INTEGRATED OVERFLOW ABATEMENT PLAN

EXECUTIVE SUMMARY

SCOPE AND DESIRED OUTCOMES

On August 12, 2005, Louisville and Jefferson County Metropolitan Sewer District (MSD) entered into a Consent Decree with the U.S. Environmental Protection Agency (EPA) and the Kentucky Department of Environmental Protection (KDEP) to address wet weather overflows within the separate and 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 separate sewer system (SSS), CSS, and wastewater treatment plants (WWTPs); and to address discharges from MSD's combined sewer overflow (CSO) locations identified in the Kentucky Pollutant Discharge Elimination System (KPDES) for the Morris Forman WWTP. 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 was released for public comment. The draft Amended Consent Decree addressed alleged violations of the CWA primarily related to wastewater treatment plant performance, record-keeping, and reporting. Public comment closes on the draft Amended Consent Decree on December 31, 2008. It is anticipated that the Amended Consent Decree will be finalized early in 2009.

The Consent Decree amendments were negotiated over several months, and the terms of the draft amendments were known to MSD during the final stages of development of this Integrated Overflow Abatement Plan (IOAP). For the purposes of the IOAP, except where specifically noted otherwise, the term "Consent Decree" will be understood to mean the draft Amended Consent Decree as it was published in the Federal Register on December 1, 2008. Any modifications made to the draft Amended Consent Decree as a result of public comment will be addressed in a revision to the IOAP that will be prepared not later than 60 days after the Amended Consent Decree is finalized, or 60 days after receipt of IOAP review comments from the appropriate regulatory agencies, whichever is later.

This IOAP is a major part of MSD's response to the Consent Decree. The IOAP is a long-term plan to control CSOs and eliminate sanitary sewer overflows (SSOs) and other unauthorized discharges from MSD's sewerage system. The IOAP is expected to improve water quality in both Beargrass Creek and the Ohio River through and below Jefferson County. The expected water quality benefits of the IOAP include: (a) reductions in the peak levels of bacteria in the Ohio River and Beargrass Creek; and (b) a substantial (greater than 95 percent) reduction in the amount of time that CSOs may cause bacteria levels to exceed water quality standards.

CSO Benefits:

The suite of projects selected for the Final CSO Long-Term Control Plan (LTCP) will result in approximately 96 percent capture and treatment of wet weather combined sewage during an average year. This benefit represents an 85 percent reduction in CSO volume compared to conditions in 2008. As a point of reference, the presumptive approach for compliance with water quality standards in EPA's CSO Control Policy is based on a minimum of 85 percent capture and treatment of wet weather combined sewage.

Remaining CSO loads will no longer cause fecal coliform water quality standards violations in the Ohio River. Downstream from Morris Forman WWTP, peak fecal coliform counts are modeled to be reduced by 54 percent, from 100,000 colony-forming units (cfu) per 100 milliliter (cfu/100mL) to 46,000 cfu/100 mL. If CSOs were eliminated, background sources (e.g. upstream Ohio River, stormwater runoff, and other sources) would continue to cause standards to be exceeded 33 percent of the recreation contact season (May to October).

Remaining CSO loads (after removing background) will result in 100 percent compliance with fecal coliform standards in Beargrass Creek with the exception of a few locations. At these locations, CSOs will be a minor factor (less than 5 percent) in potential water quality standards violations in Beargrass Creek. At the mouth of Beargrass Creek, peak fecal coliform counts are modeled to be reduced by 18 percent, from 44,300 cfu/100mL to 37,400 cfu/100 mL. Reducing fecal coliform loads from CSO sources by 85 percent (compared to 2008 levels) results in a reduction of total loads on Beargrass Creek of approximately 30 percent. This is reflective of the preponderance of loads from stormwater runoff and other sources unrelated to CSOs.

SSO Benefits

The suite of projects selected for the Final Sanitary Sewer Discharge Plan (SSDP) for SSO control will result in the elimination of capacity-related SSOs up to the site-specific level of protection. The SSO projects are anticipated to eliminate an average of 145 SSO events per year (290 million gallons of overflow volume), based on 2005–2007 data normalized for rainfall. In terms of water quality, SSO projects will eliminate 100 tons of 5-day biochemical oxygen demand (BOD_5) and approximately 200 tons of suspended solids annually.

