2018 Integrated Long-Term CSO Control Plan Summary

The Metropolitan District
Hartford, Connecticut

2018 Integrated Long-Term CSO Control Plan Summary

May 2020

CDM Smith

MDC

Table of Contents

List of Figures

List of Tables

Appendices

Glossary of Acronyms

AMP – Asset Management Plan
BNR – Biological Nutrient Removal
CBBI – Cemetery Brook Branch Interceptor
CD – Consent Decree
CIP – Capital Improvements Plan
CMOM – Capacity, Management, Operations and Maintenance
CO – Consent Order
CRI – Connecticut River Interceptor
CSO – Combined Sewer Overflow
CSS – Combined Sewer System
CT – Connecticut
CTDEEP – Connecticut Department of Energy and Environmental Protection
CWA – Clean Water Act
CWP – Clean Water Project
CWPC – Clean Water Project Charge
DAFT – Dissolved Air Flotation Thickener
DWF – Dry Weather Flow
ESSD – East Side Storm Drain
FCA – Financial Capability Assessment
GBC – Gully Brook Conduit
GBI – Gully Brook Interceptor
GI – Green Infrastructure
HAI – Homestead Avenue Interceptor
HAIE - Homestead Avenue Interceptor Extension
HWPCF – Hartford Water Pollution Control Facility
I/I – Infiltration and Inflow
IP – Integrated Planning
JSI – Jefferson Street Interceptor
LF – Linear Feet
LTCP – Long Term Control Plan
MTBM – Micro-Tunnel Boring Machine
MDC – Metropolitan District Commission
MG – Million Gallons
mgd – million gallons per day
MHI – Median Household Income
MS4 – Municipal Separate Storm Sewer System
NBPR – North Branch Park River
NED – Northeast Drain
NEI – Northeast Interceptor
NNBI – New North Branch Interceptor
NPAI – New Park Avenue Interceptor
NPDES – National Pollutant Discharge Elimination System
NSWBI – New Southwest Branch Interceptor
O&M – Operation and Maintenance

ONBI – Old North Branch Interceptor
OSBI – Old South Branch Interceptor
PFAS – Per- and poly-fluoroalkyl substances
PRAC – Park River Auxiliary Conduit
PRC – Park River Conduit
PRI – Park River Interceptor
PRSD – Park River Storm Drain
PMU/PMC – Program Management Unit / Program Management Consultant
RHWPCF – Rocky Hill Water Pollution Control Facility
RSPS - Raw Sewage Pumping Station
SBPR – South Branch Park River
SCADA – Supervisory Control and Data Acquisition
SDWA – Safe Drinking Water Act
SHCST – South Hartford Conveyance and Storage Tunnel
SSES – Sewer System Evaluation Survey
SSO – Sanitary Sewer Overflow
TBC – Tower Brook Conduit
TSD – Tremont Street Drain
USACE – United States Army Corps of Engineers
USEPA (or EPA) – United States Environmental Protection Agency
WI – Windsor Interceptor
WPCF – Water Pollution Control Facility
WTP – Water Treatment Plant
WWEP – Wet Weather Expansion Project

2018 Integrated Long-Term CSO Control Plan
Summary

Overview

The Metropolitan District of Hartford (MDC or District) is implementing a multibillion Clean Water Project (CWP) to control or eliminate combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) that impact residents, businesses, and the recreational and aesthetic benefits of the local waterways, the Connecticut River, and Long Island Sound. The CWP is being implemented in accordance with a federal Consent Decree (CD) and a state Consent Order (CO). Its components are set forth in a Connecticut Department of Energy and Environmental Protection (CTDEEP) approved document known as the "Long-Term CSO Control Plan" (CSO LTCP).

Since 2005, the District has **spent/committed approximately $1.7 billion** on wastewater system improvements to address these discharges, resulting in the reduction on an annual basis by approximately 550 million gallons (MG) of untreated CSO discharges throughout the system to date. This is more than a **50 percent reduction in CSOs**, as shown in **Figure 1**. The major initiatives completed to date have included:

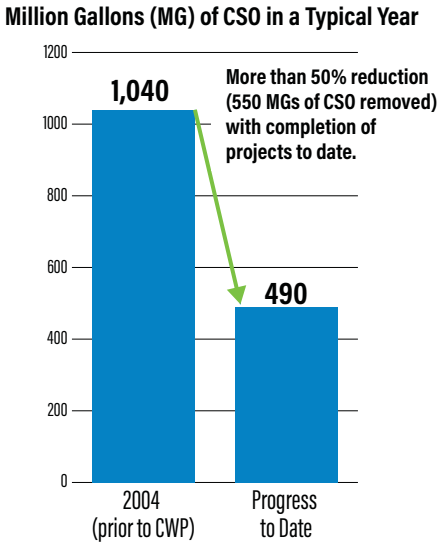


Figure 1 CSO Reduction Progress to Date

- Improvements at a cost of $490 million at the Hartford Water Pollution Control Facility (HWPCF), the heart of the combined sewer system, where all flow is treated before its discharged to the Connecticut River. The District made these WPCF improvements to revitalize the facility and protect against the potential failure of critical infrastructure that maintains compliance with its existing National Pollutant Discharge Elimination System (NPDES) permit. The improvements were also targeted to increase the treatment capacity up to 200 million gallons per day (mgd) to reduce CSOs/SSOs and eliminate nearly 1 million pounds of nitrogen per year to the Connecticut River since 2009, thereby better protecting the Connecticut River and Long Island Sound.

- Sewer system improvements of $270 million were completed to convey more flow for treatment or removal through 700 acres of sewer separation with the installation of more than 25 miles of new sewer and drain pipe over the course of more than 10 construction contracts. One significant achievement is the disconnection of Gully Brook from the sewer system, eliminating more than 750 MG per year of brook flow from the sewer system. This achievement reduced annual CSO discharges by more than 200 MG per year and eliminated the District's largest CSO discharge.

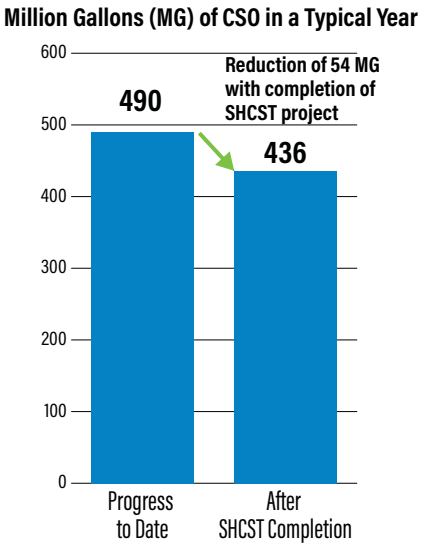


Figure 2 CSO Reduction with SHCST Completion

- The District's commitment of $190 million, through its SSO abatement program for compliance with the CD, includes comprehensive sewer system rehabilitation of more than 200 miles of existing sewer pipe in the system with a focus in the regional communities of Newington, West Hartford, Wethersfield, and Windsor to control its structural SSO discharges and sewer system surcharges. Additionally, significant upgrades were completed at the Rocky Hill WPCF (RHWPCF), as well as several sewer system conveyance improvements projects. To date, five (5) of the eight (8) structural SSOs have been eliminated.

Currently, the District is constructing the South Hartford Conveyance and Storage Tunnel (SHCST) at a projected cost of $550 million. This project is the largest single capital project the District has ever undertaken and will be a substantial milestone to **eliminate the remaining three (3) structural SSOs** from Newington and West Hartford, **eliminate CSO discharges to the Wethersfield Cove**, and further reduce CSOs in a typical year from 490 MG to 436 MG, as shown in **Figure 2**. The size of the SHCST, which is designed for a capacity of 41.5 MG, is primarily driven by the elimination of the CSOs to the Wethersfield Cove, which is approximately 42 MG and exceeds the capacity of the SHCST itself. Additionally, during that storm event, it would take in approximately 2 MG from the South Branch CSOs (up to 1-Year Design Storm) and approximately 16 MG from the three structurals SSOs. However, optimization of the tunnel is achieved by treating flow during the storm at the HWPCF, which will allow the tunnel to adequately handle such an event.

Figure 3 Capen Street Sinkhole from Pipe Failure

The work to control the CSO and SSO discharges is not complete. The District must continually manage compliance with requirements to control or eliminate its CSOs and SSOs and the normal activities of maintaining its sewer collection system. Aging infrastructure and crumbling pipes beneath the city streets are a significant concern to the District, member towns, and the public. This requires attention. Sewer failures cause sinkholes, such as the one in **Figure 3**, that pose a significant public health and safety hazard. The existing wastewater collection system, WPCFs, wastewater pumping stations, and drinking water systems all have significant capital needs that extend beyond the normal requirements for annual operation and maintenance (O&M).

As part of the 2018 Integrated LTCP Update, the District undertook a comprehensive top-to-bottom system assessment to evaluate and compile all its facility renewal requirements to ensure that the District has working facilities now and into the future that meet its obligation to the public and to comply with its numerous federal and state permit requirements. The overall cost of this infrastructure renewal program is approximately $4.5 billion (2018 dollars) over the next 40 years.

Aging Infrastructure

The combined and sanitary sewer systems are deteriorating rapidly, with recent failures to major interceptors requiring emergency response and costly repairs to restore service, such as the one in **Figure 4**, as well as recent failures on other pipes that have caused SSOs from the combined sewer system (CSS) in dry weather.

Figure 4 Pipe Collapse

The 2012 LTCP Update, while including some revisions to the plan, was just an update to the original 2005 plan; whereas the 2018 CSO LTCP Update included a far more in-depth evaluation of the existing system that was not done previously and documents the District's challenges with aging infrastructure. The Integrated Plan approach represents the District's commitment to its rate payers, as well as the environment, and incorporates the District's ongoing program to inspect, identify rehabilitation requirements, and implement system improvements to address its aging infrastructure. The average age of the sewers in the city of Hartford exceeds 80 years old, which in some cases has exceeded the intended lifespan of the pipes. Hartford's interceptors are the oldest portions of the sewer system with pipe ages of more than 100 years, and these pipes represent the most critical conveyance component of the system. Additionally, sewers in the separated member towns that convey flows to the HWPCF are also aging, in need of repair, and contributing additional wet weather flows from infiltration on top of inflow from private connections. **Figure 5** shows the miles of sewer pipe by age in the eight Member Towns, which spotlights the significant difference between the average pipe age in Hartford relative to the other Towns.

