Project WIN, not only as part of the public program required by the Consent Decree and CSO Policies, but also because the WWT Stakeholder Group was critical to the development of the values-based decision process. The values-based decision process formed the basis of the detailed content and specifics of the Final LTCP and the Final SSDP. Consequently, MSD made a considerable effort to seek out and obtain the appropriate members of the team, to bring in a nationally recognized facilitator (Ross & Associates), and to support the entire process with a highly skilled technical team. With this in place, the WWT Stakeholder Group met regularly; every four to six weeks, for a total of 22 meetings between July 2006 and December 2008. The team reconvened in May 2009 for its 23rd meeting, to review questions and requests for additional information resulting from informal meetings and communications with the regulatory reviewers and provide input on proposed revisions to the IOAP in response.

Each meeting had a set agenda that included presentations from MSD, the technical team, and the facilitators. The content of these presentations included the most recent developments and progress on projects, rates issues, and other relevant topics. Each meeting also afforded the opportunity for the WWT Stakeholder Group to engage each other in discussion and pose questions and issues to MSD and the consultant team.

All meetings were open to the public and attended at various times by MSD staff and contractors, neighborhood representatives, members of the press, and other interested parties. These guests or observers were allowed to observe the WWT Stakeholder Group meeting and were afforded the opportunity to provide comments at designated times. In general, the meeting format was as follows:

- Review agenda and ground rules
- Updates and announcements from MSD and WWT Stakeholder Group
- Specific discussions and presentations consistent with the objectives of the meeting
- Observer comments
- Wrap up and next steps

WWT meeting summaries, presentations, handouts, and documents are posted on the Project WIN website, in the WWT Document Repository. Documents are named and organized consistent with the WWT meeting in which the document was provided to the WWT. Appendix 3.2.9 of this report includes a copy of all the information / materials presented to the WWT Stakeholder Group, in chronological order. The Appendix mirrors the Project WIN website content at the time this IOAP was submitted.

Appendix 3.2.9 WWT Stakeholder Group Meetings

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

3.2.2.6. LIST OF MEETINGS AND TOPICS COVERED

The following is a brief description of the topics covered at each WWT Stakeholder Group meeting during 2006 - 2009.

- July 20, 2006 – This meeting provided an overview of the Consent Decree, MSD's infrastructure system, and the infrastructure upgrade program followed over the previous ten years.
- August 15, 2006 – This meeting was held at the Morris Forman WQTC. Prior to the meeting, guided tours of the plant were held for WWT members. The meeting presented information on the CWA, introducing the concepts of water quality standards, beneficial uses of surface water, and the sources of pollution that threaten those uses. A financial overview presented MSD's operating and capital budgets, MSD's rates and charges, and MSD's staffing levels. A presentation on MSD's RTC Program introduced the first of the CSO control technologies that was being considered during development of the overflow abatement plans.
- September 12, 2006 – This meeting introduced the concepts of values-based risk-management planning. The overall concepts were discussed, and an example of an analytical tool was presented. The WWT began the process of identifying community values that would be used in alternative evaluation.
- December 5, 2006 – This meeting continued the discussion of community values and began defining baseline conditions and objectives for the non-financial values identified in September. An update on public involvement plans was also presented.
- January 18, 2007 – This meeting provided concrete examples of how the community values would be used in developing benefit-cost analyses, using specific examples and draft performance scales for a selection of non-financial values. The WWT also engaged in a discussion of the baseline conditions and long-term objectives for the financial values identified in previous discussions.
- February 13, 2007 – This meeting presented specific problems and example response strategies for the Beechwood Village area. This provided the WWT team with a better understanding of how the benefit-cost analyses would help evaluate control alternatives. The WWT also began a detailed review of the draft performance measures to be used in the risk-management approach to value protection. A preliminary discussion was held on the relative weights of the identified values.
- March 15, 2007 – This meeting continued the discussion on problems and potential responses in the Beechwood Village area. Further discussion on relative weights of the values helped clarify the process for establishing final weighting factors in the future. Reviews of performance measures for additional values occupied the bulk of the meeting time. A brief update on the planned public participation efforts was also held.
- April 19, 2007 – This meeting continued the discussion of performance measures for additional community values. The values were categorized as "project-specific" or "programmatic" and the WWT discussed the different ways these categories would be used. The WWT continued discussions on a weighting system for the values, considering the project-specific and the programmatic values.
- May 22, 2007 – This meeting presented specific examples of the values-based risk management approach using a draft version of the evaluation tool. This allowed an evaluation of the impact of the value weighing system on the benefit-cost analysis.

- June 21, 2007 – This meeting developed a final draft weighting system for the community values. A presentation on CSO control strategies began the process of familiarizing the WWT with the technologies and approaches to controlling CSOs. Information was also presented to the WWT relative to the Interim SSDP conceptual approach, and the applicability of "green infrastructure" to wet weather planning.
- August 2, 2007 – This meeting introduced the approach to green infrastructure planning. It also began discussions on the approach to identifying appropriate technologies and developing projects under the Final LTCP.
- September 20, 2007 – This meeting began discussions on the approach to identifying appropriate technologies and developing projects under the Final SSDP. A presentation on the Post Construction Compliance Monitoring Plan was given.
- October 18, 2007 – This meeting continued discussions on SSO elimination approaches, with a focus on I/I removal. Project WIN funding methods were discussed, as the first in a series of discussions about the funding approaches. The draft outline of the IOAP was also distributed for comment.
- December 6, 2007 – This meeting continued the discussion of I/I control approaches and dealt specifically with the concept of a potential private property ordinance that Louisville Metro government could choose. Further discussions of funding approaches were held.
- January 15, 2008 – In this meeting the preliminary results of water quality modeling for the Ohio River and Beargrass Creek were presented. A discussion on the regulatory compliance impacts of the model results was held. This meeting also covered a presentation on the impacts of the different financing methods discussed previously and the start of discussions about potential refinements to the MSD rate structure.
- February 26, 2008 – This meeting included a report and brainstorming discussion on green infrastructure opportunities in the community.
- April 3, 2008 – This meeting focused on presentations that included a discussion on rates, fees, and funding mechanisms, and the emerging vision for the IOAP approach. Examples of the detailed benefit-cost scoring analysis were presented for Final LTCP and Final SSDP alternatives.
- May 15, 2008 – This meeting included a presentation on the Post Construction Compliance Monitoring Plan, and an update on the status of the green infrastructure evaluation and program development.
- June 19, 2008 – This meeting included a presentation on the Public Involvement and Outreach Program, and further discussion of the integration of green infrastructure into the Final LTCP.
- July 15, 2008 – This meeting continued discussions on the emerging vision for the IOAP, continued discussion of the probable rate impacts of the IOAP and presented a draft version of the preferred project lists for both the Final LTCP and Final SSDP.
- September 23, 2008 – This meeting presented the proposed LTCP and SSDP project lists, program schedule, total budget, and rate impacts of the IOAP. The WWT also discussed a draft WWT stakeholder support memo to the MSD Board.
- December 4, 2008 – This meeting presented the results of the 30-day public comment period and the proposed responsiveness summary.

- May 11, 2009 – This meeting reviewed questions and requests for additional information resulting from informal meetings and communications with the regulatory reviewers and provided input on proposed revisions to the IOAP in response.

All information provided to the WWT is available on the Project WIN website, at www.msdprojectwin.org.

3.2.2.7. WWT ESTABLISHES COMMUNITY VALUES

The Consent Decree requires the development of overflow abatement plans, specifically an updated LTCP and a SSDP. For the development of an SSDP, the requirement is "A plan to involve stakeholders in planning, prioritization, and selection of projects." For the LTCP, the public must be part of the process for "selecting CSO controls that will meet the requirements of the Act." MSD specifically asked the WWT Stakeholder Group to help develop an overall plan for overflow abatement that takes into account community values.

Values represented the anchoring point of the IOAP development process; they define the vision for what the wet weather program will be designed to protect or enhance. In this way, the community values directly relate to investment choices that result in infrastructure choices. The first step and the foundation of the process relied on the stakeholder's definition of values and the relative weight of the values. The WWT further refined the values by identifying the objectives, which are goals or focus areas for the values. The objectives also serve as clarifying points in a practical definition of the values.

The steps of the values-based decision-making process were as follows:

- WWT stakeholders defined values and relative weights for the values.
- The technical team developed draft performance measures and scales based on the "focus areas" or objectives the WWT Stakeholder Group identified for the values.
- WWT stakeholders reviewed and helped refine the performance measurement scales.
- The technical team used the performance scales to evaluate alternatives; and
- WWT Stakeholder Group reviewed the results and refined scoring considerations.

The interactive process, with the essential engagement of the WWT Stakeholder Group, was critical because not only did it improve the Final LTCP and the Final SSDP, it also clarified how the values and the performance measures would guide investment and infrastructure choices. A more detailed discussion of the values-based decision process is contained in Volume 1, Chapter 2.

3.2.2.8. KEY PUBLIC PROGRAM MESSAGES INDENTIFIED BY THE WWT

The WWT Stakeholder Group was charged with the development of a plan for a public program that not only educates the public about the overflow abatement programs, but also supports and sustains education and active participation in sewer overflow reduction measures. Key messages developed by the WWT Stakeholder Group provided a structure and underpinning for all the outreach, education, and notification program communications during the development of the integrated overflow abatement plans. With these key messages in mind, MSD's interaction with the engaged stakeholders, commercial and industrial interests, elected officials, and the public focused on the maximum benefit of the overflow abatement.

The following are the key messages that were developed with significant input by the WWT Stakeholder Group and were used during the planning process.

- **Value Clean Water** - Clean water benefits us all in many ways. We all have a stake in protecting and enhancing the quality of our water resources.
- **Protect Public Health** - Our streams have an increased risk to public health during, and immediately after, wet weather events due to high bacterial levels. We are working to correct this condition, but it is a big job and it will take us all working together to achieve results.
- **Support Investment Needs** - Our community needs to take steps to improve water quality. It is both a benefit to the community and a regulatory requirement. This is a big job, requiring significant investment by our ratepayers. We request your understanding and support for the rate increases necessary to complete this important undertaking.
- **Maintain Positive MSD Image** - MSD is working hard to provide clean water. MSD supports a clean, green, and growing community and will ensure that public funds are spent accordingly.
- **Provide Wet Weather Plan Input** - Public participation and input are critical to the development and success of the community's long-term plan to abate overflows.

Slightly different messages will be used to guide the public program during the implementation phase. During implementation, MSD will maintain focus on requesting input and involvement while also promoting sustained participation in activities that contribute to overflow abatement and water quality improvement.

3.2.2.9. IMPORTANCE OF PUBLIC EDUCATION AND PERSONAL RESPONSIBILITY

In the course of discussing the integrated overflow abatement program and the public program, the WWT Stakeholder Group took a clear position that a public program which attempts to modify individual consumer, housekeeping, gardening and other behaviors is critical to the optimal functionality of the MSD sewerage infrastructure to abate overflows. The WWT Stakeholder Group took the consensus position on numerous occasions that a component of the overflow abatement program should be an aggressive public program to help people understand the causes of overflows, their individual role in causing overflows, and their personal responsibility to take ownership to solve the overflow problems.

Education was also identified as one of the programmatic values used in evaluating IOAP project components. The WWT Stakeholder Group has endorsed the public program that reaches out to homeowners, community groups, and the public to provide the following tips and encouragement to take actions to prevent or reduce overflows:

- Conserve water during periods of heavy rains by deferring washing clothes or using automatic dishwashers if possible.
- Use a rain barrel to capture stormwater runoff and store the rainwater for gardening uses later when the weather is dry; and
- Keep FOG out of household drains.

The WWT Stakeholder Group has specifically stated that source control for SSOs and CSOs should be an essential part of the control program. The WWT Stakeholder Group advised that the MSD public program should reflect that there are two sides to effective wet weather management, one public and one private. While

MSD is charged with I/I reduction and overflow abatement actions in MSD-owned facilities, the behaviors and actions of residential, commercial, and industrial customers all play an important role in overflow abatement.

3.2.2.10. FOCUS ON GREEN INFRASTRUCTURE

The WWT Stakeholder Group strongly encouraged MSD to integrate green infrastructure into the plan for overflow abatement. Green infrastructure includes rain gardens, green roofs, porous pavement, and other surfaces and landscapes that allow rainwater to infiltrate into the ground. The overflow abatement benefits of green infrastructure come through a reduction of the impervious surfaces that allow for the rapid runoff of rainwater into both combined sewers and storm drainage facilities. Green infrastructure also offers many other benefits to the community including a reduction in air pollution, reversal of some of the "heat island" effects of urbanization, etc.

Implementation of green infrastructure in the combined sewer areas of MSD could reduce the frequency and volume of expected CSOs allowing for a reduction of the size of the gray infrastructure (sewers, retention basins, pump stations, and treatment facilities) that are required. The WWT Stakeholder Group encouraged MSD to be aware of green infrastructure as a potentially cost-effective solution, to explore all opportunities for green infrastructure, and to work in partnership with the Mayor's office and other regional initiatives such as the Partnership for Green City, to not only create a vision for green infrastructure but to make it happen. At the same time, the WWT Stakeholder Group encouraged MSD to make investments in green infrastructure based on a business case analysis. That is, green infrastructure projects and an overall green infrastructure program should be defensible as a good use of public funds when compared to the cost-effectiveness of the gray infrastructure components it supports.

3.2.2.11. WET WEATHER TEAM "IDEA LISTS"

During the course of the 23 Stakeholder Group meetings, numerous ideas for specific education programs and potential overflow abatement solutions were identified. The facilitation team kept a running record of these ideas, and periodically distributed them to the technical team for consideration as the potential solutions were identified and evaluated. At the end of the alternative evaluation process, the technical team reviewed the idea's list and prepared responses to each of the items prepared. These responses included a "crosswalk" document that identified the items as "considered and included in final solutions," "considered and evaluated, but not selected for implementation," "outside the scope of the IOAP but referred to other related programs for consideration," and "outside the scope of the IOAP." This crosswalk response was discussed with the WWT Stakeholder Group at the September 2008 meeting and provided documentation for the Stakeholder Group that their ideas had been carefully considered in the development of the IOAP.

3.2.2.12. CONTINUED ENGAGEMENT

At the May 11, 2009, WWT Stakeholder Group meeting, a plan was developed for continued engagement during implementation of the IOAP. To keep the members of the WWT Stakeholder Group informed, MSD will provide the group with e-mail notifications when important documents, such as Quarterly Reports, are posted on the Project WIN web page. Quarterly Reports and similar documents present progress reports on IOAP implementation and will also address substantive changes made to the IOAP program. In addition, MSD will invite the WWT Stakeholder Group in for semi-annual progress meetings, to allow for face-to-face dialog regarding IOAP maintenance and progress. MSD will also invite the members of the WWT Stakeholder Group to any IOAP-related public meetings, to any ground-breaking or ribbon-cutting ceremonies, and to tours of construction or completed facilities, as appropriate.

3.2.3. PROJECT WIN PUBLIC MEETINGS DURING OVERFLOW ABATEMENT PLANNING

The WWT Stakeholder Group's input was essential in defining the goals and objectives of the IOAP infrastructure program and the public program. With the goals and objectives in hand, the technical team of consultants and MSD staff conceptualized and prepared approaches for the broader public to review and provide comment at public meetings. While these public meetings were not specifically required by the Consent Decree or by EPA guidance, MSD and the WWT Stakeholder Group believed it would be valuable to have frequent contact with the public to validate the guidance provided by the WWT Stakeholder Group. In addition, individual WWT Stakeholder Group members attended the public meetings and provided input on the content and format of the meetings and how to advertise them. As a result, there were four rounds of public meetings, each held at the decisions and selection of priorities phases of the planning process. Following is a detailed description of the four public meetings.

3.2.3.1. MEETINGS TO INTRODUCE AND DESCRIBE PROJECT WIN

Introductory meetings were held in Spring 2007 to inform the public about the history and evolution of Louisville Metro's sewer system, Project WIN program components, how the potential for sewer rate increases relate to the required Consent Decree response, and what individual property owners can do to help improve stream water quality. The mechanisms for communicating this message included a presentation, summary handouts, and brochures on the various programs discussed. Question and answer sessions followed each set of presentations. A copy of the presentation is included in Appendix 3.2.10. Copies of the handouts, and all the brochures distributed at the Project WIN meetings are available on the Project WIN website in the Public Document Repository. The four rounds of public meetings were held on the dates and at the locations listed in Table 3.2-2 through Table 3.2-5.

Appendix 3.2.10 Project WIN Public Meetings

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

Table 3.2-2 Round 1 Introductory Meetings Held in Spring 2007

DATE	LOCATION
April 24, 2007	Southwest Government Center
May 10, 2007	NIA Center
May 14, 2007	East Government Center
May 16, 2007	Central Government Center
May 24, 2007	Girl Scouts Building
May 29, 2007	Southwest Government Center

3.2.3.2. MEETINGS TO PROVIDE A PROJECT WIN AND RATE INCREASE UPDATE

As part of preparing the discharge abatement plans, MSD conducted a second round of Project WIN meetings during Fall 2007. The second round of public meetings provided an update on Project WIN progress and obtained feedback from customers on the proposed Project WIN rate increase. The meetings also provided opportunity to describe the CSO and SSO issues that MSD is addressing, illustrating these issues through a series of maps with the locations of the CSOs and SSOs, and the likely locations for abatement projects in the future. An overview of available control technologies and approaches also gave the public an indication of the

types of projects that may be occurring in their neighborhoods in the future. Ample time was available for feedback from the public on issues that affect their neighborhood.

The mechanisms for communicating this message included a presentation, summary handouts, and brochures on the various programs discussed. Question and answer sessions followed each set of presentations. A copy of the presentation is included in Appendix 3.2.10. Copies of the handouts, and all the brochures distributed at the Project WIN meetings are available on the Project WIN website in the Public Document Repository. Meetings were held on the dates and at the locations listed in Table 3.2-3.

Table 3.2-3 Round 2 Meetings in Fall 2007

DATE	LOCATION
October 30, 2007	Fern Creek Firehouse
November 12, 2007	East Government Center
November 13, 2007	Fairdale Playtorium Center
November 20, 2007	Sun Valley Community Center
November 27, 2007	Clifton Center
December 4, 2007	Shawnee Golf Course Club House

3.2.3.3. MEETINGS TO PRESENT PRELIMINARY FACILITY PLANS AND LOCATIONS

The third round of public meetings, in Spring 2008, was specifically designed to give the public and impacted neighborhoods details on the types, locations, and size of facilities that would be constructed and information on proposed schedules The meetings provided public notice that these facilities are under serious consideration and engaged the public in some discussion about these facilities and the proposed schedule for construction to determine if there are any barriers to these plans or flaws in the plans. The meetings also provided the public with information about the remaining steps of the process, specifically the final series of public meetings, to be held in Fall of 2008, in which formal comments would be accepted and response to comments would be developed. A copy of the presentation is included in Appendix 3.2.10

Copies of the handouts, and all the brochures distributed at the Project WIN meetings are available on the Project WIN website in the Public Document Repository. Meetings were held on the dates and at the locations listed in Table 3.2-4.

Table 3.2-4 Round 3 Facility Plan Presentations in Spring 2008

DATE	LOCATION
May 6, 2008	Shawnee Golf Course Club House
May 13, 2008	Okolona Fire House
May 14, 2008	MSD Board Room
May 14, 2008	Long Run Golf Course Club House
May 27, 2008	Sun Valley Community Center
May 28, 2008	Swiss Hall
May 29, 2008	Jeffersontown Fire House

3.2.3.4. MEETINGS TO PRESENT PROPOSED IOAP PROGRAM

The fourth round of public meetings, in November 2008, was specifically designed to present to the public the IOAP program in a forum that allowed questions and answers. The presentations included an overview of the overflow abatement program, including project lists, budgets, schedules, and potential rate impacts. A copy of the presentation is included in Appendix 3.2.10. Copies of the handouts, and all the brochures distributed at the Project WIN meetings can be found on the Project WIN website in the Public Document Repository. Meetings were held on the dates and at the locations listed in Table 3.2-5.

Table 3.2-5 Round 4 IOAP Public Presentations November 2008

DATE	LOCATION
November 10, 2008	Southwest Government Center
November 12, 2008	Jeffersontown Fire House
November 20, 2008	East Government Center

3.2.3.5. PUBLIC COMMENT PERIOD AND PUBLIC HEARING ON 2012 DRAFT IOAP

The draft IOAP including the 2009 Final LTCP and the 2009 Final SSDP was distributed for public comment on October 31, 2008. Copies of the draft IOAP were available for review at all branches of the Louisville Free Public Library system, at MSD's main office at 600 West Liberty Street. The draft IOAP was also available for downloading from the Project WIN website. Due to the size of the files, the appendices were not available for download; therefore, a DVD copy of the appendices was made available for $10.00 through MSD Customer Relations.

The public notice was published in the legal notices section of *The Courier-Journal*, the major daily newspaper for the Louisville Metro region, 15 days in advance of the October 31st release date. The public notice announced the availability of the draft plan; the public hearing date, time and location, and the deadline for the acceptance of comments on the plan (see Appendix 3.2.11 for a copy of the notice.) The legal notice was repeated on the release date, and again two weeks prior to the public hearing. MSD also posted an announcement about the public hearing and comment period on the MSD and Project WIN websites. The deadline for accepting comments on the plan was December 5, 2008.

Appendix 3.2.11 IOAP Public Comment Period Public Notice, revised February 2013

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

The public hearing on the plan was held on December 2, 2008, at the MSD Board Room. The purpose of the public hearing was to receive formal comments from the public about the content of the final overflow abatement plans, including the 2009 Final LTCP and the 2009 Final SSDP. The hearing was not structured as a dialog. The Executive Director of MSD was the Hearing Officer and an independent court reporter was present to take verbatim notes. At the onset of the hearing, the Hearing Officer, Mr. H.J. Schardein, Jr., read a prepared statement about the purpose of the IOAP, the rules of the hearing, the deadline for the written comments, the proposed schedule for response to both written and oral comments, and the proposed adoption date of the revised plan. The statement is included in the transcript of the hearing. As with most public hearings each person who wanted to comment completed a request card.

Five people provided comments; the list is attached in Appendix 3.2.12 along with the transcript of the hearing. Each commenter was provided ample time to comment on the plan as official testimony. Neither questions nor

clarifications were asked of the persons commenting, nor were they answered by MSD, in accordance with the rules of the hearing.

Appendix 3.2.12 Public Hearing Transcripts

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

A complete set of all written and e-mail comments is included in Appendix 3.2.13. A summary of all written and oral comments received, and MSD's response to those comments is contained in the Responsiveness Summary attached at the end of this Chapter.

Appendix 3.2.13 Written and E-Mailed Comments

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

3.2.4. GENERAL PROGRAMMATIC OUTREACH AND EDUCATIONAL ACTIVITIES

Between August 2005 and September 2009, MSD expanded its historical outreach and education activities to include a specific program for Project WIN. The program serves several purposes:

- Promote voluntary participation in private-side I/I control, green infrastructure, and behavior modification to prevent pollution (consistent with NMC 3 and 7).
- Develop and maintain continued support for financial investment required to comply with the requirements of the Consent Decree.
- Instill a sense of value and personal ownership and responsibility for clean water.
- Educate children to ensure a long-term sustainability of voluntary participation; and
- Comply with the Consent Decree, the NMCs, the IOAP and the SORP.

The comprehensive approach used a variety of tools and media to reach out to these groups and deliver the specific messages. **Table 3.2-6** shows the wide range of media contacted by MSD between August 2005 and September 2009.

Table 3.2-6 Comprehensive Public Program Uses Wide Range of Media

AUDIENCE	PUBLIC MEETING & COMMUNITY EVENTS	WEB PORTAL TO PROJECT WIN INFORMATION	SPEAKER' S BUREAU & TECHNICAL SUPPORT	PRINT ADVERTISEMENT, PRESS RELEASES	TARGETED BROCHURES, PAMPHLETS, FAQS, ETC	REPORTS, NEWSLETTERS & BILLING INSERTS	DEMONSTRATION PROJECTS	DIRECT MAIL	SIGNAGE AT OVERFLOWS	TOURS, DEMONSTRATIONS, WORKSHOPS
General Public	√	√	√	√	√	√	√	√	√	√
Homeowners	√	√	√	√	√	√	√	√	√	√
Targeted Neighborhoods	√		√				√	√	√	√
Builders		√	√				√			
Restaurants		√	√		√		√			
Schools		√	√				√		√	√

3.2.4.1. OTHER PUBLIC MEETINGS HELD BY MSD

In addition to the WWT Stakeholder Group meetings and the Project WIN meetings focused on IOAP development, MSD developed a broad public outreach presentation aimed at educating the public on MSD's primary business functions with emphasis on wastewater, stormwater, and flood protection. During the period from September 2006 (when MSD submitted an updated NMC, SSOP, and LTCP to the State and EPA) and the end of 2008, MSD participated in or initiated numerous public meetings. A portion of the outreach presentation contains information related to the Consent Decree, including potential program direction and anticipated costs. **Table 3.2-7** provides a chronological summary of the general outreach meetings from September 2005 through December 2008.

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
2006	
July 25, 2006	Jefferson Memorial Forest ECO summer Camp - Student tour of Floyds Fork WQTC.
August 2, 2006	University of Louisville Environmental Science Department Whitney Young Scholars – tour of Floyds Fork WQTC
September 20, 2006	California Neighborhood Coalition – MSD representatives attended a neighborhood meeting as guest panelist to discuss Project WIN and address questions and concerns.
September 21, 2006	City of Rolling Fields Council Meeting – At the request of Mayor Bill Conway, attended a council meeting and talked about MSD community priorities. Staff brought map to show previous work and proposed / unbudgeted capital work in the Rolling Fields city limits.
September 26, 2006	Tour of sewer system and Southwestern Outfall – for The Courier-Journal Newspaper
October 09, 2006	District 20 Town Hall Meeting, Middletown Fire Department.
October 10, 2006	Councilwoman Bryant-Hamilton Neighborhood – meeting at the Shawnee Park Golf Course Clubhouse
October 12, 2006	Old Louisville Neighborhood Association Meeting – MSD attended to discuss Consent Decree and other priorities for the community.
October 16, 2006	Highland Business Association – MSD gave presentation about MSD's Consent Decree and priorities for the community.
October 17, 2006	District 14 Community Meeting – at Sun Valley Community Center
October 24, 2006	Meeting with City of Hurstbourne – MSD gave 20-minute presentation on the Consent Decree and other MSD priorities. After presentation, the City Administrator Ron Howard requested that MSD talk about flooding that occurred in September 2006. There were 24 homes that flooded in the city; many had never flooded before 2006.
October 24, 2006	Councilman Engel District 22 Public Town Forum meeting – Fern Creek Community Center
October 26, 2006	Natural Solutions Workshop – MSD partnered with Metro Parks, Natural Resource Conservation Service, and Spence Native Nursery. MSD organized a 2-day workshop on natural solutions: subjects included porous paving, riparian buffers, native plants, rain gardens, and rain barrels. MSD also gave opening and closing remarks to emphasize the importance of Natural Solutions and their relationship to success with the Consent Decree.
October 30, 2006	City of Hurstbourne Acres – At the request of Representative Brinkman, MSD gave a presentation on the Consent Decree and other MSD priorities and discussed drainage concerns with residents in.
November 1, 2006	Meeting with Treeline Estates – MSD gave Consent Decree presentation and discussed Floodplain Issues with residents.
November 1, 2006	2006 Kentucky Restaurant Association Exposition – MSD participated at the Churchill Downs Race Track. MSD distributed FOG educational materials, as well as pollution prevention information to expo attendees and members of the race going public.

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
November 2, 2006	Camp Taylor Neighborhood Association Meeting – at Councilman King's request, MSD gave a presentation on the Consent Decree and provided an update about projects scheduled for the Camp Taylor area.
November 04, 2006	Rain Barrel Painting Event – at the Beargrass Creek Pump Station where 20 rain barrels were distributed during the family event.
November 14, 2006	Councilman Kramer's District 11 Town Hall meeting – in Hikes Point
November 14, 2006	Beechwood Village City Meeting – at Mayor Louden's request MSD attended this council meeting to give an update on the portable pumps, Tyne Rd Drainage Response Initiative (DRI) project, future Consent Decree Sanitary Sewer project and other initiatives that may affect the neighborhood.
November 28, 2006	Bellarmine College – spoke to business school class about Business Leadership, Community Outreach, and MSD's Consent Decree and future initiatives.
December 13, 2006	Mill Creek Watershed Presentation on Consent Decree, Stormwater Management, and Rain Gardens and Barrels.
2007	
January 17, 2007	Douglass Hills Estates Neighborhood meeting – Middletown City Hall
January 20, 2007	Councilman Kramer's Neighborhood Meeting – at Saint Michael Orthodox Church
January 27, 2007	Butchertown Greenway Invasive Vegetation Removal with 50 Volunteers
February 20, 2007	Kentucky Street Blockwatch meeting – Blockwatch group requested MSD to attend their monthly meeting to discuss Sept. 22, 2006 flood event, the Plumbing Modification Program, and to discuss Consent Decree issues
February 24, 2007	Beargrass Greenway Invasive Vegetation Removal with 45 Volunteers
March 09, 2007	Living Lands and Waters Professional Development for Teachers Workshops – including riparian buffer restoration and best stormwater management practices
March 12, 2007	Newburg Neighborhoods walk – with Council member, Metro Police, and the Department of Neighborhoods.
March 16, 2007	Living Lands and Waters Professional Development for Teachers Workshops – including riparian buffer restoration and best stormwater management practices
March 17, 2007	Living Lands and Waters Professional Development for Teachers Workshops – including riparian buffer restoration and best stormwater management practices
April 03, 2007	Councilman Engel and Councilman Kramer Joint District Meetings – MSD discussed Consent Decree and drainage issues.
April 28, 2007	The Salt River Group – reserved the Floyds Fork WQTC education center for a group meeting. MSD gave an overview of Consent Decree and discussed regional priorities with the group.
April 23, 2007	Scottsdale Neighborhood Association Meeting – Councilwoman Welch District 13 requested MSD to attend their meeting and give a presentation on the Consent Decree and drainage.
April 22, 2007	Party for the Planet: Earth Day 2007 – at the Louisville Zoo. MSD sponsored a display booth to demonstrate how everyday activities can cause water pollution if not done correctly and how everyone can prevent water pollution by doing the right thing with chemicals and waste in their own yard.
April 29, 2007	Neighbors of Jefferson Memorial Forest Presentation on Native Plants, Rain Gardens, and Barrels
May 8, 2007	Rain Garden Workshop – held in MSD's Board Room. Presenters from MSD, Minneapolis, MN, and Madison, WI
May 12, 2007	Community-wide volunteer project to label storm drains that go directly to Chenoweth Run Creek – 10434 Watterson Trail (next to City Hall) at the Jeffersontown Farmers Market Pavilion. Beechwood Neighborhood Festival Rain Barrel Display and Raffle

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
May 14-18, 2007	The River Education Center – was in Louisville. MSD co-sponsored the ORSANCO Floating Classroom. Six elementary schools of Jefferson County Public Schools (JCPS) kids cruised on the river and participated in hands-on experiments in water sampling, wildlife study, mapping, etc. Farnsley Middle School Outdoor Classroom Installation with 60 students and 25 faculty/parents
May 18-19, 2007	St. Peter Claver Rain Garden – Lampton Street, installation with 20 Youthbuild and Green Team students
May 29, 2007	EarthSave Louisville – Taste of Health at Louisville Slugger Field. MSD sponsored a booth and distributed MSD handouts and educational brochures along with sample bags of Louisville Green fertilizer. The information presented also demonstrated how to prevent non-point source pollution in everyday activities that can cause water pollution.
May 31, 2007	2379 Gladstone – Residential rain garden installed. Presentation made to the Mayor of the City of Kingsley.
June 11-12, 2007	Youthbuild E-Corps Class – on rain gardens, native plants, urban ecosystems
June 16, 2007	Ohio River Sweep – MSD joined with Louisville Metro in locally coordinating the trash and debris pickup along the banks of the Ohio River.
June 23, 2007	First free rain barrel distribution of 60 barrels.
July 11, 2007	Home Builders Association Louisville (HBAL) – current sewer issues i.e. action plan updates, Consent Decree, capacity requests, I/I fixes ,etc.
July 16-18, 2007	Five Cities Water Professional Conference
July 17, 2007	District 20 Town Hall Meeting
July 24, 2007	Clifton Community Council - Meeting to discuss Consent Decree Impact on projects
July 25, 2007	Meeting with JCPS to discuss Green Solution Opportunities
July 28, 2007	Rain Barrel Distribution
August 1, 2007	Metro Council Budget Meeting – Rate Increase for Project WIN
August 9, 2007	Metro Council Vote on Rate Increase.
August 15, 2007	Kentucky State Fair – Press Conference to Announce MSD Participation in 2007 State Fair Exhibit Hall
August 16-26, 2007	Kentucky State Fair - Environmental Display
August 16-26, 2007	Kentucky State Fair – Booth on Main Street – Project WIN Education
August 22, 2007	Southern Indiana Public Works conference on Pervious Concrete
August 27, 2007	District 22 and 23 Public Town Forum
August 28,2007	Green Initiatives and Metro Government agency to form partnerships and identify sustainable community practices and implementation
August 2007	Rain Garden Manual Publication for Distribution to Homeowners
September 11, 2007	Urban Ecosystems and Environmental Best Management Practices (BMP) Presentation to Clifton Neighborhood Association
September 18, 2007	Stormwater Management, Native Plants and Ecosystems Presentation – to the University of Louisville Urban Watershed Class
September 21, 2007	Stormwater Management, Native Plants and Ecosystems Presentation to Male High School
September 23, 2007	Beargrass Creek Clean Sweep.
September 25, 2007	Mayors Water Summit - San Francisco CA - Louisville Metro's Consent Decree

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
October 2007	MSD co-sponsored a visit from ORSANCO's water quality education and demonstration boat - the P.A. Denny. The boat was docked at the Louisville waterfront for a week in October, providing education opportunities for JCPS students and the public.
October 1, 2007	District 20 Town Hall Meeting
October 1, 2007	Joint Agencies Discussion on low impact development (LID)/Green Infrastructure
October 2, 2007	Presentation on Consent Decree, addressed rate increase and senior citizen discount
October 2, 2007	JCPS – meeting to discuss development of green infrastructure concept plans for three elementary schools located in the CSO area.
October 3, 2007	Environmental task force meeting - task force includes representatives of all government agencies with focus on partnerships and green building initiative.
October 9, 2007	City of Thornhill - Presentation on Consent Decree initiatives and any current or planned projects for area
October 13, 2007	Rain Barrel Distribution
October 15, 2007	Site meeting with developer – to discuss green alternatives and sanitary sewer issues within combined sewer area relating to the Consent Decree. Provided guidance on implementation of LID methods.
October 18, 2007	Crime Prevention Summit at Brandeis Elementary School - MSD staffed a table, distributed Project WIN educational materials, raffled one rain barrel, and encouraged participation at upcoming scheduled events.
October 19, 2007	Met with Metro Public Works – to explore partnering in a high-profile beautification project, and proposal for alternative plan to install a bio-retention swale and curb inlets to direct stormwater flows away from the CSS to reduce CSOs. Opportunity for community education of green solutions in urbanized high traffic area.
October 24, 2007	Met to discuss green infrastructure possibilities – at the MSD facilities Beargrass Creek /Letterle Pump Station
October 25, 2007	Jefferson County League of Cities – presentation on the Consent Decree and recent rate increase
October 29, 2007	Bellarmine College – Executive Director's speaking engagement with college students to discuss the role of leadership in business and current Consent Decree initiatives in our community.
November 1, 2007	Climate change committee - Discussed how to involve partnering to achieve mutual environmental benefits.
November 6, 2007	Sustainable Cities Forum – Keynote Speaker
November 8, 2007	MSD participated in the 2007 Kentucky Restaurant Association Exposition on November 8, 2007, at Churchill Downs Race Track. MSD distributed FOG educational materials, as well as information on Project WIN to expo attendees and race going members of the public.
November 10, 2007	Rain Barrel Distribution
November 13, 2007	Meeting about Green Opportunities and Partnerships between Metro agencies
November 17, 2007	Butchertown Greenway Invasive Vegetation Removal and Native Tree and Shrub Planting.
November 27, 2007	Metro Council Transportation & Public Works Committee - Presented overview of Consent Decree and the importance of continued support by Metro Council for future Consent Decree rate increases and bond rating for the community
November29, 2007	Ad campaign sponsorship 2008 - Met to discuss the focus of the High School marketing/advertising campaign to increases awareness about Project WIN initiatives and encourage community involvement.
December 11, 2007	Beechwood Wood Village Council Meeting - Updated residents on Consent Decree Project status
December 13, 2007	Met with the Louisville Metro Housing Authority – to present MSD's obligations required by the Consent Decree and explore partnership and opportunities for implementing Green Infrastructure for Government owned properties.
December 14, 2007	MSD hosted a workshop on Pervious Concrete Hydrological Design and Resources training – for the Kentucky Ready Mixed Concrete Association & The Kentucky Concrete Pavement Association.

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
December 15, 2007	Rain Barrel Distribution
2008	
January 3, 2008	Meeting with Metro Public Works – about bioswales for Meyzeek Middle School.
January 19, 2008	The theme for the 2008 KY Derby Festival Conference is "Going Green"! The KY Derby festival committee requested a representative from MSD to sit on the panel and talk about Green Initiatives.
January 24, 2008	Keynote Speaker for Annual Meeting of Salt River Watershed Basin.
January 26, 2008	Volunteer event -- Invasive Plant Removal with Living Lands and Waters and Metro Parks along Butchertown Greenway.
February 6, 2008	Presentation on Consent Decree, Disconnect Down Spouts – Douglass Blvd. Neighborhood Association.
February 8,15,22,28	Storm Water Management and Rain Garden Design Class for Louisville Youthbuild
February 5, 2008 – April 22, 2008	MSD sponsored the 2008 Advertising Federation High School campaign. The Challenge: Marketing challenge to create a marketing/advertising campaign that increases awareness about MSD's Project WIN and encourages our community to prevent both point and non-point sources of water pollution when possible.
February 21, 2008	Kentucky Nurseryman Association – Keynote Address
February 23, 2008	Volunteer event – Invasive Plant Removal with Metro Parks and Living Lands and Waters
March 3, 2008	Rain Garden Workshop, – Jefferson Memorial Forest
March 7,14,	Storm Water Management and Rain Garden Design Class for Louisville Youthbuild
March 15, 2008	X-Stream Clean Sweep - 14 sites countywide, 140 volunteers
March 25, 2008	Presentation on Consent Decree, etc. – Neighborhood Institute
April 2, 2008	Presentation on Native Plants, Rain Gardens and Rain Barrels for Stormwater Management for Floyds Fork Watershed Group
April 14, 2008	Rain Barrel Sales are on-going. During this period, 263 rain barrels were distributed.
April 19, 2008	Rain Garden Workshop for Louisville Nature Center/Rain Garden Installation at Louisville Nature Center
May 10, 2008	Public presentation on Native Plants, Rain Gardens and Rain Barrels for Stormwater Management - Louisville Nature Center
May 18, 2008	Presentation on Native Plants, Rain Gardens and Rain Barrels for Stormwater Management for Old Louisville Neighborhood Association
June 3, 2008	Urban Stormwater Class for Youthbuild E-Corps
June 12, 2008	Presentation for Deer Park Neighborhood Association
June 20, 2008	Presentation on Urban Stormwater, Rain Gardens, Rain Barrels for Sierra Club
June 21, 2008	Ohio River Sweep ORSANCO
June 28, 2008	Rain Garden/Rain Barrel Workshop for Bernheim Arboretum and Research Forest
July 19, 2008	Rain Garden & Rain Barrel Workshop for Louisville Nature Center
July 21, 2008	Presentation on Urban Stormwater, Rain Gardens and Rain Barrels for Germantown Neighborhood Association
July 29, 2008	Field trip to Floyds Fork Water Quality Treatment Center – Whitney Young Scholars
August 12, 2006	Sustainable Cities Series – Presentation on what you can do to help our waterways.
August 14 – 24, 2008	Educational exhibit at the KY State Fair - exploring the underground world of sewers
September 27, 2008	Beargrass Creek Clean Sweep with Metro Parks and Natural Resource Conservation Service

Table 3.2-7 Summary Outreach Meetings, September 2005 - December 2008

DATE	LOCATION / SUMMARY
October 7, 2008	Presentation on Urban Storm Water, Native Plants, Rain Gardens and Rain Barrels Crescent Hill Library
October 11, 2008	Rain Garden Installation and On-site Workshop, 2105 and 2107 Dorothy Street, Douglass Blvd. Neighborhood Association
October 13, 2008	Presentation on Urban Storm Water, Native Plants, Rain Gardens for Indian trail/Preston Neighborhood Annual Meeting
October 14, 2008	Presentation on Urban Storm Water, Native Plants, Rain Gardens for Beckham Bird Club
November 19, 2008	Greening of Earth: Whose Responsibility? Common Experience Series, Indiana University Southeast

MSD continues to sponsor and attend public meetings throughout the community. These meetings are documented in the Annual Reports that can be accessed through the Library section of the Project WIN website at www.msdprojectwin.org.

3.2.4.2. OTHER PUBLIC EVENTS IN WHICH MSD PARTICIPATES

MSD is active across the Louisville Metro region participating in fairs and public events not only to communicate, but also to reach out to the public and ensure that everyone is familiar with MSD and the mission of the sewer district. The more the public is familiar with MSD, the Project WIN logo, the image, MSD's mission, and the issues related to stream water quality, the more they will be open to listening, and participating in MSD-sponsored meetings. In some cases, these events engage the public as volunteers to paint storm drains, plant trees or clean up the river or creeks. These are especially important events to reinforce the value of clean rivers and creeks with the public.

Participation in the public events also gives MSD the opportunity to deliver timely messages to the public that range from rate increases, overflows, non-point source pollution, and stormwater pollution in the community, housekeeping, gardening, and other consumer practices that can support the mission of clean water. MSD takes maximum advantage of the opportunities to reach the public about public health, clean stream water, infrastructure investment, and individual behaviors. This practice will continue throughout the various stages of Project WIN. **Error! Reference source not found.** provides a representative list of the other meetings in which MSD participated.

Table 3.2-8 Other Public Meetings

DATE	LOCATION
July 17, 2006	Carter Elementary School cafeteria – 3600 Bohne Avenue
August 21, 2006	Fairdale High School's small gym – 1001 Fairdale Road
September 18, 2006	Iroquois High School gym – 4615 Taylor Boulevard
October 16, 2006	Waggener High School's small gym – 330 Hubbards Lane
November 20, 2006	Portland Community Center Gym – 640 N 27th Street
February 19, 2007	Sun Valley Community Center – 6505 Bethany Lane
March 19, 2007	Fern Creek High gym – 9115 Fern Creek Road
April 16, 2007	Central High gym – 1130 W. Chestnut Street

Table 3.2-8 Other Public Meetings

DATE	LOCATION
May 21, 2007	Westport Middle – 8100 Westport Road
June 18, 2007	Carter Elementary café – 3600 Bohne Avenue
October 16, 2007	Greenwood Elementary – 5801 Greenwood Road
October 24, 2007	Conway Middle School – 6300 Terry Road
November 13, 2007	Doss High School – 7601 St. Andrews Church Road
November 21, 2007	Greenwood Elementary – 5801 Greenwood Rd
October 3, 2007	Hill St. Baptist Church – 2203 Dixie Highway
October 15, 2007	Seneca High School – 3510 Goldsmith Lane
November 19, 2007	Eastern High School – 12400 Old Shelbyville Road
January 15, 2008	Incarnation Catholic Church – 2229 Lower Hunters
February 19, 2008	Hillview Baptist Church – 5319 Dixie Highway
March 18, 2008	Beechland Baptist Church – 4613 Greenwood Road
January 28, 2008	Stuart Middle School large gym – 4601 Valley Station Road
February 18, 2008	Atherton High School small gym – 3000 Dundee Road
March 17, 2008	Butler High School small gym – 2222 Crums Lane
April 21, 2008	Fairdale High School small gym, 1001 Fairdale Road
May 19, 2008	Jeffersontown High School gym, 9600 Old Six Mile Lane
June 16, 2008	Knight Middle School large gym, 9803 Blue Lick Road
April 15, 2008	Shively Christian Church - 1822 Kendall Lane
May 20 2008	St. Lawrence Catholic Church - 1925 Lewiston Drive
June 17, 2008	Ormsby Heights Baptist Church - 2120 Lower Hunters Trace
July 15, 2008	Rockford Lane Baptist Church - 2006 Rockford Lane
August 19, 2008	Mt. Everest Baptist Church - 6012 Mt. Everest Drive
September 16, 2008	St. Paul Catholic Church - 6901 Dixie Highway
July 21, 2008	Carter Elementary School cafeteria, 3600 Bohne Avenue
August 18, 2008	T.J. Middle School large gym, 1501 Rangeland Road
September 15, 2008	Central High School large gym, 1130 W. Chestnut Street
October 20, 2008	Waggener High small gym, 330 Hubbards Lane
November 17, 2008	Pleasure Ridge Park large gym, 5901 Greenwood Road
October 21, 2008	St. Polycarp Catholic Church - 7718 Columbine Drive
November 18, 2008	PRP High School - 5901 Greenwood Road

3.2.4.3. PROJECT WIN SEASONAL COMMUNICATIONS

MSD has also developed a program of communication to provide specific messages on a recurring basis. These communications began implementation as magazine and print advertisements in 2007, and similar

efforts are anticipated to continue for many years to come. The approach taken with the public program communications is to divide the calendar year into four seasons. The targeted messages are to specific audiences, which are subsets of the public. These seasons are:

- The Rainy Season: February through April.
- The Summer Season: May through July.
- The Fall Season: August through October.
- The Holiday Season: November through January.

To introduce this program, MSD mailed a "Seasonal Tips" postcard to customer accounts with five tips about how to help with control of overflows and preventing water pollution (See Appendix 3.2.14). The activities and public messages are seasonal. See below for examples:

- During the rainy season, the focus is on runoff issues; therefore, the message is about gardening practices, deferring the use of washing machines and dishwashers during and immediately after a rain event to conserve water and provide capacity in the sewer, and encourage the use of rain barrels. This message focuses on homeowners and gardeners.
- During the Summer season, the focus is on ensuring that water body contact and other recreation in and around the water is healthy. Consequently, the message is tailored to those who live near waters and those who recreate (water skiing, fishing, and boating) in or on the water.
- In the Fall, many households and commercial establishments are undertaking maintenance and cleanup in preparation for the Winter and the holiday/entertainment season. The message shifts to proper disposal of hazardous materials and cleaning materials, pool and spa cleaning, and other maintenance activities. The message focuses on homeowners, consumers, and owners of pools and spas.
- During the holiday season, the focus is on cooking and entertainment. FOG control is the focus of the holiday season. The message about FOG is tailored to seasonal cooking and entertainment.
    - At the beginning of each New Year, it is human nature to resolve to do and be better. MSD provided a list of New Year's Resolutions for the public to resolve to undertake as part of the WINing Team. MSD employees distributed copies of the poster to libraries, commercial buildings, restaurants, stores, and other gathering places.

The New Year's Resolution Poster and examples of the advertisements are included in Appendix 3.2.15.

Appendix 3.2.14 Seasonal Tips Postcard

Appendix 3.2.15 New Year's Resolution Poster

These appendices are the same as the 2012 IOAP submittal and are provided on the external USB drive.

3.2.4.4. PROJECT WIN IN MSD NEWSLETTERS

MSD has two newsletters that contain specific public information about Project WIN and the overflow abatement program; these are the "Update," and "Crosscurrents." Both publications are posted on MSD's website for download.

The "Update" is a monthly newsletter aimed at both customers and employees of MSD. This newsletter provides MSD with the opportunity to quickly disseminate information about items addressed at the MSD Board

meeting. For example, the March 2008 "Update" varies from articles about Black Achievers at MSD consistent with the Black History Month, an article that calls for volunteers to participate in an XStream Cleanup on March 15, to announcements about public workshops on the Ohio River sponsored by MSD with Living Lands and Water.

MSD prepares the "Crosscurrents" newsletter for customers. It is direct mailed as well as posted on the MSD website. This gives MSD the opportunity to include a specific article each quarter on the status of Project WIN and some specific tips for individuals about how to be a part of the WINning Team.

In addition, MSD publishes an Annual Report targeted at customers and elected officials. Project WIN has been discussed extensively in the Annual Reports published since the Consent Decree was filed.

3.2.4.5. BROCHURES AND OTHER PRINTED MATERIALS

MSD has created the following three main brochures to use in the public program:

- CSO Brochure: Updated in September 2006
- SSO Brochure: Updated in May 2008
- FOG Brochure: Updated in May 2008

Each of the brochures define and describe a specific problem, explain the options for correction, and provide public notification about the potential public health impact of overflows and caution about water body contact. MSD provides brochures at all public meetings at which it presents, both those organized by MSD or by another organization. In addition, the brochures are provided to Metro Council members for distribution to their District, and to neighborhood association representatives. Each brochure has the MSD and Project WIN logo and the MSD Project WIN website address for more information.

Other printed materials available to the public include:

- A FOG postcard with plastic grease scraper (Appendix 3.2.16)
- January 2008 issue of *Today's Woman*, providing a set of New Year's Resolutions for residents to follow to help provide for a cleaner environment
- Advertisements in magazines and newspapers to inform and educate the public
    - March 2008 issue of *Today's Woman* to inform the public on how to play it safe around sewer overflows
    - Information on Project WIN in the January, February, and March 2008 issues of *Business First*
    - Information on Project WIN in the January, February, and March 2008 issues of the *Louisville Magazine*
    - Advertisement for *The Courier-Journal* promoting water quality issues and the Consent Decree

Appendix 3.2.16 FOG Flyer and Postcard

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

In addition, *Louisville Magazine* did a story about the Consent Decree and MSD's focus for our community in August 28, 2006.

MSD developed and published an eight-page insert on April 29, 2007 for the Louisville Metro *The Courier-Journal* newspaper to maximize the exposure of Project WIN initiatives throughout the MSD service area. This publication provided information on the proposed rate increase, Project WIN initiatives, and a discussion of the Consent Decree. It also included a list of scheduled public meetings, annotated diagrams and definitions of SSOs and CSOs; examples of activities that the typical homeowner can perform to help alleviate sewer overflow problems; and a general warning to avoid waterways during and for 48 hours after rainstorms. This piece was substituted in place of a bill insert.