Along with delivering water quality improvements from sewer overflow control, MSD participates in other community water quality improvement efforts. Sewer overflow control is essential to improving water quality, but overflow control alone is not sufficient to meet water quality standards. In light of this challenge, MSD continues to leverage its role in supporting broader water quality improvement efforts in the community. The IOAP will be one of the key elements of MSD's participation in those water quality improvement efforts.

Integration with Other Water Quality Programs

The IOAP is a part of MSD's Consent Decree response and will be a federally enforceable action plan for sewer overflow abatement. Although many IOAP projects and programs will provide multiple benefits to the community, the scope of the IOAP is limited to commitments that directly relate to MSD programs and activities to address CSO and SSO 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 they do not fall under the same federal enforcement. These programs may, however, have different enforcement mechanisms. As noted above, MSD anticipates coordinating IOAP implementation with the water quality improvement initiatives of Louisville Metro Government and other public and private entities, even though these broader initiatives may not explicitly be part of the IOAP.

Values-Based Performance Evaluation Framework

In accordance with the Consent Decree, MSD established a Wet Weather Team (WWT) comprised of a broad range of community stakeholders, MSD staff, and consultants. Through a series of 22 meetings over the course of two years, the WWT developed a values-based performance evaluation framework to use in evaluating, selecting, and prioritizing alternative approaches to overflow abatement. This analytic framework includes both a robust benefit-cost scoring methodology for evaluating and selecting project alternatives and a systematic process for evaluating the IOAP programmatically. The WWT identified and agreed upon the following eleven community values that underpin the analysis and selection of alternatives for the IOAP.

Project-Specific Values	Programmatic Value
• Asset protection • Eco-friendly solutions • Environmental enhancement • Public health enhancement • Regulatory performance	• Customer Satisfaction • Economic vitality • Education • Environmental justice and equity • Financial equity • Financial stewardship

Using the structured decision-making process as framed by the WWT, MSD developed and evaluated overflow abatement control options for the IOAP centered on managing risks to these community values. In particular, MSD's technical team analyzed each project alternative considered for the IOAP in terms of potential benefits and costs, where "benefits" are quantified using 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 (within the boundary conditions for CSOs and SSOs described below), and the relative priority of projects for implementation.

Several of the WWT's community values relate to financial considerations, including 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). The WWT used the results of the values-based benefit-cost analysis of project alternatives to provide context to discussions about the appropriate level of investment in the IOAP.

The WWT's discussions about total program costs and the selection of projects for the IOAP have considered, as directed in EPA's CSO Control Policy, 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 (59 Code of Federal Regulations {CFR} 18688). 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, including 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. 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 technical team's analysis of the IOAP according to the WWT's programmatic values yielded the following conclusions.

Customer Service: The IOAP ensures service continuity by eliminating several small WWTPs and pump stations and by incorporating redundant equipment and standby generators in the proposed projects. Odor control guidelines have been consistently applied across all projects. Most storage basins proposed in the IOAP will be covered to minimize odors. Other storage basin and pump station improvement projects incorporate odor control equipment.

Economic Vitality: MSD's current rates are near the national average. The anticipated annual rate increases of 5 to 6.5 percent are consistent with initial estimates of program costs, and they include allowances for future MSD programs as well as IOAP implementation. Even with these rate increases, MSD's rates are anticipated to remain at or near the national average, assuming other communities face similar inflation and regulatory pressures. These estimates are based on current data; many unknown factors (such as, bond market, construction market conditions, etc.) will also affect future rates.

Education: Education is an integral and essential component of the IOAP. It supports a number of IOAP objectives, including promoting and sustaining participation in green infrastructure and source control efforts, and building a sense of personal responsibility and support for clean water initiatives.

Environmental Justice and Equity: The site selection process followed uniform criteria across the county, with most solutions placed near overflow points and with no homes or private businesses permanently displaced. Furthermore, the configuration of facilities was based on a uniform application of written design criteria and odor control criteria. Other nuisance conditions, such as noise, dust, and traffic disruptions will be minimized during the design and construction phases of projects.