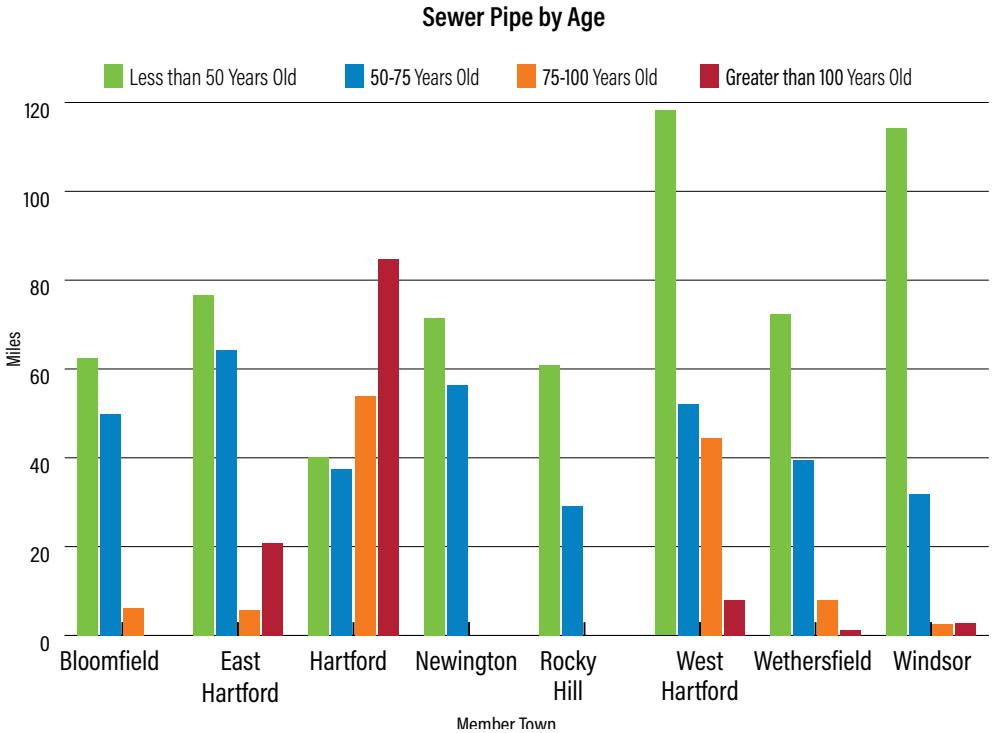


Figure 5 Member Town Miles of Sewer Pipe by Age

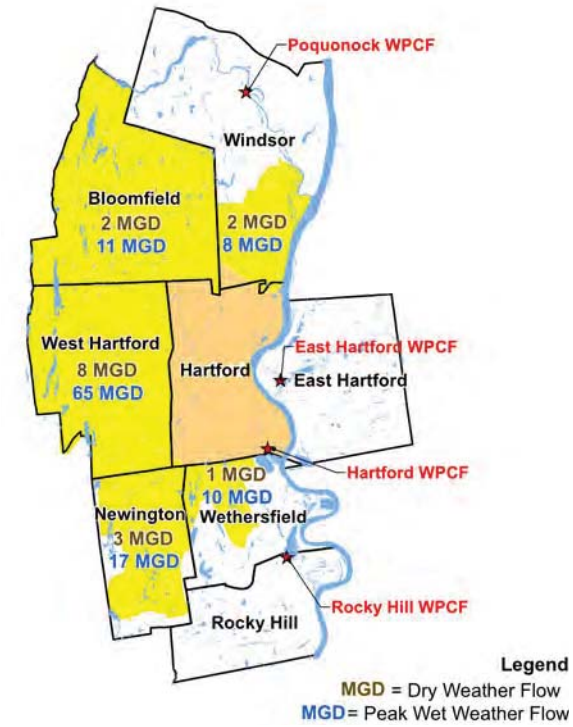


Figure 6 Dry and Wet Weather Flow from Separated Towns in HWPCF Sewershed

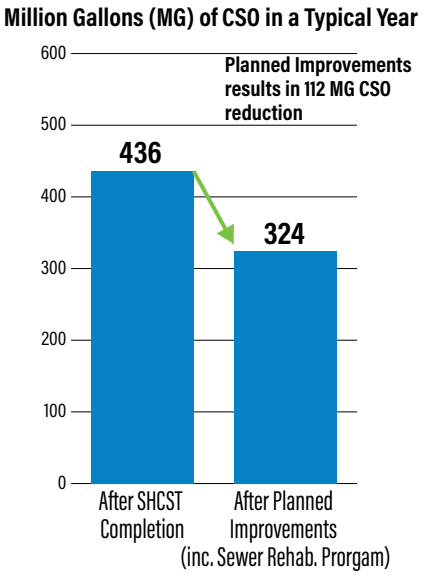


Figure 7 CSO Reduction with Planned Improvements

Sewer Rehabilitation

Excessive infiltration and inflow (I/I) from pipe deficiencies and illicit private inflow connections to the sewer system are an ongoing issue that limits system capacity and contributes to localized sewer backups, manhole flooding, and structural SSOs/CSOs. Per the CD issued by the United States Environmental Protection Agency (EPA), the District must establish remedial measures to meet Clean Water Act (CWA) objectives to control SSOs in the sanitary collection systems.

Both the combined and separated sewer systems have **significant I/I that reduces capacity in the Hartford interceptors and contributes to CSO discharges during wet weather**. For instance, average daily wastewater flow from the town of West Hartford is approximately 8 mgd during dry weather and increases dramatically to approximately 65 mgd during peak wet weather as I/I enter the sewer system. The I/I response ratio of 8 to 1 in West Hartford is considered excessive based on industry standards and EPA guidelines which indicate that this ratio should be no greater than 4 to 1. The I/I response ratios of Wethersfield, Newington, and Bloomfield also exceed these guidelines. A summary of approximate dry and peak wet weather flows from separated towns in the HWPCF sewershed is shown in **Figure 6**.

The I/I response in the entire sewer system tributary to the HWPCF has a substantial impact on CSOs that occur in Hartford. **In fact, the peak flows from the Town's outside of Hartford exceed the secondary treatment capacity of the HWPCF.**

As part of this Integrated Plan, the proposed Sewer Rehabilitation Program within the HWPCF sewershed, coupled with sewer cleaning to maintain 90 percent or greater pipe capacity, will reduce the system-wide CSO discharges by 112 MG from 436 MG (which is the remaining CSO in a typical year after the completion of the SHCST project) to 324 MG annually in a typical year (as shown on **Figure 7**), which is a 26 percent reduction. Comparatively, the SHCST is only predicted to provide a 54 MG reduction in CSO discharges in a typical year. Thus, the 2018 CSO LTCP Update analysis determined that the recommended Sewer Rehabilitation Program and sewer cleaning within the HWPCF sewershed will be more cost-effective for CSO reduction than the SHCST and should be performed as a baseline LTCP program as "Planned Improvements" given the associated significant CSO reduction benefit. In addition to the CSO reduction benefit, sewer rehabilitation is necessary to avoid catastrophic system failures that could result in sewer backups into homes and present potential safety hazards to the public due to the direct exposure to sewer flow on city streets. **This is the essence of integrated planning because it prioritizes projects that address multiple CWA objectives (address aging infrastructure AND abate CSOs) with a cost-effective solution.** In most cases, this involves the rehabilitation of existing infrastructure.

In some cases, it involves replacement with larger facilities to increase capacity and replace aging infrastructure.

Integrated Planning

The EPA Integrated Planning framework was proposed in 2012, several years after CO WC 5434 was issued, because the EPA understood that local government agencies should develop holistic, cost-effective, and balanced approaches to meet the shared objectives of clean water and protection of public health and the environment. EPA's Integrated Municipal Stormwater and Wastewater Planning Approach (https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater) states the following:

> *"Currently, municipalities often focus on each CWA requirement individually. This may not be the best way to address these stressors and may have the unintended consequence of constraining a municipality from addressing its most serious water quality issues first.*
>
> *Recognizing the limits of this approach, EPA developed an integrated planning approach that offers a voluntary opportunity for a municipality to propose to meet multiple CWA requirements by identifying efficiencies from separate wastewater and stormwater programs and sequencing investments so that the highest priority projects come first. This approach can also lead to more sustainable and comprehensive solutions, such as green infrastructure, that improve water quality and provide multiple benefits that enhance community vitality."*

EPA's Integrated Planning Framework, as depicted in **Figure 8**, provides entities the opportunity to consider and pursue cost-effective plans to achieve CSO control in conjunction with the District's full implementation of its Capacity, Management, Operations and Maintenance (CMOM) program as part of the compliance obligations under the CD.

Figure 8 Integrated Planning Framework

The District is faced with the stressors mentioned above, plus the CO requirements to meet a stringent 1-year level of CSO control, with complete elimination to North Branch Park River (NBPR) and Wethersfield Cove, as well as the CD requirements. Since 2005, the District has spent or committed $1.7 billion to meet the CO and CD requirements, which is far more than any other community in the state or the region, with Hartford being one of the state's most economically disadvantaged communities.

Although the LTCP has evolved since it was first approved in 2005, the **Integrated Planning approach does not change or alter the**

previously established environmental and water quality goals set forth in the CO and committed to by the District. However, this approach does take into consideration the projects and schedule to achieve these goals. Integrated Planning was selected as the approach for this LTCP Update since it allows the District to **attain and maintain regulatory compliance, accomplish its system operation goals, maintain its role as a steward of the environment, and affirm the need to provide its ratepayers with a cost-effective plan**.

2018 Integrated CSO LTCP Update

The three-volume 2018 Integrated Plan and CSO LTCP Update (reference **Figure 9**) provides the information and data necessary to support a balanced spending program that fulfills these objectives. This approach is based in part on feedback the District has received from its ratepayers, customers, and member towns regarding recent and projected cost increases associated with the CWP.

- **Volume 1** focuses on the needs assessment for the District's non-CSO control obligations including the wastewater collection system and the drinking water system.
- **Volume 2** includes the 2018 CSO LTCP Update as required by the CO and is a stand-alone technical document that evaluates and outlines the best and most reasonable plan to apply CSO control strategies and technologies to reduce CSO discharges from the District's combined sewer system and to improve water quality to meet compliance requirements.
- **Volume 3** features the integrated planning process and proposed implementation schedule, including an extensive prioritization and ranking of all the District projects.

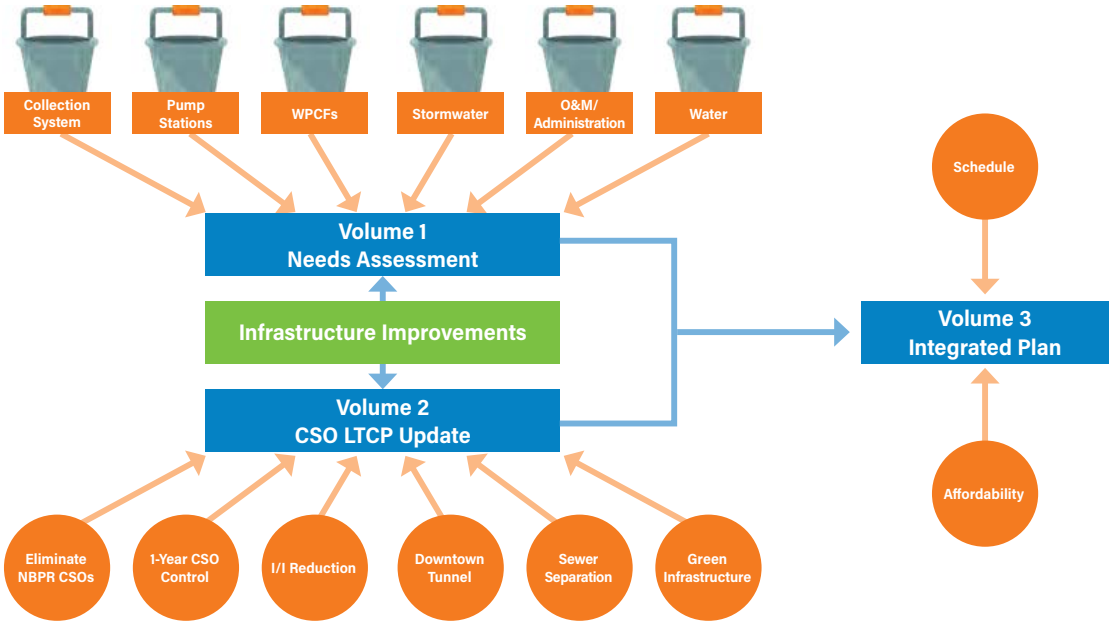


Figure 9 Three Volume 2018 Integrated CSO LTCP Approach

The intent of this 2018 Integrated CSO LTCP Summary is to present the key components addressed in these three volumes in a single concise document, while also identifying the differences between the prior plan (2012 CSO LTCP Update) and the District's Recommended Plan. **This document confirms that all objectives of the CO will be met with the proposed new plan, with implementation occurring over a longer integrated planning schedule.** This high-level document includes a summary of the affordability analysis and proposed CSO implementation schedule, so all information related to the 2018 CSO LTCP Update is in one concise document.

Public Input

The 2018 Integrated Plan has received significant public input. The 2018 LTCP Update was developed in close collaboration among CDM Smith, the District, and CTDEEP, including 17 workshops with CTDEEP. Initial versions of the plan were discussed with the Member Towns and other stakeholders. The draft Integrated Plan was presented at more than 15 District Board and Town Council meetings, which were open to the public, and to several targeted community groups. These presentations ensured that the public and Town officials were appropriately notified of the analysis, technical approach, and final recommendations, as well as providing an opportunity to the public and Town Council feedback during the plan development about the recent significant rate increases. District staff performed outreach to gain interest in and awareness of the public meetings through means that included newspaper advertisements, mailings, social media, and press releases.

Development of this Integrated LTCP Update culminated with a Public Hearing on December 11, 2018, to present the progress to date and the Recommend Integrated Plan and Implementation Schedule.