3.2.4.6. PRETREATMENT AND COMMERCIAL PUBLIC OUTREACH PROGRAMS

As described previously under the NMC discussion, MSD is required to review and revise the Industrial Pretreatment Program as appropriate. While the Industrial Pretreatment Program addresses a broad scope of industrial discharge issues, one focus area of the pretreatment program has been FOG control to prevent blockages of the combined and separate sewer. FOG control is a mainstream program, and most clean water agencies around the country have a commercial FOG program aimed at commercial bakeries, restaurants, and other businesses that prepare or process food. MSD continues working with a FOG consultant to develop updated brochures and technical information.

3.2.4.7. POLLUTION PREVENTION OUTREACH AND EDUCATION PROGRAMS

Pollution prevention outreach is also a component of one of the nine NMCs. A part of any pollution prevention program is public education about pollution prevention activities that can be implemented at home or at work. The difference between the outreach of pretreatment review and the pollution prevention outreach is the focus on industrial or commercial establishments (pretreatment) as opposed to government or personal actions that prevent pollutants from entering the waste stream. Often, pollution prevention programs are the same as public outreach or education programs because preventing the pollutant from entering the waste stream can only be accomplished if the public is aware. Consequently, many pollution prevention activities include a public program to develop public awareness using some of the programs previously discussed, including the seasonal tips, the New Year's Resolutions, and the FOG scrappers for home use. Other specific MSD activities to prevent pollution include the following:

- Coordination of MSD's role in activities performed by Louisville Metro such as, street sweeping, Operation Brightside (litter prevention and collection campaigns), and other Louisville Metro pollution prevention programs.
- Implementation of the Hazardous Materials Ordinance, which requires users with hazardous materials on site to submit a spill prevention and control plan. Continued response to spills of hazardous materials and incidents involving discharges to the sewer system and provide spill mitigation kits to the Louisville Metro and Suburban Fire Departments to use to absorb vehicle fluids rather than flushing to the sewer.
- Implementation of the Erosion Prevention and Sediment Control Ordinance.
- Facilitation or sponsorship of clean sweep events at which volunteers remove trash and debris from the waterways in Louisville Metro.
- Design and assist with the installation of several rain gardens within the CSS (including one currently being constructed at MSD's Main Office Building) to minimize stormwater runoff, thus reducing non-point source pollution.

- Development of a rain barrel distribution program to reduce runoff, particularly within the CSS, and thus reducing non-point source pollution.
- Installation of a strip of pervious concrete in the street along the curb-line at MSD's main office in downtown Louisville and around catch basin inlets in MSD's parking lot as a pilot demonstration project. Pervious pavement allows stormwater to be directed into the soils rather than to the combined sewer or creeks, thus reducing overflows and pollution carried by runoff.
- Completion and distribution of informational pieces targeted to inform customers and residents on activities that they can practice within their homes to assist in the reduction of overflows within the collection system.
- Promotion of Green Infrastructure initiatives within Louisville Metro, such as pervious pavement, bioswales and rain gardens.
- Continuation of coordination with Louisville Metro staff for programs such as, "Adopt-a-Highway" cleanup programs, and litter pick-up activities to maximize the efficiency of those operations and determine the amounts of materials as they relate to preventing solids and floatable from entering the CSS.

3.2.4.8. DISTRICT-WIDE GENERAL PROGRAMS

Before the Consent Decree, MSD had an active public outreach and education program. With the Consent Decree and the creation of Project WIN, MSD has continued the District-wide public program which is focuses on a *"Clean, Green, Growing Community"* including Project DRI (Drainage Response Initiative), learning about wastewater and infrastructure, and promoting the use of Louisville Green.

MSD also continues to invest in both formal and informal public education of primary and secondary level students through a variety of programs. Two key messages are to value clean stream water and take personal responsibility for protecting the rivers and streams of Louisville Metro.

MSD participation is intended to prepare students to be active public participants and ratepayers of tomorrow. MSD includes in the information distributed to students many of the housekeeping, gardening, and consumer behavior concerns that are targeted to property and homeowners.

These educational programs include the following:

- Urban Watershed Program in cooperation with JCPS Center for Environmental Education, using rafts to take students into urban waterways to discuss water quality and how water is managed in an urban area.
- Professional development and teaching support materials for teachers needing additional background and information regarding water quality issues and the use of outdoor classrooms.
- Support for the Floyds Fork Environmental Education Center at the Floyds Fork WQTC as a resource for teachers wishing to visit the plant.
- Tours of other regional WQTCs closer to schools not located in the Floyds Fork area.
- Louisville Metro Brightside, a one-day youth summit held bi-annually to allow elementary and secondary school students and teachers to focus on obtaining knowledge and skills related to environmental issues.

- Speakers Bureau providing in-class lectures and demonstrations about wastewater collection and treatment, water quality, and green infrastructure.
- Eco Drama, a program open to all second-grade students in Louisville Metro, focusing on water quality issues and storm drain basins.
- Support for the design and implementation of outdoor classrooms.
- Support for environmental education programs at Portland and Cane Run Elementary Environmental Education Magnet Schools and the environmental sciences program at Eastern High School (planned to be expanded to all JCPS high schools in the future).

MSD continues in-house training programs for employees related to the SORP and Consent Decree requirements. Copies of the Consent Decree and supporting information were distributed to employees and the basic elements and obligations of the Consent Decree were reviewed. As documentation is updated, it is posted and made available on the Project WIN website. New employee training has also been modified to include information regarding the Consent Decree. Further, each training module includes general messages about Project WIN, such as the Seasonal Tips about household, garden and vehicle washing best management practices, the New Year's Resolutions, and information about upcoming Project WIN meetings. MSD employees are also Project WIN customers and ambassadors. The expectation is that by including this public program information into SORP training that the employees will not only understand and use best practices but also will pass along this information to their neighbors.

The MSD Call Center or the Online Inquire system (Customer First) is another method for informing the public about water quality and sewer overflow issues. The MSD Customer Relations Call Center (CRCC) personnel are trained to answer questions from the public about sewer overflows. The CRCC is available 24 hours a day, 7 days a week.

FAQs have been developed for use by the CRCC and are posted on the MSD website. The posting on the website is accessible within the Project WIN sub-website or from the MSD Home Page. The FAQs are revised when needed to ensure that they contain the most up-to-date information and expanded information about the status of the overflow abatement program, Project WIN.

MSD, often in partnership with Louisville Metro government or other community partners, has several other ongoing public programs related to the goals and objectives of Project WIN including information and outreach about the following:

- Project DRI, a successful initiative that has focused on preventing flooding through infrastructure and other solutions to drainage across the Louisville Metro region.
- Louisville Green, a fertilizer produced by MSD and sold to the public.
- Greener Solutions, rain gardens and rain barrels as a sustainable way to accomplish infiltration of runoff, including a "How to Guide for Building Your Own Rain Garden."
- Special events such as medicine take-back events (May 2008 at six locations) and tree planting and clean sweep events.

To promote and announce all of these programs, MSD posts specific information on the website. Announcements and articles are also published in monthly or quarterly newsletters, and in some cases, MSD

prepares special flyers and announcements for the press. All of these programs promote "Clean, Green, and Growing Communities" that specifically protect the water resources of the Louisville Metro region.

3.3. PROGRAM IMPLEMENTATION BETWEEN OCTOBER 2009 AND JUNE 2013

During the development of the IOAP, the primary focus areas of the public program were related to notifications of overflow events, education and input on Consent Decree response strategies, and building support for the community investments required to achieve the requirements of the Consent Decree. As the IOAP moved from the planning stage to implementation, the public program remained a vital part of MSD's response strategy. This section describes the public program activities that occurred since approval of the IOAP.

3.3.1. PUBLIC NOTIFICATION

MSD continued the public notification efforts outlined in Section 3.2. Modifications and/or enhancements to those efforts are documented below.

3.3.1.1. WARNING SIGNS

Approximately 1,200 Overflow Advisory signs have been installed along the creeks and the Kentucky side of the Ohio River within both the combined and separate sanitary sewer systems. In the CSS area, approximately 250 signs are installed. In the separate sewer system area, approximately 950 are installed. Refer to the approved SORP for additional information.

Figure 3.2-1 shows the location for the signs, published in October 2012.

Bilingual Overflow Advisory Sign Installed by MSD

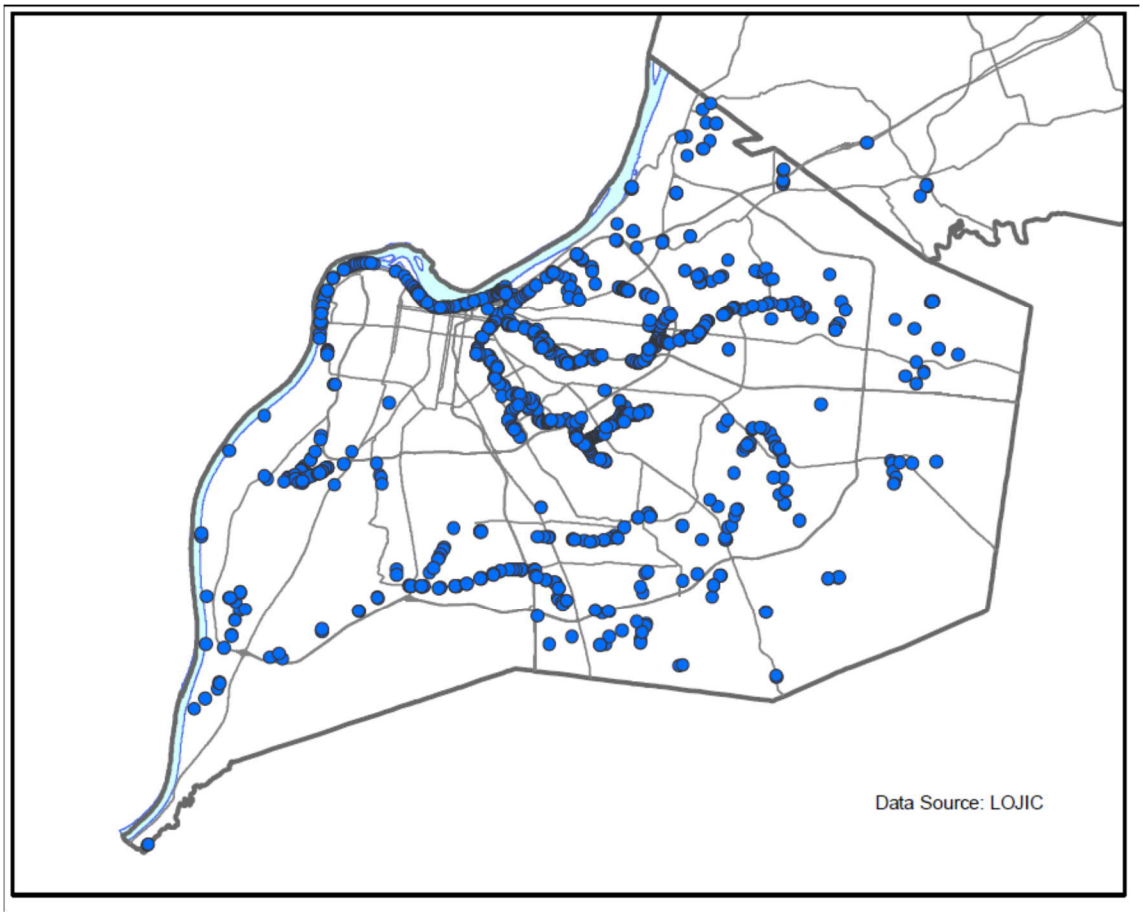

Figure 3.3-1 Overflow Advisory Sign Locations Within Louisville Metro, KY

3.3.1.2. PROJECT WIN WEBSITE

MSD continued to maintain the Project WIN website as a sub-website of the main MSD website. The Project WIN website was revamped to be more user-friendly. The following framework was used to display notification, education, and outreach materials for the interested public. Refer to the website for additional information at www.msdprojectwin.org.

- **Home**: Project WIN E-mail Notification System sign-up and Quick-links to major subsections defined below
- **About Us**: Information about Project WIN, the Federal Consent Decree, Louisville's Sewer Overflows, the IOAP and the WWT
- **How You Can Help**: Tips & Resources describing what individuals can do on their own property and within our community, education materials and a Just for Kids page
- **Projects**: Interactive Viewing Tool displays sewer overflow abatement projects defined in the approved IOAP

- **Library**: repository that contains the Consent Decree planning documents, approved submittals, WQTC Reports, technical program reports and public meeting documentation
- **Public Input**: Notification and documentation of IOAP Project Review and Public Input meetings

3.3.1.3. ELECTRONIC NOTIFICATION

MSD continued the programmatic approach to public notification via electronic communication forms as previously documented in Section 3.2.1.3.

3.3.1.4. WRITTEN NOTICES

MSD continued the written notification approach to communicate with customers and regulatory agencies as previously documented in Section 3.2.1.4.

3.3.2. THE WET WEATHER TEAM

MSD continued the WWT Stakeholder Group efforts outlined in Section 3.2.2. Modifications and/or enhancements to those efforts are documented below.

3.3.2.1. CONTINUED ENGAGEMENT

MSD continued to engage the WWT Stakeholder Group in the planning and implementation of the IOAP. A broad-based community input program does not replace the need for the focused participation of an active, well informed Stakeholder Group.

As part of the adaptive management approach outlined in the approved 2009 IOAP, MSD expanded the monitoring network throughout its sewer system. This data was utilized to recalibrate the hydrologic and hydraulic models used to size overflow abatement projects and refine individual project approaches and sizes based on an improved understanding of the sewer system operation and the relationship of certain overflows to one another.

MSD utilized the same benefit/cost methodology defined by the WWT Stakeholder Group for the 2009 approved plan to develop the programmatic justification for a proposed 2012 IOAP Modification. The justification demonstrated the proposed modifications achieve a higher overall benefit to the community through earlier overflow reduction, increased use of green infrastructure and acknowledgement of pertinent public input.

A smaller group of the original WWT Stakeholder Group was assembled to serve as a sounding board, ensuring the modifications to the plan and specific project designs remain true to values, priorities and financial plan that was originally developed. It was critical to continue working with the same people to leverage the two and ½-year education process which occurred during development of the IOAP. Due to the approved IOAP schedule of projects, particularly the timing of projects slated for modification, there was not time available to bring new members into the WWT Stakeholder Group and get them up to speed on all that occurred during IOAP planning and approval.

3.3.2.2. WWT STAKEHOLDER GROUP CHARTER

In May 2012, the WWT Stakeholder Group project description was revised to acknowledge continued expectations and membership moving forward. Refer to Appendix 3.3.1 for a copy of the WWT Stakeholder Group Project Description, Revised May 2012.

Appendix 3.3.1 WWT Stakeholder Group Project Description, Revised April 2012

Appendix is the same as the 2012 IOAP submittal and is provided on the external USB drive.

3.3.2.3. LIST OF PARTICIPANTS

Each member from the WWT Stakeholder Group was contacted to thank them for service to the community as a member of the WWT Stakeholder Group, and to invite their continued participation in guiding the implementation of the IOAP and other ACD response activities. The list of individuals that chose to continue participation is listed in Appendix 3.3.1 the WWT Stakeholder Group Project Description, Revised May 2012.

3.3.2.4. WET WEATHER TEAM STAKEOLDER GROUP MEMBERSHIP MOVING FORWARD

Per the ACD, the WWT includes "MSD personnel such as WQTC operators and engineering personnel, local political officials, the general public, including rate payers and environmental interests. Private consulting resources are also included." Since the WWT Stakeholder Group will remain active through the year 2024, it is likely that attrition of members will occur. If any of the categories required by the ACD become under-represented, MSD will replace members to ensure that all requirements are met.

If replacement of the WWT Stakeholder Group members is required, under Paragraph 23 of the ACD it is the responsibility of the Regulatory Services Director to select those replacements. Consistent with the original selection criteria, a replacement should be a recognized community opinion leader associated with the specific interest group needing representation. The replacement should also be free of any personal or organizational conflict of interest per the MSD Ethics Policy governing MSD staff. (Even though the Stakeholder Group members are not MSD staff, it is deemed important for the credibility of the group that no real or perceived conflicts of interest exist). In addition, the replacement should not be a party to any active legal action against MSD or any other members of the WWT Stakeholder Group, or in the last ten years have been a party to a legal action against MSD or any other member of the WWT Stakeholder Group which was lost, dismissed, or voluntarily abandoned without a settlement.

3.3.2.5. APPROACH TO MEETINGS AND USE OF CONSULTANTS

MSD continued the WWT Stakeholder approach to meetings and use of consultants, as previously documented, with one modification, as follows.

WWT Stakeholder Group meetings continue to be scheduled twice per year, for two or three hours per meeting, based on the issues and time urgency of decisions that need to be made during implementation. These meetings will be scheduled in coordination with IOAP Project Review and Public Input meetings. Technical consultants will continue to be utilized; however, facilitation will be performed by MSD staff.

Information provided to the WWT Stakeholder Group is posted to the Project WIN website, at **www.msdprojectwin.org.**

3.3.2.6. WWT ESTABLISHES COMMUNITY VALUES

The values-based decision process developed by the WWT Stakeholder Group and utilized to develop the Final LTCP and the Final SSDP, was the same process used to develop the 2012 IOAP Modification. A more detailed discussion of this process is contained in Volume 1, Chapter 2.

3.3.3. PROJECT WIN PUBLIC MEETINGS DURING OVERFLOW ABATEMENT PLAN IMPLEMENTATION

Following approval of the IOAP, MSD continued to seek public input on specific projects as they moved through the planning and design process. Two of the largest projects in the IOAP were the early focus as described below:

- Derek R. Guthrie WQTC wet weather expansion project. Conducted an "open house" on October 3, 2009. Invitations were sent to local residents, elected officials and other interested parties, and notices of the open house were posted on MSD's website. The purpose of the open house was to explain upcoming improvement projects and receive public input on the planned modifications.
- Jeffersontown WQTC blending elimination plan. Conducted two public meetings on this project to review the alternatives evaluated and the preferred suite of projects selected.
    - Jeffersontown Community Center on March 16, 2010.
    - Sun Valley Community Center on March 17, 2010.

Public attendance at these meetings was less than desired. A higher level of public input on specific projects and public support for program funding is necessary to sustain the program through 2024. MSD, with input from the WWT Stakeholder Group, developed a more robust framework for seeking public input on specific projects as they move through the design process and for plan updates proposed due to green infrastructure and I/I removal right-sizing initiatives.

3.3.3.1. PROJECT REVIEW AND PUBLIC INPUT MEETING PROCESS

IOAP projects will be designed and constructed over multiple decades. As projects move out of planning and into design over the course of many years, challenges may occasionally occur. These challenges include, but are not limited to, the following examples: land availability, easement attainment, hydraulic model updates, permitting limitations, and technology advancements. As a result, a more robust Project Review and Public Input process was implemented in 2011, containing the following elements:

- Periodic IOAP meetings, initially scheduled quarterly, with frequency adjusted based on attendance, numbers of projects moving from one stage to another, or as experience indicates the effectiveness.
- Meetings were publicized via a variety of methods including but not limited to: general notice on MSD's website and the Project WIN website; specific email invitation to WWT Stakeholder Group members, Metro Council members, and KDOW, requesting forwarding to other interested parties; and/or direct mail.
- MSD utilized various methods and/or combinations of communication methods to take advantage of technology advancements and social media availability to find the combination that produces the most cost-effective means of delivering the invitations and garnering public meeting attendance and/or support for program implementation.
- The presentations were recorded for replay on Metro TV and streamed from the Project WIN website. Copies of the presentations given at the Project WIN meetings are available on the Project WIN website.
- The public was provided multiple methods for submitting questions and comments, including documentation on a standard form at the meetings, voicing concerns at the meeting on camera for

replay on Metro TV and streaming on MSD's Project WIN website, submission via email and written letter via standard mail submission.

- MSD documented and responded in writing to each question and comment received. Comments and responses of general interest were posted to Project WIN website, with personal information excluded. If an answer does not satisfy the questioner, the issue can be presented to the MSD Board in accordance with Board policy on receiving public comment.

3.3.3.2. 2012 IOAP REVIEW AND PUBLIC INPUT MEETINGS HELD

During 2011 – 2012, MSD conducted the IOAP Project Review and Public Input meetings listed in Table 3.3-1 under the new format outlined in the section above. Refer to the Project WIN website for detailed documentation of each meeting.

Table 3.3-1 2012 IOAP Project Review and Public Input Meetings

DATE	LOCATION	TOPICS
September 27, 2011	MSD Main Office, 700 West Liberty Street	IOAP Program Overview, Logan Street CSO Basin project, Jeffersontown WQTC Elimination project, Prospect WQTC Elimination project
January 24, 2012	Girl Scouts of Kentuckiana, 2115 Lexington Road	IOAP Program Overview, I-64 & Grinstead Drive CSO Basin project, Derek Guthrie WQTC and Hite Creek WQTC Action Plans
May 10, 2012	NIA Center, 2900 West Broadway	Proposed IOAP 2012 Modifications, 18th & Northwestern Parkway basin project, Paddy's Run High Rate treatment project, Southern Outfall Relief Inline Storage projects
May 15, 2012	Jeffersontown Community Center, 10617 Taylorsville Road	Proposed IOAP 2012 Modifications, Billtown Road Project, Jeffersontown WQTC Elimination project
May 17, 2012	Harrods Creek Fire Department, 8905 US Hwy 42	Proposed IOAP 2012 Modifications, Prospect WQTC Elimination project
August 14, 2012	Camp Taylor Elementary School, 1446 Belmar Drive	Proposed IOAP 2012 Modifications, Camp Taylor Sewer Rehabilitation and Replacement projects, Butchertown Neighborhood Green Infrastructure project

3.3.3.3. PUBLIC COMMENT PERIOD AND PUBLIC HEARING FOR DRAFT 2012 IOAP

The following meetings were held between November 2012 – February 2013 to review the Proposed IOAP 2012 Modifications with the interested public. The meetings were advertised via general notice on MSD's webpage and the Project WIN webpage; including a specific email invitation to WWT Stakeholder Group members, Metro Council members, and KDOW, requesting forwarding to other interested parties; and/or direct mail.

Table 3.3-2 Proposed IOAP 2012 Modifications Public Input Meetings

DATE	LOCATION	TOPIC
November 8, 2012	Louisville Urban League, 1535 West Broadway	Proposed IOAP 2012 Modifications
November 13, 2012	East Government Center, 200 N Juneau Drive	Proposed IOAP 2012 Modifications
November 15, 2012	Southwest Government Center, 7219 Dixie Highway	Proposed IOAP 2012 Modifications
January 8, 2013	Shively Community Center, 3920 Dixie Hwy	Proposed IOAP 2012 Modifications
January 22, 2013	Krammerer Middle School, 7315 Westport Rd	Proposed IOAP 2012 Modifications
January 29, 2013	Shawnee Community Center, 607 S 37th St	Proposed IOAP 2012 Modifications
February 5, 2013	Moore Traditional High School, 6415 Outer Loop	Proposed IOAP 2012 Modifications

The proposed IOAP 2012 Modification including the Final LTCP and the Final SSDP were distributed for public comment in March 2013. Copies of Volume 1 with redline markups was available for review at all branches of the Louisville Free Public Library system, and at MSD's main office at 700 West Liberty Street. The proposed IOAP 2012 Modification in full with appendices was also available for downloading from the Project WIN website.

The public notice was published in the legal notices section of *The Courier-Journal*, the major daily newspaper for the Louisville Metro region February 24, 2013, 15 days in advance of the release date. The public notice announced the availability of the draft plan; the public hearing date, time and location, and the deadline for the acceptance of comments on the plan (see Appendix 3.2.11 IOAP Public Comment Period Public Notice, revised February for a copy of the notice). The legal notice was repeated on the release date, March 10, 2013. MSD posted an announcement about the public hearing and comment period on the MSD and Project WIN websites. The deadline for accepting comments on the proposed IOAP 2012 Modification was April 12, 2013.

The public hearing on the proposed IOAP 2012 Modification was held on March 26, 2013 in the MSD Board Room. The purpose of the public hearing was to receive formal comments from the public about the proposed IOAP 2012 Modification. As with the previous public hearing on the 2009 Plan, the hearing was not structured as a dialog. The MSD Executive Director was the Hearing Officer and an independent court reporter was present to take verbatim notes. At the onset of the hearing, the Hearing Officer, read a prepared statement about the purpose of the IOAP and the proposed IOAP 2012 Modification, the rules of the hearing, the deadline for the written comments, the proposed schedule for response to both written and oral comments, and the proposed adoption date of the revised plan. The statement was included in the transcript of the hearing. As with most public hearings, each person who desires to comment was asked to complete a request card. This meeting was taped by Metro TV Productions as video documentation and made available on the Project WIN website.

Each commenter was provided ample time to comment on the proposed IOAP 2012 Modification as official testimony. Neither questions nor clarifications were asked of the persons commenting, nor were they answered by MSD, in accordance with the rules of the hearing.

A summary of all written and oral comments received, and MSD's response to those comments is contained in the Responsiveness Summary provided in Appendix 3.3.2. A complete set of all received comments is included in Appendix 3.2.13.

Appendix 3.3.2 2008 and 2012 Responsiveness Summaries

This is a new appendix that was created for the 2021 IOAP. The documents were previously provided as an Attachment. The documents remain the same as the 2012 IOAP and are provided on the external USB drive.

3.3.4. GENERAL PROGRAMMATIC OUTREACH AND EDUCATIONAL ACTIVITIES

MSD continued the Project WIN outreach and education activities as previously documented in Section 3.2.4. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.1. OTHER PUBLIC MEETINGS HELD BY MSD

MSD continued to host and attend public meetings in addition to the WWT Stakeholder Group meetings and the Project WIN meetings focused on IOAP development as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.2. OTHER PUBLIC EVENTS IN WHICH MSD PARTICIPATES

MSD continued to participate in fairs and public events not only to communicate, but also to reach out to the public and ensure that everyone is familiar with MSD and the mission of the sewer district as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.3. PROJECT WIN SEASONAL COMMUNICATIONS

MSD continued to focus seasonal specific messages to the public as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed.

3.3.4.4. PROJECT WIN IN MSD NEWSLETTERS

MSD continued to publish two newsletters that contain specific public information about Project WIN and the overflow abatement program as previously documented. These are the “Update,” and “Crosscurrents.” Both publications are posted on MSD’s website for download. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

In addition, MSD publishes an Annual Report targeted at customers and elected officials. Project WIN has been discussed extensively in the Annual Reports published since the Consent Decree was filed.

3.3.4.5. BROCHURES AND OTHER PRINTED MATERIALS

MSD continued to provide program specific brochures and other printed materials as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.6. PRETREATMENT AND COMMERCIAL PUBLIC OUTREACH PROGRAMS

MSD continued the Industrial Pretreatment and commercial public outreach programs as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.7. POLLUTION PREVENTION OUTREACH AND EDUCATION PROGRAMS

MSD continued the public education focus on pollution prevention activities that can be implemented at home or at work as previously documented. In addition, a significant emphasis was placed on educating the community at large on the benefits, best practices, and limitations of Green Infrastructure, particularly as it

pertains to stormwater runoff control and sewer overflow reduction within the CSS. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed during this timeframe.

3.3.4.8. DISCTRICT-WIDE GENERAL PROGRAMS

MSD continued the district-wide general education programs as previously documented. Refer to the Project WIN website, Library Section, Annual and Quarterly Reports for specific activities completed.

3.4. PROGRAM FROM JULY 2013 – DECEMBER 2015

Note that when this section was drafted for the 2012 IOAP, it included public program elements that were expected to continue through 2024. Programmatic improvements since 2015 are reflected in Section 3.5 of this chapter.

During the development of the IOAP, the primary focus areas of the public program were related to notifications of overflow events, education and input on Consent Decree response strategies, and building support for the community investments that will be required to achieve the requirements of the Consent Decree. As the IOAP moves from the planning to the implementation stage, the public program will remain a vital part of MSD's response strategy. While the future objectives of the public program will have a slightly different focus, MSD anticipates that the future program will continue many of the practices that have been successful over the past few years.

3.4.1. OBJECTIVES OF THE CONTINUED PUBLIC PROGRAM

The objectives of a public program during the IOAP implementation stage are expected to be as follows:

- Continue the required notifications of overflow events intended to protect public health (NMC 8 and SORP requirements).
- Instill a sense of value, personal ownership, and responsibility for clean stream water:
    - Promote sustained voluntary participation in private-side I/I control and green infrastructure programs to reduce loadings on the sewer system
    - Reinforce the need to reduce water use during rain events
    - Encourage behavior modification to prevent pollution through source control by residential and industrial/commercial customers (NMC 3 and 7)
- Maintain continued support and understanding of the required financial investment.
- Educate children (and teachers) through formal and informal measures to ensure a depth of knowledge of water quality issues, promote the personal use of best practices to reduce sewer overflows, and instill deeply rooted values around water quality, thereby reinforcing the long-term sustainability of voluntary participation.
- Continue support to customers through neighborhood-specific informational needs as sewer system evaluation studies are conducted, construction projects are planned, or as targeted source reduction programs require homeowner participation in plumbing modifications and similar activities.
- Continue the engagement of the WWT Stakeholder Group as described in Section 3.2.2 and 3.3.2.

The following sections describe in more detail how MSD's future public program will address each of these objectives.

3.4.2. PUBLIC NOTIFICATION

MSD will continue public notification to inform the public of potential sewer overflows, the location, and the possible public health and environmental effects of the overflows. The public notification of the potential or actual sewer overflows will continue to advise the public to curtail recreational activities or commercial activities in areas directly or indirectly affected by overflows. Overall, the intent of the ongoing notification is to reduce the public's exposure to potential health risks. A secondary purpose of the public notification is to develop long-term support for overflow abatement programs and personal behavior modifications that can reduce overflows and the resultant interruption of use of the waters.

Notification activities will continue to be both event-based and programmatic. Event notification, for both CSOs and SSOs, will focus on warnings, and delivering information about the potential public health impacts where the overflows occurred. MSD will continue a comprehensive approach to enhancing the public's knowledge and awareness of overflows. This awareness will include why, how, and where overflows occur, as well as solutions and mitigation techniques to abate these overflows.

MSD will continue its public notification efforts implemented to-date including permanent CSO and SSO warning signs, overflow advisory signs, email notification of events, and web page notification. Electronic notification via the MSD website, list-serve e-mail list, and other electronic and print media will continue to broaden the opportunity for notification and awareness.

3.4.2.1. WARNING SIGNS

MSD will continue to maintain approximately 1,200 Overflow Advisory signs along the creeks and the Kentucky side of the Ohio River. Sign locations will be reviewed annually, with signs added or subtracted based on changes in overflow location, land use, stream accessibility, etc.

MSD staff will inspect the installed signs annually. Signs will be repaired, replaced, relocated, or cleaned as appropriate. To aid in the tracking of these signs, an inventory is maintained in MSD's CMMS software.

Overflow Advisory Sign on the Kentucky side of the Ohio River.

3.4.2.2. PROJECT WIN WEBSITE

The Project WIN website is a sub-section of the MSD website, located at www.msdprojectwin.org. MSD's website and the Project WIN website will continue to provide alerts about potential sewer overflows. Other relevant and timely information will continue to be displayed on this Project WIN Home Page.

The Project WIN website will continue to contain the Consent Decree, Public Information and outreach materials, including copies of PowerPoint presentations from IOAP-related public meetings required annual reports to EPA and the State, and quarterly and technical reports under the Final LTCP, CMOM, NMC, and SORP.

The Project WIN website was updated with appropriate copies of correspondence with EPA and KDEP related to proposed project changes that result from "right-sizing" following the evaluation of the effectiveness of green infrastructure and I/I removal programs or updated hydraulic model calibration. A summary of all minor modifications made to the IOAP since the 2012 IOAP Modification is provided in Table 1.1-1 of Volume 1. Correspondence with regulators and other information relative to IOAP changes resulting from previously unforeseen conditions or emerging opportunities will also be posted on the Project WIN website.

MSD will develop performance metrics relative to the participation and effectiveness of green infrastructure and I/I reduction programs in Louisville Metro. These metrics will be trended and publicly displayed, either on the Project WIN website, or on a more broadly-based website that will be linked from the Project WIN site.

3.4.2.3. ELECTRONIC NOTIFICATION

MSD will continue the programmatic approach to public notification including a wide variety of electronic communication forms as documented below.

Website: From MSD's Home Page, the public can access the Project WIN section of the website. Clicking the Project WIN logo brings up the Project WIN site, which includes a link to sign up for overflow advisory emails warning when significant precipitation has caused overflows in MSD's system. Since it is electronic and contains "real time" information, the website is an important component of public notification. The Project WIN website provides important information on the condition of area streams, and shows a warning if overflows are likely to be happening or have happened in the past 48 hours.

Web Page Stoplights and Supplemental Information: Overflow alert messages in the form of screen crawls are maintained on the Project WIN website. The website's Home Page features a simulated traffic light to inform the public of the overflow advisory level as current conditions:

- "Green" for no overflows.
- "Yellow" if a dry weather overflow greater than 1,000 gallons has occurred; and
- "Red" when rainfall occurs and conditions for overflows is likely.

The rain gauge network is utilized to automatically trigger the "red" condition when any rain gauge tributary to the CSO area receives more than 0.1-inches of rain, or any other rain gauge in the county receives more than 0.75 inches of rain.

- The notification alert lights remain on the website for 48 hours after the rainfall or dry weather overflow has ended to reinforce the message that the public should avoid water body contact.
- The screen crawl is located below the notification lights with up-to-date information about weather conditions and alerts about contact with local waterways.

Blending Events Notification: On February 12, 2008, MSD added a notification of blending events at the Jeffersontown WQTC to the Public WIN website. The blending notification is in addition to the overflow alert. This blending notification was active until the Jeffersontown WQTC was decommissioned in 2015.

Jeffersontown WQTC
Blended Flow Data

As of 2/12/08, MSD is providing near real time flow information on blended flow from this plant. Up to 60 days of historical data is presented below. You may also **view all historical data.**

Start Date/Time	End Date/ Time	Amount (Gal.)

E-mail Notifications: The public can voluntarily sign up to receive automatic email alerts about the potential overflows based on wet weather conditions. On the MSD Home Page, customers can register by clicking on the Project WIN E-mail Notification list message.

Press and Public Service Announcements: Project WIN messages will continue to be provided to radio, TV, and other local media for announcements.

2021 IOAP Update: A letter dated December 23, 2015, certified the elimination of the Jeffersontown WQTC. Note that the blending notification for the Jeffersontown WQTC was removed from the Project WIN website after the plant was decommissioned.

3.4.2.4. WRITTEN NOTICES

MSD will continue to utilize many forms of written material as outlined in Section 3.2 to communicate with customers. Briefly, the notices include, but are not limited to, the following:

- Door Hangers
- Direct Mail within 500 ft. of Waterways
- Water Quality Warnings Prior to Onset of Recreational Season
- Brochures
- Newsletters and Other MSD Publications
- Public Meetings
- Media and Newspaper Articles

3.4.3. THE WET WEATHER TEAM

MSD will continue the WWT Stakeholder Group efforts outlined in Section 3.2.2 and 3.3.2.

3.4.4. PROJECT WIN PUBLIC MEETINGS DURING OVERFLOW ABATEMENT PLAN IMPLEMENTATION

MSD will continue to seek public input on specific projects as they move through the design process and for plan updates proposed due to green infrastructure and I/I removal right-sizing initiatives as outlined in Section 3.3.3.

3.4.5. PERSONAL RESPONSIBILITY AND BEHAVIOR MODIFICATION

A public education and outreach program is essential to achieving behavioral changes and create a sustainable overflow abatement program. While MSD understands the value and supports the concept of a broad-based, community-wide environmental education program, the messages essential to implementation of the IOAP are more limited. MSD will continue to reach out to the public about personal behaviors and individual actions and how people impact the results of the overflow abatement program. These messages will continue to focus on private sewers, household and gardening practices, consumer behavior, sustainability, and green infrastructure.

The recommended Gray Infrastructure Program will not eliminate all overflows under all conditions nor will it guarantee that harmful pollutants do not reach the surface waters under some conditions. Behavior changes related to commercial and individual housekeeping (for example, control of FOG, elimination of illegal clear water connections to the sanitary sewers, etc.), gardening, and drainage and consumer practices can maximize

the potential for the sewerage infrastructure to abate overflows. MSD will continue to implement a public outreach program to inform and educate the general public and specific targeted audiences to add value to and ensure optimal results of the (gray) infrastructure program. The IOAP program assumes a high-level of individual actions to reduce I/I, control stormwater volumes through green infrastructure, and reduce pollutant loads on our streams through active pollution prevention implemented at the level of individual homes and businesses.

3.4.5.1. SUSTAINABILITY OF GREEN INFRASTRUCTURE INITIATIVES

Sustainability goes hand-in-hand with green infrastructure; both are focused on a long-term ability to improve our waterways and reduce impacts on the natural environment so that we can maintain a high quality of life. The WWT has focused on participation of individuals and integration of green infrastructure as two essential aspects of the Project WIN program in order to assure that it is sustainable and produces results.

Green infrastructure can make parts of Louisville Metro act more like a sponge and less like a funnel. Green infrastructure includes anything from rain barrels and gardens that capture rain, to rooftops covered by plants that absorb moisture, to new designs for streets and parking lots that direct rain into the ground, to planting more trees and restoring wetlands. The green solutions are especially suited for areas with combined sewers because keeping stormwater from pouring into sewer lines will directly reduce overflows.

MSD will continue to explore reasonable feasible, and cost-effective (as compared to gray infrastructure control) opportunities for green infrastructure, and will work in partnership with the Mayor's office and other regional initiatives such as the Partnership for Green City, to not only create a vision for green infrastructure, but also to make it happen. Louisville Metro Government, JCPS, the University of Louisville, and MSD have recently formed a formal partnership to coordinate planned construction programs and to identify opportunities to better leverage public agency green infrastructure initiatives. MSD will continue its leadership in the Rain Garden Program, the Rain Barrel program, and the tree planting program. It will also continue to work with the Louisville Metro Parks department on riparian buffers and conservation easements.

The message of "*Clean, Green, Growing Community*" will continue to be delivered and demonstrated to the public to support engagement and adoption of the green infrastructure practices and programs. The long-term objective is that green infrastructure will be integrated across Louisville Metro programs and across the population of the region as part of daily life and plans for the future.

3.4.5.2. PARTICIPATION IN PRIVATE I/I INITIATIVES

Inflow/Infiltration (I/I) is the major cause of SSOs. MSD data, along with data collected from other clean water utilities and national reports, all indicate that I/I from private sewers (laterals which connect the private building to the public sewer) cause at least 50 percent of I/I in most collection systems. Therefore, the more success MSD has in the reduction or control of I/I, the smaller the SSO control facilities can be. Successful I/I control also will benefit the community with savings in capital construction, operations, and maintenance (O&M), and reduced disruption in neighborhoods.

MSD's experience with sewer rehabilitation suggests that while public side I/I removal can be effective, maintenance of private sewers and elimination of illicit connections would greatly increase I/I removal effectiveness. Consequently, the WWT Stakeholder Group has encouraged MSD to work with the Louisville Metro Council to adopt a local ordinance to inspect and repair private sewers. Regardless of whether an ordinance is adopted or not, a broad based outreach program that informs and educates the public about MSD's

current *Wastewater and Stormwater Discharge Regulation*s (WDRs) prohibitions of clear water discharges to sanitary sewers will be necessary to ensure that private-side I/I is effectively reduced.

In April 2010, MSD announced a program to provide for the repair or replacement of private sewer laterals as a service and an additional measure of I/I control on single family residential properties. It is anticipated that this program will both tighten up a leaking sewer system, public and private, and potentially provide financial assistance to customers on fixed or lower incomes to replace a sewer line that probably has caused them sewer backups in the past.

3.4.5.3. PRETREATMENT AND POLLUTION PREVENTION

Consistent with NMC 3, MSD administers a comprehensive Industrial Pretreatment program. As part of the continued application of this program, the MSD public program will continue to focus on FOG for both industrial and commercial businesses. FOG control is a mainstream program, and most clean water agencies around the country have a commercial FOG program aimed at commercial bakeries, restaurants and other business that prepare or process food. MSD will continue working with its industrial and commercial customers, with particular attention given to food service establishments, to ensure that they understand their obligations under MSD's Wastewater/Stormwater Discharge Regulations (WDR) and to provide them with the information and technical support needed to prevent FOG-related sewer blockages. MSD will also continue the active residential FOG information program through the continued distribution of brochures ("Fat-Free Sewers") and other items as appropriate at public events where MSD participates.

In the ongoing public program, pollution prevention (NMC 7) will be a prominent component of the program. The difference between the Industrial Pretreatment program and the pollution prevention program is that pretreatment focuses on industrial or commercial establishments and the pollution prevention program focuses on government or personal actions that prevent pollutants from entering the waste stream. Often pollution prevention programs are the same as public outreach or education programs, since preventing the pollutant from entering the waste stream can only be accomplished if the public is aware. Pollution prevention also can be an important component of a Municipal Separate Storm Sewer System (MS4) program. MSD will continue its existing pollution prevention program including the following:

- Cooperation with related activities performed by Louisville Metro such as street sweeping, Operation Brightside litter pick-up programs and other Metro pollution prevention programs activities. MSD will work to maximize the efficiency of those operations and determine the amounts of solids and floatables that are prevented from entering the CSS and the SSS.
- Continued implementation of the Hazardous Materials Ordinance, which requires users with hazardous materials on site to submit a spill prevention and control plan.
- Continued response to spills of hazardous materials and incidents involving discharges to the sewer system and providing spill mitigation kits to the Louisville Metro and Suburban Fire Departments to absorb vehicle fluids rather than flushing to the sewer.
- Continued implementation of the Erosion Prevention and Sediment Control Ordinance.
- Facilitation of annual clean sweep events to remove trash and debris from the waterways in Louisville Metro.
- Improvement and distribution of informational outreach materials that are targeted to inform customers and residents about activities that can be practiced within their homes to assist in the reduction of overflows and/or the reduction of pollutants contributed to the combined or separate systems.

3.4.5.4. SUPPORT FOR SUSTAINED INVESTMENT

The hundreds of millions of dollars of public money needed to implement the overflow abatement program indicate the need for a comprehensive, ongoing public outreach and education program. Since the overall community investment in environmental enhancement extends beyond the boundaries of overflow abatement, MSD anticipates participating in a broad-based, comprehensive program of community-wide environmental education. One objective of an ongoing public outreach program is to ensure understanding and acceptance of the need to control sewer overflows, so that over a long period there continues to be a willingness to pay for the infrastructure (of various types) needed to protect and enhance our environment.

MSD's public outreach program successfully gained the approval of elected officials to enter into debt and raise rates to cover that debt in order to finance Project WIN projects. MSD fully understands that it was not only the WWT team process, but also the public meetings and the public hearing that helped MSD establish the priorities and schedule for the overflow abatement program. Continued participation of the public and a continued public outreach program will be essential throughout the entire Project WIN program in order to continue the support for ongoing rate increases that will be necessary. The ongoing public program will utilize the same media strategy (public meetings. newsletters, website, brochures, bill inserts and press and other electronic media) to continue to tell the story of what, why, where, how, and most importantly the progress, benefits, and results of Project WIN.

3.4.5.5. EDUCATE CHILDREN

To ensure the sustainability of all the programs required for Consent Decree compliance, the active support and participation of all MSD's customers must continue for generations to come. An active program supporting environmental education in our schools can help create good stewards of the environment. MSD understands that the educational objectives of Project WIN are just a piece of a comprehensive program of environmental education that requires the support of a wide range of public agencies and private businesses and interest groups.

MSD has pursued many diverse initiatives in the area of environmental education since the inception of Project WIN. These initiatives include the offer to use MSD facilities as "classrooms" in partnership with individual schools. We have learned that this type of "offering" approach is difficult to sustain, much less expand, as its dependent in large amount on the individual teacher's desires at any particular school at any given time.

In moving forward, MSD intends to pursue strategic partnerships with entities already involved in education of primary and secondary level students to leverage opportunities for ensuring the delivery of information about our environment. MSD's goal will be to support a broad-based comprehensive program to instill in its future customers an understanding of the value of clean stream water, and the role that personal responsibility plays in protecting the rivers and streams of Louisville Metro.

3.4.5.6. NEIGHBORHOOD SPECIFIC INFORMATION NEEDS

In addition to service area wide initiatives, MSD's public program will also support the specific information needs of neighborhoods. Examples of the initiatives that will be implemented on a neighborhood basis are as follows:

- IOAP project-specific meetings conducted during the design phase to get neighborhood input on project constraints, opportunities, and preferences relative to the project.
- "Pardon Our Dust" meetings informing people about upcoming construction projects that may affect their neighborhood.

- Sanitary Sewer Evaluation Study (SSES) program notifications, informing residents about upcoming sewer evaluation projects such as smoke testing, sewer cleaning, and closed-circuit television (CCTV) inspection that may involve partial street closures, access to back-yard manholes, or require specific actions to be taken by homeowners.
- Private property I/I reduction programs that may include voluntary or mandatory inspections of sewer laterals, basement connections, and downspout connections requiring MSD staff or contractors access to private property.
- Green infrastructure focus areas to encourage widespread use of green infrastructure practices such as downspout disconnects, installation of rain barrels and rain gardens, and pervious pavement on driveways and sidewalks in areas of the CSS where the potential for a high level of runoff reduction has been identified and assumed in the sizing of gray control components.

3.4.6. PROGRAM MESSAGES

Consistent messages are an important part of any public program. Consistency provides for repetition and reinforcement of messages, maximizing the opportunities for retention of the message, and for sustainable behavior changes resulting from the public program.

In addition, MSD's intent to make the Project WIN public program a part of an overall community-wide environmental education program, the Project WIN public program is similarly a subset of MSD's overall public program, so the messages of Project WIN must also be consistent with MSD's general program of "*Clean, Green, Growing Community."* Some general principles of the Project WIN messages are as follows:

- Convey positive messages, as often as is feasible.
- Educate and create sense of being part of a WINning team, especially when focused on modification of personal behavior and habits.
- Maintain compliance with the letter and intent of regulatory requirements (that is, do not allow a positive message to "sugar-coat" a tough regulatory requirement to the point that the intent of the regulation is lost).
- Support the Project WIN capital plan and operating initiatives.

Consistent with these general principles, some specific program-wide messages will be used time after time. This program is intended not only to inform the public but also to educate the public about its part in achieving the CWA goals as part of the WINning Team. The program has taken the key messages as developed by the WWT Stakeholder Group and refined them for the ongoing outreach and education to the public as follows.

- **Our Community Values Clean Streams and Rivers** - Our streams and rivers provide an intrinsic value to our community. Clean, healthy, and diverse streams and rivers provide a high quality of life for Louisville Metro.
- **Protecting Public Health is Our Primary Concern** - Project WIN is working to ensure our streams and rivers are healthy and clean. There will be times when one has to be careful about contact with waters. Working together, we can ensure clean waterways for your family's health and enjoyment.
- **Your Investment Is Producing Results** - Recognize the value and results of the investment in clean streams and rivers. Clean waterways are worth the investment.

- **Be Part of a WINning Team** - Focus on personal behavior, each person can make a difference. Participate in our team projects and initiatives. Provide feedback to MSD.

Supplementing these general messages will be a seasonal approach to specific themes. Consistent with the seasonal messages conveyed by MSD during the IOAP development, the calendar year will be divided into four seasons and messages/activities will be targeted to specific audiences that are subsets of the public.

These seasons are:

- The Rainy Season: February through April.
- The Summer Season: May through July.
- The Fall Season: August through October.
- The Holiday Season: November through January.

The activities and public messages are consistent with the season, as described previously in Section 3.2.4.3.

3.4.7. FUTURE APPROACHES AND AVAILABLE MEDIA

MSD recognizes the need for a broad-based, comprehensive program of environmental education for our entire community. This represents a mission far beyond the relatively narrow overflow abatement objectives of Project WIN. MSD supports the concept of an over-arching organization to spearhead and be responsible for the community-wide environmental education program. This program will likely be implemented through an organization already focused on education as its mission, such as the University of Louisville. MSD's early efforts to initiate this program were not successful, so MSD will continue its current Project WIN public outreach and education efforts in cooperation with the University of Louisville, the JCPS, and the Louisville Metro Office of Sustainability, while continuing to encourage a coalition of agencies and programs (including the MS4 program) to both fund and guide the environmental education program.

Since there is no assurance that this over-arching environmental education program will ever be developed, MSD must continue with the more focused Project WIN public program. The Project WIN public program has a wide variety of audiences and a corresponding variety of media approaches to connect with those audiences. The audience for the Project WIN future program will be a comprehensive cross-section of the Louisville Metro region.

In the future, the Project WIN public program will use a variety of tools and media sources to reach out to various groups and deliver the specific messages. Table 3.4-1 shows the wide range of media approaches that MSD anticipates using. Over the course of the program, it is expected that enhancements will be made as the technology improves, as the community environmental education program becomes a reality, and as the effectiveness of the tools is measured.

Table 3.4-1 Media Approaches for Various Audiences

AUDIENCE	PUBLIC MEETING & COMMUNITY EVENTS	WEB PORTAL TO PROJECT WIN INFORMATION	SPEAKER' S BUREAU & TECHNICAL SUPPORT	PRINT ADVERTISEMENT, PRESS RELEASES	PUBLIC TV VIDEO, TV & RADIO PSA	RECOGNITION PROGRAM	TARGETED BROCHURES, PAMPHLETS, FAQS, ETC	REPORTS, NEWSLETTERS & BILLING INSERTS	DEMONSTRATION PROJECTS	DIRECT MAIL & PHONE SURVEYS	EDUCATIONAL PROGRAMS AND CURRICULUM SUPPORT MATERIAL	SIGNAGE AT OVERFLOWS	TOURS, DEMONSTRATIONS, WORKSHOPS
General Public	√	√	√	√	√	√	√	√	√	√		√	√
Homeowners	√	√	√	√	√	√	√	√	√	√		√	√
Targeted Neighborhoods	√		√			√	√		√	√		√	√
Builders		√	√			√	√		√	√			√
Restaurants		√	√			√	√		√	√			√
Schools	√	√	√				√		√		√		√
MSD Employees		√				√	√	√	√				√
Green Infrastructure Partners	√	√	√			√	√		√		√		√

3.4.8. ANNUAL CALENDAR OF EVENTS

The proposed events that are envisioned during Project WIN implementation will be posted on the Project WIN website. MSD's customers will be encouraged to review the website calendar and request or suggest MSD's participation in other community events. The program will be continually evaluated for its effectiveness, and evolve as indicated by changing needs, opportunities, or as technology advances dictate.

