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**BOARD OF COUNTY COMMISSIONERS OF HAMILTON COUNTY, OHIO
PHASE 2A WET WEATHER IMPROVEMENT PROGRAM (WWIP)
SCHEDULE OF WORK SUBMISSION**

June 29, 2018

Hamilton County WWIP Phase 2A Schedule of Work Submittal

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1. EXECUTIVE SUMMARY

The MSD Global Consent Decree requires projects to be implemented as “expeditiously as practicable” according to community affordability criteria. The projects are implemented through the Final Wet Weather Improvement Program (WWIP) in multiple phases. Phase 1 of the WWIP ends December 31, 2018 and is estimated to cost \$1.14 Billion (in 2006\$) or \$1.51B in current dollars. Subject to Court approval, the Regulators have agreed to additional Consent Decree projects to be implemented during the 2018-2020 time frame, referred to as Bridge projects, estimated to cost \$62 Million (2006\$) or \$82.5M in current dollars. Phase 2A will begin January 1, 2020, and a schedule of projects is required to be submitted by June 30, 2018. This document is the Board of County Commissioner’s (Board) proposed WWIP Phase 2A.

Phase 2A is proposed to last five (5) years until December 31, 2024 and to include a subpart of the entire WWIP Phase 2 projects. Phase 2B would begin in 2025 and its scheduling and project list would be due June 30, 2023. WWIP Phase 2A Capital Projects and Allowances are estimated to cost about \$200M (2006\$) or \$266M in current dollars, including project planning, design and/or construction of 28 projects, and \$13.4M/year for “WWIP allowances including the SBU program” used across broad areas of the MSD service area. The Phase 2A projects are listed below with milestones and costs, and are discussed in more detail in Section 5.

Adding \$50M/year (2006\$) for Asset Management brings the total cost for implementation of Phase 2A to approximately \$450M (2006\$) or \$599M in current dollars.

The Board governs MSD and sets its policies, budgets, rules and rates. The Board set the following Policy Goals for Phase 2 and Phase 2A:

- **COMPLIANCE:** Comply with the requirements of the Consent Decrees to address Combined and Sanitary Sewer Overflows and improve water quality within the constraints of community affordability, asset management to continue MSD operations, and practicability.
- **RATEPAYER PROTECTION:** Protect MSD ratepayers and the community from unaffordable program costs.
- **IMPROVEMENT:** Focus work on the existing list of WWIP projects, but adapt those that can benefit from lessons learned, special wet weather needs, new technologies, integrated planning, and changed circumstances from the start of Phase 1 and earlier.
- **FLEXIBILITY:** Keep Phase 2A brief enough to accomplish major work and develop new and improved projects for construction in Phase 2B. Meanwhile, protect the community by avoiding a lengthy program of mandated projects, each with schedule penalties and grossly under-estimated costs developed years ago. Retain flexibility for Phase 2B scheduling by preparing another affordability analysis in 2023 prior to Phase 2B scheduling in 2024, a key to controlling costs from 2025 onward.

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Phase 2A Projects: Planning, Design and Construction Milestones and Costs

WWIP INDEX	REVISED WWIP ATTACHMENT 2 DESCRIPTION June 2018	PTI Submittal	Start Construction	End Construction Substantial Completion	Cost 2006\$	Current \$
195R,196R 198R, 205R 206R	Little Miami WWTP PS Upgrades for EHRT Part 1	1/1/2022	6/30/2022	12/31/2024	\$17.0M	\$22.6M
204	LMWWTP Standby Power & 2-Yr Duke Rider Cost	6/30/2021	1/1/2022	12/31/2023	\$5.1M	\$6.8M
215B	Muddy Creek WWTP Pump Station (for EHRT)	6/30/2021	1/1/2022	12/31/2023	\$32.9M	\$43.8M
215B	Muddy Creek WWTP EHRT	6/30/2022	1/1/2023	12/31/2024	\$32.9M	\$43.8M
218, 219, 220, 221 222	Muddy Creek CSO 402-406 Improvements	12/31/2019	6/30/2020	6/30/2022	\$9.7M	\$12.9M
235B	Addyston Extraneous Stormwater Removal	6/30/2022	1/1/2023	12/31/2024	\$5.3M	\$7.1M
236B	CSO 198 Partial Separation/SBU Mitigation	6/30/2022	1/1/2023	12/31/2024	\$8.2M	\$10.9M
248	Mill Creek WWTP CEPT (Pump Station) - complete diversion chamber	12/31/2020	6/30/2021	6/30/2022	\$4.6M	\$6.1M
317B	Mt. Washington Source Control Implementation	6/30/2022	1/1/2023	12/31/2024	\$8.2M	\$10.9M

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Phase 2A Projects: Planning and Design Only and Costs

WWIP INDEX	REVISED WWIP ATTACHMENT 2 DESCRIPTION June 2018	Cost 2006\$	Current Cost
193R	CSO 552 Partial Separation	\$0.3M	\$0.4M
195R, 196R 198R, 205R 206R	Little Miami WWTP PS Upgrades for EHRT Part 2 ⁽¹⁾	\$2.6M	\$3.5M
240, 241, 242 243, 244	East Branch Muddy Creek Interceptor (Part 1)	\$1.0M	\$1.3M
248	Mill Creek WWTP – New Wet Weather Pump Station to future EHRT	\$4.6M	\$6.1M

⁽¹⁾ PTI Submittal Milestone: 6/30/2024

The Phase 2A projects include construction of major projects, and planning and design for other major projects to be built at the start of Phase 2B. Key Phase 2A projects include significant additional capacity to treat wet weather flows through Enhanced High Rate Treatment (EHRT) systems at MSD’s main treatment plants. The EHRTs and other Phase 2A projects will add substantial new control of Combined Sewer Overflows (CSOs) and are focused first in areas prone to Sewer Back Ups (SBUs) and overflows emanating from the combined sewer system. Other Phase 2A projects are located in the Muddy Creek watershed on Cincinnati’s West side and Mount Washington on Cincinnati’s East side.

Phase 2A utilizes the EPA 2012 Integrated Planning Framework to prioritize investments needed to meet all Clean Water Act obligations. This approach allows limited funds to be spent on green infrastructure or source control to manage rainwater where it falls, and on more traditional gray infrastructure at the end of the pipe. The focus on keeping rainwater out of combined and sanitary sewers will save money on both capital projects and operating costs, while meeting Clean Water Act obligations. This balanced plan will result in high benefit overflow volume reductions and address surface flooding and high priority SBUs. Phase 2A Integrated Planning will allow for proper sizing of Phase 2B projects.

It is imperative to take advantage of the EPA 2012 Integrated Planning Framework so that Phase 2B can naturally grow out of, and benefit from, the information and lessons learned from Phase 2A. This approach will be important in designing and constructing EHRTs at the main MSD treatment plants and implementing strategic stormwater source control projects in the neighborhoods to address surface flooding and SBUs, while also further reducing CSOs. Sequencing design and construction schedules of these EHRTs ensures that later EHRT projects and other WWIP Phase 2B projects are right-sized and scoped properly based on the outcomes of Integrated Planning and post-construction evaluation.

EHRTs treat large volumes of overflows from the collection system that would otherwise be released untreated into the environment. EHRT’s are smaller and less expensive than conventional

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treatment facilities, can process wastewater more quickly, operate on an as-needed basis, and can be designed to fit into the surrounding neighborhood. They improve local water quality, reduce sewer odors and debris, and result in an overall cleaner environment. Successfully operated EHRTs could also significantly reduce the overall WWIP projects to be built, further decreasing costs to MSD ratepayers. Future Phase 2B will capitalize on these less expensive, environmentally appropriate solutions.

Phase 2A includes Allowances to implement projects under subject matter programs listed in the WWIP that address, reduce and/or eliminate overflows and improve water quality, such as Urgent Capacity Response, Sewer Relining, Manhole Rehabilitation, and Home Sewage Treatment System replacements with public sewers. Phase 2A includes an average of \$6M/year (2006\$) or \$8M/year in current dollars, totaling \$30M (2006\$) or \$40M in current dollars for Allowances over the 5 year Phase 2A. The annual MSD budget will identify the specific amounts for each Allowance.

The first in the Nation SBU Program currently provides prevention devices, clean-up costs, damage reimbursement, and other activities. Although currently funded from MSD's Operating Budget, the SBU Program is also a WWIP/Consent Decree Allowance. Costs to implement the SBU program are running about \$7.4M/year (2006\$) or \$10M/year in current dollars, which annual cost is projected to continue during 2020-2024 although some fluctuation is expected based upon rainfall. The total SBU Program cost over 5 years is projected to be \$37M (2006\$) or \$50M in current dollars.

The primary maintenance, repair and replacement of the aging MSD system comes from non-Consent Decree spending referred to as "Asset Management." Phase 2A includes an average of \$50M/year (2006\$) or \$66.5M in current dollars, totaling \$250M (2006\$) or \$332.7M in current dollars for Asset Management over the 5 year Phase 2A. The annual MSD budget will identify the specific types and amounts to be spent on Asset Management projects and allowances.

MSD rate increases have been significant. Cumulative rate increases cause a heavy burden on people and families. MSD estimates its rates are nearly 2.5 times those of neighboring communities and were the 4th highest in the Country as of 2015. Ratepayers experienced a nearly 8.5% average annual rate increase between 2006-2015 which is a 108% cumulative increase, and a cumulative rate increase of 800% since the first MSD consent decree in 1985.

Multiple factors impact the need to increase revenues and decrease expenses all of which will be analyzed and adjusted to ensure rates will be increased only when absolutely necessary. The Board will scrutinize all Consent Decree Project and Allowance budgets and all Asset Management spending to ensure all work is designed, engineered, and constructed with best management practices for productivity and efficiency, and to eliminate unnecessary costs.

The pace of Consent Decree work and spending is governed by "Affordability Considerations," including multiple criteria evaluating a community's financial and social health. As part of this process, a calculation evaluates the financial burden on residential customers as if the entire

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Program was constructed in a certain time period. The cost of constructing all of the remaining WWIP projects in Phase 2 over thirty (30) years is estimated to be \$2.3B (2006\$), or \$3.1B in current dollars (including projects and Allowances). This cost exceeds U.S. EPA's 2.0% Residential Indicator threshold and is unaffordable. In fact, the Residential Indicator calculation of the entire Phase 2 for the entire MSD Service Area is about 2.5% and for the City of Cincinnati is about 3.5%.

There are major populations in the MSD Service Area (City of Cincinnati; other high poverty areas and groups) which are suffering severe burdens due to MSD costs. A 5-year Phase 2A provides the "high burden" community the opportunity to survey its overall financial health again prior to Phase 2B. History has demonstrated that project cost estimates beyond 5 years can be grossly underestimated. A 5-year Phase 2A will protect the community from making guaranteed project construction commitments with no guaranteed protection against major cost spikes. To lessen the impact to the community to below U.S. EPA's "high burden" criteria, the use of a multi-step Phase 2, starting with a short Phase 2A, is justified and wise.

Advantages of the Phase 2A Proposal:

- Protection of Human Health and Water Quality Improvements Sooner. The Board's proposed Phase 2A projects aim at two major targets:
 - (1) *Water quality improvements in our creeks, streams and rivers, and*
 - (2) *Relief from sewer-related surface flooding and basement backups.*
- Immediate Focus on Muddy Creek and Little Miami Watersheds where Population Density is High, Residential Impacts Significant, and Attention is Overdue while Still Continuing Work on Mill Creek and Ohio River Issues
- Benefits Provided are High for The Dollars Spent
- Integrated Planning Achieves Best Selection Of Projects
- Water Quality and Quantity/Overflow Issues Addressed Together
- Ratepayer Protection
- Avoids Locking into Projects with Vastly Underestimated Costs
- Results in Right-Sizing Future Phase 2B Projects
- Will Not Tie The Hands of the New Permanent MSD Director
- Is Flexible to Adapt to New Circumstances.

Future Phase 2B will be based on an Affordability Analysis completed near the end of Phase 2A. Specific Phase 2B activities and costs cannot be completely predicted at this time. The Board's current vision for Phase 2B project planning, design and construction is provided in the table below and is discussed in more detail in Section 6.

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Vision for Phase 2B Projects

WWIP INDEX	REVISED WWIP ATTACHMENT 2 DESCRIPTION June 2018	ACTIVITY
193R	CSO 552 Partial Separation (Little Miami)	Design / Construction
195-196, 198, 205-206	Little Miami WWTP PS Upgrades for EHRT (Part 2)	Construction
200R	Little Miami WWTP (EHRT)	Design / Construction
199, 201-203	Little Miami WWTP (Remaining Bundle Part 1)	Design / Construction
199, 201-203	Little Miami WWTP (Remaining Bundle Part 2)	Design
215	Lower Muddy Creek Interceptor (Tunnel Alternative)	Planning / Design
216	Muddy Creek Pump Station Upgrade & Force Main	Planning / Design / Construction
223	West Branch Muddy Creek Interceptor - Based on IWAP Results	Planning / Design
227B	SSO 700 Integrated Plan Early Action Projects	Planning / Design / Construction
233, 234	Upper Muddy Creek Interceptor (Part 2) - Based on Integrated Planning Results	Planning / Design / Construction
235	Addyston Pump Station Elimination	Planning / Design / Construction
238R	CSO 410 Separation	Planning / Design / Construction
238, 239, 245	CSO 415, 416 Separation (Part 1)	Planning / Design / Construction
239, 245	CSO 411, 412, 413, 414 Separation	Planning / Design / Construction
240-244	East Branch Muddy Creek Interceptor (Part 1) - Based on Integrated Planning Results	Construction
240-244	East Branch Muddy Creek Interceptor (Part 2) - Based on Integrated Planning Results	Planning / Design / Construction

The Phase 2B projects will include a schedule, and may include additions to and/or different projects than listed in the table. Consistent with both its philosophy for Phase 2A and with its vision for Phase 2B, the Board will consider affordability, necessity, cost, new technology, model updates, design lessons or improvements, policy changes, and overall lessons learned from Phase 1 and Phase 2A when submitting its proposed Phase 2B schedule of projects to the Regulators.

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2. INTRODUCTION

This document is the Hamilton County Board of Commissioners' (Board or County) submission of a proposed Phase 2A Schedule of Work for the Wet Weather Implementation Program (WWIP) implemented under the Consent Decrees (Consent Decree) approved in Case No. 1:02-CV-107 in the U.S. District Court of the Southern District of Ohio, Western Division. The County is the owner of the Metropolitan Sewer District of Greater Cincinnati (MSDGC) and is to become the operator of MSDGC under the terms of Commitment Letter dated August 14, 2017 and enacted by the Board of Commissioners and the City of Cincinnati (City) Council on that date. The proposed Phase 2A is the next phase for implementing the WWIP.

3. BACKGROUND TO BOARD'S WWIP SUBMISSION

A. Consent Decree

The approved final Wet Weather Improvement Plan (WWIP) was developed to meet the Consent Decree requirements in Case No. 1:02-CV-107 in the U.S. District Court of the Southern District of Ohio, Western Division pertaining to implementation of a Long Term Control Plan Update (LTCPU) and Capacity Assurance Plan Program. The Court approved the WWIP on August 10, 2010. The WWIP establishes a phased implementation approach with the Phase 1 schedule of work due to end on December 31, 2018. The County, City and the Consent Decree Plaintiffs (United States, State of Ohio, Ohio River Valley Sanitation Commission) (collectively the Consent Decree Regulators), have negotiated a one year extension to the deadline for filing the Phase 2A submission to June 30, 2018. This negotiation will also result in a commitment by the County and City for MSDGC to design and construct a suite of projects known as the "bridge" to be conducted during 2018-2020. The County, City and Regulators will request the approval of the federal Court for these matters.

B. Wet Weather Improvement Program (WWIP)

Just over \$1 billion in 2006 U.S. Dollars will be spent on Phase 1 of the WWIP when it is completed. This represents a huge investment by the community in improving water quality and public health.

MSD is nearing completion of Phase 1 of the WWIP, a federally mandated program for reducing or eliminating sewer overflows into local creeks and rivers. Phase 1 began in 2009 and ends on December 31, 2018.

Accomplishments to date include¹:

- Completed 112 of 133 total projects (84%) across MSD's service area
- Eliminated 146 Combined Sewer Overflows (CSOs)
- Eliminated or controlled 44 Sanitary Sewer Overflows (SSOs)
- Eliminated 22 Pump Station Overflows (PSOs)

¹ As provided by MSD, current as of June 2018.

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- 145 projects constructed to improve all 7 WWTPs
- 45 Pump Stations eliminated or upgraded
- Constructed 75 projects to eliminate 703 private home sewage treatment systems
- Installed approximately 916 sewer backup prevention devices
- MSD has spent \$100,217,900 on sewer backup cleaning, damage claims and prevention
- Lower Mill Creek Partial Remedy will be substantially complete by December 31, 2018 estimated to reduce CSO by 1.78 billion gallons in a typical rainfall year.

Under the WWIP, the key provision for submission of Phase 2 of the WWIP is as follows:

The Defendants are required to submit a proposed schedule for additional WWIP projects to be constructed consistent with the priority order established in Attachment 2, and according to the design and performance criteria set forth on Attachment 2 (and Attachment 5 for EHRTs). See, WWIP paragraph B.1.

The Phase 2 schedule shall be as expeditious as practical, based on considerations listed in Exhibit 4, section II.F of the Consent Decree (not listed in the WWIP, but incorporated by reference):

- *Water quality;*
- *Public health;*
- *Pollutant loadings;*
- *Volume of discharge;*
- *Community priorities;*
- *Sensitive areas;*
- *US EPA Financial Capability guidance, and Economic Guidance for WQSs; and*
- *Reducing inefficiencies in the event future contingencies do not occur as anticipated (e.g., if WQSs are not revised).*

The WWIP also states that the considerations for a proposed Phase 2 schedule include the Residential Indicator (RI) analysis through the method set forth in paragraph B.3 of the WWIP.

Phase 2 shall also be based on the following other relevant factors, including but not limited to:

- a) The impact that costs and length of schedule of Phase 2 will have on Defendants' financing in the tax-exempt market;*
- b) Local and national experience with the time, cost, economics and practicality of CSO and SSO program implementation;*
- c) Availability of "stimulus" money applicable to WWIP projects; and*
- d) Technical feasibility.*

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The proposed Phase 2 schedule shall include all remaining WWIP projects, unless Defendants choose to submit a proposed Phase 2 schedule for only a subpart of the remaining WWIP projects ("Phase 2A"), with the remainder of the WWIP projects to be scheduled as part of an additional subpart (Phase 2B") to be scheduled at a later specified date. Any later submitted Phase 2 schedules shall both be as expeditious as practicable and based on the above considerations.

A schedule for additional subparts beyond Phase 2B may only be requested if defendants can demonstrate that the additional schedule is necessary to avoid severe financial hardship and the schedule is as expeditious as practical based on the above considerations.

Under paragraph C.2.a of the WWIP, Defendants may submit proposed significant changes to one or more projects (including associated appropriate changes to Performance and Design Criteria) because of changes in watershed approaches, priorities, technologies, methods, and other information through the concepts of "adaptive management"; provided that such changes will provide comparable or better aggregate control of annual volumes as the original project or projects. Also, under WWIP paragraph C.2.b, adaptive management review may be a part of Phase 2 scheduling.

If the submitted proposed schedule for Phase 2 is for only a subset of remaining Attachment 2 projects, the schedule for Phase 2A shall include:

- *Planning and design work for a subset of Phase 2B projects in priority order to ensure that WWIP project work does not stop between Phase 2A and 2B for lack of projects, and;*
- *A schedule for completing a geotechnical investigation for the remaining Lower Mill Creek remedial project bundle as set forth in Att. 2 (LMCFR) unless the LMCFR has been approved and that some or all of such geotechnical investigation is not needed. (Note: the Regulators approved the LMCFR on May 30, 2013; therefore a geotechnical investigation schedule is not required to be included as part of the Phase 2A submittal).*

4. PHASE 2 SCHEDULE CONSIDERATION

A. Description of Considerations

i. Phase 2A Duration

There are many factors that affect the proposal of a duration for Phase 2A. Some of the factors are: the length of the project production cycle, the number of integrated watershed plans that have been or are desired to be completed, projects that have been planned, the number and size of projects being designed, the level of planning that has been performed for Phase 2A, and finally the anticipated spending for the Phase. Each item is briefly discussed below. The anticipated spending and financial affordability is discussed in Section 4.B below.

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ii. Project Production Cycle

For the majority of projects performed at MSDGC, the procurement of a design firm can take between 4 to 6 months. Larger projects may take longer due to the potential need for a two-step process that would include a Request for Qualifications followed by a Request for Proposals to the qualified bidders. Once the design firm is under contract, the majority of projects MSDGC will be performing can be designed in 1 to 1-1/2 years. Additional time, that would extend the 1 to 1-1/2 year design period, may be required for some projects where extensive right of way easements or property acquisition are required. Finally, the construction duration for the kinds of projects that are being proposed in Phase 2A will be between 18 and 24 months.

The net result is project duration from procurement for design through construction completion is approximately 3 to 4 years.

iii. Integrated Watershed Planning Progress

Both the Defendants and the Regulators recognize the need for and desire to implement integrated watershed planning (referred to by the USEPA as the 2012 Integrated Planning Framework).² Integrated watershed planning has the potential to provide greater improvement to in-stream water quality and greater positive impact to the communities faster by addressing and prioritizing both storm water and wastewater issues as they affect the wastewater utility, compared to the benefits provided by the projects defined in WWIP Attachment 2. Further planning consistent with the U.S. EPA Integrated Planning Framework and Ohio EPA guidance has been implemented on the local level. For example, MSDGC has been working on the preparation of an integrated watershed plan for the SSO-700 watershed which represents approximately 10% of the MSDGC service area.

MSDGC has already accomplished significant goals through the integrated planning process. For instance, MSDGC has been able to achieve collection system hydraulic model calibration/validation status for more than 10% of the service area, and have been able to develop a water quality sampling protocol that will ensure that all future water quality sampling will be performed in such a way that it can be incorporated into future water quality models to inform future project selection. Also, the water quality model has been developed and is currently being refined in concert with the collection system hydraulic model to allow for project selection focused on in-stream water quality and public health improvements.

In addition, having the SSO-700 watershed collection system hydraulic model calibrated and validated, as part of the SSO 700 integrated plan development, has allowed for identifying a reduction in the SSO-700 default remedy from over \$230M

² See, U.S. EPA June 5, 2012 Joint Office of Water and Office of Enforcement and Compliance Assurance Memorandum on Integrated Municipal Stormwater Planning Approach Framework and the May 2012 Framework Document).

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(as described in the 2012 SSO-700 final remedy submission) to approximately \$124M (as noted in the April 2018 final remedy submission).

MSDGC plans to implement the preparation of at least one integrated watershed plan in every 5-year planning horizon. For example, the SSO 700 integrated plan will be completed by the end of 2019 and the Muddy Creek integrated plan is expected to be completed by the end of 2021. This work allows for the implementation of design of some projects in the same planning horizon, and the construction of other projects in the next 5-year horizon. This adaptive management approach allows for the benefits of each integrated watershed plan and the associated projects to help inform the next 5-year project planning and implementation horizon.

Integrated watershed planning is encouraged and accepted at the national, state, and local level. Our Ohio River neighbors to the south, Northern Kentucky Sanitation District No. 1 (SD1) has a consent decree that requires watershed plans for each of the SD1 watersheds in the service area for the purpose of reduction and control of discharges from CSO Outfalls and SSO Outfalls that are developed and proposed in five (5) year time blocks.³ SD1 is required at least 90 days prior to the five (5) year anniversary of approval of each watershed plan, to submit a proposed updated watershed plan to the Commonwealth and U.S. EPA for review and approval. A framework⁴ for developing the watershed plans was submitted and approved. The framework describes how the Sewer District developed the first watershed plan and how it will update them every five (5) years to meet consent decree goals by December 31, 2025. SD1 prepared watershed plans for four (4) major basins and sixteen (16) watershed sections. Importantly, five (5) year implementation schedules and programs are detailed in the five (5) year watershed plan updates based on (i) prioritization at that time in the life of the program, (ii) cost-benefit analyses and (iii) financial capability considerations.⁵

Given the quickly evolving nature of the integrated planning approach and adaptive management process for MSDGC, it would be in all parties' interest to incorporate new developments at a relatively short and regular frequency, similar to the SD1 Consent Decree and Watershed Plans Framework.

iv. Phase 1 Planning Effort

MSDGC's project development cycle was discussed above; however, that discussion took the project from planning level through construction. There are 61 projects in Attachment 1B that were to be planned and designed for early Phase 2 construction. All of the projects have been planned to some level; however, MSDGC has determined that many of the conditions and long-term management of existing

³ *Commonwealth of Kentucky v. Sanitation District No. 1 of Northern Kentucky*, Case 2:05-cv-00199-WOB (April 18, 2007), section IV [Remedial Measures], subsection D [Watershed Plans], paragraphs 39-41 (p. 16-28)(SD1 Consent Decree).

⁴ Framework for Developing Watershed Plans for Northern Kentucky (April 17, 2008); submitted in compliance with paragraph 39(a) of the SD1 consent decree (Watershed Plans Framework).

⁵ *Id.* at section 2.10, p. 19.

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projects when planning was performed have changed significantly (e.g. Little Miami WWTP and solids handling; critical need to address significant creek and river intrusion into the sewer system in Muddy Creek). The planning of collection system projects can take approximately 12 months, but for the wastewater treatment plant (WWTP) projects which are more complex, the planning can take between 1 and 2 years. This is primarily due to the need to gather and verify the data on the existing equipment, systems and processes.

During WWIP Phase 1, there was a significant amount of information developed that has informed the next phase of the WWIP and management of the District's assets. Information learned from implementing Phase 1 supports a change in direction for several Phase 2A projects, of which some projects were planned over ten years ago. One of the "lessons learned" from Phase 1 is the system-wide collection system hydraulic model was determined to be sufficient for conceptual project planning, but not sufficiently accurate for final design (and sizing) of projects. As a result, it may not always be possible to develop final performance criteria for a project that is still being planned until the model has been sufficiently calibrated and validated. MSDGC is in the process of updating the calibration and validation of the hydraulic model for several watersheds. It is also not possible to design certain Phase 2 projects until the hydraulic model has been updated for the watershed at issue.

The identified constraints above have been taken into account in selecting projects for construction completion in Phase 2A, and in the planning and design during Phase 2A for later construction scheduling as part of Phase 2B. This will ensure that WWIP project work does not stop between Phase 2A and 2B. See Section 5 for the detailed discussion of the Phase 2A project selection.

B. Financial Capability (Affordability) & Residential Indicator Analyses

This section reports on the financial capability and Residential Indicator (RI) analyses performed to determine the phasing of Phase 2 and size and length of Phase 2A.

i. Phasing of Final WWIP Implementation

The WWIP includes hundreds of projects to be implemented through a phased approach totaling approximately \$3.29 billion (2006\$; NOTE: all dollar figures are in year 2006\$ unless specified otherwise because the Consent Decree uses 2006 dollars). The Defendants' concerns regarding the affordability of the WWIP resulted with the phased implementation of the Program. Phase 1 of the plan is underway. The schedule for Phase 2 projects was not defined in the August 2010 WWIP approval. Rather, the Phase 2 proposed schedule (and any sub-phase of Phase 2) was to be proposed at the end of Phase 1. The WWIP allows for dividing Phase 2 into multiple sub-phases based upon affordability.

The term "Full Phase 2" as expressed in the affordability discussion includes all projects listed on WWIP Attachment 2. The estimated cost of the Full Phase 2 projects is \$2.1 billion (2006\$). The term "Phase 2A" represents the subset of Attachment 2 projects proposed for construction from 2020 through 2024 as part of

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the proposed 5 year Phase 2A. Projects not included in the Phase 2A program would be addressed in a future phase or phases. The schedule for the next sub-phase of Phase 2 projects would be submitted to the Consent Decree Regulators 18 months before completion of the Phase 2A program, currently targeted to be submitted by June 30, 2023.

The premise of the Phase 2A proposal closely mirrors the prioritization outlined in the Final WWIP Attachment 2. Attachment 2 listed projects in the order they are to be completed. Planning and/or design funding for the first 61 projects listed in Attachment 2 was included in Attachment 1B of the Phase 1 WWIP program. However, based on the experience of implementing Phase 1, and the Board's desire to implement and take full advantage of Integrated Watershed Planning, some projects are anticipated to be delayed and or adaptively modified. The delay or modifications will allow for more efficient, effective, and sustainable projects to address overflows and water quality.

Given current economic conditions, MSDGC ratepayers cannot afford to complete all projects in one Phase 2 program in a reasonable time frame, while responsibly managing existing infrastructure through a meaningful asset management program. As such, the Phase 2A Plan will manage affordability concerns while investing in infrastructure and continuing to address Consent Decree requirements.

The Final WWIP requires the completion of a Financial Capability Assessment (FCA), as outlined in Paragraph B.3 of the WWIP similar to the EPA's "Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development." The 1997 EPA Guidance⁶, with expansions made in the 2012 integrated planning framework and clarifications provided in the 2014 FCA Framework, uses a two-step approach to evaluate a permittee's financial capability to complete the Program. This document provides an overview of the preliminary outcomes from using this methodology. In summary, Step 1 measures the impact of the Program costs on individual households (Residential Indicator, or RI) and Step 2 measures the debt, socioeconomic and financial conditions of a permittee (Financial Capability Indicators, or FCIs). Figure 4.1 provides an overview picture of the methodology.

⁶ <https://www3.epa.gov/npdes/pubs/csofc.pdf>

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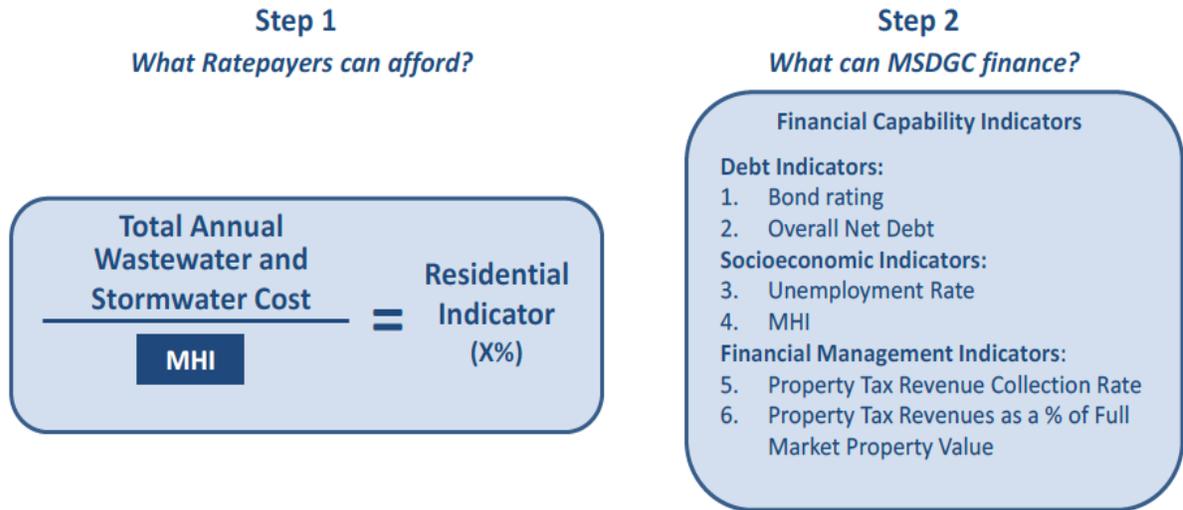


Figure 4.1 – Schematic of EPA Financial Capability Analysis

Step 1: FCA – Residential Indicator (RI)

Household income and Program costs are used to calculate the RI for households served by MSDGC. According to the 1997 Guidance, a RI above 2.00% of median household income (MHI) is considered “high” financial impact by EPA, and provides one of the measures used to determine MSDGC’s overall level of burden, as shown in Table 4.1 below. In the 2014 FCA Framework, EPA also noted that additional income considerations, such as residential indicator by income quintile, geography, or other categories are also appropriate.

Table 4.1 – Categorization of Residential Indicator per EPA Guidance

Financial Impact	Residential Indicator (Cost per Household as % MHI or other metric)
Low	Less than 1.0 Percent MHI
Mid-Range	1.0-2.0 Percent MHI
High	Greater than 2.0 Percent MHI

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ii. MSDGC RI – Full Phase 2 Based on Service Area MHI Area M

The County calculated the RI for the Full Phase 2 Program, as required by the WWIP, assuming that it would be constructed in 30 years. The results of this analysis are shown in Tables 4.2 and 4.3 below (Worksheet 1 and Worksheet 2). The RI calculation is a “snapshot” type analysis outlined in the 1997 EPA Guidance and is used to assess the level of burden of the Program. These tables reflect wastewater costs only. The wastewater costs include both the 229 projects identified in Attachment 2 of the Final WWIP and Asset Management project costs. As discussed on the following pages, while the RI has been calculated based on wastewater costs only, as outlined in Attachment 3 of the WWIP, an RI that includes both wastewater and stormwater costs is more appropriate and necessary to reflect all CWA costs. The City of Cincinnati and certain suburbs have stormwater fees but they are not uniform and thus a calculation of stormwater costs is not submitted at this time, but will be submitted once an appropriate methodology is identified.

Table 4.2 – Full Phase 2 Worksheet 1

Worksheet 1		
WASTEWATER COST PER HOUSEHOLD (2018 dollars)		
Total Phase 2 (2020 - 2049; 30 years; 3.5% PV Factor) County Plan		
Line No.	Current Costs	
100	Annual Operation & Maintenance Expenses (excluding depreciation and Net Pension Liability) ⁽¹⁾	\$ 119,032,000
101	Annual Debt Service (principal & interest) ⁽¹⁾	89,397,000
102	Subtotal (Line 100 + Line 101)	208,429,000
Projected WWIP Costs (Current Dollars)		
103	Estimated Additional Annual O&M Expenses (excluding depreciation) – MSDGC ⁽²⁾	\$ 23,799,331
103a	Cash Financed Capital/Asset Management ⁽³⁾	87,748,876
104	Annual Debt Service (principal & interest) - MSDGC ⁽⁴⁾	282,596,764
105	Subtotal (Line 103 + Line 103a +Line 104)	394,144,972
106	Total Current and Projected WWT & CSO Costs (Line 102 + Line 105)	602,573,972
107	Residential Share of Total WWT & CSO Costs	368,775,271
107a	Residential Share ⁽⁵⁾	61.20%
108	Total Number of Households in Service Area ⁽⁵⁾	301,508
109	Cost Per Household (Line 107 / Line 108) ⁽⁶⁾	1,223

(1) 2017 Draft MSD Financial Statements (May 2018)

(2) Aggregate Phase 2 Costs multiplied by 0.75% (per MSD methodology)

(3) Average annual cash financing of total capital program, 2020-2049

(4) Estimated debt service of debt financed portion of capital program, 25 year Revenue Bonds, 5.22% interest, level debt service payments; 30 year OWDA Loans, 3.22% interest, level debt service payments

(5) Source: MSDGC Financial Analysis (2018)

(6) Does not include Stormwater costs

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Table 4.3 – Full Phase 2 Snapshot Comparison Worksheet 2 (For Service Area)

Worksheet 2		
RESIDENTIAL INDICATOR		
Total Phase 2 (2020 - 2049; 30 years; 3.5% PV Factor) County Plan		
Line No.	Median Household Income (MHI) - MSDGC Service Area	
201	Census Year MHI ⁽¹⁾	\$ 48,532
202	MHI Adjustment Factor ⁽¹⁾	1.32%
203	Adjusted MHI	49,822
204	Annual WWT & CSO Control Cost per Household (CPH) (Line 109) ⁽²⁾	1,223
Residential Indicator - MSDGC Service Area		
205	Cost per Household as a Percentage of Adjusted MHI (Line 204 / Line 203 x 100)	2.45%

(1) Source: MSDGC Financial Analysis (2018) and 2016 American Community Survey

(2) Does not include Stormwater costs

The wastewater only costs consist of Full Phase 2 projects and asset management projects. The Full Phase 2 Program cost over 30 years is \$2.1 billion (2006\$). Asset management (AM) needs through Phase 2 have been forecasted at \$50 million (2006\$) per year for Phase 2 and ongoing needs (based on Phase 1 asset management average spending levels).

Based on full Phase 2 Program costs over 30 years, the County (approximate service area) has calculated the RI to be 2.45%. This analysis has been completed as required by Attachment 3 of the WWIP and reflects wastewater costs only. While the County and City have consistently asserted that the RI is insufficient to understand the true impact on households in the Service Area, the outcome of this analysis demonstrates completion of the full Phase 2 Program is unaffordable within a projected 30 year time frame. A full Phase 2 Program places the MSDGC Service Area well beyond the 2% level EPA considers “High” as shown in Table 4.3.

Furthermore, as previously discussed, the initial RI calculation reflects only MSDGC’s costs (wastewater utility only) and does not reflect additional stormwater costs expected to be incurred by households in the Service Area. Stormwater costs are incurred by numerous stormwater utilities in the Service Area, including Cincinnati Stormwater Management Utility (“SMU”), serving the City, Hamilton County Stormwater District (HCSWD), serving the majority of the remainder of the County, and a few additional stormwater utilities serving cities not served by HCSWD. In addition, many communities fund stormwater costs not recovered from the HCSWD through their general fund.

iii. RI – Full Phase 2 Based on City MHI

While a calculation of the RI must begin with the MSDGC Service Area, it is necessary to evaluate impacts in other significant political subdivisions. Accordingly, it is important to evaluate the impact on significant concentrations of disadvantaged customers by calculating the RI based on their MHI as well. The City of Cincinnati (City) represents one such area. This is important due to the significant impact the

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City has on the Service Area. It is the core inner-city population area of the Service Area, contains the oldest and most asset management-needy parts of the sewer system, and contains the large majority of combined sewer overflows in the Service Area. Based on the City’s MHI, the RI for the Phase 2 schedule is 3.46% which is far above the 2% level EPA considers high, as shown in Table 4.4.

Table 4.4 – Full Phase 2 Snapshot Comparison Worksheet 2 (Wastewater & Stormwater For City of Cincinnati)

Worksheet 2 RESIDENTIAL INDICATOR		
Total Phase 2 (2020 - 2049; 30 years; 3.5% PV Factor) County Plan		
Line No.	Median Household Income (MHI) - City of Cincinnati	
201	Census Year MHI ⁽¹⁾	\$ 34,629
202	MHI Adjustment Factor ⁽¹⁾	1.02%
203	Adjusted MHI	35,339
204	Annual WWT & CSO Control Cost per Household (CPH) (Line 109) ⁽²⁾	1,223
Residential Indicator - City of Cincinnati		
205	Cost per Household as a Percentage of Adjusted MHI (Line 204 / Line 203 x 100)	3.46%

(1) Source: MSDGC Financial Analysis (2018) and 2016 American Community Survey

(2) Does not include Stormwater costs

As shown in Table 4.4, the resulting RI indicates “High Impact” and in fact, is nearly twice the threshold EPA uses to determine “high impact” of 2%.

iv. Summary of FCA – Financial Capability Indicators

The second step outlined in the 1997 Guidance involved the calculation of six financial indicators (FCIs) intended to determine the community’s financial capability for financing the Phase 2 program. The six FCIs outlined in EPA’s Guidance include:

Debt Indicators:

1. Bond rating
2. Overall net debt

Socioeconomic Indicators:

3. Unemployment rate
4. Median Household Income (MHI)

Financial Management Indicator:

5. Property Tax Revenue Collection Rate
6. Property Tax Revenues as a % of Full market property value

Each FCI is scored as “weak,” “mid-range,” or “strong” and assigned a value of 1, 2 or 3, respectively.

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The FCIs have been calculated based on the most recent data available and compared to conditions in 2006 (for the County) when the WWIP was first submitted. This assessment is based on available and appropriate City and County audited financial data and data obtained from City and County official statements. County data is used as a proxy for Service Area, as audited financial data for certain indicators is not available specifically for the Service Area. The following is a brief summary of each of the indicators used in the EPA FCI analysis.

The two debt FCIs for the County and City both indicate a decline as compared to the results of the FCA completed in the development of Phase 1. An effort was made in the current County FCA to collect debt for municipalities contained within the County for the Overall Net Debt as a Percent of Full Market Property Value calculation. Municipal debt was included in the calculation because it represents a claim on taxpayer incomes and, therefore, an important factor when attempting to measure the debt burden of the Service Area.

The Bond Rating has increased from a Moody’s rating of Aa3 to a rating of Aa2 since 2006. This increase was due to a global rating recalibration by Moody’s for United States municipal credits, rather than a fundamental improvement of MSDGC’s credit position. However, no bond rating updates have been made since 2015 because the County and City have been in litigation and then federal court mediation to address the future operation of MSDGC. At present, and likely until the transfer of MSDGC operations from the City to the County is more solidified, the County continues to be hindered in its ability to seek bond market funding for MSDGC, meaning that at this moment state revolving loan funds are the only ongoing source of debt financing for capital projects. This is a significant threat to the future ability of MSDGC to perform Phase 2 project work. As a result, the 2015-based Debt Financial Capability Indicators are no longer accurate and may, unfortunately, be more accurately evaluated as Weak. Table 4.5 summarizes the individual Debt Indicators as of approximately three years ago (2015). Total and per capita MSDGC-related debt burdens are discussed below in section (e).