Financial Equity: MSD's rate structure is based on a cost-of-service model tempered by consideration of customers' ability to pay. The rate increases proposed to fund the IOAP and other MSD programs will continue to be based on the cost of service, but MSD will recommend to the MSD Board that the existing low income, senior citizen discount program be expanded. The IOAP also proposes subsidies and incentives for green infrastructure and inflow and infiltration (I/I) control based on their business value for overflow abatement.

Financial Stewardship: As described above, the IOAP is based upon a rigorous benefit-cost analysis that considered a broad range of technology alternatives and different levels of control that met or exceeded regulatory guidelines. The "knee of the curve" evaluations of IOAP projects demonstrated that the IOAP provides a high level of control, but does not exceed the point of diminishing returns.

As noted previously, the WWT included a diverse group of community stakeholders. This Stakeholder Group included 20 community opinion leaders from local government, industry environmental advocacy groups, education, public health and many other areas of interest. The Stakeholder Group played a key role in developing the framework for alternative evaluation, selection, and prioritization. One of the final acts of the Stakeholder Group was to develop a memorandum expressing support for the IOAP. This WWT Support Memorandum is attached at the end of this Executive Summary (Attachment 1). The support from the Stakeholder Group is based on their understanding of the plan as represented by an "IOAP Vision." The IOAP Vision is also attached at the end of the Executive Summary (Attachment 2).

Control Levels for CSOs and SSOs

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[1] has guidelines for establishing abatement targets for CSOs, one of which is the presumptive approach of establishing controls that provide for the elimination or capture and treatment of at least 85 percent of wet weather combined sewage. Under this approach, CSOs are presumed to be adequately controlled to comply with water quality standards. Regardless of the approach that the community follows to establish abatement targets, implementation of the plans should provide that CSOs, in the absence of other loads, do not by themselves cause a violation of water quality standards.

Using the values-based performance evaluation and risk management decision process described previously, MSD has elected to provide a level of CSO control that greatly exceeds EPA's presumptive approach of 85 percent capture of wet weather combined sewage. This level of overflow control represents a 96 percent capture of wet weather combined sewage, and an 85 percent reduction in overflow volumes as compared to 2008 levels.

CSO projects in the IOAP have the following levels of control:

- Seven projects result in no overflows in a typical year; these locations would only overflow as a result of very large storms.
- Two projects would result in four overflows per year in a typical year.
- Thirteen projects result in eight overflows per year in a typical year.

[1] EPA's Combined Sewer Overflow Control Policy is available at http://cfpub1.epa.gov/npdes/cso/cpolicy.cfm.

One of the CSO projects (the Beargrass Creek Parallel Interceptor) does not directly impact overflow frequency, as it provides conveyance capacity for drainage of storage basins. This project is not included in the level of control discussion above.

MSD's strategy for SSO control reflects the fact that SSOs, unlike wet-weather CSOs, are considered to be unauthorized discharges that must be eliminated according to EPA. Given the variable impacts of rainfall on sewage flows, elimination of unauthorized discharges must be framed in the context of a "design storm" that will be community-specific. 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. Consistent with an analysis of sixty years of historical weather patterns for Louisville Metro, the IOAP uses a three-hour "cloudburst" storm, with a statistically anticipated rainfall of 1.82 inches, as the minimum design storm considered. There is a 50 percent probability that a storm this large will occur in this area in any given year. The Cities of Atlanta, Cincinnati, and Knoxville used similar statistically probable design storms as the minimum protection level for SSO control. 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 (such as, a 2.25-inch cloudburst storm instead of a 1.82-inch cloudburst storm) because they yield a higher benefit-cost ratio in the analysis of project alternatives.

SSO projects in the IOAP have the following levels of control:

- Thirty projects eliminate overflows up to a 1.82-inch cloudburst storm.
- Nine projects eliminate overflows up to a 2.25-inch cloudburst storm.
- Seven projects eliminate overflows up to a 2.60-inch cloudburst storm.

COMPONENTS OF MSD'S INTEGRATED OVERFLOW ABATEMENT PLAN

Control options in the IOAP, known as the IOAP toolkit, include source control such as green infrastructure and I/I reduction efforts, storage, conveyance/transport, treatment, and sewer separation. MSD's technical team used the benefit-cost tool to compare the project alternatives and program elements considered for inclusion in the IOAP. The specific mix of control options for individual CSO or 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 WWTPs and draw on synergistic benefits from other MSD projects (for instance the Interim SSDP projects). Furthermore, project budgets include an enhanced site restoration allowance to fund localized opportunities to reduce historical overflow impacts on aquatic and riparian environments near the sites of overflow abatement projects.