3.5. CURRENT AND FUTURE PROGRAM FROM DECEMBER 2015 – DECEMBER 2035

Since 2007, public education and outreach has been an integral part of developing and implementing the IOAP. With ever-changing demographics, technology, and community needs, it has been essential that Louisville MSD adapt this program. Since 2015, this has included expanding MSD's Community Engagement Strategy for significant capital projects, enhancing advertising and marketing strategies, developing social media platform messaging, ramping up earned media opportunities, pursuing additional education programs and partnerships, and overall re-branding to promote safe, clean waterways. MSD has learned that in order to continue seeing progress, this program for public participation and agency interaction must evolve with the community's interests and education. A foundational component of the future program will be one of continuous improvement, striving to ultimately advance customer behavior objectives of the IOAP.

3.5.1. OBJECTIVES OF THE FUTURE PUBLIC PROGRAM

The objectives of a public program during the IOAP implementation stage are expected to be as follows:

- Continue the required notifications of overflow events intended to protect public health (NMC 8 and SORP requirements).
- Instill a sense of value, personal ownership, and responsibility for clean stream water:
    - Promote sustained voluntary participation in private-side I/I control and green infrastructure programs to reduce loadings on the sewer system
    - Reinforce the need to reduce water use during rain events
    - Encourage behavior modification to prevent pollution through source control by residential and industrial/commercial customers (NMC 3 and 7)
- Maintain continued support and understanding of the required financial investment.
- Educate children (and teachers) through formal and informal measures to ensure a depth of knowledge of water quality issues, promote the personal use of best practices to reduce sewer overflows, and instill deeply rooted values around water quality, thereby reinforcing the long-term sustainability of voluntary participation.
- Continue support to customers through neighborhood-specific informational needs as sewer system evaluation studies are conducted, construction projects are planned, or as targeted source reduction programs require homeowner participation in plumbing modifications and similar activities.
- Continue the engagement of the WWT Stakeholder Group as described in Section 3.2.2 and 3.3.2.
- Seek program enhancements based on continuous improvement opportunities.

The following sections describe the communications resources and methods through which MSD's public program uses to address these objectives via notification, education, and outreach.

3.5.2. PUBLIC NOTIFICATION

The core components of MSD's public notification efforts remain consistent with past program efforts, aimed at both making information readily available on the risks associated with coming into contact with sewage overflows and disseminating warnings when overflows occur. These include warning signs at overflow locations, ProjectWIN website information, real-time overflow advisories, and print notifications. The public notification of the potential or actual sewer overflows will continue to advise the public to curtail recreational activities or commercial activities in areas directly or indirectly affected by overflows. Overall, the intent of the ongoing notification is to reduce the public's exposure to potential health risks. A secondary purpose of the public notification is to develop long-term support for overflow abatement programs and personal behavior modifications that can reduce overflows and the resultant interruption of use of the waters.

3.5.2.1. WARNING SIGNS AND DOOR HANGERS

MSD will continue to maintain approximately 1,200 Overflow Advisory signs along the creeks and the Kentucky side of the Ohio River. Sign locations will be reviewed annually, with signs added or subtracted based on changes in overflow location, land use, stream accessibility, etc.

MSD staff will inspect the installed signs annually. Signs will be repaired, replaced, relocated, or cleaned as appropriate. To aid in the tracking of these signs, an inventory is maintained in MSD's CMMS software.

In addition to maintaining permanent overflow warning signage, overflow response crews distribute doorhangers with advisory language to affected residences and businesses as described in MSD's SORP.

Overflow Advisory Sign on the Kentucky side of the Ohio River.

3.5.2.2. ELECTRONIC NOTIFICATION

MSD's programmatic approach continues to employ electronic communication forms to notify the public of overflow events when they occur:

- The longstanding Louisville Metro e-mail system is still used to notify customers who have signed up to receive overflow alerts. The public can voluntarily sign up to receive automatic email alerts about potential overflows based on wet weather conditions through a link on the Project WIN website.
- Overflow advisory alerts are prominently displayed on MSD's main webpage as well as Project WIN, indicating exposure risks for current conditions along with supplemental information.
    - Real-time warnings are displayed for potential overflows that are happening or are likely to have occurred within the last 48-hours
    - Color-coded conditional indicator is displayed as green when there are no overflows, yellow if a dry weather overflow greater than 1,000 gallons has occurred, and red during wet weather conditions when overflows are likely
    - The rain gauge network is utilized to automatically trigger the "red" condition when any rain gauge tributary to the CSO area receives more than 0.1-inches of rain, or any other rain gauge in the county receives more than 0.75 inches of rain. As LTCP and SSDP projects are implemented, there will be an opportunity to review and revise these thresholds to reflect overflow abatement improvements.
- Rain gauge network data is also available via Project WIN or MSD's main webpage for customers to access rainfall amounts specific to their local area.

3.5.3. PUBLIC EDUCATION AND OUTREACH

Public education will continue to be a key program component for realizing the shared responsibility for reducing sewer overflows within the community. This includes reaching customers through a variety of media as well as classroom and community education and event opportunities.

One example of a successful educational partnership within the community has been the Waterway Protection Tunnel exhibit at the Louisville Science Center (see Figure 3.5-1) as the tunnel boring machine, nicknamed "Bumblebee" progressed on its 4-mile journey from downtown to the intersection of Grinstead Drive and Lexington Road. Partnerships such as this as well as pursuing earned media opportunities create memorable connections and positive educational experiences related to the value of protecting local waterways.

Figure 3.5-1 Example of MSD's Public Education and Outreach Program

3.5.3.1. MEDIA AND ADVERTISING

In an effort to maximize exposure to Project WIN and overflow abatement communications, MSD adapted its Project WIN advertising and marketing strategy in 2019 to use more online and digital content. This new approach kept some of the traditional print advertising and combined them with digital elements to reach a larger and more diverse audience. Strategically enhancing types, technologies, and platforms associated with MSD's advertising and marketing outlets was estimated to triple the education and informational messaging exposure opportunities within the community.

The suite of media and advertising methods utilized during this period have included:

- Outreach letters to residents in areas that have FOG issues
- Project WIN information packets and brochures
- Direct Mail to residents that live within 500 ft. of Beargrass Creek and the Ohio River

- Water Quality Warnings Prior to Onset of Recreational Season
- Newsletters and Other MSD Publications
- Television, radio, digital, and print articles
- Social media
- Earned media

3.5.3.2. CLASSROOM AND COMMUNITY EDUCATION AND EVENTS

Since many environmental solutions involve collective behavior-change at a community-level, some of the most powerful opportunities for widespread, sustainable benefits are through academic-based partnerships. MSD seeks and sustains partnerships with schools, non-profits, and professional organizations to promote our mission of safe, clean waterways. Working with educators in the classroom, hosting workshops for targeted audiences, offering tours, organizing volunteer activities, and promoting water quality best-practices at local events are a few of the ways that MSD has utilized tools and resources to educate the community. The range of topics covered through the 2021 program year have included:

- Green infrastructure
- Sewer overflow prevention
- Critical Repair and Reinvestment Plan messages, including the need to address aging infrastructure
- Stream cleanup
- Shared benefits of fostering good water quality
- Limiting household water use during rain events
- What not to flush and why

Educational materials on these topics are readily available for through the education links on MSD's main webpage and Project WIN.

3.5.3.3. PUBLIC OUTREACH

Public outreach compliments the public education components of Project WIN by engaging and seeking input from community stakeholders in order to successfully implement significant capital projects. MSD developed this community engagement strategy to bolster its existing public meeting approach, when appropriate, for IOAP projects:

Information Gathering

Information from a cross-section of key partners is a valuable resource as projects advance. The intent of this objective is to reach out to key stakeholders first as an initial step. It can allow these partners to express proactive feedback on potential topics, provide a support role during the public engagement period, or distribute meeting information to their networks, as appropriate. Stakeholders may include Louisville Metro government agencies, metro council representatives, and neighborhood partners.

Public Meetings

Figure 3.5-2 illustrates public meeting opportunities as projects advance through design. They generally range from project orientation, conceptual design, advanced design, and construction information (Pardon Our Dust). These four phases are a guide and can be adapted according to available project information, stakeholders, and delivery method. For recent significant capital projects, MSD has paired this method with structured public input surveys that have shown success in engaging audiences and distilling feedback in a meaningful way. Survey responses are anonymous, and questions can be tailored to address topics of relevance for each project.

Stakeholder Follow-up

Customer follow-up builds trust and presents an opportunity to share relevant information. This aspect of MSD's public meeting approach has included responding questions as well as making meeting information available on the Project WIN website and (if video is available,) through Metro TV. Posting available meeting materials (like presentations, surveys, videos, contact information, etc.) on Project WIN also promotes connectivity and transparency for community members who aren't available to attend public meetings.

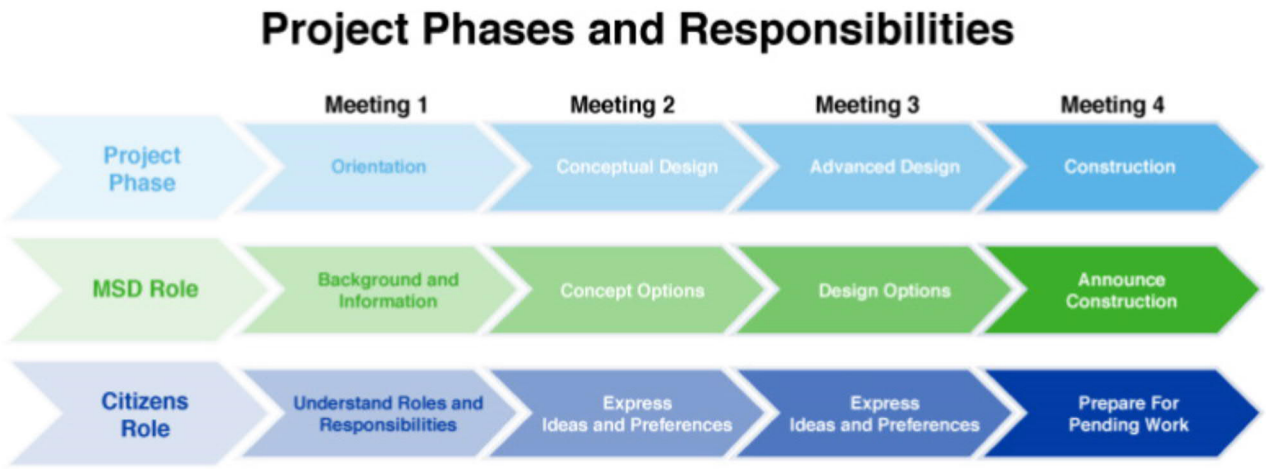

Figure 3.5-2 Conceptual Public Education Graphic

3.5.4. PROJECT WIN WEBSITE

The Project WIN website (**www.msdprojectwin.org**) continues to serve as a central repository for information across the notification, education, and outreach components of the public program. In 2020, MSD's Project WIN website was updated to provide for a more user-friendly experience while maintaining key content. Community members may use it to seek ways they can support program efforts, find project information, read the latest agency reports, understand program history, access the calendar of events, or view public input materials. or view public input materials.

MSD's green program website (**https://louisvillemsd.org/Green**) supports Project WIN messaging by promoting green installations that reduce stormwater runoff to commercial and residential customers.

3.5.5. THE WET WEATHER TEAM

MSD will continue the WWT Stakeholder Group efforts outlined in Section 3.3.2. The longstanding commitment of several of the WWT stakeholders who have served their community since the group was chartered during

IOAP development activities in 2005 is absolutely commendable. To sustain the group's diverse representation as a cross-section of the community, new members have been invited as others have stepped down. This group has continued to engage approximately two times per year through the IOAP implementation.

3.5.6. PROGRAM MESSAGES

3.5.6.1. MSD REBRANDING – SAFE, CLEAN WATERWAYS

MSD underwent an extensive rebranding campaign in 2015, which was further enhanced in 2019. Building on the general Project WIN principles described in Section 3.4.6, MSD's vision, mission, and organizational values are described below:

Our Vision

The innovative regional utility for safe, clean waterways

Our Mission

Provide quality wastewater, stormwater, and flood protection services to protect public health and safety through sustainable solutions, fiscal stewardship, and strategic partnerships

MSD Guiding Principles and Organizational Values

- **Investing in People** - Ensuring a sustainable future by aligning organizational architecture and enhancing leadership development, succession planning, generational inclusion and employee career planning programs that provide staff opportunity for advancement and utilize the right people in the right places to achieve greater operational excellence for the community.
- **Respect** - We demonstrate high regard, value and consideration for each other, our customers, and the community.
- **Customer Focus** - We provide value-added service to our internal and external customers
- **Focusing on Performance** - Enhancing quality of life in the region by providing safe, clean waterways through consistent, reliable, and transparent delivery of our core business functions through teamwork, innovation, superior internal and external customer service.
- **Excellence -** We strive for personal excellence, recognize exemplary performance, and seek continuous improvement.
- **Integrity -** We serve with high ethical standards, deliver on commitments, and maintain honesty as we advance the greater good.
- **Innovating through Leadership** - Engaging in collaborative problem-solving with partners locally, regionally, and nationally to develop innovative solutions for managing our aging wastewater, storm water and flood protection assets.
- **Accountability -** We account for our actions, address challenges promptly, and implement effective solutions.
- **Stewardship -** We manage the infrastructure, environment and resources entrusted to our care in a responsible and sustainable manner.

3.5.6.2. PROJECT WIN GENERAL PRINCIPLES AND MESSAGES

Consistent messages are an important part of any public program. Consistency provides for repetition and reinforcement of messages, maximizing the opportunities for retention of the message, and for sustainable behavior changes resulting from the public program. To that end, Project WIN has been integrated as a subset of MSD's overall community engagement program, and "safe, clean waterways" messaging. The Project WIN general principles, established in 2009 still hold true for current public participation program elements:

- Convey positive messages, as often as is feasible.
- Educate and create sense of being part of a WINning team, especially when focused on modification of personal behavior and habits.
- Maintain compliance with the letter and intent of regulatory requirements (that is, do not allow a positive message to "sugar-coat" a tough regulatory requirement to the point that the intent of the regulation is lost).
- Support the Project WIN capital plan and operating initiatives.

Consistent with these general principles, some specific program-wide messages will be used time after time. This program is intended not only to inform the public but also to educate the public about its part in achieving the CWA goals as part of the WINning Team. The program has taken the key messages as developed by the WWT Stakeholder Group and refined them for the ongoing outreach and education to the public as follows.

- **Our Community Values Clean Streams and Rivers** - Our streams and rivers provide an intrinsic value to our community. Clean, healthy, and diverse streams and rivers provide a high quality of life for Louisville Metro.
- **Protecting Public Health is Our Primary Concern** - Project WIN is working to ensure our streams and rivers are healthy and clean. There will be times when one has to be careful about contact with waters. Working together, we can ensure clean waterways for your family's health and enjoyment.
- **Your Investment Is Producing Results** - Recognize the value and results of the investment in clean streams and rivers. Clean waterways are worth the investment.
- **Be Part of a WINning Team** - Focus on personal behavior, each person can make a difference. Participate in our team projects and initiatives. Provide feedback to MSD.

Supplementing these general messages will be a seasonal approach to specific themes. Consistent with the seasonal messages conveyed by MSD during the IOAP development, the calendar year will be divided into four seasons and messages/activities will be targeted to specific audiences that are subsets of the public.

These seasons are:

- The Rainy Season: February through April.
- The Summer Season: May through July.
- The Fall Season: August through October.
- The Holiday Season: November through January.

The activities and public messages are consistent with the season, as described previously in Section 3.2.4.3.

3.6. REPORTING AND AGENCY MEETINGS

During the development of the overflow abatement plans, there was frequent and scheduled regulatory agency interaction designed to facilitate open communication between MSD and the regulators regarding the progress of Project WIN and the compliance with the Consent Decree requirements. It is anticipated that future meetings will be scheduled as needed. MSD underwent an extensive rebranding campaign in 2015, which was further enhanced in 2019. Building on the general Project WIN principles described in Section 3.4.6, MSD's vision, mission, and organizational values are described below:

Our Vision

The innovative regional utility for safe, clean waterways

Our Mission

Provide quality wastewater, stormwater, and flood protection services to protect public health and safety through sustainable solutions, fiscal stewardship, and strategic partnerships

MSD Guiding Principles and Organizational Values

- **Investing in People** - Ensuring a sustainable future by aligning organizational architecture and enhancing leadership development, succession planning, generational inclusion and employee career planning programs that provide staff opportunity for advancement and utilize the right people in the right places to achieve greater operational excellence for the community.
- **Respect** - We demonstrate high regard, value and consideration for each other, our customers, and the community.
- **Customer Focus** - We provide value-added service to our internal and external customers
- **Focusing on Performance** - Enhancing quality of life in the region by providing safe, clean waterways through consistent, reliable, and transparent delivery of our core business functions through teamwork, innovation, superior internal and external customer service.
- **Excellence -** We strive for personal excellence, recognize exemplary performance, and seek continuous improvement.
- **Integrity -** We serve with high ethical standards, deliver on commitments, and maintain honesty as we advance the greater good.
- **Innovating through Leadership** - Engaging in collaborative problem-solving with partners locally, regionally, and nationally to develop innovative solutions for managing our aging wastewater, storm water and flood protection assets.
- **Accountability -** We account for our actions, address challenges promptly, and implement effective solutions.

Stewardship - We manage the infrastructure, environment and resources entrusted to our care in a responsible and sustainable manner

3.6.2. REGULATORY REPORTING

Consistent with the requirements of the 2009 Consent Decree, MSD prepared regular reports for the State of Kentucky and EPA Region 4. Thus far, MSD has prepared fifteen annual reports for Fiscal Years (FYs) 2006 through 2020; and quarterly reports for the State and EPA. These reports are available on the MSD website in the Project WIN Library.

Reports to date have been prepared for each of the four quarters of the calendar year: January through March; April through June; July through September; and October through December. Reports were submitted to EPA and the KDEP within 30 days of the end of each quarter. The reports included specific information about activities consistent with the requirements of the Consent Decree, including the progress on the Early Action Projects and the progress toward the development of the overflow abatement plans, which include the Final LTCP and the Final SSDP. These reports are available on the Project WIN Public Document Repository and will be for the duration of the Consent Decree.

Per the terms discussed associated with the 2021 ACD, the reporting frequency will be adjusted to semiannually. A Mid-Year Status Report of July through December program information will be submitted by February 28th of each year with the Annual Report of July through June fiscal year program information submitted by September 30th of each year.

3.6.3. MEETINGS WITH STATE AND FEDERAL CONSENT DECREE PARTNERS

In addition, regulatory reports, MSD has initiated periodic face-to-face meetings with technical team members from the KDEP and EPA to discuss the progress of the Project WIN overflow abatement program. Since 2008, these specific meetings of the technical team took place:

- February 25, 2008, in Southern KY with EPA Region 4 and the KDEP staff.
- April 16, 2008, in Louisville Metro with the EPA Region 4 and KDEP staff.
- June 12, 2008, in Louisville Metro with KDEP staff.
- February 11, 2009, in Louisville Metro with and KDEP staff.
- May 10, 2011, in Louisville Metro with and KDEP staff.
- February 17, 2012, in Atlanta with EPA Region 4 staff and KDEP staff by telephone.
- July 25, 2012, in Louisville Metro with and KDEP staff.
- November 28, 2012, in Louisville Metro with EPA Region 4 and KDEP staff.
- May 14, 2015, in Atlanta with EPA Region 4 and KDEP staff by telephone.
- May 7-10, 2019, in Louisville Metro with EPA Region 4 and KDEP staff.
- July 23, 2019, in Atlanta with EPA Region 4 and KDEP staff by telephone.

Regular meetings with the regulatory agencies facilitate communication and understanding of the priorities and requirements of the overflow abatement program and coordination between agencies. A copy of the agendas from the meetings held since 2012 are included in Appendix 3.6.1.

Appendix 3.6.1 Regulatory Meeting Agendas
This is a new appendix added for the 2021 IOAP and is provided on an external USB drive.

3.6.4. CONFERENCE CALLS

Conference calls were initially scheduled on a bi-weekly basis between technical staff from MSD, EPA, and KDEP. These calls ensured regular communication about the progress of both the technical analysis and the public program overflow aspects of abatement plans. In addition to reporting on the progress of the plans, MSD answered questions posed by KDEP and EPA. The conference calls encourage partnerships and open communication to ensure common goals and perspectives and to reach success. Additionally, the process is more efficient with no surprises for both parties. A scheduled appointment also clears up confusion about monthly or quarterly reports. Over the period of development of the overflow abatement plans, all parties have felt free to informally reach out to each other via e-mails and phone calls to ask questions and clarify technical issues. These calls continue to occur on a monthly basis and focus on program implementation challenges, project-specific concerns and follow-up to Consent Decree reporting.

3.7. MEASURING EFFECTIVENESS

Because there are a multitude of factors affecting personal behavior changes across our community, the most meaningful measures of success for the public participation program are likely to be demonstrated by incremental increases in customer reach for key messages. Project WIN communications strategies that increase awareness through consistent and targeted messaging as well as evolving the program based on how users prefer to consume media will offer enhancements to an already robust IOAP.

MSD has had the opportunity to track the fluctuation of many of these public program elements through a customer awareness survey conducted biannually. The intent of this survey has been to gauge public attitudes towards clean waterways, awareness and knowledge of key water pollution issues, and public willingness to change behaviors. The results are used to inform outreach and communications strategies for improved effectiveness. 2019 marked the sixth recurring Project WIN survey.

Because of the shared community responsibility for safe, clean waterways, public notification, education, and outreach are inherent to implementing the IOAP. Volume 1, Chapters 5 and 6 discuss the presumption approach and post-construction compliance methodology outlined in this 2021 IOAP.

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APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 4

METROPOLITAN SEWER DISTRICT

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Note: Appendices shown in italic text were not revised for the 2021 IOAP and remain the same as the 2012 IOAP Modification. All appendices have been provided on a separate USB flash drive and are not included in this report.

Chapter 4: INTEGRATED OVERFLOW ABATEMENT PROGRAM

Special Note – 2021 IOAP Modification: This chapter was developed in 2009. The statistical data for the CSO's reported, specifically related to individual CSO overflow volumes and frequency in a typical rainfall year, were derived from the CSS model calibrated in 2007. Since then, a more detailed calibration and validation effort has adjusted the average annual overflow volumes and frequencies in the Typical Year. Updated information is provided in Volume 2. The vast majority of the physical system characterization in this chapter is still accurate. The Volume 1, Chapter 4 appendices remain the same as those provided with the 2012 IOAP. A new Appendix 4.5.1 was added in 2021 for MSD's Plumbing Modification and Sump Pump Disconnection, Downspout Disconnection, and Sewer Line Replacement Packet Information. This appendix was previously included in Volume 3, Chapter 2. Information regarding the Plumbing Modification Program has been consolidated into this Chapter.

4.1. DISCHARGE ABATEMENT PROGRAMS

As discussed in Chapter 2 of this volume, the Integrated Overflow Abatement Program (IOAP) is an integration of the Final Sanitary Sewer Discharge Plan (SSDP) and the Final Long-Term Control Plan (LTCP), both of which are requirements of the Consent Decree. The Consent Decree required that Louisville and Jefferson County Metropolitan Sewer District (MSD) submit reports detailing prerequisite, or precursor programs also intended to abate and mitigate overflows. The updated Sanitary Sewer Overflow Plan (SSOP) and the Interim SSDP both address the sanitary sewer system (SSS) programs. The Interim LTCP addresses the combined sewer system (CSS). In addition to these programs, the Early Action Plan (EAP) reported on activities related to the entire sewer system. The following is a brief overview of these precursor programs.

4.1.1. UPDATED SANITARY SEWER OVERFLOW PLAN

MSD has focused collection system repair and rehabilitation efforts on wet weather infiltration and inflow (I/I) issues that contribute to SSOs. The projects have been successful in reducing sanitary sewer overflow (SSO) volume and frequencies but have not completely eliminated overflows. The Updated SSOP was MSD's centralized program for managing the investigation, prioritization, and rehabilitation of the SSS. The program goals were to reduce SSOs, basement backups, and other unauthorized discharges. The Updated SSOP was submitted on February 10, 2006 to the U.S. Environmental Protection Agency (EPA) and Kentucky Department of Environmental Protection (KDEP), however, no review or approval was required by the Consent Decree.

The Updated SSOP-related studies included flow monitoring; Sanitary Sewer Evaluation Studies (SSES); hydraulic modeling; rehabilitation, repair, or replacement projects; and post-rehabilitation flow monitoring. Since 1997, 32 projects costing nearly $16.5 million and impacting 2.5 million feet of sewers have been completed and documented within the Updated SSOP. This included more than $9 million focused on rehabilitation projects. The Updated SSOP document serves as the obvious foundation for the Final SSDP by providing both data for evaluating current conditions and experience in adopting preferred solutions.

4.1.2. INTERIM SANITARY SEWER DISCHARGE PLAN

On September 28, 2007, MSD submitted to the EPA and KDEP the Interim SSDP identifying remedial measures for specific unauthorized discharges (specified in Paragraph 25(a) (2) of the Consent Decree) in the SSS. Comments were received on January 8, 2008, and the Interim SSDP was resubmitted on March 7, 2008. Approval of the Interim SSDP was received July 24, 2008. The approved Interim SSDP can be downloaded from the "Library" section of the Project WIN website at: **http://msdprojectwin.org/**.

The Interim SSDP identified all corrective measures necessary for remediation of the unauthorized discharges of the five Beechwood Village pumped SSO locations and Southeastern Diversion Structure by December 31, 2011; and for the five Hikes Point pumped SSO locations and the Highgate Springs Pump Station by December 31, 2013. The estimated capital cost to implement the Interim SSDP was approximately $200 million.

4.1.3. INTERIM LONG-TERM CONTROL PLAN

In accordance with the Consent Decree, the Interim LTCP addressed discharges from CSO locations identified by the Kentucky Pollutant Discharge Elimination System (KPDES) for the Morris Forman Water Quality Treatment Center (WQTC). The Interim LTCP was a modification of the preceding 1996 and 1997 Draft LTCP. As such, the Interim LTCP included summaries of notable work completed as components of those documents. The Interim LTCP can be downloaded from the Project WIN website at: http://msdprojectwin.org.

4.1.4. EARLY ACTION PLAN

The Consent Decree required MSD to implement an EAP comprised of programs that were implemented immediately without significant engineering and design components. The EAP included projects that were in the process of being implemented when the Consent Decree was issued. The purpose of the EAP was the immediate reduction of overflow events through improved operation and control of MSD's collection, conveyance, and treatment system. MSD's interaction with government agencies, customers, and internal communications were included as a part of the improvement process.

Outlined in this section are the following four required components of the EAP:

- Nine Minimum Controls (NMC) Compliance Report
- Capital Improvement Projects already underway when the Consent Decree was issued
- Capacity, Management, Operations, and Maintenance (CMOM) Self-Assessment Report
- Sewer Overflow Response Protocol (SORP)

4.1.4.1. NINE MINIMUM CONTROLS

The NMCs are technology-based actions or measures designed to reduce the number of CSO events and to mitigate the effects on water quality. Implementing the NMCs is among the first steps in a CSO control policy because by definition they do not require significant engineering studies or major construction, and typically require less than 2 years to implement.

In 1997, MSD prepared and submitted to the KDEP a NMC Compliance Report, which summarized NMC activities completed to-date, showing compliance with EPA's CSO Control Policy. Since 1997, MSD has continued to implement the NMC program and has prepared regular updates to the original Combined Sewer Operational Plan. In June of 2003, MSD prepared the NMC Compliance Report Update, which summarized the continuation of implementation of NMC activities from January 1997 through June 2003.

As required by paragraph 24(a) of the Consent Decree, MSD submitted an updated NMC Compliance Report to the EPA and the KDEP on February 10, 2006 and received comments from the EPA and KDEP on May 5, 2006. MSD submitted a revised report to the EPA and KDEP on June 3, 2006 and received a letter of disapproval on August 22, 2006. A second revision of the updated NMC Compliance Report was subsequently submitted to the EPA and KDEP on September 15, 2006. MSD received an approval letter dated February 22, 2007, for the updated NMC Compliance Report. The approved NMC Compliance document can be viewed at http://msdprojectwin.org.

4.1.4.2. CAPITAL IMPROVEMENT PROJECTS

Paragraph 24(b) of the Consent Decree required the implementation of specific projects to be completed and/or initiated prior to the implementation of the Final LTCP and Final SSDP. Capital Improvement Projects were classified into five types: SSO projects, backup power generator installations, solids and floatables control device installations, sewer separations, and the real time control (RTC) system. The following sections outline each of the five project types.

4.1.4.2.1. SSO PROJECTS

Paragraph 24(b)(1) of the Consent Decree required the implementation of specific SSO projects. The SSO projects completed prior to August 12, 2005, are included in **Error! Reference source not found.**. Those projects, as a group, were certified as complete on September 9, 2005, through a separate transmittal to the KDEP and EPA. Projects completed after August 12, 2005, are discussed in the following text. Refer to Volume 3, Chapter 4 for SSO projects that have been completed subsequent to the EAP.

Table 4.1-1 Early Action Plan SSO Projects

SSO LOCATION	WTP SERVICE AREA	ABATEMENT DATE		CERTIFIED COMPLETION DATE
		QUARTER	YEAR	
7204 Preston Hwy	West County WQTC	1	2002	September 9, 2005
West Goose Creek Pump Station	Morris Forman WQTC	3	2002	September 9, 2005
Park Ridge Woods Pump Station	West County WQTC	4	2002	September 9, 2005
Vagabond and Siesta	West County WQTC	2	2002	September 9, 2005
Melody Pump Station	Morris Forman WQTC	1	2003	September 9, 2005
Cedar Creek WQTC	Cedar Creek WQTC	1	2003	September 9, 2005
12700 Abbey Lane	West County WQTC	2	2003	September 9, 2005
Fairway View Pump Station	Hunting Creek South WQTC	2	2003	September 9, 2005

Table 4.1-1 Early Action Plan SSO Projects

SSO LOCATION	WTP SERVICE AREA	ABATEMENT DATE		CERTIFIED COMPLETION DATE
		QUARTER	YEAR	
Old Copper Pump Station	Floyds Fork WQTC	1	2004	September 9, 2005
Running Creek WQTC	Running Creek WQTC	1	2004	September 9, 2005
Savage Drive Pump Station	West County WQTC	1	2004	September 9, 2005
Woodland Hills Pump Station	Morris Forman WQTC and Floyds Fork WQTC	2	2004	September 9, 2005
English Station WQTC	English Station WQTC	2	2004	September 9, 2005
Jarvis Lane Pump Station	Morris Forman WQTC	2	2005	September 9, 2005
Hurstbourne Lane Pump Station	Morris Forman WQTC	2	2005	September 9, 2005
Hite Creek WQTC	Hite Creek WQTC	4	2005	January 30, 2006
Shelbyville and Marshall	Morris Forman WQTC	4	2005	January 30, 2006
Canoe Lane Pump Station	Morris Forman WQTC	2	2006	July 28, 2006
Gunpowder Pump Station	Hunting Creek North WQTC	2	2006	July 28, 2006

Please refer to MSD's Quarterly and Annual Reports for projects completed since December 2008. The reports can be found in the Library section of the Project WIN website at **www.msdprojectWIN.org**.

4.1.4.2.2. BACKUP POWER GENERATOR INSTALLATIONS

Paragraph 24(b)(2) of the Consent Decree required the installation of backup power at two specific facilities of the CSS. Table 4.1-2 lists these projects and the dates they were certified as complete.

Table 4.1-2 Early Action Plan Backup Generator Projects

PROJECT LOCATION	COMPLETION DATE		CERTIFIED COMPLETION DATE
	QUARTER	YEAR	
34th Street Pump Station	1	2006	April 30, 2006
Starkey Pump Station	2	2006	July 28, 2006

In addition to the backup generators specifically required by the Consent Decree, MSD has been actively adding to the fleet of mobile generators and has added fixed generators to eight additional pump stations. These standby generators were identified in the CMOM Self-Assessment Report discussed in Section 4.1.4.3.

MSD has continued to systematically increase the number of fixed generators located throughout its service area. Through December 2020, MSD has 94 fixed generators at pump stations and 29 fixed generators serving WQTCs and RTC structures.

4.1.4.2.3. SOLIDS AND FLOATABLES CONTROL DEVICE INSTALLATIONS

Paragraph 24(b)(3) of the Consent Decree required the installation of solids and floatables (S&F) control devices at 15 specific CSO locations. Table 4.1-3 provides a listing of the S&F control projects and the date they were certified as complete.

Table 4.1-3 Early Action Plan Solids and Floatables Control Projects

CSO LOCATION (ID #)	COMPLETION DATE		CERTIFIED COMPLETION DATE
	QUARTER	YEAR	
109	4	2004	September 9, 2005
113	4	2004	September 9, 2005
125	4	2004	September 9, 2005
126	4	2004	September 9, 2005
127	4	2004	September 9, 2005
144	4	2004	September 9, 2005
166	4	2004	September 9, 2005
28	1	2005	September 9, 2005
30	1	2005	September 9, 2005
34	1	2005	September 9, 2005
54	1	2005	September 9, 2005
119	1	2005	September 9, 2005
83	2	2005	September 9, 2005
121	2	2005	September 9, 2005
82	3	2005	September 9, 2005

4.1.4.2.4. SEWER SEPARATIONS

Paragraph 24(b)(4) of the Consent Decree required elimination of three specific CSO locations through the implementation of sewer separation projects. Table 4.1-4 provides a listing of the sewer separation projects and the dates they were certified as complete.

Table 4.1-4 Early Action Plan Sewer Separation Projects

CSO LOCATION (ID #)	COMPLETION DATE		CERTIFIED COMPLETION DATE
	QUARTER	YEAR	
209	3	2005	October 28, 2005
87	3	2006	October 7, 2006
147	3	2007	October, 2006

4.1.4.2.5. REAL TIME CONTROL (RTC) SYSTEM

As required by paragraph 24(b)(5) of the Consent Decree, MSD implemented the initial phase of a fully operational RTC System. The estimated reduction of the CSS's average annual overflow volume (AAOV) due to the initial phase was required to be at least 10 percent. Testing and verification of the RTC system was completed on August 12, 2006, confirming that the ten percent reduction was achieved, and the system was placed into operation in accordance with the Consent Decree.

The RTC software has been configured and installed at the Computer Room at Morris Forman WQTC. Additionally, system modifications were completed at the Southeastern Diversion Structure, Nightingale Pump Station, Southwestern Pump Station Sluice Gate Chamber, Sneads Branch In-line Storage site, and the Upper Dry Run Trunk System storage basins (Brady Lake and Executive Inn). The initial phase of the RTC System was certified as complete on September 11, 2006. MSD continues to report on the status of the RTC and system storage projects in its annual Consent Decree reports.

4.1.4.3. CAPACITY MAINTENANCE, OPERATIONS, AND MANAGEMENT SELF-ASSESSMENT

According to the EPA, the purpose of the CMOM Program is to:

> "*Incorporate many of the standard operation and maintenance activities that are routinely implemented by the owner or operator with a new set of information management requirements in order to better manage, operate, and maintain collection systems, Investigate capacity constrained areas of the collection system, proactively prevent SSOs and respond to SSO events.*"

Like many sewer districts, MSD has used techniques outlined in CMOM to audit its system. In 2003, MSD initiated a *CMOM Challenge Analysis* as the first step in a comprehensive Self-Audit Program. The CMOM Self-Assessment Report was originally submitted to the EPA on February 10, 2006, re-submitted on May 12, 2006, and approved on August 22, 2006. The approved report can be downloaded from MSD's Project WIN website at: http://msdprojectwin.org.

The self-assessment process identifies the many activities that were performing well. It also identifies six program areas and activities that would benefit from improvement, namely:

- Continuous Sewer System Assessment
- Infrastructure Rehabilitation
- System Capacity Assurance Plan
- Pump Station Preventive Maintenance Program
- Gravity Line Preventive Maintenance Program
- Sewer Use Ordinance Legal Support Program

MSD has implemented improvements to all these programs, in accordance with the schedule in the approved CMOM Self-Assessment Report. MSD continues to expand and improve the CMOM program, and reports to KDEP and EPA on CMOM activities in the Consent Decree progress reports. One element of the CMOM program that directly impacts overflow abatement activities is the System Capacity Assurance Plan (SCAP).

System Capacity Assurance Plan (SCAP)

The objective of the SCAP is to enable MSD to authorize new sewer service connections or increases in flow from existing sewer service connections while making system improvements in accordance with the May 2006 CMOM Self-Assessment Report recommendations. The SCAP applies to the SSS only and works hand-in-hand with the Final SSDP to support MSD's efforts for overflow abatement. The SCAP is the basis for coordinating capacity decision criteria for each sewershed within the SSS. Providing wastewater collection, conveyance, and treatment that will meet the expansion needs of MSD's customers, while protecting the environment and meeting regulatory requirements, are top priorities of MSD's facility improvement efforts.

New service connections will contribute additional flow that utilizes available capacity in the system. Since capacity deficiencies have been identified as the cause for a significant portion of wet weather SSOs, it is important that MSD's SCAP can provide that new flow connections do not cause or contribute to SSOs.

The SCAP is a document that is intended to change and evolve due to various components including modeling improvements, map updates, process improvements, reporting automation, capital improvement projects, capacity requests, and other CMOM and MSD programs. The 2012 IOAP submittal referenced the SCAP that was dated February 28, 2008. MSD submitted a revised SCAP dated November 2014 to EPA and KDEP on December 9, 2014. MSD received a letter approving that plan and acknowledging the November 2014 document superseded the 2008 SCAP on February 5, 2015. on February 5, 2015 A copy of the 2014 SCAP is included in Appendix 4.1.1. The 2008 SCAP can be downloaded from MSD's Project WIN website at: http://msdprojectwin.org.

Appendix 4.1.1 2014 System Capacity Assurance Plan (SCAP)

This appendix has been updated from the 2012 IOAP and is provided on an external USB drive.

4.1.4.4. SEWER OVERFLOW RESPONSE PROTOCOL (SORP)

Paragraph 24(d) of the Consent Decree required MSD to include an updated SORP as a component of the EAP. MSD submitted an updated and enhanced SORP to the EPA and KDEP on May 12, 2006, and received a letter approving that plan on August 22, 2006. The SORP is reviewed annually and revised if needed. Revisions to the SORP since 2012 are noted below.

- 2016: Revised SORP approved submitted to EPA and KDEP on August 22, 2016. Document approved on July 21, 2017 and a revised Appendix C was approved on August 22, 2017. Revisions primarily involved removing eliminated facilities, updating map of current documented and suspected SSO locations, and organizational changes.
- 2020: No major revisions requiring a revised SORP were needed in 2020. However, the document was rebuilt into a new format to reflect current software configuration and provided to EPA and KDEP on August 22, 2020.

The current approved SORP document and historical versions can be viewed and downloaded from the MSD Project WIN website at: http://msdprojectwin.org.

The purpose of the SORP is to provide guidance to MSD personnel regarding response to overflows, mitigation of the overflow's impact, public notification, and reporting of the overflow. Utilizing a SORP enables MSD to respond to overflows in a consistent and effective manner and reduces an overflow's impact on the environment and human health.

The SORP provides guidance for the following:

- **Overflow Response Protocol** - detailing the steps taken once MSD is alerted of a potential overflow event.
- **Initial Response and Mitigation** - detailing the steps taken by MSD once an overflow initiates in publicly owned systems, such as filtration, flow diversion, portable generators, pump and haul activities, containment, diversion, and other corrective actions.
- **Cleanup** - detailing the steps taken by MSD once an overflow ceases to clean up the site, minimizing public health and environmental risks.
- **Public Notification and Communication** - detailing the steps taken by MSD to warn the public and limit access to areas impacted by the overflow.
- **Regulatory Reporting and Data Management** - detailing the steps taken by MSD to provide transmission of the unauthorized discharge's data to KDEP and EPA within the required timeframe. The transmission includes estimates of volume and duration of the overflow.
- **Staff Training and Communication** - detailing the steps taken such that knowledge of SORP procedures and practices is transferred to all of MSD's employees.

4.2. COMBINED SEWER SERVICE AREA IMPROVEMENTS

Prior to implementation of the approved 2009 IOAP, the MSD CSS had 106 CSO discharge points, spatially distributed across 37 square miles of Louisville Metro. A total of 198 CSO control alternatives were originally proposed and an initial screening pared this list to 136 viable alternatives that consisted of different types of control technologies, wide-spread geographic siting, and numerous consolidations of CSO structures such as outfall, localized, or regionalized solutions.

In order to normalize the evaluation process, the performance level for comparison of these 136 alternatives were initially set at four overflow events per year. Using criteria that included benefit-cost ranking, CSS operation improvement opportunities, and expansion of wet weather treatment facilities, 23 projects were selected to proceed to a more stringent process-forward evaluation.

The suite of projects resulting from the 2012 IOAP Modification are noted in Volume 2, Chapter 4. For more detail about the adaptive management approach followed and a summary of the LTCP project changes refer to Volume 1, Chapter 6. Project modifications related to LTCP projects are described in Volume 2, Chapter 4, Table 4.0-1.

4.3. SANITARY SEWER SERVICE AREA IMPROVEMENTS

A wide range of technology approaches were considered at the baseline level (refer to Volume 3, Chapter 3 for the preferred solution process). The approaches included:

- Source control through I/I reduction
- Conventional constructed facilities commonly referred to as gray infrastructure, including:
- Peak flow storage (constructed tanks, or oversized pipes providing “in-line” storage)
- Increased conveyance capacity (increased pipe sizes, parallel relief sewers, new or expanded pump stations)
- Flow diversions to other portions of the system that have available capacity
- Expanded wastewater treatment capacity (provided at existing regional treatment facilities or provided remotely as high-rate wet weather treatment facilities)

The final projects selected for reducing SSOs include a mixture of source control (including I/I reduction efforts), wet weather storage, system diversion, and conveyance/transport. The suite of projects resulting from the 2012 IOAP Modification are noted in Volume 3, Chapter 4. For more detail about the adaptive management approach followed and a summary of the SSDP project changes, refer Volume 1, Chapter 6, Section 6.3.1. Project modifications related to SSDP projects are described in Volume 3, Chapter 4, Table 4.0-1.

4.4. WASTEWATER CAPACITY EVALUATION

4.4.1. BACKGROUND AND SUMMARY

MSD continues to implement a SCAP to confirm capacities of its treatment plants, pump stations, and conveyance system; identify treatment and hydraulic constrictions at the water quality treatment centers and conveyance system; and identify potential capacity improvements that support MSD’s performance objectives. Due to MSD’s ongoing SCAP, several technical memoranda, and reports have been previously prepared to document this information. These memoranda were initially used to document the existing capacity of the WQTCs during alternative development. As mentioned earlier, a copy of the SCAP is included in Appendix 4.1.1. The SCAP is updated periodically. The current SCAP can be viewed in the Library Section of the Project WIN website at www.msdprojectwin.org.

This section addresses regional WQTCs and small WQTCs that may receive additional flow due to SSO abatement projects. If the selected alternatives for SSO abatement result in an increase in flows to the WQTCs, it is anticipated that these plants may require operational changes or capital improvements as part of the overall program to avoid bypasses resulting from flow peaks exceeding the available capacity of one or more unit processes. In accordance with the 2009 ACD, a Comprehensive Performance Evaluation was completed for these WQTCs in accordance with applicable portions of the EPA publications, “Improving POTW Performance using the Composite Correction Approach,” EPA CERI, October 1984, and “Retrofitting POTWs” EPA CERI, July 1989.

SSOs have been documented in several treatment facilities service areas within the MSD system, including:

- Morris Forman WQTC

- Derek R. Guthrie WQTC (*Formerly known as the West County Wastewater Treatment Plant*)
- Floyds Fork WQTC
- Cedar Creek WQTC
- Hite Creek WQTC
- Jeffersontown WQTC (Decommissioned in 2015)
- Berrytown WQTC (Decommissioned in 2015)
- Hunting Creek South WQTC (Decommissioned in 2015)
- North Hunting Creek WQTC (Decommissioned in 2015)
- Lake Forest WQTC (Decommissioned in 2012)
- Chenoweth Hills WQTC (Decommissioned in 2014)

The 2009 ACD specifically excludes the Morris Forman WQTC from the requirement for a Comprehensive Performance Evaluation but requires maximizing wet weather treatment and an evaluation of the plant wet weather capacity. The Derek R. Guthrie WQTC and Floyd's Fork WQTCs were both in the process of expanding treatment capacity, so a Comprehensive Performance Evaluation was not appropriate. Expansion of the Derek R. Guthrie WQTC to 60 MGD average day and 300 MGD peak day (for short durations) was completed in 2018 and the State approved this rerating in 2020. Similarly, expansion of the Floyd's Fork WQTC to 6.5 MGD was completed in 2012.

The 2009 ACD also specifically required a Comprehensive Performance Evaluation be conducted on the Jeffersontown WQTC due to the practice of "blending" at the plant. Since the Jeffersontown WQTC was eliminated, a Comprehensive Performance Evaluation only required on any plant that will receive additional flows (except for the Morris Forman WQTC and Derek R. Guthrie WQTC which are specifically excluded from this requirement). In addition, the 2009 ACD required Comprehensive Performance Evaluations be developed at the Lake Forest WQTC and Timberlake WQTC due to past discharge permit violations and established a requirement for phosphorus removal at five plants in the Prospect area.

Error! Reference source not found. lists the WQTCs that were evaluated through a Comprehensive Performance Evaluation and gives the reason each plant was evaluated, and the actual elimination date for the facility, if appropriate.

Table 4.4-1 Comprehensive Performance Evaluations

WQTC NAME	DOCUMENTED SSOS?	REASON FOR CONSIDERATION (IF APPLICABLE)	PHOSPHORUS LIMIT	TYPE 3	ELIMI-NATION YEAR	FLOW DIRECTED TO
Morris Forman	X	N/A - CD exclusion		N/A	N/A	MFWQTC
Derek R. Guthrie	X	N/A - Expansion Completed		Expansion 2020	N/A	DRGWQTC
Floyds Fork	X	N/A - Expansion Completed	Current KPDES	Expansion 2012	N/A	FFWQTC
Cedar Creek	X	Could receive added flow	Current KPDES	N/A	N/A	CCWQTC

Table 4.4-1 Comprehensive Performance Evaluations

WQTC NAME	DOCUMENTED SSOS?	REASON FOR CONSIDERATION (IF APPLICABLE)	PHOSPHORUS LIMIT	TYPE 3	ELIMI-NATION YEAR	FLOW DIRECTED TO
Hite Creek	X	Could receive added flow	Current KPDES	Expansion 2022	N/A	HCWQTC
Jeffersontown	X	Secondary bypass/blending	Current KPDES	Elimination	2015	MFWQTC / DRGWQTC
Berrytown	X	Could receive added flow		Elimination	2015	FFWQTC
Lake Forest	X	Effluent discharge violations		Elimination	2012	FFWQTC
Chenoweth Hills	X	Could receive added flow		Elimination	2014	CCWQTC
Hunting Creek South	X	Could receive added flow	Added by Consent Decree	Elimination	2015	HCWQTC
North Hunting Creek	X	Could receive added flow	Added by Consent Decree	Elimination	2015	HCWQTC
Ken Carla		MSD SCAP consideration	Added by Consent Decree	Elimination	2015	HCWQTC
Starview		MSD SCAP consideration		Elimination	2014	FFWQTC
Timberlake		Effluent discharge violations	Added by Consent Decree	Elimination	2015	HCWQTC

As noted previously, the Morris Forman WQTC was specifically excluded from requiring a Comprehensive Performance Evaluation. The Derek R. Guthrie WQTC underwent a 100 MGD expansion in wet weather treatment capacity as documented in the Interim SSDP. Since the Composite Correction Approach identified in the EPA documents referenced is intended to address only those plants that do not require major construction, the Composite Correction Approach does not apply to this plant. To satisfy the implied Consent Decree requirement for a Composite Correction Approach evaluation, a copy of the Preliminary Engineering Report for the Derek R. Guthrie WQTC expansion is included in Appendix 4.4.1. Flow projections used to size the treatment and flow equalization basins planned for the Derek R. Guthrie WQTC system included additional wet weather flows anticipated to be captured in the Pond Creek and Mill Creek watersheds. Flow projections also included wet weather flows diverted from the Middle Fork watershed that previously flowed through the CSS to the Morris Forman WQTC. In addition, the closure of the Jeffersontown WQTC resulted in the diversion of wet weather flows from that watershed into the Derek R. Guthrie WQTC system. Note that dry weather flows from the Middle Fork watershed and from the Jeffersontown WQTC will be routed to the Morris Forman WQTC. Only the wet weather flows from these basins will be routed to the Derek R. Guthrie WQTC. Since the expansion of the Derek R. Guthrie WQTC has been addressed previously in the Interim SSDP, it will not be addressed further in this Section.

Appendix 4.4.1 WCWTP Flow Equalization and Treatment Preliminary Engineering Report
This appendix is the same as the 2012 IOAP and is provided on an external USB drive.

In 2009, the Floyds Fork WQTC was planned to have a significant expansion of overall treatment capacity, primarily to address growth pressures in the watershed, and to allow decommissioning of the Lake Forest WQTC, Starview WQTC, and the Berrytown WQTC. While the Floyds Fork WQTC expansion was primarily driven by the need to accommodate new customer connections, the design conditions used in sizing new facilities also considered the addition of wet weather flows resulting from SSO eliminations anywhere in the expanded service area. Similar to the Derek R. Guthrie WQTC, the Composite Correction Approach was not applicable to the Floyds Fork WQTC expansion. To satisfy the implied Consent Decree requirement for a Composite Correction Approach report, a copy of the Preliminary Engineering Report for the Floyds Fork WQTC expansion is included in Appendix 4.4.2. The plant expansion was completed in 2012.

Appendix 4.4.2 Preliminary Engineering Report for the Floyds Fork WQTC
This appendix is the same as the 2012 IOAP and is provided on an external USB drive.