Table 4.5 – Summary of Debt Financial Capability Indicators

Debt	2006 WWIP (County-MSD)	County-MSD	City⁷
Bond Rating	Aa3	Aa2/AA+ ⁸	Aa2/AA
<i>FCI Rating</i>	<i>Strong (3)</i>	<i>Strong (3)</i>	<i>Strong (3)</i>
Overall Net Debt as a Percent of Full Market Property Value	3.57%	3.58% ⁹	5.11%
<i>FCI Rating</i>	<i>Mid-range (2)</i>	<i>Mid-range (2)</i>	<i>Weak (1)</i>

⁷ Source of calculations: MSD (2017)

⁸ Hamilton County Official Statement (October 2017); MSDGC Revenue bond series 2015A (February 2015).

⁹ Hamilton County Official Statement (October 2017) - Debt Table A and Assessed Valuation; Estimated Actual Taxable Value

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The Socioeconomic FCIs for the County are consistent with the results of the 2006 financial capability assessment. In both assessments, the Unemployment and Median Household Income indicators fall within the Mid-Range score according to EPA criteria. However, the inclusion of an assessment of the City's FCIs demonstrates how a singular focus on the County is insufficient, would place undue burden on the Service Area and region, and would be crippling for residents of the City. The County believes the Unemployment Rate and MHI for the City are representative of significant areas and deserve consideration for local consideration and, as compared to both the national level and the County, the City's condition is far worse, with the EPA criteria scoring indicating a "Weak" socioeconomic condition.

Another key factor is that the use of "County" data overstates the financial and socioeconomic health of the Service Area. This is because all or part of the two wealthiest communities in the County (Terrace Park and Indian Hill) are not part of the Service Area. The extraordinary wealth in these communities thus overstates and misrepresents the financial status of the County.

Table 4.6 summarizes unemployment based on three alternative data sources for the current analysis. While the EPA Guidance references Bureau of Labor Statistics ("BLS") data, since the Guidance was published, the American Community Survey ("ACS") has become available. According to the BLS, the 2015 unemployment rate for the County (an approximation of the Service Area) was the same as that at the national level. The City data indicate an unemployment rate 0.6 percentage points higher, still within the one percent differential indicated by the Guidance. However, the unemployment situation may actually be better reflected by the ACS data, since discouraged workers may be more likely to self-identify as unemployed in this dataset. In fact, the 2015 national "U-5" rate, as reported by BLS, which includes "discouraged workers, plus all other persons marginally attached to the labor force" is 6.5%, which is nearly identical to the 6.3% national rate in the 1-year ACS data. As shown in Table 6, while the County still falls within the one percent range indicated by the Guidance, and therefore is considered "Mid-Range," the City unemployment rate is substantially higher, falling well within the "Weak" range.

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Table 4.6 – Summary of Socioeconomic Financial Capability Indicators

Socioeconomic Indicator	2006			Service Area ¹¹	National
	WWIP ¹⁰	County	City		
Unemployment - BLS ¹²	5.8%	5.3%	5.9%		5.3%
Unemployment - 1-year ACS ¹³		6.8%	10.5%		6.3%
Unemployment - 5-year ACS ¹⁴		8.8%	12.5%	9.2%	8.3%
<i>FCI Rating</i>	<i>Mid-range (2)</i>	<i>Mid-range (2)</i>	<i>Weak (1)</i>	<i>Mid-range (2)</i>	
Median Household Income	\$ 40,664	\$ 49,013	\$ 33,604	\$ 46,960	\$ 53,889
<i>FCI Rating</i>	<i>Mid-range (2)</i>	<i>Mid-range (2)</i>	<i>Weak (1)</i>	<i>Mid-range (2)</i>	

Furthermore, the post-recession trends for both of these indicators are, in many urban areas, not an indication of an improving economy, but rather a reflection of increasing discouragement in the labor force and income stagnation or even decline. In many areas, residents have been experiencing significant job loss. In these cases, the unemployment rate has gone down more rapidly simply because people have left the labor force faster than the number of jobs has decreased, which is evidence for a “Weak” rating.

The Property Tax Revenues as a Percent of Full Property Value Property FCI as applied to MSDGC’s local conditions is not an appropriate comparison metric. EPA’s 1997 Guidance states that a standard set of metrics allows EPA to compare communities across the country equitably. Nowhere is this more misleading than in the Guidance’s exclusive consideration of property tax burden for this metric.

While municipalities in all states rely on a combination of sources for their tax revenue, property tax accounts for the majority of municipal tax revenue in 29 states, while sales tax represents the majority in eight other states. In twelve states and the District of Columbia, there is a more balanced mix of tax sources, but only Ohio municipalities rely overwhelmingly on local income tax revenue.

Given this great disparity, it is essential that the FCA take all local tax revenue sources into account in evaluating financial indicators. This FCI for the County has worsened since the 2006 assessment. However, the current analysis of FCIs includes income tax revenue. Inclusion of all other tax revenues, such as sales tax, would likely place the County in the “Weak” category as well. The other revenue sources are included in the newest calculation because they represent an expense that lowers disposable incomes within the Service Area and hinders the City and County’s ability to increase revenue from other sources.

¹⁰ WWIP values per 2006 submittal to Regulators

¹¹ Source of calculated number: MSD (2017)

¹² Bureau of Labor Statistics Current Population Survey 2015

¹³ 2015 ACS 1 Year estimates

¹⁴ 2015 ACS 5 Year estimates

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The Property Tax Revenue Collection Rate FCI has improved for the County since 2006 and now scores as “Mid-Range” instead of “Weak” according to the EPA FCA criteria. However, the collection rate for the City, which has experienced some fluctuation, has a long-term average that qualifies as a “Weak” score.

Table 4.7 – Summary of Financial Management Financial Capability Indicators

Financial Management Indicators	2006 WWIP	County	City ¹⁵
Property Tax Revenues as a Percent of Full Market Property Value¹⁶	2.2%	2.5%	3.2%*
Property & Income Tax Revenues as a % of Full Market Property Value¹⁷		3.6%	5.5%
FCI Rating	Mid-range (2)	Mid-range (2) to Weak (1)	Weak (1)
Property Tax Revenue Collection Rate (average of past 10 years)	92.3%	95.4%	92.3%*
FCI Rating	Weak (1)	Mid-range (2)	Weak (1)

* 2016 CAFR, City of Cincinnati

v. Summary of Financial Capability Indicators (FCI)

The EPA criteria assign a score of 1, 2 or 3 to each indicator to reflect a general label of “Weak,” “Mid-Range,” or “Strong.” The indicator scores are averaged to calculate a total FCI score to provide a summary indicator of the Service Area. Below are the preliminary outputs of the FCI analysis based on the above discussion.

As shown in Table 4.8 below, the FCI score has gone from 2.00 in 2006 to a current score of 2.08, reflecting some slight improvement in the County’s property tax revenue collection rate. The current FCI score for the City is 1.33, indicating that the City’s financial capability is well below that of the County, and reflects a “weak” position relative to the FCI.

¹⁵ Source of calculations: MSD (2017)

¹⁶ Source of calculations: MSD (2017)

¹⁷ Source of calculations: MSD (2017)

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Table 4.8 – Summary of FCI Scores¹⁸

Metric	2006 WWIP	County	City
Bond Rating	Strong (3)	Strong (3)	Strong (3)
Overall Net Debt as a Percent of Full Market Property Value	Mid-Range (2)	Mid-Range (2)	Weak (1)
Unemployment	Mid-Range (2)	Mid-Range (2)	Weak (1)
Median Household Income	Mid-Range (2)	Mid-Range (2)	Weak (1)
Property Tax Revenues as a Percent of Full Market Property Value	Mid-Range (2)	Mid to Weak (1.5)	Weak (1)
Property Tax Revenue Collection Rate	Weak (1)	Mid-Range (2)	Weak (1)
Total Score	2.00	2.08	1.33
Overall FCI Indication	Mid-Range	Mid-Range	Weak
Weak: <1.5; 2.5>Mid-Range>1.5; Strong>2.5			

While the bond ratings for the services area are “Strong”, the overall FCI lies somewhere between “Weak” and “Mid-Range” according to the EPA FCA criteria. Indeed, as noted above, MSDGC bond ratings have not been updated in the past 3+ years as litigation and mediation over MSDGC operations has resulted in the inability to enter the bond marketplace. A “Weak” rating is thus more appropriate.

The comparison of the RI calculation in Step 1 and the FCI score in Step 2 result in a financial capability matrix that the EPA uses to determine the level of burden imposed on the community in the implementation of mandated Consent Decree projects. As discussed, the two components of the FCA come together to result in a matrix rating of “Low Burden,” “Medium Burden,” or “High Burden” as outlined in Table 4.9 below.

¹⁸ Source of calculations: MSD (2017)

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Table 4.9 – Financial Capability Indicators Assessment Matrix – Full Phase 2 WWIP

Financial Capability Indicators	Residential Indicator (Cost per Household as a % MHI)		
	Low (<1.0%)	Mid-Range (1.0-2.0%)	High (>2.0%)
Weak (<1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5-2.5)	Low Burden	Medium Burden	High Burden
Strong (>2.5)	Low Burden	Low Burden	Medium Burden

One of the key elements of the 2014 FCA Framework is that “financial capability should be viewed as on a continuum.” Rather than being viewed according to the table outlined in Table 4.9 above, the characterization and application of the Financial Capability Matrix is more along the lines of the chart as shown below in Figure 4.2.

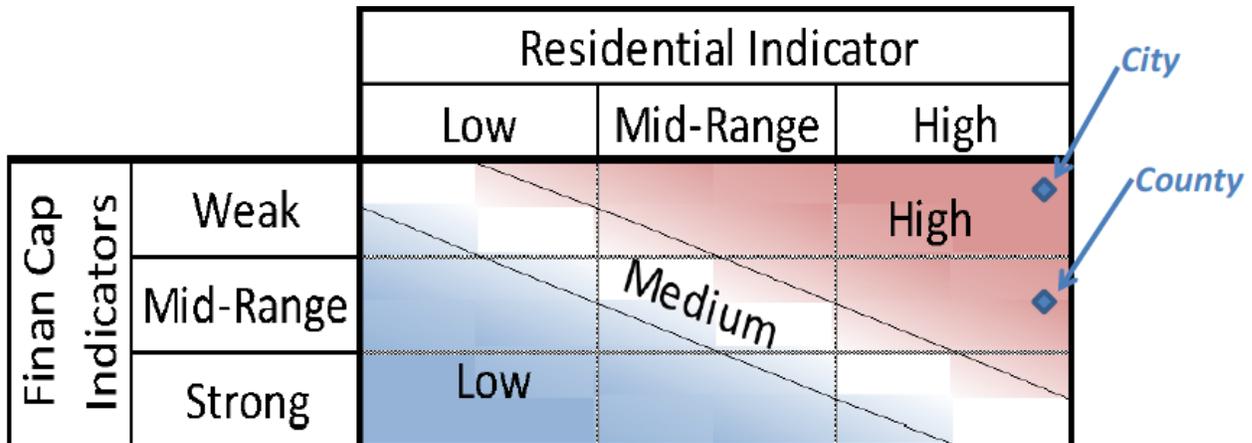


Figure 4.2 – Financial Capability Matrix

Based on the analysis of the Full Phase 2 Program, including an asset management allocation as described in the proposed Phase 2A, the Full Phase 2 Program would result in a “High Burden” based on both evaluations of impact on the Service Area as well on the City, as shown in Table 4.9, and better illustrated in Figure 4.2. Therefore, the Board has developed a recommended Phase 2A Program to mitigate affordability concerns, as allowed by the Final WWIP.

v. Unique Local Conditions

Affordability is not based solely on the strict calculation of the aforementioned 1997 EPA guidance formulas (RI, MHI and FCIs), as even that document recognized its limitations for demonstrating the reality of how such mandated compliance with wastewater requirements can strain the fiscal capacity of local communities. In recognition of this disparity, EPA released its “Integrated Municipal Stormwater and Wastewater Planning Approach Framework” in 2012. This 2012 framework was designed to provide additional guidance for EPA, States, and local governments in

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the development and implementation of integrated plans to comply with Clean Water Act (CWA) requirements under a reasonable schedule. The framework identifies the principles and elements of an integrated plan. The approach is designed to recognize the flexibilities in the CWA for appropriate sequencing and scheduling. Later, in 2014, EPA released its “Financial Capability Assessment Framework for Municipal Clean Water Act Requirements.” In this document, EPA acknowledges the need to evaluate additional considerations to determine financial impact on the community.

U.S. EPA’s 2012 Integrated Planning Framework includes additional considerations for determining Affordability and Financial Capability and to assess the economic condition within the Service Area and segments of the Service Area including the City, and to determine the potential impact of the program on ratepayers. Detailed analysis of the local economic, demographic, and financial data, has been performed, including for the following:

Economic and Demographic

- Income Distribution and Trends
- Poverty
- Unemployment
- Housing Units and Tenure
- Housing Starts
- Construction Inflation
- Rates versus Inflation and Income

Service Area Profile

- Large number of Political Jurisdictions
- Communities of Concern

Other Local Economic Challenges

- Withdrawal of State Funding to local governments (County, City and other local units)
- Industrial Presence and Revenue
- Other Major Water Related Infrastructure
- Transportation Infrastructure
- City Income Taxes
- City Pension Plan
- County and City Revenue Deficiencies/Budget Cuts
- Township Challenges
- Other Community Demands

The following sections highlight just a few of the aforementioned topics.

a) Income Distribution and Trends

Both the City and the County experience a higher proportion of households at the lower end of the income distribution range than for the United States as

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a whole, as shown in Figure 4.3. This disparity, which is greatest in the lowest income bracket (Less than \$10,000), indicates that a larger percentage of households will be more heavily burdened by the program when compared to the U.S. as a whole. As the figure shows, nearly 18% of households in the City will experience a burden that is more than three times the burden of a median income City household and more than four times the burden of a median income County household.¹⁹ As noted above, the County median household income figure is artificially skewed high due to the inclusion of its two wealthiest communities (Terrace Park and Indian Hill) within the County, but all (Terrace Park) or most (Indian Hill) of them are entirely *outside of the Service Area*.

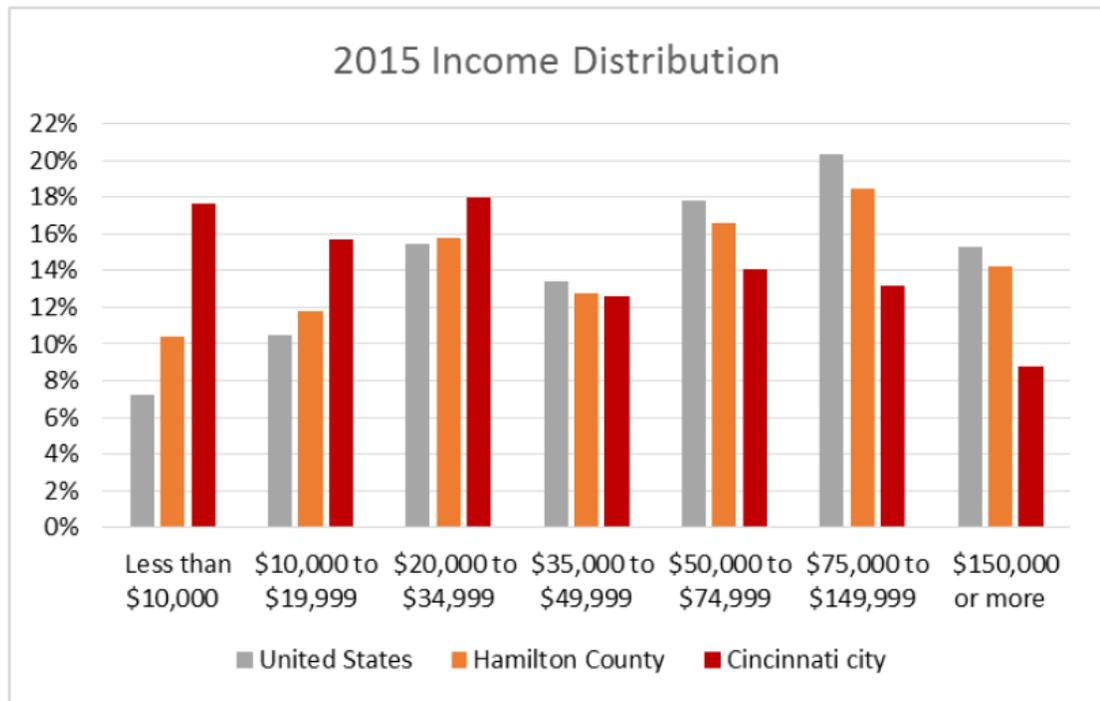


Figure 4.3 – Current Hamilton County and Cincinnati Income Distribution²⁰

Figure 4.4 provides a comparison of City and County household income trends by US quintiles. The figure shows that both the City and the County have experienced substantial growth in the number of households with incomes at or below the lowest U.S. income quintile.²¹ Within the City, a distressingly large concentration (36.3%) of households have incomes in this quintile, and nearly 60% of all City households have incomes below the upper limit of the nation's second quintile. Although the County as a whole is

¹⁹ American Community Survey (ACS), per MSD

²⁰ Source of calculations: MSD (2017)

²¹ American Community Survey (ACS), per MSD

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experiencing similar trends, the economic condition of City households is far worse. Unfortunately, these negative trends show no sign of abating.

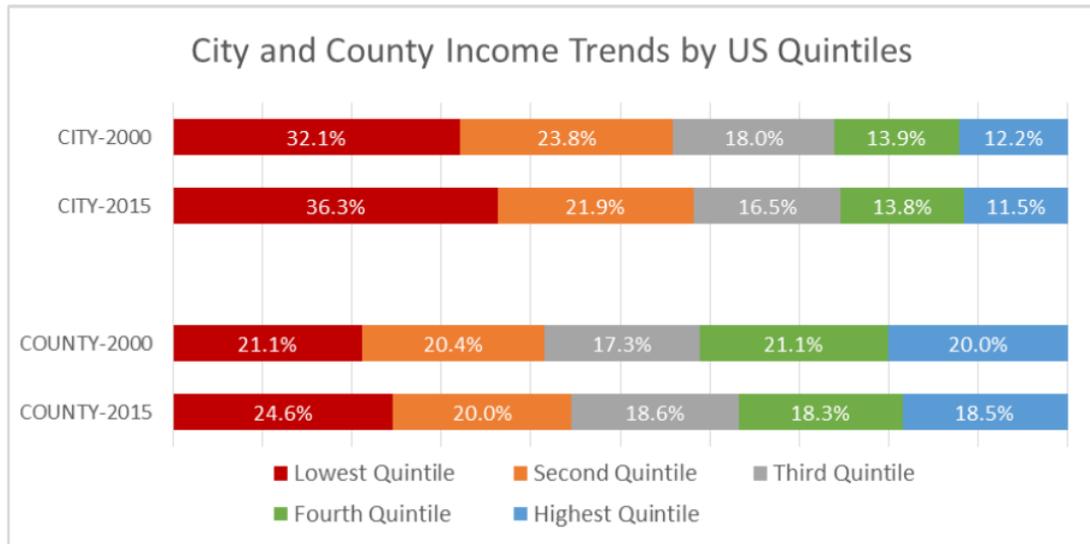


Figure 4.4 – Comparison of City and County income by U.S. Quintiles²²

Figures 4.5 and 4.6 further illustrate that the Service Area is not only in less healthy economic condition than the U.S. as a whole, but there is a trend of diverging income within the Service Area, meaning that incomes at the top of the distribution have been increasing, while incomes at the low end of the distribution have been declining. In fact, they have been declining quite substantially. This decline comes at the same time as MSDGC sewer rate increases to pay for the WWIP have significantly increased.

²² Source of calculations: MSD (2017)

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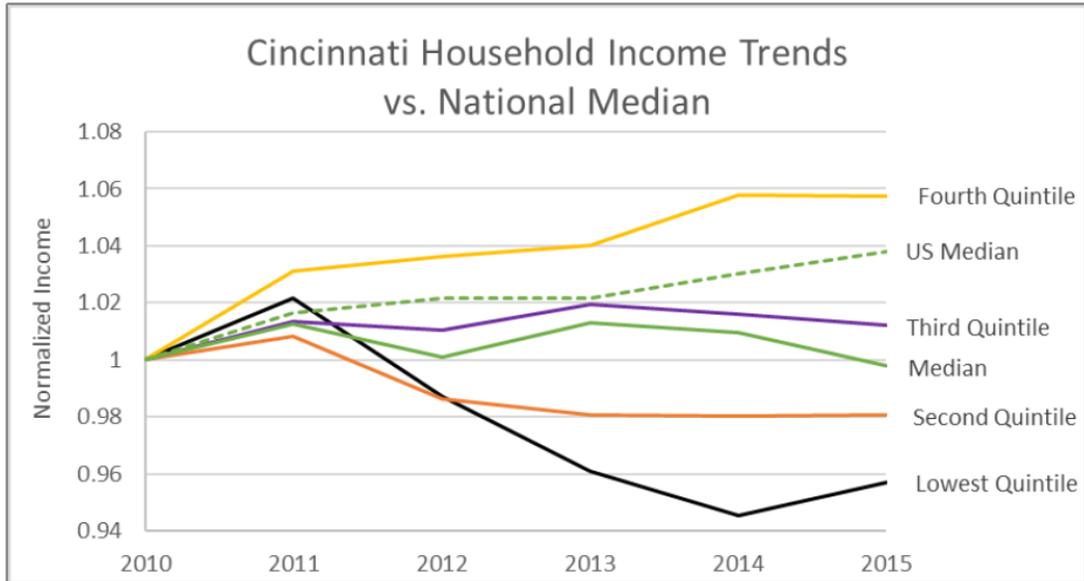


Figure 4.5 – Cincinnati Household Income Trends vs. National Median²³

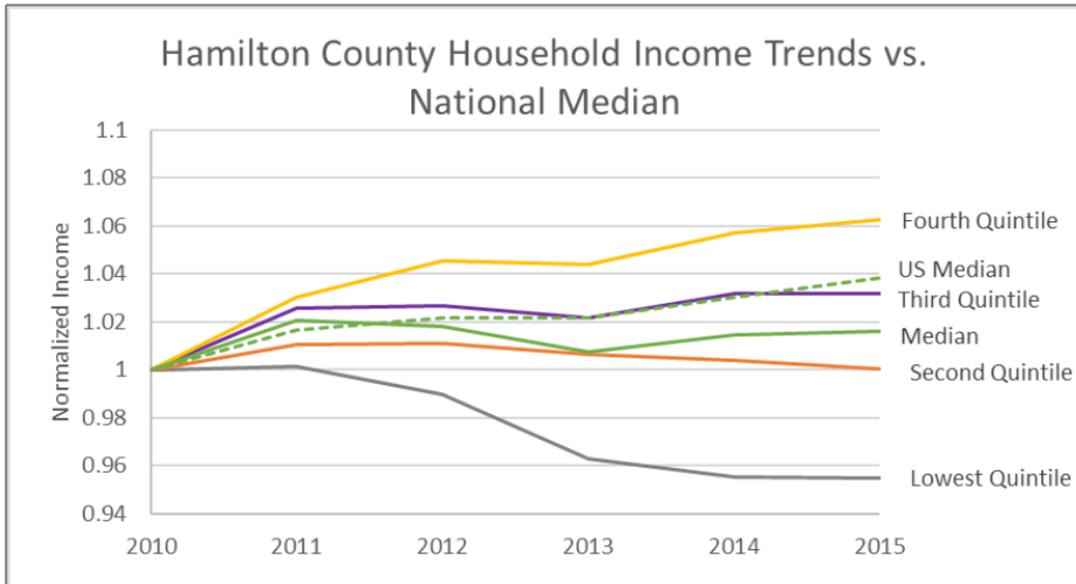


Figure 4.6 – Hamilton County Household Income Trends vs. National Median²⁴

In both the City and the County, the income trends of the quintiles are diverging from the overall median. In other words, the fourth quintile and the lowest quintile were much closer to each other in normalized income during 2011 than 2015. As this divergence grows, the MHI becomes a more and more misleading measure of program affordability, and it becomes increasingly

²³ American Community Survey (ACS), per MSD (2017)

²⁴ American Community Survey (ACS) 2015 five year average estimates, per MSD (2017)

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important to consider other metrics such as the impact on households at the bottom income quintile threshold or households in poverty.

b) Poverty and Income Inequality

The County and the City have poverty rates (18.3% and 30.5%, respectively) that exceed the overall national rate of 15.5%. There is a sharp contrast between the poverty status of the population inside and outside of the City in the 2015 data as illustrated in Table 4.10. The table shows that poverty and assistance rates for the City are double the national levels. Figure 4.7 provides two maps that illustrate how dramatically poverty has changed and grown throughout the Service Area since 2000, representing an affordability challenge for MSDGC.

Table 4.10 – Poverty Rates and Growth

Description	Cincinnati	Balance of County	Hamilton County	United States
Poverty Rate:				
2000	21.9%	5.5%	11.8%	11.3%
2015	30.5%	11.3%	18.3%	15.5%
2000-2015 Change:				
Total Population	-10.1%	-1.6%	-4.8%	12.7%
Poverty Population	25.0%	102.4%	47.2%	40.9%

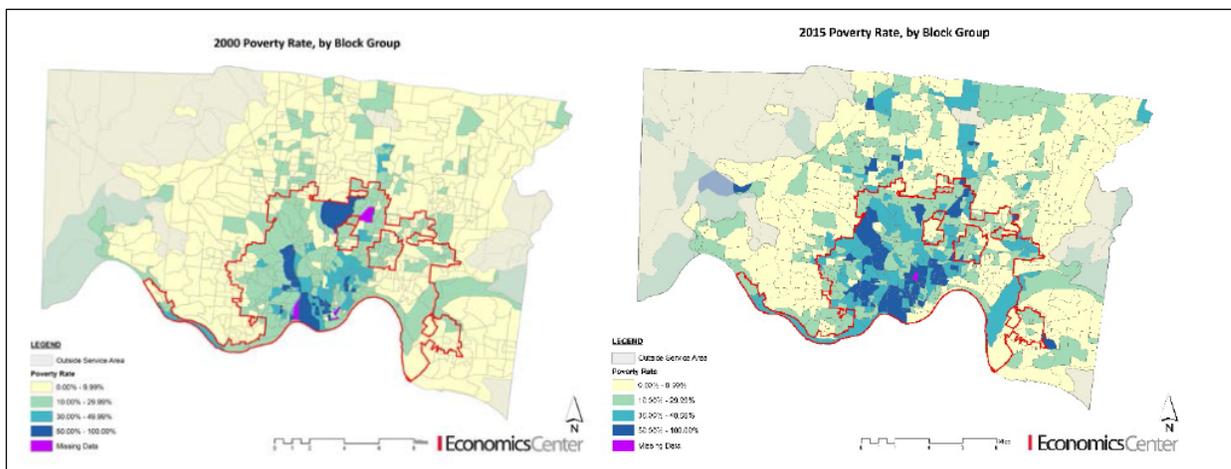


Figure 4.7 – Poverty Rate for Hamilton County 2000 – 2015

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c) Communities of Concern

Within each major component of the Service Area (The City and the balance of the County), there are substantial numbers of utility users who face a harsher economic situation than the “average” ratepayer. In fact, nearly 25% of the County fell within the lowest quintile of US income in 2015.

While the RI for the Service Area (Full Phase 2, 30 years) is calculated at 2.78% , County households in the lowest quintile would experience an RI of at least 8%, based on the upper limit of the quintile, meaning that all households within the lowest quintile would see an RI of 8% or higher. Households in the lowest quintile for the City would suffer even more, with an RI of 12%. While it is understood that households at the lower end of the income distribution will necessarily experience higher burden than households at the median, it is imperative that the dangers of an extreme burden on a significant percentage of the community be taken into consideration in evaluating the time allowed to complete the program.

While the Board has developed a Phase 2A Program that would help mitigate affordability concerns, even this level of spending will result in significant burden to low income customers, with calculated RIs almost 150% greater than the 2% EPA threshold. This represents a severe burden on low income customers and is a good example of why a subdivided Phase 2 approach is necessary and important to the community.

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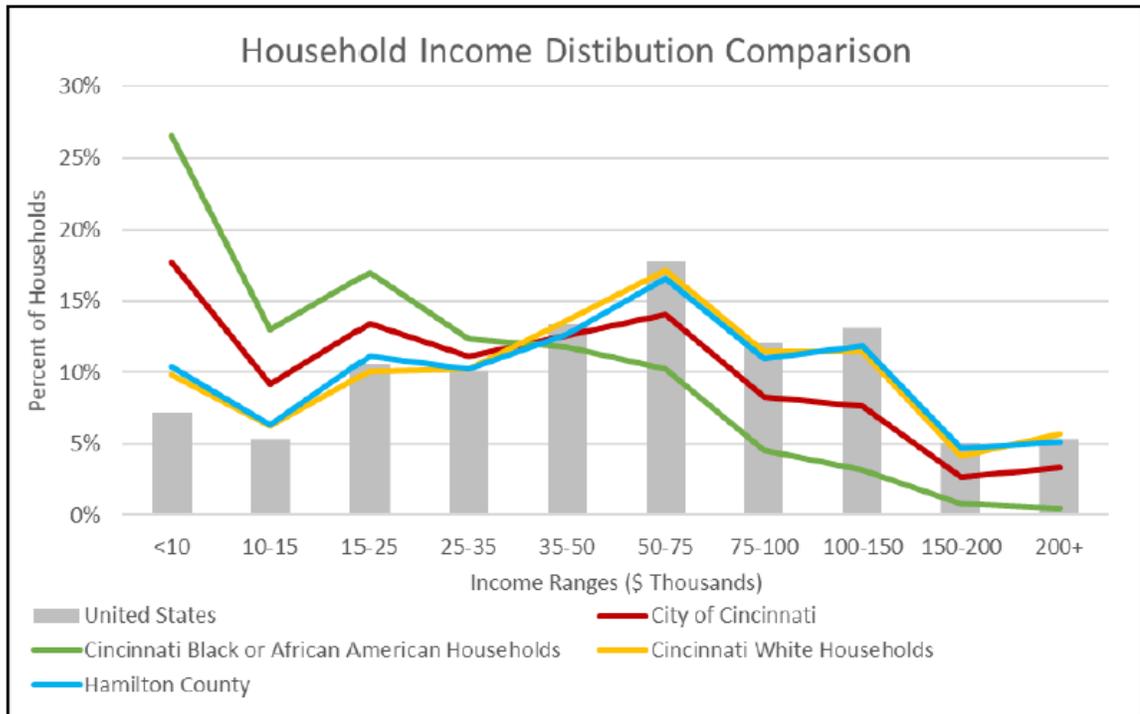


Figure 4.8 – Household Income Distribution Comparison²⁵

In addition, Black or African American households in the County are calculated to be disproportionately impacted compared to the County as a whole. Over 80% of Black or African American households in the City have an income below \$50,000 compared to 64% of all households. Further distribution of income is shown in Figure 4.8. This raises environmental justice issues that should be taken into consideration when evaluating the impacts of the WWIP and its next phases.

d) MSDGC Wastewater Rates

MSDGC rates have increased substantially over the past 30 years, as indicated in Figures 4.9 and 4.10. Annual increases have averaged 9.3% per year over this time period, resulting in a **cumulative rate increase of nearly 800% since 1985, and 265.4% since 2000.** While the percent increase in early years did not result in significant impact on customers in terms of increased dollars spent per quarter, over time, rates have risen to the point where each percentage increase does result in meaningful impact on customers, particularly low income customers who have limited discretionary income and are therefore heavily impacted by rising rates.

²⁵ American Community Survey (ACS), per MSD (2017)

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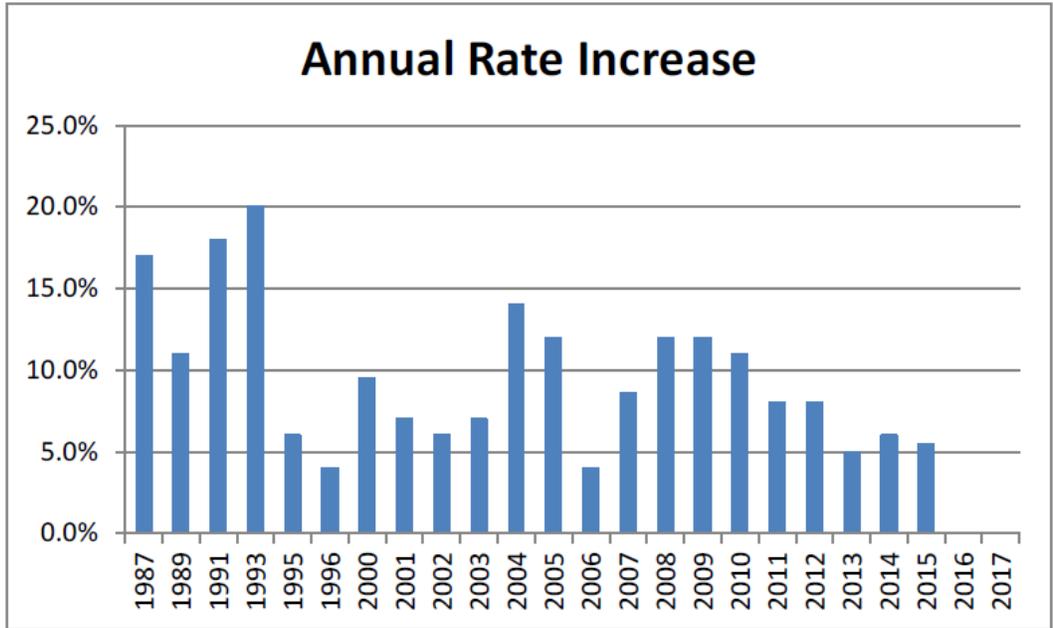


Figure 4.9– Annual MSDGC Rate Increase (No rate increase in 2016 and 2017)

In recognition of the financial burden the increasing sewer rates have placed on the community, and the resulting public outcry against a continuation of Phase 1 spending levels, the Board has held rates constant for the past two years.

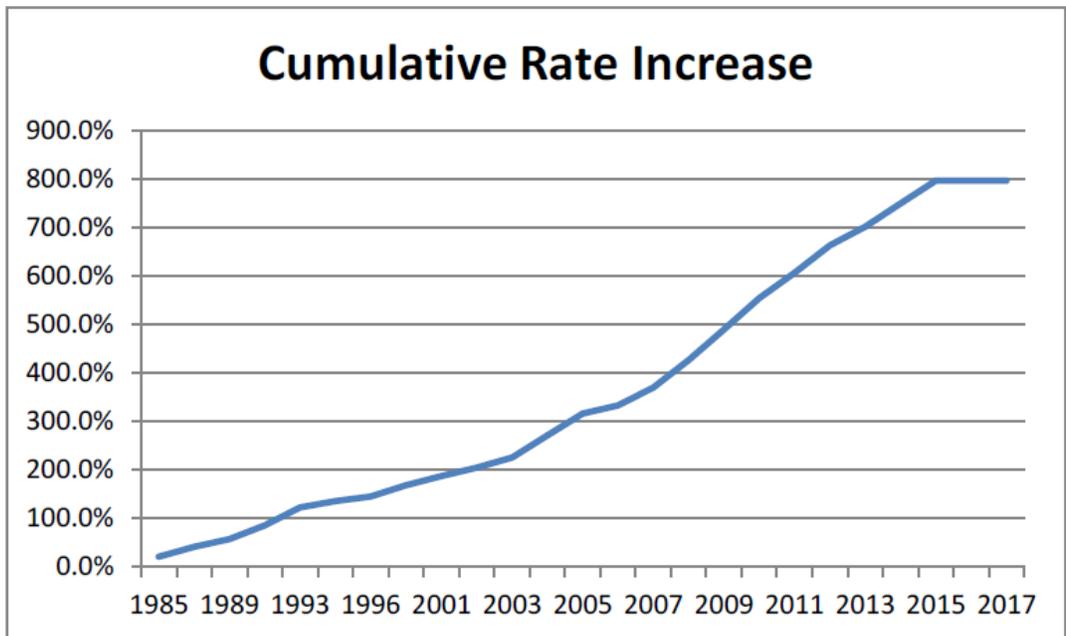


Figure 4.10– Cumulative MSDGC Rate Increase (2017)

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Furthermore, MSDGC rates are significantly higher than other local and regional utilities. For the purpose of comparison, quarterly bills, based on 20 ccf/quarter, have been compared for local Ohio Wastewater Utilities (Figure 4.11), as well as regional utilities (Figure 4.12). As shown, MSDGC rates result in quarterly bills that are up to **three times higher than other local and regional wastewater utilities**. Increasing wastewater rates can be a significant factor in household decisions regarding where to locate in the Greater Cincinnati area. Recent population growth in surrounding suburban communities which are outside the Service Area has outpaced growth in the County, as shown in Figure 4.13. Furthermore, the impact of rates can affect where employers locate, particularly if the business has substantial wastewater flows. This can affect the economy of the Service Area, as loss of employers will subsequently result in loss of population, requiring program costs to be borne by a shrinking Service Area customer base.

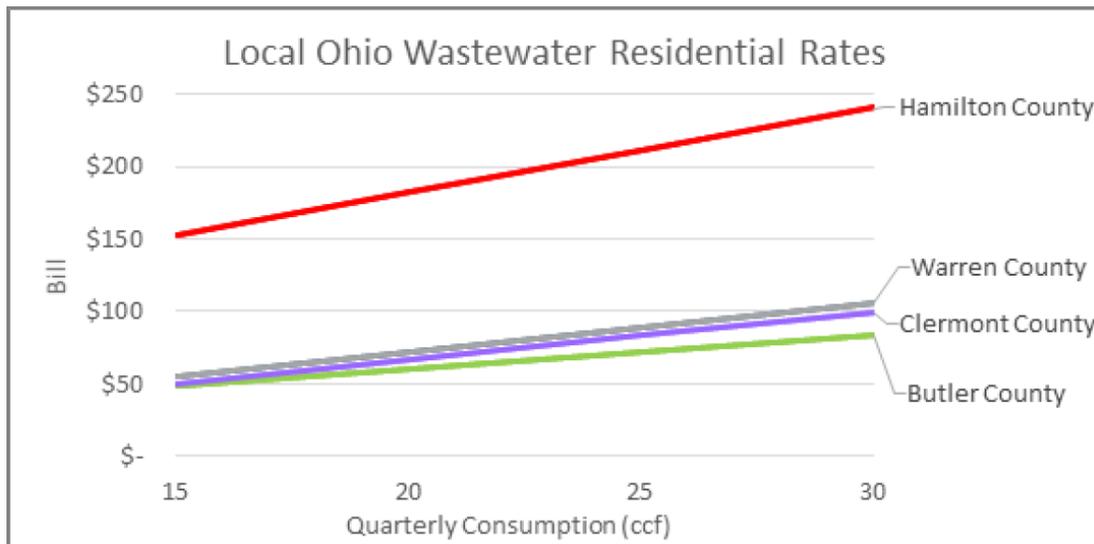


Figure 4.11– Comparison of Quarterly MSDGC Rates with Surrounding Utilities (2015)

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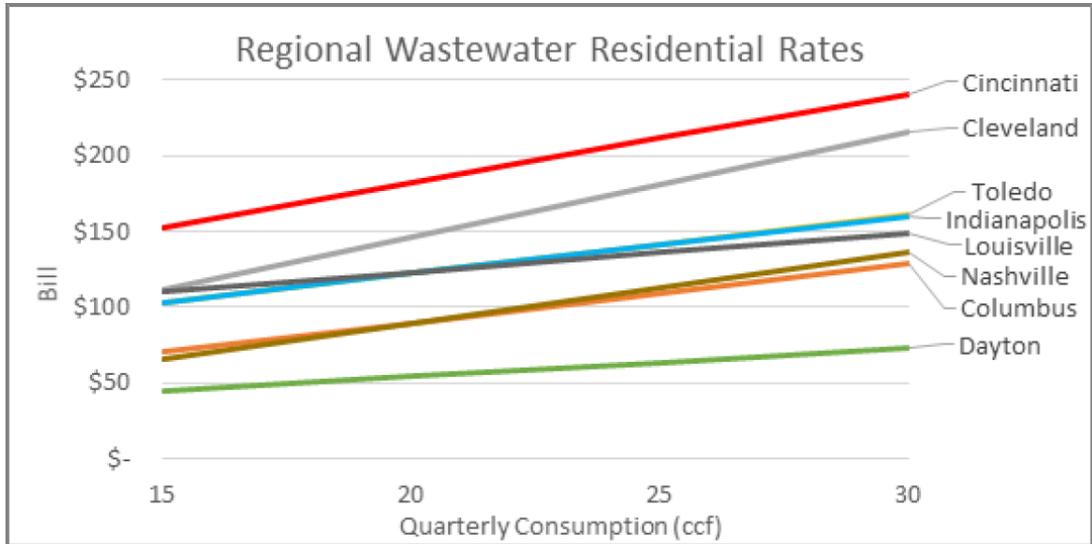


Figure 4.12– Comparison of Quarterly MSDGC Rates with Other Regional Utilities (2015)

MSDGC rates are almost 2.5 times the rates for neighboring communities. The rates are also higher than comparable communities throughout the Midwest.