Green Infrastructure and Gray Solutions, Initiatives and Programs in the Final CSO LTCP

Driven by the values-based benefit-cost analysis, the IOAP reflects a balanced mix of green infrastructure and gray solutions to prevent and control sewer overflows. "Green infrastructure" solutions include options such as vegetated roofs, rain gardens, rain barrels, porous pavement, and bioretention, while "gray" solutions include options such as storage, treatment,

conveyance/transport, and sewer separation. As a guiding principle, MSD's IOAP has been developed based on front-end consideration of source control and green infrastructure. This means that more traditional "gray" infrastructure in the IOAP has been sized after considering both (1) the anticipated flow-reduction benefits of programmatic and site-specific green infrastructure solutions and (2) the anticipated effectiveness of other source control approaches, including reduction of private sources of I/I.

Green solutions in the IOAP will be implemented as soon as possible, to allow data to be gathered on the flow reduction benefits that occur. Approximately 17 percent of the Final CSO LTCP budget is allocated to green infrastructure, and most of that is planned to support projects in the first six years of IOAP implementation. Prior to the final design of supporting gray solutions, the actual flow reduction performance will be documented and compared against the estimated targets. The final sizing of the gray solutions will then be based on actual documented performance of green infrastructure solutions, as well as any further green and source control investments justified by performance information. Green infrastructure investments are estimated to reduce the initial costs of CSO gray infrastructure projects by $40 million; potential future savings could double or triple this amount. A more detailed discussion of the green infrastructure program is presented in a later section.

Table ES.1 shows the 23 gray infrastructure projects to control CSOs defined in the IOAP.

TABLE ES.1

GRAY INFRASTRUCTURE PROJECTS TO CONTROL CSOS

Number of Projects	Project Type
6	Sewer separation projects
14	Storage basin projects includes in-line and off-line storage. Most in-line storage projects have a RTC component
1	Replacement and expansion of the Nightingale Sanitary Pump Station
1	Relief interceptor
1	One high-rate wet weather treatment (screening, settling, and disinfection).

In addition to these 23 CSO control projects, MSD will implement five projects at flood pump stations. These projects will eliminate a major cause of dry weather overflows related to operation of the flood pump stations in compliance with the U.S. Army Corps of Engineers Flood Protection System Pumping Operations Manual.

Green Infrastructure Program

The IOAP includes both an annual Green Infrastructure Program and an initial set of green infrastructure demonstration projects. The Green Infrastructure Program is front-end loaded to maximize benefits on downsizing future gray infrastructure. For example, the IOAP project schedule calls for a $40 million investment in green infrastructure programs and projects during the first six years.

Programmatic green infrastructure components in the IOAP include a downspout disconnect program, green roof construction subsidies or incentives, green roads and alleys partnership incentives, and pervious pavement sidewalks and parking. MSD has based the proposed incentives and subsidies on a "business case" analysis of the financial benefit of green infrastructure in terms of costs per gallon of flow removed from the CSS. Through the anticipated green infrastructure partnership, incentive, and education programs, MSD's initial $40 million investment in green infrastructure has the potential to leverage $60 million more from other private and public funding sources, thereby yielding up to $100 million in green infrastructure projects.

MSD plans to construct a series of new green infrastructure demonstration projects across Louisville Metro. The proposed green infrastructure projects in the combined sewer area (CSA) will be part of MSD's IOAP, while the proposed green infrastructure projects outside the CSA will be a part of the community's MS4 stormwater program and not a part of this IOAP. These demonstration projects are designed to achieve three main objectives: (1) improve water quality and reduce sewer overflows, (2) provide data on green infrastructure effectiveness, and (3) educate the community about the value and benefits of green infrastructure.

All proposed green infrastructure demonstration projects will incorporate a monitoring component, so that the effectiveness of the pilot projects can be regularly tracked. Project reports will document lessons learned and successes and be the mechanism to report to regulators and the public. MSD will use these monitoring results to guide future IOAP implementation, under the IOAP's adaptive management plan (further described below).