Each of the small WQTCs that have SSOs in their watersheds were eliminated as part of MSD's long-term strategic plan to eliminate small WQTCs in its service area. Over the past 20 years, MSD has eliminated over 300 small treatment plants. Berrytown WQTC, Starview WQTC, and Lake Forest WQTC were originally scheduled for elimination by December 31, 2011 assuming resolution of outstanding wasteload allocation questions in the Floyds Fork watershed. Since the wasteload allocation was substantially delayed, the Floyd's Fork WQTC was not able to take the additional flows until late 2012. In addition, a portion of the project needed to take two of these plants off-line was to be constructed under an existing recapture agreement with a developer. The flows from these plants were routed to the expanded Floyds Fork WQTC. The Lake Forest WQTC was taken off line in late 2012, and flows are currently being treated at the Floyds Fork WQTC. Hunting Creek South, North Hunting Creek, Ken Carla, Shadowwood, and Timberlake WQTCs were eliminated by December 31, 2015 and the flows were routed to the Hite Creek WQTC. Considerations of these additional flows are included in the Comprehensive Performance Evaluation for the Hite Creek WQTC. The Chenoweth Hills WQTC was eliminated in 2015, with flows routed to the Cedar Creek WQTC.

A Comprehensive Performance Evaluation was conducted at each plant that could receive more flow as a result of SSO elimination with the exception of the Morris Forman WQTC, Derek R. Guthrie WQTC, and the Floyds Fork WQTC, as noted previously. The Comprehensive Performance Evaluations were completed to identify wet weather performance improvements that may be necessary to keep the plants in compliance with discharge permit requirements and avoid bypassing one or more unit processes despite receiving additional flows as a result of SSO elimination. For those plants scheduled to be eliminated in the near future, the Comprehensive Performance Evaluation focused on operational or low-cost improvements (known in the Composite Correction Approach as "Type 1" and "Type 2") to be able to reduce or mitigate the potential for plant bypasses or effluent standard violations that increased wet weather could cause prior to plant elimination. Where facilities modifications have been recommended, a Composite Correction Program is required to develop the implementation plan and schedule for the modifications. Comprehensive Performance Evaluations and the associated Composite Correction Programs for these plants are included in Appendix 4.4.3 Note these references are left in for historical documentation. The small WQTCs and Jeffersontown have been eliminated.

Appendix 4.4.3 Comprehensive Performance Evaluations and Composite Correction Reports
This appendix is the same as the 2012 IOAP and is provided on an external USB drive.

Since these plants have the potential to receive additional wet weather flow as a result of SSO reduction, they were evaluated under various wet weather conditions. Influent flows at each plant were simulated for the 1.82-inch three-hour cloudburst storm, the 2.25-inch three-hour cloudburst storm, and the 2.60-inch three-hour cloudburst storm, assuming "worst case" conditions (all SSOs eliminated by conveyance expansion without adding any peak flow storage to the system). For the plants evaluated, the wet weather rate limiting factor was

usually (but not always) the surface overflow rate of the final clarifiers. In general, the peak hour capacity of the WQTCs was calculated using peak clarifier surface overflow rate of 1,000 gallons per day per square foot (gpd/sf) clarifier, based on the most current edition of the "Recommended Standards for Wastewater Facilities" published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (commonly known as the 10-States Standards). For the purpose of this analysis, shallow clarifiers (less than 8-feet in depth) were evaluated using a de-rated value of 800 gpd/sf of clarifier surface overflow rate, recognizing the reduced capacity for solids capture in shallow clarifiers.

The Comprehensive Performance Evaluations showed that, for most of the WQTCs, operational changes or minor facility modifications (Type 1 and Type 2) would not be sufficient to allow the plants to accept the additional worst-case wet weather flows projected due to SSO elimination. If conveyance with no in-system storage would be the selected solution for all the SSOs in a WQTC service area, the plants will require significant facilities expansion to deal with the increased flows (Type 3 modification). Note that total conveyance was never selected as the only selected solution in a watershed, so this worst-case evaluation is hypothetical, for the purpose of WQTC capacity expansion alternative development and evaluation.

4.4.2. ALTERNATIVES TO EXPAND TREATMENT PLANT WET WEATHER CAPACITY

2021 Update: For historical reference, this section is left in the document as it was originally written in 2009. Most of the evaluations performed are no longer applicable as WQTCs have been eliminated or upgraded.

WQTC unit processes that contributed to wet weather flow capacity limitations included influent pumping capacity, clarification (with associated return activated sludge equipment) and disinfection systems. Treatment options were developed to expand the rate-limiting unit process only as required to address wet weather flows and not to increase current annual average capacity at each plant, as modifications of that type are required to be considered as part of a wastewater facilities plan and not within the scope of an overflow abatement program.

Given that the modeled wet weather flow peaks were generally very short duration, flow equalization was evaluated as an alternative to unit process expansion. Flow equalization included the following facilities: storage tank, submersible pump, wash-down pump, additional influent pumping capacity, and influent diversion structure and piping modifications, as appropriate.

The unit costs for the treatment unit process expansion options ranged from $1.00 per gallon per day (gpd) for flow rates greater than 1 MGD to $1.30 per gpd for flow rates less than 1 MGD. The cost for the wet weather flow equalization alternatives ranged from $2.75 per gallon for volumes less than 100,000 gallons to $1.88 per gallon for volumes greater than 100,000 gallons. Note that the costs for treatment are expressed in gpd, while the storage volumes are expressed in gallons. The units of measure are not equivalent, and the costs are therefore not directly comparable. Determining the optimal solution requires consideration of modeled wet weather hydrographs developed for the plant influent flows to identify the required peak flow rates for treatment and the storage volumes required to eliminate the need for increased treatment capacity.

Table 4.4-2 and Table 4.4-3 provide examples of this trade-off analysis. The costs do not include non-engineering and contingency mark-ups and common modifications to each option such as increased influent pumping requirements.

Table 4.4-2 Example of Low Volume/Low Flow Rate Cost Comparison

CHENOWETH HILLS WQTC 2.60-INCH STORM	TREATMENT COST	STORAGE COST
Excess Flow – 0.46 MGD	$598,000	

CHENOWETH HILLS WQTC 2.60-INCH STORM	TREATMENT COST	STORAGE COST
Excess Volume – 0.03 MG		$82,5000

Table 4.4-3 Example of High Volume/High Flow Rate Cost Comparison

HITE CREEK WQTC 2.60-INCH STORM	TREATMENT COST	STORAGE COST
Excess Flow – 2.73 MGD	$2,730,000	
Excess Volume – 0.38 MG		$714,000

These examples illustrate the evaluation for all the plants and all the design conditions. The modeled influent worst-case hydrographs for the small WQTCs all showed a very high flow peak at the plant, but for a relatively short duration. The wet weather peaks were often several times greater than would be predicted using 10-States Standards. As a result, the wet weather treatment capacity often required a doubling or tripling of clarification and disinfection facilities. Storage volumes, however, were relatively modest due to the short duration of the flow peak. Based on this analysis, in every case it was determined that wet weather flow equalization was the most cost-effective Type 3 option for expanding the wet weather capacity of the WQTCs being evaluated under worst-case conditions.

Error! Reference source not found. summarizes the wet weather storage required for flow peaks generated by overflow elimination projects in the collections system that are worst-case (conveyance only) design conditions at each of the plants and presents a comparative cost estimate to use in evaluating the impacts of the various SSO reduction strategies in the collection systems.

Table 4.4-4 WQTC Alternatives - Summary

PLANT	STORM EVENT	AVERAGE DESIGN DAILY FLOW CAPACITY (MGD)	EXTENDED PEAK FLOW CAPACITY (MGD)	MODELED EXCESS EXTENDED PEAK FLOW (MGD)	MODELED EXCESS VOLUME (MG)	ESTIMATED CAPITAL CONSTRUCTION COST [1]
Berrytown WQTC	1.82-inch	0.137	0.46	0.36	0.12	$1,700,000
	2.25-inch			0.61	0.22	$2,400,000
	2.6-inch			0.82	0.31	$2,900,000
Chenoweth Hills WQTC	1.82-inch	0.2	0.46	0.09	0.00 [2]	0
	2.25-inch			0.29	0.00 [2]	0
	2.60-inch			0.46 [3]	0.03	$156,000
Lake Forest WQTC	1.82-inch	0.47	1.047	1.55	0.36	$3,400,000
	2.25-inch			2.34	0.57	$4,200,000
	2.6-inch			2.95	0.76	$4,900,000
Hunting Creek South WQTC	1.82-inch	0.25	0.63	1.20	0.07	$2,100,000
	2.25-inch			1.23	0.08	$2,200,000
	2.60-inch			1.24	0.09	$2,200,000
	1.82-inch	0.396	1.127	0.17	0.05	$1,200,000

Table 4.4-4 WQTC Alternatives - Summary

PLANT	STORM EVENT	AVERAGE DESIGN DAILY FLOW CAPACITY (MGD)	EXTENDED PEAK FLOW CAPACITY (MGD)	MODELED EXCESS EXTENDED PEAK FLOW (MGD)	MODELED EXCESS VOLUME (MG)	ESTIMATED CAPITAL CONSTRUCTION COST [1]
North Hunting Creek WQTC	2.25-inch			0.41	0.15	$2,100,000
	2.60-inch			0.63	0.24	$2,700,000
Cedar Creek WQTC	1.82-inch	7.5	31.5	0	0	0
	2.25-inch			3.35	0.1	$4,000,000
	2.60-inch			14.24	1.22	$9,600,000
Hite Creek WQTC	1.82-inch	6.0	16	0	0	0
	2.25-inch			0.18 [4]	0	0
	2.60-inch			2.73	0.38[5]	$817,000

Notes:

1. Estimated Capital Costs are in 2010 dollars
2. Chenoweth Hills existing 70,000-gallon wet weather storage tank can accommodate up to the 2.25-inch storm event.
3. Chenoweth Hills effluent pump station has adequate capacity.
4. Hite Creek excess peak flow is close to the design capacity of the plant and, therefore, no storage is required.
5. Hite Creek existing facilities can accommodate the additional excess peak flow. Storage is not necessary.

The Ken Carla, Starview, and Timberlake WQTCs are not included in **Error! Reference source not found.** because they do not have capacity-related SSOs in their service areas, and therefore are not projected to receive any additional flows as a result of IOAP projects. The Jeffersontown WQTC is not included in the evaluations documented in **Error! Reference source not found.** because it has been evaluated in much greater detail, for a wider range of expansion alternatives. The Jeffersontown detailed evaluations are described in the Comprehensive Performance Evaluation in Appendix 4.4.3

4.4.3. COLLECTION SYSTEM ALTERNATIVES

MSD's modeling team identified a number of alternatives to the worst-case conveyance solution set assumed for Comprehensive Performance Evaluation evaluations. A description of the projects evaluated in the collection system that would minimize SSOs at the treatment center is described below:

4.4.3.1. BERRYTOWN WQTC

An in-line storage solution was selected to address SSO MSD0199-LS in the Berrytown WQTC service area. This included constructing two large parallel storage pipes to store peak flows until the pump station can catch up with the inflow and avoid overflows. As a result of this storage solution, no increase in peak flows was expected at the Berrytown WQTC. See the Berrytown Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. MSD did not approve any new connections to the WQTC unless there was an equivalent offset that resulted in no net increase in flow to the plant. The Berrytown WQTC was eliminated as discussed in Section 4.4.1. No Type 3 modifications to the Berrytown WQTC were required.

4.4.3.2. CHENOWETH HILLS WQTC

SSOs associated with the Chenoweth Run and Chippewa Pump Stations were eliminated by a gravity elimination of the plant associated with the Jeffersontown WQTC elimination. These IOAP projects were not expected to increase current peak flows at the WQTC. See the Chenoweth Hills Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. The Chenoweth Hills WQTC was eliminated by the Chenoweth Hills WQTC, Chenoweth Run, and Chippewa Pump Station Elimination project. No Type 3 modifications were required.

4.4.3.3. LAKE FOREST WQTC

The SSO associated with the Lake Forest WQTC was attributed to capacity of the influent pump station, which MSD upgraded in 2008 to eliminate this issue. There were no IOAP projects planned that would have increased peak flows. See the Lake Forest Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. The Lake Forest WQTC was eliminated as discussed in Section 4.4.1above. No Type 3 modifications were required.

4.4.3.4. HUNTING CREEK SOUTH WQTC

SSOs in the Hunting Creek South WQTC service area were eliminated by a combination of pump station upgrades and out-of-basin flow diversion. The net result of these IOAP projects did not increase peak flows. See the Hunting Creek South Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. The Hunting Creek South WQTC was eliminated as specified in the Consent Decree. No Type 3 modifications were required.

4.4.3.5. NORTH HUNTING CREEK WQTC

SSOs in the North Hunting Creek WQTC service area were eliminated through a combination of pump station upgrades and inline storage at two locations. IOAP projects did not increase peak flows. See the North Hunting Creek Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. MSD did not approve any new connections to the WQTC unless there was an equivalent offset that resulted in no net increase in flow. The North Hunting Creek WQTC was eliminated as specified in the Consent Decree. No Type 3 modifications were required. Note, however, that MSD was granted approval to remove the “polishing pond” from the flow stream, thereby eliminating the primary cause of effluent violations at this plant (TSS violations due to algae growth in the pond).

4.4.3.6. CEDAR CREEK WQTC

A conveyance solution was designed to address SSOs 86423, 89197, 89195, 67999, and 67997 for the 1.82-inch storm event. This included upsizing lines in the region downstream to a larger interceptor. An in-line storage solution was designed to address SSOs at 28984, 28998, 63094, 63095, and 70158 for the 1.82-inch storm event. This project was designed to create large in-line storage lines to store peak flows. A pump station was upgraded to address SSOs at 81316 and 97362 for the 2.60-inch storm event (Offline storage was subsequently added to address those SSOs). This project is a design to create large in-line storage lines to store peak flows until the downstream pump station can catch up with the inflow and avoid overflows. Pumping capacities will be expanded to address SSO MSD1080-PS and SSO 88545 during the 1.82-inch and 2.25-inch storm events, respectively. IOAP projects are not expected to increase current peak flows. See the Cedar Creek Comprehensive Performance Evaluations in Appendix 4.4.3 for a hydrograph illustrating modeled peak flows before and after the IOAP project implementation. No Type 3 modifications are required. MSD will monitor the

loading to this plant and begin facilities planning for an overall Type 3 plant expansion when conditions indicate this is warranted.

4.4.3.7. HITE CREEK WQTC

An in-line storage solution was designed to address SSOs 91087, 91088, and MSD1082-PS for the 1.82-inch storm event. This project is designed to create large in-line storage lines to absorb peak flow rates until the downstream pump station can catch up with the inflow and avoid overflows. Pumping capacity of the pump station was increased to address SSOs 90781 and MSD1085-PS during the 2.60-inch storm event. I/I reduction is proposed to get the sewershed back down to levels of I/I that were consistent with other nearby basins which address SSOs 90776, 108956, 108957, and MSD1086-PS for the 2.60-inch storm event. With the elimination of the five Prospect WQTCs, the Hite Creek WQTC will see an increase in base flow projected to approach 5.3 MGD. The plant has both the dry weather and wet weather capacity to accept these additional flows, but these flows will bring the WQTC to almost 90 percent of rated capacity. MSD will monitor the loading to this plant and begin facilities planning for an overall Type 3 plant expansion when conditions indicate this is warranted. The Hite Creek WQTC is under construction to expand its capacity to 9 MGD average daily flow and 24 MGD peak flow. Construction is scheduled for completion in FY22.

4.4.4. OTHER WQTC EVALUATIONS

As noted previously, the Consent Decree required Comprehensive Performance Evaluations of specific plants that may not receive any additional flow as a result of SSO elimination projects. In addition, MSD chose to conduct Comprehensive Performance Evaluations for two other plants with performance or potential capacity issues that indicated a Comprehensive Performance Evaluation would be of value. The following describes the outcomes of Comprehensive Performance Evaluations conducted on plants that do not have IOAP projects associated with them. The Comprehensive Performance Evaluation conducted for the Jeffersontown WQTC is also a special case, described below.

4.4.4.1. TIMBERLAKE WQTC

The Timberlake WQTC does not have any documented, suspected, or modeled SSOs in its service area, and therefore has no IOAP projects associated with it. A Comprehensive Performance Evaluation for the Timberlake WQTC was required by the Consent Decree, however, to address KPDES discharge permit violations. The Comprehensive Performance Evaluation review of the past years of effluent violations revealed that most of the violations were directly or indirectly associated with the “polishing pond”. During the years of record evaluated, the polishing pond problems were primarily related to algae blooms during warm weather and septic sediments releasing organics and solids during periods of water temperature instability (typically the spring and fall “turnover”). In addition to these typical polishing ponds operating problems, the Timberlake polishing pond were inundated by high water, resulting in effluent samples that included muddy flood waters. Since the Timberlake WQTC was eliminated, no Type 3 actions were recommended. MSD eliminated the polishing pond from the flow stream, thereby eliminating the primary cause of violations at the plant (high TSS caused by pond flooding from the creek, or algae growth in the pond).

4.4.4.2. JEFFERSONTOWN WQTC

The Jeffersontown WQTC is the only facility in MSD’s system (other than the Morris Forman WQTC, which treats combined sewage) that was equipped to “blend” primary effluent with treated secondary effluent prior to discharge. The practice of blending in a facility that does not treat combined sewage was previously viewed as

a bypass under the regulations. The Consent Decree required MSD to either eliminate or upgrade the Jeffersontown WQTC to stop the practice of blending by December 31, 2015. A Type 3 modification was required to either eliminate or expand the Jeffersontown WQTC. The Jeffersontown WQTC was eliminated in 2015.

4.4.4.3. KEN CARLA AND STARVIEW WQTCS

The Ken Carla WQTC and Starview WQTC were eliminated as discussed in Section 4.4.1. Comprehensive Performance Evaluations were conducted at these treatment centers to determine if there were any Type 1 or Type 2 corrective actions that could improve plant performance prior to elimination. Type 1 actions were identified for both plants. No Type 2 recommendations were developed.

4.4.4.4. SUMMARY

While no Type 3 solutions are currently recommended for any of the treatment centers (with the exception of the regional WQTCs already planned for expansion), the Comprehensive Performance Evaluations identified Type 1 operational modifications and Type 2 minor facility modifications for several of the centers. These modifications will be made in accordance with the schedules in the individual plant Composite Correction Program, see Appendix 4.4.3 with the Comprehensive Performance Evaluation in an individual Comprehensive Performance Evaluation/ Composite Correction Program report for each plant.

A summary of the schedule for completing Type 1 and Type 2 modifications is included in Figure 4.4-1. All the Type 1 and Type 2 modifications were completed on schedule as documented in the Quarterly and Annual Reports that can be found in the Library section of the Project WIN website at www.msdprojectWIN.org.

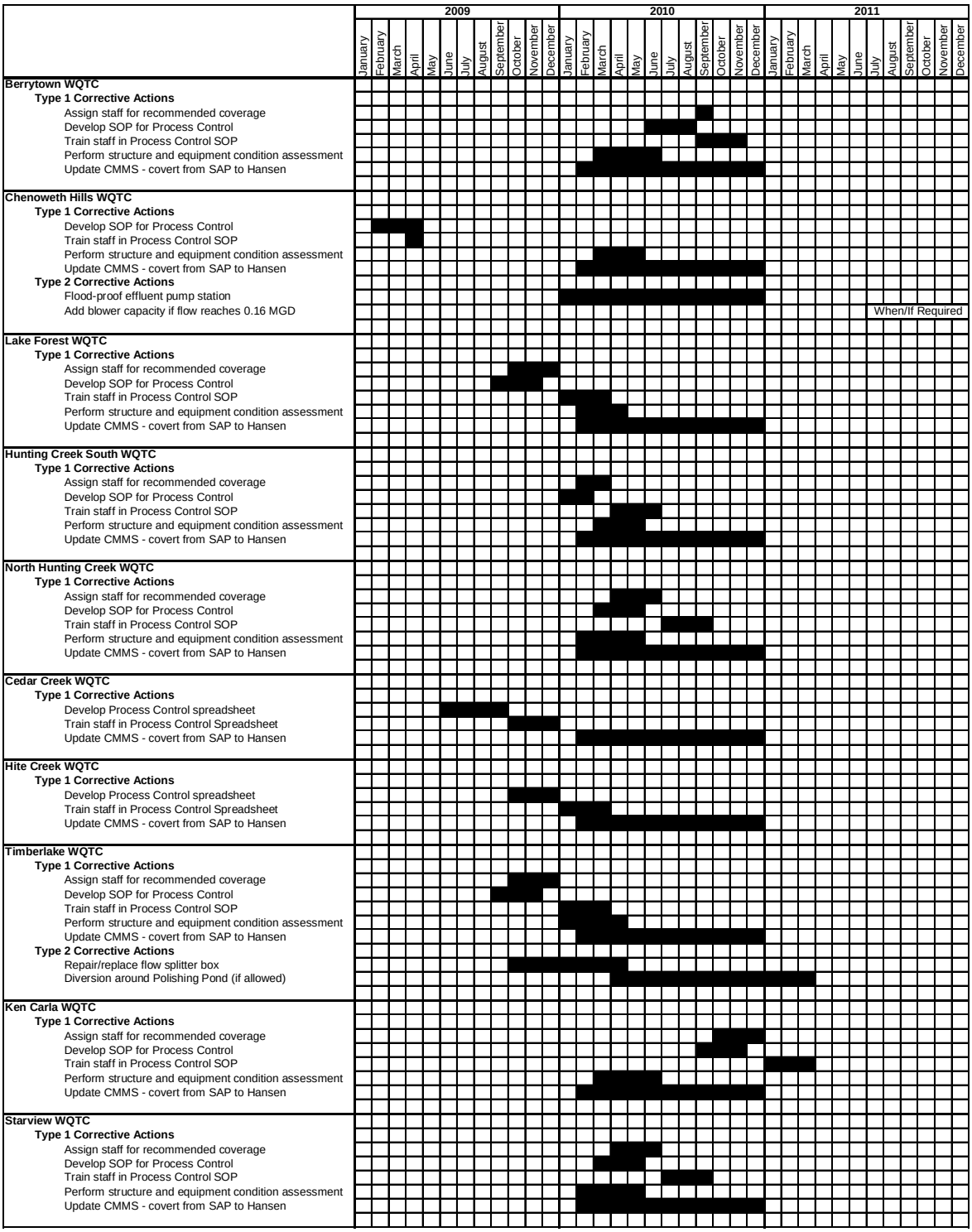

Figure 4.4-1 Type 1 and Type 2 Modifications Summary

4.5. SOURCE CONTROL AND CAPACITY SUSTAINABILITY

Source control measures related to removing illicit connections from MSD's sewer system, both in the combined and separate systems, can play a vital role in reducing sewer overflows and protecting, lowering the risk of basement backups, and reducing treatment costs. MSD currently offers a voluntary program for plumbing modification on private property to protect against backups and remove illicit connections such as downspouts and sump pumps. The program components include the Plumbing Modification, Downspout Disconnection, Sump Pump Disconnection, and Sewer Line Replacement programs. Example packets available to MSD customers can be found in **Error! Reference source not found.**.

Appendix 4.5.1 Plumbing Modification and Sump Pump Disconnection, Downspout Disconnection, and Sewer Line Replacement Packet Information

This appendix is the same information provided in the 2012 IOAP and is provided on an external USB drive.

4.5.1. PLUMBING MODIFICATION PROGRAM – BASEMENT BACKUPS

In 1994, MSD started a program to help home owners that experience basement backups to install backflow prevention devices at MSD's expense. For the first few years, MSD offered the program to about 450 property owners per month. After the March 1997 flood, MSD began offering a backflow prevention device to any separate SSS residential customer reporting a backup. The countywide program is now available to all MSD customers experiencing basement backups related to MSD's system. MSD will pay up to $4,000 per residence for plumbing modifications. Generally, installations average about $2,500.

Since the program's inception, MSD has completed over 17,992 projects totaling approximately $21.7 million dollars. This is a considerable investment in backflow prevention that has been successful throughout the implementation of the IOAP. As backflow issues are mitigated and eligible customers with wet weather backup issues decrease across the community, we expect that the program participation trend will naturally decrease as well. See Figure 4.5-1 for a map of completed Plumbing Modification Program Projects through 2020.

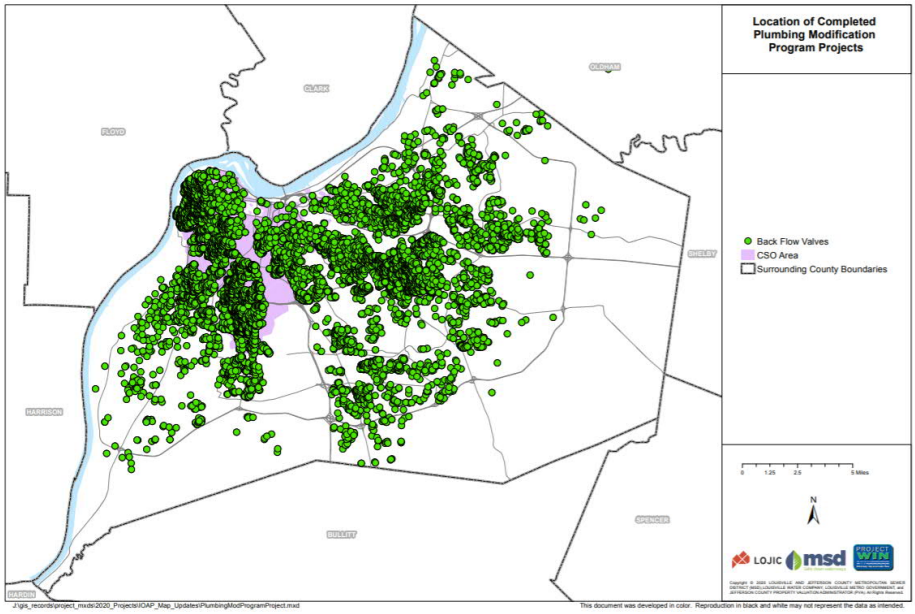

Figure 4.5-1 Location of Completed Plumbing Modification Program Projects, 2020

The two most common plumbing modifications involve a sump pump or a backwater and ball valve. A sump pump will be installed if a floor drain is present in the basement but no toilet or shower. Usually the floor drain is connected to the main sewer in the street and is the first place the main sewer could backup into the basement.

The sump pump installation consists of capping the existing floor drain, installing a sump pump, and then installing a new floor drain that will be connected to the sump pump. The new floor drain runs into the new sump pump that discharges to the home's exterior.

If a toilet and/or shower exist in the basement, a backwater valve and a ball valve will be installed. The valve installation consists of placing a backwater and ball valve between the toilet and floor drain and the main sewer in the street. Therefore, if the main sewer backs up into the basement, the backwater and ball valve will prevent the water from getting to an outlet (the toilet, shower, or floor drain).

4.5.2. PRIVATE PROPERTY SOURCE CONTROL – DOWNSPOUT DISCONNECTION, SUMP PUMP DISCONNECTION, AND SEWER LINE REPLACEMENT PROGRAMS

MSD's Wastewater/Stormwater Discharge Regulations (WDRs) provide a framework around which a more extensive policy regarding the removal of illicit connections from MSD's system can be considered. As of 2021, the programs for private property source control are voluntary and include downspout disconnections, sump pump disconnections, and sewer line replacement.

Single-family rooftops account for 18 percent of the impervious area within the CSS area. By disconnecting roof downspouts, a significant portion of this impervious area can be removed from the combined system. Removal of downspout as well as sump pump stormwater connections can result in reduced wet weather flows and ultimately overflows. Illicit connections in the separate sanitary sewer system, which typically have much smaller sewer lines than in the combined, can have a dramatic effect on sewer flows and can result in basement backups and surface overflows.

Downspout Disconnection Program

Within the combined system, MSD utilized LOJIC data to calculate the total square footage of single-family rooftops for each drainage basin. Field surveys of approximately 30 basins were conducted in an effort to determine the percentage of single-family homes with downspouts that are directly connected to the CSS. The results of this effort indicated that, on average, approximately 65 percent of parcels have downspouts that are directly connected to the combined sewer system. For those sewersheds where field surveys were conducted the actual percent of downspouts connected was utilized in the evaluation.

Since 2009, MSD proactively integrated pilot downspout disconnection incentive projects in two targeted areas of the combined system. Implementation provided insight to what participation rates could be expected from a voluntary program as well as corresponding peak flow benefits. Following these pilot projects, MSD has offered incentives for any customers who elect to disconnect their downspouts from the sewer.

Sump Pump Disconnection Program

The sump pump disconnections are offered to property owners through the plumbing modification program described above. Opportunities to disconnect direct sump pump connections benefit overall source control and I/I reduction efforts to maximize wet weather capacity in MSD's sewer system.

Sewer Line Replacement Program

Aging sewer lines contribute to clear water infiltration into the sewer system. To help address this on private property, MSD's Sewer Line Replacement Program, which began in 2010, benefits source control reduction efforts by providing qualified homeowners the cost of replacing their private sewer laterals (up to a cost of $5000) via a no-interest loan over the course of up to three years. Additionally, and independent of this program, MSD's I/I rehabilitation projects have included lining lateral connections up to, and in many cases, beyond the property line in order to maximize infiltration reduction associated with asset management efforts.

Potential Future Opportunities

In order to further reduce inflow from residential sources, MSD has considered several strategies. Jurisdiction for an ordinance that would allow MSD to require private property improvements lies with Metro Council, and to date, the response to such proposals has been that other options for I/I flow reductions should be exhausted first. Although effectiveness will be limited without support from Metro Council, MSD has considered the benefits of incorporating incentives, fees, and/or point-of-sale property requirements for customers who need to reduce clear water discharges to the sewer system. If an ordinance is adopted, strategies for a more comprehensive program could include the following:

- Identify clean water discharges from private property into MSD's sewer system as possibly illicit and subject to MSD inspection and possible disconnection. Waiver of disconnection may be granted under certain circumstances, such as disconnected discharges that might put structures at risk for flooding or cause other damage or risk to property.
- Allow MSD to request access from a property owner to confirm connection when an illicit connection is suspected.
- For a certain grace period from the initiation of this program, allow MSD or its contractor to remove, at MSD's expense, clean water connections safely and direct them to the ground.
- Following this grace period, require property owners to removed illicit connections at their expense including a follow-up inspection by MSD.
- Allow MSD to expand its financial assistance programs to support removal of these connections by property owners by spreading the cost over a longer period.
- Should access to the property be denied or the illicit connect not be removed, allow MSD to apply a monthly penalty to the property's bill until compliance is reached.

Each of these strategies could be subject to Executive Director and MSD Board approval; therefore, details of the illicit discharge removal program will be further refined as discussions with the Board move forward. As expressed in Volume 1, Chapter 2, Section 2.3, implementing strategies above would ultimately require the approval of enforcement measures by Metro Council. Should MSD not successfully adopt a mandatory program as generally described above, the voluntary disconnection and sewer repair programs are expected to continue.

MSD has documented the sewer expansion, rehabilitation and replacement actions taken to provide adequate sewer system capacity in the SCAP report. MSD's recognizes the importance of ongoing operations and maintenance (O&M) activities that also contribute to sustaining that capacity. The ongoing O&M program is documented under the Continual Sewer System Assessment program that resulted from the approved CMOM Self-Assessment Report. These inspection, maintenance and rehabilitation activities enable the sewer system to operate at its maximum capacity and to convey successfully the current and future demands placed upon

that system. Green stormwater source control measures are discussed at length in Volume 2, Chapter 3 with a green program update provided in Volume 2, Chapter 4.

4.6. COMMUNITY-WIDE GREEN INFRASTRUCTURE INITIATIVE

MSD is committed to fully incorporating a comprehensive green infrastructure initiative into the Final CSO LTCP. MSD's green initiative will utilize both specific green project and program elements. Integrated with traditional gray solutions various green technique, will be used to capture, treat, and/or infiltrate stormwater runoff from existing impervious areas.

After an extensive evaluation of impervious surface types and local physical conditions such as soils and geology, MSD has proposed a Green Infrastructure Program that includes the following diverse elements:

- Vegetated roofs
- Downspout disconnection
- Rain barrels
- Green streets
- Dry wells
- Urban reforestation
- Green alleys
- Biofiltration
- Rain gardens

Additionally, MSD identified 19 locations for green infrastructure demonstration. The proposed projects originally included:

Figure 4.6-1 Green Alley

4.6.1. GREEN DEMONSTRATION PROJECTS

Green Alleys (Refer to Figure 4.6-1)

- Seventeenth Street and West Hill
- Campbell Street and Main Street
- Seventh Street and Market Street

Dry Wells (subsequently replaced with other projects)

- Interstate (I)-264 On-Ramp
- I-264 Off-Ramp
- I-264 and Gibson Lane
- JFK Montessori School Area
- Russell Lee Drive

Green Parking Lots

- Sixth Street and Muhammad Ali Boulevard

- Seventh Street and Cedar Street
- Second Street and Broadway
- MSD Main Office Parking Lot, 700 West Liberty Street
- Third Street and Ormsby Avenue

Green Street (refer to Figure 4.6-2)

- Twelfth Street and Jefferson Street

Rain Gardens (refer to Figure 4.6-3)

- Sixth Street and Broadway
- Four additional locations yet to be determined

Figure 4.6-2 Green Street

In 2009, these 19 demonstration projects combined represented approximately $1.5 million in construction costs and are projected to remove approximately 12 MG of stormwater from the CSS resulting in an average cost to MSD of $0.13 per gallon.

Figure 4.6-3 Rain Gardens

While MSD is committed to implementing each of the demonstration projects, issues such as easements, land acquisition, permitting and other site-specific constraints that have not been identified at this level of evaluation may require adjustments to the list of proposed projects during later phases. However, MSD is committed to aggressively pursuing these projects and has budgeted $2 million for their implementation that includes an allowance for design, permitting, land acquisition, and other contingencies.

MSD completed implementation of 19 demonstration projects and is evaluating performance and maintenance issues. For a complete discussion of the actual list of demonstration projects completed see Volume 2, Chapter 4.

As discussed in Volume 2, Chapter 3, Section 3.2.5, MSD utilized a spreadsheet-based tool to assist in the development of the Green Infrastructure Program. The recommended plan targets major categories of impervious surfaces and applies various green techniques to reduce the runoff associated with each impervious surface type. Conservative estimates of anticipated implementation rates for each green element dictate the cumulative impact of stormwater reduction from a particular category of impervious surface. Based on this evaluation, MSD is able to determine overall programmatic costs for varying degrees of green control.

The green infrastructure incentives program has been very successful, with numerous projects completed or under development. For a complete discussion of the incentives program results through December 2020, see Volume 2, Chapter 4.

[1] Implementation level defines the proposed percentage of that impervious surface type to be retrofitted with a green control as part of the Green Infrastructure Program.

[2] Represents the potential reduction in stormwater if the listed implementation rates are successfully carried out over 15 years as part of the Green Infrastructure Program.

4.7. 2021 SPECIFIC REMEDIAL PROJECTS AND PROGRAM MEASURES

This Section was added in 2021 to document the technical information related to the projects and program measures associated with the Second ACD. MSD has agreed to incorporate additional work into the Second ACD related to the following:

- Specific Remedial Projects
- Critical Interceptors
- Asset Management Program

4.7.1. SPECIFIC REMEDIAL PROJECTS

MSD requested a significant time extension with the Consent Decree. As noted in the Executive Summary, the additional time is needed to reprioritize critical capital needs with limited resources. The specific remedial projects listed in this section are being added to the Consent Decree in addition to the time extensions requested for the remaining LTCP and SSDP projects. Details regarding each remedial project are provided herein.

4.7.1.1. MORRIS FORMAN WQTC NEW BIOSOLIDS FACILITY

The Morris Forman Water WQTC processes, markets (Louisville Green), and disposes of biosolids generated from all of MSD 's wastewater treatment facilities. The existing dewatering and drying equipment have reached the end of their useful life. Replacement of the biosolids infrastructure with a modern facility has been reviewed by two independent consulting engineers. MSD is ready to proceed with a progressive design-build procurement for the $197.8M project.

Due to the cost of the project, in 2018 MSD submitted a Letter of Interest to USEPA's Water Infrastructure Finance and Innovation Act Program (WIFIA) to request participation in a low-interest loan program for the Morris Forman WQTC New Biosolids Facility. The project was accepted, and the WIFIA loan closing date is scheduled for Spring 2021.

In the meantime, the biosolids facilities have continued to deteriorate at an escalated rate. This has resulted in a situation in which MSD is able to process only 35% of the biosolids. In turn, the Morris Forman WQTC effluent permit limits for total dissolved solids (TSS) and biochemical oxygen demand (BOD_5) are not consistently met. In order to meet effluent permit water quality, MSD needs to process fewer biosolids at the Morris Forman WQTC. This challenge will continue until the new Biosolids Facility is operational no later than December 31, 2030.

4.7.1.1.1. BIOSOLIDS PROCESSING 2019 - PRESENT

In 2019, MSD commissioned preparation of a District-Wide Biosolids Master Plan. The Master Plan confirmed the new Biosolids Facility to be constructed via the WIFIA loan program is the recommended long-term solution. The Master Plan identified short-term improvements that would help MSD achieve permit compliance and support construction of the new facility. The short-term improvements include replacing outdated equipment at the Morris Forman WQTC (centrifuges and dryers) and offloading regional biosolids. All six centrifuges were sent to the manufacturer for refurbishment in a phased approach. An emergency certification project was issued in 2019 to replace the Morris Forman WQTC biosolids dryers.

To sufficiently offload regional biosolids from the Morris Forman WQTC, the Biosolids Master Plan recommended MSD construct dewatering facilities for the regional WQTCs. This approach will significantly increase MSD's reliability for processing biosolids. MSD confirmed the Derek R. Guthrie WQTC has adequate space to accommodate construction and operation of a regional dewatering facility. An emergency certification project was issued in 2019 to expedite off-loading the regional biosolids from the Morris Forman WQTC by constructing a dewatering facility at the Derek R. Guthrie WQTC.

Brief descriptions of the major biosolids projects included in the 5-Year CIP are listed below.

- **New Biosolids Facility ($198M)**: This project will construct a modern biosolids processing facility at the Morris Forman WQTC that utilizes a thermal hydrolysis pretreatment process (THP) to create a useable biogas. Benefits of the new facility include improved effluent quality; production of 4 MW of power; decreased consumption of natural gas; and reduced landfill utilization capacity.
- **Drying of Morris Forman WQTC Biosolids ($48M):** The dryers at the Morris Forman WQTC have been systematically failing over the past few years. In 2019, the last dryer failed and significantly impaired MSD's ability to process biosolids. Under an emergency certification, MSD demolished the outdated drying systems and is replacing them with two state-of-the art dryers. This investment will ensure continuous biosolids processing during construction of the new Biosolids Facility and will provide added future system reliability. Additionally, the dryers will remain part of the biosolids management strategy going forward. Construction began in 2019 and will be fully completed in 2022.
- **Dewatering of Regional Biosolids ($50M):** Under an emergency certification, MSD is constructing a dewatering facility at the Derek R. Guthrie WQTC to process biosolids from all the regional WQTCs. The project includes an interim and permanent solution so regional biosolids could be immediately off-loaded from the Morris Forman WQTC. The dewatered biosolids are being landfilled in lieu of being pumped/hauled to the Morris Forman WQTC. Construction began in 2019 and will be fully completed in 2022. Regional biosolids were offloaded from the Morris Forman WQTC in February 2020.

4.7.1.1.2. NEW BIOSOLIDS TREATMENT FACILITY

The proposed biosolids processes to be designed and constructed by the Progressive Design Builder are schematically shown in Figure 4.7-1. The schematic shows existing and new processes and a combination of both. In the proposed new facility, waste activated sludge (WAS), both local and imported from the regional WQTCs will continue to be thickened via the Dissolved Air Flotation Tanks (DAFT). Thickened WAS will be combined with the Primary Sludge in the existing Sludge Holding Tanks. The combined sludges will be screened with new sludge screens prior to dewatering by new centrifuges. The dewatered cake will be fed to the new THP process prior to anaerobic digestion. The anaerobically digested biosolids will be dewatered via new post-dewatering centrifuges to produce a Class A cake solid to be hauled away for beneficial use

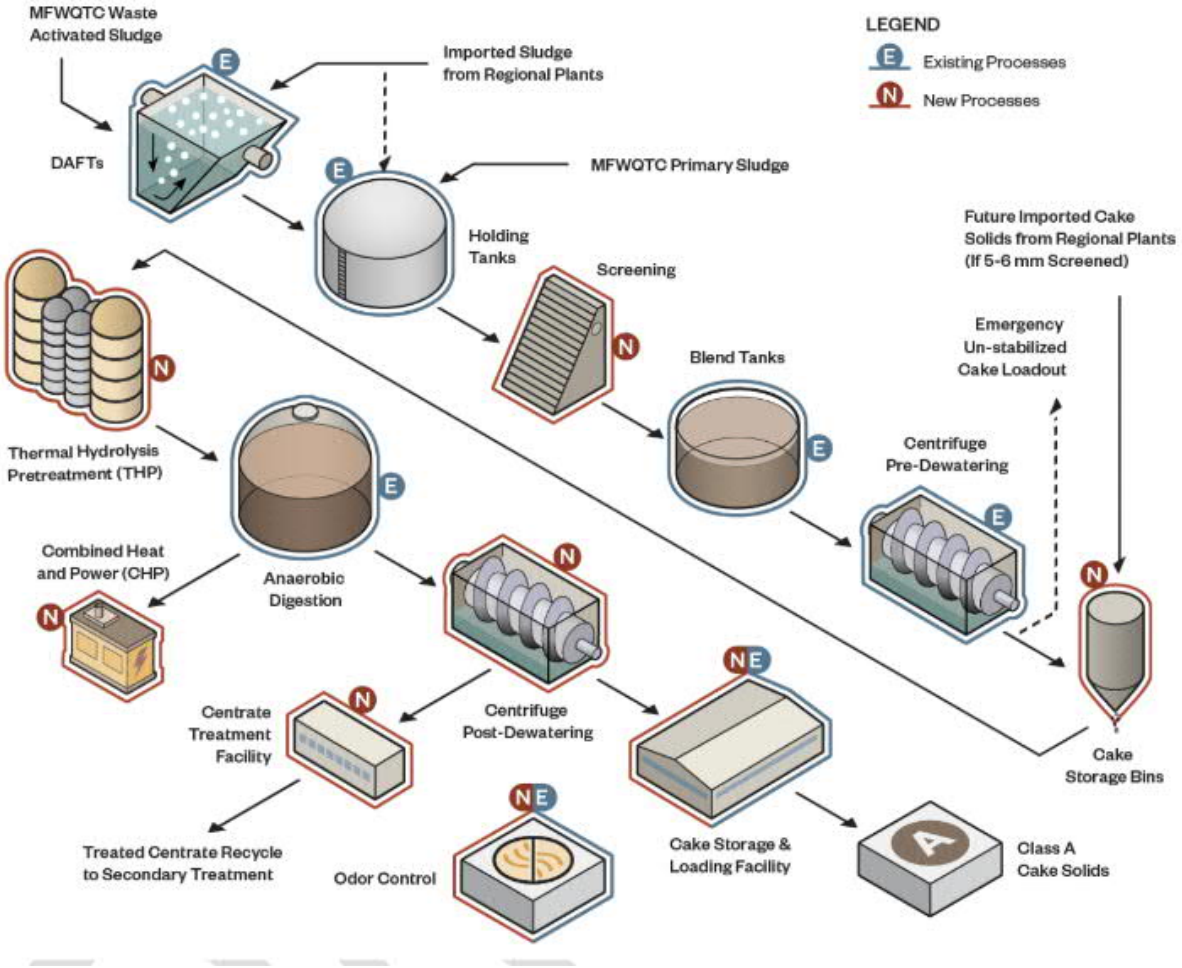

Figure 4.7-1 Schematic of New THP Biosolids Facility
(source: Hazen & Sawyer)

- **Solids Loading Capacity**: The new biosolids system will be designed for an average annual solid loading capacity of 122 dry tons per day (DTPD); maximum daily solids loading of 220 DTPD; and maximum month solids loading of 154 DTPD.
- **Odor Control Systems**: The new system will include additional odor control systems. Minimization of off-site odor migration is a priority for this project's performance criteria. Proposed modifications to the existing and new odor control systems for the new solids processing trains is anticipated to limit off-site migration of odor to a peak single occurrence dilution to threshold value (D/T) to 50 and to limit occurrences of D/T of 20 to less than 50 hours per year.
- **Biogas Production**: The energy recovery system from the generated biogas will include digester gas compression, scrubbing, storage, internal combustion generators, and steam boilers. The generated biogas from the digestion process is expected to be 1.66 million cubic feet of biogas per day on an annual average basis assuming a volatile solids reduction of 60% in the digestion system. Use of the biogas will be maximized for electricity production. The waste heat recovered from the proposed

combined heat and power (CHP) system used for generating steam will also be used for electricity production. An estimated 4 MW CHP system rating is expected. Any additional energy required for the THP system will use natural gas.

4.7.1.2. PADDY'S RUN PUMP STATION CAPACITY IMPROVEMENT

The Paddy's Run FPS was designed by USACE and put into service in 1953 to protect both the public and many critical assets within MSD's combined sewer system from river related flooding (refer to Figure 4.7-2). The Paddy's Run Station pumps from the largest pipe in the Louisville combined sewer system, the Southwestern Outfall. The station routinely pumps combined sewer overflows during wet weather events when the river is elevated, further protecting the public from contact with flood waters impacted by combined sewers.

In 2017 MSD placed the Bells Lane Wet Weather Treatment Facility into service. When the Ohio River flood stage exceeds 58 feet the Paddy's Run Station becomes the effluent pump station for the Bells Lane Facility. As such in addition to providing critical flood protection, the Paddy's Run Pump Station serves as essential wastewater infrastructure for CSO control. The pump station protects an estimated 216,000 citizens, 87,000 structures, and $33 billion in property in Louisville.

According to hydraulic modeling, the pump station's level of service has significantly reduced since its 1950s era design from a 10-year, 24-hour capacity. The current pump station only has the capacity to keep up with a 2-year, 24-hour storm event without flooding basements due to development and more impervious area within the drainage basin. For these reasons, MSD is planning for a higher level of protection at this facility. Increased pump capacities will improve resilience for vulnerable populations and help mitigate flood risks that have resulted from changed land use, population, and infrastructure growth over the past 70 years. In order to pump a proposed 10-year, 24-hour storm event (5.0 inches), MSD plans to construct a new 5,250 sq foot pump station rated at 1,900 MGD, install the associated discharge piping system over the existing levee to a new outfall structure on the Ohio River, and demolish the existing pump station.

Furthermore, because of the uncertainty and increased frequency associated with extreme storm events, as well as the public health and safety impacts those type of storms cause for the community, secondary power is essential for system resilience. While on-site power generation for full operation of larger facilities is impractical, the applicability of secondary power at this facility will be evaluated.

4.7.1.2.1. NEW PADDY'S RUN PUMP STATION

It is anticipated the new replacement pump station will be constructed within the existing levee southwest of the existing pump station. The location requires a new channel to convey flow from the Southwestern Outfall to the new Pump Station. This location provides sufficient space to construct the new station and the associated force mains while maintaining operation of the existing pump station during construction.

- **Proposed Station Pumps**: In consideration of the hydraulic conditions and pump capacity requirements of the new Paddy's Run Pump Station, six large pumps and two small pumps were selected during preliminary design. The six larger pumps will be rated for 199,900 gpm at 70.9 feet maximum total dynamic head (TDH) with a 4,500 hp synchronous motor. The two smaller pumps will be rated for approximately 60,000 gpm at 70.4 feet maximum TDH with a 1,500 hp synchronous motor. The two smaller pumps were selected to match the capacity of the existing "small" pumps currently in use at the Paddy's Run Pump Station. The information related to flow and TDH will be confirmed during the project design phase.

- **Redundant Electrical**: It is proposed the station be served by redundant primary power metered 13.8kV electrical services from the adjacent LG&E transmission substation. Each primary circuit will terminate at a motor-operated vacuum circuit breaker in a new 15 kV primary selective switchgear lineup. The main circuit breakers for the two incoming services will be key interlocked to prevent simultaneous closing on the bus.
- **Environmental Conditions**: This project will require a low water crossing permit from the USACE for Stream 2 to Paddy's Run and loss of approximately 0.25 acres of forested wetland to accommodate force main construction. The areas for construction have no anticipated impacts related to hazardous waste, PCBs, or petroleum products. The existing pump station contains asbestos that must be removed prior to demolition.

MSD expects to procure a progressive design-builder for this project in FY22. The work is anticipated to be substantially complete by December 31, 2026.