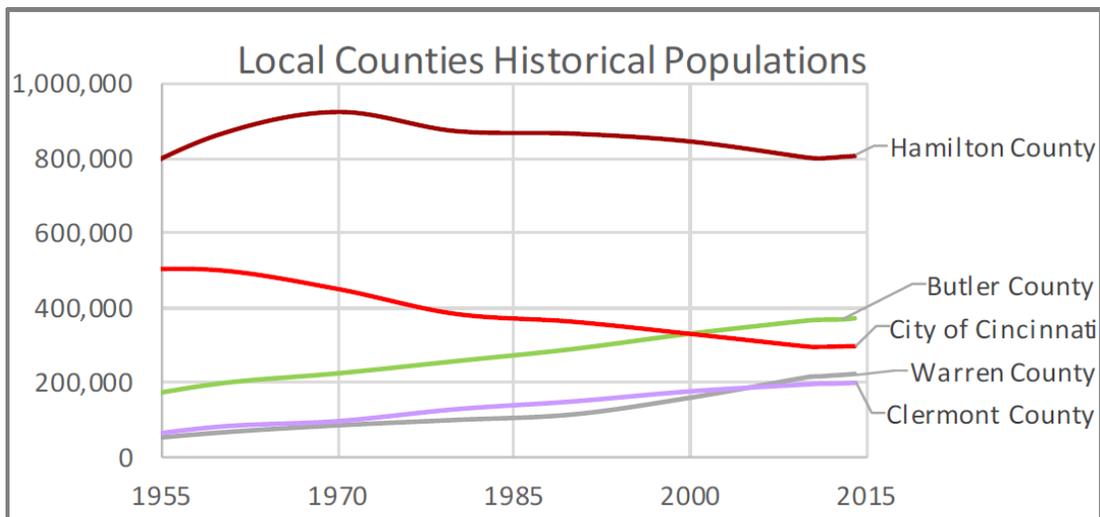


Figure 4.13– Local County Population Growth Comparison

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The population for the County and the City has decreased historically while the neighboring counties' populations are increasing. A continuation of this trend will place even greater pressure on the ratepayers that remain in MSDGC.

MSDGC rates were compared to other national utilities, utilizing the National Association of Clean Water Agencies "Opportunities and Challenges in Clean Water Utility Financing and Management" report released July 2015. Figure 4.14 presents calculated annual bills based on 20 ccf/quarter, for the eight utilities with the highest reported rates. As shown, **MSDGC is one of the utilities with very highest rates in the entire Nation.**

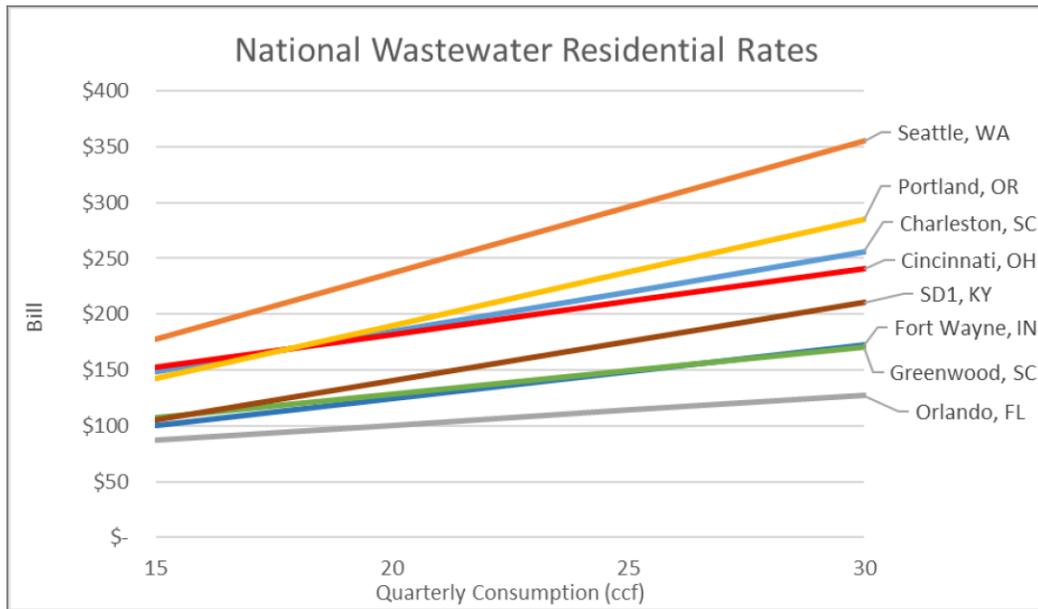


Figure 4.14– Comparison of Quarterly MSDGC Rates with 8 Highest-Rate Utilities (2015)

Even more compelling is the impact of such rates as compared to MHI for the central city served by each utility. As shown in Figure 4.15, Cincinnati's rates, compared to the MHI of customers served, is substantially higher than that of other utilities. Figure 4.15 does not present residential indicator information, but rather shows rates as a percentage of central city MHI for comparison purposes.

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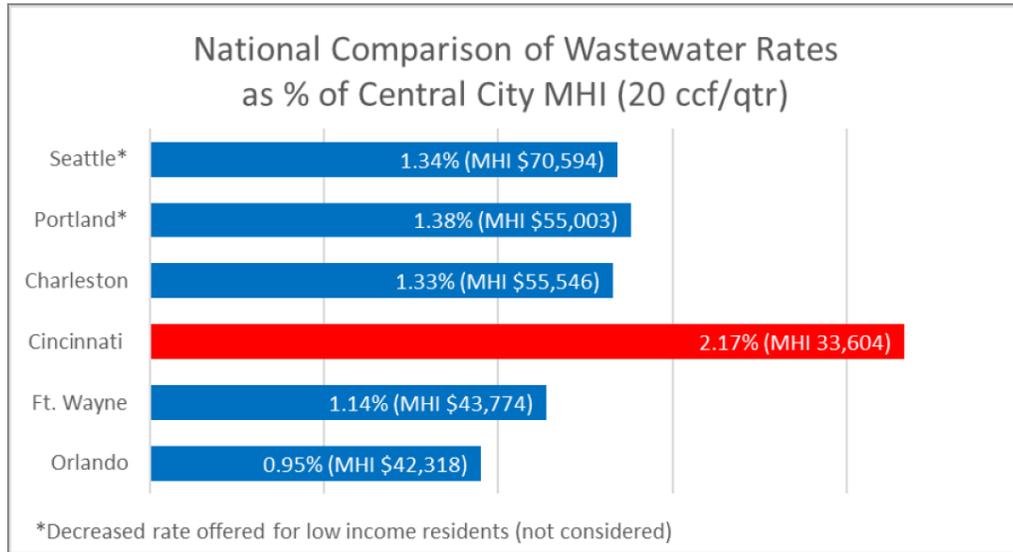


Figure 4.15– Comparison of Annual Bill as a Percent of Central City MHI (20 ccf/Quarter) Among Communities with Highest Sewer Rates in the Nation

e) Debt Service and Per Capita Debt to Income

MSDGC per capita debt²⁶ has increased from approximately \$761 in 2006 to \$1,119 in 2016, reflecting the significant debt that MSDGC has incurred to date in complying with the consent decree. MSDGC and its ratepayers now have a staggering amount of debt even before any the huge Phase 2 spending begins. The implications of this debt are enormously negative. In determining the schedule for the remainder of the program, it is important to manage capital spending such that debt remains at a level that can be supported by the utility’s financial capacity and bond market expectations. Rating agencies evaluate a utility’s outstanding debt and projections for increased debt when determining a utility’s bond rating. Fitch, for example, considers total debt per capita of more than \$650 to be “weaker”. Moody’s indicated one of MSDGC’s challenges as an above average debt burden with further borrowing anticipated. The program schedule needs to be considered such that overall level of debt is managed such that MSDGC’s financial capacity to borrow is not limited, or that would cause MSDGC to be at risk of a bond rating downgrade, which would further increase costs.

Figure 4.16 below presents the projected outstanding debt for MSDGC over the 50 year horizon, assuming the completion of the Full Phase 2 over a 30-year time period with equal annual WWIP spending.

²⁶ Reflects wastewater utility debt only, based on estimated population for Hamilton County. Sources: 2016 MSD CAFR, census population.

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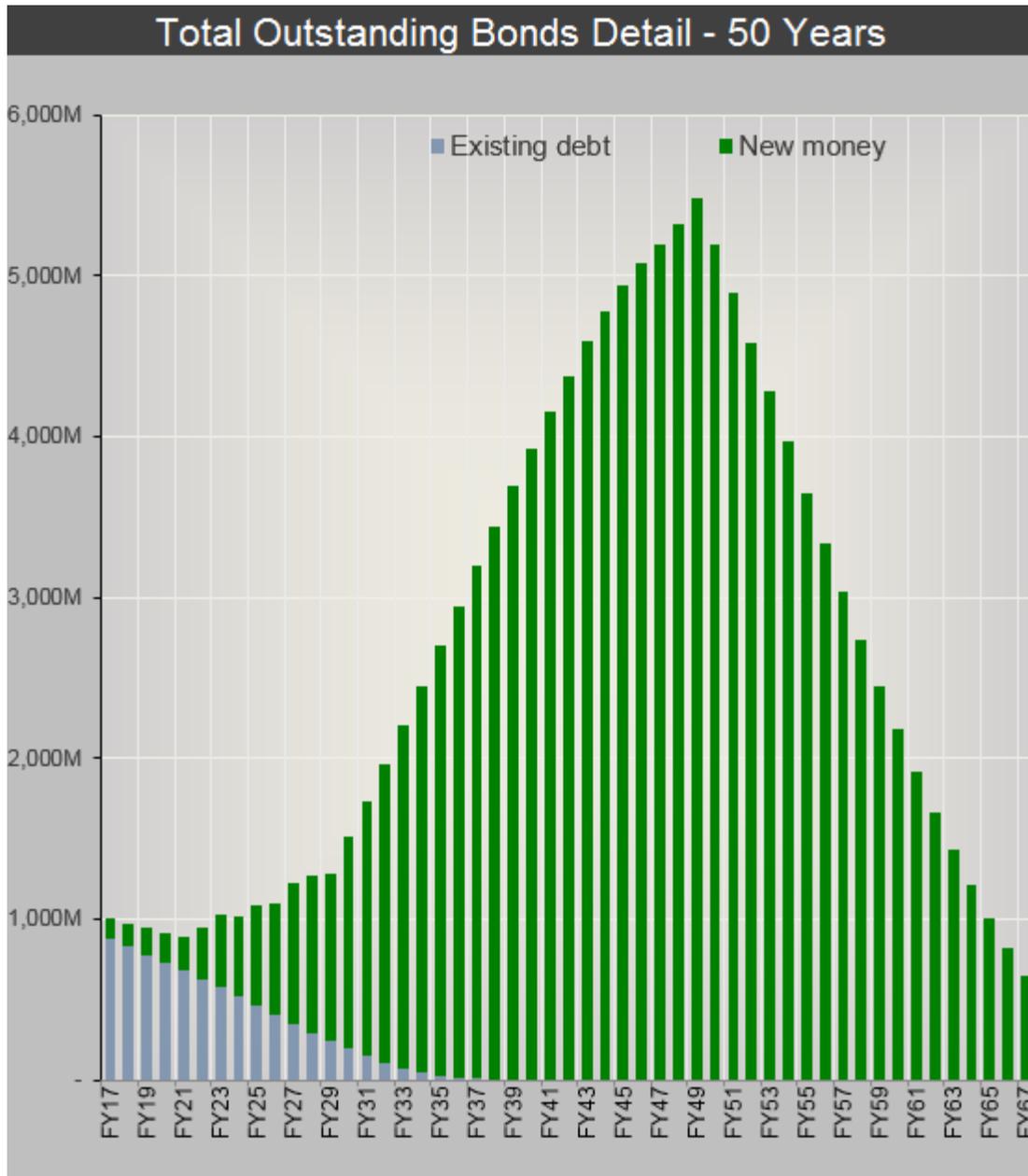


Figure 4.16: Total Outstanding Bonds Detail 50 years

The debt necessary to fund the projected Full Phase 2 spending is significantly higher than the existing debt. At the projected peak, outstanding debt is approximately 500% higher than current levels in order to sustain the total Phase 2A program. Without direct federal or state government grant money – as opposed to more and more debt – Phase 2 is fiscally unsustainable.

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vi. Conclusions from Demographic and Economic Assessment

This assessment provides the following conclusions:

- **Rates:**
 - MSDGC current sewer rates are among the highest in the country for similar metropolitan areas.
 - MSDGC current sewer rates are higher than most similar sized cities in the region. Sewer rates may affect ratings on the competitive scorecard for industry and commerce decisions on where to locate and maintain facilities.
 - MSDGC current sewer rates are significantly higher than adjacent Ohio counties. This can contribute to decisions on where to locate in the Greater Cincinnati area. Recent population growth in these Suburban counties outside the Service Area have been greater than the County.
 - The MHI of the adjacent Ohio counties are higher than the MSDGC service area which means that the impact of higher rates is even greater.
- **Economic conditions:**
 - The national median income growth has been faster than local growth, and especially much greater than the three lowest quintiles of the City.
 - MSDGC sewer rates have increased at much higher rate than the construction indices and consumer price index.
 - Poverty has increased in previously existing areas and expanded to other parts of the Service Area.
 - The percentage of households earning less than \$10,000 in the City is more than double the national average.
 - More than 81% of Black or African American alone households would fall below the \$50,000 income required to live without assistance compared to 50% of White alone households. This presents an environmental injustice issue as well as an affordability issue for MSDGC.
 - The City's high vacancy rates may be an indicator of lack of demographic and economic growth, resulting in less new construction and lower property values.

vii. WWIP Phase 2A Affordability Approach

As previously discussed, the EPA Financial Capability Assessment establishes, based on the methodology outlined in the FCA, that the Full Phase 2 Program is unaffordable. The discussions about unique local conditions also indicate that severe economic restraints exist for the Service Area and in particular segments of the

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Service Area, including many incorporated communities. The Board has developed an affordability approach in developing the Phase 2A Program.

A. Central City

EPA Guidance discusses consideration of the sewer rates' impact on communities and the FCA Framework cites the relevancy of fees as a percentage of household income, quintile, geography or other breakdown. With this in mind, and in light of the understanding of the significant and widespread impact the Program will have on customers in the City and other communities throughout the Service Area with similar economic conditions, the County has developed a Phase 2A Program based on financial metrics of the City. In addition, the City serves as a meaningful proxy for many other communities within the Service Area, who are experiencing similar economic conditions. This approach is reasonable and consistent with current regulations and guidance and recent national practice.

B. Basis for Using City of Cincinnati Affordability Analysis

Basing the Affordability calculation on the City instead of the entire Service Area is reasonable and compliant with existing EPA regulations and policies. This approach is supported by the Affordability discussions in the USEPA's 1997 CSO Affordability Guidance and the "March 1995 Interim Economic Guidance for Water Quality Standards: Workbook." *The MSDGC Global Consent decree recognizes both the 1997 and the March 1995 Workbook. A basis for determining Affordability using the 1995 Workbook approach is a finding of "significant and widespread economic and social impact". There is also discussion in that Guidance about consideration of individual communities within the Service Area.*

Affordability (Financial Capability) is recognized as an integral component of the Clean Water Act. The CWA at the beginning of its implementation provided for an extensive Construction Grants Program that made the cost of compliance with new requirements affordable. The Water Quality Standards also acknowledge financial capability is important – for example in the *Use Attainability Analyses* procedures. EPA has included "significant and widespread social and economic impact" as a guiding regulatory criterion. *In the "Interim Economic Guidance for Water Quality Standards" (1995), EPA describes a procedure for determining affordability based on "significant and widespread" impacts. As part of the process this guidance cites a review of individual communities within the service area for the affordability evaluation.*

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The USEPA CSO Affordability Guidance is dated just two years later (1997) and was needed because of the potential size/costs of some of the CSO Programs. The CSO Program is largely water quality based and so it logically connects to compliance with Water Quality Standards affordability discussed above. The 1997 CSO Affordability Guidance was based in part from EPA's experience with the 1995 WQS Guidance (and others). The procedures presented to determine affordability in the 1997 Guidance are similar to the 1995 Guidance. A major exception is that the 1997 Guidance uses the service area, and does not focus on individual communities, to calculate the Residential Indicator. (It should be noted that the **1997 Guidance allows flexibility and provides the opportunity to present unique local conditions that could include financial capability of individual communities**. The USEPA's 2014 Integrated Planning Financial Capability Framework likewise describes the opportunity to paint a picture of local economics that can include examining local communities and demographics within the service area.)

This jump from consideration of individual communities to focus on service area in calculating the residential indicator may be completely arbitrary. For MSDGC and other major wastewater agencies with a central city, the impact is huge. ***If the real goal is to determine and assess the "significant and widespread social and economic impact" of a compliance program, service area has no more relevance than individual communities. The central city may be more relevant as the economic, social, and recreational hub of the region than the Service Area.*** Therefore, it is proper to use the City, and not only the Service Area, in determining Affordability and in developing a schedule that is as "expeditious as practicable".

viii. Conclusion

Basing the Affordability calculation on the City instead of only the entire Service Area is reasonable and compliant with existing EPA regulations and policies. This approach is supported by EPA Regulations and Guidance as evidenced in the USEPA's 1997 CSO Affordability Guidance and the "March 1995 Interim Economic Guidance for Water Quality Standards: Workbook". The Global Consent Decree recognizes both the 1997 and the March 1995 documents. Impacts on the City constitute "significant and widespread" because of the significance to the many households in the City and similar communities in the Service Area, and the City's overall impact on the entire Service Area and the region.

C. Asset Management Considerations

In addition to more than \$2 billion of Consent Decree mandates for the Phase 2 Program, MSDGC has a massive set of aged, existing sewer assets that compete for funding and must be addressed as part of the Phase 2 Program. To adequately fund the \$1.14 billion Phase 1 WWIP program, MSDGC was unable to address many critical asset management infrastructure needs. Extensive continuing work is still needed to maintain existing Wastewater Collection, Wastewater Treatment, and Watershed Operation assets in proper

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working order and to minimize both dry and wet weather overflows, as noted in Figure 4.17 below. Even with the extreme financial pressure created by Phase 1 WWIP spending, rates were increased and new debt incurred to finance \$470 million of asset management work during the period 2008-2017. During the period 2008 to 2017, the average annual spending on asset management projects and allowances was \$47 million. Going forward into Phase 2A, the Board and MSDGC project that critical and necessary annual asset management spending will be approximately \$50 million per year for the 5- year Phase 2A period, totaling \$250 million, and will average this amount for the remaining years of Phase 2.



Figure 4.17 - Summary of Priority Asset Management Needs

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i. Asset Management Needs in Next 5 Years

As shown in Figure 4.17, although MSDGC estimates that a **minimum of \$400 million** (2006\$) is warranted for asset management capital spending over the next five years, the WWIP limits asset management spending to \$51 million (2006\$) per year for the purposes of calculating the Residential Indicator unless it is reasonably demonstrated there is a necessity of greater spending. The Board believes that \$50 million (2006\$) per year is reasonable and appropriate at this time for CIP asset management spending, so the 5-year total asset management spending proposed for Phase 2A is \$250 million (2006\$). MSDGC is currently developing comprehensive asset management programs for its WWTPs, pump stations and collection system. Once these programs are more fully developed, and a more comprehensive understanding of the existing asset conditions are determined, this level of required asset management may increase.

ii. Wastewater Collection System Asset Management

Maintaining sewer assets in fit-for-purpose condition throughout their target lifespan is a primary goal for MSDGC. Selecting the right pipes for rehabilitation at the right time is one of the main Asset Management challenges. As the sewer infrastructure aging process advances, the need for effective asset integrity management becomes more pressing. When estimating the service lives of pipes, utilities have generally relied on predictions of the durability of the pipe materials used for construction. However, because of varying environmental and climate conditions, soil type, pipe size, internal corrosion, quality of installation, level of hydraulic surcharging, operating and transient pressures for force mains, additional fill placement, and other factors, this method is not always accurate. Because most pipes are buried, there is little data available about how they deteriorate and fail.

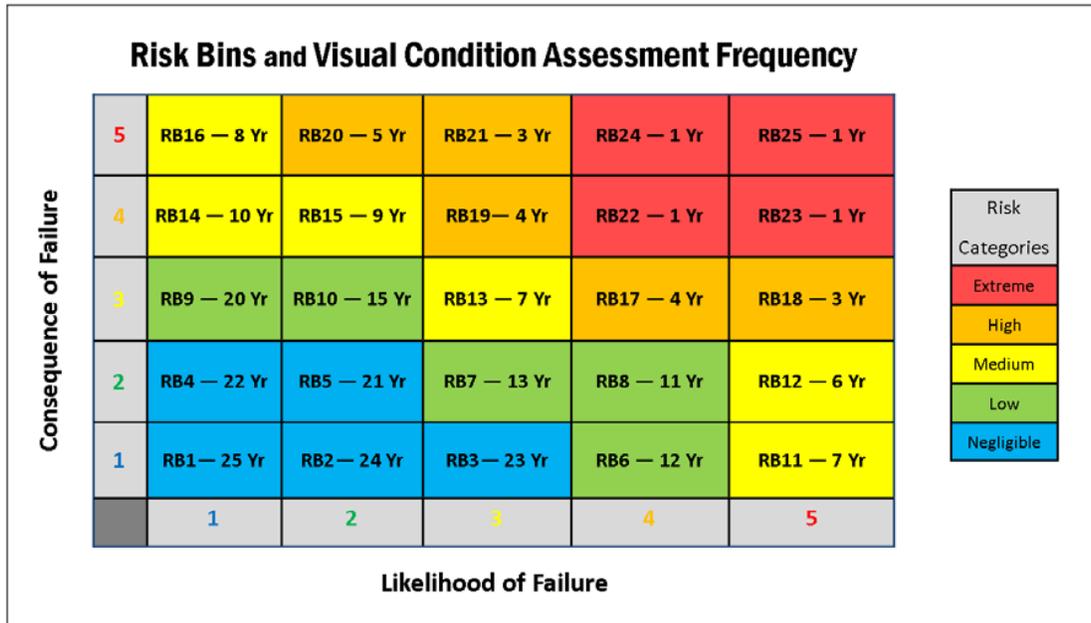
An understanding of how pipes fail, combined with a quantitative grasp of the underlying causal factors likely to induce failure, is valuable in formulating a targeted approach to rehabilitation, repair and renewal planning. MSDGC has recently incorporated new software into its computerized maintenance management system (CMMS) called InfoMaster®. This software uses the available sewer condition assessment data along with consequence of failure determinations to help MSDGC:

- Pinpoint assets at the greatest risk of failure,
- Identify the best possible improvement alternatives for optimal system performance,
- Prioritize and phase improvements based on available budget, and
- Realize cost savings by repairing sewers before they fail.

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The results of the InfoMaster® tool are input into MSDGC’s Gravity Sewer Asset Management (GSAM) Program to spatially identify where repairs are required and to organize the needed workload. To prioritize where the greatest needs lie, MSDGC has aggressively pursued a robust risk-based asset management strategy that combines GIS, CMMS, risk and condition assessment data to predict what work needs to be done and where. The comprehensive risk model takes into consideration the likelihood and consequence of the failure both from a structural and maintenance perspective. These criteria are combined to classify pipeline segments into risk categories – as noted in Figure 4.18.

Figure 4.18. Visual Condition Assessment Frequency per Risk Bin



This critical information facilitates a proactive approach for identifying and managing these high-risk assets to help preserve structural integrity and keep the collection system operating well into the future. It also helps to reduce reactive and emergency maintenance over time, i.e., waiting for pipe failures to occur before repairing.

MSDGC has performed condition assessments for about 50% of the approximate 3,000 miles of sewer collection system to-date. A priority for WWIP Phase 2 will be to continue this condition assessment for high priority and consequence of failure sewers across the system. MSDGC is also still in the process of loading its historical condition assessment data into InfoMaster® so only a portion of the risk priorities are available for quantification. An overview of the collection system risk priorities (approximate as of December 2017) as calculated by MSDGC is presented in the following Table 4.11. This information provides a general understanding of the

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magnitude of the capital need. Specific sewers will be addressed as funding is available.

Table 4.11. Overview of the collection system risk priorities (approximate as of December 2017)

Renewal Method	Sewer Risk Category					
	Extreme		High		Medium	
	Footage (LF)	Estimated Cost (2006\$)	Footage (LF)	Estimated Cost (2006\$)	Footage (LF)	Estimated Cost (2006\$)
Full Lining	57,320	\$ 10,228,200	205,036	\$ 28,253,000	216,000	\$ 20,009,700
Grout Joint	960	\$ 99,000	2,074	\$ 184,600	23,792	\$ 1,383,700
Point Repairs	4,144	\$ 2,765,200	9,576	\$ 5,508,300	17,440	\$ 9,710,200
Partial Lining	4,206	\$ 2,100,500	12,922	\$ 6,167,100	20,239	\$ 9,489,800
Full Replacement ¹	32,889	\$ 20,589,300	97,826	\$ 61,241,400	118,002	\$ 73,872,100
Totals	99,519	\$ 35,782,200	327,434	\$ 101,354,400	395,473	\$ 114,465,500

iii. Wastewater Treatment Plants, Pump Stations & Remote Facilities Asset Management

MSDGC operates several large wastewater treatment and pumping facilities. To maintain a reliable, safe, and efficient operation of these assets, millions of dollars must be invested annually. These assets are critical to maintaining established levels of service for the communities MSDGC serves. MSDGC has evaluated wastewater treatment and pumping facilities investments made during Phase 1 and compared them with industry standard Asset Management Programs. It can reasonably be concluded the WWIP Phase 1 Capital Program has required several WWTP, pump stations and remote facilities asset management projects to be deferred in order to comply with Consent Decree mandates.

In 2014, MSDGC undertook a comprehensive effort to evaluate the treatment processes, structures, and asset conditions for each facility, updating facility plans for WWTPs to identify asset replacement needs and prioritize projects at each plant and pump station based upon risks. The facility needs and project costs were estimated by the engineers performing the facility plan updates and formed the basis for MSDGC's Phase 2A Asset Management Program needs.

Concurrent with the update of facility plans, MSDGC developed a Wastewater Treatment Asset Management prioritization tool that combined project drivers with risk criteria to assist staff with ranking capital needs for WWTPs. MSDGC also drafted a Pump Station Prioritization Plan to forecast and prioritize pump station capital needs. Assets were evaluated based upon the risk consequence of occurrence and risk likelihood of occurrence. The product of the risk

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consequence and likelihood resulted in a risk score that was used to prioritize facility upgrades and improvements. MSDGC also looked at Maximo CMMS data to confirm when assets were forecasted to need replacement. This tool and its prioritization are in the process of being updated and expanded to all assets across all WWTPs and Pump Stations.

MSDGC created a Watershed Operations Division in 2013 to support its watershed-based approach to improving its performance during wet weather. It also carries forward the innovative approaches to wet weather management that MSDGC built into its Wet Weather Improvement Plan (WWIP). This Division is responsible for the operation and maintenance of MSDGC's wet weather facilities, oversight of the green infrastructure installations, and management of all sewer data collection activities from across the entire collection system. To do this, Watershed Operations focuses on the operation and maintenance of assets built to handle wet weather flow, specifically high-rate treatment facilities, real time control facilities and stormwater control measures, with the ultimate objective of optimizing performance and lowering the total life-cycle cost of ownership. The Division is responsible for the following facilities and asset types:

- Daly Road CSO Treatment Facility
- Muddy Creek & Westbourne HRT Facility
- SSO 700 Storage and Treatment Facility
- Werk & Westbourne EHRT Facility
- Storage-based real time control facilities (Lick Run, Mitchell, Badgeley Run, and Ross Run)
- Stormwater Control Measures/Green Infrastructure (bioswales, detention ponds, etc.)

A current summary of the Asset Management needs for the WWTPs, pump stations, and remote facilities is presented in the following Table 4.12. These needs are subject to change as MSDGC's asset management program is more fully developed, and a more comprehensive understanding of the existing assets' conditions are determined.

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Table 4.12 Overview of WWTPs, Pump Stations, and Remote Facilities - Phase 2A
Forecasted Asset Management Needs

MSDGC WWTP/Facility (2006\$)	ASSET Renewal Needs in Phase 2	Comments
Mill Creek <i>\$169 Million</i>	Electrical Systems Solids Handling Processes Primary Sludge Pumping Disinfection Odor Control	Solids handling and processing improvements are required to address long-term solids processing for the MSDGC and in coordination with the Hamilton County Solid Waste District. The plant electrical system has not been updated for 50 years and requires improvements across the plant site. Odor control investment is needed to reduce multiple regular odor complaints and continue to meet the BOCC goal of no odors beyond the fence line.
Muddy Creek <i>\$69 Million</i>	Influent Pumping Disinfection Effluent Pumping	A new influent pump station was deferred during the WWIP Phase 1 Program. The new pump station will be coordinated with the proposed Muddy Creek EHRT project. During the WWIP Phase 2A Program the effluent pumps and other select process components will reach the end of their useful life.
Little Miami <i>\$25 Million</i>	Mixed Liquor Pumping Electrical Systems Influent NPW System Odor Control System	Nearly all asset management needs were deferred for this WWTP during WWIP Phase 1. Multiple asset management projects are needed across the WWTP processes to be implemented in WWIP Phase 2A. Odor control investment is needed to reduce multiple regular odor complaints and continue to meet the BOCC goal of no odors beyond the fence line.
Taylor Creek <i>\$26 Million</i>	Aeration Process Grit & Grease Removal Electrical Systems Yard Piping	This WWTP has been operating nearly 20 years and several processes will reach the end of their useful life during the Phase 2A Program.
Polk Run <i>\$25 Million</i>	Influent & Effluent Pumping Admin Building Settling Tanks Primary Sludge & Skimmings	Projects are needed to address aging and hydraulic limited liquid stream processes. Several pumps are recommended to be rebuilt during the Phase 2A Program throughout the WWTP.
Sycamore Creek <i>\$37 Million</i>	Screening System Sludge Pumping Disinfection Influent & Effluent Pumping	This WWTP has been operating nearly 20 years and several processes will reach the end of their useful life during the Phase 2A Program.

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Table 4.12 continued...

Indian Creek <i>\$3 Million</i>	Plant-Wide Pumping Grinders Blowers Polymer Systems	Phase 2A replacement needs include influent channel grinders, influent pumps, influent sump pumps, RAS pumps, digester sludge pump, thickened WAS pumps, recycle pumps, GBT polymer system pump, NPW pumps, digester blowers, post aeration blowers, and post aeration gate.
Collection System Pump Stations <i>\$30+million</i>	33 pump stations have been identified as candidates for either elimination or necessary upgrades	These pump stations require backup power solutions, new electrical or mechanical components or are candidates to reduce overall O&M costs through elimination. The eliminations need to be closely evaluated to prevent additional overflow volume downstream.
Remote Treatment & RTC Facilities <i>\$10+million</i>	Pumping System Replacements Rotating Equipment Replacements Electrical Replacements On-Site Buried Infrastructure Replacements HVAC System Replacements Process Equipment Replacements	Asset management activities have been progressively employed since 2014 for these facilities. Reliability Centered Maintenance (RCM) studies have been utilized to identify improved maintenance strategies to provide high availability and reliability and focus required maintenance activities.

MSDGC has conservatively identified nearly \$400 million (2006\$) for Asset Management needs at the WWTPs, pump stations and remote treatment facilities that could be initiated during Phase 2A. These needs must be balanced with the affordability constraints and will impact the amount of capital available for these needs.

iv. Estimated Asset Replacement Cost & Annual Renewal Needs

A summary of full replacement costs of MSDGC’s infrastructure by asset category is shown in the following Table 4.13. Full replacement cost equals the value of assets at today’s costs based upon Engineering News–Record (ENR) cost indices to escalate costs to current dollars. MSDGC estimates the sum of sewers and force mains replacement value totals \$9.9 billion. Industry standard asset renewal rates are approximately 1% for linear sewer assets and approximately 2% for treatment and pumping facilities. Using these industry standard metrics indicates a needed investment of about \$80.4 million per year (2006\$) for gravity sewers, pump stations and force mains, and \$26.5 million per year for treatment facilities.

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Table 4.13 - MSDGC Estimated Asset Replacement Cost & Annual Renewal Needs

Category	Replacement Cost (2016\$)	1% CIP for Collection System & 2% CIP for Treatment (2016\$)	1% CIP for Collection System & 2% CIP for Treatment (2006\$)
Gravity Sewer	\$9.8 billion	\$98.0 million	\$78.6 million
Force Main	\$62 million	\$0.7 million	\$0.6 million
Pump Stations	\$135 million	\$1.4 million	\$1.2 million
Buildings	\$88 million	\$0.9 million	\$0.8 million
Treatment Facilities	\$1.6 billion	\$32.0 million	\$25.7 million
Land	\$4 million	N/A	N/A
Total	\$11.7 billion	\$133.0 million	\$106.9 million

Adequate funding for the MSDGC Asset Management Program is important to ensure assets are repaired and replaced prior to failure. The infrastructure reinvestment measure is used to assess the need for increasing spending for renewal and replacement of existing infrastructure. The measure is calculated by dividing the annual amount of expenditure on reinvestment in a particular asset class (e.g., wastewater collection systems; treatment plants, pump stations, etc.) by the total replacement value of the respective assets. This indicator focuses attention on whether the current investment is adequate or may compromise the ability of future generations to meet infrastructure needs by under-investing in renewal and replacement projects.

For example, investing 1% of the total replacement value of the MSDGC wastewater collection sewers would require 100 years to replace all sewers during their life span. Similarly, wastewater treatment processes and components tend to have life spans ranging from 20 years to 50 years. If properly maintained, equipment can be made to last longer, but requires adequate asset maintenance investment to achieve longer life spans.

Phase 1 of the WWIP (ending December 2018) was so financially aggressive that MSDGC's Asset Management Program (i.e. replacement of aging infrastructure) could not be funded at a level consistent with its needs. However, given current economic conditions, MSDGC ratepayers cannot afford this level of Asset Management spending while also balancing investment in WWIP Phase 2 projects. Prioritization of both needs is required. Section 5 of this report further explains the rationale for balancing the necessary asset management funding with high benefit WWIP overflow reduction, surface flooding and basement backup mitigation, and water quality improvement projects.

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D. Other Considerations (long-term water quality improvements and integrated planning)

A cornerstone of the Board's proposed WWIP Phase 2A program is the selection of projects using the EPA 2012 Integrated Planning Framework to achieve measurable water quality improvements while also addressing immediate issues of surface flooding and basement backups. The Board's integrated approach addresses multiple water quality and public health issues with a single investment.

The Consent Decree requires that CSOs comply with all WWIP (i.e., the CSO Long-term Control Plan) design and performance criteria (including the WWIP CSO Volume Remaining performance criteria), Clean Water Act, National CSO Policy, Ohio Revised Code Chapter 6111, ORSANCO Compact and Pollution Control Standards, and the various MSDGC NPDES permits issued for the wastewater treatment plants and CSOs. The Regulators have indicated through the post-construction monitoring plan procedures, that they require compliance with not only current NPDES permit requirements, but also with any future NPDES permit requirements that are in effect at a particular time in question. The water quality based effluent limitations in the NPDES Permit currently in effect as of 2016 applicable to the CSOs are narrative General Effluent Limitations. The Regulators have further indicated that it is possible that the NPDES permits that are in effect for any particular sewershed at the time when final measures are substantially completed will include numeric limitations.

MSDGC will need to ensure project designs will result in compliance with the applicable water quality requirements. It is neither prudent nor affordable to design and build a project based solely on WWIP CSO remaining volume and then find out after post construction monitoring that another project at additional cost must be implemented because water quality requirements in an NPDES permit were not met. Moreover, if new NPDES permit water quality requirements are imposed that impact CSOs, it will be necessary to ensure there is sufficient time to incorporate any new requirements into the design for an upcoming project.

In addition, the multiple "cloudburst" extreme rain events experienced in the combined sewer service area on August 28, 2016, February 28, 2017, April 18, 2017 and April 28-29, 2017 led to thousands of basement backups, from both sewers backing up and surface flooding emanating from the combined sewer system. These events have highlighted the need to implement solutions that can mitigate both surface flooding and basement backups while also reducing CSO volume. In 2014, The National Science and Technology Council and the U.S Global Change Research Program published a report "Climate Change Impacts in the United States" that measured an observed 37% increase in very heavy precipitation in our region and a national trend toward a greater amount of precipitation being concentrated in very heavy rain events. See Figure 4.19.

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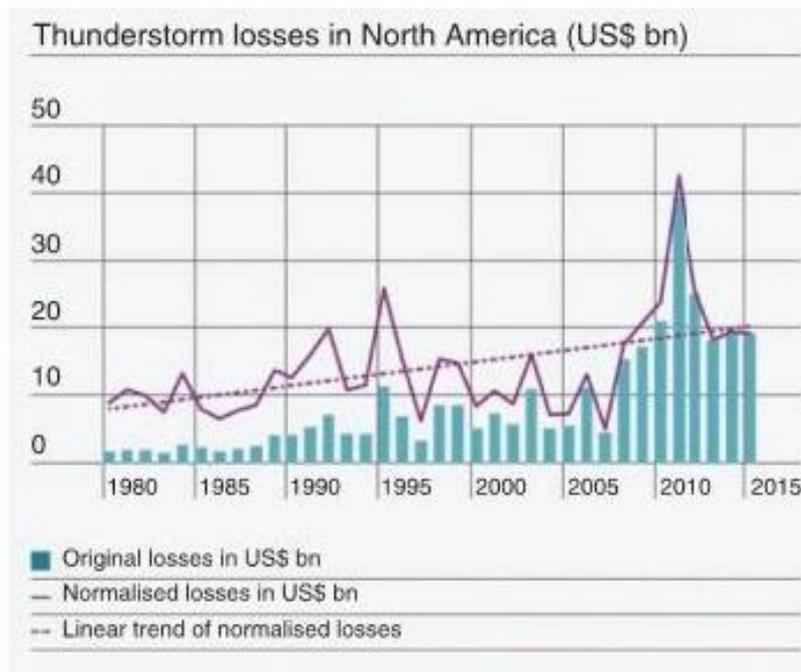


Figure 4.20 - Nominal and normalized annual losses from severe thunderstorms in North America

MSDGC has determined the combined sewer system is mostly designed at a maximum threshold storm event intensity of a 10-year storm with many areas not able to achieve a 10-year storm design standard. The existing sewer system cannot handle or respond to an increase of about 37% or more in heavy precipitation as has been witnessed with the recent storm events. MSDGC reports that a total upgrade of sewers to carry these increases in stormwater runoff volume would increase sewer rates of MSDGC customers by over 400% and could not, for feasibility reasons, be implemented in less than 40 years.

Hamilton County and other local municipalities in the Service Area, including the City of Cincinnati, have multiple Clean Water Act obligations:

- CSOs and SSOs must be addressed;
- Sewage backups in basements and buildings;
- Surface flooding due to storm water emanating from combined sewers throughout the County;
- Stormwater pollution control requirements under MS4 (Municipal Separate Storm Sewer System) permits are increasingly more stringent (the Hamilton County Stormwater District and City Stormwater Management Utility have OEPA-issued MS4 permits);
- TMDLs that exist or are proposed to be developed or updated on some of the County's waterways may require investment to address impairments caused by sewer or stormwater discharges; and

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- Dry weather bacteria and other pollutants impairments to the waterways occur throughout the County.

Solving the problems associated with these multiple obligations requires an integrated watershed approach given the limited available ratepayer funds.

The full WWIP Phase 2 project list was developed 8-20 years ago with overflow volume capture as the primary focus. The Regulators have emphasized that water quality considerations are also critical, as evidenced in the post construction monitoring and modeling procedures and requirements. U.S. EPA guidance and policies indicate that Integrated Planning can be used to prioritize investments needed to meet all the responsible party's CWA obligations. Investment in CSO/SSO projects for WWIP Phase 2A should maximize benefits to address all the County's, inclusive of the local municipalities and the City of Cincinnati's, CWA obligations. The investment should not focus on overflow volume alone during Phase 2A. Therefore, the County has developed a Phase 2A plan that includes projects that achieve (1) immediate high benefit overflow volume reductions, (2) significant mitigation of surface flooding and basement sewer backups, and (3) measurable improvement in water quality and significant further progress in achieving water quality standards compliance).