This IOAP vision currently reflects a minimum commitment to 19 green infrastructure demonstration projects. Along with various partnerships and regulatory approval, these proposed new green infrastructure demonstration projects include:

- Six bioswale and biofiltration projects (for example, green parking lots and green streets);
- Five rain gardens;
- Three pervious concrete alleys; and
- Five infiltration dry wells.

Source Control and Gray Solutions, Initiatives and Programs in the Final SSDP

Similar to the blending of green infrastructure with gray infrastructure in the CSO LTCP, MSD will implement an annually funded I/I reduction program to reduce clear water intrusion into the sewers. I/I is one of the main causes of SSOs, so eliminating the source can be an effective way of reducing SSOs. To be effective, an I/I elimination program must deal with collection system defects in both the public and the privately owned portions of the sewer system. MSD's program includes an active private side I/I reduction approach currently implemented through voluntary, subsidized programs. Prior to the final design of supporting gray solutions, the actual flow reduction performance from source control programs will be documented and compared against the estimated targets. The final sizing of the gray solutions will then be based on actual

documented performance of source control solutions. Approximately 15 percent of the Final SSDP budget is allocated to I/I reduction and other source control programs. In addition, the Final SSDP includes seven specific I/I reduction projects targeting overflows that appear to be controllable through source control alone.

Table ES.2 shows the technology components of the 42 gray infrastructure projects to control SSOs defined in the Final SSDP. Note that some projects have multiple components, so those projects will be counted in more than one category.

TABLE ES.2

GRAY INFRASTRUCTURE PROJECT COMPONETS TO CONTROL SSOS

Number of Projects Including Component	Project Type
24	Conveyance capacity upgrades and interceptor relief projects
19	Storage projects (in-line and off-line storage, many with pipe upgrades also)
10	Pump station upgrades, or replacements.
10	Pump Station eliminations
5	WWTP eliminations in the Prospect Area

Note: Final SSDP projects also include the potential elimination of the Jeffersontown WWTP. Interim SSDP projects include the replacement of the SSS in the Beechwood Village area, the decommissioning of the Highgate Springs Pump Station, construction of an interceptor to eliminate pumped overflows in the Hikes Point area, construction of a relief sewer and a diversion interceptor to route wet weather flows to the West County WWTP, and an expansion of the wet weather capacity of the West County WWTP (recently renamed the Derek R. Guthrie Water Quality Treatment Center).

Control of Private Sources of I/I

MSD's technical team analyzed methods to control private sources of I/I into the SSS and proposed several potential options. This analysis indicates that private-side I/I control must be an essential part of the IOAP implementation, because it will reduce the overall anticipated costs of overflow abatement.

Private source options include mitigating building laterals, downspouts, sump pumps, and foundation drains. The technical team also analyzed options requiring inspections of private properties. The required inspection options include: during the property transfer process, when building permits are issued, when contractors install roof and gutter systems, when plumbers connect sump pumps, and/or at other times. MSD would seek some form of cost share as well as conduct an aggressive education campaign. Lastly, MSD will continue to work with Louisville Metro Government in support of further development of an ordinance supporting these requirements.

Public Information, Education, and Involvement Program

Education and public involvement are critical to the long-term implementation success of the IOAP. MSD uses the term "Project WIN" (Waterway Improvements Now) to describe its Consent Decree response activities to the public.

The ongoing public information, education, and involvement program for Project WIN is designed to accomplish the following objectives:

- Generate a sense of personal ownership and responsibility for clean water;
- Promote and sustain participation in critical voluntary programs in the IOAP, including private-side I/I control and green infrastructure;
- Promote public acceptance and support for the financial investments required to achieve consent decree and CWA compliance; and
- Encourage support for other agency programs or legislation that supports overflow abatement efforts.

To achieve these objectives, the Project WIN education and public involvement program uses a wide range of communication media. These public involvement efforts are focused on several key audiences; including property owners, schools and children, and target groups such as, project neighborhoods, builders, and restaurants. Focusing education efforts on children is important to ensure the long-term sustainability of voluntary programs in the IOAP. MSD uses five key messages to promote Project WIN:

1. Value clean water.
2. Your investment is paying dividends, and our water is getting cleaner.
3. Protecting public health is critically important.
4. MSD and many community partners are working hard to improve water quality.
5. You can make a difference in improving water quality.