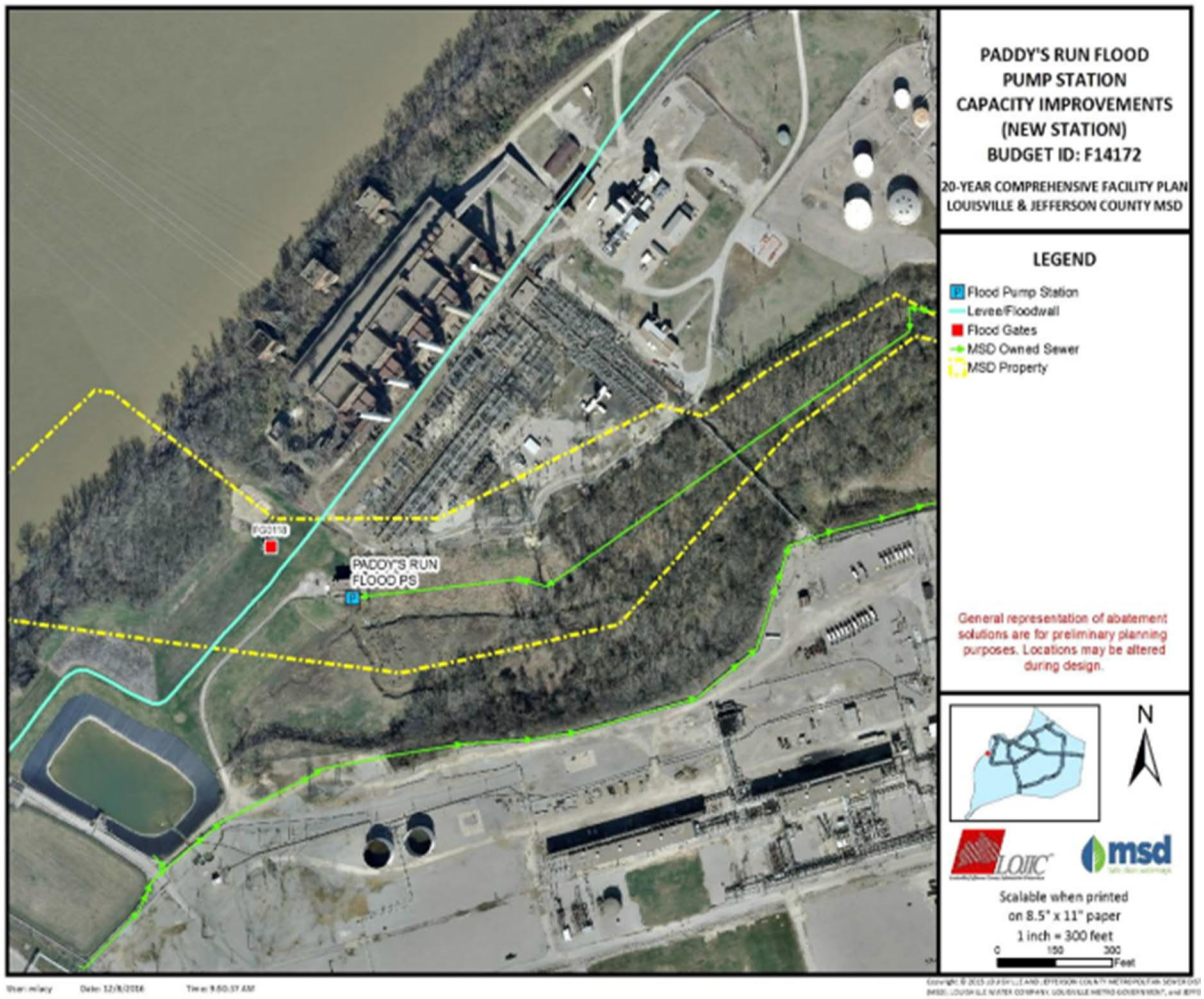

Figure 4.7-2 Paddy's Run Pump Station Location Map

4.7.1.3. MORRIS FORMAN WQTC AGREED ORDER CORRECTIVE ACTION PLAN

On May 3, 2018, MSD entered into an Agreed Order with the Cabinet to address improvements necessary to recover from a mechanical failure due to a lightning strike resulting with a power outage at Morris Forman WQTC that occurred April 8, 2015. Extensive damage was experienced to the primary treatment, secondary treatment, and electrical systems causing the plant to be out of compliance with permit effluent discharge limits. MSD continues to work diligently to restore the Morris Forman WQTC to its full operational capacity. MSD provided a suite of projects to serve as the Corrective Action Plan (CAP) for this Agreed Order. Some projects have been completed whereas others are on-going. The Morris Forman WQTC CAP completed projects are listed in **Error! Reference source not found.** and the remaining projects to be completed are listed in Table 4.7-2. The benefits offered by each project are noted in both tables. This information is provided to demonstrate the level of investment MSD is making to improve the Morris Forman WQTC. The projects included in the CAP are not part of the Second ACD.

Table 4.7-1 Completed Projects in the Morris Forman WQTC CAP

MSD BUDGET ID	MORRIS FORMAN WQTC COMPLETED CAP PROJECTS	ESTIMATE AT COMPLETION	SUBSTANTIAL COMPLETION DATE	ASSIST WITH REDUCING EFFLUENT BOD	ASSIST WITH REDUCING EFFLUENT TSS	ALLOW CONTINUED OPERATION OF CRITICAL SYSTEM	PREVENT CATASTROPHIC FAILURE AT THE PLANT	ADDRESS A SAFETY ISSUE/CONCERN
H14108	Rubbertown Flow Sampling	$50,457	6/20/2016	X	X			
D15022	MEB Leak Repair	$372,988	6/30/2016			X		
F14179	Wet Cake Pump	$984,566	9/14/2016	X	X	X	X	
D15127	Process Water Line	$365,534	10/29/2016			X	X	
F13013	Condenser Upgrades	$395,172	1/13/2017		X			
D15017	Centrifuge Controls	$1,091,886	11/15/2017	X	X	X		
F14183	FEPS Generator	$3,275,587	5/25/2018			X	X	
D18359	Delta Transformer	$98,474	6/30/2018		X			
D18360	Air Dryer	$39,536	6/30/2018		X			
D18362	FEPS Substation	$596,869	6/30/2018			X	X	
F13016	High Yard Electrical Modifications	$7,396,897	8/31/2018			X	X	X
F13023	Headworks Replacement	$14,940,610	11/8/2018		X	X	X	
F09510	OGA Plants 1 and 2	$7,306,656	11/17/2018	X		X	X	X
D19044	Primary Sludge Pump Compressor	$83,498	5/31/2019		X	X	X	
D20249	District-Wide Biosolids Master Plan	$250,000	12/31/2019		X	X	X	
F14182	FEPS Pump & Motor Repair	$450,000	6/30/2020			X	X	
D15020	Cake Pump Phase 2	$1,802,400	6/30/2020	X	X	X	X	
D19227	Primary Sludge Line Replacement	$762,800	7/13/2020			X	X	
D20167	East Headworks HVAC	$101,900	8/24/2020			X	X	

Table 4.7-1 Completed Projects in the Morris Forman WQTC CAP

MSD BUDGET ID	MORRIS FORMAN WQTC COMPLETED CAP PROJECTS	ESTIMATE AT COMPLETION	SUBSTANTIAL COMPLETION DATE	ASSIST WITH REDUCING EFFLUENT BOD	ASSIST WITH REDUCING EFFLUENT TSS	ALLOW CONTINUED OPERATION OF CRITICAL SYSTEM	PREVENT CATASTROPHIC FAILURE AT THE PLANT	ADDRESS A SAFETY ISSUE/CONCERN
D19307	FEPS VFD Replacement	$813,200	10/30/2020			X	X	
	Projects Completed	**$41,179,030**		**5**	**10**	**16**	**14**	**2**

The remaining projects included in the Agreed Order CAP are underway and are expected to be completed no later than December 31, 2026.

Table 4.7-2 Remaining Projects in the Morris Forman WQTC CAP

MSD BUDGET ID	MORRIS FORMAN WQTC CAP PROJECTS IN 5-YEAR CIP	ESTIMATE AT COMPLETION	ASSIST WITH REDUCING EFFLUENT BOD	ASSIST WITH REDUCING EFFLUENT TSS	ALLOW CONTINUED OPERATION OF CRITICAL SYSTEM	PREVENT CATASTROPHIC FAILURE AT THE PLANT	ADDRESS A SAFETY ISSUE/CONCERN
D20228	Morris Forman WQTC Centrifuge Rehabilitation	$1,100,000		X	X	X	
D20291/84	Derek R. Guthrie WQTC Dewatering Facility	$47,282,200		X	X	X	
D20285	Morris Forman WQTC LG Dryer Replacements	$49,305,200		X	X	X	
D19045	Morris Forman WQTC Sodium Hypochlorite Relocation	$3,471,000			X		
D18130	Morris Forman WQTC FEPS Load center & MCC Replacement	$500,000			X	X	
D17042	Morris Forman WQTC Sedimentation Basin Rehabilitation	$32,514,000	X	X	X	X	X
	Projects Included in 5-Year CIP	**$134,172,400**	**1**	**4**	**6**	**5**	**1**

Three of the remaining projects were noted in Section 7.1.1 because they are associated with biosolids processing (Morris Forman WQTC centrifuges and dryer replacement projects and the Derek R. Guthrie WQTC Dewatering Facility). The other three remaining projects are described below.

- **Morris Forman WQTC Sodium Hypochlorite Relocation**: The existing chemical piping that is current subject to frequent failures and repairs and replacement has been recommended by operations staff. The new biosolids facility will utilize the existing sodium hypochlorite building. To maintain reliable

chemical operation, MSD is relocating the sodium hypochlorite system to a new building. The location of the new building will allow the chemical to be stored closer to the discharge point; thereby reducing future line breaks for this system. MSD is advancing the project now to replace the chemical piping and accommodate the upcoming biosolids facility. This project will be substantially complete no later than December 31, 2023.

- **Morris Forman WQTC FEPS Load center & MCC Replacement**: Replacement of the Motor Control Center (MCC) in the FEPS due to obsolescence and corrosion. The MCC is showing signs of significant corrosion. Many spare parts are only available through electrical salvage sites if available at all. This project will be substantially complete no later than December 31, 2024.
- **Morris Forman WQTC Sedimentation Basin Rehabilitation**: The Morris Forman WQTC is limited to a max wet weather flow of 240 MGD due to capacity constraints with the sedimentation basins. When the four sedimentation basins have been fully rehabilitated, they will enable the WQTC to process up to 330 MGD. Treating ≈330 MGD wet weather flows will reduce potential discharges from the Main Diversion Structure (CSOs 210, 211, 016) and the Southwest Pump Station (CSOs 015 and 191). This will reduce the level of pollutants discharged into the Ohio River. This project involves complete rehabilitation of the four primary sedimentation basins. Each rectangular basin is approximately 275 feet long, 70 feet wide, 17 feet deep, and each has a capacity of nearly 88 MGD. Primary Sedimentation Basin were originally constructed in the 1950s. Most equipment serving the basins has exceeded the expected service life, and equipment performance has become unreliable. The timing for implementing this project is dependent upon Ohio River elevations and the associated impact on the Sedimentation Basins. MSD anticipates being able to rehab one basin per year upon completion of the design phase of this project. This project will be substantially complete no later than December 31, 2026.

4.7.2. SPECIFIC REMEDIAL MEASURE - CRITICAL SEWERS

Since entry of the original Consent Decree and the Amended Consent Decree, MSD has been experiencing an increase in the failures of critical interceptor sewers. MSD represents that most of the failing interceptors were constructed during the same time and therefore the risk of widespread failures demands near term attention.

The list of MSD's most critical sewers (as of December 31, 2020) from a risk perspective is provided in Table 4.7-3. As more information is gathered about MSD's sewers, risk scores could change causing other sewers to be considered at a critical or higher risk level. As a specific remedial measure, MSD has agreed to advance the critical sewer rehabilitation or replacement projects listed below that total an estimated $70M during FY21 through FY25 (by December 31, 2026). A brief narrative of each critical sewer project is provided in this section. An accounting of progress related to this Critical Sewer Projects will be provided in the Annual Consent Decree Report. Additional interceptor-related capital projects beyond those listed in Table 4.7-3 may be counted toward the Asset Management Program discussed in Section 4.7.3.

Table 4.7-3 MSD's List of Critical Sewers and Interceptors

MSD BUDGET ID	CRITICAL SEWER PROJECT	LENGTH OF REPAIR (FT)	DIAMETER (IN)	OLDEST SEGMENT (YEARS)	RISK SCORE	ESTIMATED COST
A20244	Large Diameter Sewer Rehab[1]	N/A	N/A	N/A	N/A	$8,300,000
A19208	Broadway Interceptor	5,405	84 to 96	153	20.3/18.8	$10,000,000
H20147	Western Outfall	18,350	108 to 141	151	21.8/22.0	$16,000,000
H21019	Rudd Ave Sewer	4,020	120 to 138	130	4.7/9.2	$2,300,000
H18503	I-64 & Grinstead Interceptor	13,735	8 to 123	123	14.4/16.9	$16,000,000
E17053	Buechel Trunk Sewer	20,500	12 to 30	68	16.1	$3,000,000
A20280	Harrods Creek Force Main	3,200	18 to 30	8	N/A	$8,400,000
H16075	Prospect Area Sewers (HC-ORFME)	2,000	6 to 15	52	12.4	$3,000,000
H16074	Nightingale Area Sewers	49,500	6 to 18	54	N/A	$3,000,000
					5-Year CIP Total Project Cost	**$70,000,000**

4.7.2.1. LARGE DIAMETER INTERCEPTOR REHABILITATION PROGRAM

Recognizing multiple large diameter sewers have reached a level of concern, in 2019 MSD developed a Large Diameter Interceptor Rehabilitation Program to address sewers in four separate areas: 1) Broadway area, 2) Grinstead Drive area, 3) Rudd Avenue area, and the 4) Western Outfall area. An overall project map is provided in Figure 4.7-3.

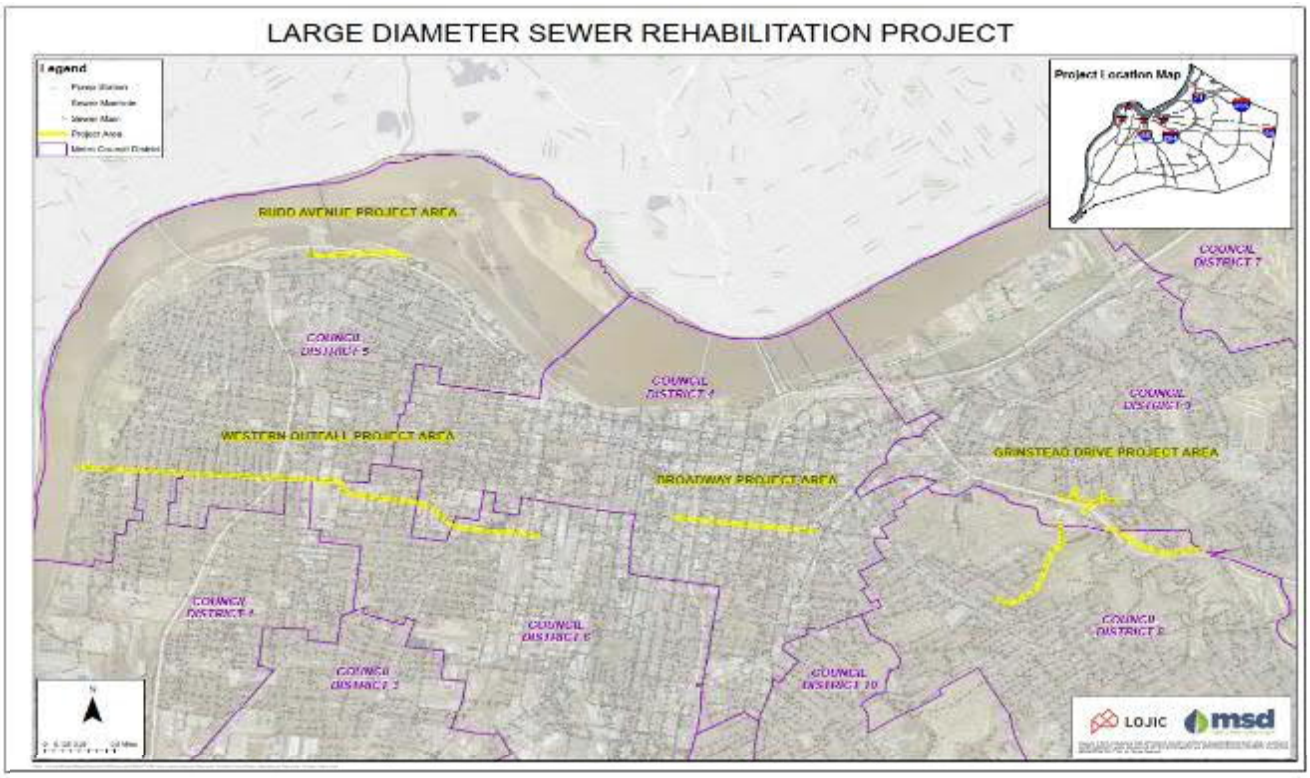

Figure 4.7-3 Large Diameter Sewer Rehabilitation Project

This program includes the following overarching activities that are required to fully quantify, design, and construct rehabilitation of the aging sewers. The costs presented in Table 4.7-3 are inclusive of all these activities.

- **Inspection:** Non-destructive inspection and assessment of the sewers (pipe and access structures) utilizing National Association of Sewer Service Companies (NASSCO) standards.
- **Planning**: Development of a Rehabilitation and Renewal Plan in coordination with MSD and its representatives, which will reduce the failure risk to maximize the life of the sewers.
- **Design & Construction**: Implementation of the Rehabilitation and Renewal Plan including design and construction services.

These sewers are aging and have high risk scores. The sewers are large diameter and the consequence of their failure could be equivalent to the 2018 Main Street Emergency Repair Project. This design-build project was advanced to determine the best rehabilitation techniques for each of the areas of concern. The design-build approach was preferred to expedite the work and to enable MSD to immediately respond to any unforeseen circumstances that may arise during inspection of the aging sewers.

This project's MSD Budget ID represents the umbrella project for which all professional services will be billed against. The work for this Large Diameter Interceptor Rehabilitation Project was divided into two stages. The stages were initially developed to determine the appropriate level of funding required each year. For example, the first year of the program was targeted for Stage 1 activities and most costly Stage 2 work will following during years 2 and 3.

- **Stage 1** includes the inspection, pre-design services, and design work to the 60% level. The Contractor's guaranteed maximum price will be issued at the end of Stage 1.
- **Stage 2** includes professional services provided during construction of the sewer rehabilitation work for each of the four areas. Construction services will be charged to individual project Budget ID numbers assigned to each area. The details of each area are listed in this section.

4.7.2.2. BROADWAY INTERCEPTOR

The Broadway Interceptor is a combined sewer interceptor located in the Morris Forman WQTC service area. The Broadway Interceptor was constructed in 1866, is circular in shape, of brick construction, and ranges in size from 84- to 96-inches in diameter. The sewer extends approximately 5,405 linear feet in West and East Broadway from South 2nd Street to CSO118 near South Fork Beargrass Creek. The Broadway Interceptor serves major industries, including the Jefferson Community and Technical College and multiple healthcare facilities. It is also within a major arterial road, Broadway, the Louisville Central Business District, crosses underneath an Interstate 65 overpass, and a portion is located within the 100-year floodplain of South Fork Beargrass Creek. The oldest segment of this sewer is approximately 153 years old. The Broadway Interceptor has been assigned a risk score of 20.3. The project area is shown in Figure 4.7-4. Construction for this project began in 2021.

Figure 4.7-4 Broadway Interceptor Project

4.7.2.3. WESTERN OUTFALL INTERCEPTOR

The Western Outfall is a combined sewer interceptor located in the Morris Forman WQTC service area, as well as the section of the outfall that discharges to the Ohio River that interacts with two flood gate structures. The Western Outfall was constructed between 1868 and 1897. It is a circular pipe of brick construction ranging in size from 108- to 141-inches in diameter. The Western Outfall section of interest extends approximately 18,350 linear feet from West Breckinridge Street at South 12th Street to beyond West Broadway at Southwestern Parkway to the outfall into the Ohio River. Peak wet weather flows have been measured at more than 220 MGD in the Western Outfall Interceptor with typically average daily flows ranging between 3 and 4 MGD.

The Western Outfall serves multiple residential neighborhoods and major industries, including the Brown Forman Distillery. It drains the area along Broadway from the Ohio River east to about 12th Street, encompassing about 1,800 acres. It also intersects major arterial roads including West Broadway and Dixie Highway; crosses underneath a railroad overpass and an Interstate 264 overpass.

The portion of the Western Outfall that interacts with two flood gate structures was constructed in 1951, is a circular pipe, of RCP construction, and is 60-inches in diameter. The section of interest extends approximately 215 linear feet from the end of West Broadway to an outfall point to the Ohio River beyond the flood protection earthen levee. The oldest segment of this sewer is approximately 151 years old. The Western Outfall Interceptor has been assigned a risk score of 21.8. The project area is shown in Figure 4.7-5Figure 4.7-5Figure 4.7-5. Construction for this project will begin in 2022.

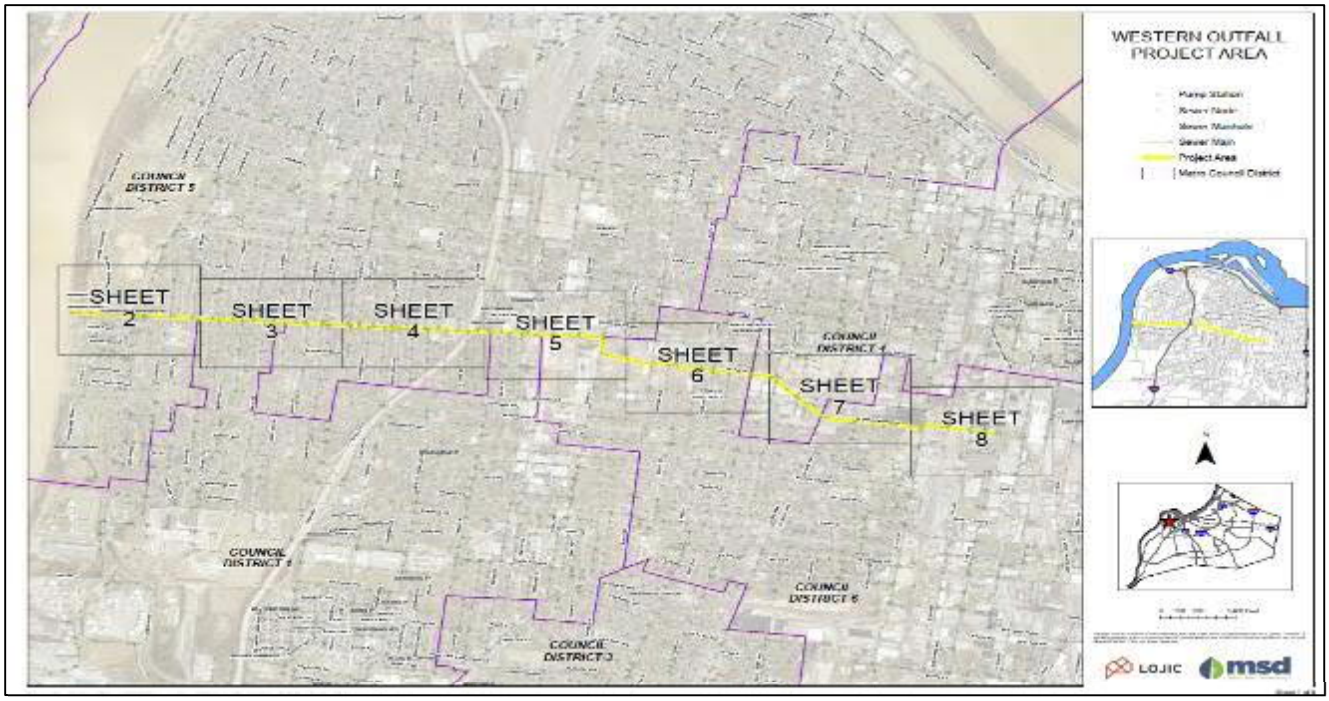

Figure 4.7-5 General Location of Western Outfall Interceptor Project

4.7.2.4. RUDD AVENUE SEWER

The Rudd Avenue Sewer is a combined sewer interceptor located in the Morris Forman WQTC service area. The sewer was constructed in 1890 with a portion of the sewer being reconstructed in 1946. It is a circular pipe

of brick and RCP construction ranging in size from 120- to 138-inches in diameter. The Rudd Avenue Sewer section of interest extends approximately 4,020 linear feet from North 27th Street at Marine Street to Rudd Avenue at North 34th Street as shown in Figure 4.7-6. Construction of this project will begin in 2022.

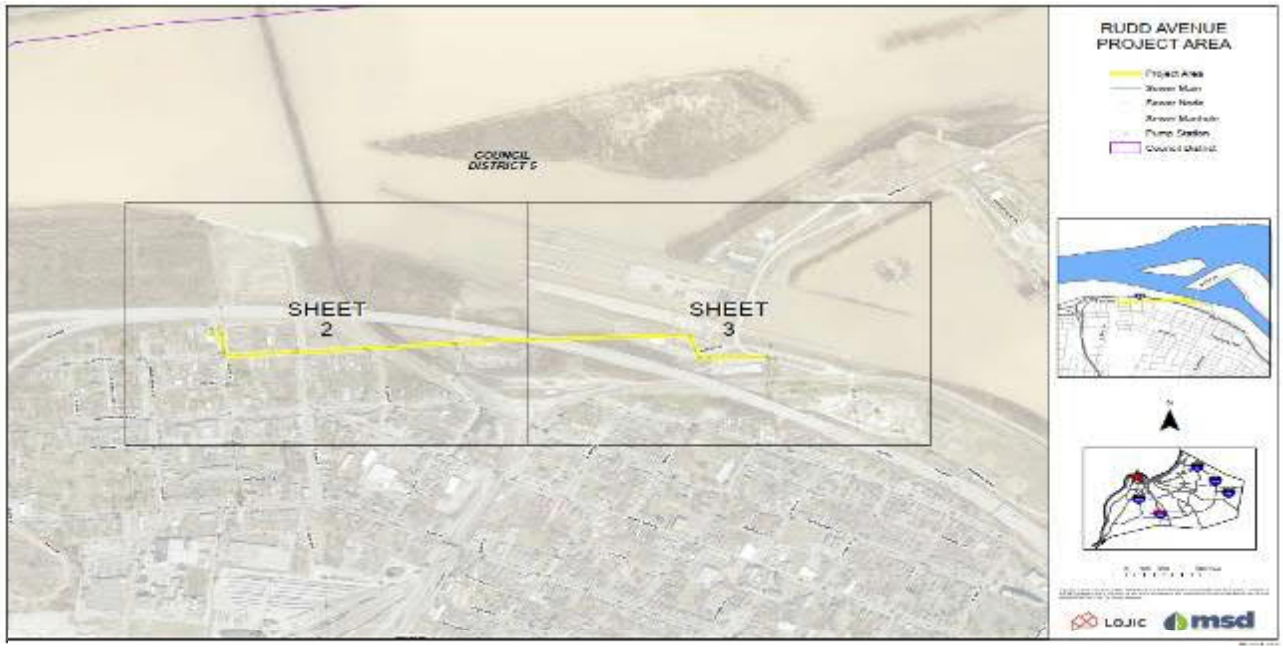

Figure 4.7-6 Rudd Avenue Sewer Project

Portions of the Rudd Avenue Sewer are located within the 100-year floodplain of the Ohio River, near the McAlpine Locks and Dam, crosses underneath Interstate 64, crosses under a railroad, crosses the flood protection earthen levee, and is near MSD's 34th Street Pump Station. MSD's Portland CSO Basin is located immediately upstream of the Rudd Avenue Sewer. When flows exceed the available capacity in the sewer, the Portland CSO Basin is utilized to mitigate overflows at CSO019. This sewer receives the flow as the Portland CSO Basin is dewatered following wet weather events and is also the sewer used for inline storage during wet weather events.

4.7.2.5. I-64 & GRINSTEAD INTERCEPTOR

The Grinstead Drive Area is comprised of a multitude of combined sewer interceptors that include, but is not limited to, the Beals Branch Trunk Sewer, Cherokee Enterprise Sewer, Grinstead Drive Sewer, CSO 125 Outfall, and the CSO 166 Outfall which are all located in the Morris Forman WQTC service area (refer to Figure 4.7-7). Below is a general description of each major combined sewer interceptor within the Grinstead Drive Area that totals to approximately 13,735 linear feet of sewers. Construction will advance in 2021 for the Cherokee Enterprise Sewer and in 2022 for the remaining sewers listed below.

- **Beals Branch Trunk Sewer** section of interest was constructed in 1931, is an arched shape semi-elliptical sewer, of RCP construction, and is 123-inches in diameter. The Beals Branch Trunk Sewer section of interest extends approximately 3,455 linear feet from Alta Vista Court to CSO166 located near Lexington Road and Cross Hill Road. Portions of the section of interest is in or near residential

neighborhoods, located within the 100-year floodplain of Beals Branch, in wooded areas, near Interstate 64, and crosses underneath Cherokee Park.

- **Grinstead Drive Sewer** was constructed in 1926, is an arched shape semi-elliptical sewer, of RCP construction, and ranges in size from 84- to 87-inches in diameter. The Grinstead Drive Sewer section of interest extends approximately 1,060 linear feet from Grinstead Drive and South Peterson Avenue to CSO125 located near Grinstead Drive and the Interstate I-64 westbound on-ramp. Portions of the section of interest is in/near a residential neighborhood, in a conservation easement, located within the 100-year floodplain of a tributary to Middle Fork Beargrass Creek, near Interstate I-64, and near a school. The upstream end of the section of interest is scheduled to be under construction in the summer of 2020 as part of a separate MSD project therefore coordination with that contractor may be necessary.
- **In the vicinity of the Grinstead Drive Sewer (unnamed sewer)**, there is approximately 3,255 linear feet of circular shaped sewers of brick, RCP, and VCP construction, ranging in size from 8- to 36-inches in diameter, and was constructed between 1911 and 1964. Portions of the section of interest is in/near residential neighborhoods, in a conservation easement, located within the 100-year floodplain of a tributary to Middle Fork Beargrass Creek, near CSOs 125 and 126, and near Interstate I-64.
- **Cherokee Enterprise Sewer** was constructed in 1897 and 1900 with a portion of the sewer being reconstructed in 1984. It is a circular pipe of brick construction and ranges in size from 48- to 72-inches in diameter. The Cherokee Enterprise Sewer section of interest extends approximately 4,990 linear feet from Everett Avenue and Longest Avenue to CSO127 located near Grinstead Drive and Utley Avenue. Portions of the section of interest is in a residential neighborhood, in/near Willow Park, Cherokee Park, and Cherokee Park Golf Course, in a restaurant parking lot, and within minor arterial roads, Cherokee Parkway and Lexington Road. This portion of the project will be completed in 2021.
- **CSO 125 Outfall** was constructed in 1926, is rectangular in shape, of concrete construction with approximate dimensions of 10 feet by 7 feet. The CSO 125 Outfall extends approximately 560 linear feet from CSO 125, located near Grinstead Drive and the Interstate I-64 westbound on-ramp, underneath Interstate I-64 to the outfall located on Middle Fork Beargrass Creek. The CSO 125 Outfall is located entirely within the right-of-way of Interstate I-64, located within the 100-year floodplain of Middle Fork Beargrass Creek, and has direct connections to catch basins within the Interstate I-64 right-of-way. The downstream end of the CSO 125 Outfall is scheduled to be under construction as part of a separate ongoing MSD project therefore coordination with that contractor may be necessary.
- **CSO 166 Outfall** was constructed in 1931 with a portion of the sewer being reconstructed in 1966. It is square in shape, of concrete construction with approximate dimensions of 10 feet by 10 feet. The CSO 166 Outfall extends approximately 415 linear feet from CSO 166, located near Lexington Road and Cross Hill Road, underneath Interstate I-64 to the outfall located on Middle Fork Beargrass Creek. The CSO 166 Outfall is located within the rights-of-way of Interstate I-64 and Lexington Road, a portion is located within the 100-year floodplain of Middle Fork Beargrass Creek, is near a residential neighborhood and Cherokee Park, and has direct connections to catch basins within the Interstate 64 right-of-way and the surrounding area.

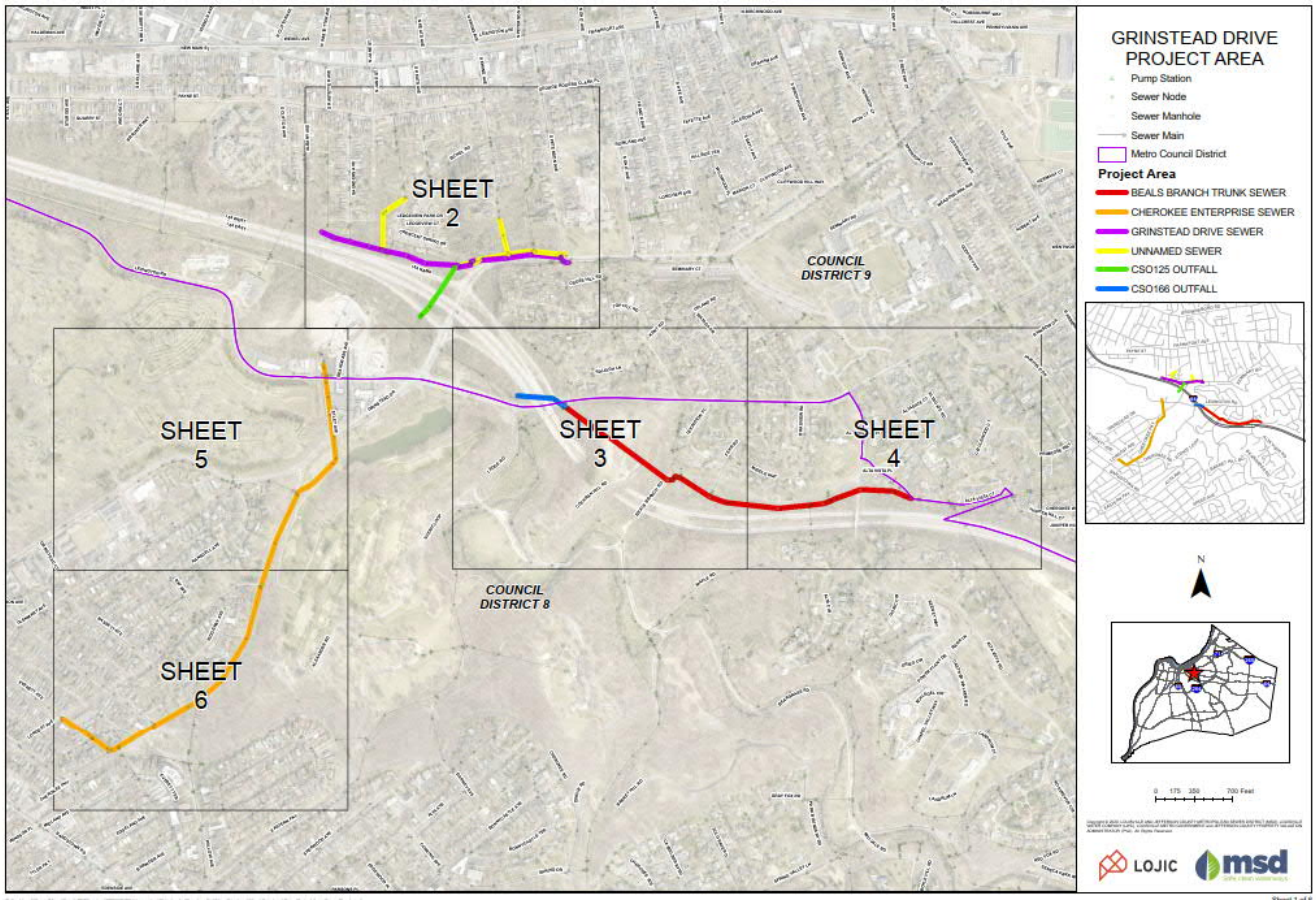

Figure 4.7-7 I-64 & Grinstead Sewer Rehabilitation Project

4.7.2.6. BUECHEL TRUNK SEWER

The 33-inch Buechel Trunk Sewer is located in eastern Jefferson County along the Buechel Branch of Beargrass Creek in the Morris Forman WQTC service area (refer to Figure 4.7-8). The Buechel Trunk Sewer was constructed in the 1950s to 1970s and discharges into the Beargrass Creek Interceptor (BGI).

Historically, root balls have caused 80 percent of the obstructions removed from this interceptor. The interceptor was cleaned and is ready for reinspection. The project will inspect the Buechel Trunk Sewer and determine the best path forward for rehabilitation. Work associated with the project is anticipated to include lining, point repairs, and manhole rehabilitation. This project will be completed no later than December 31, 2026.

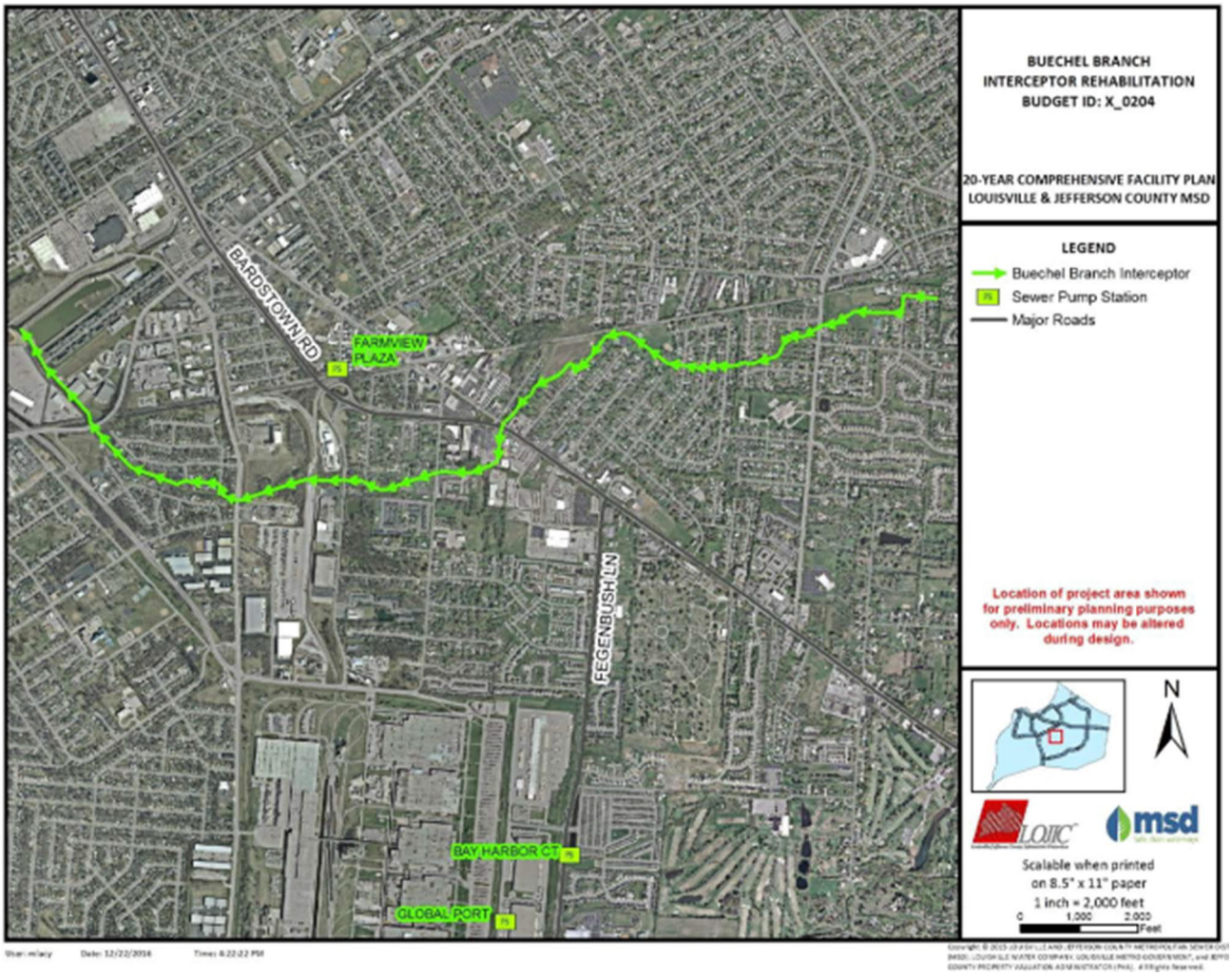

Figure 4.7-8 Buechel Trunk Sewer Location Map

4.7.2.7. HARRODS CREEK FORCE MAIN

The Harrods Creek Force Main serving Prospect area was constructed in 2012 to eliminate five small package plants and direct flow to MSD's Hite Creek WQTC. After a break was discovered in the Fall of 2019 in the 35-foot deep force main, MSD initiated an emergency project to repair a leaking manhole, repair the force main break, install a second parallel casing with pipe and valve vault cross connections, and install VFDs at the pump station. The extent of infrastructure damage was greater than initially thought. The majority of construction is completed, and all construction is anticipated to be completed in 2021 for this project. Work for this project included the following activities:

- 1,700 LF of 18-inch force main parallel to the failed 30-inchforce main with casing pipe
- 1,500 LF of 20-inch force main slip-lined into the original force main
- 2 valve vaults to cross connect dual force mains
- 4 valves and appurtenances

- Replaced soft starts with 4 variable frequency drives (VFDs) in the Pump Station
- Repair of 42-inch interceptor

4.7.2.8. PROSPECT AREA SEWERS

Based on the results of the inspection within the Hite Creek WQTC service area, MSD identified a need to rehabilitate over 2,000 linear feet of 6 to 15-inch sewers, nearly 300 manholes, and over 100 service lines in the Prospect area. This work is anticipated to begin in 2023 after expansion of the Hite Creek WQTC and will be completed no later than December 31, 2026.

4.7.2.9. NIGHTINGALE AREA SEWERS

The Nightingale Road Pump Station and sewers were constructed in 1966 to pump 13,500 gpm of combined sewage in the Morris Forman service area. Based on the results of inspection work performed within this area, MSD identified a need for sewer rehabilitation. The scope of this rehabilitation work shown in Figure 4.7-9 includes approximately 49,500 linear feet of 6 to 18 inch cured in place pipe, 200 rehabbed manholes, and 1,200 service line renewals. Rehabilitation of the Nightingale service area will renew infrastructure back to good working condition and potentially reduce the number of possible basement backups.

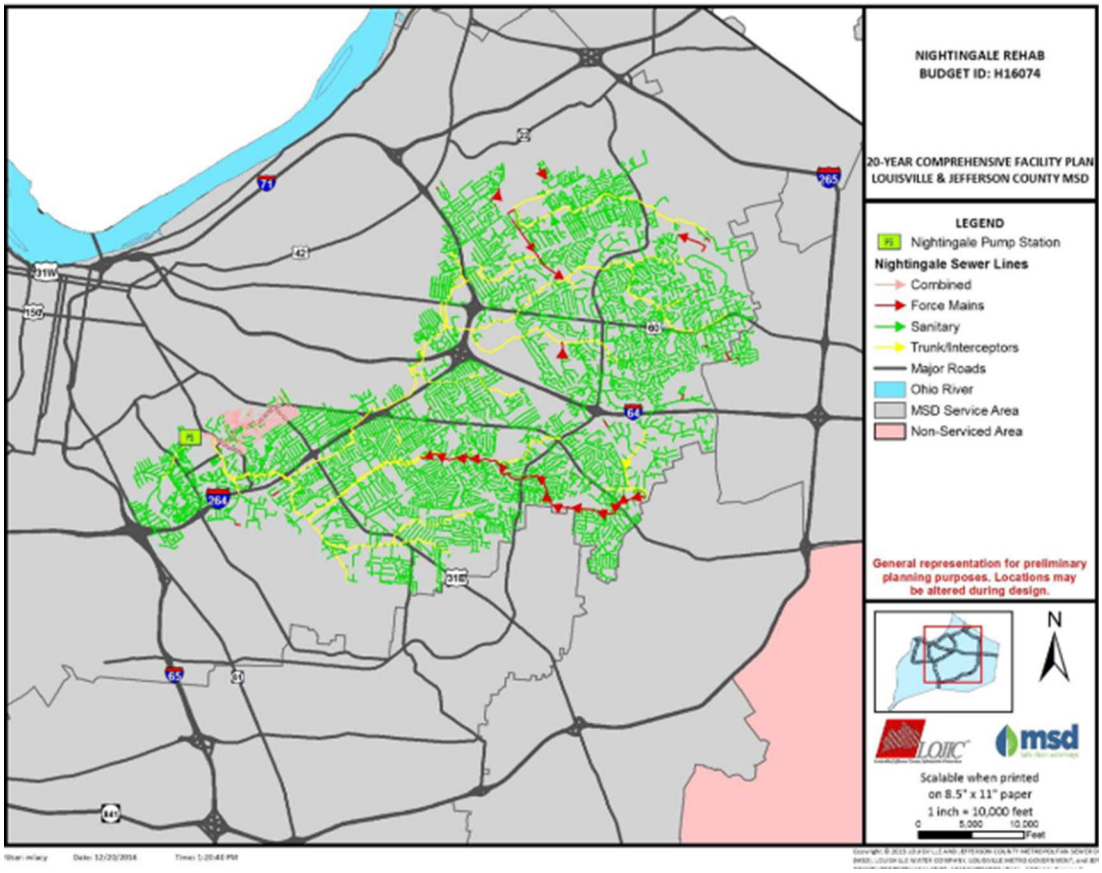

Figure 4.7-9 Extent of Nightingale Area Sewer Rehabilitation Work

The Nightingale Sewer rehabilitation work is currently under construction and is scheduled to be substantially complete in Summer of 2021.

4.7.3. SPECIFIC REMEDIAL ASSET MANAGEMENT PROGRAM

MSD has identified potential risks to future KPDES permit non-compliance along with potential risks to public health and safety from its wastewater system that could be addressed through an Asset Management (AM) Plan providing a long-term maintenance and funding strategy for the rehabilitation and renewal of its aging infrastructure. MSD is actively strengthening its asset management program to cost-efficiently maintain assets while managing risk.

MSD agreed to invest an average of $25M per fiscal year on wastewater AM improvements totaling no less than $125M in five-year increments through 2035. As such, MSD will invest $125M from FY21 to FY25 for existing wastewater collection system and WQTC assets; $125M from FY26 to FY30; and $125M from FY31 to FY35. This time frame coincides with the time extension granted for the remaining SSDP projects. MSD will document annual and 5-year progress in its Consent Decree Annual Report.

MSD agreed to provide the Regulators a 5-Year AM Plan identifying candidate projects to be addressed during each five-year window. Given the dynamic nature of MSD's aging wastewater system, MSD will retain the flexibility to substitute or replace annual projects with the understanding the resulting 5-year expenditures must total $125M. The projects selected for each 5-year Plan will be limited to capital investment averaging a total of $25M per year.

4.7.3.1. DEFINITION OF ASSET MANAGEMENT

MSD is proposing to use the definition for "Asset Management" included in ISO 55000. Asset management is the set of coordinated activities that an organization uses to realize value from assets in the delivery of its outcomes or objectives. Realization of value requires the achievement of a balance of costs, risks and benefits, often over different timescales. This definition is consistent with guidance documents published by EPA[1].

EPA published five questions designed to test a utility's readiness to maintain infrastructure at a specified level of service (refer to Figure 4.7-10).

[1] Refer to the References Section for a list of the documents noted throughout this report.

Figure 4.7-10 Asset Management Program Formulation Guidance

Under this definition the following elements are proposed to be included in MSD's AM Plan:

- **Rehabilitation & Renewal**. CMOM and Nine Minimum Control (NMC) programmatic elements related to rehabilitation/renewal (R&R) of assets under a replacement planning model, including growth forecasting, to develop long- and short-term plans for capital improvement.
- **Risk Management**. Risk management programmatic elements related to mitigating failures through proactive renewal approaches and risk mitigation plans for existing assets.
- **Internal and External Levels of Service**. Characteristics or attributes of a service that describe its required level of performance such as *how much*, *of what nature*, or *how frequently*.
- **Optimization Strategies**. CMOM & NMC programmatic elements related to maintenance optimization strategies, including proactive condition assessment for critical asset classes and failure analysis.

4.7.3.2. INDUSTRY STANDARD ASSET MANAGEMENT (AM) PROGRAM

MSD is strengthening its asset management program (AM) to cost-efficiently maintain assets while managing risk. This is done by balancing system cost, risk, and performance of services in their wastewater, stormwater, and flood protection systems. The objectives of MSD's AM program are to:

- **Programmatic Approach**. Institute a defined approach to prioritize, perform, and track the inspection, cleaning, rehabilitation, replacement, and maintenance of wastewater assets on a consistent and prioritized cycle.
- **Collection System**. Maintain system capacity and abate overflows related to maintenance issues by increasing the efficiency of the gravity line system through routine hydraulic cleaning, sewer root control, and manhole preventive maintenance programs. Maintain pump stations at fit for purpose condition to be able to handle flows reliably. Conduct regular inspection of critical sewers and interceptors to prioritize rehabilitation needs and techniques.
- **Treatment Plants**. Maintain WQTC assets to process average daily flows and peak wet weather flows in a manner that avoids unauthorized discharges and complies with permit conditions and regulatory requirements.

- **Support Facilities & Systems**. Maintain structures, buildings, vehicles, computers, software systems, telemetry components, and similar assets intended to support MSD's staff and infrastructure with providing the appropriate levels of service.
- **Costs eligible** to be counted toward the Asset Management Program include work or services performed by MSD, its consultants, vendors, and contractors associated with facility plans, master plans, asset management plans, hydraulic and process modeling, asset inspection, condition assessment, risk assessment, field testing, design services, bidding services, asset performance evaluations, construction, construction inspection, commissioning (asset start-up), asset rehabilitation, asset replacement or upgrade, infiltration/inflow mitigation projects, and projects related to existing sewers, pump stations, storage facilities, treatment facilities, large equipment, utility vehicles, emergency repairs, and power/electrical systems.
- **Costs not eligible** include work or services associated with basin/watershed studies, permit renewal applications, financing, grant/loan applications, website updates or upgrades, facility remodeling, property acquisitions and land purchases, urban forestation or tree planting, landscaping, wetlands restoration, river/stream bank erosion or protection projects, aesthetic improvements not related to asset performance, Drainage Response Initiative (DRI) projects, construction of new sewers in unsewered areas, litigation, and annual operating budget line items such power, chemicals, labor, crane rental, or services associated with preventative or minor corrective maintenance costing less than $5,000. These costs are to be excluded from the AM Program accounting unless they are associated with an Asset Management Project need.

In 2020, MSD embarked upon a comprehensive effort to consolidate its approach and AM programs across all asset types (wastewater, stormwater, and flood protection) in accordance with utility industry standard principles and guidelines. MSD is working through the following multi-step process to reach this goal:

- Assessment: Gap analysis of current asset management program and tools = October 31, 2020
- Level 1: Development of Strategic Asset Management Plan (SAMP) = June 30, 2021
- Level 2: Development of the first Tactical Asset Management Plan (TAMP) = December 31, 2021
- Level 2: Development of second round of TAMPs = December 31, 2022

A gap analysis of the existing program has been completed and an action plan has been developed for implementation of a Level 1 SAMP and Level 2 TAMPs system-wide within five years. Key actions in the initial stages of the plan include developing, documenting or refining existing processes to support risk management and mitigation, decision making and capital planning, operations and maintenance, and data management. These actions will provide the data needed to support a risk-based, data-driven asset management strategy across the organization.