E. Phase 2A Project Selection Description

The Board governs MSD and sets its policies, budgets, rules and rates. The Board is acutely aware of its duties under the Consent Decrees and the impact of a \$3B+ program on ratepayers. Taking into account input from the public and MSD and County staff, the Board set the following Policy Goals for Phase 2 and Phase 2A:

- **COMPLIANCE:** Comply with the requirements of the Consent Decrees to address Combined and Sanitary Sewer Overflows and improve water quality within the constraints of community affordability, asset management to continue MSD operations, and practicability.
- **RATEPAYER PROTECTION:** Protect MSD ratepayers and the community from unaffordable program costs.
- **IMPROVEMENT:** Focus work on the existing list of WWIP projects, but creatively adapt those to lessons learned, special wet weather needs, new technologies, integrated watershed planning, and changed circumstances from the start of Phase 1.
- **FLEXIBILITY:** Keep Phase 2A brief enough to accomplish major work and develop new and improved projects for construction in Phase 2B. Meanwhile, protect the community by avoiding a lengthy program of mandated projects (each with schedule penalties) regardless of actual costs. Retain flexibility for Phase 2B scheduling by requiring another affordability analysis in 2023 prior to Phase 2B scheduling in 2024, a key to controlling costs from 2025 onward.

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To accomplish these policy goals, the Board's Phase 2A program includes the following pillars for investment as shown in Figure 4.21:

1. **Implement WWIP Attachment 2 projects as-is where they can accomplish the above goals.**
2. **Project investment should be measured using the metrics of both (i) cost per overflow gallon reduced and (ii) cost per increased number of days of water quality standard compliance.** If the cost-benefit for both metrics is not favorable, dollars should be refocused to projects with high cost-benefit for both metrics.
3. **Implement green infrastructure integrated with gray infrastructure to provide a balanced CSO/SSO solution while reducing surface flooding and basement backups.** It is important to evaluate both types of green and gray infrastructure in an integrated fashion. One root cause of CSOs/SSOs is insufficient wet weather treatment capacity at the WWTP. At the 3 primary MSDGC WWTPs – Mill Creek, Little Miami, and Muddy Creek, the existing installed conveyance capacity exceeds the wet weather treatment capacity at the WWTP leading to elevated hydraulic grade lines in the sewers upstream of the WWTPs. The elevated hydraulic grade lines in the sewers then result in CSOs and SSOs. If the existing installed conveyance capacity is matched by adding additional wet weather treatment capacity at the WWTP, then solutions can be implemented that result in significant overflow volume reductions over multiple stream miles at a relatively low cost per gallon of overflow reduction and more days of in-stream water quality compliance. This integrated approach also leads to more local source control projects, such as green infrastructure and inflow and infiltration (I/I) removal projects to further reduce overflow volumes while also addressing surface flooding and basement backups with the same project investment.

The BOCC Phase 2A focus on keeping rainwater out of combined and sanitary sewers will save money on both capital projects and operating costs, while meeting Clean Water Act obligations. This balanced plan will result in high benefit overflow volume reductions and address surface flooding and basement backups. Phase 2A integrated watershed planning will also allow for proper sizing of Phase 2B projects.

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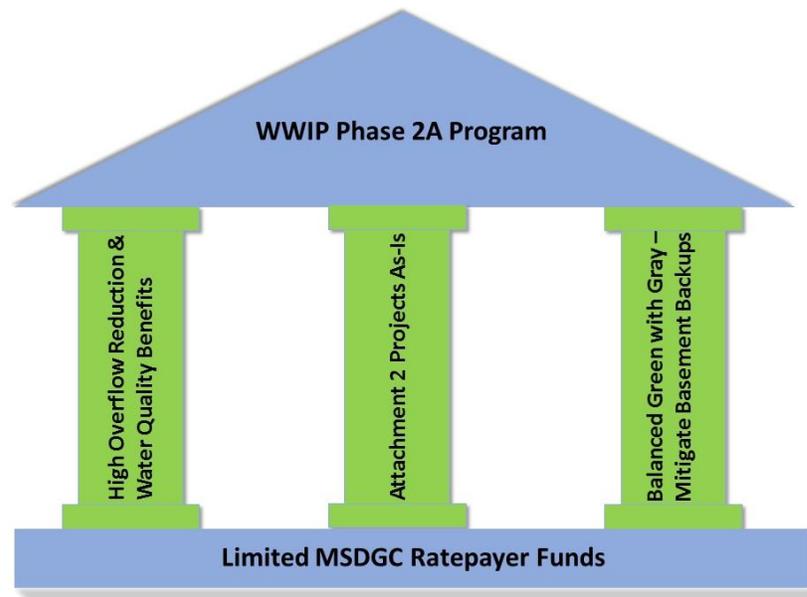


Figure 4.21 - Pillars of Investment for Phase 2A Program

F. Phase 2A Length of Schedule

Phase 2A will begin January 1, 2020, and the Board proposes that it will last five (5) years until December 31, 2024. Phase 2B would begin in 2025 and its scheduling and project list would be due June 30, 2023. The Board's proposed Phase 2A plans, designs, and constructs projects that achieve measurable water quality improvements while also addressing immediate issues of surface flooding and basement backups. The Board's proposed projects are consistent with the existing list of Phase 2 projects and will address multiple water quality and public health issues with single project investments. The Clean Water Act requires MSD to meet both Consent Decree project performance criteria and NPDES permit limits. The Board's projects and approach aims to meet both requirements.

The Board has heard the protests of ratepayers regarding the massive cumulative MSD rate increases and their heavy burden on people and families. The Board designed its proposal to minimize rate increases while investing the hundreds of millions of dollars necessary to comply with the Consent Decree.

Rate increases have been significant. MSD estimates its rates are nearly 2.5 times those of neighboring communities and were the 4th highest in the Country as of 2015. Ratepayers experienced a nearly 8.5% average annual rate increase between 2006-2015 (which is a 108% cumulative increase), and a cumulative rate increase of 800% since the first MSD consent decree in 1985.

The Board's Phase 2A is currently estimated to result in a 5-year cumulative rate increase of about 3%. Under the Board's 5-year Plan as currently estimated, the Average Annual MSD Bill would increase from \$660.63 (2018) to approximately \$680.65 (2024). Multiple factors impact the need to increase revenues and decrease expenses all of which will be analyzed and adjusted to ensure rates will be increased only when absolutely necessary. A

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longer Phase 2A Plan, particularly with higher spending, would cause rates to rise significantly more. The MSD ratepayer cannot afford excessive rate increases. Controlling duration and spending is the key to controlling rates and avoiding continued, unnecessary rate hikes.

The Board will scrutinize all Consent Decree Project and Allowance budgets and all Asset Management spending to ensure all work is designed, engineered, and constructed with best management practices for productivity and efficiency and to eliminate unnecessary costs.

Constructing the entire Phase 2 is estimated to cost \$2.3B (2006\$) or \$3.1B in current dollars, and is unaffordable -- well beyond the "Heavy Burden" threshold. Moreover, there are major populations in the MSD Service Area (City of Cincinnati; other high poverty areas and groups) which are already suffering severe burdens due to MSD costs. As a "high burden" community, it is justified and wise to initiate Phase 2 with a short Phase 2A.

Looking ahead, the Board is committed to a much shorter Phase 2A than the 10-year Phase 1. Keeping Phase 2A at 5 years will grant the community the right to have its overall financial health surveyed again prior to Phase 2B. History has demonstrated that project cost estimates beyond 5 years can be grossly underestimated. A 5-year Phase 2A will protect the community from making guaranteed project construction commitments with no guaranteed protection against major cost spikes.

A shorter Phase 2A minimizes the risk of underestimated project costs. A long term Phase 2A locks in projects even if there are better, cheaper methods identified later. Multiple EHRTs and other projects beyond year 5 need time during years 1-5 to better estimate costs. We know from Phase 1 that MSD's original EHRT cost estimates were far lower than later estimates based on detailed planning and design. The lessons learned in years 1-5 of Phase 2A should result in improved cost estimate accuracy for the 2nd in-plant EHRT in Phase 2B (after year 5) and then a 3rd in-plant EHRT.

Additional planning (including more accurate modeling and integrated planning) should influence and hopefully shrink the sizing of "Grey projects" after year 5. Guaranteeing to construct such projects in Phase 2A risks improper sizing, insufficient performance, and unanticipated costs. The risk of over-sizing falls entirely on MSD ratepayers. Locking now into projects beyond year 5 would limit opportunity to fairly negotiate changes in year 6 and beyond to apply new information (i.e., climate change), implement integrated planning, use new technologies (green or otherwise), and respond to regulatory changes.

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5. PHASE 2A: PROJECTS, SCHEDULES, BUDGETS, and WWIP REVISIONS

A. Phase 2A Project Listing

As discussed in Section 4, a cornerstone of the Board’s proposed WWIP Phase 2A program is the achievement of measurable water quality improvements while also addressing immediate issues of surface flooding and basement backups. In addition, the Phase 2A projects must be affordable and capable of being implemented in 5 years with a sufficient number of projects being planned and designed that can be scheduled early in Phase 2B.

The Index numbers noted below are included in the updated Final WWIP Attachment 2 to this document, in Appendix A. The Board attempted to select projects that were already listed in WWIP Attachment 2, where possible. A project fact sheet for each of the Phase 2A selected projects is included in Appendix B.

The projects selected for implementation WWIP Phase 2A are listed in Table 5.1 below. The projects are generally in priority order of WWIP Attachment 2. There are some project selection variations in the priority order of WWIP Attachment 2 based on new information learned during WWIP Phase 1, as further described below.

Table 5.1. WWIP Phase 2A Planning, Design and Construction

PLANNING, DESIGN & CONSTRUCTION			
WWIP Project Numbers	Description	Cost 2006\$	Current (\$)
Muddy Creek Watershed			
215	Muddy Creek WWTP Pump Station/EHRT (proposed change to WWIP)	\$65.8M	\$87.6M
218, 219, 220, 221, 222	Muddy Creek CSOs 402 – 406 Improvements	\$9.7M	\$12.9M
235	Addyston Extraneous Stormwater Removal (proposed change)	\$5.3M	\$7.1M
236	CSO 198 Partial Sep/SBU Mitigation (proposed change)	\$8.2M	\$10.9M
Little Miami Watershed			
195, 196, 198, 205, 206	Little Miami WWTP PS Upgrades for EHRT Part 1 (proposed change)	\$17.0M	\$22.6M
204	Little Miami WWTP - Standby Power Installation	\$4.3M	\$5.7M
204	Little Miami WWTP Standby Power – Address Duke Rider Cost	\$0.8M	\$1.1M
317	Mt. Washington Source Control	\$8.2M	\$10.9M
Mill Creek Watershed			
248	Mill Creek WWTP EHRT complete diversion chamber (proposed change)	\$4.6M	\$6.1M
16 Construction Projects	Total 5-year Phase 2A WWIP Construction Projects Estimated Cost:	\$123.9M	\$164.9M

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Table 5.1 continued...

PLANNING & DESIGN ONLY			
WWIP Project Numbers	Description	Cost 2006\$	Current (\$)
Little Miami Watershed			
193	CSO 552 Partial Separation Little Miami tributary area (proposed change)	\$0.3M	\$0.4M
195, 196, 198, 205, 206	Little Miami WWTP PS Upgrades for EHRT Part 2 (proposed change)	\$2.6M	\$3.5M
Muddy Creek Watershed			
240, 241, 242, 243, 244	East Branch Muddy Creek Interceptor (Part 1)	\$1.0M	\$1.3M
Mill Creek Watershed			
248	Mill Creek WWTP – New Wet Weather Pump Station to future EHRT (proposed change)	\$4.6M	\$6.1M
12 Planning/ Design Projects	Total 5-year Phase 2A WWIP Planning & Design Projects Estimated Cost:	\$8.5M	\$11.3M

Phase 2A will build many major projects and design other major projects to be built at the start of Phase 2B. Key Phase 2A projects include major additional capacity to treat Wet Weather flows through Enhanced High Rate Treatment (EHRT) systems at MSD’s major treatment plants. The EHRTs and other Phase 2A projects will add significant new control of Combined Sewer Overflows and are focused first in areas prone to Sewer Back Ups and overflows. Other major Phase 2A projects are located in the Muddy Creek watershed on Cincinnati’s West side and Mount Washington on Cincinnati’s East side.

In addition, Phase 2A focuses on integrated watershed planning to prioritize investments needed to meet all Clean Water Act obligations. Integrated watershed planning allows our ratepayers limited funds to be spent on green infrastructure or source control to manage rainwater where it falls and more traditional gray infrastructure at the end of the pipe. The BOCC Phase 2A focus on keeping rainwater out of combined and sanitary sewers will save money on both capital projects and operating costs, while meeting Clean Water Act obligations. This balanced plan will result in high benefit overflow volume reductions and address surface flooding and basement backups. Phase 2A integrated watershed planning will allow for proper sizing of Phase 2B projects.

Phase 2A Capital Projects and Allowances are estimated to cost \$162.5M (2006\$) or \$217M in current dollars, including project planning, design and/or construction of 28 projects, and \$6M/year for WWIP allowances used across the MSD service area. Adding Sewer Back Up (SBU) Operating Allowance costs of \$7.4M/year (2006\$) brings the total 5-year Phase 2A Consent Decree cost up to \$200M (2006\$) (\$266M in current dollars).

The WWIP Phase 2A projects capital expenditures and implementation schedule are provided in Table 5.2 below. The WWIP Allowances and SBU program spending are also summarized below and discussed in detail in Section 5.D.

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Table 5.2 - Schedule of Board's Proposed 5-Year WWIP Phase 2A Projects

5-Year Program							
							
WWIP \$33M Per Year Encumbrance Projects Schedule (2006\$)³							
WWIP Index Line No.	Project Description	Estimated Total Cost (2006\$) ¹	Y2020 1	Y2021 2	Y2022 3	Y2023 4	Y2024 5
WWIP Phase 2A Proposed Schedule			\$ 162,487,445				
193R	CSO 552 Partial Separation (Little Miami)	\$ 316,290					
195R, 196R, 198R, 205R, 206R	Little Miami WWTP PS Upgrades for EHRT (Part 1)	\$ 17,007,903					
195R, 196R, 198R, 205R, 206R	Little Miami WWTP PS Upgrades for EHRT (Part 2)	\$ 2,637,139					
204	Little Miami WWTP Standby Power	\$ 4,285,071					
204	Little Miami WWTP Standby Power – Duke Rider Cost	\$ 822,454					
215B	Muddy Creek WWTP Pump Station (for EHRT)	\$ 32,898,173					
215B	Muddy Creek WWTP EHRT	\$ 32,898,173					
218-222	Muddy Creek CSOs 402 – 406 Wet Weather Improvements	\$ 9,732,447					
235B	Addyston Extraneous Stormwater Removal	\$ 5,319,573					
236B	CSO 198 Partial Separation/SBU Mitigation	\$ 8,200,000					
240-244	East Branch Muddy Creek Interceptor (Part 1) - Based on Integrated Planning Results ²	\$ 1,000,000					
248	Mill Creek WWTP CEPT (Pump Station) - complete diversion chamber	\$ 4,585,111					
248	Mill Creek WWTP CEPT (Pump Sta.)	\$ 4,585,111					
317B	Mt Washington Source Control Implementation	\$ 8,200,000					
	Annual WWIP Allowances	\$ 30,000,000	\$ 6,000,000	\$ 6,000,000	\$ 6,000,000	\$ 6,000,000	\$ 6,000,000
WWIP Encumbrance per year			\$ 28,432,487	\$ 20,469,304	\$ 54,438,029	\$ 52,989,481	\$ 6,158,145
SBU Mandated WWIP Allowance Spending (Operating Budget)³			\$ 7,400,000	\$ 7,400,000	\$ 7,400,000	\$ 7,400,000	\$ 7,400,000
Total WWIP (Encumbrance + SBU)			\$ 35,832,487	\$ 27,869,304	\$ 61,838,029	\$ 60,389,481	\$ 13,558,145
Asset Management - \$50M per year⁴			\$ 50,000,000	\$ 50,000,000	\$ 50,000,000	\$ 50,000,000	\$ 50,000,000
<p>####R = Proposed adaptive management replacement project for WWIP listed Index project ####B = Proposed adaptive management partial replacement project for WWIP listed index project ¹ MSD provided costs unless noted otherwise. For planning & design only costs, 20% of the MSD total project cost was assumed. ² Estimated costs of planning and design may change based upon initial planning work. ³ Consent Decree mandated SBU costs have recently averaged \$7.4M/year (2006\$) or \$10M in current dollars. Depending on rainfall, the SBU Phase 2A costs may fluctuate in any given year. These fluctuating Consent Decree costs are in addition to the encumbrances identified in this Phase 2A proposal. ⁴ Average annual cost for Asset Management is \$50M, but actual annual cost will vary year to year.</p>							

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B. Projects as Pillars of Investment Supporting the Phase 2A Program

As described in Section 4.E, the Board developed three Pillars of Investments to guide their selection of projects for Phase 2A from WWIP Attachment 2 to achieve their stated goals. The selected Phase 2A projects are described below under each Pillar of Investment.

1. WWIP Attachment 2 Projects As-is from the WWIP

- a. Little Miami Standby Power (Index 204) – Standby power improvements will be implemented at the Little Miami WWTP to provide power redundancy in case a primary electrical feed is lost. This work also includes a reserve capacity charge imposed by Duke Energy to have this backup electrical capacity reserved should it be needed.
- b. Muddy Creek CSOs 402-406 Regulator Improvements (Indices 218, 219, 220, 221, 222) – The planning and design work completed as part of the Bridge will result in construction start and construction completion in Phase 2A.
- c. East Branch Muddy Creek Interceptor (Part 1) (Indices 240, 241, 242, 243, 244) – Since the time Index 240-244 East Branch Muddy Creek Interceptor project was developed, new information has been learned during WWIP Phase 1 regarding the flows in the collection system. For example, the existing East Branch interceptor has approximately 2 times the conveyance capacity as each of the existing 4 East Branch pump stations’ rated capacity which provides the opportunity to convey more wet weather flow to the Muddy Creek WWTP for treatment. In addition, during planning for the original interceptor replacement project, poor soils and constructability challenges were identified that increased the capital cost from \$60.3M (2006\$) to over \$100M (2006\$).

This project will perform planning and design work for wet weather and reliability improvements to the 4 East Branch PSs and the East Branch interceptor consistent with Index 240 – 244 and in coordination with Index 215B Muddy Creek WWTP EHRT and integrated planning currently underway. A combination of improvements to the 4 PSs, maximizing the existing conveyance capacity of the East Branch interceptor, source control upstream of each of the CSOs, and additional relief sewer capacity will be planned and designed.

- d. Mill Creek WWTP CEPT (Index 248) – To take advantage of the existing available conveyance capacity to the WWTP, planning is occurring as part of the WWIP Bridge for an EHRT at the Mill Creek WWTP in coordination with, or in lieu of, the chemically enhanced primary treatment (CEPT) project listed in WWIP Attachment 2 (Index 248). A wet weather diversion chamber to the future EHRT is also being designed and partially constructed as part of the WWIP Bridge. In Phase 2A, the following will be completed:
 - i. Diversion chamber construction, including the tie-ins to the Mill Creek and Auxiliary Mill Creek interceptors in Phase 2A,

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- ii. Upgrades to the existing North PS influent gate, which is currently at risk of failing,
- iii. Design of a new WWTP wet weather influent pump station to facilitate a future CEPT or HRT facility.

The construction of the WWTP wet weather influent pump station and design and construction of the CEPT or HRT facilities will be advanced after WWIP Phase 2A.

2. High Overflow Reduction & Water Quality Benefits Adaptive Management projects

- a. CSO 552 Partial Separation (Index 193R) – There is no proposed change in the WWIP Required Performance Criteria (18.6 MG Plan Remaining CSO Typical Year) for this CSO. The original WWIP project is described as a Regulator Improvement. The original plan for the improvement was to upgrade the regulator with floatables control and increase underflow capacity with a larger diameter underflow pipe. The proposed adaptive management change for control of CSO 552 is to split the original project into two projects, 1) partial separation to be completed in Phase 2A, and 2) underflow capacity increase as needed in coordination with the Little Miami WWTP EHRT and future Upper Duck EHRT after Phase 2A. The proposed change will provide comparable or better aggregate control of annual volumes as the original project.

Under the original plan, the CSO 552 increase in underflow capacity needed to be completed in conjunction with changes in the upstream CSO underflow capacities associated with CSOs 170, 549, 550 and 500 which are to be routed to a future Upper Duck EHRT facility. Constraints determined in WWIP Phase 1 relative to this approach include limited available interceptor capacity downstream to accept these higher flows which was not fully understood at the time of the WWIP project development. The proposed Little Miami EHRT will also increase interceptor capacity in this area affecting the necessary underflow capacity for CSO 552.

This adapted CSO 552 Partial Separation project is proposed as an interim project in Phase 2A to separate storm flows before they reach the combined sewer to reduce peak storm flows and volumes entering the combined sewer. Because this adapted project is partial separation, it can be implemented independently of other WWIP projects, including Upper Duck All Bundle projects and the Little Miami EHRT to provide immediate CSO reduction benefits. The final project to increase underflow capacity to achieve the Final WWIP Remaining Overflow Volume (ROV) performance criteria, if necessary, will be determined and implemented in a future Phase 2 project.

- b. Little Miami WWTP PS Upgrades for EHRT Part 1 & Part 2 (Indices 195R, 196R, 198R, 200R, 205R, 206R) – There is no proposed change in the WWIP Required Performance Criteria for these Little Miami WWTP (LMWWTP)

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Bundle projects which is stated in the WWIP as Plan CAPP - Note 1 “project complete and in service at specified capacity.” There are no WWIP Plan Remaining CSO performance standards for these projects. The original WWIP LMWWTP Bundle (Attachment 2 Indices 195 – 206) was developed to increase the wet weather treatment capacity of the LMWWTP from 85 MGD to 100 MGD and address several asset management needs at the LMWWTP. The bundle was also developed with the assumption that the Little Miami Incinerator would remain in-use for sludge disposal. As discussed below, adaptive management changes are proposed to change the original plans for these projects. The change will result in comparable or better aggregate control of annual volume as the original projects or projects.

Since the time this bundle was originally developed, new information has been learned during WWIP Phase 1 about the flows in the collection system and the WWTP Auxiliary Outfall overflow volume. In addition, new emission regulations were enacted by EPA that necessitated a shutdown of the LMWWTP incinerator. The County directed the City to develop a coordinated and holistic District-wide solids management master plan. The County also directed the master plan consider the disposal of food waste in coordination with the Hamilton County Solid Waste District. The master plan is currently under development with completion expected by the end of 2018. Currently, dewatered sludge from the LMWWTP is hauled to a landfill.

In addition, it was learned during WWIP Phase 1, that existing conveyance capacity to the LMWWTP is available to currently convey more than 100 MGD to the LMWWTP. MSDGC reports indicate peak wet weather flows in the range of 250 MGD to 300 MGD can currently be conveyed to the LMWWTP. These larger peak flows are not only a root cause of CSOs upstream in the collection system, but also lead to large overflow volumes at the LMWWTP through the Auxiliary Outfall. It was also learned during WWIP Phase 1 that prior versions of the WWIP included an EHRT at the LMWWTP and the existing RTC chamber was built to accommodate a future connection to an EHRT. This EHRT was not included in the approved Final WWIP and may have inadvertently been left out because the current Final WWIP does not include a project(s) to address the Auxiliary Outfall overflow volume.

Because of the new hydraulic information and the lack of a long-term solids handling strategy for the LMWWTP, this bundle of projects needs to be modified. The planning of an EHRT and modified bundle projects at the LMWWTP is occurring as part of the WWIP Bridge. The EHRT is proposed to provide significantly greater CSO reduction than the current LMWWTP bundle as well as address the Auxiliary Outfall. It is also expected that by utilizing the available conveyance capacity and treating more wet weather flow at the LMWWTP, during extreme storm events, this can help reduce flooding and upstream basement backups driven by system hydraulic grade line (HGL) issues.

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Construction of the EHRT will be constructed in multiple projects to address affordability limitations. The first project is the necessary pump station (PS) upgrades at the WWTP to add wet weather pumping capacity for the future EHRT. Peak wet weather flows in the range of 250 MGD to 300 MGD will need to be pumped for treatment at the LMWWTP. Part 1 of the wet weather capacity PS upgrades is being planned, designed and constructed in Phase 2A. Part 2 of the wet weather capacity PS upgrades is being planned and designed in Phase 2A.

The proposed EHRT at the LMWWTP is a new watershed approach for the Little Miami watershed and applies a different technology. The final total project cost and sizing of the EHRT will be determined through the planning process so the final overflow volume reduction benefit is not known at this time, and will be provided as soon as the information is available. The focus of the original WWIP LMWWTP bundle projects was not on reducing CSO volumes, but the new EHRT is expected to significantly reduce upstream CSO volumes.

- c. Muddy Creek WWTP Pump Station (for EHRT) & Muddy Creek WWTP EHRT (Index 215B to complement Index 215) – The original WWIP project is described as an 8,500 feet long (1.6-mile), 25 feet diameter tunnel and the technology is listed as “tunnel.” It was planned to primarily store wet weather flows above 35 MGD for treatment at the Muddy Creek WWTP. There is no change being proposed in the WWIP Required Performance Criteria for the tunnel that is stated in the WWIP as “Plan CAPP 2 yr.” There is no Plan Remaining CSO (MG/yr) performance criteria for the original tunnel project.

MSDGC, through their 2010 planning efforts, identified that this tunnel could be downsized to 8.5 feet diameter with the addition of a 35 MGD EHRT for treatment of the wet weather flows. As discussed below, adaptive management is being proposed to change the original project to include a new EHRT at the Muddy Creek WWTP. In addition, the change will provide control of CSOs 518, 404, 405 and 406 and there is no change being proposed to the performance criteria for those CSOs (CSO 518 [Index 237]: 8.4 MG; CSO 404 [Index 220]: 16.2 MG; CSO 405 [Index 221]: 3.7 MG; CSO 406 [Index 222]: 9.0 MG). The new project and changes will result in comparable or better aggregate control of annual volumes as the original project or projects. The need for and final sizing of a tunnel will be determined after the EHRT is constructed and post-construction monitoring, and if the tunnel is needed, it will be scheduled for final design and construction later in Phase 2. Further details are provided below and in the Fact Sheet in Appendix B.

Since the time Index 215 Muddy Creek Basin Storage & Conveyance Sewer (tunnel) project was developed, new flow information learned during WWIP Phase 1, identified there is a significant amount of creek and river water intrusion that enters the interceptors through the CSOs and Muddy Creek interceptor from the Ohio River and Muddy Creek reducing the dry and wet weather sewer system capacity. This river water intrusion has prevented the collection system hydraulic

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model from properly matching observed flows and meeting model calibration and validation industry standards. This issue provides limited confidence in properly sizing a number of the WWIP Attachment 2 projects, including the WWIP tunnel project (Index 215), until this river water intrusion is addressed.

In addition, it was learned, during WWIP Phase 1, that existing conveyance capacity to the Muddy Creek WWTP is currently available to convey more than 35 MGD to the Muddy Creek WWTP. These larger peak flows, exceeding the capacity of the Muddy Creek WWTP (currently 28 MGD) are the root cause of CSOs upstream in the collection system, including along the existing east branch and west branch interceptors.

The current project is proposed to be modified to construct an EHRT at the Muddy Creek WWTP in Phase 2A to provide immediate and significant CSO reduction. Phase 2A also includes construction of regulator improvements at CSOs 402 – 406 (Index 218) to protect each CSO regulator from Ohio River intrusion. The WWIP Bridge includes strategic repair and replacement of the Muddy Creek interceptor (Index 234) to eliminate Muddy Creek water intrusion. These projects once completed will then allow proper representation of flows in the Muddy Creek hydraulic model. In addition, the Muddy Creek integrated watershed plan, currently underway, will provide the necessary planning for the watershed to properly size future projects in later phases of WWIP Phase 2. As mentioned, the EHRT may eliminate the need for a tunnel; therefore, the need for and size of a tunnel will need to be determined after EHRT construction and monitoring, and if required the tunnel will be constructed after Phase 2A.

An EHRT at the Muddy Creek WWTP will also allow dynamic underflow control projects to be considerably more effective because additional treatment capacity will be available to treat the dynamic flows directed to the interceptors.

The pump station and EHRT are tentatively sized at 35 MGD, however, the final cost and sizing of the EHRT is currently being determined. The final overflow volume reduction benefit is not known at this time, and will be provided as soon as the information is available. It is expected that the changes in this project will provide comparable or better aggregate control of annual volumes as the original WWIP projects.

- d. Addyston Extraneous Stormwater Removal (Index 235B to complement Index 235) - There is no proposed change in the WWIP Required Performance Criteria for this pump station elimination project (i.e., Plan CAPP: meet 2-yr design storm event). The proposed adaptively managed project complements the original Village of Addyston Pump Station Elimination project. The changed project involves planning, designing and constructing street-load separation of stormwater runoff (approximately 5,800 feet of separate storm water pipes) to reduce overflows in the area and flows conveyed to the Muddy Creek Pump Station. The extraneous stormwater removal (ESR) will reduce surcharging and reduce the peak flow from Addyston to also reduce overflows upstream of the Muddy Creek

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Pump Station for the 2-year, 24-hour event. This project will also reduce the peak flow and volume that the Muddy Creek PS will need to convey to the existing interceptor, minimizing long-term treatment costs and tunnel/EHRT sizes.

The Addyston PS elimination project will be coordinated with available downstream capacity to be determined after this ESR project and the Muddy Creek EHRT project are completed and post-construction flow monitoring is performed. The physical elimination of the Addyston PS will then be reevaluated for implementation after Phase 2A.

3. Balanced Green with Gray – Mitigate Basement Backups

There are numerous opportunities in the Little Miami, Muddy Creek, and Mill Creek sewersheds to implement stormwater source reduction projects. These projects also allow for implementation of stormwater source control through green infrastructure and other technologies to address overflow reduction, surface flooding emanating from the sewer system and basement backups with a single project investment. The following projects have been selected for implementation in Phase 2A. These projects are in addition to the WWIP funding included in the SBU program and the Urgent Capacity Response program described in Section 5.D. below.

- a. CSO 198 Partial Separation/SBU Mitigation (Index 236B to complement Index 236) - This project is located in the Muddy Creek watershed. This project partially replaces the project at Index 236 – Muddy Creek @ Westbourne EHRT in the sense that the ultimate capacity of the EHRT may be smaller than the listed 126 MGD. The 61.2 MG Plan Remaining CSO performance criteria is not proposed to be changed at this time for the EHRT. Since the time Index 236 was originally developed many years ago, new information has been obtained during WWIP Phase 1 about the flows in the collection system and the extent of the SBUs upstream of CSO 198. Previous SBU solutions have focused on individual house grinder pump installations with backflow prevention. The SBU Prevention Program approach in this area has had limited success. This project is intended to address a number of the chronic SBUs, reduce surface flooding emanating from the sewer system, and reduce CSO 198 volume with a cost effective engineered solution that will include consideration of strategic property acquisition in combination with detaining and separating stormwater entering the existing combined sewer system upstream of CSO 198.

Stormwater from impervious surfaces associated with the large approximately 60-acre shopping center, Glenway Crossing, contributes significantly to the flows to the SBU locations and CSO 198. Separating and/or detaining the stormwater from this site along with the roadways downstream are being evaluated. The final limits and scope of the partial stormwater separation are currently being further planned under the integrated planning approach. Remaining CSO volume after the partial separation will be addressed with additional improvements at the EHRT facility at CSO 198 (Index 236), which is planned to be constructed after Phase 2A. Because

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the original cost estimates for EHRTs in the WWIP have significantly increased, this project approach will assist with right-sizing the necessary EHRT and help to reduce the overall cost to address CSO 198. The change complementing the project at Index 236 will lead to comparable or better aggregate control of annual volumes as the original project.

- b. Mt. Washington Source Control Implementation (Index 317B to complement Index 317 [CSO 182]) – This project is located in the Little Miami watershed and has the original name of Berkshire HRT. Since the time Index 317 was originally developed, new information has been obtained during WWIP Phase 1 about the flows in the collection system and the extent of the SBUs upstream of CSO 182. Approximately 46 homes with sewer backups have been reported on the streets of Mayland Drive, Woodlark Drive, and Lusanne Terrace tributary to CSO 182. The homes are currently being evaluated as part of the MSDGC Sewer Backup Prevention Program (SBUPP) for installation of SBU prevention devices.

With prevention devices at every home within the project area, it is likely there will be an increase of the Hydraulic Grade line (HGL) downstream potentially causing SBUs at other properties and increasing overflow volume at CSO 182. To address these issues and help reduce CSO 182 volume, this project will implement stormwater source control solutions to reduce stormwater entering the combined sewer system tributary to the SBUs and CSO 182. The possible stormwater source control solutions under consideration include:

- Addressing stormwater on private property through disconnections and routing to rain gardens, infiltration trenches, or other green infrastructure on private property or in the public right of way;
- Better control of stormwater within the subdivision through possible modification of the existing detention system, construction of new detention, or a combination thereof.
- Utilizing local inline pipe or offline storage within the right of way in combination with the source control solutions.

The final scope of the project will be determined through the integrated planning approach before proceeding to design. Remaining CSO 182 volume after implementation of source control will be addressed with an EHRT as contemplated under the original WWIP if necessary at CSO 182 (Index 317), and would be constructed after Phase 2A. The original cost estimates for EHRTs in the WWIP have significantly increased, so this project will assist with right-sizing the necessary EHRT and help to reduce the overall cost to address CSO 182.

C. Milestone Deadlines for Listed Projects

As discussed in Section 4, the Board has evaluated an expeditious schedule to complete all of the WWIP Attachment 2 projects within 30 years. This proposed schedule was found to

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cause substantial and widespread economic impact to the MSDGC ratepayers with resultant Residential Indicators of 2.45% across the Service Area and 3.46% within the City of Cincinnati. There are another 12 local communities within the MSDGC Service Area with inputs similar to the City of Cincinnati. Taken together, the City of Cincinnati and the other 12 communities represent 55.9% of all households in the MSDGC service area. As discussed in Section 4.B. of this report, implementing all of the WWIP Attachment 2 projects within 30 years is not affordable and per the EPA's Affordability guidance, including the *EPA's Interim Economic Guidance for Water Quality Standards Workbook (March 1995)*, an affordable spending plan and affordable Residential Indicator can be selected by the Board for implementation.

The Board has developed a 5-year Phase 2A program that includes spending approximately \$450 million (2006\$) on WWIP and asset management (\$200M WWIP plus \$250M Asset Management) or \$599M in current \$. The next sub-phase of additional projects would be due by June 30, 2023 - scheduled 18 months before Phase 2A ends.

The schedule milestone dates for the proposed Phase 2A projects are provided in Tables 5.3 & 5.4. As indicated in Tables 5.3 & 5.4 the Board has proposed an expeditious schedule to complete numerous WWIP projects that are expected to have substantial overflow reduction benefits, in-stream water quality improvement, and reductions in surface and basement sewage flooding. In addition, the Board is advancing in parallel with project implementation, an Integrated Watershed Action Plan for the Muddy Creek watershed to inform project selection and implementation for future sub-phases and adaptive management. This IWAP spending is NOT included in the WWIP spending summarized above. The Board believes these schedules are aggressive.

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Table 5.3 - WWIP Phase 2A Milestone Schedules

WWIP INDEX	REVISED WWIP ATTACHMENT 2 June 2018	PTI Submittal Milestone	Start Construction Milestone	End Construction (Substantial Completion) Milestone
195R, 196R, 198R, 205R, 206R	Little Miami WWTP PS Upgrades for EHRT Part 1	1/1/2022	6/30/2022	12/31/2024
204	LMWWTP Standby Power & Duke Rider	6/30/2021	1/1/2022	12/31/2023
215B	Muddy Creek WWTP Pump Station (for EHRT)	6/30/2021	1/1/2022	12/31/2023
215B	Muddy Creek WWTP EHRT	6/30/2022	1/1/2023	12/31/2024
218, 219, 220, 221, 222	Muddy Creek CSO 402-406 Improvements	12/31/2019	6/30/2020	6/30/2022
235B	Addyston Extraneous Stormwater Removal	6/30/2022	1/1/2023	12/31/2024
236B	CSO 198 Partial Separation/SBU Mitigation	6/30/2022	1/1/2023	12/31/2024
248	Mill Creek WWTP CEPT (Pump Station) - complete diversion chamber	12/31/2020	6/30/2021	6/30/2022
317B	Mt. Washington Source Control Implementation	6/30/2022	1/1/2023	12/31/2024

###R = Proposed adaptive management replacement project for WWIP listed Index project

###B = Proposed adaptive management partial replacement project for WWIP listed Index project

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Table 5.4 - Phase 2A Planning & Design Only

WWIP Project Numbers	Description
193R	CSO 552 Partial Separation
195R, 196R, 198R, 205R, 206R	Little Miami WWTP PS Upgrades for EHRT Part 2 ⁽¹⁾
240, 241, 242, 243, 244	East Branch Muddy Creek Interceptor (Part 1)
248	Mill Creek WWTP – New Wet Weather Pump Station to future EHRT

⁽¹⁾ PTI Submittal Milestone: 6/30/2024

###R = Proposed adaptive management replacement project for WWIP listed Index project

D. Adaptive Management Proposals to Replace or Complement WWIP Attachment 2 projects

Under the WWIP, paragraph C.2.b, Defendants may through the use of the concepts of “adaptive management” propose significant changes to the WWIP schedule as part of the Phase 2 scheduling. The proposed changes need to provide comparable or better aggregate control of annual volumes as the original projects. In a letter dated February 23, 2018, the Regulators requested certain information when proposing Adaptive Management changes as part of the Phase 2 scheduling. Generally, besides the WWIP annual volume control test stated above, the requested additional information is related to impact (i) on length of Phase 2 schedule, (ii) the priority order in WWIP Attachment 2, (iii) costs, and (iv) Defendants’ financial capability.

Using Adaptive Management concepts along with utilization of the U.S. EPA integrated planning framework have resulted in consent decree/LTCP projects being changed for the better. The projects on WWIP Attachment 2 were initially developed in the 2004-2006 timeframe. The initial WWIP/LTCP Update was submitted in June 2006. Further negotiations occurred, and a Final WWIP was conditionally approved by the Regulators on January 6, 2010 which for the most part, retained the initial project identification and planning from 2004-2006 for the projects on Attachment 2.

Moreover, during the course of implementing WWIP Phase 1, MSDGC has learned more about the hydraulics within the sewer collection, conveyance and treatment systems, the root causes of the overflows and basement backups, capacity constrained areas (including the effects of river water intrusion), and the accuracy of the collection system hydraulic model. Through additional flow monitoring across the system and updates to the flows and collection system representation within the hydraulic models, the system flows have become more fine-tuned and accurate. The complex hydraulics within the collection system creates challenges to calibrate and validate the sewershed collection system models to match observed flows and meet industry standards. It is critical that the hydraulic model tool is as accurate as possible because the WWIP projects and the associated large capital expenditures are founded on the accuracy and results of the hydraulic model. The needed

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updating and fine-tuning of the model, including fully calibrating and validating the model, supports a shorter planning time period for Phase 2A to design projects with the most up to date and accurate model results.

The multiple “cloudburst” extreme rain events in 2016 and 2017 mentioned above highlight the need for solutions that can address surface flooding and basement backups, as well as CSOs. The Adaptive Management process is proposed to be followed for some projects in Phase 2A to address those over-arching concerns.

There are 10 projects listed in Table 5.2 SCHEDULE OF BOARD’S PROPOSED 5-YEAR WWIP PHASE 2A PROJECTS provided in Section 5.A that the County proposes be changed using the Adaptive Management process for Phase 2A. The projects are labeled with an “R” or “B” after the WWIP Attachment 2 Index number. The “R” indicates a proposed adaptive management project to replace the WWIP listed Index project. The “B” indicates an additional project to be added to WWIP Attachment 2 that will partially replace the WWIP listed index project – meaning the listed WWIP Index project may be downsized or scope modified after Phase 2A, after the “B” project is constructed and post-construction monitoring performance is confirmed.

In addition, as previously discussed, additional planning is being performed for Muddy Creek using the integrated watershed approach that will identify and inform projects for implementation in future WWIP Phase 2B. However, at the request of the Regulators, this planning work is separate and not included in the WWIP spending listed in Sections 5.A and 5.B. The sewers in Muddy Creek receive large amounts of both Muddy Creek and Ohio River water intrusion in both dry weather and during elevated creek and river levels, which are not able to be properly represented in the models. This river water intrusion has prevented the model from properly matching observed flows and meeting calibration and validation industry standards. As a result, there is limited confidence in properly sizing a number of the WWIP Attachment 2 projects until the river water intrusion is addressed. The WWIP Bridge and the County’s Phase 2A includes projects to address this issue (Bridge Index 234, 238, 239; Phase 2A Index 218-222). This work is required to avoid substantial increases in capacity, perform the necessary hydraulic model calibration and validation, and to right-size the necessary future projects once the Phase 2A projects are completed.