Post-Construction Compliance Monitoring

MSD's IOAP will use an adaptive management implementation approach based on monitoring and evaluation efforts. MSD's post-construction compliance monitoring and evaluation plan for the IOAP includes: (a) water quality monitoring, (b) sewer flow monitoring, (c) overflow events analysis, (d) gray and green infrastructure project performance monitoring, and (e) measurement of the effectiveness of source control and behavior-change efforts. A part of the post-construction compliance monitoring program will be a periodic recalibrating of sewer system models that will support project performance evaluation and resultant project re-sizing based on monitoring results.

MSD will adapt the CSO management and SSO elimination approaches based on the monitoring and evaluation results. Adjustments may include recalibrating models, "right-sizing" gray solutions, reevaluating the effectiveness of green solutions, and adjusting the types and characteristics of projects planned for later phases of implementation, supplementing existing

control projects with additional storage or conveyance, and including additional investments in green infrastructure or source control beyond those proposed in the initial program. At this time, there is recognition that historical weather trends may not be as reliable as in the past due to potential changes in the climate. The IOAP's adaptive management approach will allow MSD to continue to monitor rain events and weather pattern developments and adjust its plans as more technical data become available.

Future Development Considerations

Solutions in the IOAP consider future development based on the community's long-term landuse plan, Cornerstone 2020.[2] IOAP solutions are designed to accommodate the anticipated impacts of population growth and landuse development. The solutions consider the effects of growth on connections to existing infrastructure that is upstream from existing overflow points. However, the IOAP is not intended to provide capacity for all future growth that is predicted by Cornerstone 2020. Cases where the growth outlined in Cornerstone 2020 would logically be provided by new infrastructure and is not hydraulically dependent on or connected to the IOAP solution, have not been considered part of the IOAP. Moreover, the IOAP solutions are designed and sized to account for the impacts of anticipated growth on existing infrastructure, but the IOAP itself is not intended to build the capacity needed for growth.

IOAP Funding Plan

To meet the requirements of the Consent Decree, the funding plan is designed to cover the IOAP capital projects that will be constructed to improve MSD's sewer infrastructure. The IOAP funding plan is based on the following four principles:

1. Rates and fees for the IOAP must pay MSD's operating costs and debt service.
2. MSD's current bond rating (AA) should, at a minimum, be maintained.
3. Rates and fees should allow for continued economic development in the community and a strong local economy.
4. Rates must be affordable for MSD's customers.

For IOAP implementation, these funding plan principles affect the amount of money MSD may borrow at one time and the level of increases in rates and fees needed to fund capital and operating expenses.

MSD will fund the IOAP primarily through a combination of annual rate increases and bond issues or other loans. MSD also plans to pursue grants, line-item appropriations, and public/private partnerships (e.g., recapture agreements) to help pay for capital construction costs, as appropriate; however, the funding plan is not built around these funding sources since they are less certain. By estimates, the Consent Decree will cost $843 million in capital expenditures; as a result, average sewer bills for residential customers are expected to increase from 5 to 6.5 percent annually through 2021. Due to the Consent Decree capital construction

[2] For more information about the Cornerstone 2020 plan, see www.louisvilleky.gov/PlanningDesign/Cornerstone+2020.htm.

expenses, this means that the average monthly residential bill would increase from $29.58 in 2008 to approximately $63.12 by 2024. Along with these rate increases, MSD expects to borrow approximately $1.25 billion by 2024 based on the estimates of capital costs; this would increase MSD's debt service payments from $94 million annually to $163 million annually by 2025, assuming interest rates remain at five to six percent. A mixture of fixed and variable rate borrowings is anticipated. These rate increases and loans would be used to address both IOAP construction costs and other MSD capital needs for infrastructure renewal, replacement, and expansion.

Estimates of IOAP costs appear to be within community ability to pay, as indicated by an affordability analysis completed using EPA guidelines. MSD recognizes, however, the rate increases could nevertheless be difficult for some segments of the population to afford, especially in the context of other living expenses. For this reason, the WWT considered potential discount options to customers that face financial hardship. Therefore, in the IOAP funding plan, MSD proposes a few revisions to the existing rate structure that the MSD Board will need to consider. These revisions are designed to accomplish two objectives: (1) provide discounts for low-income senior citizens, and (2) ensure steady and predictable revenue flows overall.