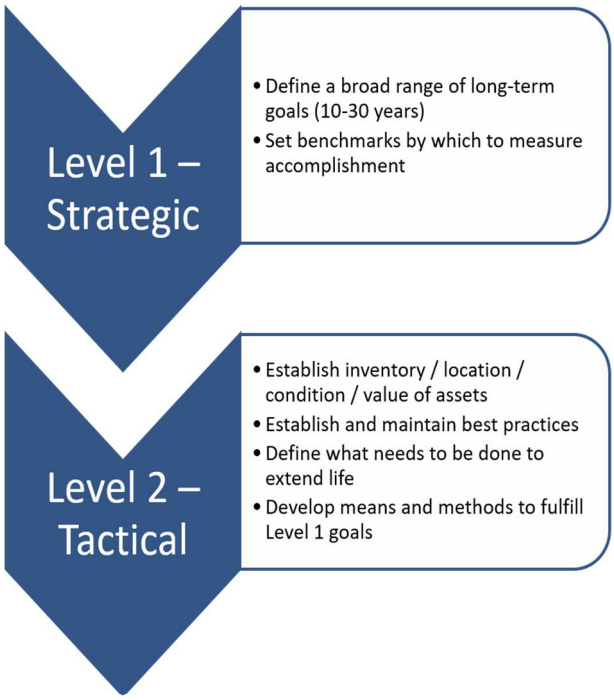

Figure 4.7-11. MSD's Asset Management Approach

MSD's refined AM Program development involves two levels of work. The first strategic level develops the framework and benchmarks for the program. In October 2020, MSD advanced the Level 1 strategic framework. MSD's CIP Management Team is the sponsor of the asset management program, holding all staff accountable for its progress. MSD has established an Asset Management Steering Committee with cross-functional skills represented across MSD that are important for successful implementation given the diversity of the areas under development.

The second level develops the approaches and methods to be used within the framework to define specific projects and assets in need of capital funding and the appropriate funding mechanism. These specific projects will be included within the 5-Year AM Plans to be provided to the Regulators.

Given the timing of the 2021 IOAP modification and MSD's progress to-date with developing a comprehensive asset management program, the first 5-Year AM Plan provided to the Regulators will be the SAMP with a list of known capital needs and projects for existing assets.

4.7.3.3. FIRST 5-YEAR AM PLAN (FY 2021 THROUGH FY 2025)

The first of the three 5-Year AM Plans will be developed based upon the needs that have already been identified and documented. MSD manages its assets in accordance with industry standard guidelines related to condition assessment, risk mitigation, and capital planning. MSD will submit the first 5-Year AM Plan no later than June 30, 2021 in accordance with the Second ACD.

4.7.3.3.1. STRATEGIC ASSET MANAGEMENT PLAN (SAMP)

The SAMP serves to standardize and document MSD's asset management program implementation. The plan will be structured as a reference for MSD's strategic AM practices. We anticipate the following information will be included in the SAMP to be provided to the Regulators by June 30, 2021.

- Condition assessment evaluation
- Operation and maintenance strategies
- Level of Service and performance metrics
- Rehabilitation, repair and replacement strategies
- Capital planning and decision making
- Information systems and data management
- MSD's Organizational framework

The SAMP will define and clarify how MSD will deliver its asset management program. It will not provide a list of tactical capital projects. In addition to the SAMP content noted above, MSD will provide a list of known needs that have been incorporated into the annual CIP for each 5-Year AM Plan to be provided in accordance with the Second ACD.

The TAMPs will identify and prioritize specific capital needs for MSD assets. The following wastewater related TAMPs will be developed over the next 5-years:

- Morris Forman WQTC
- Wastewater Collection System
- Regional WQTCs
- Bells Lane Wet Weather Treatment Facility

4.7.3.3.2. PRELIMINARY LIST OF CIP PROJECTS

Over the past several years, MSD has evaluated its assets and developed a prioritization methodology for capital needs. The result of this work is a list of CIP project candidates to improve existing wastewater assets. A preliminary listing of AM candidate projects is provided in **Error! Reference source not found.**. This list of projects excludes the following:

- Consent Decree required work for the remaining LTCP projects (refer to Volume 2, Chapter 4)
- Consent Decree required work from the remaining SSDP (refer to Volume 3, Chapter 4)
- New work added to the 2021 IOAP Modification for the Morris Forman WQTC New Biosolids Facility and Paddy's Run Pump Station Capacity Improvements (refer to Volume 1, Chapter 4, Section 7.1)
- Projects included in the Morris Forman WQTC State Agreed Order Corrective Action Plan (refer to Volume 1, Chapter 4, Section 7.1)
- Critical sewers to be addressed under the Specific Remedial Program for FY21 through FY25 (refer to Volume 1, Chapter 4, Section 7.2)

Table 4.7-4 Preliminary List of 5-Year AM Candidate Projects

MSD BUDGET ID	PROJECT NAME	ESTIMATED COST
C20332	Admiral Pump Station Foundation Repairs	$ 263,500
D20222	Bells Lane Grit Classifier Drain Line	$ 113,100
D20224	Bells Lane PAA System	$ 602,100
D20223	Bells Lane WWTF Polymer Feed System Improvements	$ 332,000
F20321	Bluegrass Fields PS Renovation	$ 511,000
E15036	Broad Fern Pump Station Elimination	$ 287,000
D20149	Cedar Creek WQTC Admin Building Expansion.	$ 1,067,000
D19039	Cedar Creek WQTC Effluent Parshall Flume Upgrade	$ 1,786,000
D16272	Cedar Creek WQTC Influent PS MCC Upgrades	$ 757,000
D16274	Cedar Creek WQTC Oxidation Ditch Mods	$ 375,000
D16273	Cedar Creek WQTC Power Reduction Mods	$ 124,000
A18069	Cedar Creek WQTC Service Area Back-Up Power For Critical Pump Stations	$ 895,000
E21118	Cedar Creek WQTC Service Area Inventory For Critical Pump Stations	$ 708,000
D20017	Cedar Creek WQTC Sodium Aluminate Building	$ 814,000
D18090	Cedar Creek WQTC Solids Dewatering Handling Facility (& Dig. Decant Enhance)	$ 5,020,000
D17032	Cedar Creek WQTC Tertiary Filtration	$ 5,812,000
D16275	Cedar Creek WQTC WAS Cycle Automation	$ 187,000
D20016	Derek R. Guthrie WQTC Admin and RAS Buildings HVAC	$ 678,000
New_BD163	Derek R. Guthrie WQTC Replace Clarifiers 4, 5, & 6	$ 1,374,000
D18093	Derek R. Guthrie WQTC Alternative Outfall	$ 3,590,000
D18292	Derek R. Guthrie WQTC Clarifier Grout Repair and RAS Gate Replacement	$ 2,551,000
D21129	Derek R. Guthrie WQTC Elevator Repairs	$ 1,123,000
D20278	Derek R. Guthrie WQTC RAS Building Electrical Modifications	$ 235,000
A18073	Derek R. Guthrie WQTC Service Area Back-Up Power For Critical Pump Stations	$ 1,119,000
E21116	Derek R. Guthrie WQTC Service Area Inventory For Critical Pump Stations	$ 631,000
E18065	Derek R. Guthrie WQTC Service Area Upgrade Critical PSs With Inadequate Capacity	$ 730,000
D20286	Derek R. Guthrie WQTC Substation U-13 Modifications	$ 150,000
D18132	Derek R. Guthrie WQTC WWPS WW Screen Bldg HVAC	$ 1,030,000
A18068	Floyds Fork WQTC Service Area Back-Up Power For Critical Pump Stations	$ 672,000
X_0166	Floyds Fork WQTC Service Area Inventory For Critical Pump Stations	$ 682,000
D18092	Floyds Fork WQTC Solids Dewatering Handling Facility RR	$ 5,195,000
Annual	CMOM Collection System PS RR	$ 2,500,000
Annual	CMOM Gravity Line Cleaning & Inspection	$ 6,675,000
Annual	Morris Forman WQTC Equipment RR	$ 13,100,000
Annual	Miscellaneous Facility Repairs	$ 1,090,000

Table 4.7-4 Preliminary List of 5-Year AM Candidate Projects

MSD BUDGET ID	PROJECT NAME	ESTIMATED COST
Annual	MSD Owned Building Roof Replacements	$ 2,025,000
Annual	Operations Renewal & Replacement	$ 10,300,000
Annual	Regional WQTC RR	$ 7,500,000
A14129	Gorham Way Pump Station Elimination	$ 286,000
A18077	Hite Creek WQTC Service Area Back-Up Power For Critical Pump Stations	$ 1,900,000
K18067	Hite Creek WQTC Service Area Inventory For Critical Pump Stations	$ 1,178,000
D21057	Hite Creek WQTC Sodium Aluminate Feed Automation	$ 129,000
D20008	Kirby Lane Pump Station Elimination	$ 860,000
E15035	Lake Forest Pump Station Eliminations	$ 893,000
A20006	Lea Ann Way Pump Station Elimination	$ 13,587,000
G18417	Morris Forman WQTC Admin. Building Roof Replacement	$ 356,000
D15024	Morris Forman WQTC Chiller Replacement	$ 477,000
D18161	Morris Forman WQTC Chlorine Contact Tanks Structural Repairs	$ 308,000
D17039	Morris Forman WQTC DAFT Rehab and TWAS Piping Replacement	$ 3,680,000
G20028	Morris Forman WQTC Elevator Repairs	$ 1,895,000
D18121	Morris Forman WQTC Heat Polymer Water	$ 356,000
D20304	Morris Forman WQTC Headworks and Blower Building Repairs	$ 307,000
D18159	Morris Forman WQTC HPO Tanks (Battery A, B, and C) Structural Repairs	$ 2,607,000
D18162	Morris Forman WQTC Final Effluent Pump Station (FEPS) Structural Repairs	$ 66,000
D18157	Morris Forman WQTC North And South Primary Sludge PS Structural Repairs	$ 142,000
F14181	Morris Forman WQTC Process Water Pump & VFD	$ 100,000
D19048	Morris Forman WQTC Radio Repeater	$ 528,000
D18160	Morris Forman WQTC Secondary Clarifiers Structural Repairs	$ 186,000
D18156	Morris Forman WQTC Service And Blower Building Structural Repairs	$ 124,000
A18088	Morris Forman WQTC Service Area - Enhanced Odor Control For Two Pump Stations	$ 2,518,000
A18082	Morris Forman WQTC Service Area Back-Up Power For Critical Pump Stations	$ 2,844,000
E21120	Morris Forman WQTC Service Area Inventory For Critical Pump Stations	$ 1,886,000
E18084	Morris Forman WQTC Service Area Upgrade Critical PSs With Inadequate Capacity	$ 2,543,000
D21104	Morris Forman WQTC Sewer and Manhole Rehab	$ 469,000
D18118	Morris Forman WQTC Truck Unloading Station Pavement Repair	$ 59,000
E21062	Modesto Pump Station Elimination	$ 320,000
D20010	Northern Ditch Pump Station Odor Control	$ 715,000
D20011	Northern Ditch Pump Station Replacement	$ 20,947,000
D18285	ORFM Odor and Corrosion Control	$ 2,325,000
E21066	Pirogue Pump Station Elimination	$ 720,000

Table 4.7-4 Preliminary List of 5-Year AM Candidate Projects

MSD BUDGET ID	PROJECT NAME	ESTIMATED COST
E21070	Rosa Terrace PS Elimination	$ 4,405,300
E21091	Sanders Lane PS Rehabilitation	$ 690,000
A18485	Shady Villa Pump Station Elimination	$ 1,356,000
H16076	Sneads Branch Pump Replacement	$ 726,000
E21090	Sonne Avenue PS Elimination	$ 2,298,000
D19286	SWPS Gas Monitoring	$ 569,000
E21071	Wathen Lane PS Rehabilitation	$ 1,559,000
	Total	**$ 159,518,000**

Note: This list of projects excludes MFWQTC Corrective Action Plan, Critical Interceptors, MFWQTC New Biosolids Facility.

A brief overview of information used to generate the preliminary list of capital projects candidates is provided herein. The list of projects may change due to changed asset condition; risk prioritization; construction coordination; or other unforeseen capital need.

4.7.3.3.3. CRITICAL REPAIR AND REINVESTMENT PLAN (CRRP)

In 2014-2017 MSD worked with its consultants to determine the highest priority project needs over the next 20-year period. The CRRP identified needs for infrastructure rehabilitation, renewal, replacement, upgrade, and expansion. As the CRRP was being developed, infrastructure condition assessments were performed including staff interviews, visual inspections, and in some cases diagnostic measurements. A number of projects were determined to be critically needed to correct the past under-investment in asset renewal and replacement. A review of maintenance trends confirmed the number of infrastructure failures was directly related to an asset's age.

The CRRP used the same project evaluation and prioritization approach used to develop the IOAP. A values-based benefit/cost evaluation assisted with developing scoring scales to grade projects on their effectiveness by considering environmental protection; public health protection; regulatory compliance; sustainability; property protection; and economic vitality. The values-based benefit scores were coupled with life-cycle cost information to develop a benefit/cost score that was used as the first round of project prioritization. This approach was supplemented with a risk evaluation by determining the likelihood of failure and consequence of failure and resulting infrastructure risk. The anticipated change in risk resulting from implementing a project resulted in a risk reduction factor that was used in conjunction with the benefit/cost score to prioritize projects. The CRRP, consistent with EPA's June 2012 Integrated Planning Framework, included public participation in the prioritization of projects.

4.7.3.3.4. CMOM-BASED GRAVITY SEWERS AM PLAN

In 2017-2018, in conjunction with development of its Continuous Sewer System Assessment Protocol, MSD incorporated industry-standard asset management approaches for gravity sewers. Condition assessments were performed followed by data evaluation and quantification of asset defects. The data was used to calculate pipe ratings and indexes using the National Association of Sewer Service Companies' (NASSCO) Pipeline

Assessment and Certification Program (PACP) Condition Grading System. Ratings and indexes were calculated for overall defects, structural defects including corrosion, and O&M defects per the NASSCO guidance. MSD also developed additional ratings and indexes to identify specific defects, such as infiltration and fats, oils, and grease (FOG), or to prescribe specific maintenance activities, such as root cutting or point repair.

MSD developed a risk register for gravity sewer mains based on the likelihood of failure and the consequence of failure at the segment level, similar to the process described in NASSCO's PACP-Based Risk Management. This information is used to inform the annual CIP.

4.7.3.4. SECOND AND THIRD 5-YEAR AM PLANS

The projects to be proposed for the second and third 5-year AM Plans will be selected based on the criteria developed for each facility or system established in the Level 2 TAMPs as well as known and previous documented capital needs.

4.7.3.5. COMPLIANCE WITH CONSENT DECREE

MSD's compliance with the Asset Management requirement of the Second ACD will be based upon the total expenditures related to the work defined in Section 4.7.3 herein. MSD will report total annual expenditures in each Annual Consent Decree report. The determination for compliance and the penalties associated with under investment/performance during each 5-year AM program are specified in the Second ACD.

APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 5

METROPOLITAN SEWER DISTRICT

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TABLES

FIGURES

APPENDICES

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Chapter 5: REGULATORY COMPLIANCE

Special Note: This chapter was developed in 2009. The statistical data for the CSO's reported, specifically related to individual CSO overflow volumes and frequency in a typical rainfall year, were derived from the CSS model calibrated in 2007. Since then, a more detailed calibration and validation effort has adjusted the average annual overflow volumes and frequencies in the Typical Year. This information is provided in Volume 2, Chapters 3 and 4. The vast majority of the physical system characterization in this chapter is still accurate. As with the 2012 IOAP submittal, Volume 1, Chapter 5 does not have any appendices.

This Chapter illustrates the approaches that the Louisville and Jefferson County Metropolitan Sewer District (MSD) has taken through the Integrated Overflow Abatement Plan (IOAP) to comply with the regulatory requirements of the Consent Decree, the Clean Water Act (CWA), and the Combined Sewer Overflow (CSO) Control Policy.

5.1. MEETING THE REQUIREMENTS OF THE CONSENT DECREE

On August 12, 2005, MSD entered into a Consent Decree with the U.S. Environmental Protection Agency (EPA) and the Kentucky Environmental and Public Protection Cabinet to address wet weather overflows within the separate sewer system (SSS) and the combined sewer systems (CSS). The stated objective of the Consent Decree is to further the objectives of the CWA; eliminate unauthorized discharges from MSD's SSS, CSS, and water quality treatment centers (WQTCs); and to address discharges from MSD's CSO locations identified in the Kentucky Pollutant Discharge Elimination System (KPDES) permit for the Morris Forman WQTC. The Consent Decree outlines the compliance program and schedules for achieving specific objectives, including the development of discharge abatement plans.

On December 1, 2008, a draft Amended Consent Decree (ACD) was released for public comment. The draft ACD addressed alleged violations of the CWA primarily related to WQTC performance, record-keeping, and reporting. Public comment closed on the draft ACD on December 31, 2008. The ACD was filed in Federal Court on April 15, 2009. MSD is currently negotiating a 2nd ACD to modify project schedules and incorporate additional elements to comply with the objectives of the Consent Decree and the original IOAP. For the purpose of the IOAP, the term "Consent Decree" will be understood to mean the 2021 ACD, unless specifically noted otherwise.

The discharge abatement plans required by the 2009 ACED included both interim and final plans. The requirements of the interim plans and the updated SSOP have since been completed, and the 2021 ACD removes the language discussing those requirements. The abatement plans required by the 2009 ACD include:

- An Updated Sanitary Sewer Overflow Plan (SSOP), was submitted February 10, 2006, in accordance with Consent Decree Requirements.
- An Interim Sanitary Sewer Discharge Plan (SSDP) was submitted in accordance with the Consent Decree and approved on July 28, 2008. The Interim SSDP addresses unauthorized discharges in the Beechwood Village and Hikes Point areas, at the Highgate Springs Pump Station, and at the Southeastern Diversion Structure.
- An Interim Long-Term Control Plan (LTCP) was submitted in accordance with the Consent Decree and approved on February 27, 2007.

- A Final LTCP to address discharges from permitted CSOs, was submitted as Volume 2 of the 2009 IOAP; and
- A Final SSDP intended to eliminate unauthorized discharges from MSD's SSS, CSS, and WQTCs, was submitted as Volume 3 of the2009 IOAP.

Volume 1, Chapter 5 describes how the IOAP complies with the Consent Decree and its underlying laws, regulations, policies, and guidance documents. The purpose of this chapter is not to address compliance with the Nine Minimum Controls (NMCs); the Sewer Overflow Response Protocol (SORP), the Capacity Management Operations and Maintenance (CMOM) Self-Assessment Report, or the Early Action projects required by the Consent Decree. These plans have been submitted separately and approved by EPA and KDEP. It should be recognized, however, that compliance with the Consent Decree, CWA, and the CSO Control Policy all require plan elements in combination with the NMCs, the CMOM program, the SORP program, and the Final LTCP. Similarly, elimination of unauthorized discharges in MSD's sewerage system requires coordinated implementation of the SORP, CMOM, and Final SSDP.

5.1.1. KEY FINDINGS

The 2021 IOAP Update has been organized to show compliance with the second criterion of the Presumption Approach as described in the CSO Policy which states:

> *ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis.*

Selection of the Presumption Approach has been made in close coordination with the regulatory agencies. Based on a review of the system characterization and past water quality monitoring and modeling, the regulatory agencies have determined that it is reasonable to presume that MSD's proposed approach, once fully implemented, "would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA…"[CSO Policy]

It is important to note that consistent with this approach, the Post Construction Compliance Monitoring Program will involve flow metering of the collection system and updated modeling to confirm achievement of the target percent capture values. Once system performance has been validated, KDOW will coordinate with MSD to transition to a post LTCP permit that requires continued operation and maintenance of the controls necessary to maintain compliance.

The key findings below were developed as part of the 2009 IOAP. Previous water quality information is still provided in the updated 2021 IOAP for reference. Water quality data in this section and in this chapter refer to modeling performed in 2007 and 2008 using available data at the time. The 2021 IOAP is similar to the 2009 IOAP with respect to systemwide reduction in overflow volumes and water quality improvements are expected to be similar. Furthermore, measured reductions of Beargrass Creek and Ohio River bacteria levels during wet weather compared to pre-construction data support the environmental and health benefits of IOAP implementation as the general validity of the 2007 water quality modeling.

A. The Final LTCP includes a complementary combination of gray and green infrastructure as well as continued pollution prevention, and behavior modification outreach programs that when combined jointly results in full compliance with the CSO Control Policy and the Consent Decree (Volume 1, Chapter 3, Section 3.3.3 and Volume 2, Chapter 4, Section 4.1.2).

B. The CSO Control Policy requires provisions to make use of the maximum storage available in the system. MSD's evaluation of in-line storage opportunities and use of Real Time Control (RTC) systems

to maximize the effective use of storage opportunities demonstrates compliance with this requirement (Volume 2, Chapter 4, Section 4.1.2).

C. The CSO Control Policy also requires provisions to maximize the use of existing WQTC capacity. MSD's previous evaluations of the wet weather capacity of the Morris Forman WQTC resulted in facility modifications that have maximized wet weather treatment on that site. A further evaluation of the current facility and site constraints at the Morris Forman WQTC concluded that no additional treatment capacity could be added to the existing site (Volume 2, Chapter 3, Sections 3.2.4 and 3.2.7).

D. The IOAP considers the entire watershed in its approach to control both CSOs and SSOs (Volume 2, Chapter 2, Section 2.9, and Chapter 4, Sections 4.1.3 and 4.4). Consistent with the CSO Control Policy and guidance, the IOAP incorporates a Final LTCP that includes extensive analysis of current water quality conditions, including the impacts of CSOs and other pollutant sources and pathways on water quality standards attainment. The Final LTCP evaluates the cost, performance and likely water quality improvements associated with a wide range of CSO control alternatives. The Final LTCP also evaluates control measures based on cost, performance and cost-benefit criteria as established by the Wet Weather Team (WWT) Stakeholder Group and consistent with EPA memos and guidance[1]

E. Implementing the Final LTCP will achieve an estimated 95 percent capture and treatment of the combined sewage that is collected during wet weather under most operating scenarios. This wet weather capture performance exceeds the minimum requirements of the CSO Policy Presumption Approach, that requires at least 85 percent capture and treatment (Volume 2, Chapter 4, Section 4.1.1).

F. Implementing the Final LTCP will improve the water quality in the Ohio River and all three forks of Beargrass Creek. Water quality modeling predicts that the remaining CSO wet weather loads (after removing background) will not cause exceedances of the applicable water quality criteria for the protection of contact recreation on the Ohio River or Beargrass Creek (Volume 2, Chapter 4, Section 4.4).

G. Water quality modeling on both the Ohio River and Beargrass Creek predict continued water quality challenges and water quality standard violations, primarily due to pollution sources not attributable to CSOs. The total Final LTCP program costs and the selection of project alternatives are based on the "knee of the curve" analysis which indicates clearly where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs of control. This approach is entirely consistent with the CSO Policy and LTCP guidance documents[2] (Volume 2, Chapter 4, Section 4.1.3).

H. Consistent with the CSO Policy, it appears that in Beargrass Creek water quality standards exceedances are significantly influenced by natural background conditions or pollution sources other than CSO (Volume 2, Chapter 4, Section 4.1.3).The implementation schedule for the gray and green infrastructure programs is consistent with the values, goals and objectives of the IOAP. The schedule shows early implementation of the green infrastructure program, incorporating a Post Construction

[1] US EPA Memorandum from Michael B. Cook, Director of the Office of Wastewater Management and Eric Shaffer, Director of the Office of Regulatory Enforcement to the Water Division Director Regions I-X; , July 7, 1999 , Subject: Water Quality Attainment and Technology –Based CSO Requirements; page 2.

US EPA Memorandum from Robert Perciasepe, Assistant Administrator, Office of Water and Steven A. Herman, Assistant Administrator Office of Enforcement and Compliance Assurance to Water Management Division Directors Regions 1-10; Regional Counsels, Regions 1-10 and State Directors, May 19, 1998; Subject: Implementation of the CSO Policy; pages 3 and 4.

[2] US EPA, National CSO Control Policy, EPA 830-B-94-001, April 1994; Section II.C.5; and US EPA, Office of Water (4204) EPA 832-B-95-002, September 1995, Combined Sewer Overflows Guidance for Long-term Control Plan; Chapter 3, Section 3.4.3.

Monitoring Program to ensure that gray infrastructure projects in later phases are properly sized and designed. The phased implementation of the IOAP schedule is affordable, and consistent with the CSO Policy and guidance on phased implementation and affordability (Volume 1, Chapter 6, Sections 6.3 and 6.4).

I. The development of the IOAP relied on an analytical framework using a values-based performance evaluation framework established by the WWT. This framework is recommended in the "Guide to Managing Peak Wet Weather Flows in Municipal Wastewater Systems" (WEF 2006), a guidance manual jointly sponsored by the Water Environment Federation (WEF) and the EPA. The framework included a robust benefit-cost scoring methodology for evaluating and selecting project alternatives and a systematic process for evaluating the IOAP programmatically (Volume 1, Chapter 2, Section 2.5).

J. The suite of projects selected for the Final SSDP will result in the elimination of capacity related SSOs up to the specified level of control (Volume 3, Chapter 4, Section 4.2).

K. The WWT agreed that a three-hour "cloudburst" storm with a statistically anticipated rainfall of 1.82 inches as the minimum design storm considered is consistent with the values-based evaluation framework for determining elimination of SSOs. The cloudburst storm approach at a similar recurrence interval has previously been approved for this application in Atlanta, Georgia, and elsewhere. Consistent with the site-specific nature of wet weather flows however, the WWT determined that in some specific locations, a higher level of control could be provided at a reasonable cost. (Volume 3, Chapter 4, Section 4.1).

L. With the full implementation of the Final LTCP and the Final SSDP, sewer overflows will not be the cause of water quality standards exceedances in the Ohio River (Volume 2, Chapter 4, Section 4.2).

M. With full implementation of the Final LTCP and Final SSDP, sewer overflows will not be the cause of water quality standards exceedances in Beargrass Creek (Volume 2, Chapter 4, Section 4.2).

5.2. MEETING WATER QUALITY CRITERIA AND CSO POLICY REQUIREMENTS

The Consent Decree requires that the Final LTCP be developed to comply with the CSO Control Policy. The CSO Control Policy provides a comprehensive approach to developing a reasonable and affordable way of achieving water quality standards and public health objectives. Following the approach outlined in the CSO Control Policy, MSD worked with regulators and the interested stakeholders to develop a site-specific plan that is both affordable and compliant with applicable regulations. The CSO Control Policy recognizes that control of CSOs is site-specific based on rainfall patterns, the receiving waters, and the existing sewer system.

Consequently, the required Final LTCP should consider not only the site-specific nature of the CSOs in Louisville Metro, but the range of cost-effective control options and strategies that could be implemented to control CSOs and provide water quality and public health protection. The result of this analysis should be a Final LTCP that:

- Chooses either the Presumption Approach or the Demonstration Approach.
- Takes into account the cost and performance of the selected alternatives to identify where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs (commonly known as the knee of the curve).

- Describes how the plan maximizes the delivery of the wet weather flows to the existing WQTC for treatment and disinfection.
- Provides a construction and financing schedule which may be phased based on the relative importance of the specific projects in the plan and is consistent with the financial capability of the rate payers in the MSD service area; and
- Includes a Post Construction Compliance and Monitoring Program adequate to verify the performance of CSO controls which, per the approval of this IOAP, have been "presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA" [CSO Policy].

As required, all these elements of a Final LTCP should be developed by working with the permitting and regulatory agencies and while engaging the public fully in the stakeholder process of selecting the alternatives and making decisions.

The CSO Control Policy itself has many components and should be considered and applied jointly and holistically in a coordinated fashion to provide the most comprehensive and cost-effective approaches to CSO control. Additionally, the CSO Control Policy encourages innovation and alternative approaches and technologies to be applied in a site-specific manner (consistent with the characteristics of the wet weather flows and sewer systems and the public acceptance and affordability of the program) to achieve the agreed upon control of CSO.

MSD recognizes the uniqueness of the CSO Control Policy and the flexibility of the policy to allow for a watershed approach to water quality allowing for the development of an innovative and cost-effective plan. MSD's Final LTCP takes into account the requirements to:

- Control CSOs,
- Eliminate unauthorized discharges,
- Implement the NMCs,
- Educate and engage the public to reduce the discharges to the collection systems in peak wet periods,
- Apply cost-benefit analysis to ensure that public funds will produce water quality and other public results and benefits, and
- Incorporate the most reasonable and practical development of green infrastructure to reduce the runoff of stormwater into the collection system.

5.2.1. PRESUMPTION AND DEMONSTRATION APPROACHES TO LONG TERM CONTROL OF CSOS

The CSO Policy identifies two approaches, the "demonstration" and the "presumption" approaches to establish targets for CSO controls that will protect water quality and designated uses (59 Code of Federal Regulations {CFR} 18688). The CSO Policy provides the flexibility to choose either approach, or a combination of these approaches, as long as the LTCP shows reasonable attainment of water quality.

The Presumption Approach was conceived as a high level of control with explicit performance criteria. This presumed adequate control approach would be considered reasonable in light of the available characterization, monitoring, modeling and water quality information. The Presumption Approach requires a program to meet any of the following three criteria; allow no more than an average of four overflows per a program to meet any

of the following three criteria; allow no more than an average of four overflows per year, elimination or capture for treatment of 85 percent of the combined sewer flow collected in the CSS during precipitation events on a system-wide annual average basis; or a reduction of not less than the mass of pollutants that were identified as causing water quality impairments.

The Demonstration Approach allows a municipal agency to apply site-specific parameters to choose a control program that is different from what is required by the Presumption Approach (typically lower levels of capture than required by the Presumption Approach) as long as it can be shown to meet water quality standards and protect designated uses. In addition, the continued overflows should not preclude the attainment of standards or impairment of the uses. If natural background or other sources of pollution or conditions do cause impairments, then a TMDL should be developed.

When MSD established the WWT and embarked upon the development of the values-based risk approach to all overflow abatement (for both CSOs and SSOs), the process produced a Final LTCP consistent with the CSO Control Policy. The Final LTCP is consistent with the Presumption Approach of the CSO Control Policy as the system will capture a minimum 85%. MSD's hydraulic model indicates that a 95% capture rate is achievable for the CSS under most operating scenarios.

As described in Chapter 3 of the Final LTCP, one of the Presumption Approach criterion (four overflows per year maximum) was used to initially size control alternatives for all CSOs. To establish the best technical solution for each of the CSOs, site-specific technology approaches were identified by applying a cost-benefit tool with an initial control level of four overflows per year. Alternative solutions were then established using other levels of control, namely zero, two, and eight overflows per year.

Since the approval of the 2012 IOAP Modification, MSD has experienced a reduction in wet weather treatment capacity at Morris Forman WQTC. This reduction in wet weather treatment capacity results in a percent capture of CSO volume of 95 percent. The 2021 IOAP update includes significant capital projects to restore the wet weather capacity at Morris Forman WQTC. However, due to the age and nature of the infrastructure at the WQTC, and to be more inline with standard engineering practices, the 2021 IOAP will be based on the firm capacity of the Morris Forman WQTC. While MSD fully intends to operate the WQTC at its maximum capacity as often as possible, planned and emergency maintenance and repair projects may require specific plant components to be repaired or replaced, which would limit the plant capacity. Therefore, the 2021 LTCP modification results in an anticipated overall percent capture of 95%, greatly exceeding the 85% required in the Presumption Approach. Water quality results from 2009 and the knee of the curve analysis from 2009 demonstrate that this level of control results in an appropriate, cost-effective level of CSO control that would result in full compliance with water quality standards in a Typical Year if background loads were not present. Some water quality information is still provided for reference in this document. However, the 2021 Final LTCP exceeds the requirements of the Presumption Approach.

The Consent Decree also requires that the Final LTCP shall meet the following conditions:

- If CSOs occur, they will only be the result of wet weather including activities to address those discharges resulting from MSD's compliance with the requirements of the United States Army Corp of Engineers (USACE) Ohio River Flood Protection System Pumping Operations Manual, dated 1954 and revised 1988.
    - The Final LTCP contains a detailed analysis of the flood pump station operating protocols that initially resulted in dry-weather CSOs. An approach was developed and implemented to eliminate the need for the operating conditions that caused these dry weather overflows.

  - Projects identified in the Final LTCP included modifications to gate and actuators where necessary to implement the revised operating strategies. MSD opened discussions with the USACE to obtain their agreement that the operating protocols could be changed. The capital improvements were completed, and the protocols have been changed.
  - The flood pump station evaluation is discussed in Volume 2, Chapter 2, and the full report is appended to that chapter. Capital projects required to implement the proposed revisions to the operating strategies are described in Volume 2, Chapter 4.

- All wet weather overflow points must comply with the technology and water quality requirements of the CWA and minimize the impacts on water quality, biota and human health. The technology requirements for the CSO overflows are the NMCs.
  - MSD showed compliance with the NMC in the September 15, 2006, report.

This is further discussed in Section 5.2.1 below.

According to the Consent Decree, CSO Policy, and LTCP guidance, the Final LTCP must have the following elements:

- Characterization, monitoring and modeling and design parameters as the basis for selection and design of effective CSO controls, (including control to address those discharges resulting from MSD's compliance with the requirements of the USACE' "Ohio River Flood Protection System Pumping Operations Manual," dated 1954 and revised 1988). This is addressed in Volume 2, Chapter 2.
- Results of the evaluation of WQTC peak flow treatment capacity for any WQTC, other than the Morris Forman WQTC, that will receive additional flow based on the MSD Final LTCP project. Such evaluation shall be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach," EPA CERI, October 1984, and "Retrofitting POTWs," EPA CERI, July 1989. The Morris Forman WQTC is the only treatment facility in MSD's system that receives combined sewage; therefore, none of MSD's WQTCs require this evaluation as part of the Final LTCP. The capacity of the Morris Forman WQTC is addressed in Volume 2, Chapter 3.
- A report on the public participation process. The public participation process is discussed in detail in Volume 1, Chapter 3, and the specific role of public participation on the Final LTCP is contained in Volume 2, Chapter 4.
- Identification of how the Final LTCP addresses sensitive areas as the highest priority for controlling overflows. Sensitive areas are addressed in Volume 2, Chapters 2 and 4.
- A report on the cost analysis of the alternatives considered. The cost analysis for alternative selection is addressed in Volume 2 Chapter 3. The development of budget costs for the selected alternatives is discussed in Volume 2 Chapter 4. The analysis of the impact of capital and operating costs on projected rates is addressed in Volume 1 Chapter 6, as is an analysis of the affordability of the projected rates.
- Operational plan revisions to include agreed-upon long-term CSO controls. The operational plan for all the projects in the IOAP is contained in Volume 1, Chapter 6.
- Maximization of treatment at MSD's WQTCs for wet weather flows to ensure that these flows receive at least the equivalent of primary clarification, removal of solids and floatables (S&F) and disinfection before being discharged to the receiving waters. Maximization of treatment at the Morris Forman WQTC

was addressed in Section 3 of the updated NMC Compliance Report of September 15, 2006, and is addressed in the IOAP in Volume 2, Chapter 3.

- Schedule for implementation of the CSO controls that are selected by the plan including a phasing plan which considers protection first of sensitive uses and financial capability and viable funding of the program, including users fees. Prioritizing and scheduling are addressed in Volume 1, Chapter 6, and Volume 2, Chapter 4.
- A Post-Construction Compliance Monitoring Program adequate to verify compliance with water quality-based CWA requirements and ascertain the effectiveness of the CSO controls. The Post-Construction Compliance Monitoring Program for the entire IOAP is presented in Volume 1, Chapter 6, Section 6.3.

The IOAP includes a suite of gray and green infrastructure projects to control wet weather CSOs. The plan is comprised of sewer separations, offline storage basins, pump station upgrades, inline storage, two green infrastructure projects, and a high rate wet weather treatment system. The final project list is described in Volume 2, Chapter 4 and in the Executive Summary.

In addition, the five projects identified at flood pump stations to allow MSD to make operational changes that address dry weather overflows resulting from USACE operating rules for the flood protection system have been completed.

The 2009 IOAP also identified a number of complementary green infrastructure wet weather and water quality programs managed by MSD and/or by other community partners. These complementary efforts have included partners such as the Mayor's Green City Initiative, the Partnership for a Green City, the Louisville Metro Office of Sustainability, Louisville Metro's Municipal Separate Storm Sewer System (MS4) stormwater permit, and initiatives of Jefferson County Public Schools (JCPS), University of Louisville, private developers, and other partnering entities. The Final LTCP outlines proposed budgets to provide subsidies and incentives to potential partners and to encourage them to implement green infrastructure that can reduce the amount of stormwater runoff that reaches the CSS. In 2009 green infrastructure was a relatively new technology. MSD has been at the leading edge of the analysis and impacts of various green infrastructure technologies. As part of the adaptive management approach, green infrastructure has been incorporated with traditional gray infrastructure projects into the LTCP where it is appropriate and effective. A summary of the implementation and evolution of the green program can be found in Volume 2, Chapters 3 and 4.

5.2.2. WATER QUALITY STANDARDS REVIEW

Implementing the IOAP is expected to improve water quality in both Louisville Metro streams and the Ohio River. MSD's model indicates that under most operating conditions, The IOAP projects, when fully implemented, are projected to achieve 95 percent capture of the wet weather combined sewage generated in the service area, which greatly exceeds EPA's Presumption Approach requirement of 85 percent. Although not required by the Presumption Approach, water quality modeling (described in this chapter), supports that both Beargrass Creek and the Ohio River would be in compliance with existing water quality standards if all background loads were removed. Therefore, successful implementation of projects associated with this IOAP will inherently provide that remaining CSOs, in the absence of other loads, do not by themselves cause a violation of water quality standards. The measured reductions of Beargrass Creek and Ohio River bacteria levels during wet weather compared to pre-construction data support the environmental and health benefits of IOAP implementation.

Both the Consent Decree and the CSO Control Policy require that if control of CSOs alone will not consistently achieve established water quality standards, then the regulatory agency and the CSO community should review

together the causes of the exceedances of the standards and develop a full understanding as to whether the standards are achievable. The CSO Policy has supplemental guidance on compliance approaches available to deal with water quality issues in LTCPs (Michael B. Cook, Director of Wastewater Management, Office of Water, EPA Headquarters, *Water Quality-Based, Technology-Based CSO Requirements;* Memo to Water Division Director Regions I-X; dated July 17, 1999). This memo recognizes the potential that CSO control may not provide for full compliance with water quality standards.

All EPA Policy guidance and memorandum recommend that during the development of the LTCP:

- Use a watershed approach, including extensive analysis of the current water quality conditions, the impacts of the CSO and other sources on water quality attainment.
- Evaluate the cost, performance and likely water quality improvements associated with a wide range of CSO control alternatives and evaluate control measures on a cost/performance criteria.
- Involve State and Federal authorities during the development of information and the decisions about the controls and attainment of water quality; and
- Include stakeholder participation, including consideration of the cost/performance criteria and the potential for water quality attainment or non-attainment.

As stated in a memorandum signed by Assistant Administrator Robert Perciasepe on May 19, 1998,

> *"Site specific data collected as part of the development of the long-term control plan and data from watershed analyses should assist States in evaluating the adequacy of the long-term control plan to contribute to the attainment of water quality standards. Such data will also provide important information necessary for determining whether a use is attainable and, where the designated use is not attainable, the appropriateness of a variance or other revision to the applicable water quality standards."* [3]

Water quality monitoring and modeling clearly demonstrate that overflow control alone is not enough to improve water quality enough to consistently meet water quality standards. The specific water quality exceedances that are anticipated for Louisville Metro are summarized in Volume 2, Chapter 2 (current conditions) and Chapter 4 (expected conditions after implementation of the Final LTCP).

In light of this challenge, MSD's implementation of the IOAP is key to broader contributions to water quality improvement efforts in the community. Review and revision of the water quality standards may be appropriate as MSD implements CSO controls and conducts the appropriate monitoring and model recalibration called for in the post-construction compliance monitoring plan. Ohio River Sanitation Commission (ORSANCO) adopted a provision in its water quality standards for the Ohio River allowing for development and application of alternative criteria if CSO communities have submitted a long-term CSO control plan and a Use Attainability Analysis (UAA) (ORSANCO, 2006).

The IOAP was developed in response to a Consent Decree negotiated with EPA and the KDEP. As such, the IOAP will be a federally enforceable action plan for sewer overflow abatement. The IOAP must, therefore, limit its scope to commitments that directly relate to MSD programs and activities to address CSO and unauthorized discharge issues. Other Louisville Metro community water quality programs, which may be partly or completely

[3] USEPA, Robert Perciasepe, Assistant Administrator Office of Water and Steven A. Herman, Assistant Administrator Office of Enforcement and Compliance Assurance; Memorandum Subject: Implementation of the CSO Control Policy; To: Water Management Division Director, Regions, Regional Counsels Region 1-10, State Directors; May 19, 1999

out of MSD's control, can provide synergistic benefits with the IOAP, but they do not fall under the same level of federal enforcement. These programs may, however, have different mechanisms for ensuring accountability.

5.2.3. EVALUATION OF APPROACHES TO WATER QUALITY STANDARDS COMPLIANCE

MSD developed the IOAP using a values-based performance evaluation framework established by the WWT. The WWT identified five project-specific community values to underpin the analysis and selection of alternatives for the IOAP. Three of these five are fully driven by and consistent with the requirements of the Consent Decree:

- Public health enhancement
- Environmental enhancement
- Regulatory performance

The remaining two project-specific values are Asset Protection and Eco-Friendly Solutions. These project-specific values are not directly related to Consent Decree issues, but reflect additional community values that the WWT Stakeholder Group wanted to factor into IOAP decision-making.

At the same time as these project specific community values were being applied to alternatives, the six programmatic values were also applied including:

1. Customer satisfaction
2. Economic vitality
3. Education
4. Environmental justice and equity
5. Financial equity
6. Financial stewardship

Using a structured decision-making process as framed by the WWT, MSD developed and evaluated overflow abatement control options for the IOAP based on managing risks to these community values. In particular, MSD analyzed each project alternative considered for the IOAP in terms of potential benefits and costs, where "benefits" are quantified based on the anticipated reduction in risks to the community values and "costs" reflect the total capital and operational costs of the alternative. The benefit-cost analysis (same as cost/performance) influences the selection of site-specific abatement approaches or technologies, site-specific levels of protection (within the boundary conditions for CSOs and unauthorized discharges), and the relative priority of projects for implementation. The suite of Final LTCP projects that resulted from this evaluation was then compared with a knee of the curve evaluation and found to be in complete agreement.

Figure 5.2-1 illustrates that the 2009 recommended program achieves 96 percent capture of wet weather flows at a cost of approximately $320 million (2008 dollars) (the 2021 IOAP meets a 95% capture). The cost to achieve 100 percent capture would have cost an additional $600 million. The recommended program is considered to be at the knee of the curve, and further reductions would be beyond the point of diminishing returns. Note that the data points on the curve represent system-wide costs and capture calculated at eight, four, two, and zero overflows per year.

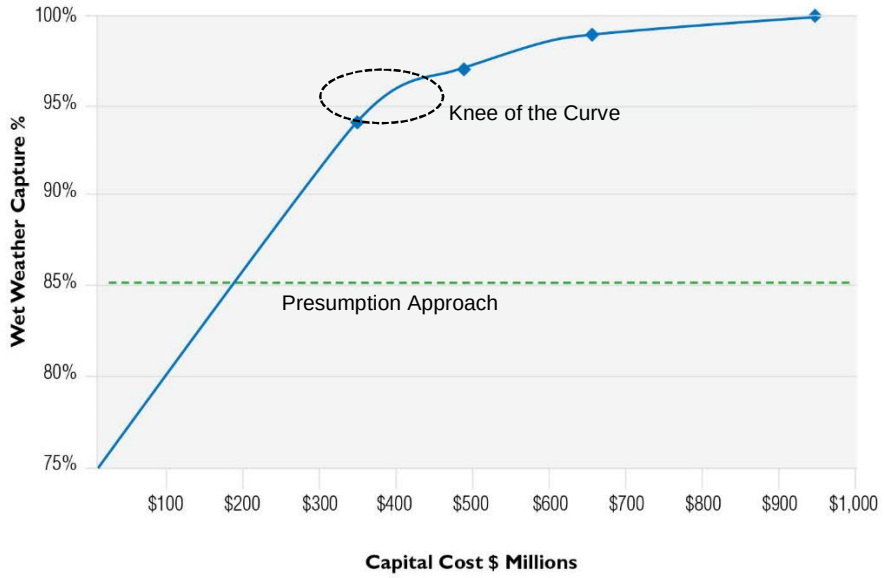

Figure 5.2-1 Example Knee-of-the-Curve Graph

The WWT's discussions about total program costs and the selection of projects for the IOAP, as directed in EPA's CSO Control Policy, considered a "knee of the curve" analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. In addition to this analysis, the community's level of investment in the IOAP has been considered in the context of anticipated future requirements and other needs for MSD services. These services may include stormwater compliance needs associated with Louisville Metro's MS4 stormwater permit and requirements to meet the forthcoming total TMDL allocations for Beargrass Creek. This consideration of other water quality investment needs is important since sewer overflow control alone will not be sufficient to meet water quality standards.

The following two figures illustrate how the knee of the curve analysis for both the Ohio River and Beargrass Creek are related to the values-based choices to implement a Final LTCP which captures 96 percent of the combined sewage during wet weather events (the 2021 IOAP Modification has a 95 percent capture, but does not change the conclusions reached). When this analysis was originally performed, fecal coliform bacteria was the indictor organism used to determine attainment of the contact recreation use. Although peak fecal coliform is not a criteria for water quality, these graphs from 2009 exhibit that the knee-of-the curve analysis generally extends to water quality performance benefits.

Figure 5.2-2 graphs the peak fecal coliform levels in the Ohio River predicted at various levels of CSO reduction investment. Under pre-LTCP conditions, CSO loads were predicted to cause peak fecal coliform levels to be approximately 100,000 cfu per 100 ml of water. The recommended level of CSO control reduces this value to approximately 45,000 cfu/100 ml, at a cost of approximately $320 million. Spending an additional $600 million is predicted to reduce the fecal coliform levels so slightly that it is indistinguishable at this scale, and represents an insignificant further reduction in public health risk. This graph shows that almost all the fecal coliform reduction benefits come in the first $320 million of CSO reduction projects, and virtually no fecal coliform reduction benefits come from additional expenditures beyond $320 million. The data points on the curve represent system-wide costs and capture calculated at eight, four, two, and zero overflows per year. Note that this curve was generated for the suite of projects submitted as part of the September 30, 2009, version of the

IOAP. Water quality models were not re-run with the suite of projects submitted as the 2021 IOAP Modification since the changes in loadings were very small relative to the overall loadings originally modeled.

Figure 5.2-3 graphs the peak fecal coliform levels in Beargrass Creek, predicted at various level of CSO reduction investment. Under current pre-LTCP conditions, CSO loads were predicted to cause peak fecal coliform levels to be approximately 43,500 cfu per 100 ml of water. The recommended level of system-wide CSO control reduces this value to just over 37,500 cfu/100 ml, at a cost of approximately $320 million. Similar to the Ohio River results, spending an additional $600 million was predicted to reduce the fecal coliform levels so slightly it is indistinguishable at this scale, and represents an insignificant further reduction in public health risk. The data points on the curve represent system-wide costs and capture calculated at eight, four, two, and zero overflows per year. Note that this curve was generated for the suite of projects submitted as part of the September 30, 2009, version of the IOAP. Water quality models were not re-run with the suite of projects submitted as the 2021 IOAP Modification since the changes in loadings were very small relative to the overall loadings originally modeled.

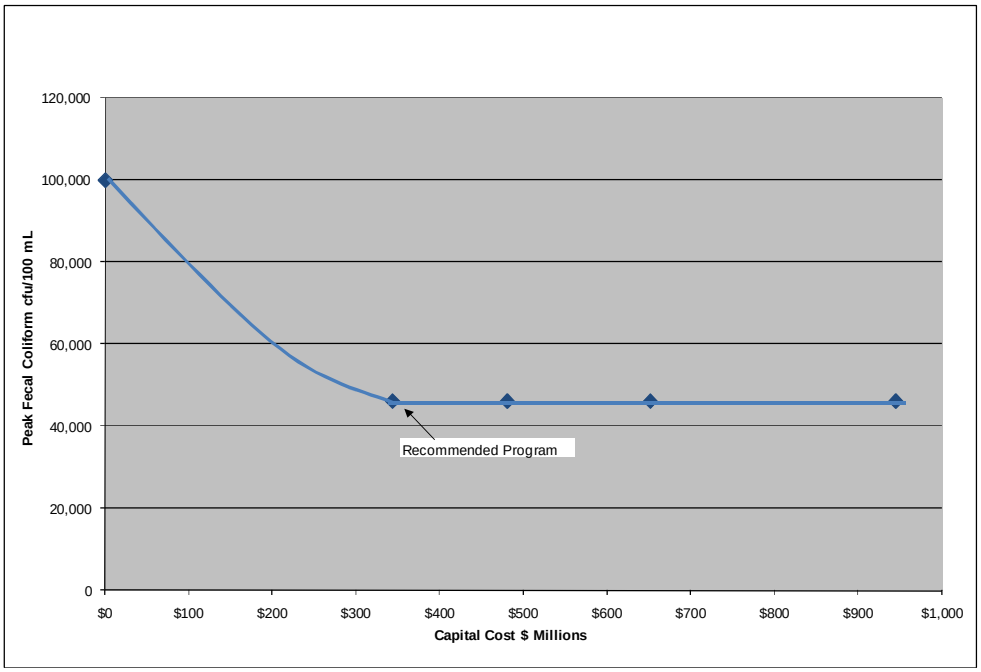

Figure 5.2-2 Modeled Peak Fecal Coliform Reductions - Ohio River, 2009

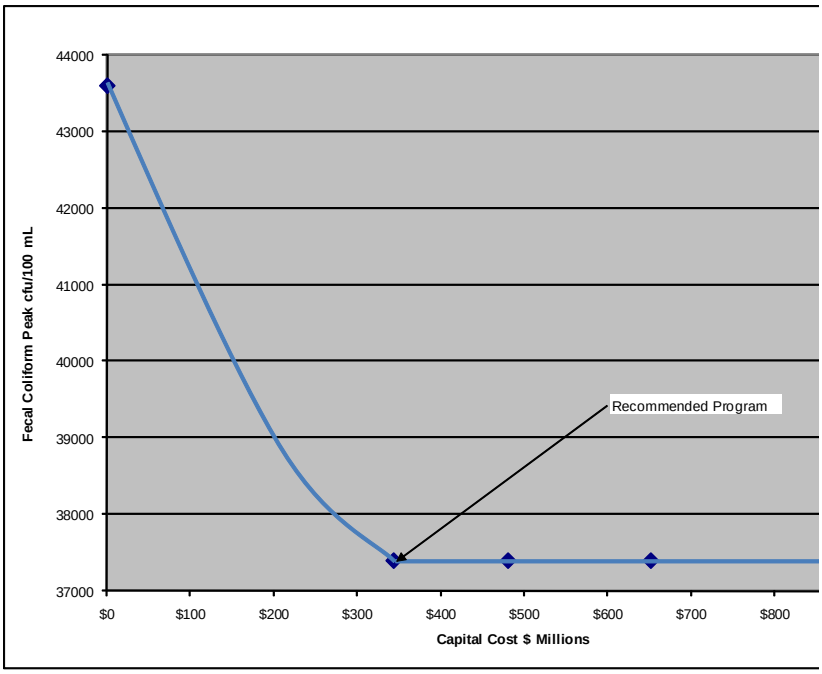

Figure 5.2-3 Peak Fecal Coliform Reductions - Beargrass Creek

5.3. ELIMINATING UNAUTHORIZED DISCHARGES FROM THE SEWER SYSTEM

The Consent Decree requires MSD to develop a Final SSDP designed to eliminate unauthorized discharges from the SSS, CSS, and WQTCs. When MSD established the WWT and embarked upon the development of the values-based risk approach to all overflow abatement, the process produced an SSDP, including the following Consent Decree elements (Note: locations of specific requirements are cited from the 3-volume IOAP):

- A map that shows the location of all known unauthorized discharges, including areas and sewers lines that serve as tributary to each unauthorized discharge. This is addressed in Volume 3, Chapter 2, Section 2.2.2.
- A description of each unauthorized discharge location that includes:
    i. frequency of discharge
    ii. annual volume of discharge
    iii. type of discharge (i.e. manhole, pump station; constructed discharge, etc)
    iv. the receiving stream
    v. land use for the immediate and downstream area where discharge occurs, and potential for public health impact
    vi. any previous SSOs in the last five years
    vii. any previous, current or proposed rehabilitation, or construction work to remediate or eliminate the discharge

This information is presented in Volume 3, Chapter 2, Sections 2.4.3 and 2.5, and on the project fact sheets included in Volume 3, Chapter 4.