A Project Fact Sheet for the projects being changed using the adaptive management process are included in Appendix B. Appendix B also includes project fact sheets for the Phase 2A projects that are not being changed from their current description and performance in Attachment 2 of the WWIP. The project fact sheets address the Regulators’ information requests in the February 23, 2018 Adaptive Management Review letter. The County’s Phase 2A submission includes a proposed Phase 2A schedule for WWIP projects, as provided in Section 5.B, to be constructed in a logical priority order, and design and performance criteria are provided in the project fact sheets. Most of the performance criteria in the current Attachment 2 are not proposed to change and will be met with the proposed changed projects or projects to be implemented after Phase 2A, as described in the project fact sheet. The project fact sheets provide proposed clear, enforceable design

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criteria. Costs are described in the Financial Capability (Affordability) Section 4.B above, which includes the Residential Indicator analysis.

The proposed schedule the County believes is expeditious as practicable is provided in Table 5.3 WWIP Phase 2A Milestone Schedules above and is based on the considerations set forth in Exhibit 4, Section II.f of the CSO consent decree, particularly the affordability of the program.

The projects proposed to be changed are high priority projects the County believes at this time in the life of the WWIP provide the best use of limited funds to substantially further progress towards compliance with water quality requirements and remaining volume control. To the extent the Regulators believe data is still needed to review the proposed adaptively managed changes to projects, the County will use its best efforts to provide the data and supplement this submission as soon as possible. If the County does not have the requested data or access to the data necessary to perform a requested analysis, the County will request the data and or analysis from MSDGC and then supplement this submission as soon as possible when the data or analysis is provided by MSDGC.

E. WWIP Allowances: Types and Expected Budgets

Since 2010, MSDGC has used allowances for WWIP and Asset Management projects. This provides an efficient way to address the time and effort required to define the scope, design the project, bid the project and construct smaller projects. For example, the allowances allow for the “bundling” of work for similar projects such as trenchless technology and pipe rehabilitation.

WWIP Section C.6 lists 8 subject matter programs referred to as “Allowances”. These Allowances are as follows:

1. Water in Basement
2. Sewer Relining (Trenchless Technology) Program
3. Manhole Rehabilitation (Trenchless Technology) Program
4. Rainfall Derived Infiltration and Inflow (RDI/I) Program
5. Home Sewage Treatment System (HSTS) Elimination Program
6. Urgent Capacity Response Program
7. WWIP Progress Studies and Recreation Management
8. MSD Sustainable Infrastructure (Green) Program

The WWIP Phase 2A includes a total WWIP Allowance spending of \$13.4M per year (2006\$), spread across several WWIP Allowances for a total of \$67M (2006\$) over five years. Of the eight WWIP Allowances, only five are proposed to be utilized in WWIP Phase 2A. Below is a discussion of each of the WWIP Allowances to be utilized and annual spending (all costs are in 2006\$). Specific annual spending for each allowance may vary from year to year, depending upon need.

- A. **Water-in-Basement (renamed, Sewer Back Up (SBU)) Program:** This allowance is nationally unique to the Consent Decree and WWIP. It has been used in the past to address situations where water from the collection system backs up into private

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structures not designed to store wastewater. The Allowance funds the cleanup of structures and, depending on circumstances, funds the repair and/or replacement for damage resulting from the backup. The average annual spending for this allowance from 2004 through 2015 is approximately \$5.3M (2006\$), or a total spending of \$64.1M (2006\$) for this period. However, recent large storms that occurred in 2016 and 2017 have caused spending on SBU's to skyrocket, amounting to \$24.8M (2006\$) for these two years. More money is being allocated to SBUs via the CIP process. As a result, the average annual spending from 2004 through 2017 is \$6.3M (2006\$).

The Board proposes to spend \$7.4M/year (2006\$) or \$10M/year in current dollars, funded through the Operating Budget. This annual SBU spending is projected to continue during Phase 2A (2020-2024). The total amount may fluctuate, depending upon rainfall. The total SBU Program cost over 5 years is projected to be \$37M (2006\$) or \$50M in current dollars.

- B. Sewer Relining (Trenchless Technology) Program:** This program conducts internal lining of buried sewers and is a cost-effective method for rehabilitating structurally deteriorated sewers. The trenchless technology deployed with this allowance is primarily a Cured-In-Place-Pipe (CIPP) technology. These projects are identified through investigations of the sewer lines and are prioritized based on a standardized condition assessment procedure.

Consistent with prior years' spending and recognizing the need to increase renewal of the existing sewer assets, the Board proposes to spend \$3.5M per year in Phase 2A for this allowance program.

- C. Manhole Rehabilitation (Trenchless Technology) Program:** The manhole rehabilitation program involves rehabilitating structurally deteriorated manholes. In the past, the manhole rehabilitation effort was coordinated with the City of Cincinnati and other political jurisdictions street re-paving projects. This afforded the ability to adjust manhole elevations in coordination with the repaving and to address the manhole deficiencies.

Consistent with prior years' spending, the County proposes to spend \$0.7M per year in Phase 2A for this allowance program.

- D. Home Sewage Treatment System (HSTS) Elimination Program:** This program funds the design, property acquisition and construction of new sanitary sewers to connect to properties in built up areas of the MSDGC service area to eliminate home sewage treatment systems (HSTS). These projects improve the water quality of the MSDGC watersheds by replacing failing or inadequate home systems. These projects are identified and prioritized based on public health risk.

Consistent with prior years' spending and recognizing the importance of addressing HSTSs and the associated impact on water quality, the Board proposes to spend \$1.5M per year in Phase 2A for this allowance program.

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- E. **Urgent Capacity Response (UCR) Program:** Many homes and businesses throughout the MSDGC service area experience surface flooding and sewer back up problems during wet weather events. The UCR Program is in addition to the Sewer Back Up (SBU) Program, noted above in this Section. The SBU Program is intended to address individual property solutions (e.g., installation of backflow prevention devices, cleanup costs, and personal property loss costs), whereas the UCR Program will focus on historically documented problem SBU areas, to determine the root cause(s) of the reported problems. The UCR Program will focus on identifying and planning broader long-term project solutions for multiple affected properties to address surface flooding and sewer back up problems, and in addition, where possible, CSO reduction.

Initially, this allowance will be used to evaluate the Ludlow Run historic problem area. Other known historic problem areas include: Beechmont, Blanchette, Norwood, Reading and St. Bernard.

The County proposes to spend \$0.3M per year for this allowance program in order to identify and conceptually plan solutions for the historic SBU problem areas. Once the solutions are conceptually planned, a separate capital project number and separate capital funding (separate funding from the \$0.3M per year) will be assigned so the projects can be advanced to design and construction.

The following three WWIP Allowances have been reduced in use to the point where funding for the past five years has been minimal:

- Rainfall Derived Infiltration and Inflow (RDI/I) Program;
- WWIP Progress Studies and Recreation Management; and
- MSDGC Sustainable Infrastructure (Green) Program.

The work in these three allowances is being addressed in specific, larger projects which negate the need for these allowances in Phase 2A. Therefore, no funds are planned for these allowances for Phase 2A.

F. Asset Management: Expected budgets

The Board has budgeted \$50M (2006\$) per year for asset management during Phase 2A for a 5-year total of \$250M (2006\$). WWIP Section C.5. defined “asset management” as generally referring to “a comprehensive and structured approach to the long-term management of assets as tools for the efficient and effective delivery of services; for purposes of this WWIP, the term “Asset Management” means those capital expenditures by MSD that are not formally considered WWIP Projects or Allowance expenditures.” Asset Management budgets are submitted as part of the annual capital budget which is then subject to public review and evaluation prior to approval by the Board of County Commissioners.

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MSDGC's Asset Management total spending during Phase 1 from 2010 through 2017 was \$354.5M (2006\$). The average per year has been approximately \$44.3M (2006\$).

6. PHASE 2B PLANNING PROCESS AND SUBMITTAL

The Board believes it is imperative to take advantage of the EPA 2012 Integrated Planning Framework (Integrated Planning) and that Phase 2B naturally grow out of, and benefit from, the information and lessons learned from Phase 2A. As indicated above, the Board intends to utilize the results of Integrated Planning, in part, to design and build EHRTs at the major MSD treatment plants, and implement strategic stormwater source control projects in the neighborhoods to address surface flooding and SBUs, while also further reducing CSOs. Sequencing design and construction schedules of these EHRTs and stormwater source control projects ensures that these EHRTs and successive EHRTs and other WWIP Phase 2 projects are right-sized and scoped properly based on the outcomes of Integrated Planning. Integrated Planning takes advantage of the most up to date information and citizen input.

EHRTs treat large volumes of overflows from the collection system that would otherwise be released untreated into the environment. EHRT's are smaller and less expensive than conventional treatment facilities, can process wastewater more quickly, operate on an as-needed basis, and can be designed to fit into the surrounding neighborhood. They improve local water quality, reduce sewer odors and debris, and result in an overall cleaner environment. Successfully operated EHRTs could also significantly reduce the overall WWIP projects to be built, further decreasing costs to MSD ratepayers. Thus, the Board's expected proposed Phase 2B capitalizes on these less expensive, environmentally friendly solutions.

Phase 2B will be based on an Affordability Analysis completed near the end of Phase 2A. As a result, the specific activities and costs cannot be completely predicted at this time. However, it is the Board's current vision, consistent with Table 6.1 below, that Phase 2B would include the following projects to be planned, designed, and/or constructed:

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Table 6.1 - Vision for Phase 2B Projects

WWIP INDEX	REVISED WWIP ATTACHMENT 2 DESCRIPTION June 2018	ACTIVITY
193R	CSO 552 Partial Separation (Little Miami)	Design / Construction
195, 196, 198, 205, 206	Little Miami WWTP PS Upgrades for EHRT (Part 2)	Construction
200R	Little Miami WWTP (EHRT)	Design / Construction
199, 201, 202, 203	Little Miami WWTP (Remaining Bundle Part 1)	Design / Construction
199, 201, 202, 203	Little Miami WWTP (Remaining Bundle Part 2)	Design
215	Lower Muddy Creek Interceptor (Tunnel Alternative)	Planning / Design
216	Muddy Creek Pump Station Upgrade & Force Main	Planning / Design / Construction
223	West Branch Muddy Creek Interceptor - Based on IWAP Results	Planning / Design
227B	SSO 700 IWAP Early Action Projects	Planning / Design / Construction
233, 234	Upper Muddy Creek Interceptor (Part 2) - Based on IWAP Results	Planning / Design / Construction
235	Addyston Pump Station Elimination	Planning / Design / Construction
238R	CSO 410 Separation	Planning / Design / Construction
238, 239, 245	CSO 415, 416 Separation (Part 1)	Planning / Design / Construction

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Table 6.1 continued...

239, 245	CSO 411, 412, 413, 414 Separation	Planning / Design / Construction
240, 241, 242, 243, 244	East Branch Muddy Creek Interceptor (Part 1) - Based on IWAP Results	Construction
240, 241, 242, 243, 244	East Branch Muddy Creek Interceptor (Part 2) - Based on IWAP Results	Planning / Design / Construction

The Phase 2B projects will include a schedule, and may include additions to and/or different projects than listed in the table. Consistent with both its philosophy for Phase 2A and with its vision for Phase 2B, the Board will consider affordability, necessity, cost, new technology, model updates, design lessons or improvements, policy changes, and overall lessons learned from Phase 1 and Phase 2A when submitting its proposed Phase 2B schedule of projects to the Regulators.

7. PUBLIC PARTICIPATION

The Board placed its draft, proposed Phase 2A Plan Summary on its website. It then sent a letter via email notifying political subdivisions, elected officials, and community groups in the MSDGC service area of upcoming public hearings on its draft, proposed Phase 2A Plan. The notice of public hearings also included an electronic link to the draft, proposed Phase 2A Plan. The Board then held 3 public meetings to discuss its proposed, draft Phase 2A Plan and obtain input from stakeholders, and invited stakeholders to submit written comments on the Phase 2A. This process opens and maintains channels of communication with stakeholders and will continue.

These meetings were held as follows:

- May 30, 2018, 11:00 a.m., at the County Administration Building, 138 East Court Street;
- June 5, 2018, 6:00 p.m., at the Delhi Senior Center, 647 Neeb Road; and
- June 7, 2018, 6:00 p.m., at the North Church, 4222 Hamilton Avenue.

The public expressed two over-arching concerns: rates and SBUs. The public indicated that rates were unaffordable and that a wide number of MSD ratepayers, especially low-income ratepayers, could not afford more or continued rate increases. The public also expressed significant concern of the Consent Decree’s mandated SBU program and the immediate need to not only respond to SBUs after they occurred, but to take Consent

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Decree required action to eliminate or prevent SBUs. Certain documents and analyses were not completed in time to be distributed for the public meetings. All pertinent new information will be made available to the public and any further comments will be accepted and reviewed. All comments received to date were reviewed and considered by the Board.

After due consideration, the Board adopted a Resolution that directed that its final, proposed Phase 2A Plan be submitted to the Regulators by June 30, 2018. A copy of that Resolution is provided as Appendix C.

The Board will place the proposed Phase 2A Plan submitted to the Regulators on its website. Notice of the availability of the submitted Phase 2A will be emailed or otherwise communicated to political subdivisions, elected officials, and community groups in the MSDGC service area, along with those who have signed up to receive MSDGC notices/alerts. A press release will be issued in the next 10 days to the local press and other media of the availability of the Board's proposed Phase 2A Plan that was submitted to the Regulators. The Board will request that the local media like the Cincinnati Enquirer Newspaper, Cincinnati Business Courier and local bizjournal.com run articles on the proposed Phase 2A Plan. The County Commissioners also plan to appear at various functions to mention the proposed Phase 2A Plan.

8. CONCLUSION

The proposed Phase 2A is the right program at the right time at the right cost for the MSD community. It includes a schedule of major work with milestones for a 5-year period of time that is affordable and will achieve substantial human health and environmental benefits. Phase 2A sets the stage for better Phase 2B solutions that will achieve compliance with the Consent Decree much quicker than projected and at a lower cost.

The cost for implementing the 5-year WWIP Phase 2A is estimated to be \$40M per year (2006\$) (\$53.2M in current dollars). Adding WWIP asset management costs at \$50M per year (2006\$), brings the total cost to approximately \$450M (2006\$) or \$599M in current dollars for the 5-year period. This nearly \$600M cost in current dollars comes on the heels of Phase 1, which when completed is estimated to cost \$1.14B (2006\$) (\$1.51B current dollars).

The pace of Consent Decree work and spending is governed by "Affordability Considerations," including multiple criteria evaluating a community's financial and social health. As part of this process, a calculation evaluates the financial burden on residential customers as if the entire Program was constructed in a certain time period. The cost of constructing all of the remaining WWIP projects in Phase 2 is estimated to be \$2.3B (2006\$), or \$3.1B in current dollars over 30 years (including projects and Allowances). This cost exceeds U.S. EPA's 2.0% Residential Indicator threshold and is unaffordable. In fact, the Residential Indicator calculation of the entire Phase 2 for the entire MSD Service Area is about 2.5% and for the City of Cincinnati is about 3.5%. There are major populations in the MSD Service Area (City of Cincinnati; other high poverty areas and groups) which are suffering severe burdens due to MSD costs. A 5-year Phase 2A provides the "high burden" community the opportunity to survey its overall financial health again

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prior to Phase 2B. History has demonstrated that project cost estimates beyond 5 years can be grossly underestimated. A 5-year Phase 2A will protect the community from making guaranteed project construction commitments with no guaranteed protection against major cost spikes. To lessen the impact to the community to below U.S. EPA's "high burden" criteria, the use of a multi-step Phase 2, starting with a short Phase 2A, is justified and prudent.

The selection and prioritization of some Phase 2A projects, while not exactly the same order or scope as WWIP Attachment 2, are consistent with the order and underlying WWIP philosophy that they be high priority projects with significant CSO benefits based on sound planning. Projects and schedules that are proposed to be changed using adaptive management concepts will provide comparable or better aggregate control of annual volumes as the original project or projects. Considerations and events arising after WWIP Attachment 2 was developed and finalized in 2006-2009 impact the selection and order of projects being proposed now in 2018, such as further planning performed under the 2012 EPA Integrated Planning Framework, lessons learned from Phase 1, modeling updates, affordability constraints, and citizen concerns. Severe SBUs and flooding will be addressed sooner, work will be performed in the Muddy Creek watershed which needs immediate attention, and there is a balance of the need for work at the Little Miami River treatment plant and work in the collection system. The Phase 2A projects achieve measureable water quality improvements, and at the same time address much earlier in Phase 2, immediate human health and sensitive area concerns with SBUs and flooding than previously planned in the WWIP Attachment 2.

Phase 2A provides numerous benefits and advantages. A short Phase 2A provides flexibility and the ability to adapt WWIP projects to implement new technologies or watershed management approaches that provide an environmentally-preferred way to reduce sewer overflows and provide greater watershed benefits. This will lead to achieving water quality improvements more quickly and cost-effectively.

Appendix A-1: WWIP Attachment 2 – Project Status for Phase 2A

Appendix A-1: WWIP Attachment 2 - Project Status for Phase 2A

 Project included in Bridge
 Project included in Phase 2A
Bold text Indicates added to WWIP Index (Phase 2A)

INDEX		PROJECT STATUS FOR PHASE 2A (FROM WWIP ATTACHMENT 2)		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)	WWIP Project Status
185	10171540	CSO 135 Elimination	CSO 135	Regulator Improvements - 2.4 cfs	RI		0.0	Construction in WWIP Bridge	
186	10171560	CSO 43 Elimination	CSO 43	Regulator Improvements - 2.8 cfs	RI		0.7	Construction in WWIP Bridge	
187	10171600	CSO 170 Elimination	CSO 170	EHRT - Regulator Improvement - 3.1 cfs	RI		in 71800	Construct modified project after Phase 2A. Project dependent on EHRT Index 194. Right-size based on Upper Duck Integrated Plan results.	
188R	10171640	CSO 214 Storage Facility Partial Separation	CSO 214	Storage - 2.00 MG Partial Separation	STOR PS		57.4	Construction in WWIP Bridge	
189	10171660	CSO 500 Improvements	CSO 500	Regulator Improvement - 1.5 cfs. See E-500	RI		in 71800	Construct modified project after Phase 2A. Project dependent on EHRT Index 194. Right-size based on Upper Duck Integrated Plan results.	
190	10171680	CSO 501 Improvements	CSO 501	Regulator Improvement - 0.1cfs. See E-500	RI		0.0		
191	10171700	CSO 549 Improvements	CSO 549	Regulator Improvement - 5.0 cfs. See E-500	RI		in 71800		
192	10171720	CSO 550 Improvements	CSO 550	Regulator Improvement - 0.4 cfs. See E-500.	RI		in 71800		
193R	10171760	CSO 552 Improvements Partial Separation	CSO 552	Partial Separation & Regulator Improvement - 19.4 cfs	PS & RI		18.6	Constructed in Phase 2A. Project modified to be partial separation & regulator improvements.	
194	10171800	Upper Duck Creek EHRT Facility		E-500 - EHRT - 40-MGD - Serves CSOs 170, 549, 550, 501 & 500 (NOTE 2)	EHRT		106.0	Construct modified project after Phase 2A. EHRT has tripled in size from 40 MGD to 120 MGD and tripled in cost. The proposed Little Miami WWTP EHRT will also likely increase interceptor capacity in this area affecting the necessary sizing of the Duck Creek EHRT. Project to be right-sized based on Upper Duck Integrated Plan and Little Miami WWTP EHRT results.	
195R	10170782	LM Four Mile Pump Station Upgrade		E-503 - Four Mile Pump Station Rec Proj – PS-1	WWTP	NOTE 1		Part of the project is being constructed in the Bridge. Remainder is constructed in Phase 2A to convey flow to future EHRT at LMWWTP. See Phase 2A project fact sheet for further details.	
196R	10170783	LMWWTP Pump Station Reconfiguration		E-503 - Modify LMR Pump Station Rec Proj – PS-5	WWTP	NOTE 1		Modified project constructed in Phase 2A to convey flow to future EHRT at LMWWTP. See Phase 2A project fact sheet for further details.	
197	10170784	LMWWTP Grit Station Upgrade		E-503 - Grit Collection Proj – SG-1	WWTP	NOTE 1		Construction in WWIP Bridge	
198R	10170785	LMWWTP Pump Station Hydraulic Improvements		E-503 - Four Mile Pump Station to Screen Building Rec Proj - H-1	WWTP	NOTE 1		Modified project constructed in Phase 2A. See Phase 2A project fact sheet for further details.	
199	10170786	LMWWTP Primary to Secondary Hydrau. Improvements		E-503 - Primary to Secondary Conveyance Rec Proj – H-2	WWTP	NOTE 1		Coordinated with EHRT sizing. Constructed after Phase 2A.	
200R	10170787	LMWWTP Chemically Enhanced Primary EHRT		E-503 - Chemical Enhance Primary Rec Proj – PT-2 EHRT	WWTP	NOTE 1		Project modified to EHRT. EHRT to be constructed after Phase 2A. See Phase 2A Index 195R, 196R, 198R, 205R, 206R project fact sheet for further details.	
201	10170788	LMWWTP Secondary Treatment Modifications		E-503 - Modification to Secondary Treatment Rec Proj – ST-2	WWTP	NOTE 1		Constructed after Phase 2A. Coordinated with EHRT sizing.	
202	10170790	LMWWTP Chemical Feed Upgrades		E-503 - Upgrade Chemical Feed Sys Storage – D-2	WWTP	NOTE 1		Constructed after Phase 2A. Coordinated with EHRT sizing.	
203	10170793	LMWWTP Sludge Receiving Improvements		E-503 - Improvement to Sludge Receiving Facility Rec Proj – DR-6	WWTP	NOTE 1		Constructed after Phase 2A. Coordinated with District wide Solids Handling Master Plan and EHRT sizing. Constructed after Phase 2A.	
204	10170794	LMWWTP Standby Power		E-503 - Dual Feed / Standby Power Rec Proj – E-1	WWTP	NOTE 1		Constructed in Phase 2A	
205R	10172020	LMWWTP Wet Weather Pump Station		E-505 - Wet Weather Pump Station with Screening 150 MGD to Auxiliary Outfall	WWTP	NOTE 1		Modified project constructed in Phase 2A. See Phase 2A project fact sheet for further details.	
206R	10172260	LMWWTP Dry Weather Pump Station		Four Mile PS - Dry Weather Pumps - B&N Rec. Proj. PS-1	WWTP	NOTE 1			

Appendix A-1: WWIP Attachment 2 - Project Status for Phase 2A

Project included in Bridge
 Project included in Phase 2A
Bold text Indicates added to WWIP Index (Phase 2A)

INDEX		PROJECT STATUS FOR PHASE 2A (FROM WWIP ATTACHMENT 2)		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)	WWIP Project Status
207	10140400	Lockland Sewer Separation		SSO 1045, 1010	Replace collector following original alignment - 7968 ft of 12-24"	CONV	2 yr		Construct modified project after Phase 2A. Tributary to Mill Creek interceptor. Capacity not available in downstream Mill Creek interceptor. May increase SBUs downstream.
208	10142280	Oxley Grating		CSO 226	Regulator Improvement-6 cfs. Combine with implementation of green infrastructure as redevelopment, renovation, and routine maintenance occurs to achieve CSO control to achieve 85%.	RI		4.6	See note in Index 207
209	10142300	914 Oak St. Grating		CSO 559	Regulator Improvements-14.0 cfs. Green potential greater than storage need.	RI		7.0	See note in Index 207
210	10142320	200' West of Bacon St. Grating		CSO 515	Regulator Improvements-0.7 cfs	RI		0.0	See note in Index 207
211	10142340	Bacon St. Grating		CSO 516	Regulator Improvements-0.11 cfs	RI		0.1	See note in Index 207
212	10142360	No. 96 North Park Grating		CSO 538	Regulator Improvements-0.31 cfs	RI		0.1	See note in Index 207
213	10142380	117 E. Charlotte Grating		CSO 539	Regulator Improvements-5.0 cfs	RI		1.3	See note in Index 207
214	10142400	428 South Cooper Grating		CSO 562	Regulator Improvements-3.08 cfs	RI		0.0	See note in Index 207
215	10130000	Muddy Creek Basin Storage & Conveyance Sewer		701, 702, SSO 692, 697, 675-A, 1061	Storage & Conveyance Tunnel unloads Muddy Creek PS, Eliminating SSOs 692 & 697, provides CSO control for 518, 404, 405, and 406 - 25 ft diameter, 8500 ft long; firm influent pumping capacity, firm effluent pumping capacity, and peak wet weather treatment capacity at the Muddy Creek WWTP to all be 35 MGD.	TUNNEL	2 yr		Construct modified project after Phase 2A. See Phase 2A Index 215B project fact sheet for further details.
215B	TBD	Muddy Creek WWTP Pump Station (for EHRT)			EHRT Pump Station - Sizing under determination	Pump Station		See Index 215B	Construction in Phase 2A. See Phase 2A Index 215B project fact sheet for further details.
215B	TBD	Muddy Creek WWTP EHRT		402, 403, 404, 405, 406, 416, 415, 414, 413, 412, 411, 410, 223, 654, 408, and 541 CSO	EHRT - Serves West Branch and East Branch CSOs - Sizing under determination	EHRT		No change to listed CSOs	Construction in Phase 2A. See Phase 2A Index 215B project fact sheet for further details.
216	10130160	Muddy Creek Pump Station Upgrade and Forcemain		SSO 692, 697, 675-A	Elim. PSO - Increase capacity & convey to Hillside Relief Tunnel - 25 MGD pumps, 12" FM for DWF, 36" FM for WWF (associated with 30000)	PSU/FM	2 yr		Construct modified project after Phase 2A. Downstream capacity does not currently exist. Sizing to be confirmed after Muddy Creek WWTP EHRT is constructed.
217	10130400	River Rd. Near Muddy Creek WWTP Conveyance Sewer		SSO 702	Rapid Run/Bender Rd. Interceptor directly into New Tunnel - 800 ft of 36"	CONV	2 yr		Construct modified project after Phase 2A. Sizing to be confirmed after Muddy Creek WWTP EHRT is constructed.
218	10131020	CSO 402 Topinabee Dr. Reg. Improvements		CSO 402	Regulator Improvement - 13.3 cfs (dependent on 30000, 30160, 31120)	RI		7.2	Constructed in Phase 2A
219	10131040	CSO 403 Elco St. Div. Dam Reg. Improvements		CSO 403	Regulator Improvement - 7.10 cfs (dependent on 30000, 30160, 31120)	RI		3.6	Constructed in Phase 2A
220	10131060	CSO 404 Ivanhoe St. Reg. Improvements		CSO 404	Regulator Improvement - 26.9 cfs (dependent on 30000, 30160, 31120)	RI		16.2	Constructed in Phase 2A
221	10131080	CSO 405 Revere St. Reg. Improvements		CSO 405	Regulator Improvement - 6.20 cfs (dependent on 30000, 30160, 31120)	RI		3.7	Constructed in Phase 2A
222	10131100	CSO 406 Kennebeck St. Reg. Improvements		CSO 406	Regulator Improvement -15.4 cfs (dependent on 30000, 30160, 31120)	RI		9.0	Constructed in Phase 2A
223	10131120	West Branch Ohio River Interceptor Sewer		CSO 404, 405, 406	Convey Flow from CSO 404 to WWTP - 4000' - 60", sized for 85% control for CSOs 404, 405 and 406 (dependent on 30000, 30160)	CONV		-	Construct modified project after Phase 2A. Sizing to be confirmed after Muddy Creek WWTP EHRT is constructed.
224	10140000	SSO 1048 Conveyance Sewer Phase 1		SSO 1048	Replace collector following original alignment - 4115 ft of 18-27"; Tunnel 375 ft of 18-24"	CONV	2 yr		Construct modified project after Phase 2A. Right-size based on SSO 700 Integrated Plan results.
225	10140020	SSO 1048 Conveyance Sewer Phase 2		SSO 1048	Replace collector following original alignment - 4256' of 30-36"	CONV	2 yr		See note in Index 224
226	10140080	SSO 587 Conveyance Sewer		SSO 587	Replace collector following original alignment - 4235 ft of 15-24"	CONV	2 yr		See note in Index 224
227	10140120	Sharonville/Evandale Trunk to SSO 700		SSO 1048, 587	24,929 LF of 30-66"; Tunnel 6250 LF of 30-78"	CONV	2 yr		See note in Index 224
228	10140480	Pleasant Run Interceptor Replacement			WIBs - Replace collector following original alignment - 4246 ft of 21-24"	CONV			See note in Index 224

Appendix A-1: WWIP Attachment 2 - Project Status for Phase 2A

 Project included in Bridge
 Project included in Phase 2A
Bold text Indicates added to WWIP Index (Phase 2A)

INDEX		PROJECT STATUS FOR PHASE 2A (FROM WWIP ATTACHMENT 2)		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)	WWIP Project Status
229	10241820		SSO 700 Facility Improvements (note: original project 10141180 has been moved to Index Row 455 "SSO 700 Remedial Plan" and will be scheduled in accordance with the WWIP prioritization provisions.	SSO 700	Increase Storage at existing site - Add 1.2 MG and improve facility reliability. (NOTE 3) (Refer to Index 455 for "SSO 700 Remedial Plan" project)	STOR	2 yr		Construction in WWIP Bridge
230	10142120	Mill & Vine St, Grating		CSO 512	Regulator Improvements-3.25 cfs	RI		0.2	Construct modified project after Phase 2A. Tributary to Mill Creek interceptor. Capacity not available in downstream interceptor. May increase SBUs downstream.
231	10142200	Bernard & Reisenberg Grating		CSO 513	Partial Separation	PS		1.7	Construction in WWIP Bridge
232	10142220	Smalley Grating		CSO 514	Partial Separation	PS		0.2	Construction in WWIP Bridge
233	10130020	Muddy Creek Interceptor Rehabilitation		SSO 1061 CSO 518 MH 16006007	Clean Interceptor - 5000 ft of 36"	CLEAN			Addressed with Index 234
234	10130040	CSO 518 Muddy Creek Conveyance Sewer		SSO 1061 CSO 518 MH 16006007	Replace section of Muddy Creek Int. - 9000 ft of 36"	CONV	2 yr		Construction in WWIP Bridge
235	10130280	Addyston PS Elimination		PSO 730, 10902003	Elim. Addyston P.S. w/gravity along Rte. 50 - 2650' of 36" and two 100' of 24"	CONV	2 yr		Construct modified project after Phase 2A. Project needs to be coordinated with available downstream capacity to be determined after Muddy Creek EHRT construction and monitoring.
235B	TBD	Addyston Extraneous Stormwater Removal		PSO 730, 10902003	Partial Separation	PS			Constructed in Phase 2A. See Phase 2A Index 235B project fact sheet for further details.
236	10130700	Muddy Creek @ Westbourne EHRT		CSO 198	EHRT - 126 MGD Community Priority (NOTE 2)	EHRT		61.2	Diversion chamber improvements constructed as part of WWIP Bridge. Complete construction of modified project after Phase 2A. See Phase 2A Index 236B project fact sheet for further details.
236B	TBD	CSO 198 Partial Separation/SBU Mitigation		CSO 198	Partial Separation/SBU mitigation	PS			Constructed in Phase 2A. See Phase 2A Index 236B project fact sheet for further details.
237	10130720	CSO 518 Improvements		CSO 518	Regulator Improvement - 27.4 cfs Premised on CAPP Activity ID – 30040, 30000 Community Priority	RI		8.4	Construct modified project after Phase 2A. Right-size based on Muddy Creek Integrated Plan results.
238	10130780	CSO's 223, 408, 410, 541, 654		CSO 223, 408, 410, 541, 654	CD Exhibit 1 Partial Separation	PS		0.3	Construction of CSO 408 regulator improvements as part of WWIP Bridge. The partial separation solutions for CSOs 223, 408, 410, 541, and 654 are dependent on the Muddy Creek EHRT and associated flow reduction. Projects for these CSOs to be constructed after Phase 2A.
239	10130840	CSO's 411, 412, 413, 414, 415, 416		411, 412, CSO 413, 414, 415, 416	CD Exhibit 1 Regulator Improvement–3.21 cfs and Relocation Complete Partial Separation - Activity ID 31140	PS		12.9	Construction of CSO 413 regulator improvements as part of WWIP Bridge. The partial separation solutions for CSOs 411, 412, 413, 414, 415, and 416 are dependent on the Muddy Creek EHRT and associated flow reduction. Projects for these CSOs to be constructed after Phase 2A.
240	10131000	E. Branch Muddy Ph1 Interceptor - Combined in 31006			W-103 - CD Exhibit 1 Interceptor Replacement Phase 1	CONV			Part 1 of planning and design for this work in Phase 2A.
241	10131002	E. Branch Muddy Ph2 Interceptor - Combined in 31006			W-103 - CD Exhibit 1 Interceptor Replacement Phase 2	CONV			Construct modified project after Phase 2A. Project needs to be coordinated with available downstream capacity to be determined after Muddy Creek EHRT construction and monitoring.
242	10131003	E. Branch Muddy Ph3-A Pump Station - Combined in 31006			W-103 - CD Exhibit 1 Interceptor Replacement Phase 3	CONV			
243	10131004	East Branch Muddy Ph3-B Pump Station - Combined in 31006			East Branch Muddy Ph3-B Pump Station	CONV			
244	10131006	East Branch Muddy Interceptor			W-105 - Interceptor Extension	CONV			
245	10131140	E. Branch Ohio Interceptor Sewer Separation		408, 411, CSO 412, 414, 415, 416	W-104 - Complete the Partial Separation in CSOs areas 408, 411, 412, 414, 415, 416	PS		In 30840 and 30780	

Appendix A-1: WWIP Attachment 2 - Project Status for Phase 2A

Project included in Bridge
 Project included in Phase 2A
Bold text Indicates added to WWIP Index (Phase 2A)

PROJECT STATUS FOR PHASE 2A (FROM WWIP ATTACHMENT 2)		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)	WWIP Project Status
246	REMAINING PHASE 2 PROJECTS/BUNDLES						
247	MIWWTP	Mill Creek Wastewater Treatment Plant					
248	10144882		C-402 - Enhanced Primary Treatment to incorporate improvements for Additional Primary Sludge Pumping and Auxiliary Outfall Improvements	WWTP	NOTE 1		New diversion chamber to be constructed in Bridge. Interceptor tie-ins to the diversion chamber and related improvements to be completed in Phase 2A. Design of new wet weather influent PS for future EHRT to be performed in Phase 2A. Construct CEPT/EHRT after Phase 2A.
249	LDCU	Lower Duck Creek Upper					
250	10170920	CSO 68	Storage - 2.53 MG	STOR		36.9	Projects after Phase 2A. Proposed Little Miami WWTP EHRT required to increase interceptor capacity in this area to achieve specified CSO reduction.
251	10170960	CSO 66	Regulator Improvements - 2.7 cfs	RI		0.0	
252	10171260	CSO 61	Regulator Improvements - 8.2 cfs	RI		2.1	
253	10171280	CSO 64	Regulator Improvements - 9.7 cfs	RI		0.1	
254	10171300	CSO 80	Regulator Improvements - 7.0 cfs	RI		0.0	
255	10171320	CSO 83	Regulator Improvements -11 cfs	RI		2.7	Dynamic underflow control construction in WWIP Bridge.
256	10171340	CSO 188	Regulator Improvements - 8.1 cfs	RI		4.4	Projects after Phase 2A. Proposed Little Miami WWTP EHRT required to increase interceptor capacity in this area to achieve specified CSO reduction.
257	10171360	CSO 199	Regulator Improvements - 27 cfs	RI		0.0	
258	10171440	CSO 205	Partial Separation	PS		0.5	
259	10171460	CSO 84	Consolidate to STO @ CSO 503 1,500' of 72" sewer	STOR		in 71520	
260	10171480	CSO 136	Storage - 4.00 MG	STOR		31.0	
261	10171520	CSO 503	Pipe Rehab Replacement and Stream Restoration	SEP/GREEN		15.1	Monitor performance of completed project. Future work to be determined.
285	10171500	CSO 472	Regulator Improvements	RI		26.5	Dynamic underflow control construction in WWIP Bridge.
317	10170890	CSO 182	EHRT - 44.3 MGD Community Priority (NOTE 2)	EHRT		18.3	Complete construction of modified project after Phase 2A. See Phase 2A Index 317B project fact sheet for further details.
317B	TBD	CSO 182	Partial Separation/SBU mitigation	PS			Constructed in Phase 2A. See Phase 2A Index 317B project fact sheet for further details.
319	10170860	PSO 861	Prospect Woods PS Upgrade	PSU	2 yr		Construction in WWIP Bridge

Appendix A-2: Updated Final WWIP Attachment 2

General Note:

Red text reflects changes made since Regulator letter authorized changes dated October 8, 2015.

Purple text reflects changes to address Sierra Club comments on Red text.

Blue text reflects changes for Phase 2A plan.

REVISED WWIP ATTACHMENT 2 - JUNE 2018			Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan
			2006 Dollars	2006 Dollars					Remaining CSO (MG/year)
185	10171540	CSO 135 Elimination		\$ 243,716	CSO 135	Regulator Improvements - 2.4 cfs (Note 18)	RI		0.0
186	10171560	CSO 43 Elimination		\$ 244,159	CSO 43	Regulator Improvements - 2.8 cfs (Note 18)	RI		0.7
187	10171600	CSO 170 Elimination		\$ 242,681	CSO 170	EHRT - Regulator Improvement - 3.1 cfs	RI		in 71800
188	10171640	CSO 214 Storage Facility Partial Separation		\$ 14,074,375	CSO 214	Storage - 2.00 MG Partial Separation (Note 18)	STOR-PS		57.4
189	10171660	CSO 500 Improvements		\$ 243,069	CSO 500	Regulator Improvement - 1.5 cfs. See E-500	RI		in 71800
190	10171680	CSO 501 Improvements		\$ 243,373	CSO 501	Regulator Improvement - 0.1cfs. See E-500	RI		0.0
191	10171700	CSO 549 Improvements		\$ 243,613	CSO 549	Regulator Improvement - 5.0 cfs. See E-500	RI		in 71800
192	10171720	CSO 550 Improvements		\$ 243,820	CSO 550	Regulator Improvement - 0.4 cfs. See E-500.	RI		in 71800
193	10171760	CSO 552 Improvements Partial Separation		\$ 242,109	CSO 552	Partial Separation & Regulator Improvement - 19.4 cfs	PS & RI		18.6
194	10171800	Upper Duck Creek EHRT Facility		\$ 14,541,318		E-500 - EHRT - 40-MGD - Serves CSOs 170, 549, 550, 501 & 500 (NOTE 2)	EHRT		106.0
195	10170782	LM Four Mile Pump Station Upgrade		\$ 3,617,502		E-503 - Four Mile Pump Station Rec Proj - PS-1 (Note 18 & 24)	WWTP	NOTES 1 & 10	
196	10170783	LMWWTP Pump Station Reconfiguration		\$ 3,172,158		E-503 - Modify LMR Pump Station Rec Proj - PS-5 (Note 24)	WWTP	NOTES 1 & 10	
197	10170784	LMWWTP Grit Station Upgrade		\$ 8,174,858		E-503 - Grit Collection Proj - SG-1 (Note 18)	WWTP	NOTES 1 & 10	
198	10170785	LMWWTP Pump Station Hydraulic Improvements		\$ 1,799,992		E-503 - Four Mile Pump Station to Screen Building Rec Proj - H-1 (Note 24)	WWTP	NOTES 1 & 10	
199	10170786	LMWWTP Primary to Secondary Hydrau. Improvements		\$ 1,328,132		E-503 - Primary to Secondary Conveyance Rec Proj - H-2	WWTP	NOTES 1 & 10	
200	10170787	LMWWTP Chemically Enhanced Primary EHRT		\$ 5,860,701		E-503 - Chemical Enhance Primary Rec Proj - PT-2 EHRT	WWTP	NOTES 1 & 10	
201	10170788	LMWWTP Secondary Treatment Modifications		\$ 9,235,525		E-503 - Modification to Secondary Treatment Rec Proj - ST-2	WWTP	NOTES 1 & 10	
202	10170790	LMWWTP Chemical Feed Upgrades		\$ 3,618,935		E-503 - Upgrade Chemical Feed Sys Storage - D-2	WWTP	NOTES 1 & 10	
203	10170793	LMWWTP Sludge Receiving Improvements		\$ 455,361		E-503 - Improvement to Sludge Receiving Facility Rec Proj - DR-6	WWTP	NOTES 1 & 10	
204	10170794	LMWWTP Standby Power		\$ 7,141,778		E-503 - Dual Feed / Standby Power Rec Proj - E-1	WWTP	NOTES 1 & 10	
205	10172020	LMWWTP Wet Weather Pump Station		\$ 36,586,845		E-505 - Wet Weather Pump Station with Screening 150 MGD to Auxiliary Outfall (Note 24)	WWTP	NOTES 1 & 10	
206	10172260	LMWWTP Dry Weather Pump Station		\$ 375,000		Four Mile PS - Dry Weather Pumps - B&N Rec. Proj. PS-1 (Note 24)	WWTP	NOTES 1 & 10	
207	10140400	Lockland Sewer Separation		\$ 2,424,977	SSO 1045, 1010	Replace collector following original alignment - 7968 ft of 12-24"	CONV	2 yr	
208	10142280	Oxley Grating		\$ 241,149	CSO 226	Regulator Improvement-6 cfs. Combine with implementation of green infrastructure as redevelopment, renovation, and routine maintenance occurs to achieve CSO control to achieve 85%.	RI		4.6
209	10142300	914 Oak St. Grating		\$ 241,284	CSO 559	Regulator Improvements-14.0 cfs. Green potential greater than storage need.	RI		7.0
210	10142320	200' West of Bacon St. Grating		\$ 243,670	CSO 515	Regulator Improvements-0.7 cfs	RI		0.0
211	10142340	Bacon St. Grating		\$ 243,670	CSO 516	Regulator Improvements-0.11 cfs	RI		0.1
212	10142360	No. 96 North Park Grating		\$ 241,284	CSO 538	Regulator Improvements-0.31 cfs	RI		0.1
213	10142380	117 E. Charlotte Grating		\$ 241,356	CSO 539	Regulator Improvements-5.0 cfs	RI		1.3
214	10142400	428 South Cooper Grating		\$ 241,356	CSO 562	Regulator Improvements-3.08 cfs	RI		0.0
215	10130000	Muddy Creek Basin Storage & Conveyance Sewer		\$ 120,122,277	SSO 701, 702, 692, 697, 675-A, 1061	Storage & Conveyance Tunnel unloads Muddy Creek PS, Eliminating SSOs 692 & 697, provides CSO control for 518, 404, 405, and 406 - 25 ft diameter, 8500 ft long; firm influent pumping capacity, firm effluent pumping capacity, and peak wet weather treatment capacity at the Muddy Creek WWTP to all be 35 MGD.	TUNNEL	2 yr	NOTE 11
215a	TBD	Muddy Creek WWTP Pump Station (for EHRT)				EHRT Pump Station	Pump Station		

General Note:
 Red text reflects changes made since Regulator letter authorized changes dated October 8, 2015.
 Purple text reflects changes to address Sierra Club comments on Red text.
 Blue text reflects changes for Phase 2A plan.