As noted above, MSD will construct the capital projects to meet the regulatory requirements of the Consent Decree and achieve compliance with the CWA. Many of the elements of the IOAP—including the Project WIN education program, operations and maintenance of IOAP projects, and monitoring and evaluation programs—will also continue past the construction phase of the IOAP. MSD is committed to making sure that the IOAP programs and projects provide for long-term improvements in water quality in Louisville Metro.

An Approvable IOAP

MSD has developed the IOAP in conformance with the Consent Decree, the CSO Control Policy, and other applicable regulations. The following presents the "road map" of compliance factors for both the Final CSO LTCP and the Final SSDP.

An Approvable Final CSO LTCP

The MSD Final CSO LTCP as submitted on December 31, 2008, is fully compliant with the Consent Decree and the requirements of the CSO Policy. MSD's water quality compliance approach is based on EPA's Presumption Approach in that at least 85 percent of the wet weather combined sewage will be captured and treated with at least the equivalent of primary clarification, control of solids and floatables, and disinfection. The innovative and site-specific approach includes implementation of green infrastructure and public education. As stated above in Section 5.2.1, the Final CSO LTCP is also fully compliant with the three goals required in the Consent Decree [Item 25. (b) (2) A (i); (ii) and (iii)].

Both the Consent Decree and the CSO Policy require specific elements of the CSO LTCP as noted in the Table ES 3; MSD has fully complied with both the Consent Decree and the CSO Policy through the full inclusion of each of these elements in the CSO LTCP.

TABLE ES 3
FINAL CSO LTCP ELEMENTS AS REQUIRED BY THE CONSENT DECREE

Requirement Per Consent Decree Item 25 (b) (2)	IOAP and 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, Chapter 2 for an evaluation of the controls to address flood pumping issues, Volume 2 Chapter 3 for the alternative analysis and Volume 2 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 WWTP peak flow treatment capacity for any WWTP other than the Morris Forman WWTP that will receive additional flow based on any LTCP. Such evaluation shall 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 WWTP will receive any additional flow as a result of the Final CSO LTCP. Volume 2, Chapter 3.3 Evaluation of CSO Control Alternatives; Table 3.11 shows 17 treatment alternatives; Section 3.2.75 Utilization of Morris Forman WWTP; Section 3.2.8 Satellite treatment alternatives; Table 3.13.	**Yes** – peak flow treatment capacity will be available with use of storage, RTC, and treatment.
(iii) Report on the Public Participation Process	IOAP 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 LTCP addresses sensitive area as the highest priority for controlling overflows	Volume 2 Chapter 1.6.6.1; Chapter 2.8; Chapter 3.2.7.6.	**Yes** – while all receiving waters considered in the Final CSO LTCP are categorized sensitive under CSO Policy criteria, 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; Volume 2, Chapter 3.3.2, Volume 2 Chapter 4. Volume 1 Chapter 6 presents rate and affordability impacts.	**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	**Yes** – operational plan budgets adequate resources to operate and maintain the Final CSO LTCP projects.
(vii) maximization of treatment and evaluation of treatment capacity at Morris Forman WWTP	Volume 2, Chapter 3.3 Evaluation of CSO Control Alternatives; Section 3.2.7.5 Utilization of Morris Forman WWTP; Appendix 3.2.20 MFWTP Wet Weather Standard Operating Procedures, and Appendix 3.2.21 Morris Forman WWTP Expansion Tech 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 2, Chapter 4, Final CSO LTCP and selected Project Final Recommended Project List	**Yes** – All projects completed by Consent Decree deadline of December 31, 2020.
(ix) A post-construction compliance monitoring program adequate to verify compliance with water quality-based CWA requirement and ascertain the effectiveness of CSO controls	IOAP Volume 1 Chapter 6, Section 6.5.	**Yes** – a full suite of monitoring will be implemented in order to determine efficacy and adapt plan as appropriate.

An Approvable Final SSDP

The MSD Final SSDP as submitted on December 31, 2008 is fully compliant with all the requirements of the Consent Decree under section 25 (a) (3) A. and B, as shown in Table ES 4. 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 SSDP, in conjunction with the Sewer Overflow Response Protocol (SORP) and public education aimed at individual responsibility and behavior modification (as it relates to fats, oil and grease {FOG}, private sewer maintenance and rehabilitation and illicit cross connections and drainage) will eliminate unauthorized discharges from the SSS, CSS and WWTPs by December 31, 2024.