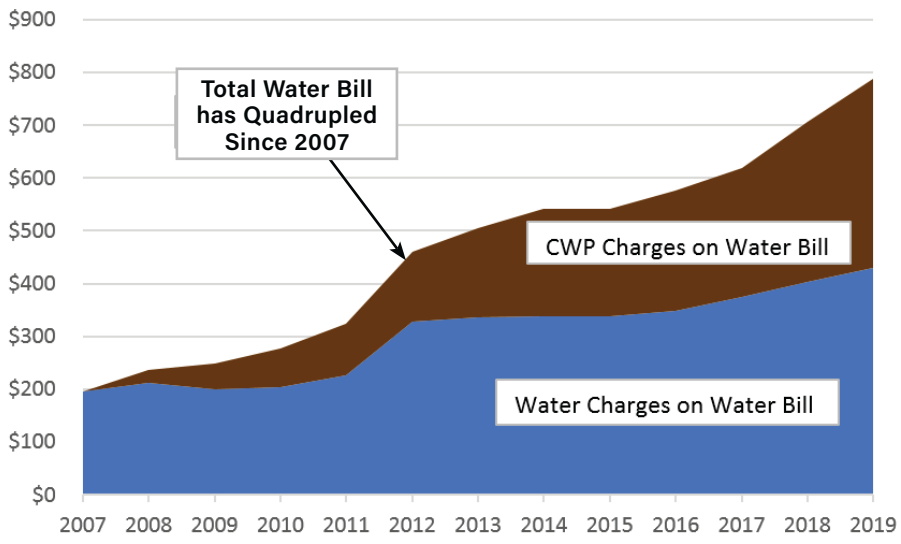


Figure 10 Customer Water Bills

Overall, outreach feedback provided a full spectrum of input. However, **the overarching feedback from the Town Councils and the public was that the recent Clean Water Project Charge and water rate increases (see Figure 10) have been substantial and impactful. These stakeholders also generally agreed that prioritizing sewer renewal expenditures on addressing aging infrastructure before it continues to fail is prudent.**

The District received Town Council resolutions from Bloomfield, East Hartford, Hartford, Newington, Rocky Hill, and Windsor in support of the proposed Integrated Plan.

Prior Approved CSO LTCP Update

The 2012 LTCP Update was submitted in December 2012, finalized in December 2014, and approved by CTDEEP in April 2015. The centerpiece of the District's current work from the prior LTCP Update is the $550 million SHCST. The SHCST is a 21,800-foot long, 18-foot diameter deep-rock tunnel storage system that will include a new dewatering pump station, connecting drop shafts, odor control, and consolidation piping, and have a capacity of 41.5 MG. The SHCST, shown graphically in **Figure 11**, will allow the District to eliminate seven (7) CSOs from the Franklin Area that discharge to Wethersfield Cove and to control the ten (10) southern South Branch Park River Area CSOs (S-19 through S-30) to the 1-Year Design Storm. As stated previously, when online this will result in a 54 MG CSO volume reduction in a typical year, while structural SSO volume will be reduced by 35 MG in a typical year, as summarized in **Table 1**.

Table 1 Typical Year and Elimination Storm Overflow Volume to SHCST

Drainage Area	Typical Year Overflow Volume to SHCST (MG)	Elimination Storm Overflow Volume to SHCST (MG)
Franklin District	37	42
South Branch District	17	2
Structural SSOs (NTS, CTS-2, CTS-3)	35	16

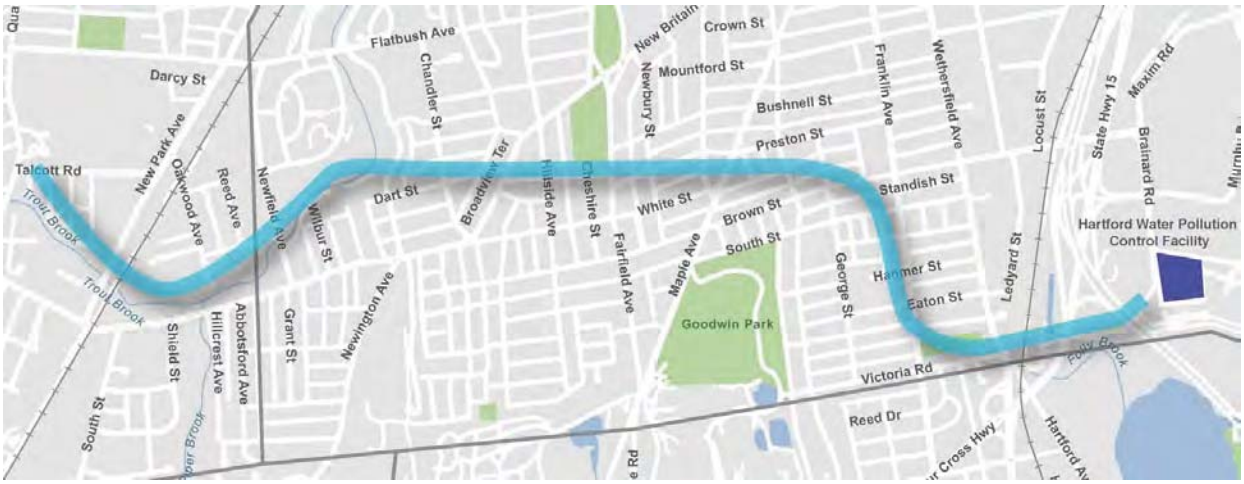


Figure 11 South Hartford Conveyance and Storage Tunnel (SHCST)

The prior LTCP Update had two other major components to achieve full CO compliance:

1. Future North Tunnel, Granby Spur Tunnel, Downtown Spur Tunnel and consolidation conduits to provide an additional storage volume of 45.5 MG.

2. 14,600 linear feet of new sewer pipe ranging from 24-inch to 72-inch to improve system conveyance, as well as regulator modifications at eight (8) CSO structures.

After approval of the 2012/2014 LTCP Update, the CO was modified in December 2016 and May 2017 to establish completion dates for the next LTCP update by December 31, 2018 and construction of all recommended improvements by December 31, 2029.

2018 CSO LTCP Update

Planned Improvements/Sewer Rehabilitation

As discussed previously, the District must address its aging infrastructure and excessive I/I in the sewer system. The 2018 CSO LTCP Update determined that significant system benefits could be achieved by ongoing system-wide maintenance (pipe cleaning and sewer inspection) and the District's Sewer Rehabilitation Program. Based on District experience, which includes a pilot study examining the potential I/I reductions of various sewer rehabilitation approaches, it is expected that the system-wide pipe rehabilitation program will reduce existing I/I by 10 percent or more. Collectively with pipe cleaning, these activities were considered Planned Improvements. The extent of the planned rehabilitation is shown in Section 4 of Volume 1 of the 2018 Integrated CSO LTCP Update (Needs Assessment).

Table 2 summarizes the average annual CSO discharges in 2004 and the estimated CSO reduction that would be achieved when the ongoing HWPCF and SHCST improvements are completed and the Planned Improvements are implemented. The Planned Improvements, including Sewer Rehabilitation Program, will reduce the system-wide CSO discharges from approximately 436 MG (which is the remaining CSO in a typical year after the SHCST project is completed) to approximately 324 MG in a typical year.

Table 2 Annual CSO Discharge Summary

Drainage Area	Annual CSO Discharges (MG)		
	2004 Baseline	2018 Future Baseline[1]	2018 Future Baseline + Planned Improvements [2]
North Branch	71	70	57
Gully Brook	132	20	14
Park River	475	210	166
North Meadows	112	96	55
South Branch	188	39	31
Franklin Avenue	51	0	0
South Meadows	11	1.4	0.8
TOTAL	**1,040**	**436**	**324**

1. 2018 Future Baseline includes HWPCF upgrade to 200 mgd wet weather treatment capacity and SHCST.
2. Planned Improvements include CSS sediment removal to maintain 90% pipe capacity and 10% system-wide I/I reduction (Sewer Rehabilitation Program).

The Planned Improvements are extensive and must be planned and implemented carefully to avoid excessive disruption in the system (existing flows are typically redirected as lining and repair work is completed) and to avoid the challenges of multiple widespread work areas in one neighborhood and saturation of construction markets which can have a significant adverse impact on costs. **Table 3** summarizes the proposed project list and schedule for Planned Improvements as part of the CSO plan. There are many projects associated with this work, therefore careful consideration was taken to schedule these projects. Rehabilitation for larger diameter sewers will be staggered continuously, with two contracts under construction at a time. For similar reasons, no more than two to three smaller diameter rehabilitation projects were generally targeted for concurrent construction, for a total of four to five trenchless sewer rehabilitation projects at one time. These 44 sewer rehabilitation projects associated with this work within the HWPCF sewershed and included as part of the 2018 CSO LTCP Update will cost approximately $385 million in 2018 dollars and will take approximately 26 years to complete. Accordingly, the District will recognize the incremental flow reduction from this work over a period that allows for the logical sequencing of the projects.

These Planned Improvement projects were NOT included in the 2012/2014 CSO LTCP Update as they were not known at that time and the need for implementing these projects has set a course for a different direction for this 2018 Integrated CSO LTCP Update.

Table 3 Planned Improvements Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - 10	Yr 11 - 20	Yr 21-26
Projects Focused on Large Diameter Rehabilitation				
Farmington/ Homestead Avenue	$8.4			
Cemetery Brook	$3.8			
Broad Street	$14.2			
Gully Brook Interceptor	$14.5			
Franklin Avenue and Downtown	$16.6			
Newington	$6.4			
North and South Meadows	$6.7			
West Hartford North	$4.7			
Granby Street	$16.3			
Connecticut River Interceptor	$12.8			
West Hartford South	$11.1			
Bloomfield Trunk Sewer	$16.4			
OSBI and NSWBI	$15.8			
Jefferson Street Interceptor	$12.0			
Total $M Spent (Annual CSO Reduction)		← $104 (31 MG) →	← $55 (16 MG) →	←$0 (0 MG) →
Projects Focused on Smaller Diameter Rehabilitation				
I-4/N-30	$0.2			
West Hartford SSES (2012-59)	$11.0			
18-in to 21-in Brick	$11.5			
Windsor Styrene	$3.5			
North and South Meadows	$3.7			
Bloomfield Styrene	$2.6			
West Hartford Styrene	$2.6			
Windsor	$7.3			
Newington Styrene	$3.5			
Gully Brook	$6.9			
Lower North Branch	$8.0			
Upper North Branch	$6.8			
Newington	$7.3			
Bloomfield	$9.6			
West Hartford	$6.2			
Park River Interceptor	$10.6			
Franklin Avenue	$13.9			
South Branch	$14.3			
Folly Brook Trunk South	$9.2			
West Hartford South	$12.7			
Folly Brook SSES #1	$10.4			
Folly Brook SSES #2	$10.4			
W. Hartford Remaining SSES	$21.6			
Bloomfield SSES Contract 2	$5.7			
Bloomfield SSES Contract 3	$6.5			
Bloomfield SSES Contract 4	$6.7			
Bloomfield SSES Contract 5	$4.9			
Windsor SSES 2012-58	$4.9			
Bloomfield SSES Contract 6	$4.4			
Total $M Spent (Annual CSO Reduction)		←$67 (18 MG) →	←$105 (31 MG) →	←$55 (16 MG)→

1. Opinion of probable costs includes 25% contingency only.

Design/Bid Construction

Overview of Remaining CSO LTCP Update

The 2018 CSO LTCP Update presents a modified control plan to meet CO objectives for the remaining CSO regulators using the latest baseline conditions from the extensive 2016/2018 hydraulic model updates. This update incorporates the completed system improvements, ongoing projects, and the sewer rehabilitation projects discussed above, and evaluates the relative costs of alternative CSO control approaches by drainage district for the remaining CSO regulators discharging 324 MG in a typical year (see **Figure 12**). As required by the CO, the recommended plan will eliminate the NBPR CSO regulators (N-2, N-4, N-9, and N-10) and control the remaining CSOs in Hartford to the 1-year event.

In this section a comparison is provided between the technical approach in the prior plan (2012/2014 CSO LTCP Update) and that in the current recommended plan (2018 CSO LTCP Update) including the reasons for the change if the approach is different. This section also lays out the projects included in each CSO area with a generic schedule to accomplish the projects if only the projects in that area were being completed. The proposed overall schedule for all CSO projects is then provided. **Appendix A** presents the 2018 CSO LTCP Update Recommended Plan.