REVISED WWIP ATTACHMENT 2 - JUNE 2018			Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
INDEX			2006 Dollars	2006 Dollars					
215b	TBD	Muddy Creek WWTP EHRT			402, 403, 404, 405, 406, 416, 415, 414, 413, 412, 411, 410, 223, 654, 408, 541	EHRT - Serving West Branch and East Branch Interceptor's CSOs	EHRT		Note 20
216	10130160	Muddy Creek Pump Station Upgrade and Forcemain		\$ 8,643,782	SSO 692, 697, 675-A	Elim. PSO - Increase capacity & convey to Hillside Relief Tunnel - 25 MGD pumps, 12" FM for DWF, 36" FM for WWF (associated with 30000)	PSU/FM	2 yr	
217	10130400	River Rd. Near Muddy Creek WWTP Conveyance Sewer		\$ 396,774	SSO 702	Rapid Run/Bender Rd. Interceptor directly into New Tunnel - 800 ft of 36"	CONV	2 yr	
218	10131020	CSO 402 Topinabee Dr. Reg. Improvements		\$ 242,680	CSO 402	Regulator Improvement - 13.3 cfs (dependent on 30000, 30160, 31120) (Note 18)	RI		7.2
219	10131040	CSO 403 Elco St. Div. Dam Reg. Improvements		\$ 245,338	CSO 403	Regulator Improvement - 7.10 cfs (dependent on 30000, 30160, 31120) (Note 18)	RI		3.6
220	10131060	CSO 404 Ivanhoe St. Reg. Improvements		\$ 241,095	CSO 404	Regulator Improvement - 26.9 cfs (dependent on 30000, 30160, 31120) (Note 18)	RI		16.2
221	10131080	CSO 405 Revere St. Reg. Improvements		\$ 242,108	CSO 405	Regulator Improvement - 6.20 cfs (dependent on 30000, 30160, 31120) (Note 18)	RI		3.7
222	10131100	CSO 406 Kennebeck St. Reg. Improvements		\$ 242,079	CSO 406	Regulator Improvement -15.4 cfs (dependent on 30000, 30160, 31120) (Note 18)	RI		9.0
223	10131120	West Branch Ohio River Interceptor Sewer		\$ 3,477,204	CSO 404, 405, 406	Convey Flow from CSO 404 to WWTP - 4000' - 60", sized for 85% control for CSOs 404, 405 and 406 (dependent on 30000, 30160)	CONV		-
224	10140000	SSO 1048 Conveyance Sewer Phase 1 (to be constructed with Index 455)		\$ 1,710,579	SSO 1048	Replace collector following original alignment - 4115 ft of 18-27"; Tunnel 375 ft of 18-24"	CONV	2 yr	
225	10140020	SSO 1048 Conveyance Sewer Phase 2 (to be constructed with Index 455)		\$ 2,467,502	SSO 1048	Replace collector following original alignment - 4256' of 30-36"	CONV	2 yr	
226	10140080	SSO 587 Conveyance Sewer (to be constructed with Index 455)		\$ 1,178,958	SSO 587	Replace collector following original alignment - 4235 ft of 15-24"	CONV	2 yr	
227	10140120	Sharonville/Evandale Trunk to SSO 700 (to be constructed with Index 455)		\$ 34,000,590	SSO 1048, 587	24,929 LF of 30-66"; Tunnel 6250 LF of 30-78"	CONV	2 yr	
228	10140480	Pleasant Run Interceptor Replacement (to be constructed with Index 455)		\$ 1,203,840		WIBs - Replace collector following original alignment - 4246 ft of 21-24"	CONV		
229	Left Blank; See Note 19								
229a	10141180	I-75 & Shepard Ave. SSO 700 SSO 700 Reliability Improvements		\$ 8,557,600	SSO 700	Increase Storage at existing site. (NOTE 17 and 18)	STOR	2 yr	
230	10142120	Mill & Vine St, Grating		\$ 241,286	CSO 512	Regulator Improvements-3.25 cfs	RI		0.2
231	10142200	Bernard & Reisenberg Grating		\$ 2,242,366	CSO 513	Partial Separation (NOTE 18)	PS		1.7
232	10142220	Smalley Grating		\$ 1,226,004	CSO 514	Partial Separation (NOTE 18)	PS		0.2
233	10130020	Muddy Creek Interceptor Rehabilitation		\$ 4,889	SSO 1061 CSO 518 MH 16006007	Clean Interceptor - 5000 ft of 36"	CLEAN		
234	10130040	CSO 518 Muddy Creek Conveyance Sewer		\$ 5,495,655	SSO 1061 CSO 518 MH 16006007	Replace section of Muddy Creek Int. - 9000 ft of 36" (NOTE 18)	CONV	2 yr	
235	10130280	Addyston PS Elimination		\$ 1,712,696	PSO 730, 10902003	Elim. Addyston P.S. w/gravity along Rte. 50 - 2650' of 36" and two 100' of 24"	CONV	2 yr	
235a	TBD	Addyston Extraneous Stormwater Removal			PSO 730, 10902003	Partial Separation	PS		Note 21

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			2006 Dollars	2006 Dollars					Remaining CSO (MG/year)
236	10130700	Muddy Creek @ Westbourne EHRT		\$ 24,184,412	CSO 198	EHRT - 126 MGD Community Priority (NOTE 2 and 18)	EHRT		61.2
236a	TBD	CSO 198 Partial Separation/SBU Mitigation			CSO 198	Partial Separation to Mitigate Sewer Back Ups (SBU)	PS		Note 22
237	10130720	CSO 518 Improvements		\$ 244,422	CSO 518	Regulator Improvement - 27.4 cfs Premised on CAPP Activity ID – 30040, 30000 Community Priority	RI		8.4
238	10130780	CSO's 223, 408, 410, 541, 654		\$ 1,859,360	223, 408, CSO 410, 541, 654	CD Exhibit 1 Partial Separation (NOTE 18)	PS		0.3
239	10130840	CSO's 411, 412, 413, 414, 415, 416		\$ 4,082,231	411, 412, CSO 413, 414, 415, 416	CD Exhibit 1 Regulator Improvement–3.21 cfs and Relocation Complete Partial Separation - Activity ID 31140 (NOTE 18)	PS		12.9
240	10131000	E. Branch Muddy Ph1 Interceptor - Combined in 31006				W-103 - CD Exhibit 1 Interceptor Replacement Phase 1	CONV		
241	10131002	E. Branch Muddy Ph2 Interceptor - Combined in 31006				W-103 - CD Exhibit 1 Interceptor Replacement Phase 2	CONV		
242	10131003	E. Branch Muddy Ph3-A Pump Station - Combined in 31006				W-103 - CD Exhibit 1 Interceptor Replacement Phase 3	CONV		
243	10131004	East Branch Muddy Ph3-B Pump Station - Combined in 31006				East Branch Muddy Ph3-B Pump Station	CONV		
244	10131006	East Branch Muddy Interceptor		\$ 60,315,458		W-105 - Interceptor Extension	CONV		
245	10131140	E. Branch Ohio Interceptor Sewer Separation		\$ 15,848,746	408, 411, CSO 412, 414, 415, 416	W-104 - Complete the Partial Separation in CSOs areas 408, 411, 412, 414, 415, 416	PS		In 30840 and 30780
246	REMAINING PHASE 2 PROJECTS/BUNDLES		\$ 182,720	\$ 1,547,526,371					
247	MIWWTP Mill Creek Wastewater Treatment Plant								
247a	10145500	Mill Creek WWTP Outfall Improvements		\$ 15,163,200		To be evaluated in conjunction with index no. 248.	WWTP		NOTE 12
247b	10145580	Mill Creek WWTP Added Sludge Pumping		\$ 1,315,000		To be evaluated in conjunction with index no. 248.	WWTP		NOTE 12
248	10144882	Mill Creek WWTP Chemical Enhanced Primary Treat.	\$ 164,235	\$ 25,215,765		C-402 - Enhanced Primary Treatment to evaluate need and incorporate improvements for Additional Primary Sludge Pumping and Auxiliary Outfall Improvements (NOTE 12, 18)	WWTP	NOTE 1	NOTE 12
249	LDCU Lower Duck Creek Upper								
250	10170920	Nu-Tone Parking Lot Grating		\$ 9,989,847	CSO 68	Storage - 2.53 MG	STOR		36.9
251	10170960	Madison & Redbank Grating		\$ 277,349	CSO 66	Regulator Improvements - 2.7 cfs	RI		0.0
252	10171260	4730 Madison Ave. Grating		\$ 277,349	CSO 61	Regulator Improvements - 8.2 cfs	RI		2.1
253	10171280	End of Harrow St. Div. Dam		\$ 277,350	CSO 64	Regulator Improvements - 9.7 cfs	RI		0.1
254	10171300	Brotherton Rd. Grating		\$ 277,349	CSO 80	Regulator Improvements - 7.0 cfs	RI		0.0
255	10171320	3675 Forest Hills Grating (Dynamic Underflow Control)		\$ 277,349	CSO 83	Regulator Improvements -11 cfs (NOTE 18)	RI	NOTE 15	2.7
256	10171340	3646 Madison Rd. Div. Dam		\$ 277,350	CSO 188	Regulator Improvements - 8.1 cfs	RI		4.4
257	10171360	Ford Gate Grating		\$ 277,350	CSO 199	Regulator Improvements - 27 cfs	RI		0.0
258	10171440	Camberwell Ave. Div. Dam		\$ 2,259,200	CSO 205	Partial Separation	PS		0.5
259	10171460	Old Red Bank Rd. Grating		\$ 5,514,020	CSO 84	Consolidate to STO @ CSO 503 1,500' of 72" sewer	STOR		in 71520
260	10171480	3979 Rosslyn Dr. Grating		\$ 19,158,278	CSO 136	Storage - 4.00 MG	STOR		31.0
261	10171520	Zaeh Rd. Grating		\$ 5,099,999	CSO 503	Pipe Rehab Replacement and Stream Restoration (NOTE 18)	SEP/GREEN		15.1
262	PLWWTP Pleasant Run Wastewater Treatment Plant								
263	10145540	WWTP Joint MSD/ Butler County Facility		\$ 100,354,974		Pleasant Run Flow Diversion from Mill Creek - Joint MSD/Butler Co. Facility	WWTP	NOTE 1	
264	RL Reading Lower								
265	10140340	Ronald Reagan & Reading Rd.		\$ 1,402,999	SSO 1001, 1020	Replacement collector following original alignment - 4336 ft of 12-21"	CONV	2 yr	
266	10142060	214 Clark St. Grating		\$ 277,351	CSO 507	Regulator Improvements-0.9 cfs	RI		0.4

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			2006 Dollars	2006 Dollars					Remaining CSO (MG/year)
267	10142080	Gebert St. Grating		\$ 277,350	CSO 509	Regulator Improvements-3.0 cfs	RI		0.1
268	10142100	531 Davis Street Grating		\$ 277,350	CSO 511	Regulator Improvements - 4.49 cfs	RI		0.0
269	10142140	Reading Rd @ Galbraith		\$ 3,854,201	CSO 670	Partial Separation	PS		2.2
270	10142160	Southern Ave. Grating		\$ 277,350	CSO 510A	Regulator Improvements- 0.6 cfs	RI		0.1
271	10142180	245 Clark St. Overflow		\$ 948,900	CSO 508	Partial Separation	PS		1.3
272	LDR Little Duck Regulators								
273	10171040	Camargo & East Fork Grating		\$ 277,345	CSO 69	Regulator Improvements - 8.4 cfs Relocated Completed CIP 96-12	RI		0.0
274	10171080	Plainville & Indian Hill		\$ 277,345	CSO 71	Regulator Improvements - 2.0 cfs Relocated Completed CIP 96-12	RI		0.3
275	10171100	4800 Jameson Grating		\$ 277,344	CSO 72	Regulator Improvements -1.7 cfs	RI		0.1
276	10171120	6402 Roe St. Grating		\$ 277,345	CSO 74	Regulator Improvements -3.2 cfs	RI		0.7
277	10171140	6333 Roe St. Grating		\$ 277,344	CSO 75	Regulator Improvements -7.9 cfs	RI		1.3
278	10171160	Bramble & Homer Grating		\$ 277,344	CSO 76	Regulator Improvements - 7.9 cfs	RI		1.3
279	10171180	3980 South Whetsel Grating		\$ 277,344	CSO 78	Regulator Improvements - 5.5 cfs	RI		0.3
280	10171200	Southern Ave. Grating		\$ 277,346	CSO 79	Regulator Improvements - 7.0 cfs	RI		1.5
281	10171220	Wooster @ Red Bank Div. Dam		\$ 277,343	CSO 656	Regulator Improvements Remove downstream flow restriction @ Beechmont Sluice Gate	RI		In 71920
282	LDCR Lower Duck Creek								
282a	10270190	Columbia Square Separation		\$ 555,514	CSO 469	CONV (NOTE 18)	CONV	NOTE 16	
283	10171380	5150 Wooster Pike Grating		\$ 2,180,499	CSO 85	Full Separation	FS		0.0
284	10171400	Archer St. Div. Dam, SEP		\$ 2,327,200	CSO 86	Partial Separation CIP 93-02 HW/DW Relocate	PS		1.9
285	10171500	Turpin St. Div. Dam (Dynamic Underflow Control)		\$ 277,349	CSO 472	Regulator Improvements (NOTE 18)	RI	NOTE 15	26.5
286	ICWWTP Indian Creek Wastewater Treatment Plant								
287	10110000	Indian Creek WWTP		\$ 299,238		Opt.Existing Facility, 8.2 - 10.8 MGD	Optimization	NOTE 1	
288	10110020	Cleves Pump Station		\$ 11,042,000	PSO 677	1.5 MG Storage w/new 3.6 MGD pumps and FM for wet weather flow	STOR	2 yr	
289	AC Amberely Creek								
290	10141160	Reading Rd. & Losantiville Rd.		\$ 824,968	SSO 1032	Replace collector following original alignment - 1793 ft of 12-18"	CONV	2 yr	
291	10142460	Beredith & Kincaid Grating		\$ 277,332	CSO 505	Regulator Improvements -8.3 cfs	RI		0.0
292	10142480	Ridge/Lakeview Div. Dam		\$ 277,332	CSO 651	Regulator Improvements -3.75 cfs	RI		0.3
293	10142500	6536 Cliffridge Grating		\$ 1,953,100	CSO 506	Partial Separation	PS		1.3
294	CRU Congress Run Upper								
295	10142520	146 Ridgeway Grating		\$ 277,350	CSO 535	Regulator Improvements -3.25 cfs	RI		0.0
296	10142540	60 St. Clair Grating		\$ 277,350	CSO 560	Regulator Improvement - 3.25 cfs	RI		0.0
297	10142580	No. 41 Sherry Grating		\$ 928,701	CSO 537	Partial Separation	PS		0.2
298	10141140	Ronald Reagan & Galbraith Rd.		\$ 784,079	SSO 1029	Replace collector following original alignment - 3005 ft of 15-21"	CONV	2 yr	
299		Replaced with Index 455							
300	10140880	W. Galbraith Road		\$ 3,181,999	SSO 568, 569	CIP 2008-25 (in planning)	CONV	2 yr	
301	10141100	Ronald Reagan & Galbraith		\$ 7,297,254	SSO 1029	Replace collector following original alignment - 15,583 ft of 21-48"; Tunnel 200 ft of 42"	CONV	2 yr	
302	TWLL Tributary to Winton Lake Lower								
303	10141020	Colerain & Galbraith Storage Facility	\$ 2,356	\$ 17,353,671	SSO 640	Below ground Storage, protects trunk sewer - 5.9 MG	STOR	2 yr	
304	10140820	Colerain - Jessup Replacement Sewer	\$ 2,406	\$ 5,893,498		Replace collector following original alignment - 12,950 ft of 15-60"; Tunnel 220 ft of 18-42"	CONV		
305	MA Montgomery All								

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REVISED WWIP ATTACHMENT 2 - JUNE 2018			Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
INDEX			2006 Dollars	2006 Dollars					
306	10170160	Dawson Rd. & Rosecrest Ave.		\$ 2,150,290	SSO 1008, 1014, 608	Replace existing pipe - Approx. 2600 LF of 18-27"	CONV	2 yr	
307	10170180	Miami Ave. N. Btwn Mardel Dr. & Euclid Rd.		\$ 3,023,001	SSO 1008	Replace existing pipe - Approx. 7300 LF of 15-21"	CONV	2 yr	
308	10170320	Miami Rd. W. @ Miami-Demar Rd.		\$ 1,369,644		Replace existing pipe - Approx. 1700 LF of 18"	CONV		
309	10170340	Graves Rd. @ Rheinstorm Park		\$ 1,795,303		Replace existing pipe - Approx. 3800 LF of 15-18"	CONV		
310	CCA	Clough Creek A							
311	10170120	Beechmont Ave. South of Birkshire		\$ 3,524,420	SSO 588	Replace existing pipe - Approx. 4000 LF of 27-30"	CONV	2 yr	
312	10170140	Birney Ln. South of Beechmont		\$ 1,929,768	SSO 588	Replace existing pipe - Approx. 4100 LF of 15-27"	CONV	2 yr	
313	10170220	Spindlehill Dr. @ Beechview Estates		\$ 17,284,000		Regional Storage - 4.6 MG	STOR		
314	10170240	Clough Pike @ Batavia Rd. & Corbly Rd.		\$ 18,560,565		Replace existing pipe - Approx. 9600 LF of 15-48"	CONV		
315	10170260	Clough Pike @ Bartels Rd. & Goldengate Dr.		\$ 2,298,465		Replace existing pipe - Approx. 3000 LF of 48"	CONV		
316	10170280	Berkshire Rd.		\$ 2,882,335		WIBs - Replace existing pipe - Approx. 4100 LF of 27-54"	CONV		
317	10170890	Berkshire HRT		\$ 17,781,369	CSO 182	EHRT - 44.3 MGD Community Priority (NOTE 2)	EHRT		18.3
317a	TBD	Mt. Washington Source Control Implementation			CSO 182	Partial Separation to Mitigate Sewer Back Ups (SBU)			Note 23
318	10170900	Clough Cir. Div. Dam		\$ 277,729	CSO 476	Regulator Improvements - 49.2 cfs Premised on operational changes at WWTP Four Mile P.S.	RI		2.4
319	10170860	Prospect Woods		\$ 819,293	PSO 861	Prospect Woods PS Upgrade (NOTE 18)	PSU	2 yr	
320	W	Winton							
321	10140620	Springfield Pike & Riddle Rd.		\$ 24,900,000		Partially buried Storage - Protects Interceptors; 9.4 MG, gravity in & out	STOR		
322	10141040	Winton Rd. & Lakeview Dr.		\$ 5,799,999		New parallel sewer to follow original alignment - 11,238 ft of 18-42' Sensitive Receiving Stream	CONV		
323	10141320	Greenpine Acres PS		\$ 609,699	PSO 794	PS Elim, PSO 794, w/sewer	CONV	2 yr	
324	10140800	Ronald Reagan & Hamilton		\$ 5,199,070	SSO 612, 1003	Replace collector following original alignment - 12,396 ft of 12-48"; Tunnel 80 ft of 36"	CONV	2 yr	
325	DAL	Delta Ave. Lower							
326	10172000	Kellogg @ Wilmer, REG		\$ 277,730	CSO 669	Regulator Improvement	RI		0.0
327	D	Deerfield							
328	10170980	Stewart & Ken Arbre Grating		\$ 277,349	CSO 554	Regulator Improvements - 4.1 cfs	RI		0.0
329	10171000	6735 Ken Arbre Grating		\$ 5,200,543	CSO 555	Sewer Separation	PS		8.9
330	10171020	Stewart Rd. West Regulator		\$ 11,779,329	CSO 556	Storage - 2.90 MG	STOR		17.5
331	RR	Rapid Run							
332	10130440	Wulff Run Creek, From Neeb Rd. to Viscount		\$ 3,293,342		Replace Interceptor in Wulff Run - 4500 ft of 24"	CONV		
333	10130460	Delhi Rd & Oakwood Park Dr.		\$ 8,389,474	SSO 623	Storage Tank capturing SSO 623 - 1.25 MG w/3 MGD pump	STOR	2 yr	
334	10130500	Delhi Rd. East to Schroer Ave.		\$ 1,524,556		Replace Interceptor along original alignment through Delhi - 5500 ft of 18-24"	CONV		
335	10130760	Rapid Run & Devils Backbone		\$ 26,634,390	CSO 523	EHRT - 106 MGD Community Priority (NOTE 2)	EHRT		55.3
336	TWLU	Tributary to Winton Lake Upper							
337	10142260	Daly Rd. Vortex Separator		\$ 63,483,831	CSO 532	EHRT - 204.7 MGD Community Priority (NOTE 2)	EHRT		33.9
338	LDC	Lower Duck Conveyance							
339	10170200	Wooster Pike & West St.		\$ 1,844,367		WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
340	10170680	Plainview Rd.		\$ 1,580,886		WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
341	SP	Sycamore Plan							
342	10160020	Montgomery & Deerfield		\$ 192,639		Replace pipe - 500 ft of 18"	CONV		
343	CCB	Clough Creek B							

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			2006 Dollars	2006 Dollars					
344	10170300	Gungadin Dr. W. of 5 Mile & Paddison		\$ 4,716,433		Replace existing pipe - Approx. 8800 LF of 21-27"	CONV		
345	10170360	Concordridge Dr. & Hunley Rd.		\$ 5,019,056		Replace existing pipe - Approx. 6600 LF of 15-18"	CONV		
346	10170380	Lawyer Rd. @ Heatherwood Ln.		\$ 786,806		Replace existing pipe - Approx. 2100 LF of 15"	CONV		
347	10170480	Clough Pike @ Goldengate Dr.		\$ 4,263,535		Replace existing pipe - Approx. 6100 LF of 21-27"	CONV		
348	10170500	Clough Pike @ Wolfangle Rd.		\$ 2,185,711		Replace existing pipe - Approx. 5300 LF of 18-21"	CONV		
349	PRWWTP	Polk Run Wastewater Treatment Plant							
350	10150020	Polk WWTP STO Storage Tank		\$ 16,936,648		Storage - 6 MG (NOTE 1)	STOR		
351	10150015	Polk Run WWTP Optimization Ph4		\$ 8,156,003		Polk Run WWTP Optimization Ph4	Optimization	NOTE 1	
352	10150080	Polk WWTP STO Replace Pipe		\$ 5,852,872		Replacement pipe - 800 ft of 30"/1 MG tank	CONV/STOR		
353	10150100	Polk WWTP CNV Map 015		\$ 1,141,145		Replacement pipe - 2700 ft of 15-18"	CONV		
354	10150140	Polk WWTP CNV Map 002		\$ 5,424,227		Replace pipe (200 ft of 18"). New PS & Storage tank	CONV/STOR		
355	10150160	Polk WWTP CNV Map 010		\$ 12,937,008		Replace pipe - 7000 ft of 36 - 48"	CONV		
356	CA	California Plan							
357	10170400	5 Mile Rd. & Old Kellogg		\$ 7,976,701		Replace existing pipe - Approx. 5000 LF of 36-54"	CONV		
358	10170420	5 Mile Rd. & Birney Ln.		\$ 6,037,842		Replace existing pipe - Approx. 2000 LF of 42"	CONV		
359	10170440	4 Mile Rd. @ I-275		\$ 5,890,945		Replace existing pipe - Approx. 7400 LF of 21-30"	CONV		
360	10170460	Indian Creek Rd.		\$ 3,739		Seal Manhole Lids	Seal Manhole Lids		
361	10170540	Kellogg Ave. @ Coney Island		\$ 7,195,266		Replace existing pipe - Approx. 6200 LF of 54-66"	CONV		
362	WOL	West Ohio Lower							
363	10144660	Delhi Ave. Div. Dam		\$ 583,399	CSO 420	Partial Separation	PS		0.1
364	10144680	River Rd. @ Delhi Div. Dam		\$ 857,500	CSO 421	Partial Separation	PS		0.2
365	10144760	Bold Face Sr. Div. Dam		\$ 96,810,229	CSO 419	EHRT - 275 MGD (NOTE 2)	EHRT		137.2
366	10144780	Mt. Echo Rd. Regulator		\$ 277,350	CSO 422	Regulator Improvements - 22.2 cfs	RI		13.4
367	10144800	Mt. Hope Ave. Regulator		\$ 13,886,537	CSO 423	Storage-3.5 MG	STOR		24.9
368	KRU	Kings Run Upper							
369	10142940	Ross Run Regulator		\$ 277,300	CSO 485	Regulator Improvements -70.4 cfs	RI		29.1
370	10143180	Wooden Shoe Regulator	\$ 13,723	\$ 25,596,976	CSO 217A	Partial Separation with Storage - 1.5 MG (project included in Revised Original LMCP)	STOR/PS		
371	10143000	Kings Run and Spring Cove		\$ 2,245,402	CSO 486	Partial Separation	PS		0.4
372	10143040	Ross Run Grating		\$ 186,895,962	CSO 487	EHRT - 584 MGD (NOTE 2)	EHRT		289.2
373	10143140	Kings Run Regulator		\$ 5,487,501	CSO 483	Partial Separation (project included in Revised Original LMCP)	PS		
374	HS	Hopple Street							
375	10142760	Vinton St. Regulator - CSO 8		\$ 277,301	CSO 8	Regulator Improvements - 1.54 cfs	RI		0.9
376	WF	West Fork							
377	10143680	Powers No. 1 Grating		\$ 277,349	CSO 527A	Regulator Improvements - 4.6 cfs	RI		0.4
378	10143700	Beekman North Grating		\$ 277,350	CSO 528A	Regulator Improvements - 3.0 cfs	RI		0.2
379	10143720	Beekman South Grating		\$ 277,350	CSO 528B	Regulator Improvements - 8.5 cfs	RI		0.9
380	10143740	Liewellen Grating		\$ 277,350	CSO 529B	Regulator Improvements - 3.9 cfs	RI		0.1
381	10143760	Hoffner Grating		\$ 359,200	CSO 123	Partial Separation	PS		0.0
382	10143780	Hays Grating		\$ 895,800	CSO 127	Partial Separation (project included in Revised Original LMCP)	PS		0.2
383	10143800	Todd No. 2 Grating		\$ 1,337,900	CSO 128	Partial Separation (project included in Revised Original LMCP)	PS		0.3
384	10143860	Butte/Todd 1/Twin Grating		\$ 85,000,001	CSO 130	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer	CONV		56.3

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REVISED WWIP ATTACHMENT 2 - JUNE 2018			Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan
			2006 Dollars	2006 Dollars					Remaining CSO (MG/year)
385	10143820	Badgeley Run Grating - incl. with 10143820			CSO 125	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer, Cost in CSO 130	CONV		68.9
386	10143840	Todd 1 Grating, CNV - incl. with 10143820			CSO 126	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer, Cost in CSO 130	CONV		33.2
387	10143880	Twin Grating, CNV - incl. with 10143820			CSO 203	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer, Cost in CSO 130	CONV		5.4
388	10143900	Dreman Grating - incl. with 10143820			CSO 117A	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer, Cost in CSO 130	CONV		9.4
389	EL	Elmwood Lower							
390	10142640	Vine St. Div. Dam		\$ 1,019,100	CSO 544	Partial Separation	PS		0.1
391	10142660	Murray Rd. Div. Dam		\$ 510,101	CSO 653	Partial Separation	PS		0.4
392	10142700	Bloody Run Regulator		\$ 75,958,176	CSO 181	EHRT - 230 MGD (NOTE 2)	EHRT		215.1
393	EO1U	East Ohio 1 Upper							
394	10144160	Gest St. West-2-A Div. Dam, STO			CSO 430	In-line Storage in existing piping (also 431 & 432)	STOR		27.6
395	10144180	9th & McLean Div. Dam, STO			CSO 432	In-line Storage in existing piping (also 430 & 431A)	STOR		5.2
396	10144200	Blackford St. Regulator		\$ 2,702,301	CSO 431A	In-line Storage in existing piping (also 430 & 432) Dewater pump station for 2.0 MGD	STOR		102.5
397	EO2	East Ohio 2							
398	10144220	Pike St. Div. Dam		\$ 277,350	CSO 449 444	Regulator Improvement - 1.0 cfs	RI		0.1
399	10144240	Collard St. Regulator		\$ 277,349	CSO 453A 447	Regulator Improvement - 2.6 cfs	RI		0.3
400	10144260	Riverfront Coliseum Regulator		\$ 1,530,200	CSO 447 443	Partial Separation	PS		0.1
401	10144320	Parsons St. Div. Dam		\$ 277,350	CSO 452 446	Regulator Improvement - 8.5 cfs	RI		4.1
402	10144340	Eggleston & 4th Div. Dam		\$ 27,874,917	CSO 461	EHRT - 120 MGD (NOTE 2)	EHRT		119.2
403	10144360	Eggleston & 3rd F. Div.		\$ 277,350	CSO 464 462	Regulator Improvement - 6.4 cfs	RI		3.6
404	10144380	Eggleston & 3rd		\$ 277,350	CSO 465 463	Regulator Improvement - 2.0 cfs	RI		1.0
405	10144400	Eggleston & 3rd E. Div.		\$ 277,349	CSO 465E 464	Regulator Improvements- 5.8 cfs	RI		2.8
406	10144420	Eggleston & Pete Rose Way		\$ 277,350	CSO 466E 465	Regulator Improvement - 2.6 cfs	RI		1.6
407	WOU	West Ohio Upper							
408	10144700	Evans & 6th Street Div.		\$ 381,500	CSO 668	Partial Separation	PS		0.5
409	10144720	Evans & River Rd. No. 1 Div.		\$ 97,801	CSO 426A 426	Full Separation	FS		0.3
410	10144740	Evans & River Rd. No. 2 Div.		\$ 1,682,099	CSO 426B 427	Partial Separation	PS		0.5
411	10144820	River Rd. @ State Div. Dam		\$ 4,237,794	CSO 424	Partial Separation	PS		5.2
412	10144860	State Ave. Div. Dam		\$ 277,351	CSO 425B 425	Regulator Improvement - 1.7 cfs Overcontrol @ CSO 419	RI		8.5
413	EO1LW	East Ohio 1 Lower West							
414	10144020	Baymiller St. Regulator		\$ 277,333	CSO 435	Regulator Improvements-11.2 cfs	RI		6.6
415	10144040	Carr St. Regulator		\$ 2,638,500	CSO 433	Partial Separation	PS		1.0
416	10144060	Carr & Front Div. Dam		\$ 824,599	CSO 434	Partial Separation	PS		0.2
417	10144120	7th & Mclean Div. Dam		\$ 785,300	CSO 489	Partial Separation	PS		0.1
418	10144140	Gest & Front Regulator		\$ 4,587,403	CSO 436	Partial Separation	PS		8.4
419	CRL	Congress Run Lower							
420	10142560	Lockland & Highway Grating		\$ 2,876,601	CSO 490	Partial Separation	PS		0.9
421	10142600	Vine & Decamp Div. Dam		\$ 8,274,751	CSO 171	Storage - 2.00 MG	STOR		23.0
422	KRL	Kings Run Lower							
423	10142960	Station Ave. A. Div Dam		\$ 277,301	CSO 26A	Regulator Improvements - 7.1 cfs	RI		0.0
424	10142980	Clifton Ave. West Grating		\$ 1,159,300	CSO 480	Partial Separation	PS		1.3

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INDEX		REVISD WWIP ATTACHMENT 2 - JUNE 2018		Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
		2006 Dollars	2006 Dollars	2006 Dollars	2006 Dollars					
425	EO3W	East Ohio 3 West								
426	10144440	Walden St. Div. Dam		\$	6,473,599	CSO 455-450	Partial Separation	PS		3.3
427	10144460	Hazen St. Div. Dam		\$	1,459,000	CSO 456-451	Partial Separation	PS		1.0
428	10144480	Collins St. West Div. Dam		\$	1,323,000	CSO 457-452	Partial Separation	PS		0.2
429	10144520	Hazen St. @ Glen Alley Div.		\$	541,898	CSO 658	Full Separation	FS		0.0
430	10144560	Litherbury St. South Div.		\$	136,000	CSO 454B-449	Full Separation	FS		0.0
431	10144580	Collins St. West Regulator		\$	1,272,000	CSO 457A-453	Partial Separation	PS		0.5
432	10144600	Collins St. East Div. Dam		\$	19,890,435	CSO 458	Storage - 6.0 MG Consolidate with CSO 460	STOR		10.1
433	10144640	Litherbury St. North Div.		\$	277,350	CSO 454A-448	Regulator Improvement - 5.5 cfs	RI		12.7
434	EO1LE	East Ohio 1 Lower East								
435	10144000	3rd St. @ Central Ave.		\$	277,331	CSO 438A-439	Regulator Improvements-52.4 cfs	RI		8.9
436	10144100	Central Ave. Grating		\$	3,683,099	CSO 438	Partial Separation	PS		14.3
437	NSL	North Side Lower								
438	10143200	Geringer St. Grating		\$	277,300	CSO 19	Regulator Improvement - 7.6	RI		0.9
439	EU	Elmwood Upper								
440	10142620	Maple St. Div. Dam		\$	277,301	CSO 37	Regulator Improvements - 6.2 cfs	RI		1.3
441	10142720	64th St. Div. Dam		\$	2,280,418	CSO 39	Partial Separation	PS		2.2
442	10142740	68th St. Div. Dam		\$	277,301	CSO 488	Over Control at 181 to eliminate conveyance element	RI		35.3
443	SGL	Spring Grove Lower								
444	10143360	4710 Howard Grating		\$	277,300	CSO 110	Regulator Improvements -2.90 cfs	RI		0.3
445	10143400	Springlawn Grating		\$	1,406,906	CSO 111	Partial Separation	PS		4.1
446	10143420	1547 Springlawn Grating		\$	1,218,799	CSO 112	Partial Separation	PS		0.7
447	EO3E	East Ohio 3 East								
448	10144500	Bayou St. 120 West Regulator		\$	471,800	CSO 459	Partial Separation	PS		0.3
449	10144540	Eastern and Gotham		\$	2,435,600	CSO 667	Partial Separation	PS		2.6
450	10144620	Bayou St. 100 West Div. Dam		\$	6,668,046	CSO 460/458	Consolidate with CSO 458	CONV		14.7
451	LMCFR	Lower Mill Creek Final Remedy								
452	10145380	Mill Creek "Lower 11 CSO" Phase 2 CSO controls				2, 3, 4, 5, 6, 7, 9, 666, 152, 428, and 429 ("Lower 11 CSOs")	Storage, conveyance, strategic separation, green infrastrucutre, using MSD's Integrated Watershed Planning approaches at the listed CSOs or in the LMC basin	NOTE 7		85% capture or control (aggregate) ⁹
453		Phase 2 Default (Lower Mill Creek Final Remedy)		\$	305,658,000	33, 10, 11, 12, 13, 14, 15, 22, 23, 24, 482, 28, 29, 30, 025A, Este, 18, 21, 017B	Default tunnel/conveyance (NOTE 18)	NOTE 8		85% capture or control (aggregate) ⁹
454	10130745	Werk & Westbourne Grating				CSO 522	EHRT - Sized so that, in conjunction with Attachment 1B EHRT, total EHRT capacity is at least 106 MGD	EHRT		64.7

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INDEX	REVISED WWIP ATTACHMENT 2 - JUNE 2018		Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars					
455	10141180	SSO 700 Final Remedial Plan (FRP) (Note 19)		\$ 96,200,000	SSO 700	24.8 MG storage and conveyance, in accordance with LCMFR and the SSO Final Remedial Plan approved by the Regulator's on [date]. Project also includes those included in Index No. 224-228 and upsizing of two (2) sewer segments as noted in the April 25, 2018 SSO 700 FRP.	STOR		
456	TOTAL PHASE 2 WITHOUT PHASE 2 ALLOWANCES		NOTE 14	NOTE 14					