- Prioritization of the unauthorized discharges and remedial measures, schedules for design, initiation and completion of construction of these measures. This is presented in Volume 3, Chapter 4, Section 4.2.
- A plan to involve stakeholders in the planning, prioritization and selection of project alternatives. This is addressed in Volume 1 Chapter 2, Sections 2.5 and 2.6, and in Chapter 3, Section 3.2.
- The results of an evaluation of WQTC peak flow treatment capacity for any WQTC that will receive additional flow based on any Interim or Final SSDP project. The results of this evaluation are presented in Volume 1, Chapter 4. The actual Comprehensive Performance Evaluations and Composite Correction Programs are appended to Volume 1, in Appendix 4.4.3.

Specifically, the results from the implementation of the Final SSDP will (2009 Conditions):

- Eliminate SSOs at an estimated 145 locations in an average year, (average of 2005–2007 data, normalized for rainfall) from a total of 214 potential overflow locations that are controlled to at least the 1.82-inch 3-hour cloudburst storm.(includes SSOs addressed by both the Interim SSDP and the Final SSDP);
- Eliminate an average of 290 million gallons (MG) of overflow volume per year (average of 2005–2007 normalized for rainfall), eliminating 100 tons of five-day biochemical oxygen demand (BOD5) and almost 200 tons of solids annually;
- Eliminate “blending” at the Jeffersontown WQTC.
- Provide full secondary treatment of sanitary sewage from the SSS area; and
- Eliminate five small WQTCs in the Prospect area that discharge to Harrod’s Creek, a watershed that has been severely impacted by suburban runoff.

5.3.1. ELIMINATION OF UNAUTHORIZED DISCHARGES BASED ON SITE-SPECIFIC DESIGN STORMS AND THE WWT VALUES BASED FRAMEWORK

In the IOAP, the values evaluation framework has been used to evaluate a range of site-specific design storms to establish the appropriate level of control of SSOs. MSD’s technical team analyzed each project alternative considered for the IOAP in terms of potential benefits and costs, where benefits are quantified based on the anticipated reduction in risks to the community values and costs reflect the total capital and operational costs of the alternative. The benefit-cost analysis influences the selection of site-specific abatement approaches or technologies, site-specific levels of protection, and the relative priority of projects for implementation.

The IOAP used the values-based benefit/cost evaluation framework to determine design events that reflect an appropriate level of control of sewer overflows for the Louisville Metro community. The decision to develop site-specific levels of control based on benefit/cost evaluations was made by MSD in consultation with the Stakeholder Group that is a part of the WWT. While site-specific levels of control were determined to best meet the objectives of the community, the WWT Stakeholder Group strongly supported the identification of boundary conditions representing the minimum level of protection acceptable to the community, and the maximum level of protection determined to be reasonable, given competing demands on environmental protection community resources.

A storm event with a 50 percent probability of occurring in any given year (commonly referred to as a two-year storm) was identified as the minimum level of protection acceptable to the community. The cities of Atlanta and Knoxville set the precedent for selecting a design storm with a 50 percent probability of being exceeded in any given year as the minimum protection level for unauthorized discharges.

Similarly, a storm event with a ten percent probability of occurring in any given year (commonly referred to as a 10-year storm) was selected as the maximum level of protection considered reasonable. A storm of this severity happens infrequently, and often causes high levels of non-point source pollution that overwhelm the potential impacts of SSOs. The WWT Stakeholder Group understood the need to focus community resources available for environmental protection on the pollution sources that give the greatest return on invested dollars. Protecting against SSOs in a storm with a ten percent probability of occurring in any year was identified as the upper limit of protection that the community believes is reasonable, given the potential for other, more cost-effective controls on other sources of pollution.

Relying on an analysis of sixty years of historical weather patterns for Jefferson County, the IOAP uses a three-hour “cloudburst” storm, with a statistically anticipated rainfall of 1.82 inches, as the minimum design storm considered. Additionally, the approach of using the values evaluation framework to determine the SSO control level means that solutions to address certain SSOs have been designed to protect against larger storms (for example, a 2.25-inch cloudburst storm instead of a 1.82 cloudburst storm) because they yield a higher benefit-cost ratio in the analysis of project alternatives.

In the Final LTCP, the level of control was similarly selected using the benefit-cost ratios at several levels of control (eight, four, two, and no overflows in the average year). This level of control was then assessed by the analysis referred to as the "knee-of-the-curve” analysis. This analysis typically involves estimating costs for a range of control levels, then comparing performance (benefits) versus cost and identifying the point of diminishing returns. For the Final SSDP, the knee-of-the-curve analysis focused on a comparison of total benefits versus total capital costs at various levels of protection.

The Final SSDP optimization process did not require that total capital cost and benefits be calculated for each preferred technology at all levels of protection. Total capital costs and benefits were calculated for the preferred technologies at a level of protection corresponding to the 1.82-inch and 2.25-inch cloudburst storms. Cost and benefits were calculated for 12 of these preferred technologies for the 1.52-inch and 2.60-inch levels of protection. Costs and benefits for the other preferred technologies were estimated by correlation to the 1.82-inch or 2.25-inch level-of-protection values. All costs reflect the more detailed budget-level cost estimates prepared for the preferred alternatives.

Figure 5.3-1 shows a curve of total benefits as a function of total capital cost for each level of protection. This figure also shows a single point above the curve denoting the total benefits (28,100) and total capital cost ($142 million, 2008 dollars) for the recommended projects (not including Interim SSDP projects). The figure illustrates a typical knee of the curve response, with the point of inflection representing the point of diminishing returns. The figure shows that beyond the 1.82-inch level of protection, additional capital expenditures result in a much slower increase in total benefits. The single point corresponding to the recommended projects lies just at the knee of the curve, demonstrating that the program maximizes benefits to the community with a controlled cost.

Figure 5.3-2 shows a curve of average project benefit-cost ratio versus total capital cost. There is a single point representing the average benefit-cost ratio (67) and total capital cost ($142 million) for the recommended projects. This curve is plotted in a format to show optimization of the benefit-cost ratio. This figure clearly shows that the maximum average benefit cost ratio occurs around the 1.82-inch cloudburst storm. Benefit-cost ratios decline significantly beyond a 1.82-inch level of protection. The single point shows that the recommended

projects are at the highest benefit-cost ratio, again demonstrating that the program maximizes benefits to the community.

Note that this curve was generated for the suite of projects submitted as part of the September 30, 2009, version of the IOAP. A complete re-analysis of this data was not performed on the suite of projects submitted in the 2012 IOAP Modification or for the 2021 IOAP Modification since the project changes were so minor relative to the overall SSDP program. Only two SSDP projects changed in level-of protection, with both of them going to higher levels of control than proposed in the September 30, 2009, IOAP.

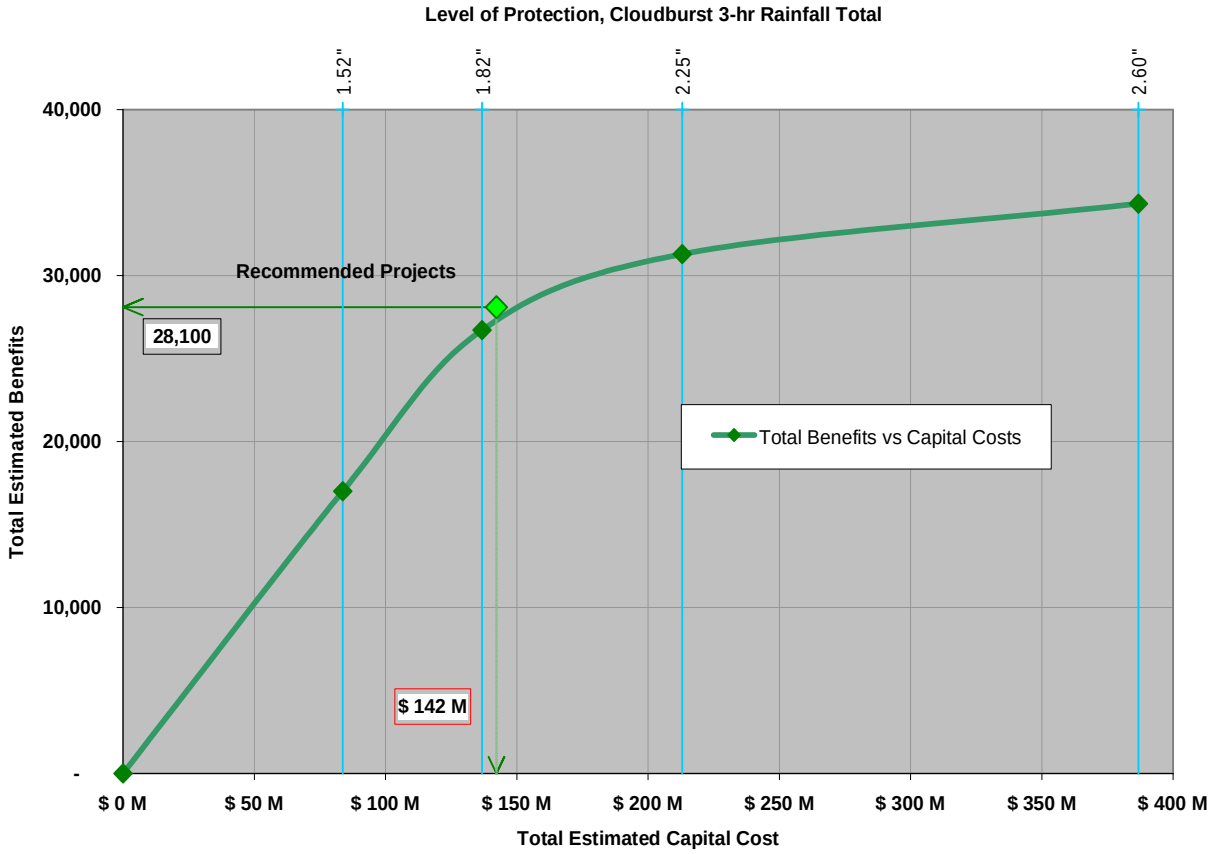

Figure 5.3-1 2012 SSDP Project Optimization: Total Benefits Versus Total Capital Cost (2008 Dollars)

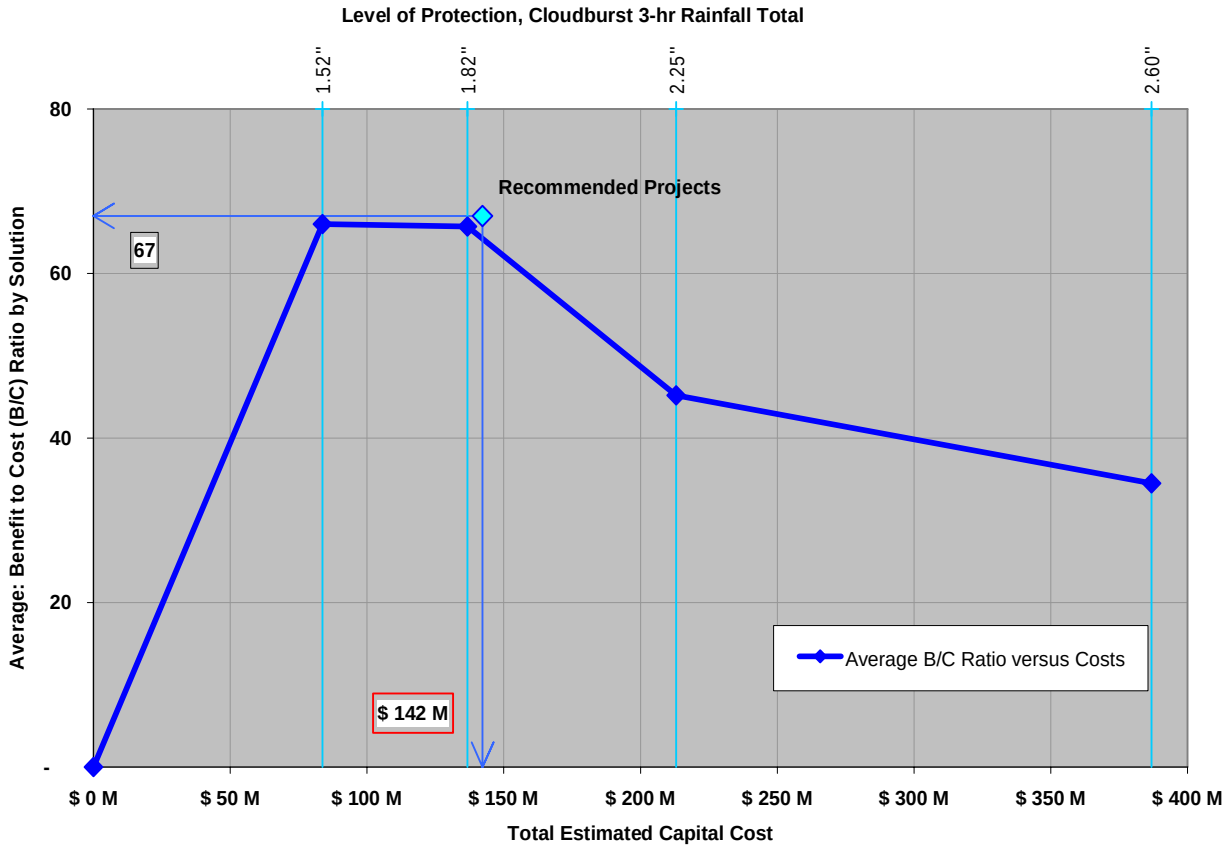

Figure 5.3-2 2012 SSDP Project Optimization: Average Benefit-Cost Ratio Versus Total Capital Cost (2008 Dollars)

The specific mix of control options for individual SSO locations in the IOAP is driven by the benefit-cost analysis of how the project alternatives affect the WWT's community values and site-specific considerations. Project alternatives are built around MSD's existing infrastructure, such as large diameter pipes and WQTCs. In addition, the project alternatives draw on synergistic benefits from other MSD projects, such as the Interim SSDP projects.

The Final SSDP was developed based on front-end consideration of source control. This means that more traditional gray infrastructure in the IOAP has been sized after the anticipated effectiveness of source control. Source control includes public outreach and education; however, the primary component is an aggressive Inflow and Infiltration (I/I) program including reduction of private sewer sources of I/I. The sizing of the gray solutions is based on actual source control investments justified by performance information applied in models. Detailed information on the implementation and history of I/I reduction can be found in Volume 1, Chapter 4.

The Final SSDP and the Interim SSDP consist of 57 and six projects, respectively to control SSOs. The projects consisted of conveyance upgrades, sewer rehabilitation, interceptor relief, in-line storage, offline storage, pump station upgrades, pump station eliminations, the expansion of one WQTC and the elimination of one regional WQTC and seven small WQTCs. Final project details and summaries are included in Volume 3, Chapter 4.

5.4. AN APPROVABLE FINAL LTCP

The MSD Final LTCP as submitted on June 19, 2009, is fully compliant with the Consent Decree and the requirements of the CSO Control Policy. This 2021 IOAP modification uses the same methodologies for project selection, sizing, and the implementation of source control. MSD's approach is based on EPA's Presumption Approach, in that the percent capture of 95 percent (based on hydraulic modeling) exceeds the minimum requirement of 85 percent. Furthermore, previous water quality modeling showed that in the Typical Year, CSOs remaining after implementation of the IOAP will not, in the absence of background loads, cause water quality standard violations in Beargrass Creek or the Ohio River. The innovative and site-specific approach includes implementation of green infrastructure and public education. As stated above in Section 5.2.1, the Final LTCP is also fully compliant with the three goals required in the Consent Decree [paragraph 25. (b) (2)].

Both the Consent Decree and the CSO Policy require specific elements of the LTCP as noted in the Table 5.4-1 below. MSD has fully complied with both the Consent Decree and the CSO Policy through the full inclusion of each of these elements in the Final LTCP.

Table 5.4-1 Final LTCP Elements as Required by the Consent Decree

REQUIREMENT PER CONSENT DECREE PARAGRAPH 38 (b) (1)(B)	IOAP AND FINAL LTCP CHAPTERS AND SECTIONS	COMPLIANCE WITH CSO POLICY AND CONSENT DECREE
(i) Results of characterization, monitoring, modeling activities and design parameters as the basis for selection and design of effective CSO controls (including controls to address those discharges resulting from MSD's compliance with the requirements of the USACE Ohio River Flood Protection System Pumping Operations Manual, dated 1954 and revised 1988.	Volume 2 - Final LTCP, Chapter 2 includes an evaluation of the controls to address flood pumping issues, Chapter 3 for the alternative analysis, and Chapter 4 for the selection of effective CSO Controls including modifications to the flood pumping system, where required, to implement revised operating procedures at the flood pump stations.	**Yes** – the proposed plan is based on an extensive process in which every alternative accounted for data and was reviewed by WWT.
(ii) Results of an evaluation of WQTC peak flow treatment capacity for any WQTC other than the Morris Forman WQTC that will receive additional flow based on any LTCP. Such evaluation is required to be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach and "Retrofitting POTWs"	No existing treatment plants other than the Morris Forman WQTC will receive any additional flow as a result of the Final LTCP. Volume 2, Chapter 3, Section 3.3 discusses evaluation of CSO control alternatives; Table 3.1-1 shows treatment alternatives; Section 3.2.7.5 discusses utilization of the Morris Forman WQTC; and Table 3.3-1 shows satellite treatment performance.	**Yes** – peak flow treatment capacity will be available with use of storage, real time control (RTC), and treatment.
(iii) Report on the Public Participation Process	Volume 1, Chapter 3	**Yes** – the WWT and the general public were actively involved in the decision making to select the long-term CSO controls.
(iv) Identification of how the Final LTCP addresses sensitive areas as the highest priority for controlling overflows	Volume 2, Chapter 1, Section 1.6.6.7; Chapter 2, Section 2.8 ; and Chapter 3, Section .2.7.6.	**Yes** – MSD performed further prioritization of stream reaches based on ecological characteristics.
(v) Report on the cost analyses of the alternatives considered	Volume 1, Chapter 2, Section 2.5, Volume 1, Chapter 6, Section 6.2 presents rate and affordability impacts, Volume 2, Chapter 3, Section 3.3.2, and Chapter 4.	**Yes** – application of cost to community value framework for a cost-benefit and a knee of the curve analysis were part of the development of project alternatives and choices. Affordability and phases were also accounted in the development of the schedule.
(vi) Operational plan revisions to include agreed upon long term controls	Volume 1, Chapter 6, Section 6.3	**Yes** – operational plan budgets adequate resources to operate and maintain the Final LTCP projects.
(vii) maximization of treatment and evaluation of treatment capacity at Morris Forman WQTC	Volume 2, Chapter 3, Section 3.2.7.5 Utilization of Morris Forman WQTC, Section 3.3 Evaluation of CSO Control Alternatives, Appendix 3.2-20 Morris Forman WQTC Wet Weather SOP Procedures, and Appendix 3.2-21 Morris Forman WQTC Expansion Technical Memo.	**Yes** – Wet Weather flow capacity has been maximized and verified through extensive testing. Additional peak flow treatment capacity will be available with use of storage, RTC and a new retention treatment basin.
(viii) Identification of an implementation schedule for the selected CSO control	Volume 1, Chapter 6, Section 6.1 Volume 2, Chapter 4 and Executive Summary Table ES1.1-3.	**Yes** – All projects completed by Consent Decree deadline of December 31, 2026. Refer to Executive Summary Table ES1.1-3 for each LTCP project's implementation schedule and level of control.
(ix) A post-construction compliance monitoring program adequate to verify compliance with water quality-based CWA requirement and ascertain the effectiveness of CSO controls	Volume 1 Chapter 6, Section 6.3	**Yes** – in-system flow monitoring will be used to update hydraulic models and show system-wide performance in the Typical Year.

5.5. AN APPROVABLE FINAL SSDP

The MSD Final SSDP as submitted on June 19, 2009, is fully compliant with the Consent Decree and the 2021 ACD. The 2012 and 2021 IOAP modifications provide a higher level of control (as indicated by the design events used for project sizing) and therefore is also fully compliant with the Consent Decree. The combined, sustained and phased implementation includes both a gray infrastructure plan and a source control program including a private sewer program intended to reduce I/I. This Final SSDP, in conjunction with the SORP and public education aimed at individual responsibility and behavior modification (as it relates to FOG, private sewer maintenance and rehabilitation, illicit cross connections and drainage) will eliminate unauthorized discharges from the SSS, CSS and WQTCs by December 31, 2035.

As outlined in Section 5.3, the Final SSDP complies with all the requirements of the Consent Decree under paragraph 25 (a) (3), as shown in Table 5.5-1.

In addition, the Consent Decree requires that the results of an evaluation of the WQTC peak flow treatment capacity for any WQTC that will receive additional flow based on any interim or Final SSDP project. These analyses were fully developed and can be found in Volume 1, Chapter 4.

Table 5.5-1 Final SSDP Elements as Required by the Consent Decree

REQUIREMENT PER CONSENT DECREE PARAGRAPH 38(a)(1)	IOAP AND FINAL SSDP CHAPTERS AND SECTIONS	COMPLIANCE WITH CONSENT DECREE
(1) The long-term SSDP projects, including schedules, milestones, and deadlines	Volume 1, Chapter 4, Section 4.3 and Chapter 6, Section 6.1 Volume 3, Chapter 4., Section 4.1 and Table 4.0-1.	Yes – The Final SSDP describes 57 gray infrastructure projects (in addition to the six Interim SSDP projects) including, I/I reductions studies, and a source control program to eliminate 197 SSOs to the approved level of control. The project schedule provided in the Executive Summary Table ES1.1-5 shows milestones and completion dates for each of these projects.
(1) Results of an evaluation of WWTP peak flow treatment capacity for any WWTP that will receive additional flow based on any Interim or Final SSDP project. Such evaluation is required to be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach and "Retrofitting POTWs"	Volume 1, Chapter 4, Section 4.4	Yes - All the plants that could receive additional flow as a result of SSO elimination have been evaluated.
(A) A map that shows the location of all known Unauthorized Discharges. The map includes the areas and sewer lines that ser as a tributary to each Unauthorized Discharge. Smaller maps of individual tributary areas also may be included to show the lines involved in more detail.	Volume 3, Chapter 2, Section 2.5, Figures 2.5.3 through 2.5.15, Figure 2.5-3A, Figure 2.5-4A, Figure 2.5-5A, Figure 2.5-7A, Figure 2.5-8A, Figure 2.5-9A, Figure 2.5-10A, Figure 2.5-14A, and Figure 2.5.15A	Yes – The network branch maps show all 208 documented and suspected SSOs, with sufficient detail to see tributary sewers.
(B.i) A description of each Unauthorized Discharge locations that includes the frequency of the Unauthorized Discharge	Volume 3, Chapter 2, Section 2.4, Table 2.4.1, Table 4.0-1	Yes – Table 2.4.1 contains this information and in the Fact Sheets.
(B.ii) The annual volume released of the Unauthorized Discharge	Volume 3, Chapter 2, Section 2.4, Table 2.4.1, Table 4.0-1	Yes – Table 2.4.1 contains this information in the Fact Sheets.
(B.iii) A description of the type of Unauthorized Discharge location	Volume 3, Chapter 2, Section 2.4, Table 2.4.1 in the Fact Sheets	Yes – Table 2.4.1 contains this information in the Fact Sheets.
(B.iv) The receiving stream	Volume 3, Chapter 2, Section 2.4, Table 2.4.1, Table 4.0-1	Yes – Table 2.4.1 contains this information in the Fact Sheets.
(B.v.) The immediate and downstream land use, including the potential for public health concerns	Volume 3, Chapter2, Section 2.2.1	Yes – Descriptions of the WQTC service areas describe landuse and the history of sewer system development in the area.
(B.vi) A description of any previous (within the last 5 years) current, or proposed studies to investigate the Unauthorized Discharge	Volume 3, Chapter 1, Section 1.3	Yes – Chapter 1 summarizes MSD's previous and current SSO elimination efforts.
(B.vii) A description of any previous (within the last 5 years current of proposed rehabilitation or construction work to remediate or eliminate the Unauthorized Discharge	Volume 3, Chapter 2, Sections 2.2 and 2.3	Yes – The descriptions of the WQTC service areas include summary descriptions of previous construction work, and the descriptions of the model development describes those on-going or currently planned projects that contribute to SSO elimination.
(C) A prioritization of Unauthorized Discharge locations based on the frequency, volume, and impact on the receiving stream and upon public health, in coordination with CMOM programs	Volume 1, Chapter 6, Section 6.3.2.3 Volume 3, Chapter 4, Section 4.2.1	Yes – The referenced chapters describe the schedule prioritization process, based in part on the benefit-cost ratio that includes the required parameters in the benefit calculation.

Table 5.5-1 Final SSDP Elements as Required by the Consent Decree

REQUIREMENT PER CONSENT DECREE PARAGRAPH 38(a)(1)	IOAP AND FINAL SSDP CHAPTERS AND SECTIONS	COMPLIANCE WITH CONSENT DECREE
(C) Schedules for design and construction, phased based on sound engineering judgment, and in no case extending beyond December 31, 2035	Volume 1, Chapter 6, Section 6.3.4 Volume 3, Chapter 4, Section 4.2 and Table 4.0-1.	Yes – Schedules are included that show the required phases, and this schedule shows completion by December 31, 2035.
(D) A plan to involve stakeholders in the planning prioritization and selection of projects.	Volume 1, Chapter 3, Section 3.2 Volume 3, Chapter 4, Section 4.3	Yes – The IOAP included a robust and stakeholder involvement process that included participation in decisions on selection and prioritization of projects.

5.6. "NO SURPRISES" FOR APPROVING AGENCIES

Throughout the development of the IOAP, meetings were scheduled with those regulatory agencies having jurisdiction over the program to facilitate open communication between MSD and the regulators regarding progress and compliance with Consent Decree requirements (refer to Volume 1, Chapter 3, Section 3.6). Regular compliance reports as required by the Consent Decree include specific information about activities consistent with the requirements of the Consent Decree and the progress toward the development and implementation of the IOAP. These reports are available for the public to review on the Project WIN website. In addition to these reports, MSD initiated periodic face-to-face meetings with technical team members from the KDEP and EPA to discuss the progress of the Project WIN overflow abatement program. The intent of these meetings was to ensure that there no surprises when the IOAP was submitted, and that the IOAP met all the parameters to allow approval.

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APRIL 30, 2021

2021 IOAP MODIFICATION

VOLUME 1 IOAP, CHAPTER 6

METROPOLITAN SEWER DISTRICT

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There are no Appendices for this Chapter.

Chapter 6: INTEGRATED OVERFLOW ABATEMENT PLAN IMPLEMENTATION

Special Note – 2021 IOAP Modification: Volume 1, Chapter 6 of the 2012 IOAP has been replaced with updated program information related to successfully implementing the 2021 IOAP projects and program elements. As with the 2012 IOAP submittal, Volume 1, Chapter 6 does not have any appendices.

Other chapters and volumes of the Integrated Overflow Abatement Plan (IOAP) describe Louisville and Jefferson County Metropolitan Sewer District's (MSD) approach to characterizing overflows, identifying potential solutions, evaluating alternatives, and selecting technology approaches and site-specific levels of control. This chapter presents an implementation plan that outlines operational, financial, and post-construction compliance methodologies necessary to advance and sustain the recommendations of the IOAP. This chapter also addresses the impact of the IOAP capital and operating costs on MSD's rates. The project schedule described will support an adaptive management implementation methodology to meeting Consent Decree obligations and Presumption Approach for compliance with water quality standards per EPA's CSO Control Policy.

6.1. IMPLEMENTATION SCHEDULE

As described in the Executive Summary, the 2021 IOAP implementation schedule was developed to achieve the following three objectives:

1. Comply with all schedule requirements of the Consent Decree, including:
    - Completion of all Final CSO Long-Term Control Plan (LTCP) projects December 31, 2026;
    - Completion of all Final SSDP projects by December 31, 2035;
    - Meet additional Asset Management Program requirements, including:
        - Asset Management Plan deliverable by June 30, 2021;
        - Average annual spending requirements of $25 million per year, totaling $375 million by December 31, 2035;
    - Complete Early Action projects by December 31, 2026, including Paddy's Run Pump Station capacity upgrades (subject to USACE partnerships) and Critical Sewers Rehabilitation projects;
    - Complete Morris Forman WQTC Biosolids Facility Replacement by December 31, 2030;
2. Sequence projects to minimize risk, maximize benefits, reduce emergencies associated with aging infrastructure, promote public health and safety, and allow beneficial use upon completion or shortly thereafter.
3. Provide a level cash flow that matches MSD's projected ability to raise rates and borrow money.

Schedules for the Final CSO LTCP projects and the Final SSDP projects are included in Volumes 2 and Volume 3, respectively. The projects shown in Table ES1.1-3 and Table ES1.1-5 in the Executive Summary correspond to the selected alternatives described in the Final CSO LTCP and the Final SSDP. Since many of these alternatives address several overflow points with one solution, the projects often have several different components (for example, gravity interceptor sewers, wet weather storage basins, pump stations, and force main discharge). As projects move from planning to design, MSD may elect to break the overall project into

multiple phases. This allows contract sizes to better match local contracting capabilities and typically results in better construction prices for MSD.

6.2. FINANCIAL PLAN

This section describes the current and estimated operating, capital and debt service costs associated with operating and maintaining MSD's wastewater, drainage and flood protection systems and financing the cost of required improvements over the next five years. Projected average annual rate increases are included in order to provide adequate funding for these efforts. Annual operating and capital budgets are established through a management review process and approved by the MSD Board. Rate increases are separately evaluated and approved annually by the MSD Board. The information in this section has been updated to reflect current financial criteria as of December 31, 2020 including the 5-Year CIP forecast for FY21 through FY25.

6.2.1. PROJECTED EXPENDITURE SUMMARY

Historic revenues and expenses of MSD for Fiscal Years (FY) 2019 and 2020 and projected revenues and expenses of MSD for FY 2021 through 2025 are reflected in Table 6.2-1. The projected revenues reflect the increases in rates and charges adopted by MSD for FY 2021 and the anticipated increases in rates and charges for FY 2022 through 2025. The projected financial results for FY 2021 through 2025 incorporate assumptions as of the date of this document. Actual revenues, expenses, or both could differ materially from those projected and there can be no assurance that such estimates of future results will be achieved.

6.2.2. PROJECTED OPERATING EXPENSES

MSD's annual operating budget provides the funding necessary to operate and maintain its wastewater collection and treatment, drainage and flood protection systems. Together these systems provide for public health and safety and support economic development and businesses in the service area.

Table 6.2-2 shows the FY 2021 approved operating expense budget by category. The budget for existing operations totals $149.3 million which is a 3.3% increase compared to the FY 2020 actual operating results.

Table 6.2-1 Analysis of Actual and Projected Financial Results ($ in thousands)

	FY18 Actual	FY19 Actual	FY20 Actual	FY21 Budget	FY22 Projected	FY23 Projected	FY24 Projected	FY25 Projected
Rate Increase[1]	*6.90%*	*6.90%*	*6.90%*	*5.00%*	*6.90%*	*6.90%*	*6.90%*	*6.90%*
Operating Revenues								
Wastewater service charges	$210,636	$219,467	$237,807	$242,846	$257,465	$271,187	$287,020	$303,779
Drainage service charges	63,868	$ 69,706	$ 75,052	$ 78,488	$ 83,903	$ 89,692	$ 95,881	$102,497
Other operating income	4,645	$ 5,194	$ 6,198	$ 4,275	$ 4,350	$ 4,350	$ 4,350	$ 4,375
Total Operating Revenues	**279,149**	**$294,367**	**$319,057**	**$325,609**	**$345,718**	**$365,229**	**$387,251**	**$410,651**
Non-Operating Revenues								
Assessments	1,232	$ 1,137	$ 909	$ 850	$ 1,000	$ 1,000	$ 1,000	$ 1,000
BAB refund	10,248	$ 10,339	$ 10,325	$ 10,338	$ 10,338	$ 10,338	$ 10,986	$ 10,986
Investment income	6,283	$ 8,339	$ 5,275	$ 5,640	$ 5,866	$ 6,100	$ 6,344	$ 6,598
Total Non-Operating Revenues	**17,763**	**$ 19,815**	**$ 16,509**	**$ 16,828**	**$ 17,204**	**$ 17,438**	**$ 18,330**	**$ 18,584**
Total Available Revenue	296,912	$314,182	$335,566	$342,437	$362,922	$382,667	$405,581	$429,235
Operating Expenses								
Total operating expenses	131,948	142,082	149,945	153,521	163,363	172,557	178,032	183,633
Captialized cost	(38,148)	(38,383)	(39,643)	(36,886)	(39,207)	(39,688)	(39,167)	(38,563)
Net Operating Expense	**93,800**	**103,699**	**110,302**	**116,635**	**124,156**	**132,869**	**138,865**	**145,070**
Net Revenues Available for Debt Services	203,112	210,483	225,264	225,802	238,767	249,798	266,716	284,165
Debt Service								
Total senior debt service[2]	128,947	135,189	132,911	142,055	144,716	149,024	152,951	154,348
Capitalized interest	(21,859)	(18,582)	(13,043)	(18,984)	(19,069)	(19,790)	(20,800)	(20,754)
Total subordinated debt service	17,695	19,966	20,751	26,392	27,359	27,481	32,156	32,173
Total Outstanding & Projected Debt Service	**124,783**	**136,573**	**140,619**	**149,463**	**153,006**	**156,715**	**164,307**	**165,767**
Senior Debt Service Coverage	190%	181%	188%	183%	190%	193%	202%	213%
Total Debt Service Coverage	163%	154%	160%	151%	156%	159%	162%	171%
Aggregate Net Debt Service	107,088	116,607	119,868	123,071	125,647	129,234	132,151	133,594
110% of Aggregate Net Debt Service	117,797	128,268	131,855	135,378	138,212	142,157	145,366	146,953
Subordinate Debt Service	17,695	19,966	20,751	26,392	27,359	27,481	32,156	32,173
110% of Subordinated Debt Service	19,465	21,963	22,826	29,031	30,095	30,229	35,372	35,390

[1] *Projections include the former Oldham County Environmental Authority customers which are on a different rate schedule*

[2] *Projections assume bonds issued in 2022 and 2024 are issued on a senior lien basis*

Table 6.2-2 Summary of MSD's FY21 Operating Budget

FY21 OPERATING BUDGET ($ IN THOUSANDS)		
Labor & related overhead	$	76,204
Utilities	$	17,616
Contractual services & supplies	$	46,468
Bad debt	$	3,500
Chemicals and fuel	$	6,509
Insurance premiums/claims	$	2,799
Other operating expenses	$	425
Gross Operating Expenses	**$**	**153,521**
Capitalized overhead	$	(36,886)
Net Operating Expenses	**$**	**116,635**

MSD capitalizes internal costs required to manage and support its capital program through an account known as the "force account". The force account charges include the costs of directly managing the capital program (for example, Engineering Division staff) and indirect costs that also support the management of the program. Annual force account expenditures were $39.6 million in FY 2020. In 2025, this annual expense is projected to be $38.5 million.

Operating expenses are projected to increase in FY 2022 through FY 2025 between 3.2% and 6.4% annually. Assumptions about labor and related overhead, including pension expense, as well contractual increases are incorporated. Operating expense growth is buffered by available revenues and other financial metric constraints necessary to maintain our long-term bond rating.

In the same way that this 2021 IOAP submittal has added capital project commitments and revisited schedules in order to best serve public health and safety needs, reduce emergency repairs for aging infrastructure, and achieve regulatory requirements, future operating budgets need to sustain these critical capital investments. MSD's executive leadership and board are supportive of the operating budget projections necessary for ongoing operations and maintenance, including staffing, equipment, and other facilities. Implementing the Asset Management Program outlined in Volume 1, Chapter 4 is also expected to advance structured maintenance associated with Capacity, Management, Operations, and Maintenance (CMOM) and Nine Minimum Controls (NMC) programs.

6.2.3. PROJECTED CAPITAL EXPENSES

As of 2019, the cost of the capital improvements required to be completed under the 2012 IOAP was estimated to be $1.149 billion, of which approximately $974 million had been spent as of June 30, 2020 and was financed or refinanced with proceeds of the MSD's Sewer and Drainage System Revenue Bonds, Series 2008, Series 2009C, Series 2010A, Series 2013C, Series 2014A, Series 2015A, Series 2016A, Series 2017A, and Series 2020A. The projected total cost has increased from the 2005 and 2009 Consent Decree forecasts due to budgeted increases for construction contingencies in accordance with industry standards, as well as increases in projected construction costs required to comply with regulatory requirements.

Under the Second ACD and 2021 IOAP Modification, more work and specific remedial projects were added to address MSD's greatest risks to public health and safety. At this time, several Sanitary Sewer Overflow (SSO) abatement projects must be deferred to allow focus on necessary work at the Morris Forman Water Quality Treatment Center and the Paddy's Run Flood Pump Station. In the meantime, MSD continues construction of the Waterway Protection Tunnel and is collecting data on overflow abatement projects implemented to date along with overflow activity in the remaining project areas. The changed circumstances MSD encountered since 2012 (as noted in the Executive Summary) resulted with $1.032 billion of additional spending associated with the 2021 IOAP Modification. MSD anticipates a total Consent Decree investment of $2.181 billion through 2035.

MSD's budgeting process for capital improvements typically considers a five-year window. Table 6.2-3 presents MSD's most recently approved five-year Capital Improvement Plan (CIP).

Table 6.2-3 Summary of MSD's 5-Year CIP ($ in thousands)

	FY21 BUDGET	FY22-FY25 PROJECTED	TOTAL
Capital Improvement Plan	$ 194,112	$ 803,538	$ 997,650
Funding			
Cash	$ 10,867	$ 155,945	$ 166,812
Senior Debt	$ 156,145	$ 528,360	$ 684,505
WIFIA/KIA Financing	$ 2,100	$ 119,233	$ 121,333
DSR Release	$ 25,000	$ -	$ 25,000
Total	**$ 194,112**	**$ 803,538**	**$ 997,650**

6.2.4. PROJECTED DEBT SERVICE

MSD's total debt at the end of FY 2020 is $2.3 billion and is projected to increase over the next ten years as we continue to invest in rehabilitation of our aging infrastructure and address consent decree and regulatory compliance driven initiatives. Current projections call for additional revenue bond issuances of $225 million in FY 2021, $200 million in FY 2022, and $200 million in FY 2024. Note that these projections are based on assumptions regarding actual bid prices of projects and bond rates. In reality, final project costs will vary from estimates and the size and timing of issuing bonds will be determined after consultation with financial advisors and bond counsel when trends in working capital reserves indicate additional borrowing is required.

Annual senior debt service in FY 2020 was $132.9 and is projected to increase on an annual basis through 2029 by varying annual amounts, driven by pre-existing and ongoing capital borrowing. MSD manages annual debt service expenses by refinancing its long-term obligations when feasible.

6.2.5. PROJECTED SYSTEM REVENUES

MSD covenants in its Bond Resolution to maintain sufficient revenues to cover the cost of operating its systems, paying its annual debt service and funding a portion of asset repair and rehabilitation costs. Louisville Metro Ordinance §50.24 requires that whenever MSD's net revenues are less than 1.1 times the debt service on MSD's outstanding revenue bonds for any consecutive six-month period, by order of the Board of MSD, the schedule of wastewater and stormwater service charges shall be amended in order to maintain a 1.10 debt service coverage required by MSD's 1971 bond authorizing resolution provided the aggregate of such adjustments for any 12-month period shall not generate additional revenue from wastewater and stormwater service charges in excess of 7%. MSD performs this debt service calculation every March at the beginning of the rate planning process. For the six month period ending March 2020 the debt service coverage ratio was 0.82.

On July 27, 2020, the MSD Board approved a final rate resolution amending MSD's schedule of rates, rentals, and charges. The FY 2021 rate schedule, which was recommended pursuant to the debt service adjustment provisions of §50.24, includes a 5.0% rate increase in wastewater and drainage charges. This is the lowest % rate increase approved by the MSD Board in the last 10 years. The lower rate increase was implemented due to financial impacts created by the COVID-19 pandemic in the local economy. MSD implemented an Emergency

Wastewater Rate Assistance Program (EWRAP) in conjunction with the FY 21 rate increase. This program will be in place for one year and the MSD Board has the ability to review and renew in FY 22. EWRAP provides a 10% discount on wastewater services for households at or below 150% of the federal poverty level.

A 10 year history of MSD rate increases is shown in Figure 6.2-1.

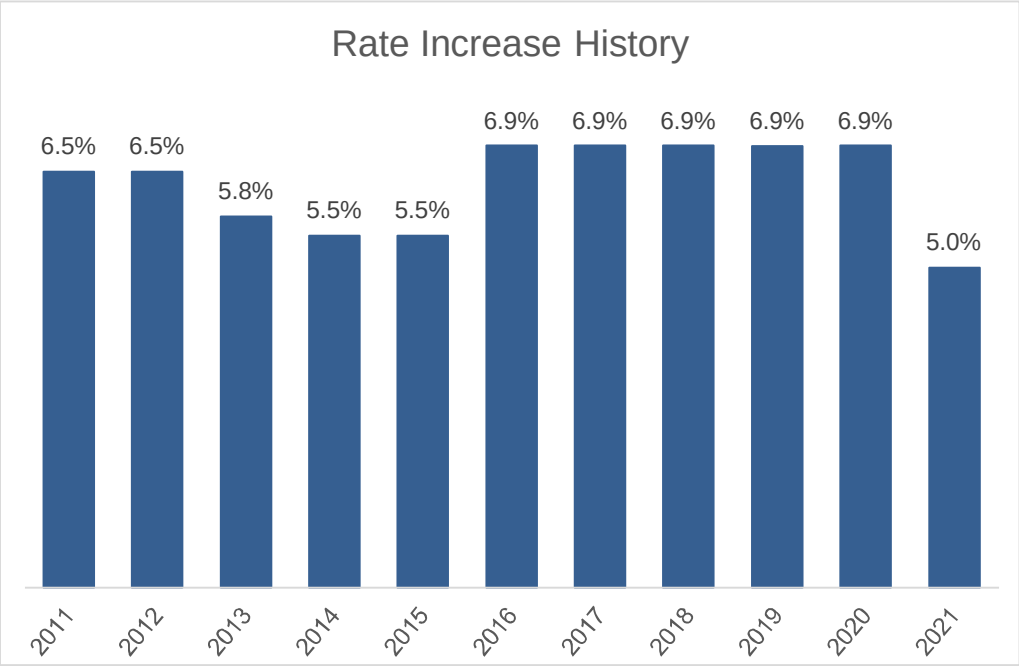

Figure 6.2-1 MSD's Rate Increase History

MSD financial projections for FY 2022 through FY 2025 call for annual 6.9% rate increases in order to support projected levels of operating, capital, and debt service expenses while maintaining the coverage limits required by ordinance and to maintain our existing long-term bond rating. These rate increase require annual approval by MSD's Board. Actual rate increases may vary from these projections due to a number of economic and political factors.

6.2.6. PROJECTED RATES AND FEES

The combined wastewater and stormwater monthly service fee is composed of three components that can be adjusted in unison or independently. The components of the combined fee are the base wastewater service charge, the stormwater service charge, and the consent decree surcharge. The 6.9% rate increases projected through FY 2025 are expected to be applied in unison across all three components of the bill. Current average rates are shown in Table 6.2-4 and Table 6.2-5.

Table 6.2-4 MSD's Average Monthly Residential Bill (4,000 gallons/month)

	8/1/2019	8/1/2020
Wastewater	$ 49.00	$ 51.45
Stormwater	$ 10.58	$ 11.11
Total	**$ 59.58**	**$ 62.56**
Monthly Wastewater Increase		$ 2.45
Monthly Stormwater Increase		$ 0.53
Total Monthly Increase		**$ 2.98**

Table 6.2-5 Sample Residential Bill for Customer Using 4,000 gallons/month

MSD'S SERVICE FEE	MONTHLY CHARGE
Monthly Wastewater Service Charge	$ 17.68
Monthly Wastewater Volume Charge ($4.83 per 1,000 gallons)	$ 19.32
Wastewater Consent Decree Surcharge	$ 14.45
Total Wastewater Charges	**$ 51.45**
Monthly Drainage Service Charge	$ 11.11
Total Wastewater and Drainage Charges as of August 1, 2020	**$ 62.56**

6.3. POST CONSTRUCTION COMPLIANCE MONITORING

Traditional post-construction compliance monitoring data are part of MSD's overall utility management strategy. Monitoring data is collected for several purposes including operational analysis, MS4 program, hydraulic modeling recalibration/revalidation, and regulatory/permit requirements. The 2021 IOAP Modification confirms MSD's use of the Presumption Approach. As such, compliance objectives will address the following: 1) certification of construction completion; 2) verify level of control achieved for each SSO project as specified in the Final SSDP; 3) verify modeled system-wide level of control for CSOs as specified in the Final LTCP. MSD expects that ongoing data collection and hydraulic model updates will continue to support program implementation and progress toward completion. This section will discuss the Post Construction Compliance (PCCM) program components of the IOAP, including:

- Historical and current monitoring efforts
- Project-based SSDP compliance
- System-wide LTCP compliance
- Wet weather treatment project-specific performance testing

In accordance with guidance provided by the EPA, the following integral components to an effective PCCM program are incorporated into MSD's overall strategy:

1. **Assessment and Documentation of Facility Operation Boundary Conditions** – MSD collects baseline data through the use of pre-construction monitoring data. In the event that pre-construction

monitoring is not feasible, sewer modeling and historic operational data is used to assess boundary conditions.

2. **Execution of Post Construction Monitoring** – MSD compares boundary condition data to post-construction data to evaluate project performance as it relates to the overflow level of control committed within the IOAP.
3. **Reporting Results to Regulatory Agencies and the Public** – Beginning with the FY14 Annual Consent Decree Report, MSD has provided project performance findings in annual reports, identifying cases where remedial measures are necessary to improve performance.

6.3.1. ADAPTIVE MANAGEMENT

MSD is dedicated to cost-effectively achieving the goals and requirements of the IOAP. MSD is focused on effectively implementing adaptive management practices to achieve its goals. The basic principle of adaptive management is to learn from successes and failures and to use the most recent data to modify future actions to be more effective in achieving long-term performance objectives. Adaptive management makes use of a constantly improving system understanding through sewer flow and overflow monitoring, system modeling advancements and operational clarity to review the proposed approaches for overflow abatement and adjusts to achieve the intended objectives. Adaptive management also includes improvement of practices and procedures included in the IOAP appendices. As these approaches change, MSD will revise and publish pieces as necessary.

Post-construction compliance monitoring flow and rain data has played a significant role in overflow abatement program adaptive management enhancements and successful program implementation to date. Monitoring solution effectiveness has informed when adjustments may be needed for hydraulically connected future projects and has proven to be an effective method for achieving system-wide goals. The benefit of this "right-sizing" strategy to the community is an assurance that the significant investment being made to comply with the Consent Decree will be based on current available system data rather than static assumptions made during the early years of the program. It has allowed validation of system performance assumptions and mid-course corrections as more is learned about project performance and the sewer system's related response. Neither this nor ultimate project and program performance could be measured without post-construction compliance monitoring (PCCM) data or representative system models.

One noteworthy example of how right-sizing coordination has successfully led to program benefits was the 2015 "Basin Balancing" submittal of minor project modifications prior to several storage basins starting construction. With new monitoring and modeling data available, MSD used EPA and KDEP-approved methods for setting level of control in the IOAP to optimize basin sizes while minimizing projected residual annual average overflow volumes. Open communication with regulators and data-supported justifications have continued to ensure "no surprises" as IOAP implementation has continued. Approved minor project modifications can be found in Volume 2, Chapter 4, Appendix 4.01 for LTCP projects and Volume 3, Chapter 4, Appendix 4.0.1 for SSDP projects.

6.3.2. HISTORICAL AND CURRENT MONITORING

MSD has been monitoring various environmental data sets for over 30 years. This program has been key to establishing baseline conditions for the purposes of hydraulic model development, pre-construction condition analysis, and stream health (via supporting MS4 requirements).