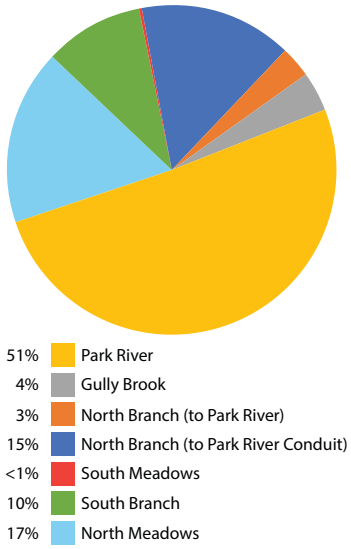


Figure 12 Remaining CSO Discharge After Planned Improvements by Percentage of Total CSO

A new approach is recommended for the Northern Hartford area CSOs differing from that in the 2012/2014 CSO LTCP Update. The previous plan proposed a deep rock tunnel storage system for CSO mitigation (North Tunnel and Granby Spur Tunnel). The 2018 evaluation showed that sewer separation can provide significant and cost-effective CSO reduction in the North Branch District (Granby and Blue Hills), Gully District, and North Meadows District. There are several reasons why sewer separation is the recommended alternative over the prior tunnel plan, as summarized in each CSO area discussed later in this document. For instance, a sewer separation approach allows the District to systematically rehabilitate and replace its aging sewer system in these areas to reduce I/I and provide multiple system benefits, including CSO control. Sewer separation also allows the opportunity to provide drainage benefits to areas that are experiencing localized flooding, such as the Blue Hills area, and update aging water mains simultaneously (costs for water main improvements have not been included in the separation projects). Ultimately, the two NBPR CSOs N-2 and N-4 will be eliminated with a combination of sewer separation, I/I reduction and new pipes to convey wet weather flows further downstream. The District understands that additional time is necessary to achieve this combined objective, but this is a better approach which meets all needs and requirements, although prior studies suggest that the North Branch Park River will still not meet its water quality objectives even after all CSOs to it have been eliminated due to other pollutants such as from stormwater.

A deep rock CSO tunnel storage system remains part of the LTCP because it continues to be the most cost-effective solution to control the Park River CSOs in the heavily congested, central portion of the city. The proposed Downtown Tunnel is an 18,600-foot long, 18-foot diameter, 30 MG deep-rock tunnel from the SHCST connection to Columbus Boulevard that will include drop shafts, odor control, consolidation piping, and associated regulator structures to control the Park River and Farmington Area CSOs. The proposed plan includes an 1,800-foot long, 8-foot diameter, shallow rock micro-tunnel boring machine connection to the N-25 CSO regulator to control the Farmington Area CSOs. A comparison of tunnel storage plans between the 2012/2014 LTCP Update and 2018 LTCP Update is provided in **Table 4.**

Table 4 Tunnel Storage Comparison

Tunnel Storage Component	Start Location	End Location	Diameter (ft)	Length (LF)	Storage (MG)
2012/2014 LTCP Update					
SHCST	HWPCF	West Hartford	18	21,800	41.5
North Tunnel	SHCST	Loomis Street	16	20,900	31.0
Granby Spur Tunnel	Loomis Street	Granby Street	16	9,700	14.5
Downtown Spur Tunnel[1]	Asylum Street	Columbus Boulevard	10	5,600	0
			TOTAL	58,000	87.0
2018 LTCP Update					
SHCST	HWPCF	West Hartford	18	21,800	41.5
Downtown Tunnel	SCHST	Columbus Blvd	18	18,600	29.8
Farmington Area (N-25) MTBM[2]	Hawthorn Street	Sigourney Street	8	1,800	0
			TOTAL	42,200	71.3

1. Component intended for conveyance only. 2. MTBM = Micro-Tunnel Boring Machine

North Branch Park River CSOs

The North Branch Park River (NBPR) district includes 14 CSO regulators that were divided into three groups: the Granby Area, the Farmington Area, and the Park Street CSO regulators. This division follows designations used in the prior LTCP. The N-2 and N-4 CSO regulators in the Granby Area and the N-9 and N-10 CSO regulators in the Farmington Area discharge to the open North Branch Park River and are being eliminated.

Granby Area CSOs

The Granby Area includes only two NBPR CSO regulators, N-2 and N-4, that regulate flows from the Granby Street Relief Trunk Sewer that connects downstream to the Homestead Avenue Interceptor. Two Gully Brook CSO regulators, G-17A and G-17B, are included within this area since they are located downstream along the Homestead Avenue Interceptor Extension and are directly influenced by flows from the Granby Area.

The 2012/2014 LTCP Update included the North Tunnel, the Granby Spur Tunnel and consolidation conduits to capture CSOs from N-2 and N-4. The 2018 CSO LTCP plan for the Granby Area recommends a combination of sewer separation, I/I reduction, Homestead Avenue improvements, and regulator modifications as an alternative to tunnel storage to achieve the CSO control goals at N-2, N-4, and G-17A. **Figure 13** shows the recommendations from the 2018 CSO LTCP Update in the Granby Area. While the proposed sewer separation plan in the northern area is slightly more expensive than the prior tunnel storage plan ($301 million for separation plan versus $269 million for tunnel storage) and will take longer to construct, there are several reasons why it is the recommended alternative. For the Granby Area CSOs, the recommended plan has the following benefits over the prior tunnel plan:

1. The Blue Hills area experiences drainage conveyance and flooding issues, as evidenced by the significant rain events on August 7, 2019 and August 23, 2019 that caused widespread street flooding throughout the Granby Area. The tunnel storage plan would provide no drainage benefit to the area as its purpose would only be to collect the discharge from the CSO outfall. Alternatively, the proposed separation plan will provide additional drainage in the area, and potentially a new storm outfall, which would improve the drainage conveyance and reduce flooding in the local streets.
2. The sewer system in the area has an average age of 94 years and needs rehabilitation and this rehabilitation work can be integrated into the sewer separation contracts.

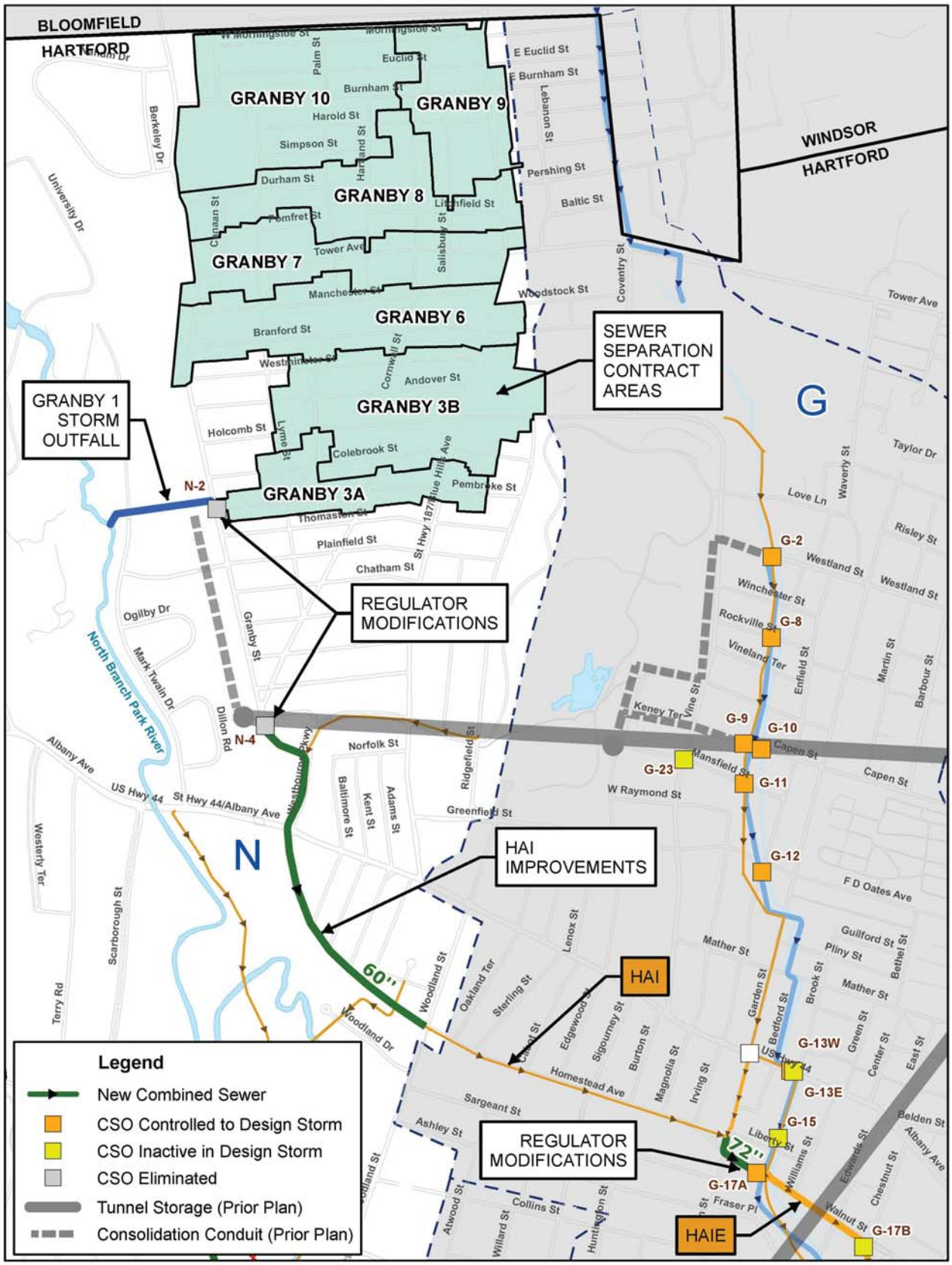


Figure 13 Granby Area CSOs

Note: HAI = Homestead Ave Interceptor; HAIE = Homestead Ave Interceptor Extension.

3. The water system in the area has an average age of 73 years and has some of the highest density of water main breaks in the District's system and requires replacement on many streets. This work can be integrated into the sewer separation contracts, representing an overall savings in costs to ratepayers.
4. The Homestead Avenue Interceptor suffered a major pipe collapse just downstream of Albany Avenue in 2017 and the District has concerns about the long-term structural integrity of the remaining portions of the interceptor. Replacement of the Homestead Avenue Interceptor (HAI Improvements) from N-4 to the Woodland Street with a larger diameter pipe is recommended to address these concerns and improve this aging interceptor. The HAI Improvements alone will also provide an intermediate CSO benefit by controlling the N-4 regulator beyond the 1-Year Design Storm earlier than with the prior plan.
5. The Recommended Plan removes the stormwater from the sewer system, thus reducing transport and treatment costs.
6. While the current CO requires completing all projects in the prior plan by 2029, the North Tunnel in the prior plan cannot be completed until 2033 at the earliest. This Recommended Plan will provide steady progress towards meeting CO goals. For example, discharges from N-4 can be mitigated to greater than 1-Year Design Storm by 2027 with the HAI Improvements project and N-2 can be mitigated to 6-month level of control by 2027. Both these interim CSO reduction accomplishments are earlier in the program than the prior North Tunnel alternative from the 2012/2014 CSO LTCP, which cannot provide any additional benefit to NBPR until completion.

Table 5 summarizes the Recommended Plan changes for the Granby Area CSOs, while **Table 6** summarizes the project list and schedule.

Table 5 Recommended Plan Changes for Granby Area CSOs

CSO Regulator	2012/2014 LTCP	2018 LTCP	Plan Change
N-2, N-4, G-17A	Consolidation to Granby Spur Tunnel and Regulator Modifications	Sewer Separation, I/I Reduction, HAI Improvements, and Regulator Modifications	Yes
G-17B	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No

Table 6 Granby Area CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10	Yr 11 - Yr 20	Yr 21 - Yr 30
Granby 7 Separation	$13.6			
Granby 8 Separation	$11.5			
Granby 9 Separation	$11.5			
Granby 10 Separation	$16.6			
Granby 3A Separation	$12.7			
Granby 3B Separation	$12.6			
Granby 6 Separation	$14.6			
HAI Improvements	$22.4			
Granby 1 Storm Outfall	$13.2			
Granby Private A	$12.1			
Granby Private B	$12.1			
Total $M Spent (Annual CSO Reduction)		←$89 (5.3 MG) →	←$40 (3.0 MG) →	←$24 (0 MG) →

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

Seven separation contracts will be scheduled continuously, with the last construction year overlapping with the first construction year of the following separation contract. This was done per discussions with CTDEEP in January of 2020 to require separation in the sensitive Granby area with discharges to the NBPR to be completed faster. The original 2018 submittal showed one separation contract at a time with an estimated six years of design/bidding/construction assumed for each contract, for a total of 24 years to complete the separation work. The modification to the schedule to overlap first and last construction years of projects allows the Granby separation to be performed in 18 years, six years faster than the original plan. A five-year period of metering and two subsequent private inflow removal contracts will also be performed, if necessary. The necessity for a potential new storm outfall will be assessed during the preliminary design of the Granby Area sewer separation and, if needed, the schedule for construction of the outfall will be updated. These sewer separation projects were prioritized in the overall schedule, which is discussed later. The total cost of the 11 projects is **$153.0 million** in 2018 dollars. **Completion of these projects will reduce CSOs in a typical year by nearly 9 MG.**

Farmington Area CSOs

The Farmington Area CSOs include nine regulators, including the N-9 and N-10 regulators that discharge CSOs to the open NBPR and will be eliminated. The seven remaining CSO regulators in the area (N-12, N-14, N-22, N-23, N-24, N-25, N-30) must be controlled to the 1-Year Design Storm.