NOTES:		
1	PROJECT COMPLETE AND IN SERVICE AT SPECIFIED CAPACITY	
2	FOR ALL PROJECTS WITH EHRT TECHNOLOGY VOLUME SHOWING IS REMAINING UNTREATED OVERFLOW - SEE ATTACHMENT 5.	
3	THIS NOTE LEFT INTENTIONALLY BLANK	
4	CAPP DESIGN: ALL CAPP SEWER PROJECTS WILL BE DESIGNED TO MEET THE 10 YEAR DESIGN STORM EVENT. ALL CAPP PUMP STATION AND STORAGE FACILITIES WILL BE DESIGNED TO MEET THE 2 YEAR DESIGN STORM EVENT. THE 2 AND 10 YEAR DESIGN STORMS ARE SCS TYPE II - 24 HOUR EVENTS.	
5	FOR THESE RTC PROJECTS, THE STATED REDUCTION IN THE TYPICAL YEAR CSO DISCHARGE VOLUME SHALL ALSO BE THE PERFORMANCE CRITERIA FOR THE FACILITY.	
6	PERFORMANCE CRITERIA FOR CSO VOLUMES REMAINING AFTER IMPLEMENTATION OF CSO CONTROLS ARE THE VOLUMES NOT TO BE EXCEEDED AT A PARTICULAR OUTFALL DURING MSDGC'S TYPICAL YEAR RAINFALL (1970). COMPLIANCE WITH THESE CRITERIA WILL BE EVALUATED BY IMPLEMENTATION OF A POST CONSTRUCTION MONITORING PROGRAM (WHICH WILL BE SUBMITTED TO THE REGULATORY AGENCIES FOR REVIEW AND APPROVAL IN ACCORDANCE WITH THE GLOBAL CONSENT DECREE) THAT WILL UTILIZE MSDGC'S HYDROLOGIC AND HYDRAULIC MODEL TO NORMALIZE THE RESULTS OF THE POST CONSTRUCTION MONITORING TO THE TYPICAL YEAR.	
7	DEFENDANTS MAY PROPOSE WORK AT ADDITIONAL CSOs IN THE LMC BASIN IN ACCORDANCE WITH THE PROVISIONS OF THE WWIP.	
8	THE DEFAULT FINAL REMEDY FOR THE LOWER MILL CREEK FINAL REMEDY ("LMCFR") IS A TUNNEL(S)/CONVEYANCE, TO BE DESIGNED WITH REFERENCE TO THE FINAL LMCFR AND TO MEET THE APPLICABLE PERFORMANCE CRITERIA. THE PERFORMANCE CRITERIA FOR THESE CSOs WERE EXPRESSED AS "PLAN REMAINING CSO" VOLUMES, BASED ON MODELING PERFORMED AT THE TIME OF THE DEVELOPMENT OF THE WWIP. THE UPDATED PERFORMANCE CRITERION IS EXPRESSED AS 85% CAPTURE OR CONTROL, ACKNOWLEDGING UPDATED MODELING INFORMATION. GIVEN THE KNOWLEDGE GAINED BY DEFENDANTS OF THE LOWER MILL CREEK BASIN OVER THE PERIOD 2009-2012, AND THE PROJECTS INCLUDED IN THE REVISED ORIGINAL LMCFR, THE DEFENDANTS PROPOSE AND THE REGULATORS UNDERSTAND THAT CONSTRUCTION OF THE CSO TUNNEL IS LIKELY NOT THE COST-EFFECTIVE ALTERNATIVE FOR THE LMCFR. THE WWIP ENVISIONED THAT AN ALTERNATIVE OTHER THAN THE LMCFR TUNNEL COULD BE APPROPRIATE FOR THE LMCFR AND ALLOWS DEFENDANTS TO PROPOSE A DIFFERENT LMCFR PURSUANT TO THE WWIP. THE DEFENDANTS HAVE EXPRESSED INTENT TO TIMELY SUBMIT AN APPROVABLE PROPOSAL FOR A REVISED LMCFR THAT REFLECTS DEFENDANTS' INTEGRATED WATERSHED PLANNING APPROACH FOR THE AGGREGATED CSO FLOWS IN THE LOWER MILL CREEK BASIN. THE REGULATORS UNDERSTAND THIS INTENT AND IF A PROPOSAL IS SUBMITTED THAT IS CONSISTENT WITH THE PROVISIONS OF THE WWIP, THE REGULATORS ANTICIPATE APPROVING IT.	
9	"PERCENT CAPTURE OR CONTROL" REFERS TO THE DIFFERENCE OF INFLOW VOLUME MINUS OVERFLOW VOLUME, DIVIDED BY INFLOW VOLUME, MULTIPLIED BY 100 $(((\text{INFLOW-OVERFLOW})/\text{INFLOW}) \times 100)$, AS PREDICTED IN A TYPICAL YEAR USING THE MOST CURRENT MODEL APPLICABLE TO THE WATERSHED UPON ACHIEVEMENT OF FULL OPERATION. FOR THE PURPOSE OF COMPUTING "PERCENT CAPTURE OR CONTROL," INFLOW VOLUMES ARE THOSE PREDICTED BY MSDGC'S MOST CURRENT MODEL (1) USING MSDGC'S TYPICAL YEAR RAINFALL (1970); AND (2) BASED ON PRE-CONTROL CONDITIONS, DERIVED IN A MANNER CONSISTENT WITH HOW BASELINE CONDITIONS WERE DEFINED IN MSDGC'S JUNE 2006 "WET WEATHER IMPROVEMENT PROGRAM; VOLUME II, CSO LONG TERM CONTROL PLAN UPDATE REPORT," SECTION 4.7 ON PAGE 4-14. FOR THE PURPOSE OF COMPUTING "PERCENT CAPTURE OR CONTROL" OVERFLOW VOLUMES ARE THOSE PREDICTED BY THE MOST CURRENT MSDGC SYSTEM-WIDE MODEL FOR THE TYPICAL YEAR RAINFALL (1970) FOR POST-CONTROL CONDITIONS. COMPLIANCE WITH THESE CRITERIA WILL BE EVALUATED BY IMPLEMENTATION OF A POST CONSTRUCTION MONITORING PROGRAM (WHICH WILL BE SUBMITTED TO THE REGULATORY AGENCIES FOR REVIEW AND APPROVAL IN ACCORDANCE WITH THE GLOBAL CONSENT DECREE) THAT WILL UTILIZE MSDGC'S HYDROLOGIC AND HYDRAULIC MODEL TO NORMALIZE THE RESULTS OF THE POST CONSTRUCTION MONITORING TO THE TYPICAL YEAR.	
10	FOR PHASE 1, THE PERFORMANCE IS 166 MG IN THE TYPICAL YEAR. PERFORMANCE CRITERIA OF 123.4 (ROV INDEX 95 & 96) IN THE TYPICAL YEAR WILL BE ACHIEVED WITH COMPLETION OF THE WWIP IMPROVEMENTS AT THE LITTLE MIAMI WWTP. DEFENDANTS WILL ALSO: 1) INSTALL DYNAMIC UNDERFLOW CONTROL AT CSO 472 AND 83; AND 2) CONNECT THE SEPARATED COLUMBIA SQUARE STORM SEWER TO THE OUTFALL SEWER AND ROUTE TO THE OHIO RIVER (SEE ATTACHMENT 2, INDEX 255, INDEX 282a & INDEX 285).	
11	PROJECT IN ATTACHMENT 1B INDEX ROW 79 WAS AN INTERIM UPGRADE TO THE MUDDY CREEK WWTP RAW SEWAGE AND EFFLUENT PUMPING CAPACITIES, TO ACHIEVE MINIMUM FIRM INFLUENT AND EFFLUENT PUMPING CAPACITIES BOTH OF 28 MGD. FINAL FIRM INFLUENT PUMPING CAPACITY OF 35 MGD WILL BE ACHIEVED AS PART OF PHASE 2 PROJECT 10130000 (SEE ATTACHMENT 1B, INDEX ROW 151 & ATTACHMENT 2, INDEX ROW 215).	
12	SCOPE OF WORK OF ATTACHMENT 2 INDEX ROW 248 INCLUDES AN EVALUATION TO DETERMINE POTENTIAL INCORPORATION OF PROJECT 10145500 (REMOVED FROM ATTACHMENT 1B INDEX ROW 103 & ADDED TO ATTACHMENT 2 INDEX ROWS 247a) FOR MILL CREEK WWTP OUTFALL IMPROVEMENTS) AND PROJECT 10145580 (REMOVED FROM ATTACHMENT 1B INDEX 105 & ADDED TO ATTACHMENT 2 ROWS 247b) FOR MILL CREEK WWTP ADDED SLUDGE PUMPING.	
13	THIS REVISED WWIP ATTACHMENT 2 DATED MAY 2018 INCLUDES THE MAY 30, 2013 APPROVED REVISED ORIGINAL LMCFR PROJECTS IN INDEX ROWS 370, 373, 382, 383, 452 & 453; OCTOBER 8, 2015 APPROVED PROJECT CHANGES IN INDEX ROWS 215, 248, & 454 AS A RESULT OF THE SEPTEMBER 2015 PHASE 1 ADAPTIVE MANAGEMENT PROCESS AND THE APRIL 3, 2018 CONDITIONAL APPROVAL OF THE BRIDGE.	
14	COSTS FOR PROJECTS REFLECT THE COST IDENTIFIED IN THE 2009 WWIP EXCEPT FOR PROJECTS CHANGED OR ADDED THROUGH "ADAPTIVE MANAGEMENT".	
15	INSTALL UP-SIZED UNDERFLOW PIPES EQUIPPED WITH AUTOMATIC FLOW CONTROL GATES ON CSO 083 AND CSO 472, AND CONNECT THOSE AUTOMATIC GATES TO A SCADA SYSTEM TO ALLOW REMOTE AND POSSIBLY AUTOMATIC OPERATION OF THOSE GATES BASED ON FLOW CONDITIONS BOTH IN THE COLLECTION SYSTEM BOTH IN THE PROXIMITY OF THESE CSOS AS WELL AS IN THE INTERCEPTOR DOWNSTREAM OF THE TWO CSOS.	

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INDEX		REVISD WWIP ATTACHMENT 2 - JUNE 2018		Sunk Costs	Remaining Costs (NOTE 14)	CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan
		2006 Dollars	2006 Dollars	Remaining CSO (MG/year)						
	16	SEPARATE THE COLUMBIA SQUARE DEVELOPMENT SITE BY CONNECTING THE SITE STORM SEWERS TO A CURRENTLY UNUSED SEWER (PREVIOUSLY USED AS THE CSO 469 UNDERFLOW SEWER), AND CONSTRUCTING A NEW SEWER TO DIVERT THAT CURRENTLY UNUSED SEWER TO THE CSO 469 OUTFALL DOWNSTREAM OF THE REGULATOR.								
	17	SEE SSO 700 FINAL REMEDIAL PLAN, REISSUED APRIL 25, 2018.								
	18	PROJECT IS INCLUDED AS PART OF THE 2018 "BRIDGE" - EITHER IN WHOLE OR IN PART.								
	19	THIS INCLUDES THE PROJECTS OUTLINED IN THE SSO FRP (APRIL 25, 2017) WHICH INCLUDES INDEX NO. 224-228 ESTIMATED AT \$40.6M, \$79.8M for 24.8 MG STORAGE FACILITIES AND \$3.5M FOR UPSIZING TWO SEGMENTS OF SEWERS.								
	20	NO CHANGE IN PLAN REMAINING CSO FOR THE CSOs IDENTIFIED FOR INDEX 215b.								
	21	INDEX 235a IS ADDED TO COMPLEMENT PROJECT INDEX 235.								
	22	INDEX 236a IS ADDED TO COMPLEMENT PROJECT INDEX 236.								
	23	INDEX 317a IS ADDED TO COMPLEMENT PROJECT INDEX 317.								
	24	PUMP STATION PROJECT RELATED TO INDEX 200 LMWWTP EHRT PROJECT AND SUBJECT TO CHANGE DEPENDING ON FINAL EHRT DESIGN.								

Appendix B: Phase 2A Project Fact Sheets

Hamilton County Phase 2A Fact Sheet

Index 193 – CSO 552 Improvements proposed to be changed to Index 193R – CSO 552 Partial Separation

Renamed	CSO 552 Partial Separation		
Dependency on other Projects	None		
Technology	Partial Separation		
WWIP Required Performance Criteria (Plan Remaining CSO Volume)	No Change (18.6 MG/Typ Year)		
Phase 2A Scope	Planning & Design		
Original Cost (2006\$) WWIP Attachment 2	\$242,109	Updated Total Project Cost (2006\$)	\$1,581,449
Phase 2A Spending (2006\$)	\$316,290		
Control of Annual CSO Volume	No change; achieved percent control will be determined during post-construction monitoring	Current Overflow	112.7 MG/Typ Year
		Project Overflow Reduction	Comparable or better aggregate control of annual volume as the original project
Project Category	Attachment 2 project (proposed Index 193R adaptively managed)		

The original Attachment 2 conceptual project was a Regulator Improvement with a goal of 19.4 cfs underflow capacity. The original project was planned to upgrade the Regulator with floatables control and a larger diameter underflow pipe. The CSO 552 increase in underflow capacity needed to be completed in conjunction with reductions in the upstream CSO underflow capacities associated with CSOs 170, 549, 550 and 500 which are to be routed to a future Upper Duck EHRT facility. Constraints relative to this approach include limited available interceptor capacity downstream to accept these higher flows which was not fully understood at the time of the WWIP project development. The proposed Little Miami EHRT will also increase interceptor capacity in this area affecting the necessary underflow capacity for CSO 552.

The intent of the Adapted CSO 552 Partial Separation project is to move forward with an interim project to separate storm flows before they reach the combined sewer to reduce peak storm flows and volumes entering the combined sewer. Because this project is partial separation it can be implemented independently of other Upper Duck All Bundle projects, including the Upper Duck EHRT and the Little Miami EHRT to provide immediate CSO reduction benefits. The final project to achieve the Final WWIP Remaining Overflow Volume (ROV), if necessary, will be determined and implemented in a future Phase 2 project.

Hamilton County Phase 2A Fact Sheet

Partial separation of 30 acres of area along Ridge Avenue is proposed. Existing inlets to the CSO sewer will be plugged. Stormwater flow will be transferred to an improved storm outlet in the adjacent CSO 214 watershed. The existing storm sewer outlet will be upgraded to convey the additional storm flows. The separated storm flow will be routed into proposed storm piping and into a proposed underground detention storage facility to be located in an existing parking lot. Bioretention/storage cells are also proposed to be added within the parking lot areas to reduce stormwater runoff peak flows. The project will collect stormwater flows from 4 sources: flow from the northern neighborhoods, the west side of the Cintas property, the former Kmart parking lot, and a former bank parking lot. These flows will then be slowly released either back into the combined sewer or into a new storm sewer coordinated with the CSO 214 partial separation project (being constructed in the WWIP Bridge). The project components and sizing will be refined based upon discussions with existing property owners and also to provide sufficient stormwater treatment BMPs to treat the separated stormwater. Floatables control will be added to the existing CSO 552 overflow along with other miscellaneous upgrades to the regulator chamber.

The proposed project will be designed to maximize CSO reduction with any additional project work to meet the WWIP ROV occurring in a future Phase 2 project. The collection system model in this area requires further calibration and validation to confirm the remaining overflow volume for this partial separation project.

The following graphics illustrate the location of the originally planned CSO 552 regulator improvements and the planned stormwater partial separation project.

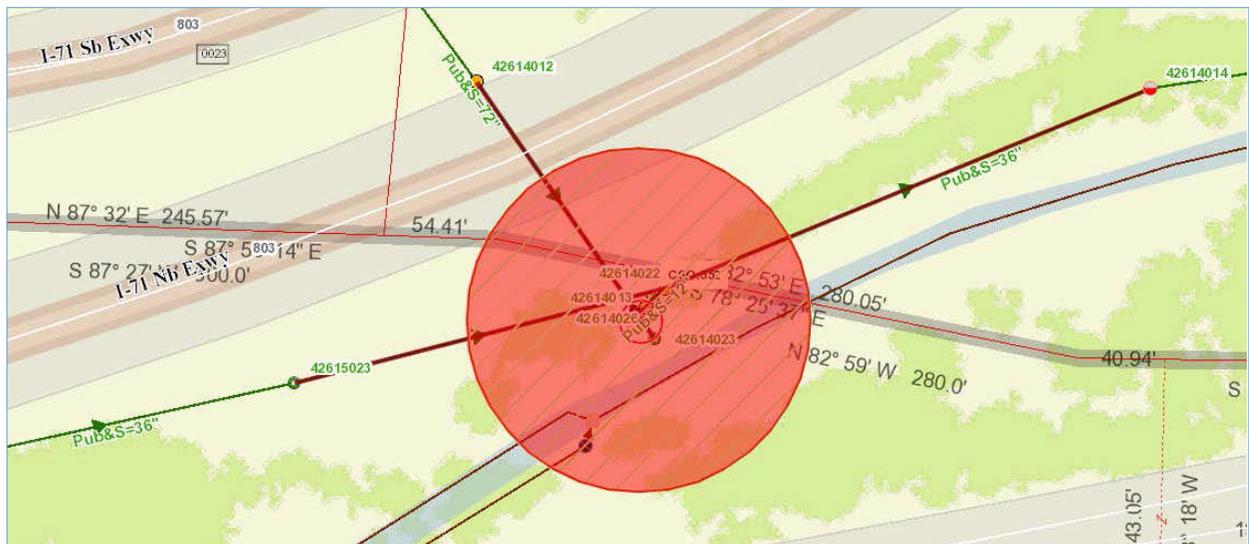


Figure 1. CSO 552 Regulator Improvements

Hamilton County Phase 2A Fact Sheet

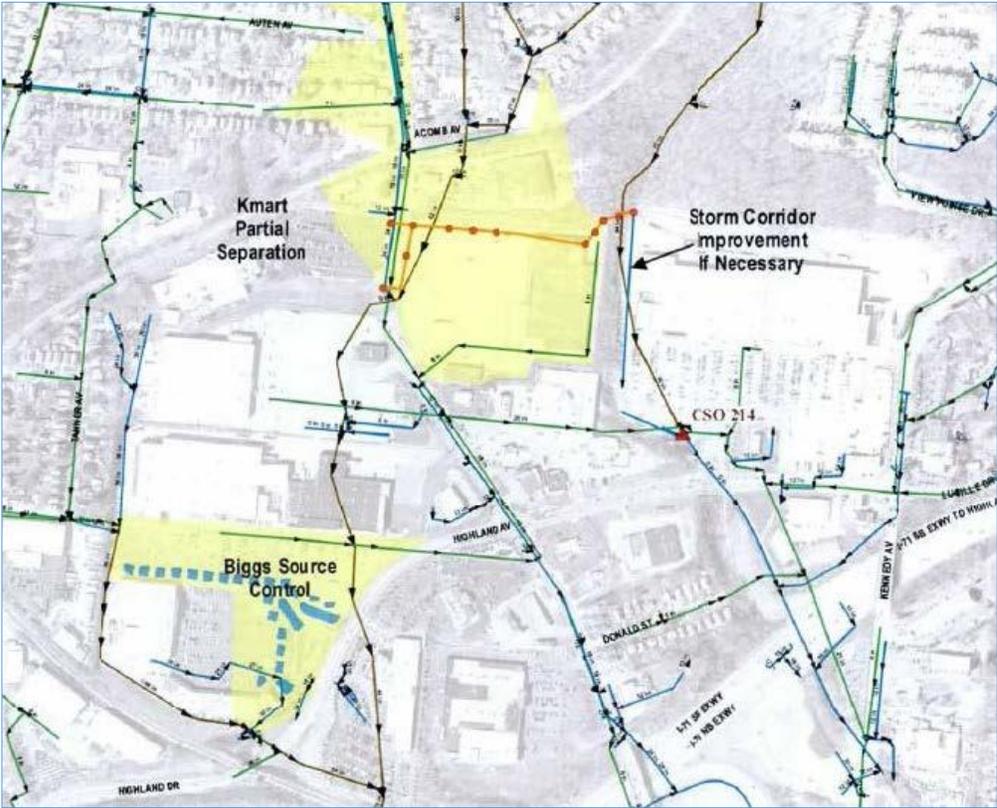


Figure 2. Proposed CSO 552 Stormwater Removal Project

Hamilton County Phase 2A Fact Sheet

Indices 195, 196, 198, 205, 206 – Little Miami WWTP bundled projects proposed to be changed to Indices 195R, 196R, 198R, 205R, 206R – LMWWTP PS Upgrades for EHRT Part 1 & Part 2

Renamed	Little Miami WWTP PS Upgrades for EHRT (Part 1 & Part 2)		
Dependency on other Project	WWTP EHRT		
Technology	WWTP EHRT		
WWIP Required Performance Criteria	No Change (Plan CAPP: Note 1 - Project complete and in service at specified capacity)		
Phase 2A Scope	Part 1 - Planning, Design & Construction Part 2 – Planning & Design		
Original Cost (2006\$) WWIP Attachment 2	\$45,551,497	Partial Project Cost (2006\$) (to be confirmed with ongoing planning)	\$17,007,903 (Part 1) \$13,185,695 (Part 2)
Phase 2A Spending (2006\$)	\$17,007,903 (Part 1) \$2,637,139 (Part 2)		
Control of Annual CSO Volume	New project; EHRT will reduce upstream CSO volume*	Current Overflow	Data requested*
		Project Overflow Reduction	Comparable or better aggregate control of annual volume as the original projects*
Project Category	Attachment 2 projects (proposed Indices 195R, 196R, 198R, 205R & 206R adaptively managed)		

*Preliminary projected overflow volume reductions requested from MSD for this new solution, but have not yet been received. Model to be fully calibrated and validated during Phase 2A.

The current WWIP Little Miami WWTP (LMWWTP) Bundle (Attachment 2 Indices 195 – 206) was developed to increase the wet weather treatment capacity of the LMWWTP from 85 MGD to 100 MGD and address several asset management needs at the LMWWTP. The bundle was also developed with the assumption that the Little Miami Incinerator would remain in-use for sludge disposal.

Since the time this bundle was originally developed, new information has been learned during WWIP Phase 1 about the flows in the collection system and the WWTP Auxiliary Outfall overflow volume. In addition, new emission regulations were enacted by EPA that necessitated a shutdown of the LMWWTP incinerator. Subsequently, dewatered sludge was planned by MSDGC to be hauled to the Mill Creek WWTP for central incineration, however, this plan was later stopped by the Mayor of Cincinnati to curtail hauling sludge across the City and odor concerns. The County directed the City to develop a coordinated and holistic District-wide solids management master plan. The County also directed the master plan consider the disposal of food waste in coordination with the Hamilton County Solid Waste District. The master plan is currently under development with completion

Hamilton County Phase 2A Fact Sheet

expected by the end of 2018. Currently, dewatered sludge from the LMWWTP is hauled to a landfill.

In addition, it was learned during WWIP Phase 1, that existing conveyance capacity to the LMWWTP is available to currently convey more than 100 MGD to the LMWWTP. MSDGC reports indicate peak wet weather flows in the range of 250 MGD to 300 MGD can currently be conveyed to the LMWWTP. These larger peak flows are not only a root cause of CSOs upstream in the collection system, but also lead to large overflow volumes at the LMWWTP through the Auxiliary Outfall. MSDGC's current model, which is not yet calibrated and validated, reports 725 – 750 MG of overflow volume in the typical year from the WWTP Auxiliary Outfall. It was also learned during WWIP Phase 1 that prior versions of the WWIP included an EHRT at the LMWWTP and the existing RTC chamber was built to accommodate a future connection to an EHRT. This EHRT was not included in the approved Final WWIP and may have inadvertently been left out because the current Final WWIP does not include a project(s) to address the Auxiliary Outfall overflow volume.

Because of the new hydraulic information and the lack of a long-term solids handling strategy for the LMWWTP, this bundle of projects needs to be modified. The planning of an EHRT and modified bundle projects at the LMWWTP is occurring as part of the WWIP Bridge. The EHRT is proposed to provide significantly greater CSO reduction than the current LMWWTP bundle as well as address the Auxiliary Outfall. It is also expected that by utilizing the available conveyance capacity and treating more wet weather flow at the LMWWTP, during extreme storm events, this can help reduce flooding and upstream basement backups driven by system hydraulic grade line (HGL) issues. An EHRT at the LMWWTP will also allow dynamic underflow control projects to be considerably more effective because additional treatment capacity will be available to treat the dynamic flows directed to the interceptors.

Construction of the EHRT will be constructed in multiple projects to address affordability limitations. The first project is the necessary pump station (PS) upgrades at the WWTP to add wet weather pumping capacity for the future EHRT. Peak wet weather flows in the range of 250 MGD to 300 MGD will need to be pumped for treatment at the LMWWTP. Part 1 of the wet weather capacity PS upgrades is being planned, designed and constructed in Phase 2A. Part 2 of the wet weather capacity PS upgrades is being planned and designed in Phase 2A.

Asset management needs at the WWTP, including standby power and process upgrades, will be coordinated with the EHRT and addressed through the other listed WWIP projects during the Bridge and Phase 2A (Index #s 197 & 204), and with asset management funding. Indices 199, 200, 201, 202 & 203 will be addressed after Phase 2A, depending upon the EHRT planning results. The final total project cost and sizing of the EHRT will be determined through the planning process so the final overflow volume reduction benefit is not known at this time, and will be provided as soon as the information is available.

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Figure 1. Potential EHRT Location at Little Miami WWTP

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Index 204 – Little Miami WWTP Standby Power & Little Miami WWTP Standby Power – Duke Rider Cost

Name	No Change		
Dependency on other Project	Little Miami EHRT, District-wide Solids Handling Master Plan		
Technology	WWTP		
WWIP Required Performance Criteria	No Change (Plan CAPP: Note 1 - Project complete and in service at specified capacity)		
Phase 2A Scope	Planning, Design & Construction		
Original Cost (2006\$) WWIP Attachment 2	\$7,141,778	Partial Project Cost (2006\$) (to be confirmed with ongoing planning)	\$4,285,071 (Standby Power) \$822,454 (Duke Utility Rider)
Phase 2A Spending (2006\$)	\$5,107,525		
Control of Annual CSO Volume	N/A	Current Overflow	N/A
		Project Overflow Reduction	
Project Category	Attachment 2 project		

Since the time the Little Miami Bundle planning was originally developed, the electric utility has introduced a new reserve capacity fee, or Duke Utility Rider, that imposes an additional fee on redundant, or standby power feeds at the distribution level of the electric utility. The LMWWTP currently has dual power feeds through two separate substations. MSDGC is evaluating options with respect to the utility rider, including on-site standby power generation options.

The project includes design and construction of standby power generators as a backup power source for the LMWWTP facilities, as required by the Ten-States Standards, in lieu of annual payments for utility reserve capacity charges. Improvements to the LMWWTP electrical feeders and grid will also be performed to integrate the generators into the WWTP's electrical system. MSD will pay the Duke Utility Rider through approximately 2021 or until generators are installed and operational.

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Index 215 – Muddy Creek Basin Storage & Conveyance Sewer proposed to add new Index 215B – Muddy Creek WWTP Pump Station (for EHRT) & Muddy Creek WWTP EHRT (to complement Index 215)

Name	Muddy Creek WWTP PS & EHRT (Index 215B)		
Dependency on other Projects	Index 234 – CSO 518 Muddy Creek Conveyance Sewer Index 220 – CSO 404 Ivanhoe Street Regulator Improvements Index 221 – CSO 405 Revere Street Regulator Improvements Index 222 – CSO 406 Kennebeck Street Regulator Improvements		
Technology	WWTP EHRT & Tunnel		
WWIP Required Performance Criteria	Tunnel: No Change (storage facility will be designed to meet the 2-yr design storm event) CSOs: No Change (CSO 518, 404, 405 & 406)		
Phase 2A Scope	Planning, Design & Construction		
Original Cost (2006\$) WWIP Attachment 2	\$120,122,277	Partial Project Cost (2006\$) (to be confirmed with ongoing planning)	\$32,898,173 (PS) \$32,898,173 (EHRT)
Phase 2A Spending (2006\$)	\$32,898,173 (PS) \$32,898,173 (EHRT)		
Control of Annual CSO Volume	New project; EHRT will reduce upstream CSO volume*	Current Overflow	Data requested*
		Project Overflow Reduction	For the CSOs, comparable or better aggregate control of annual volume as original project*
Project Category	Attachment 2 proposed added project as Index 215B (adapted project)		

*Preliminary projected overflow volume reductions requested from MSD for this new solution, but have not yet been received. Model to be fully calibrated and validated during Phase 2A.

The current WWIP project is a 1.6 mile long, 25 feet diameter tunnel to store wet weather flows above 35 MGD for treatment at the Muddy Creek WWTP. MSDGC through their 2010 planning efforts identified that this tunnel could be downsized to 8.5 feet diameter with the addition of a 35 MGD EHRT for treatment of the wet weather flows. This project was also developed with the assumption that the Little Miami WWTP Incinerator would remain in-use for Muddy Creek WWTP sludge disposal. Muddy Creek WWTP sludge was hauled to the LMWWTP for disposal. Because a district-wide solids handling master plan has not yet been developed, as described under Adaptive Management Item 2 (LMWWTP Bundle) above, the Muddy Creek sludge is currently being hauled to a landfill.

Since the time Index 215 Muddy Creek Basin Storage & Conveyance Sewer (tunnel) project was developed, new information learned during WWIP Phase 1, regarding the flows in the collection system, identified that there is a significant amount of creek and river water intrusion that enters the interceptors through the CSOs and Muddy Creek interceptor from the Ohio River and Muddy Creek. This river water intrusion has prevented the collection system hydraulic model from properly matching observed flows and meeting model

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calibration and validation industry standards. This issue provides limited confidence in properly sizing a number of the WWIP Attachment 2 projects, including the WWIP tunnel project (Index 215), until this river water intrusion is addressed.

In addition, it was learned, during WWIP Phase 1, that existing conveyance capacity to the Muddy Creek WWTP is currently available to convey more than 35 MGD to the Muddy Creek WWTP. These larger peak flows, exceeding the capacity of the Muddy Creek WWTP (currently 28 MGD) are the root cause of CSOs upstream in the collection system, including along the existing east branch and west branch interceptors. The WWIP Attachment 2 description for Index 215 identifies the project will provide CSO control for CSOs 518, 404, 405 and 406. However, WWIP projects (Indices 234, 220, 221 & 222) are required to be constructed to achieve the WWIP required performance criteria.

Because of the new hydraulic information, the lack of a long-term solids handling strategy for the Muddy Creek WWTP, and the significant creek and river water intrusion into the interceptors from the CSO outfalls and portions of the Muddy Creek interceptor (interceptor tributary to the Muddy Creek Pump Station), the Index 215 project needs to be modified. The current project is proposed to be modified to construct an EHRT at the Muddy Creek WWTP in Phase 2A to provide immediate and significant CSO reduction. Phase 2A also includes construction of regulator improvements at CSOs 402 – 406 (Index 218) to protect each CSO regulator from Ohio River intrusion. The WWIP Bridge includes strategic repair and replacement of the Muddy Creek interceptor (Index 234) to eliminate Muddy Creek water intrusion. These projects once completed will then allow proper representation of flows in the Muddy Creek hydraulic model. In addition, the Muddy Creek integrated watershed plan, currently underway, will provide the necessary planning for the watershed to properly size future projects in later phases of WWIP Phase 2. The need for and final sizing of a tunnel will be determined after EHRT construction and monitoring and the tunnel will be constructed, if needed, after Phase 2A.

An EHRT at the Muddy Creek WWTP will also allow dynamic underflow control projects to be considerably more effective because additional treatment capacity will be available to treat the dynamic flows directed to the interceptors.

The pump station and EHRT are tentatively sized at 35 MGD, however, the final cost and sizing of the EHRT is currently being determined. The final overflow volume reduction benefit is not known at this time, and will be provided as soon as the information is available.

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Figure 1. Potential EHRT Location at Muddy Creek WWTP

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Indices 218, 219, 220, 221, 222 – CSO 402-406 Regulator Improvements

Name	No Change		
Dependency on other Project	Muddy Creek EHRT Index 215B		
Technology	Regulator Improvements		
WWIP Required Performance Criteria (Plan Remaining CSO Volume)	No Change: CSO 402: 7.2 MG/Typ Year CSO 403: 3.6 MG/Typ Year CSO 404: 16.2 MG/Typ Year CSO 405: 3.7 MG/Typ Year CSO 406: 9.0 MG/Typ Year		
Phase 2A Scope	Construction		
Original Cost (2006\$) WWIP Attachment 2	\$1,213,300	Updated Project Cost (2006\$)	\$11,721,947
Phase 2A Spending (2006\$)	\$9,732,447		
Control of Annual CSO Volume	No change; achieved percent control will be determined during post-construction monitoring	Current Overflow	Data requested*
		Project Overflow Reduction	Will be determined during post-construction monitoring
Project Category	Attachment 2 Projects Index 218-222		

*Information requested from MSD, but has not yet been received. Model to be fully calibrated and validated during Phase 2A.

The WWIP Attachment 2 includes separate index numbers for each CSO 402 (Index 218), CSO 403 (Index 219), CSO 404 (Index 220), CSO 405 (Index 221) and CSO 406 (Index 222). To expedite construction and since these CSOs are located near each other and tie into the same interceptor, all improvements will be constructed under one project, titled CSO 402-406 Regulator Improvements. Planning and design for this project will be done as part of the Bridge Plan Schedule. The description for this project in the current WWIP includes modifying the regulator at each CSO diversion chamber to set target flow rates into the interceptor to achieve CSO reduction. This work will still be performed. Additional work be performed to address river water intrusion and floatables control as listed below:

- Regulator chambers moved upslope where possible to higher elevation to protect against river water intrusion.
- Floatable controls.
- Self-contained universal bi-directional actuated (SCUBA) sluice gates on the underflow capable of operation during submerged conditions.
- Backflow valves or gates on the overflow pipe for additional river water intrusion prevention.
- New underflow pipes sized in coordination with the Muddy Creek EHRT.

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- Grit chamber upstream of the regulator chamber or upstream of the diversion to reduce grit entering the interceptor or CSO.

The design for the regulator structures will include installation of an automated gate that can regulate the underflow to the interceptor to achieve remaining annual volumetric overflow performance criteria under the WWIP. The new chambers will include floatables control for all discharges to the Ohio River and the installation of backflow prevention to provide river water intrusion prevention during times of elevated river levels. In addition, a grit/stone pit will be constructed on the underflow line to remove heavier inorganic materials that could cause sediment buildup in the interceptor sewer.

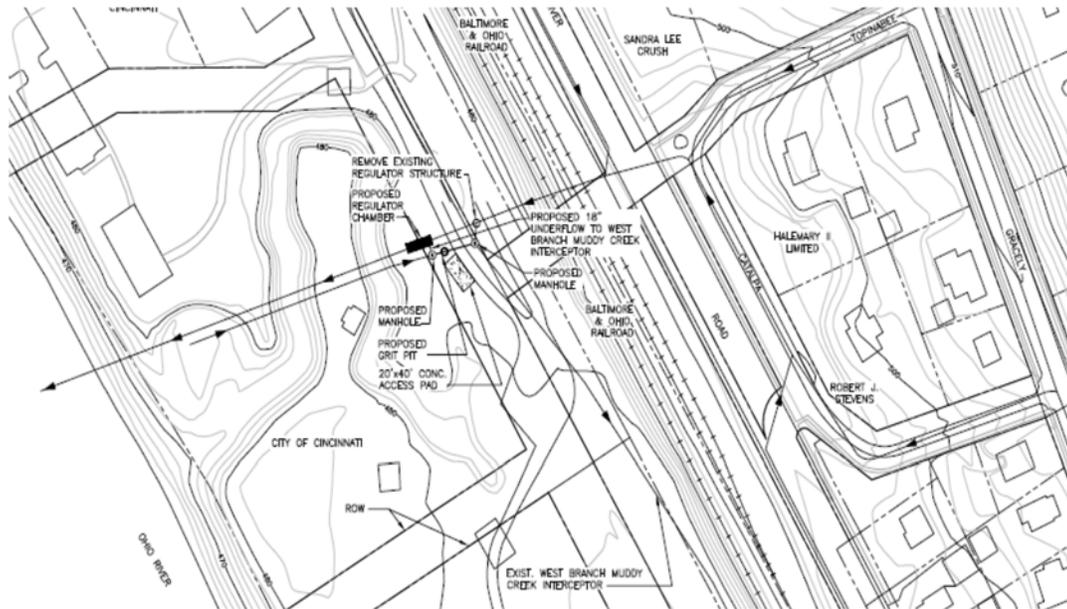


Figure. CSO 402 Regulator Improvements Project

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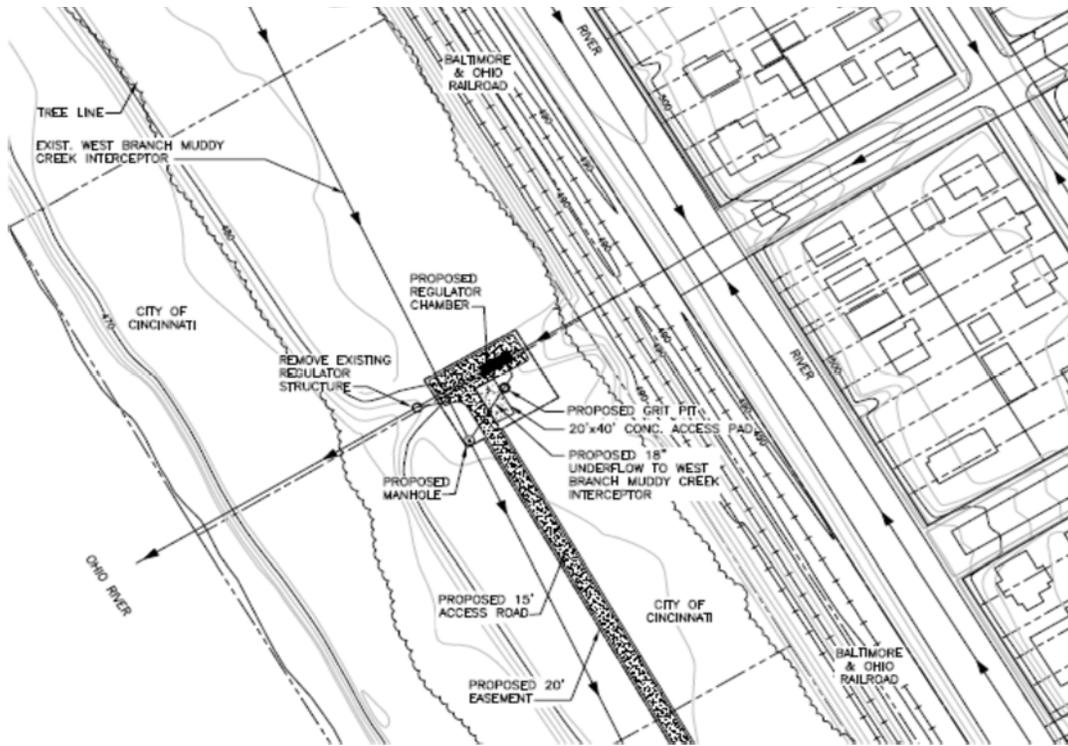


Figure. CSO 403 Regulator Improvements Project

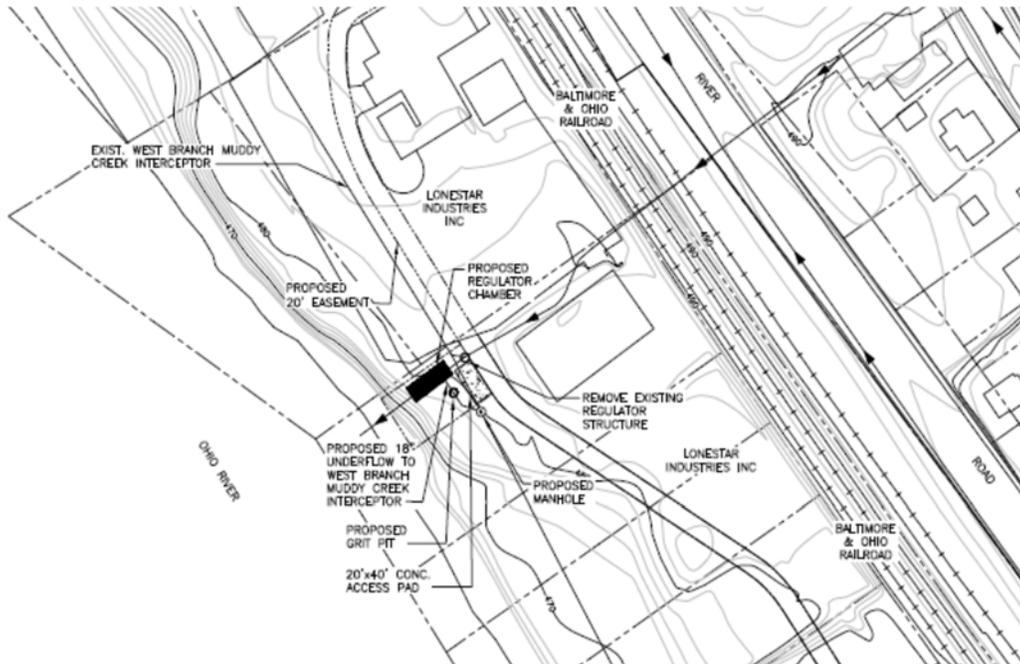


Figure. CSO 404 Regulator Improvements Project

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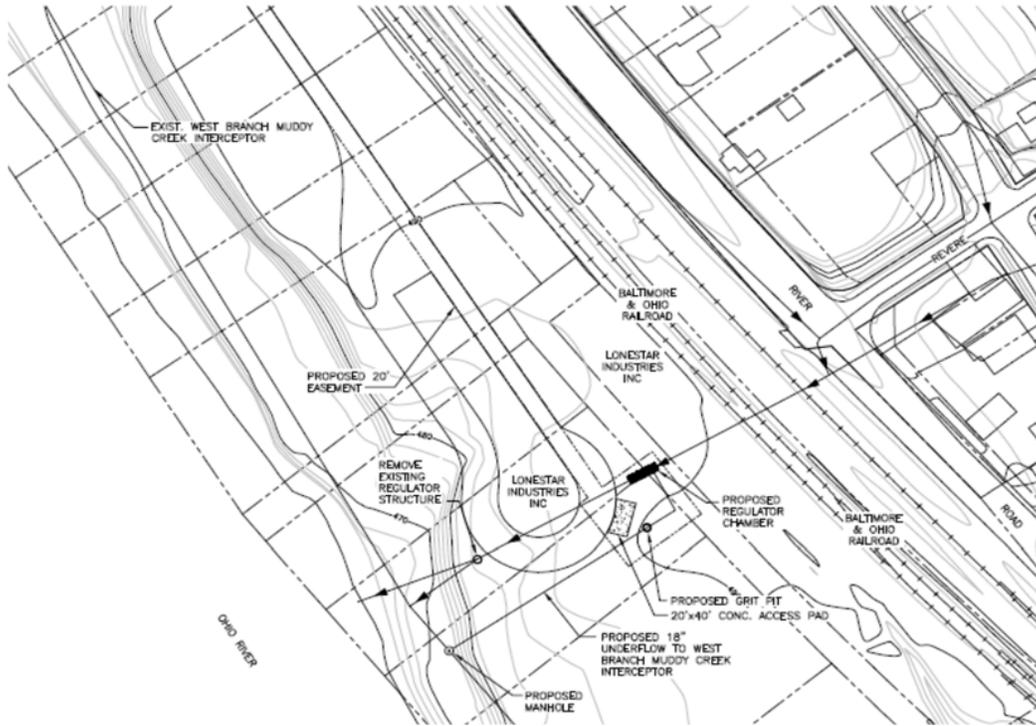


Figure. CSO 405 Regulator Improvements Project

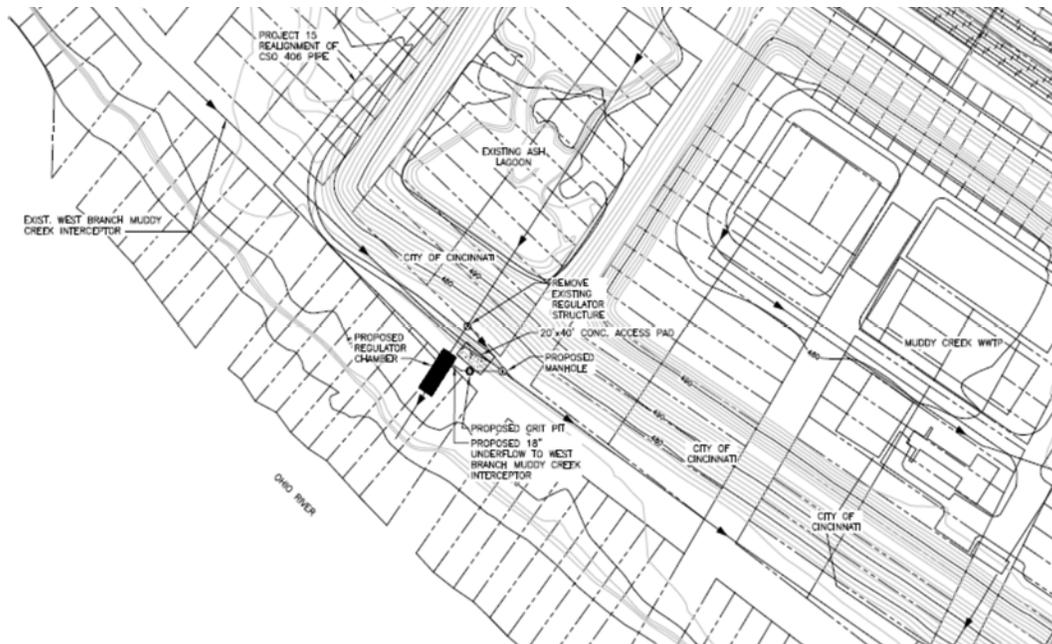


Figure. CSO 406 Regulator Improvements Project

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Index 235 – Addyston PS Elimination proposed to add new Index 235B - Addyston Extraneous Stormwater Removal (to complement Index 235)

Name	Addyston Extraneous Stormwater Removal (Index 235B)		
Dependency on other Project	Addyston Pump Station Elimination Project (Index 235)		
Technology	Partial Separation		
WWIP Required Performance Criteria	No Change (Pump station facility will be designed to meet 2-yr design storm event)(Index 235 Plan CAPP column)		
Phase 2A Scope	Planning, Design & Construction		
Original Cost (2006\$)	N/A	Updated Total Project Cost (2006\$)	\$5,319,573
Phase 2A Spending (2006\$)	\$5,319,573		
Control of Annual CSO Volume	N/A (Pump Station Overflow project)	Current Overflow	N/A*
		Project Overflow Reduction	N/A*
Project Category	Attachment 2 proposed added project as Index 235B (adapted project)		

*Information on pump station overflows has been requested from MSD, but has not yet been received.