In addition, the Consent Decree requires that the results of an evaluation of the WWTP peak flow treatment capacity for any WWTP that will receive additional flow based on any Interim SSDP or Final SSDP project. These analyses were fully developed and can be found in Volume 1, Chapter 4.

TABLE ES 4
FINAL SSDP ELEMENTS AS REQUIRED BY THE CONSENT DECREE

Requirement Per Consent Decree Item 25(a)(3)	IOAP and Final SSDP Chapters and Sections	Compliance With Consent Decree
(3) The long-term SSDP projects, including schedules, milestones, and deadlines	Volume 1, Chapter 4.3, Chapter 6.3; Volume 3 – Final SSDP, Chapter 4.1.	**Yes –** The Final SSDP describes 42 gray infrastructure projects, 7\seven I/I reductions studies, and a source control program to eliminate 173 documented SSOs. The project schedule shows milestones and completion dates for each of these projects.
(3) 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 shall be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach and "Retrofitting POTWs"	Volume 1, Chapter 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 shall include 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 – Final SSDP, Chapter 2.5, Figures 2.5.3 through 2.5.15.	**Yes –** The network branch maps show all 173 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 – Final SSDP, Chapter 2.4, Table 2.4.2, with additional information in the Fact Sheets.	**Yes –** Table 2.4.2 contains this information and in the Fact Sheets.
(B.ii) The annual volume released of the Unauthorized Discharge	IOAP Volume 3 Final SSDP, Chapter 2.4, Table 2.4.2 in the Fact Sheets at the end of the chapter.	**Yes –** Table 2.4.2 contains this information in the Fact Sheets.
(B.iii) A description of the type of Unauthorized Discharge location	IOAP Volume 3 Final SSDP, Chapter 2.4, Table 2.4.2 in the Fact Sheets.	**Yes –** Table 2.4.2 contains this information in the Fact Sheets.
(B.iv) The receiving stream	IOAP Volume 3 Final SSDP, Chapter 2.4, Table 2.4.2 in the Fact Sheets.	**Yes –** Table 2.4.2 contains this information in the Fact Sheets.
(B.v.) The immediate and downstream land use, including the potential for public health concerns	IOAP Volume 3 – Final SSDP, Chapter 2.2.1	**Yes –** Descriptions of the WWTP 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	IOAP Volume 3 – Final SSDP, Chapter 1.3.	**Yes –** Chapter 1 summarizes MSD's previous and current SSO elimination efforts.

TABLE ES 4
FINAL SSDP ELEMENTS AS REQUIRED BY THE CONSENT DECREE

Requirement Per Consent Decree Item 25(a)(3)	IOAP and Final SSDP Chapters and Sections	Compliance With Consent Decree
(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	IOAP Volume 3 – Final SSDP Chapter 2.2 and 2.3.	**Yes –** The descriptions of the WWTP 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	IOAP Volume 1, Chapter 6.3, Volume 3 – SSDP Chapter 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.
(C) Schedules for design and construction, phased based on sound engineering judgment, and in no case extending beyond December 31, 2024	Volume 1, Section 6.3, Volume 3 Final SSDP, Chapter 4.2	**Yes** – Schedules are included that show the required phases, and this schedule shows completion by December 31, 2024.
(D) A plan to involve stakeholders in the planning prioritization and selection of projects.	Volume 1, Chapter 3.2, Volume 3 – Final SSDP Chapter 4.3	**Yes** – The IOAP included a robust and stakeholder involvement process that included participation in decisions on selection and prioritization of projects.

"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. Electronic reporting updates requested by KDEP and EPA have been developed and implemented to provide current information. Additionally, reports are prepared for each of the four quarters of the calendar year and are submitted to EPA and KDEP within 30 days of the end of the new quarter and are posted on MSD's website in the Public Repository for public review. These reports include specific information about activities consistent with the requirements of the Consent Decree and the progress toward the development of the Final CSO LTCP.

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 are no surprises when the IOAP was submitted, and that the IOAP met all the parameters to allow approval.

SUPPORTING INFORMATION

Attachment 1 WWT Support Memorandum
Attachment 2 IOAP Stakeholder Group Vision