The 2018 CSO LTCP for the Farmington Area CSOs has not fundamentally changed from the 2012/2014 CSO LTCP, as discussed further below. **Figure 14** shows the Recommended Plan for the Farmington Area CSO regulators in the 2018 CSO LTCP Update. **Table 7** lists the Recommended Plan changes for the Farmington Area CSOs, while **Table 8** summarizes the project list and schedule.

Table 7 Recommended Plan Changes for Farmington Area CSOs

CSO Regulator	2012/2014 LTCP Update	2018 LTCP Update	Plan Change
N-9, N-10	NNBI Improvements, NNBI Relief Structure and Tunnel Storage	NNBI Improvements, NNBI Relief Structure and Tunnel Storage	No
N-22	Controlled with N-9/10 Improvements	Increase Dry Weather Connector	Yes
N-12	New Combined Sewer	Sewer Separation and Regulator Modifications	Yes
N-14, N-23, N-24, N-25	Consolidation to Tunnel Storage	Consolidation to Tunnel Storage	No
N-30 (I-4)	Not Active during 1-Year Design Storm	Regulator Modifications & Rehabilitation	Yes

Table 8 Farmington Area CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10
NNBI Replacement/Relocation Project[2]	$37.5	
N-12 Separation	$4.6	
NNBI Relief Structure	$12.0	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.
2. Includes N-22 dry weather connector. N-30 rehabilitation included under CSO Rehabilitation Project list. N-14, N-23, N-24, and N-25 consolidation to the Downtown Tunnel is included in the Downtown Tunnel Project (discussed in the Downtown Park River CSOs)

Design/Bid Construction

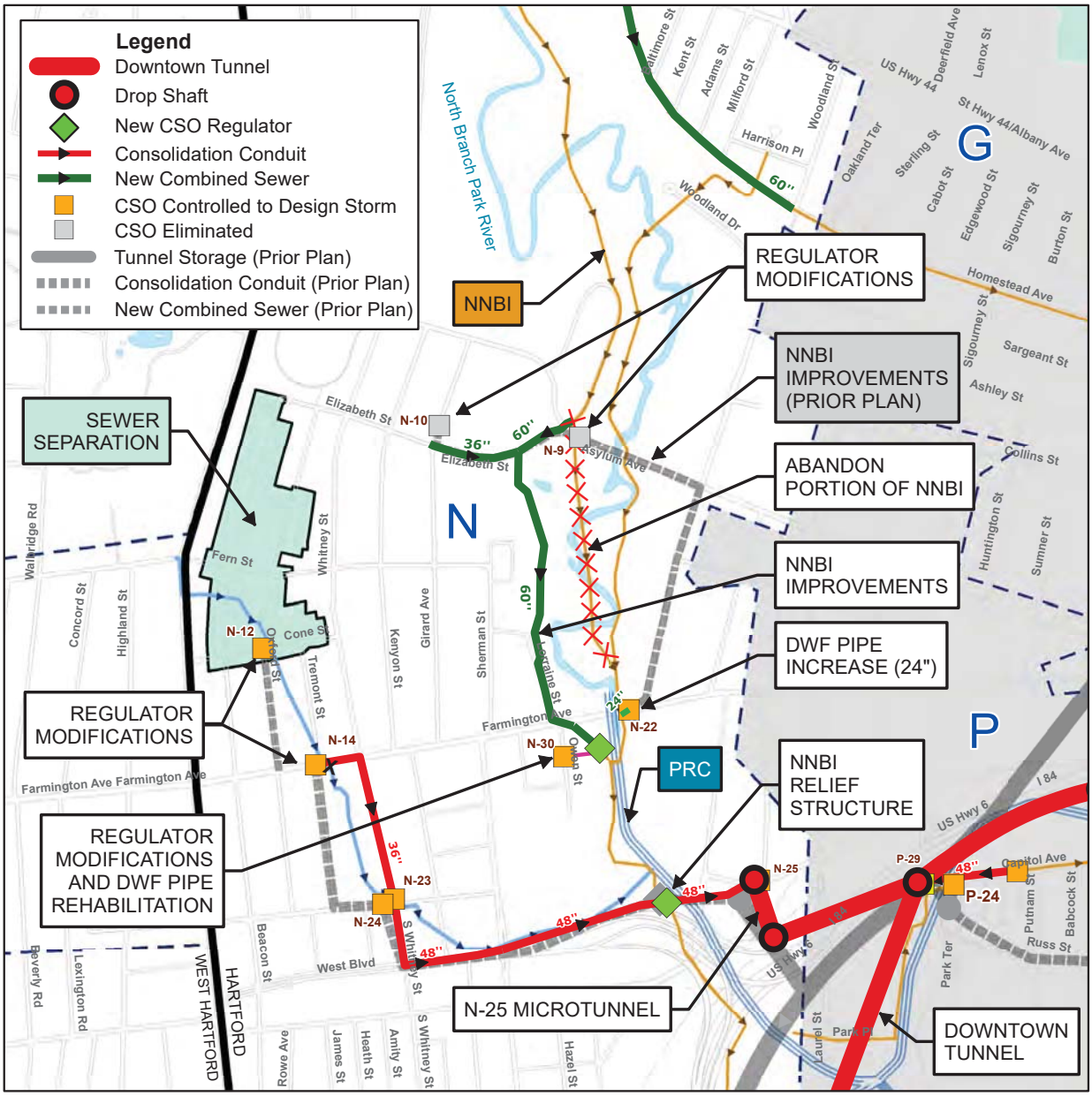


Figure 14 Farmington Area CSOs

Note: NNBI=New North Branch Interceptor; PRC=Park River Conduit; DWF=Dry Weather Flow

The existing NNBI crosses under the NBPR three times between Asylum and Farmington avenues with siphons, creating maintenance issues and flow constraints. Elimination of the N-9 and N-10 regulators requires a combination of system improvements that have been refined since the prior plan, including a preliminary study of various routes for the NNBI replacement, but the fundamental concept remains the same. The preliminary study also evaluated the maximum capacity of the existing system if the pipe and siphons were cleaned and it was determined that the existing pipe would have capacity deficiencies when it came to eliminating the N-9 and N-10 CSO regulators. Thus, the recommended plan includes the replacement of the NNBI with a new, larger interceptor on the west side of the NBPR which

will eliminate three siphons. Additionally, like the prior plan, a new NNBI Relief Structure will be connected to the proposed drop shaft and microtunnel extension to the Downtown Tunnel near the N-25 CSO regulator. **With this approach, these two CSO discharges to the open NBPR are eliminated and the new CSO discharge to the Park River Conduit is controlled to the 1-Year Design Storm.**

An emergency repair of a collapsed pipe was completed in 2017 near N-22 and future work is necessary to complete the repair and avoid additional collapses. The recommended plan for the N-22 CSO regulator is to replace the dry weather flow pipe with a larger pipe to address the defects and provide CSO control. The reason for the change from the prior plan is to address the aging infrastructure.

The 2012/2014 CSO LTCP recommended regulator modifications to N-12 and a larger dry weather connector pipe to increase conveyance. The 2018 CSO LTCP recommends sewer separation and regulator modifications to reduce wet weather flows and achieve the 1-year level of control in this basin. While the proposed $4.6 million sewer separation plan is slightly more expensive than the prior $2 million pipe conveyance plan there are several reasons why it is the recommended alternative. Like the Granby Area, sewer separation for the N-12 area will integrate the required sewer system rehabilitation of 110-year-old (on average) sewer mains and replacement of 112-year-old (on average) aging water mains and will remove stormwater from the sewer system which will reduce transport and treatment costs.

Like the 2012/2014 CSO LTCP, the N-14, N-23 and N-24 CSOs will be conveyed to the Downtown Tunnel via consolidation conduits and the N-25 microtunnel. The N-25 CSO regulator will be directly connected to the proposed drop shaft.

N-30 is anticipated to achieve the 1-year level of control by improving the conveyance capability of the dry weather flow pipe through lining and weir adjustments. The reason for the change is that activation of the N-30 CSO regulator during the 1-Year Design Storm was not known during the development of the 2012/2014 CSO LTCP and the 2018 CSO LTCP addresses this through the recommended improvements.

The NNBI Replacement/Relocation project will achieve elimination of overflows from N-9 and N-10 to the NBPR. The additional projects will achieve 1-year level of control at the remaining Farmington Avenue CSOs. The NNBI Replacement/Relocation project will be prioritized in the overall schedule. While the NNBI Relief Structure can be implemented in approximately four years, it should be constructed after the Downtown Tunnel because it redirects wet weather flow from the NNBI to the tunnel storage system. Total cost of the three projects is **$54.1 million** in 2018 dollars. **Completion of these projects will reduce the typical year CSO by 31 MG.**

Park Street CSOs

There are three CSO regulators along Park Street, in the NBPR District, that were originally grouped together to integrate improvements with the Hartford CTfastrak Busway project. The project was developed under a preliminary design report in 2013 that considered several alternatives for control of these CSO regulators. The 2012/2014 CSO LTCP recommendations remain unchanged and include sewer capacity improvements, sewer separation, drainage system improvements, and consolidation of these three regulators to a new CSO regulator on Park Street to establish the 1-year level of control, as shown on **Figure 15** and **Table 9**. The timeline to implement this $23.9 million (2018 dollars) project is provided in **Table 10.** The project could be constructed at any time and its actual proposed implementation schedule will be provided as part of the Integrated Plan. **Completion of this project will reduce the typical year CSO by 18 MG.**

Table 9 Recommended Plan Changes for Park Street Area CSOs

CSO Regulator	2012/2014 LTCP Update	2018 LTCP Update	Plan Change
N-28A, N-28B, N-29	Sewer Capacity Improvements, Sewer Separation and New CSO Regulator	Sewer Capacity Improvements, Sewer Separation, and New CSO Regulator	No

Table 10 Park Street Area CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 – Yr 10
Park Street Phase I, II, and III Improvements	$23.9	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

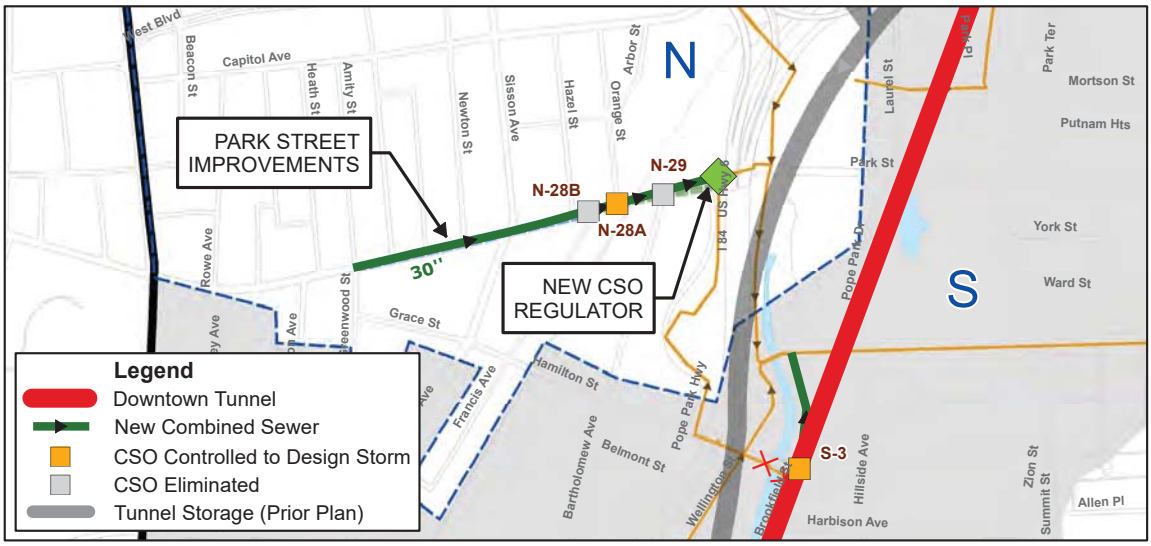


Figure 15 Park Street Area CSOs

Gully Brook Area CSOs

The Gully Brook Area CSOs include 10 remaining regulators that interconnect with the Gully Brook Interceptor and the Gully Brook Conduit. The Gully Brook Interceptor runs parallel to the Gully Brook Conduit and has three separate siphons that cross under the Gully Brook Conduit, creating maintenance issues and flow constraints. Each of the remaining Gully Brook Area CSOs is strongly influenced by sewer system surcharging along the Gully Brook Interceptor. The G-13E, G-15, and G-23 regulators have no CSO discharges during the 1-Year Design Storm with implementation of the Planned Improvements.