This adapted project complements the Addyston Pump Station Elimination project and will provide street-load separation of stormwater runoff to reduce overflows in the area and to reduce the flows conveyed to the Muddy Creek Pump Station. The extraneous stormwater removal (ESR) will reduce surcharging and reduce the peak flow from Addyston to also reduce overflows upstream of the Muddy Creek Pump Station for the 2-year, 24-hour event. This project will also reduce the peak flow and volume that the Muddy Creek PS will need to convey to the existing interceptor, minimizing long term treatment costs and tunnel/EHRT sizes.

This project includes installation of 5,800 LF of storm sewer to offload street inlets from existing combined sewers. Sufficient stormwater BMPs to treat the separated stormwater will also be constructed.

The Addyston PS elimination project will be coordinated with available downstream capacity to be determined after this ESR project and the Muddy Creek EHRT project are completed and post-construction flow monitoring is performed. The Addyston PS elimination project will then be evaluated for implementation after Phase 2A. The graphic below provides an overview of the general locations of the extraneous stormwater removal.

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Figure 1. Addyston Extraneous Stormwater Removal Project

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**Index 236 – Muddy Creek @ Westbourne Enhanced High Rate Treatment (EHRT)
Facility proposed to add new Index 236B – CSO 198 Partial Separation/SBU
Mitigation (to complement Index 236)**

Name	CSO 198 Partial Separation/SBU Mitigation (Index 236B)		
Dependency on other Project	None		
Technology	Partial Separation		
WWIP Required Performance Criteria (Plan Remaining CSO Volume)	No Change (61.2 MG/Typ Year (CSO 198))		
Phase 2A Scope	Planning, Design & Construction		
Original Cost (2006\$) WWIP Attachment 2	N/A	Total Project Cost (2006\$) (to be confirmed with ongoing planning)	\$8,200,000
Phase 2A Spending (2006\$)	\$8,200,000		
Control of Annual CSO Volume	No change; achieved percent control will be determined during Post-Construction Monitoring	Current Overflow	Data requested*
		Project Overflow Reduction	Comparable or better aggregate control of annual volume as the original project
Project Category	Attachment 2 proposed added project as Index 236B (adapted project)		

*Information requested from MSD, but has not yet been received. Model to be fully calibrated and validated during Phase 2A.

This project is located in the Muddy Creek watershed. This project partially replaces the project at Index 236 – Muddy Creek @ Westbourne EHRT. Since the time Index 236 was originally developed many years ago, new information has been obtained during WWIP Phase 1 about the flows in the collection system and the extent of the SBUs upstream of CSO 198. Previous SBU solutions have focused on individual house grinder pump installations with backflow prevention. The SBU Prevention Program approach in this area has had limited success. This project is intended to address the SBUs with a cost effective engineered solution, that will include consideration of strategic property acquisition in combination with detaining and separating stormwater entering the existing combined sewer system upstream of CSO 198 to address a number of the chronic SBUs, reduce surface flooding emanating from the sewer system, and reduce CSO 198 volume.

Stormwater from impervious surfaces associated with the large approximately 60-acre shopping center, Glenway Crossing, contributes significantly to the flows to the SBU locations and CSO 198. Separating and/or detaining the stormwater from this site along with the roadways downstream are being evaluated. The final limits and scope of the partial stormwater separation are currently being further planned under the integrated planning approach. Remaining CSO volume after the partial separation will be addressed with

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additional improvements at the EHRT facility at CSO 198 (Index 236), which is planned to be constructed after Phase 2A. Because the original cost estimates for EHRTs in the WWIP have significantly increased, this project approach will assist with right-sizing the necessary EHRT and help to reduce the overall cost to address CSO 198.

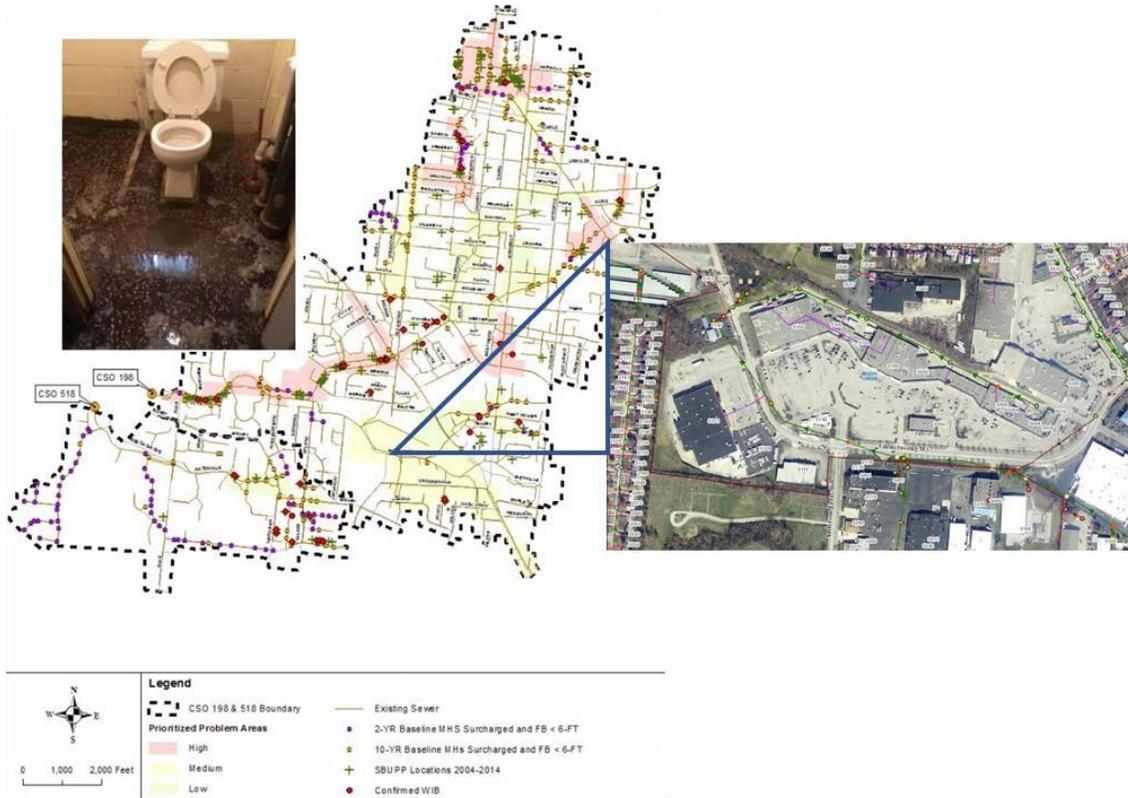


Figure. CSO 198 Partial Separation/SBU Mitigation

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Indices 240, 241, 242, 243, 244 – East Branch Muddy Creek Interceptor (Part 1)

Name	No Change		
Dependency on other Project	Index 215B Muddy Creek WWTP EHRT		
Technology	Conveyance		
WWIP Required Performance Criteria (Plan Remaining CSO Volume)	None listed		
Phase 2A Scope	Planning & Design		
Original Cost (2006\$) WWIP Attachment 2	\$60,315,458	Partial Project Cost (2006\$) (to be confirmed with ongoing planning)	\$1,000,000
Phase 2A Spending (2006\$)	\$1,000,000		
Control of Annual CSO Volume	N/A	Current Overflow	N/A
		Project Overflow Reduction	
Project Category	Attachment 2 Projects Indices 240-244		

The East Branch Muddy Creek interceptor is located in the Muddy Creek sewershed and conveys combined sewer flows generally along River Road from CSO 416 (located near Riverside Sports Complex) to the Muddy Creek WWTP. The interceptor is located on the Ohio River side of River Road and receives flows from the combined sewer areas tributary to CSOs 416, 415, 414, 413, 412, 411, 410, 223, 654, 408, and 541.

Four (4) pump stations (PSs) are located in series arrangement along the interceptor to pump flows in the interceptor to the Muddy Creek WWTP. The 4 PSs moving from east to west are Fithian PS, Anderson Ferry PS, Foley Road PS, and Rapid Run PS. The 4 PSs are influenced by elevated Ohio River levels and experience Ohio River intrusion throughout a typical year. The 4 PSs were constructed in 1956 with a steel dry well/wet well configuration. Their conditions have deteriorated due to exposure to weather, high ground water levels, Ohio River flooding, and with poor cathodic protection. The deteriorated condition of the metal walls has become a safety concern for personnel entering the dry well. Replacement or improvements to each PS is needed for protection of occupational health and safety, functionality, and maintenance reasons.

Since the time Index 240-244 East Branch Muddy Creek Interceptor project was developed, new information has been learned during WWIP Phase 1 regarding the flows in the collection system. For example, the existing East Branch interceptor has approximately 2 times the conveyance capacity as each of the existing PSs' rated capacity which provides the opportunity to convey more wet weather flow to the Muddy Creek WWTP for treatment.

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In addition, during planning for the original interceptor replacement project, poor soils and constructability challenges were identified that increased the capital cost from \$60.3M (2006\$) to over \$100M (2006\$).

This project will perform planning and design work for wet weather and reliability improvements to the 4 East Branch PSs and the East Branch interceptor consistent with Index 240 – 244 and in coordination with Index 215B Muddy Creek WWTP EHRT and integrated planning currently underway. A combination of improvements to the 4 PSs, maximizing the existing conveyance capacity of the East Branch interceptor, source control upstream of each of the CSOs, and additional relief sewer capacity will be planned and designed.



Figure. East Branch Muddy Creek Interceptor (Part 1) Project

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Index 248 – Mill Creek WWTP Chemical Enhanced Primary Treatment (complete diversion chamber, second stage)

Name	No Change		
Dependency on other Project	Mill Creek WWTP CEPT “Bridge” Project (Project ID 10144882)		
Technology	Chemical Enhanced Primary Treatment (CEPT)		
WWIP Required Performance Criteria	No Change (Plan CAPP: Attachment 2, Note 1 - Project complete and in service at specified capacity)		
Phase 2A Scope	Design & Construction		
Original Cost (2006\$)	\$25,215,765	Updated Total Project Cost (2006\$) Diversion Chamber, stage 1 & stage 2	\$12,049,111
Phase 2A Spending (2006\$)	\$4,585,111		
Control of Annual CSO Volume	N/A	Current Overflow	N/A
		Project Overflow Reduction	
Project Category	Attachment 2 project		

The existing Mill Creek Wastewater Treatment Plant (WWTP) Raw Sewage Pump Station (PS) consists of two physically separate pumping stations: The North PS and the South PS. The North PS was constructed in the mid-1950’s and consists of nine vertical centrifugal pumps rated at 40 MGD each (320 MGD firm capacity). The South PS was constructed in the late 1980’s and consists of three vertical centrifugal pumps with two rated at 65 MGD each and one rated at 30 MGD (95 MGD firm capacity). Flow from four interceptors (Mill Creek, Mill Creek Auxiliary, East Branch Ohio River, and West Branch Ohio River) is conveyed to the pumping stations through a diversion chamber. The diversion chamber was constructed at the same time as the North PS.

The WWIP anticipates a future wet weather treatment facility at the Mill Creek WWTP and this project will continue to advance the initial phases of a future CEPT or HRT facility. The future wet weather treatment facility may be located near where the existing pump stations are now located, north of Gest Street and within the WWTP fence line.

MSD has identified the location for a proposed diversion chamber and developed conceptual options for a wet weather influent pump station and future wet weather treatment facility at the Mill Creek WWTP. Advancing the first stage of construction allows for flexibility in future stages of construction where rerouting of plant utilities and possible demolition of structures may be required. The first stage of construction is being built in 2019 as part of the Bridge Plan Schedule. An existing gate has malfunctioned in the existing diversion chamber that needs to be corrected. Replacement of the gate requires bypass pumping that is not able to be accomplished without creating hydraulic disturbances

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that damage the existing Raw Sewage Pumps. The existing diversion chamber concrete is also suspected to be deteriorating in areas and in need of repair.

This project (second stage) will complete construction of the new diversion chamber, construct connections to the Mill Creek Interceptor and Auxiliary Interceptor, and construct the needed modifications to the existing diversion chamber.

This project is the second stage in a multi-staged project to implement a future wet weather influent pump station and CEPT or HRT facility at the Mill Creek WWTP.



Figure. Site of Mill Creek Diversion Chamber at Mill Creek WWTP

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Index 248 – Mill Creek WWTP Chemical Enhanced Primary Treatment (design WWTP wet weather influent pump station)

Name	No Change		
Dependency on other Project	Mill Creek WWTP CEPT (Diversion Chamber, second stage)		
Technology	Chemical Enhanced Primary Treatment (CEPT)		
WWIP Required Performance Criteria	No Change (Plan CAPP: Attachment 2, Note 1 - Project complete and in service at specified capacity)		
Phase 2A Scope	Design		
Original Cost (2006\$)	\$25,215,765	Updated Total Project Cost (2006\$) Pump Station only	\$65,796,345
Phase 2A Spending (2006\$)	\$4,585,111		
Control of Annual CSO Volume	N/A	Current Overflow	N/A
		Project Overflow Reduction	
Project Category	Attachment 2 project		

The existing Mill Creek Wastewater Treatment Plant (WWTP) Raw Sewage Pump Station (PS) consists of two physically separate pumping stations: The North PS and the South PS. The North PS was constructed in the mid-1950's and consists of nine vertical centrifugal pumps rated at 40 MGD each (320 MGD firm capacity). The South PS was constructed in the late 1980's and consists of three vertical centrifugal pumps with two rated at 65 MGD each and one rated at 30 MGD (95 MGD firm capacity). Flow from four interceptors (Mill Creek, Mill Creek Auxiliary, East Branch Ohio River, and West Branch Ohio River) is conveyed to the pumping stations through a diversion chamber. The diversion chamber was constructed at the same time as the North PS.

The WWIP anticipates a future wet weather treatment facility at the Mill Creek WWTP. This project advances the initial phases of a future CEPT or HRT facility by designing a WWTP wet weather influent pump station for a future wet weather treatment facility within the WWTP fence line.

The existing WWTP PS lacks the ability to isolate both the existing influent diversion chamber and the North PS wet well, making this a known risk. Additionally, a recent physical scale model and computation fluid dynamics (CFD) studies have shown that it is not feasible to increase WWTP pumping capacity with the existing wet wells, so building additional pumping capacity and a new larger diversion chamber at the Mill Creek WWTP site is required. The new proposed diversion chamber is being completed as a separate project within WWIP Phase 2A. This project proposes to design a new WWTP wet weather influent pump station to facilitate a future CEPT or HRT facility. The construction of the WWTP wet weather influent pump station and design and construction of the CEPT or HRT facilities will be advanced after WWIP Phase 2A.

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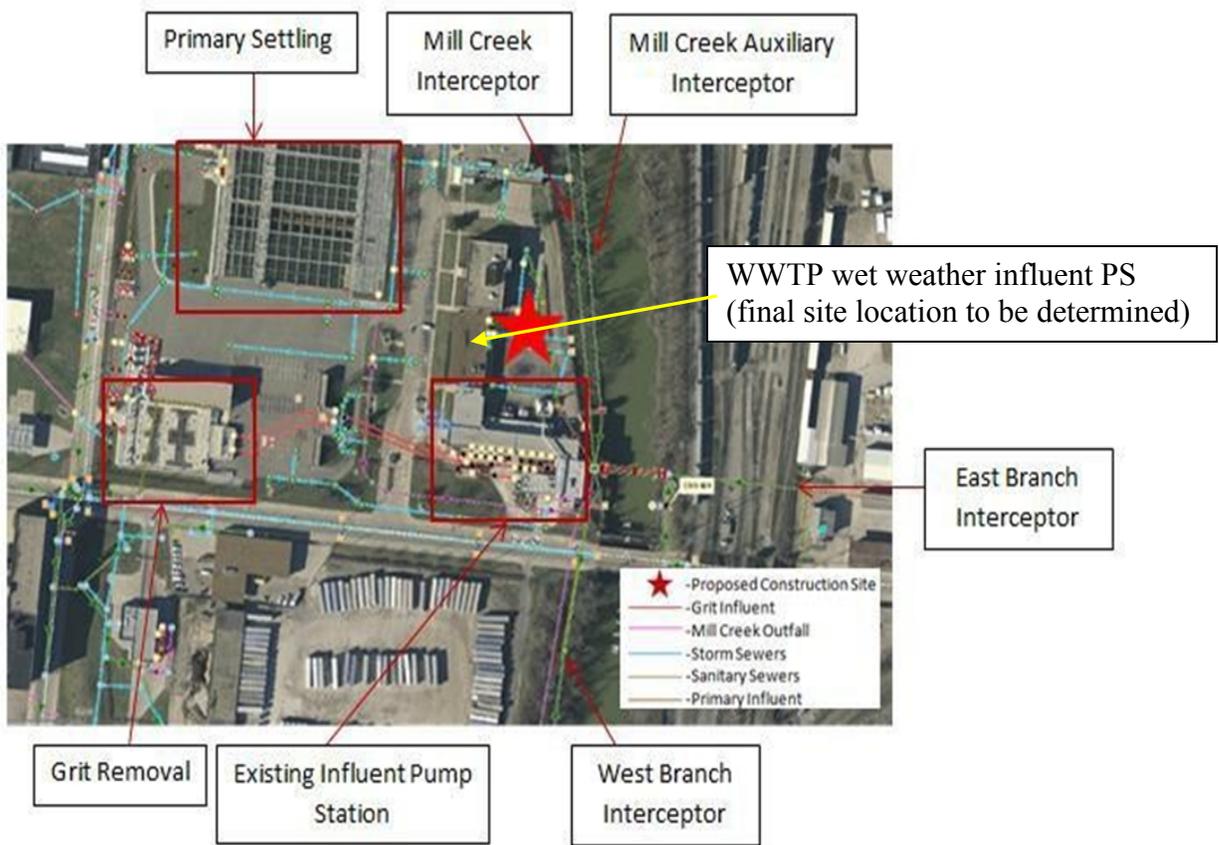


Figure. Site of Mill Creek WWTP wet weather influent pump station

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Index 317 – Berkshire HRT proposed to add new Index 317B Mt. Washington Source Control Implementation (to complement Index 317)

Name	Mt. Washington Source Control Implementation (Index 317B)		
Dependency on other Project	None		
Technology	Partial Separation		
WWIP Required Performance Criteria (Plan Remaining CSO)	No Change (18.3 MG/Typ Year (CSO 182))		
Phase 2A Scope	Planning, Design & Construction		
Original Cost (2006\$) WWIP Attachment 2	N/A	Total Project Cost (2006\$) (to be confirmed with ongoing planning)	\$8,200,000
Phase 2A Spending (2006\$)	\$8,200,000		
Control of Annual CSO Volume	No change; achieved percent control will be determined during post-construction monitoring	Current Overflow	Data Requested*
		Project Overflow Reduction	Comparable or better aggregate control of annual volume as the original project
Project Category	Attachment 2 proposed added project as Index 317B (adapted project)		

*Information requested from MSD, but has not yet been received. Model to be fully calibrated and validated during Phase 2A.

The Mt. Washington Source Control implementation project is located in the Little Miami watershed. Since the time Index 317 was originally developed, new information has been obtained during WWIP Phase 1 about the flows in the collection system and the extent of the SBUs upstream of CSO 182. Approximately 46 homes with sewer backups have been reported on the streets of Mayland Drive, Woodlark Drive, and Lusanne Terrace tributary to CSO 182. Some homes have experienced multiple sewer backups. The homes are currently being evaluated as part of the MSDGC Sewer Backup Prevention Program (SBUPP) for installation of SBU prevention devices. To protect these properties, a device or combination of devices (e.g., sewage pump, stormwater pump, backflow valve, etc.) will be installed on the building's sewer lateral to prevent the combined sewer from backing up into the homes. All stormwater connections upstream of the installed device that tie into the building lateral will be rerouted downstream of the installed device.

With the potential scenario that prevention devices at every home within the project area, it is likely there will be an increase of the Hydraulic Grade line (HGL) downstream potentially causing SBUs at other properties and increasing overflow volume at CSO 182. To address these issues and help reduce CSO 182 volume, this project will implement stormwater source control solutions to reduce stormwater entering the combined sewer system tributary

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to the SBUs and CSO 182. The possible stormwater source control solutions under consideration include:

- Addressing stormwater on private property through disconnections and routing to rain gardens, infiltration trenches, or other green infrastructure on private property or in the public right of way;
- Better control of stormwater within the subdivision through possible modification of the existing detention system, construction of new detention, or a combination thereof.
- Utilizing local inline pipe or offline storage within the right of way in combination with the source control solutions.

The final scope of the project will be determined through the integrated planning approach before proceeding to design. Remaining CSO 182 volume after implementation of source control will be addressed with an EHRT if necessary at CSO 182 (Index 317), which would be constructed after Phase 2A. The original cost estimates for EHRTs in the WWIP have significantly increased, so this project will assist with right-sizing the necessary EHRT and help to reduce the overall cost to address CSO 182.

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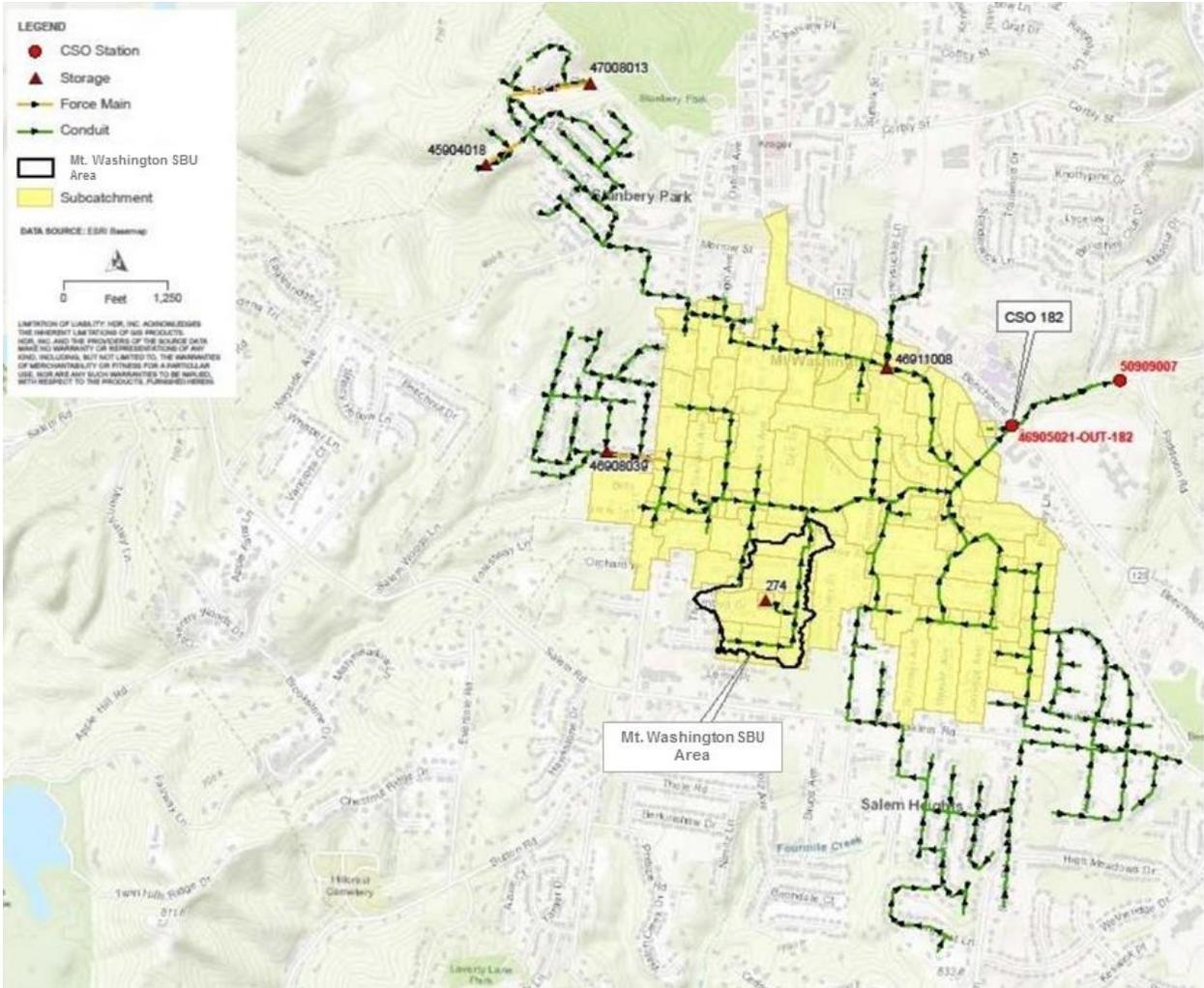


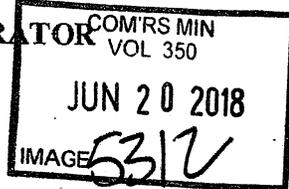
Figure. Mt. Washington Source Control Implementation Project Area

Appendix C: Board Resolution adopting Phase 2A plan (*without Exhibit A included*)

On motion of Mr. Portune, seconded by Ms. Driehaus the following resolution was adopted...

66-3
Approved

**RESOLUTION APPROVING AND AUTHORIZING THE COUNTY ADMINISTRATOR
TO SUBMIT A WWIP PHASE 2A PROPOSAL**



BY THE BOARD:

WHEREAS, the Metropolitan Sewer District of Greater Cincinnati ("MSD") was created and exists as a County Sewer District under Chapter 6117 of the Ohio Revised Code; and

WHEREAS the City of Cincinnati ("City"), by Ordinance of City Council adopted April 10, 1968, consented to be included in the county sewer district now known as the Metropolitan Sewer District of Greater Cincinnati ("MSD"); and,

WHEREAS, the Board of County Commissioners, Hamilton County, Ohio ("County") is a party to an Agreement dated April 10, 1968, with the City of Cincinnati (the "City") pursuant to which the County exercises authority and control as the owner of MSD, and the City provides certain management and operations services as on its behalf; and

WHEREAS, the County entered into two Consent Decrees (collectively "Consent Decree") on June 9, 2004 in a matter pending in the United States District Court for the Southern District of Ohio, Western Division ("Court"), Case No. C-1-02-107, captioned *United States of America, the State of Ohio, and Ohio River Valley Water Sanitation Commission vs. The Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati, Ohio*;

WHEREAS, the plaintiffs in the Consent Decree (U.S. EPA, Ohio EPA, ORSANCO)(collectively, the "Regulators") have approved a Final Wet Weather Improvement Program ("WWIP"), dated November 9, 2009 (as amended and conditionally approved by the Regulators on January 6, 2010 and by the Court as part of the First Amendment to the Consent Decree on August 10, 2010) which sets forth certain projects and terms for implementation of certain aspects of the Consent Decree; and

WHEREAS, pursuant to WWIP Section B.1., a Phase 2 Schedule of Work ("Phase 2"), with accompanying information, was due to the Regulators on June 30, 2017; and

WHEREAS, the Board began work on a Phase 2 in 2016, including discussions with MSD staff, provided Board policy directives regarding the Phase 2 in early 2017, and attempted to develop a consensus Phase 2 with the City during 2017 and 2018, including during a Mediation required by the Court which was and is subject to the Court's Protective Order;

WHEREAS, because a consensus Phase 2 could not be reached by Spring 2017, despite the Mediation, the County initiated dispute resolution procedures with the Regulators in the Consent Decree in April 2017 seeking: (1) a one-year extension of time to June 30, 2018 to submit a WWIP Phase 2; and (2) a one-year extension of the deadline by which the Regulators can impose a WWIP Phase 2 for the Consent Decree.

WHEREAS, a tentative agreement was reached with the Regulators in early 2018 regarding the WWIP extension deadline to June 30, 2018 and agreed projects to be completed during the extension. The Regulators lodged a notice of tentative agreement with the Federal Court and thereafter caused it to be the subject of public comment through a Federal Register

Notice. The Regulators have indicated they will file a motion seeking a modification of the Consent Decree shortly; and

WHEREAS, the Board continued to seek to reach a consensus Phase 2 with the City during 2018. Having failed to reach a consensus Phase 2 by May, 2018, the Board prepared its own draft Phase 2A Schedule of Work plan ("Phase 2A"), shared it first with the City in mid-May, revised it based on input from the City, then issued it to the public on May 25, 2018, and held several public meetings to present and discuss the terms of it with the public, none of which City MSD management or staff appeared despite requests and directives to so attend; and

WHEREAS, MSD presented the City's Phase 2A to a City Council committee on June 12, 2018

WHEREAS, the Court held a Consent Decree Status Report session on June 13, 2018 during which the Board publicly reported on the City's refusal to accept the Board's Phase 2A; and the Court urged the parties to reach a consensus Phase 2A or file such motions as necessary for the Court to intervene; and

WHEREAS, negotiations between Board and City regarding a consensus Phase 2A have continued this week and are ongoing; and

WHEREAS, the Board recognizes the immense difficulty in balancing the requirements of the Consent Decree WWIP, the asset management infrastructure needs of MSD, and the financial burden placed on the ratepayers of Hamilton County; and

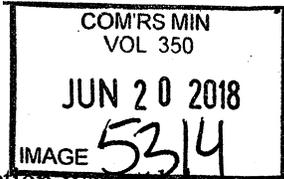
WHEREAS, the Board believes the attached draft WWIP Phase 2A provides the ratepayers with the greatest opportunity for meaningful negotiation with the Regulators;

NOW THEREFORE BE IT RESOLVED the Board of County Commissioners of Hamilton County, Ohio, formally approves and adopts the attached draft Phase 2A proposal ("Exhibit A"), and directs the County Administrator to supervise the completion of a final Phase 2A either (a) in a form substantially as Exhibit A, for submission solely on behalf of the Board or, alternatively upon further negotiation with the City and further input from this Board, (b) in a revised form for joint submission on behalf of the Board and City ; and

BE IT FURTHER RESOLVED, that the County Administrator is hereby authorized and directed to submit the final Phase 2A to the Federal District Court and Regulators on or before the June 30, 2018 deadline, or alternatively, to direct MSD to make such submission if a joint Phase 2A is to be submitted; and

BE IT FURTHER RESOLVED, that the Board affirms and ratifies its Resolution of July 18, 2012, a copy of which is attached here to as Exhibit B, setting forth Board policies to be followed by MSD in the implementation of the Consent Decree requirements, most especially the WWIP; and

BE IT FURTHER RESOLVED, that this Board of County Commissioners hereby finds and determines that all formal actions relative to the adoption of this Resolution were taken in an open meeting of the Board of County Commissioners and that all deliberations of this Board of



County Commissioners and of its committees, if any, which resulted in formal action were taken in meetings open to the public, in full compliance with applicable legal requirements, including Section 121.22 of the Ohio Revised Code.

BE IT FURTHER RESOLVED, that the Clerk of the Board be and hereby is authorized and directed to certify copies of this resolution to Jeff Aluotto, Hamilton County Administrator, John Cranley, Mayor of the City of Cincinnati, the Council of the City of Cincinnati, Diana Christy, Interim Director of MSD, and James W. Harper, Assistant Prosecuting Attorney Hamilton County.

ADOPTED at a regularly adjourned meeting of the Board of County Commissioners of Hamilton County, Ohio, this 20th day of June, 2018.

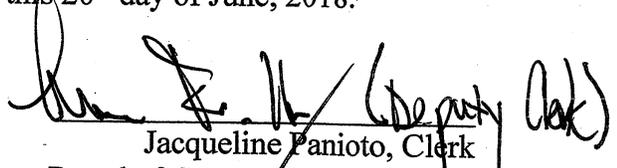
Mr. Portune YES Ms. Driehaus YES Mr. Monzel YES

Exhibit A: Phase 2A
Exhibit B: July 18, 2012 Board Resolution

CERTIFICATE OF CLERK

IT IS HEREBY CERTIFIED that the foregoing is a true and correct transcript of a resolution adopted by the Board of County Commissioners in session the 20th day of June, 2018.

IN WITNESS WHEREOF, I have hereunto set my hand affixed official seal of the Office of the Hamilton County Commissioners of Hamilton County, Ohio this 20th day of June, 2018.


Jacqueline Panioto, Clerk
Board of County Commissioners
Hamilton County, Ohio

COMRS MIN
VOL 350
JUN 20 2018
IMAGE 53/5

EXHIBIT A

Phase 2A Schedule of Work

COM'RS MIN
VOL 350
JUN 20 2018
IMAGE 5476

EXHIBIT B

July 18, 2012 Board Resolution

COM'RS MIN
VOL 350
JUN 20 2018
IMAGE 5477

On motion of Mr. Hartmann, seconded by Mr. Monzel the resolution was adopted.

RESOLUTION REGARDING MSD CONSENT DECREE WET WEATHER IMPLEMENTATION PROGRAM

COM'RS MIN
VOL. 327
JUN 18 2012
IMAGE 783

WHEREAS, the Board of County Commissioners, Hamilton County, Ohio ("Board") entered into two Consent Decrees ("Consent Decree") on June 9, 2004 in a matter pending in the United States District Court for the Southern District of Ohio, Western Division, Case No. C-1-02-107, captioned *United States of America, the State of Ohio, and Ohio River Valley Water Sanitation Commission v. The Board of County Commissioners of Hamilton County, Ohio and the City of Cincinnati, Ohio*; and

WHEREAS, the regulator plaintiffs to the Consent Decree have approved a Final Wet Weather Improvement Program ("Final WWIP"), dated November 9, 2009, which Final WWIP sets forth certain projects and terms for implementation of certain aspects of the Consent Decree;

WHEREAS, the Metropolitan Sewer District of Greater Cincinnati ("MSD") is a county sewer district established by the Board, pursuant to Ohio Revised Code Chapter 6117. As stated in the Consent Decree, the Board acts as the principal for MSD, including maintenance of funding authority for MSD, while the City of Cincinnati ("City") serves as agent for the County in the management and operation of MSD; and,

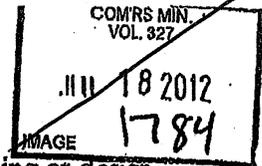
WHEREAS, the Board has the responsibility to ensure that the WWIP is implemented in compliance with the Consent Decree and applicable law and to oversee expenditures for the benefit of MSD ratepayers;

WHEREAS, pursuant to the WWIP, Board and City, as co-defendants, are due to submit to U.S. EPA, Ohio EPA, and the Ohio River Valley Water Sanitation Commission (collectively, "Regulators") certain reports by December 31, 2012 ("WWIP Reports"); and,

WHEREAS, City has requested, and County now provides, guidance regarding certain matters related to the WWIP Reports.

NOW, THEREFORE, BE IT RESOLVED, that the following are policy directives to be followed in the implementation of the Final WWIP:

1. In implementing the Final WWIP, compliance with the Consent Decree and applicable law, improvement of water quality particularly near homes and parks, financial solvency of MSD, protection of the MSD ratepayer's ability to pay for services, ongoing MSD financial transparency, and cost-saving innovation are key Board priorities.
2. In implementing the Final WWIP, specific projects and project bundles should be managed by MSD, to the greatest extent practicable within the limits of applicable law, to be planned, designed and constructed in all circumstances "on or under budget". The phrase "on or under budget" in this Resolution means the total amount spent on each Final WWIP project and project bundle shall not exceed the total projected costs listed in the Final WWIP for that project or project bundle, except as compelled by applicable law and clear engineering requirements. Except where contrary to applicable law and approved by this Board, projects and project



bundles which exceed their Final WWIP cost projections at any time during planning or design must be re-evaluated, re-planned, re-designed, or construction must be changed, to achieve the needed cost savings to be on or under budget. MSD is to immediately report to the Board if spending estimates project that a project or project bundle may be over-budget and provide management corrective action options or plans.

3. In implementing the Final WWIP, cost certainty for every project and project bundle to remain on or under budget is extremely important. MSD shall manage projects and project bundles, to the greatest extent practicable within the limits of applicable law, to minimize cost over-run risk and maximize cost certainty. The risk of cost over-runs shall be borne, where reasonably practicable, by MSD contractors, not MSD ratepayers, through procurement procedures and contracts, and MSD management thereof, which shall be consistent with Ohio law for procurement by county sewer districts. MSD shall obtain the advice of the County Prosecutor, through the County Administration, regarding consistency with applicable Ohio law.

4. The Board is supportive of "green infrastructure" and "stormwater separation/storage" alternatives to "grey treatment" approaches if the alternatives meet the cost control and cost certainty mandates noted in Policies 2 and 3, above. In implementing the Final WWIP, all MSD budgets, cost projections, and spending records for projects and project bundles should clearly identify all project elements and costs which are not required solely for Consent Decree compliance, including but not limited to roadwork, parks, waterways, and other amenities ("Amenities"). MSD shall not spend funds on planning, design, or construction of any Amenities without Board approval.

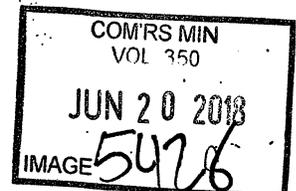
5. In implementing the Final WWIP, especially Final WWIP -related deliverables due December 31, 2012, MSD should confer intensively and frequently with the County Administration to obtain ongoing County policy input and achieve the goals of Policies 1-3 above.

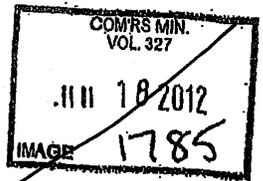
Adopted at a regularly adjourned meeting of the Board of County Commissioners, Hamilton County, Ohio, this 18th day of July, 2012

Mr. Hartmann YES

Mr. Monzel YES

Mr. Portune YES

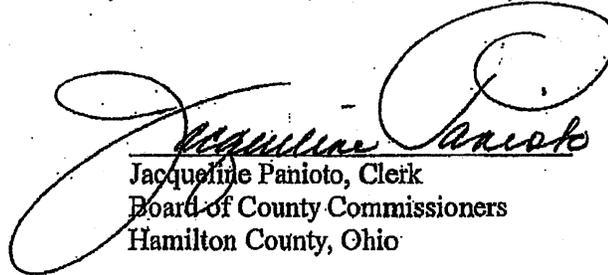




CERTIFICATE OF CLERK

IT IS HEREBY CERTIFIED that the foregoing is a true and correct transcript of a Resolution adopted by the Board of County Commissioners, Hamilton County, Ohio in session the 18th day of July, 2012.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Official Seal of the Office of the Board of County Commissioners, Hamilton County, Ohio this 18th day of July, 2012.


Jacqueline Panioto, Clerk
Board of County Commissioners
Hamilton County, Ohio