6.3.2.1. RAIN DATA

Rain data has been collected by MSD continuously on a network of rain gauges across Louisville Metro since the early 1990s. In 2003, a network of radar rainfall data and additional rain gauges were added to fill in the gaps in physical distance between the rain gauges. Since 2014, MSD has further expanded its rain gauge network to 46 sites. Some of the sites are outside of MSD's service area to better predict incoming rain events and to analyze rainfall patterns. Rain data are simultaneously evaluated with many of the other data sets to help determine the timing and impact of wet weather. A map of the rain gauges is located in Figure 6.3-1 and shows the gauges added to MSD's rain gauge network since 2012.

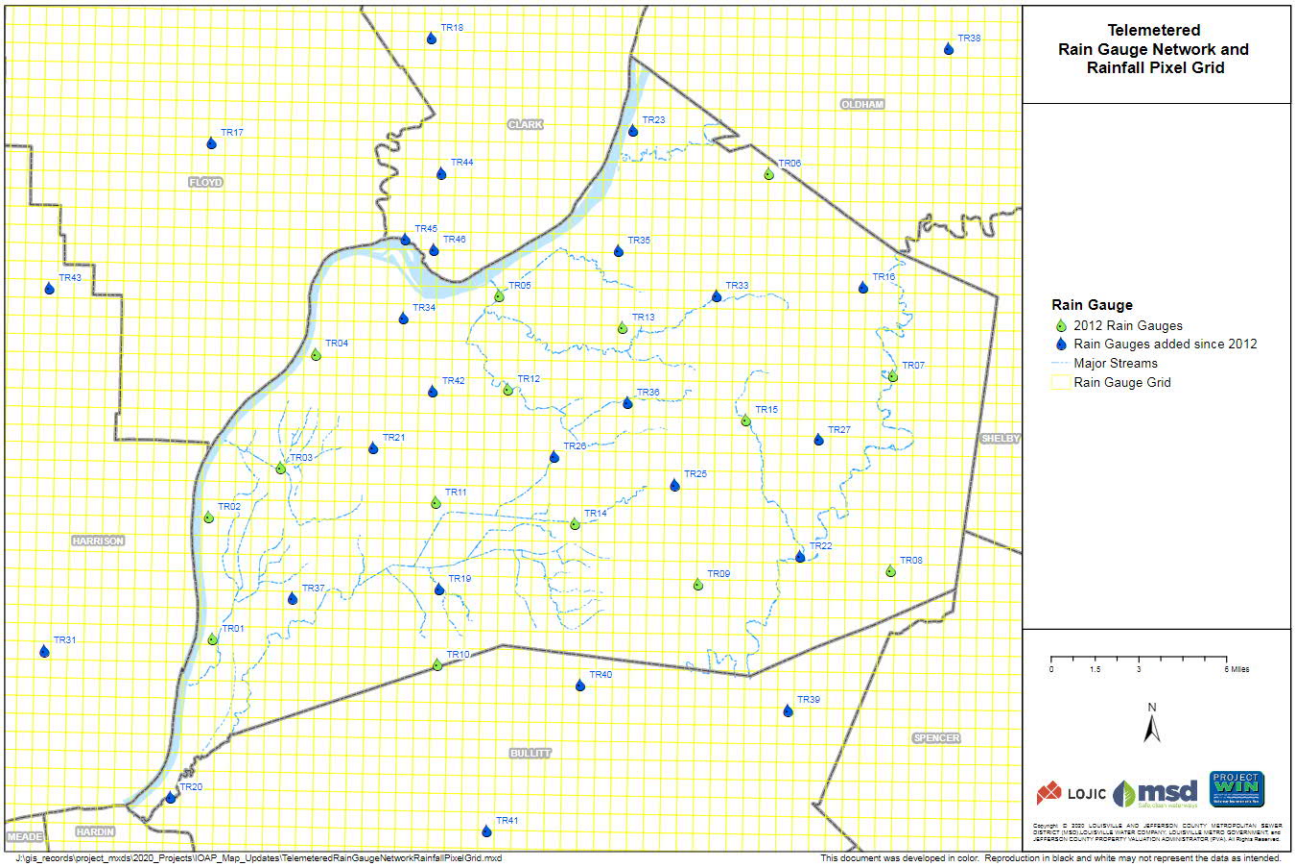

Figure 6.3-1 Rain Gauges

6.3.2.2. FLOW MONITORING

Flow monitoring is an important tool for project right-sizing as well as gauging solution performance. MSD uses flow monitoring data to verify and recalibrate flow projections, calculated using hydraulic models, for new and rehabilitated sewer lines, manholes, and pump stations. Current and future monitoring efforts encompass combined sewer flow, storage facilities, separate sanitary flow, I/I, pump stations, WQTCs, CSOs and other system characteristics critical to assessing performance.

Sewer flow meters have been in place in various locations in the MSD collection system since the early 1990s to assess baseline conditions, locate and characterize I/I, determine sewer overflow volumes, and assist sewer modeling efforts. The majority of the historical meters were temporary flow meters used for evaluation studies.

MSD currently has added some long-term sewer flow meters throughout the county and has installed additional long-term meters on almost all of the combined sewer overflows and some sanitary sewer overflows. Meters have been placed in critical locations to provide data for model recalibration, overflow behavioral analyses and overflow abatement project performance. Additional monitors may be placed in or re-located to areas affected by capital construction, green infrastructure, and sewer rehabilitation.

All of the data from the current collection system and CSO meters are available on telemetry and the data is being used to support the long-term trending and model calibration of the sewer system. A map of 2012 and historical MSD flow monitoring sites (including pump stations and WQTCs) is displayed in Figure 6.3-2, and an example of how that data can be used with rain data is displayed in Figure 6.3-3.

In addition to the sewer flow meters, MSD has telemetered monitoring on over 2,000 assets in the collection system, the majority of which are at sewage pump stations (this number excludes internal monitoring for treatment center components). From pump run times, known pump capacities, and wet well levels, MSD can infer and model flow rates at many more locations than the ones that have actual flow meters. A map of the locations MSD has installed telemetered equipment is illustrated in Figure 6.3-4. Each point on the map represents an asset that has telemetered equipment installed and many assets have monitoring points stacked together. Telemetered locations are constantly being updated as new facilities are brought online and existing facilities are de-commissioned and/or replaced. An example of how pump run time data and rain data can be used is displayed in Figure 6.3-5.

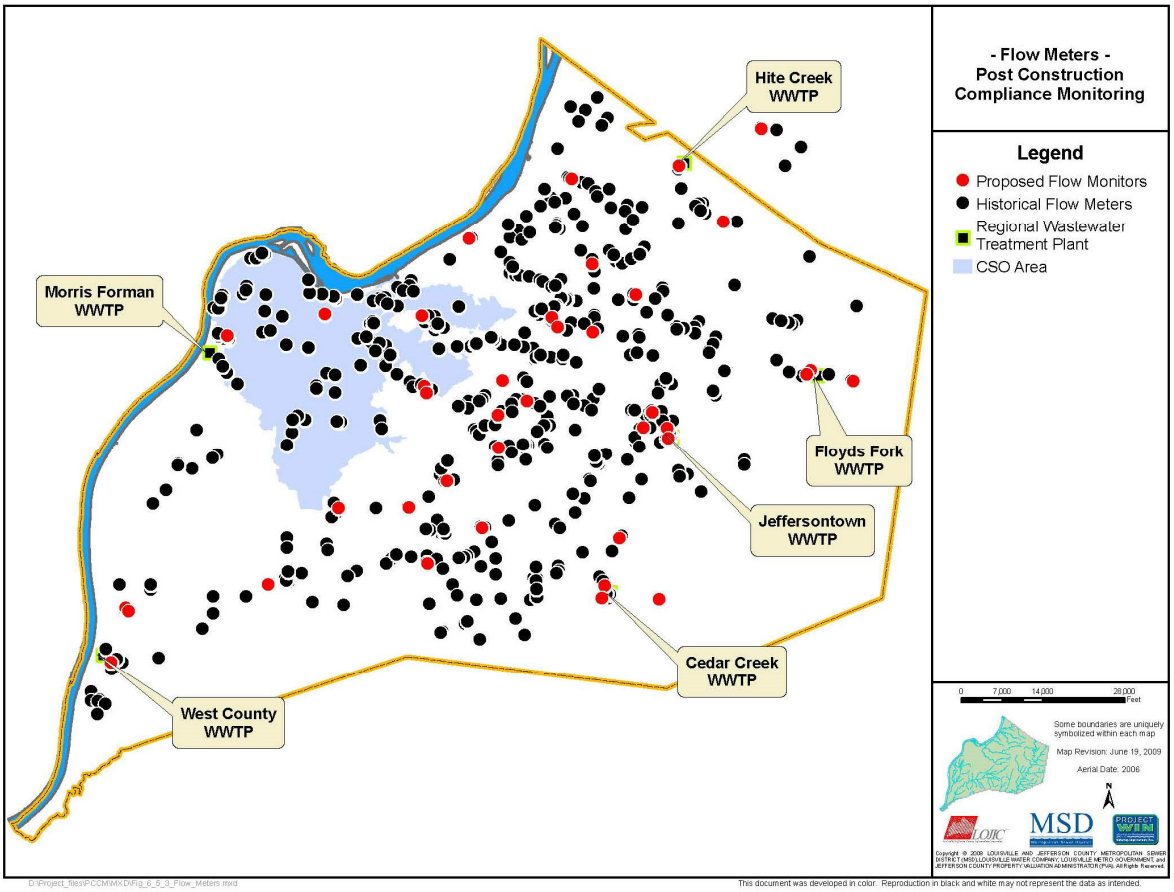

Figure 6.3-2 Historical Flow Meters

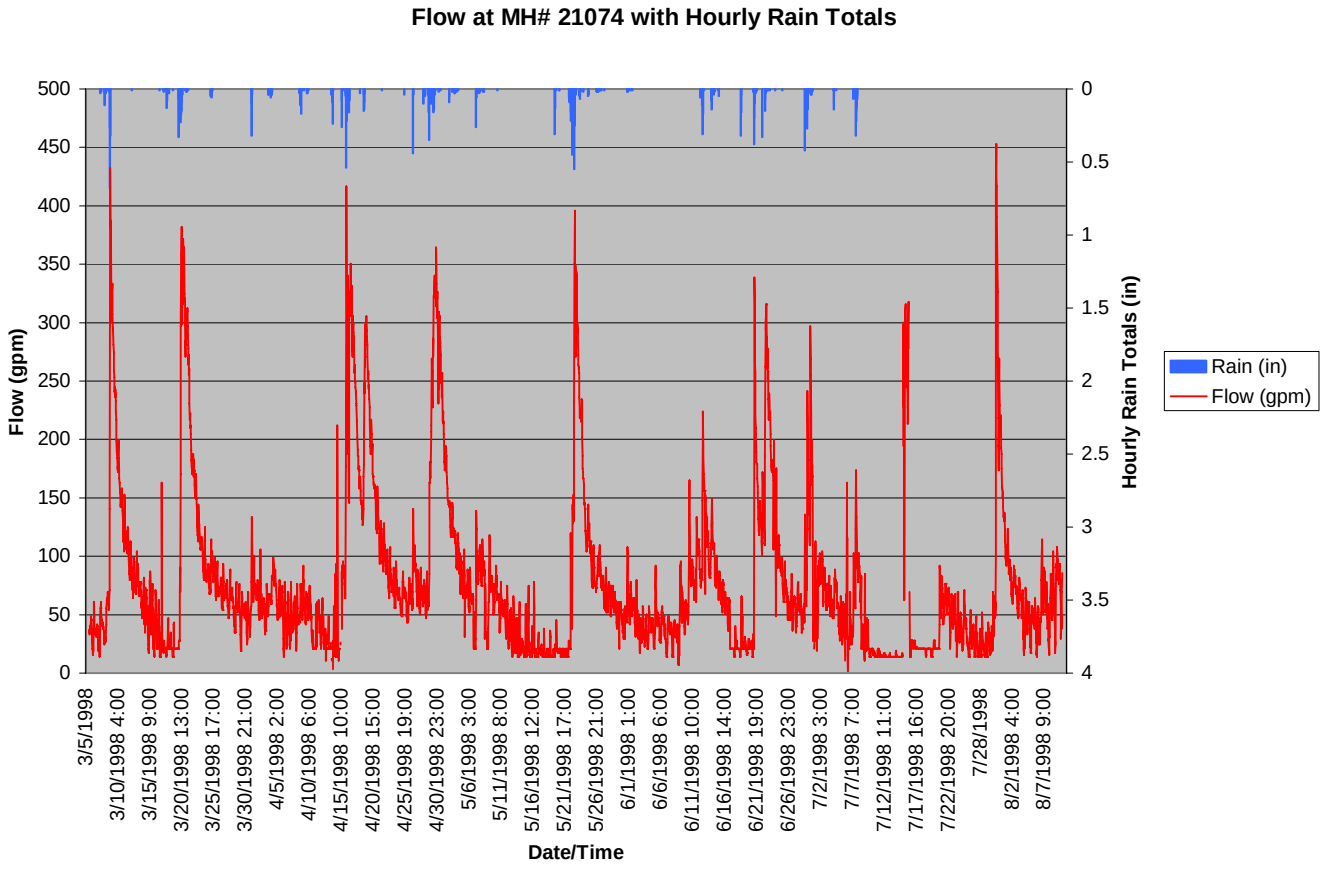

Figure 6.3-3 Sewer Flow Meter Data with Rain

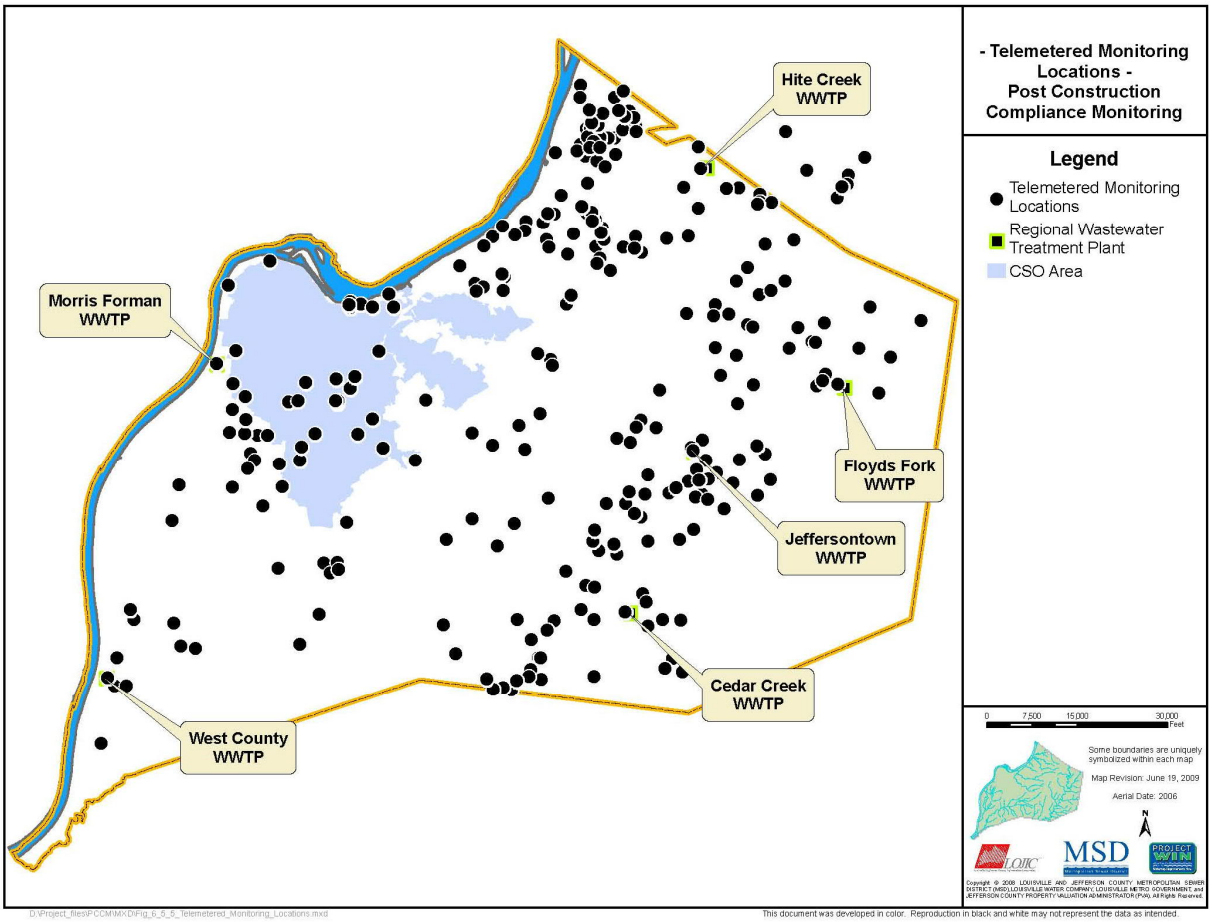

Figure 6.3-4 2012 Telemetered Monitoring Locations

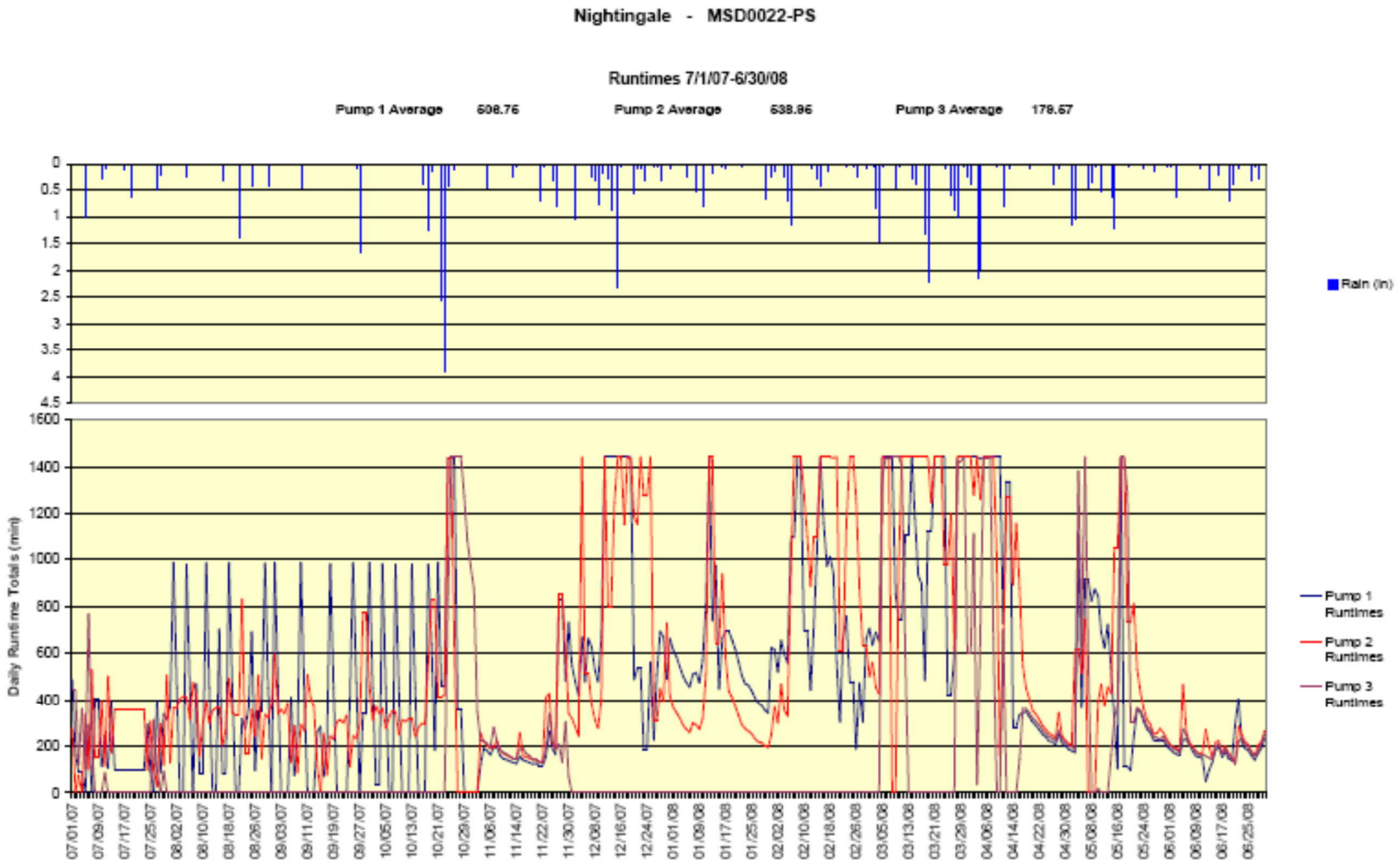

Figure 6.3-5 Pump Station Run Times and Rain at Nightingale Pump Station

6.3.2.3. STREAM FLOW AND WATER QUALITY MONITORING

Environmental data collection and stream health trending is conducted associated with the MS4 program. Although this data is not necessary for Consent Decree PCCM per the CSO Policy Presumption Approach, water quality monitoring has shown positive results for IOAP implementation to date. While the monitoring and reporting procedures here are based on current practices, they are subject to change.

MSD currently maintains a system of automated and manual stream monitoring to track stream flow and water quality trends throughout Louisville Metro. Automated water quality measurements are recorded in 15-minute intervals at the 28 Long Term Monitoring Network (LTMN) sites in Jefferson County. MSD collects bacteria samples at each LTMN location five times per month during the recreational contact season. The data is used to evaluate water quality conditions such as daily averages, maximums, minimums, and 30-day geometric means. Quarterly samples are also taken at these sites to gather more in depth readings of conventional pollutants, nutrients, and metals.

United States Geological Survey (USGS) stream flow gauges have been in place for many years at MSD's LTMN sites shown in Figure 6.3-6 and are an important part of tracking wet weather flow and calculating pollutant loadings. The data is transmitted remotely and available in real-time on the USGS web site (**http://waterdata.usgs.gov/ky/nwis/rt**) and via MSD's website.

The equipment housing and communications ports for the stream flow meters are shared with MSD's automated stream water quality meters called sondes. The sondes collect dissolved oxygen, pH, temperature, and conductivity readings every 15-minutes, which enables MSD to see diurnal patterns in those data series as well as longer-term trends. Since 2000, MSD has maintained 28 sonde sites, in and around Louisville Metro. Data from these sondes is also available at the site referenced above and on MSD's intranet. Twenty-six of those sonde sites also contain stream flow gauges. The graph in Figure 6.3-7 gives an example of healthy dissolved oxygen, pH, conductivity, and temperature readings in a local stream. The downward spikes in the conductivity directly correlate to small rain events that occurred during that time period.

Surface water and wastewater samples are collected on stream and sewer locations respectively and delivered to the laboratory for analysis on a routine basis and for special projects. The laboratory analyzes the samples for a variety of pollutants including bacteria, conventional pollutants, nutrients, and metals. A graph displaying fecal coliform samples taken during a wet weather event at one location is presented in Figure 6.3-8.

MSD conducts wet weather water quality sampling at the LTMN sites in accordance with the MS4 permit. Rain events chosen for sampling generally have a predicted depth of 0.5 inches or more. Samples are taken in accordance with the MS4 Permit to demonstrate pollutant loading in the stream during wet weather.

For WQTCs, results for the water quality testing currently taking place at treatment centers are reported monthly in the Discharge Monitoring Reports (DMR) in accordance with the respective KPDES permits. Continuing long-term monitoring at the LTMN sites, wet weather sampling, recreational contact site sampling, and treatment plant sampling is associated with KPDES permits.

Biological samples are also collected at LTMN sites to assess long-term stream health. Samples are collected for fish, macroinvertebrates, and algae because the number and species of each is an important indicator of stream health, and the sets are interrelated. Habitat data is also collected to indicate what type of environment is available to the different organisms. Figure 6.3-9 depicts how the fish data is gathered.

The number and species of each organism are important indicators of stream health. The raw data have been compiled into an objective metric called the Index of Biotic Integrity. That system provides a consistent

framework for converting detailed species lists and counts into simplified numeric evaluations against standards that rate a stream as “Excellent”, “Good”, “Fair”, etc. The standard is based on knowing the tolerance of each species of organism to different types of environmental pollution. Finding sensitive and more diverse species may be an indication of better water quality and finding less diverse and highly tolerant species may indicate poor water quality.

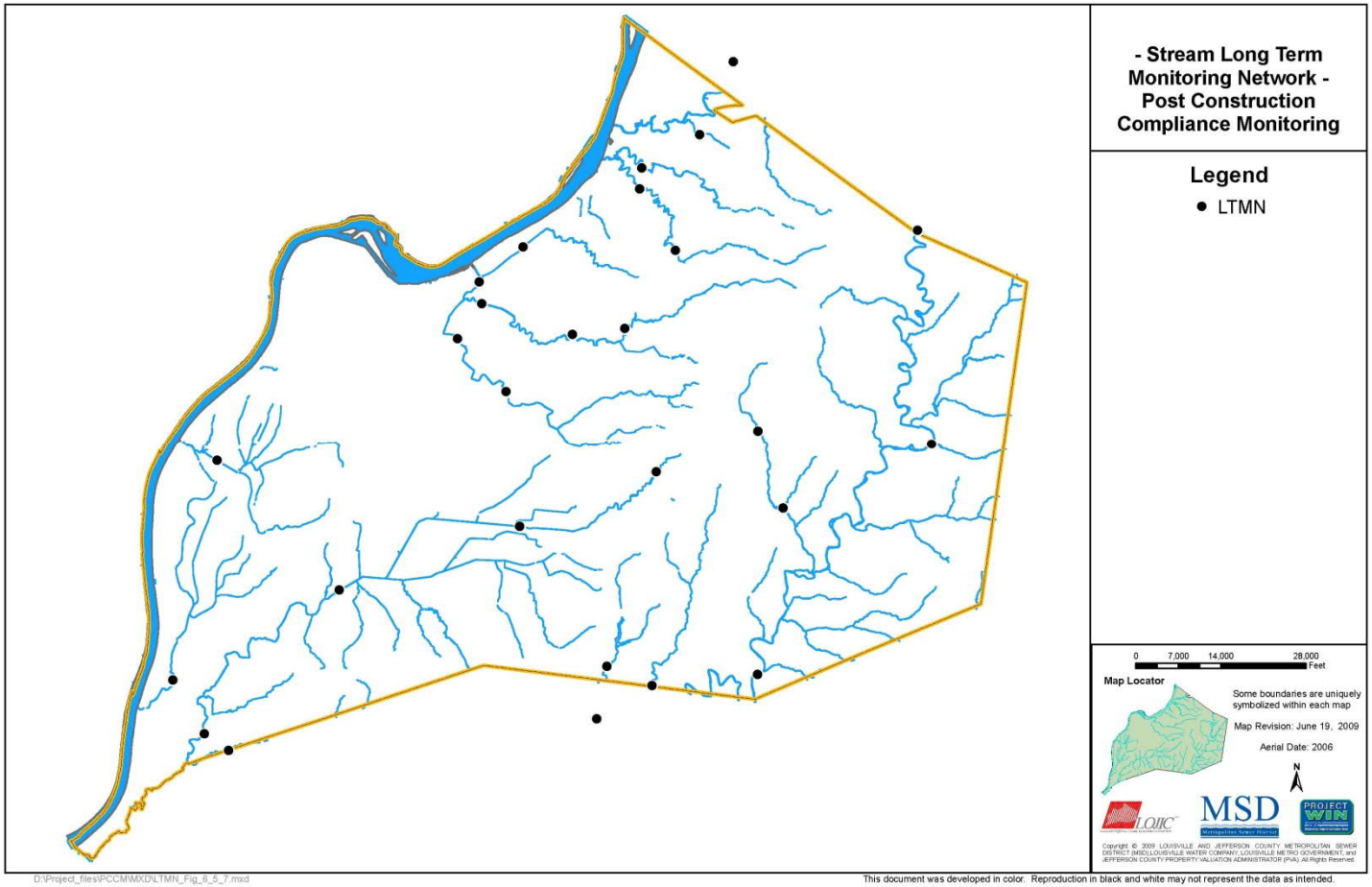

Figure 6.3-6 Stream Long Term Monitoring Network

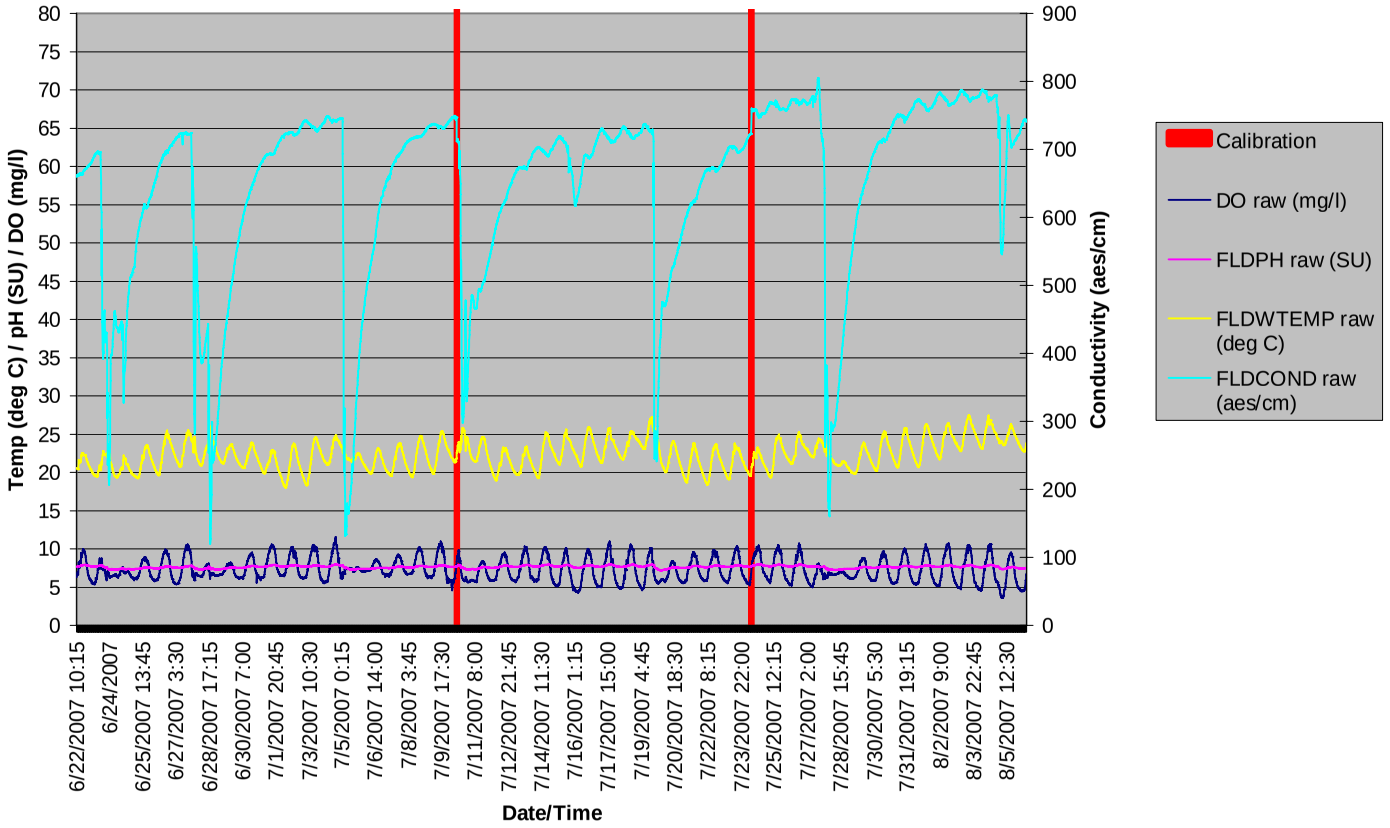

Figure 6.3-7 Sonde Data from Sampling Location EMIMI009

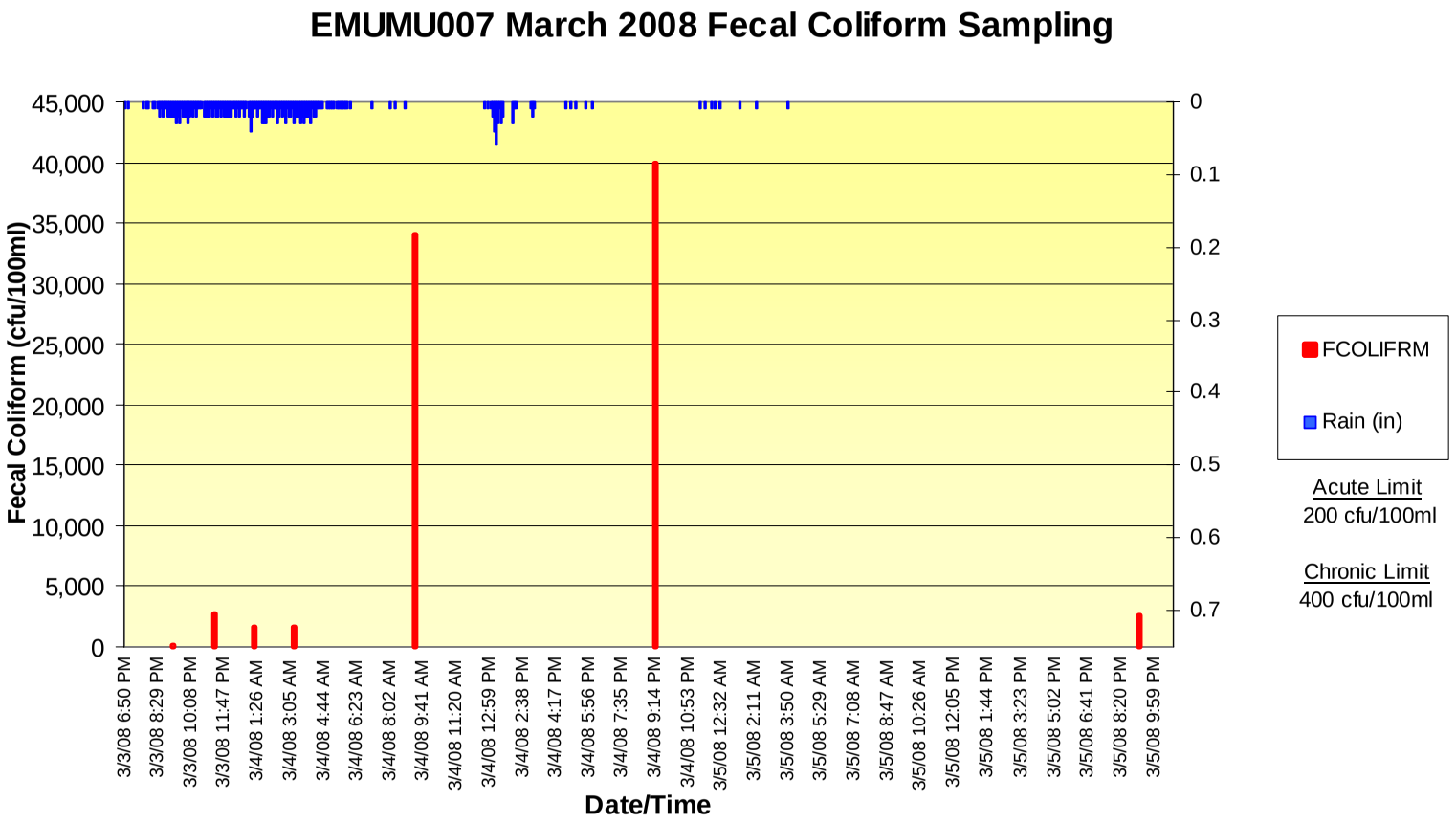

Figure 6.3-8 Fecal Coliform Samples at Sampling Location EMUMU007 with Rain

Figure 6.3-10 shows an example of Fish Index of Biotic Integrity scores trended over time at two locations. In this graph, Cedar Creek in Bullitt County shows a similar score in three different evaluation years with each score falling in the “Fair” range. Chenoweth Run at Ruck Riegel Parkway showed a similar score in three different evaluation years with each score falling in the “Poor” range.

The Water Quality Synthesis Reporting in accordance with supporting MS4 program requirements and available for reference in the Project WIN library, serve as an example of the analyses performed every five years (previously every two years) per the MS4 permit to ascertain the trending stream health throughout MSD’s LTMN.

Top Left – Stream Technicians use Electrofishing techniques to collect fish over a designated stream reach.

Top Right – They transfer all fish to a cooler for temporary holding.

Bottom Left – Species are identified for each individual fish

Bottom Right – Results are documented for number of each individual species caught. These data are turned into a measure of stream quality.

Figure 6.3-9 Fish Sampling

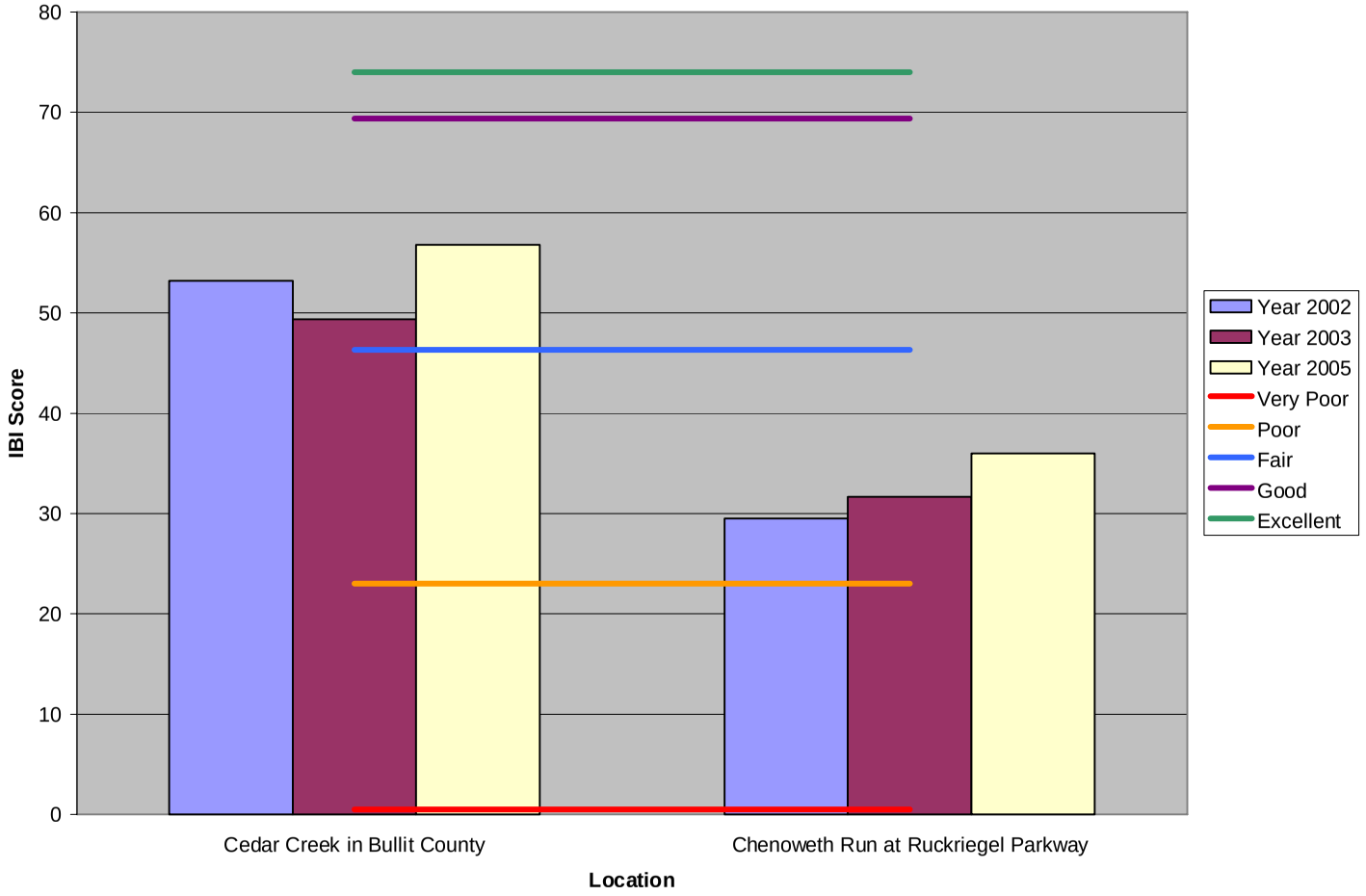

Figure 6.3-10 Fish Index of Biotic Integrity (IBI) 2002 - 2005 at 2 Locations

6.3.2.4. DATA QUALITY ASSURANCE

Monitoring procedures produce a wide variety of data, collected from both internal and external sources. Assuring that procedures associated with the life of a data point or data set, are carried out with the highest quality is a top priority for MSD. MSD intends to implement several quality assurance practices to ensure data accuracy.

Data Collection and Instrument Calibration

Proper data collection practices are crucial to achieving accuracy. Training is provided annually for staff collecting water quality samples at the LTMN sites and non-LTMN sites. This training outlines standards for collecting and delivering water quality samples and calibrating sondes. In addition, MSD has worked with USGS to administer an additional training program providing more in-depth training on sonde calibration and maintenance. Training ensures more accurate data for water quality analysis. Further adjustments to training procedures and collection and calibration methods will be made as necessary.

Data Quality Procedures

Rain data is collected by MSD through a network of rain gauges and is processed with radar data to create radar-adjusted rainfall data. Both data sets provide the data in a live feed to databases at MSD, so there is little opportunity for the data to be corrupted; however, there are opportunities for the data sets to have gaps or become misaligned. Data sets found to have missing or misaligned data are either corrected or annotated as incorrect.

Flow meter data is currently collected by MSD using telemetry and direct data downloads. The telemetry systems are utilized for the long-term flow meters. Pertinent information about the flow meter is added to IPS as a sewer flow meter asset, and the high-resolution data is stored in databases. In the migration process, a Quality Assurance application will identify records outside of acceptable parameters. Corrections and verification will be made as necessary.

6.3.3. PROJECT CERTIFICATION

Under the IOAP, the primary compliance assessment objective will be to certify completion of each overflow abatement project required by the Consent Decree and included in the IOAP. This includes project certification letters associated with the ISSDP, Final SSDP, Final LTCP, and 2021 Additional Early Action Projects, as described in Volume 1, Chapter 4.

6.3.4. PROJECT-BASED SSDP COMPLIANCE

Due to the nature of SSDP projects having varying levels of control (associated with 2-, 5-, and 10-year cloudburst storms), ensuring effective post-construction performance is important at the project level. It is the intent that performance analyses will be conducted for constructed projects as monitoring data becomes available. To complete this effort and independently assess projects that have been certified to date, MSD has partnered with the University of Louisville Center for Infrastructure Research (UofL) for the majority of the project PCCM evaluations.

Since the FY2014 Annual Report, MSD has pro-actively reported performance findings for completed projects and self-identified cases where the performance falls below the committed level of control. In such cases, MSD has defined remedial measures to improve performance to the appropriate level. The period for monitoring performance for compliance encompasses a three-year window following construction. This additional analysis will support compliance for SSDP projects where schedules allow an adequate monitoring window.

Current performance reporting includes projects certified through June 30, 2019, with data through June 30, 2020. Of the projects analyzed to date, the majority of projects have met the criteria for final committed level of control, and some remain under assessment because they are considered part of phased projects. While phased projects are not able to pass the current performance assessment, they are linked to other projects that will address performance issues. Combined system LTCP projects inherently fall into this category and are discussed below. A complete list of project-level PCCM results are updated with each annual report.

6.3.5. SYSTEM-WIDE LTCP COMPLIANCE

Because of the interconnectivity of the combined sewer system, a system-wide methodology is necessary for evaluating PCCM within the combined system. It requires a model-based approach to ensure that the certified projects are effective at exceeding 85% capture for treatment or elimination of wet weather flows when compared to pre-IOAP conditions. Consistent with the CSO policy, the post construction compliance monitoring program will involve flow metering of the collection system and updated hydraulic modeling to confirm achievement of the target percent capture values. Once system performance has been validated, KDOW will coordinate with MSD to transition to a post LTCP permit that requires continued operation and maintenance of controls necessary to maintain compliance. LTCP projects will be evaluated holistically according to this PCCM methodology when compared to the 85% Presumption Approach compliance target.

The IOAP projects, when fully implemented, are projected to eliminate or capture for treatment 95 percent of the wet weather combined sewage generated in the service area, which greatly exceeds the CSO Policy Presumption Approach requirement of 85 percent. Although not required by the Presumption Approach, initial water quality modeling (described in Volume 1, Chapter 5), supports that both Beargrass Creek and the Ohio River would follow existing water quality standards if all background loads were removed. Therefore, successful implementation of projects associated with this IOAP results in the remaining CSOs, in the absence of other loads, will not by themselves cause a violation of water quality standards. The measured reductions of Beargrass Creek and ORSANCO Ohio River bacteria levels during wet weather compared to pre-construction data additionally support the environmental and health benefits of IOAP implementation (Exec Summary Figure ES1.1-2 and Figure ES1.1-1 respectively).

6.3.6. PROJECT-SPECIFIC PERFORMANCE TESTING

In addition to wet weather storage, conveyance, and source control solutions, the IOAP includes projects that enhance or provide redundancy to ensure necessary wet weather treatment capacities, supplemental environmental projects focused on stream restoration, and supplemental source control initiatives. While PCCM per the EPA presumption approach is associated with project certification and assessing the effectiveness of the LTCP as a system, in some cases, additional post-construction monitoring was conducted.

6.3.6.1. SOURCE CONTROL

Source control solutions play into the efficacy of post construction programmatic compliance in both the separate and combined systems. While the IOAP does include some specific I/I reduction and green infrastructure projects, MSD relies on source control efforts to mitigate, enhance, and sustain IOAP solutions. Therefore, PCCM for their associated projects follows the methodology outlined in right-sizing, SSDP, and LTCP sections above. The 2021 IOAP additionally includes a robust asset management program (Volume 1, Chapter 4) to invest in I/I reductions for the system's many aging and critical assets. Source control efforts include:

- 19 green demonstration projects were completed associated with the 2012 IOAP (Volume 2, Chapter 3). The intent of these projects was fulfilled through their completion as well as development of lessons learned

associated with planning, design, and construction which informed best-practices for green program implementation.

- Green-to-gray analysis resulted in green infrastructure solutions for CSO130 and CSO190 sewershed basins. Performance for these projects follows the model-based LTCP program methodology described in Section 6.3.4.
- Downspout disconnection pilot studies, the private property plumbing modification program, and green infrastructure incentive partnerships support combined and separate system overflow reductions. While partnership and pilot efforts have incentivized and encouraged reductions in basins that benefit the most from source control, the IOAP PCCM relates to the respective SSDP or LTCP methodologies as appropriate.
- Asset Management program performance will be based on meeting program spending requirements and certification of associated projects. These projects support both separate and combined systems, so additional independent project-level PCCM for the program components will not be necessary.

6.3.6.2. STREAM RESTORATION SUPPLEMENTAL ENVIRONMENTAL PROJECTS

Two stream restoration projects were incorporated into the 2009 ACD requirements as Supplemental Environmental Projects (SEPs) per the September 25, 2009 KDEP approval letter:

- **Cherokee Park Stream Restoration** – Comprised of ecosystem restoration, including bank stabilization and native plantings along Middle Fork of Beargrass Creek
- **Pond Creek #2: Pond Creek / Mill Creek Corridor and Ecosystem Restoration Plan** – Joint project with USACE for trail and ecosystem restoration

Because the intent of these SEPs was to promote more stable and diverse ecosystems, monitoring plans specific to their scopes were developed. Post construction monitoring for a three-year period following these projects allowed documentation of changes in channel morphology and vegetative protection over time to promote sustainability. Final monitoring reports provided at the end of the three-year period (2014) reported that restoration activities met their objectives in terms of stability and functionality for habitat and riparian corridor improvement. In-stream structures, bank stabilization, and revegetation were performing effectively.

6.3.6.3. DEREK R GUTHRIE WQTC FLOW EQUALIZATION AND TREATMENT PROJECT

While PCCM is normally associated with assessing the effectiveness of LTCP system, the Derek R. Guthrie (DRG) WQTC expansion was atypical due to its influence on MSD's LTCP for the inclusion of both SSOs and CSOs. Because of its unique role, MSD completed additional PCCM efforts in order to assure that the projects were meeting or exceeding the design intent. This section discusses the additional performance testing that was conducted at this specific location. While process and operational testing may be conducted associated PCCM efficacy for other WQTC projects, compliance will ultimately be determined by the system-wide LTCP performance methodology described above.

In the Interim Sanitary Sewer Discharge Plan (ISSDP) approved in July 2008, MSD identified that the DRGWQTC wet weather expansion projects would be significant to the success of the ISSDP. The proposed DRGWQTC wet weather expansion projects provided the capability to hydraulically accept and adequately treat the elevated flows and loads generated during wet weather events. The wet weather treatment expansion projects expanded DRGWQTC ability from 100 MGD to 200 MGD along with supplemental influent storage capacity.

The wet weather expansion projects included four separate construction contracts which included:

- Upgraded blower equipment to support the additional biological treatment;
- New screening, influent pump station, rehabilitated wet weather pump station and short term detention basins;
- Expansion of the preliminary, secondary and disinfection processes; and
- New equalization basin.

MSD recognized that the success of the ISSDP rested in large part on the capability of the DRGWQTC to hydraulically handle and adequately handle and adequately treat the elevated flows and loads generated during wet weather treatment events. To this end, the project-specific PCCM components helped verify the various projects during the 2014-2015 timeframe with a final report dated July 10, 2015. The PCCM Program for the DRGWQTC Projects included four elements: 1) Equipment Testing, 2) Field Verification of the hydraulic model, 3) Field verification of the process model, and 4) Report on One Year Operations data.

The conclusion of the PCCM Program's Equipment Testing found the critical equipment installed was tested and certified to operate as specified. The Field Verification of the hydraulic model was challenging due to the limited hydraulic fall available between the influent and effluent locations. The Field Verification of the process model did find an equitable match between the model and the sampling data with only a decreased performance in the grit system. The One Year Operations report evaluated 12 months of effluent data which demonstrated the DRGWQTC produced treated water that met the Permit effluent limits and is meeting the operational performance per its design intent.

At this time, the Wet Weather Pump Station can be operated with limited capacity in such a way to meet wet weather flow requirements but has not been approved for full automated operation due to the pumps not able to meet the vibration requirements. Equipment is being fabricated for a proposed solution to resolve the vibration issues. MSD places the equalization basin in operation when flows dictate in manual mode while the Wet Weather Pump Station is in negotiations.

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