The 2018 CSO LTCP for the remaining seven CSO regulators in the Gully Brook Area has been modified from the prior 2012/2014 CSO LTCP to feature sewer separation and regulator modifications to achieve CSO control. The 2012/2014 CSO LTCP included consolidation conduits to convey flows from the largest CSO regulators (G-2, G-9, and G-10) to the Granby Spur Tunnel at Keney Park, combined with regulator modifications at G-8, G-11, and G-12. However, sewer separation is advantageous for the Gully Brook Area since the Gully Brook Conduit runs through the center of the area and serves as the major storm drain for most of these CSOs. In addition, there are partially separated areas in the upstream reaches that can be separated with new drain extensions to the Gully Brook Conduit. **Figure 16** shows the Recommended Plan for the Gully Brook Area CSO regulators from the 2018 CSO LTCP Update. **Table 11** summarizes the Recommended Plan changes for the Gully Brook Area CSOs, while the project schedule and list are summarized in **Table 12.**

Separation minimizes the surcharge along the Gully Brook Interceptor and benefits downstream interceptors by removing excessive wet weather flow. This maximizes the conveyance capacity of the Homestead Avenue Interceptor and supports the modified CSO control approach for the Granby area. The recommended plan includes full separation and private I/I removal (if required) in approximately 380 acres of combined sewer area from G-2 through G-12. Regulator modifications would also be required to meet CSO control goals. Like the Granby Area, sewer separation in the Gully Brook Area will integrate the required sewer system rehabilitation of 90-year-old (on average) sewer mains and the replacement of 95-year-old (on average) water mains and will remove stormwater from the sewer system which will reduce transport and treatment costs.

Table 11 Recommended Plan Changes for Gully Brook Area CSOs

CSO Regulator [1]	2012/2014 LTCP	2018 LTCP	Plan Change
G-2, G-9, G-10	Consolidation to Granby Spur Tunnel	Sewer Separation, I/I Reduction, and Regulator Modifications	Yes
G-8, G-11, G-12	Regulator Modifications	Sewer Separation, I/I Reduction, and Regulator Modifications	Yes
G-13E, G-13W, G-15	Regulator Modifications	Regulator Modifications	No
G-23	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No

1. G-14 and G-20 were eliminated in 2013 and 2016, respectively. G-19 and G-21 are grouped with the Park River Area CSOs. G-17A and G-17B are grouped with the Granby Area CSO regulators

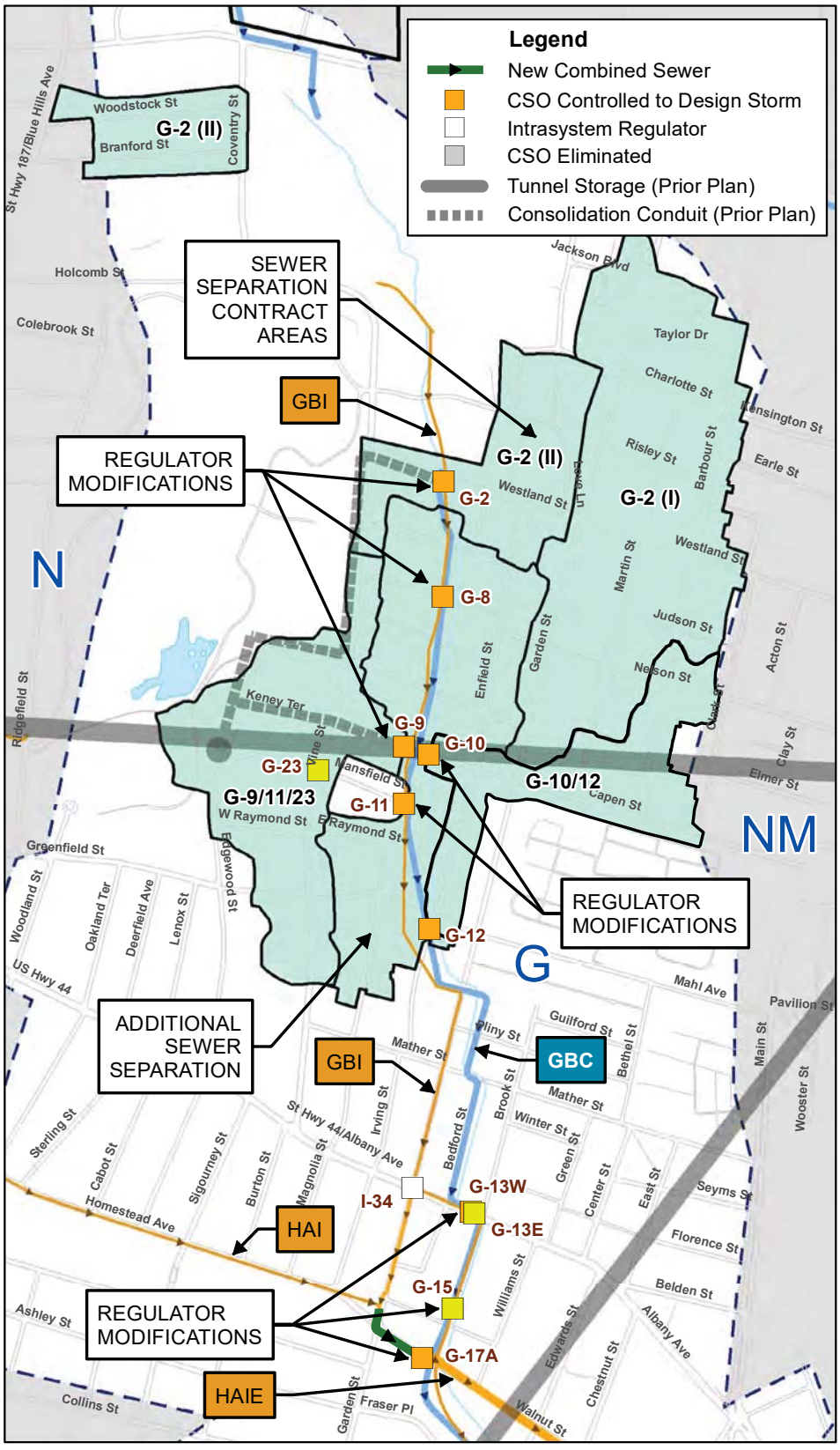


Figure 16 Gully Brook Area CSOs

Note: GBI=Gully Brook Interceptor; GBC=Gully Brook Conduit; HAI = Homestead Ave Interceptor; HAIE = Homestead Ave Interceptor Extension.

Table 12 Gully Brook Area CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - 10	Yr 11 - 20	Yr 21 - 24
G-10/12 Separation	$7.4			
G-9/11/23 Separation	$10.6			
G-2 Separation Phase I	$15.2			
G-2 Separation Phase II	$17.4			
Additional Separation - I	$11.4			
Additional Separation - II	$11.3			
Gully Private Removal	$10.2			

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

Six separation contracts will be scheduled continuously, with one separation contract at a time under construction to avoid overwhelming and negatively impacting the surrounding community. Nearly 25 years is required to perform the sewer separation work when factoring in subsequent private inflow removal (if necessary). The actual timing of these projects was evaluated as part of the development of the Integrated Plan schedule, which is discussed later. Total cost of the seven projects is **$83.5 million** in 2018 dollars. **Completion of these project will reduce the typical year CSO by 12 MG.**

North Meadows District CSOs

The North Meadows District includes eight CSO regulators. Two of the eight CSO regulators (NM-10 and NM-14) are located at the downstream end of the North Meadows District and have been included with the Downtown Park River Area CSOs. The six remaining regulators include NM-2, NM-3, and NM-4 (which regulate flow from the Tower Avenue area upstream of the Northeast Interceptor) and NM-5, NM-6, and NM-7 (located at the end of the Northeast Interceptor and the start of the Connecticut River Interceptor).

The 2018 CSO LTCP for the North Meadows District CSOs includes modification from the 2012/2014 CSO LTCP that included consolidation to the North Tunnel to address NM-2, NM-3, and NM-4 and new combined sewer and consolidation to the North Tunnel to address NM-5, NM-6, and NM-7. The changes in the 2018 CSO LTCP include sewer rehabilitation in the separated Tower Avenue area that is regulated by NM-2 and NM-3, since these regulators remain active during the 1-Year Design Storm and wet weather flow from this area also contributes to CSOs at NM-4.

While the sewer rehabilitation also benefits NM-4, additional work is necessary for control of NM-4 to a 1-Year Design Storm. The alternative to tunnel storage is replacement of the existing Northeast Interceptor from NM-4 to NM-5 with a larger pipe to minimize interceptor surcharge and to achieve 1-Year Design Storm CSO control at NM-4. This is preferred to a consolidation pipe to a tunnel or otherwise because it addresses the significant maintenance concerns for the aging Northeast Interceptor.

The upstream tributary area regulated by NM-5, NM-6, and NM-7 is partially separated, with sanitary sewers recombining just upstream of the CSOs. Fully separating these partially separated areas along with additional combined areas upstream of these regulators significantly reduces overflows at these three regulators. However, the combination of upstream sewer separation and I/I removal in the Tower Avenue area will not control NM-5 CSO to a 1-Year Design Storm and a satellite CSO storage facility (3.1 MG) is recommended at NM-5 to address the remaining CSO volume.

Figure 17 shows the Recommended Plan for the North Meadows CSOs in the 2018 CSO LTCP Update. **Table 13** summarizes the Recommended Plan changes for the North Meadows CSOs, while **Table 14** summarizes the project list and schedule. Like the Granby and Gully Areas, sewer separation in the North Meadows Area will integrate the required sewer system rehabilitation of 90-year-old (on average) sewer mains and the replacement of 95-year-old (on average) water mains and will remove stormwater from the sewer system which will reduce transport and treatment costs.

Table 13 Recommended Plan Changes for North Meadows District CSOs

CSO Regulator	2012/2014 LTCP	2018 LTCP	Plan Change
NM-2, NM-3	Consolidation to North Tunnel	Sewer Rehabilitation and Regulator Modifications	Yes
NM-4	Consolidation to North Tunnel	Sewer Rehabilitation, Regulator Modifications, and NEI Replacement	Yes
NM-5	Consolidation to North Tunnel	Sewer Separation, NEI Replacement, and Consolidation to Satellite Storage	Yes
NM-6, NM-7	Consolidation to North Tunnel	Sewer Separation and NEI Replacement	Yes

1. NM-10 and NM-14 grouped with the Downtown Park River Area CSOs.

Table 14 North Meadow CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10	Yr 11 - Yr 20
Tower Ave Rehabilitation	$3.4		
Northeast Interceptor	$18.6		
NM-5/6/7 North Sewer	$12.2		
NM-5/6/7 South Sewer	$16.2		
NM-5 Site Storage	$74.3		

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

The Northeast Interceptor and two sewer separation projects will be staggered one after another to mitigate construction impact to the community. Design of the NM-5 site storage cannot begin until the sewer separation, sewer rehabilitation, and Northeast Interceptor replacement projects are complete, because there needs to be enough time to properly meter the system after those projects are implemented to understand the remaining wet weather flow that will need to be controlled with the NM-5 site storage. The actual timing of these projects was evaluated as part of the development of the Integrated Plan schedule, which is discussed later. Total cost of the five projects is **$124.7 million** (2018 dollars). **Completion of these project will reduce the typical year CSO by 43 MG.**

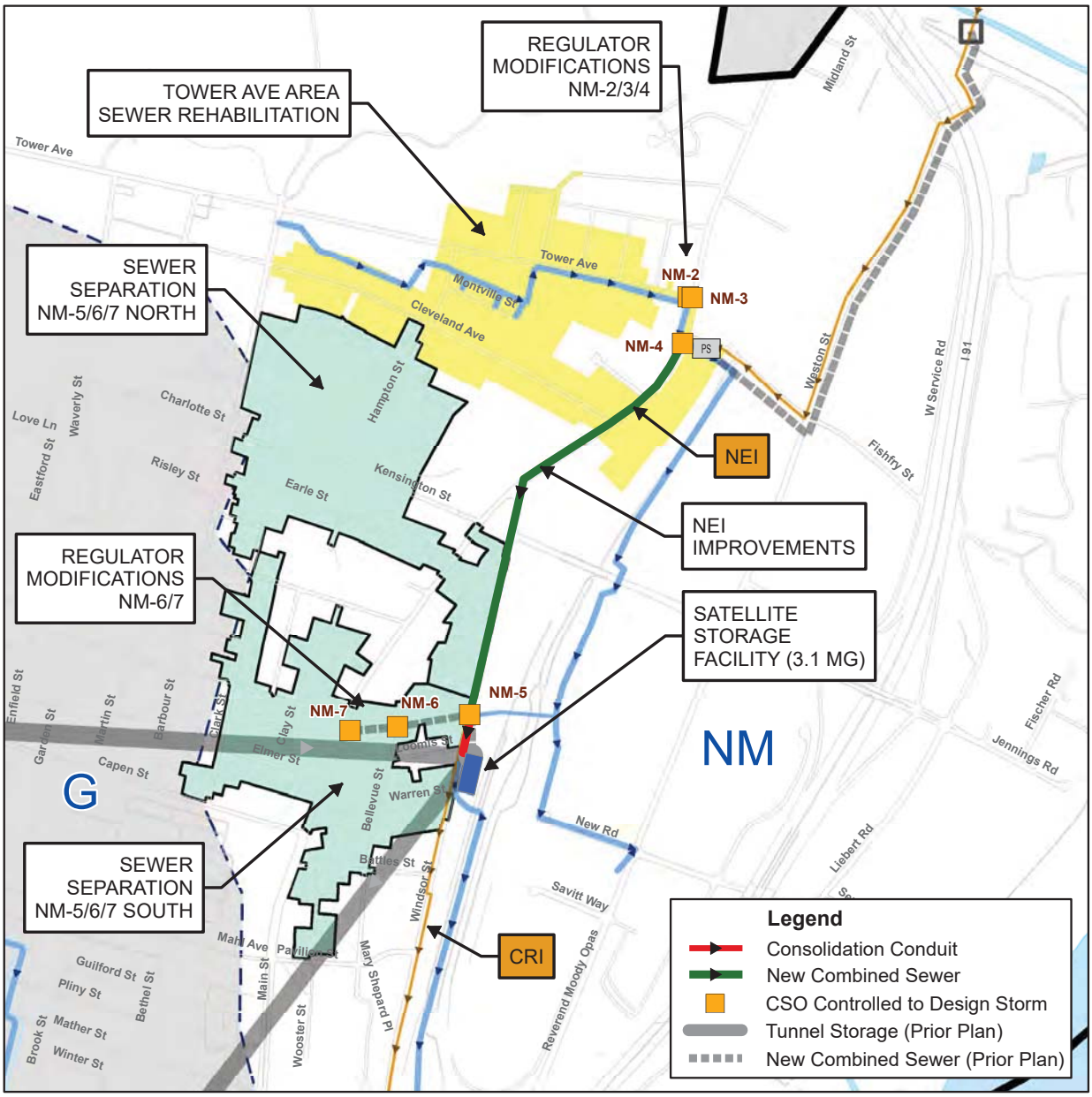


Figure 17 North Meadows District CSOs

Note: CRI=Connecticut River Interceptor; NEI=Northeast Interceptor.

Park River Area CSOs

Tunnel storage remains the most cost-effective and practical approach for the Park River Area CSOs because of the large facilities required to address these high-volume CSO discharges and the lack of available and practical sites for facilities in the dense downtown area. The Park River area was broken into two groups of CSO regulators, like the 2012/2014 CSO LTCP Update, with one grouping for the Downtown Park River CSOs and another grouping for the Upstream Park River CSOs.

Downtown Park River CSOs

The Downtown Park River Area CSOs include 16 CSO regulators (P-1, P-2, P-3, P-4, P-5, P-9, P-10, P-11A, P-12, P-13, P-26, G-19, G-21, NM-10, NM-14, and SM-2) located south of the Park River Interceptor and regulators from adjacent districts that were added to this grouping because of their proximity to the proposed Downtown Tunnel.

The 2018 CSO LTCP for the Downtown Park River CSOs includes only minor changes from the 2012/2014 CSO LTCP, with tunnel storage remaining the primary solution to control CSOs. The Downtown Spur Tunnel in the 2012/2014 CSO LTCP has evolved into the Downtown Tunnel, with tunnel storage still extending east to the P-1 CSO regulator. Consolidation conduit piping and five drop shafts will convey flows in a similar manner from ten Downtown Park River CSOs (P-1, P-2, P-4, P-5, P-9, P-10, P-11A, P-12, P-13, and P-26) to the Downtown Tunnel. The 2018 CSO LTCP continues to propose a new CSO regulator directly on the Park River Storm Drain to consolidate and convey flows to the Downtown Tunnel from the four CSO regulators (P-10, P-11A, P-12, and P-13) that currently discharge to the Park River Storm Drain.

Modifications to SM-2 Regulator, including a modulating CSO gate to convey more flow to the HWPCF, maximize interceptor storage in storms up to 1-year, and minimize interceptor surcharge during storms greater than 1-year, remain part of the plan. The recommended plan is to install structure modifications for a modulated gate valve(s) to dynamically close SM-2 during storm events up to the 1-year event but allow the District to regulate flows during larger storm events to avoid excessive surcharge and maximize flows to the HWPCF.

The 2012/2014 CSO LTCP included a new combined sewer pipe for the G-19 and a consolidation conduit to the Downtown Tunnel for G-21. These components present several challenges due to potential conflicts with existing infrastructure. Localized solutions were evaluated for the 2018 CSO LTCP and the recommended plan now features a combination of sewer separation and sewer system rehabilitation in both areas. This change was made because these alternatives were identified as the most cost-effective solution for 1-year CSO control. Like other areas, they also will integrate replacement of aging water mains and will remove stormwater from the sewer system which will reduce transport and treatment costs.

NM-10 will be addressed after implementation of North Meadow and Park River projects by replacing the existing regulator weir with a modulated gate that would be closed during storms up to the 1-Year Design Storm and opened in larger events to relieve interceptor surcharge, like the proposed modifications to the SM-2 regulator. NM-14 is not active in the 1-Year Design Storm but does activate three times during the typical year simulation.

If necessary, the existing dry weather connector pipe could be replaced to achieve typical year CSO control goals at this regulator.

Figure 18 shows the recommended plan for the Downtown Park River CSOs in the 2018 CSO LTCP Update. **Table 15** summarizes the Recommended Plan changes for the Downtown Park River CSOs, while **Table 16** summarizes the project list and schedule.

Table 15 Recommended Plan Changes for Downtown Park River Area CSOs

CSO Regulator	2012/2014 LTCP	2018 LTCP	Plan Change
P-1, P-2, P-4, P-5, P-9, P-26	Downtown Spur Tunnel	Downtown Tunnel	No
P-3	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No
P-10, P-11A, P-12, P-13	New CSO Regulator to Downtown Spur Tunnel	New CSO Regulator to Downtown Tunnel	No
G-19	New Combined Sewer to HAIE	Sewer Separation	Yes
G-21	Downtown Spur Tunnel	Sewer Separation and Increase DWF Connector	Yes
NM-10	Regulator Controlled by System Modifications	Replace with Modulated Gate Structure	No
NM-14	Regulator Controlled by System Modifications	New Combined Sewer to Replace DWF	Yes
SM-2	Regulator Controlled by System Modifications	Modulating Valve and Chamber Improvements	No

Table 16 Downtown Park River CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10	Yr 11 - Yr 20
G-21 Sewer Separation	$4.5		
G-19 Sewer Separation	$2.5		
NM-14 Combined Sewer	$0.7		
SM-2 Chamber	$1.8		
NM-10 Modulated Gate	$4.2		
Downtown Tunnel	$380.0		

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

Like for other areas, the two separation contracts will be staggered and integrate sewer rehabilitation and water main replacement into the project. The actual timing of these sewer separation and regulator modification (SM-2, NM-14, and NM-10) projects was evaluated as part of the development of the Integrated Plan schedule, which is discussed later. The implementation of the Downtown Tunnel project is also discussed later under the Integrated Plan schedule development, which includes consideration for the magnitude of this project and its impact on the rate payers. Total cost of the six projects is **$393.7 million** in 2018 dollars. The Downtown Tunnel is necessary to achieve the level of control at some of the Upstream Park River CSOs, and therefore a portion of the cost is associated with those CSOs.

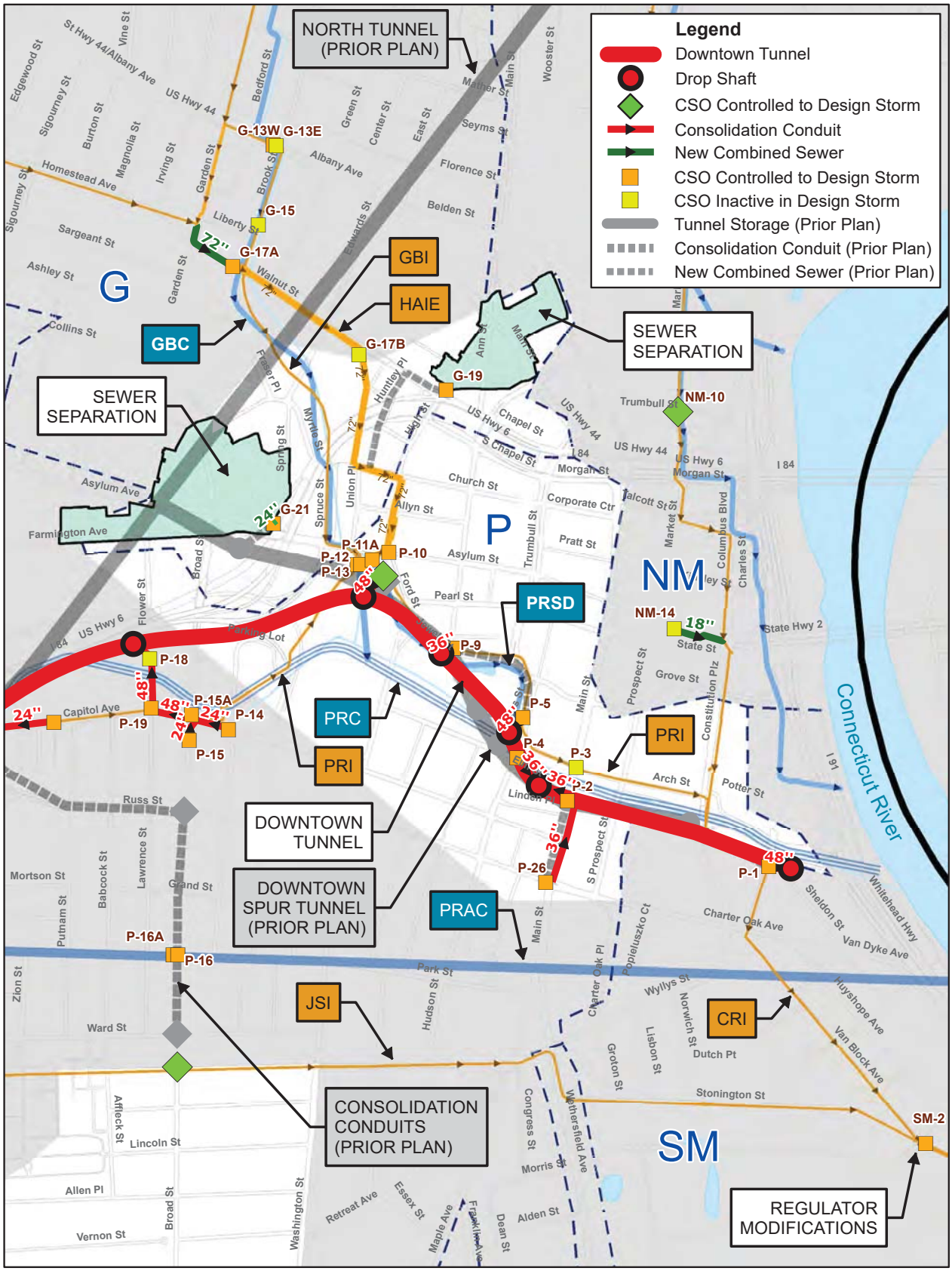


Figure 18 Downtown Park River Area CSOs

Note: CRI=Connecticut River Interceptor; PRC=Park River Conduit; PRAC=Park River Auxiliary Conduit; PRSD=Park River Storm Drain.

Upstream Park River CSOs

The Upstream Park River CSOs include 10 regulators (P-14, P-15, P-15A, P-16, P-16A, P-18, P-19, P-23, P-24, and P-29) located upstream of the Park River Interceptor and Park River Conduit intersection near Capitol Avenue. Like the Downtown Park River CSOs, the 2018 CSO LTCP for the Upstream Park River CSOs includes only minor modifications to the 2012/2014 CSO LTCP, with tunnel storage remaining the primary solution. The P-18 and P-29 regulators are not active during the 1-Year Design Storm.

Figure 19 shows the 2018 CSO LTCP recommended plan to connect the Upstream Park River CSO regulators to the Downtown Tunnel via two drop shaft locations. One consolidation pipe network collects the P-14, P-15, P-15A, and P-19 CSO regulators and the other collects the P-23 and P-24 CSO regulators.

The 2012/2014 CSO LTCP proposed a new combined sewer to control overflows at the P-14, P-15, P-23, and P-24 regulators, which was intended to direct wet weather flows to consolidation conduits and the prior North Tunnel alignment. Since the proposed Downtown Tunnel alignment is closer to these regulators than the North Tunnel, the new plan includes consolidation conduits for these four regulators to the Downtown Tunnel.

P-16 and P-16A currently overflow into the Park River Auxiliary Conduit at Broad Street and Park Street which is a highly developed location with utility concerns that make pipeline construction very challenging. During recent inspections of the sewers in the area, an existing drop-shaft to the Jefferson Street Interceptor was identified. Wet weather flow from a substantial portion of the Broad Street Sewer tributary area could be directed to the Jefferson Street Interceptor via a new regulator and modifications to the existing drop shaft. This new connection to Jefferson Street Interceptor, identified as the Broad Street Shaft Diversion project, eliminates the need for large consolidation pipes from P-16 and P-16A to the Downtown Tunnel from the prior LTCP. This change was made as it is more cost-effective for 1-year CSO control and will require less disruption to the area.

Table 17 summarizes the Recommended Plan changes for the Upstream Park River CSOs in the 2018 CSO LTCP, while **Table 18** presents the project list and schedule.

Table 17 Recommended Plan Changes for Upstream Park River Area CSOs

CSO Regulator	2012/2014 LTCP Update	2018 LTCP Update	Plan Change
P-14, P-15, P-23, P-24	New Combined Sewer to North Tunnel	Consolidation to Downtown Tunnel	No
P-15A	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No
P-16, P-16A	New CSO Regulator to North Tunnel	Regulator Modifications	Yes
P-18	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No
P-19	Not Active during 1-Year Design Storm	Consolidation to Downtown Tunnel	Yes
P-29	Not Active during 1-Year Design Storm	Not Active during 1-Year Design Storm	No

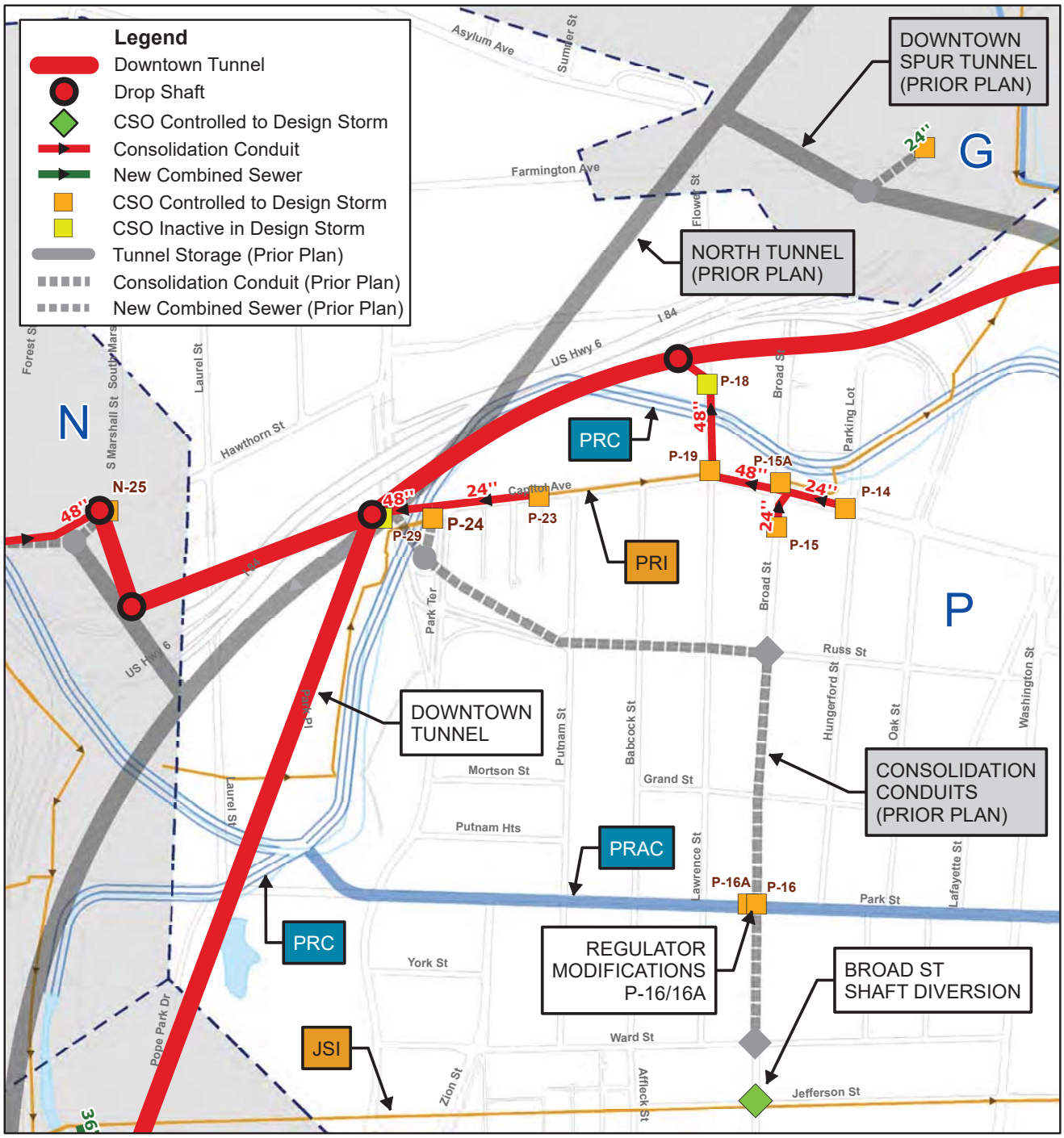


Figure 19 Upstream Park River Area CSOs

Note: JSI=Jefferson St Interceptor; PRC=Park River Conduit; PRAC=Park River Auxiliary Conduit; PRI=Park River Interceptor.

Table 18 Upstream Park River CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10
Broad Street Shaft Diversion	$9.6	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

The Broad Street Shaft Diversion is the only new project required for this group of CSOs, as the others will be controlled by the Downtown Tunnel and those project costs are included in the $380 million under the Downtown Park River CSOs. Total cost of the Broad Street Shaft Diversion project is **$9.6 million** in 2018 dollars. The construction of the SM-2 Chamber Improvements is necessary for the implementation of the Broad Street Shaft Diversion. Without the improvements at SM-2, the Broad Street Shaft Diversion could have adverse impacts on the sewer system. The actual timing of these projects was evaluated as part of the development of the Integrated Plan schedule, which is discussed later.

Summary of All Park River CSOs

The total cost for all projects in the Park River CSO Area is **$403.3 million** in 2018 dollars. **Completion of these projects will reduce the typical year CSO by 180 MG.**

South Branch Park River CSOs

The South Branch Park River (SBPR) District includes 18 CSO regulators that have been divided into three sub-groups, the Southern South Branch, the Middle South Branch, and the Northern South Branch CSO regulators. The 10 Southern South Branch CSO regulators (S-19, S-21, S-23, S-24, S-25, S-26, S-27, S-28, S-29, and S-30) have already been incorporated into the SHCST project and will be controlled to the 1-Year Design Storm.

There are eight CSO regulators remaining in the Middle and Northern SBPR groups. The three Middle SBPR regulators (S-14, S-15, and S-16) control flow into or along the Cemetery Brook Branch Interceptor. For the five Northern SBPR regulators, one CSO regulator (S-8) controls flow into the New Southwest Branch Interceptor, and four regulators (S-3, S-10, S-12, and S-13) control flow into the Old South Branch Interceptor.

The Recommended Plan for the Middle SBPR CSOs has not changed from the 2012/2014 CSO LTCP. These CSOs remain connected to the tunnel storage system via a drop shaft to the Downtown Tunnel, which is along the same alignment as the North Tunnel from the prior plan through this area.

The Recommended Plan for the Northern SBPR CSOs has been modified to address the significant maintenance issues identified along the flat-sloped Old South Branch Interceptor and the Hamilton Street siphon, including pipe plugging and heavy sedimentation that contributes to CSO discharges at S-10 and S-12. The 2012/2014 CSO LTCP included a new combined sewer and consolidation of these regulators to the North Tunnel. The changes in the 2018 CSO LTCP include a new combined sewer pipe from Hamilton Street to the Jefferson Street Interceptor through Pope Park, to re-direct Old South Branch Interceptor flows away from the problematic siphon at Hamilton Street, and Old South Branch Interceptor replacement to the S-10 regulator. The new Old South Branch Interceptor and new Pope Park pipe will connect to the deeper Jefferson Street Interceptor and have a steeper slope which will increase capacity, reduce sediment, reduce CSO discharges at S-3, S-10, and S-12, and allow for abandonment of the Hamilton Street siphon.

The recommended improvements in the 2012/2014 CSO LTCP for S-13 include connecting the S-13 outfall pipe directly to the Old South Branch Interceptor and use of the S-12 regulator as an intra-system relief point. The alternative in the 2018 CSO LTCP includes regulator modifications and a new combined sewer to the Old South Branch Interceptor to eliminate S-13 as a CSO discharge regulator and convert it to an intra-system regulator. The two plans are similar with the 2018 CSO LTCP incorporating the refined recommendations from the ongoing preliminary design for the area.

The S-8 CSO regulates flows to the New Southwest Branch Interceptor from a combined sewer area in Hartford that receives significant dry and wet weather flow from portions of the separated sewer system in West Hartford. The S-8 regulator discharges CSO to Kane Brook, which is a Class A waterway. The District is planning to relocate the S-8 outfall by increasing the size of the New Park Avenue Interceptor to direct excess wet weather flow away from Kane Brook to the SBPR. A portion of this pipe alignment was already constructed by CTDOT as part of the CTfastrak Busway Project and the District is planning to complete the relocation plan that includes a new CSO structure that will be controlled to the 1-Year Design Storm and outfall to the SBPR. The recommended plan for S-8 also includes I/I reduction through sewer rehabilitation in the West Hartford tributary to S-8. In addition, I/I reduction in West Hartford will reduce surcharging on New Park Avenue after the S-8 relocation is implemented. This is a change from the 2012/2014 CSO LTCP which included a consolidation conduit, drop shaft, and connection to the North Tunnel. The reason for change is because the 2018 CSO LTCP is a more cost-effective solution and it builds off the portion of the pipe already constructed by the CTDOT after the 2012/2014 CSO LTCP alternatives analysis was completed.

Table 19 summarizes the Recommended Plan changes for the SBPR CSOs in the 2018 CSO LTCP, while **Table 20** summarizes the project list and schedule. **Figure 20** shows the Recommended Plan for the Middle and Northern SBPR CSOs and the proposed connection to the Downtown Tunnel.

Table 19 Recommended Plan Changes for South Branch Park River CSOs

CSO Regulator	2012/2014 LTCP	2018 LTCP	Plan Change
S-19 thru S-30	Consolidation to SHCST	Consolidation to SHCST	No
S-14, S-15, S-16	Consolidation to North Tunnel	Consolidation to Downtown Tunnel	No
S-3, S-10, S-12, S-13	Consolidation to North Tunnel and Regulator Modifications	OSBI Replacement, Pope Park Pipe and Regulator Modifications	Yes
S-8	New S-8 Regulator, New Combined Sewer and Consolidation to North Tunnel	New S-8 Regulator, New Combined Sewer, I/I Reduction and New Outfall	Yes

Table 20 South Branch Park River CSOs Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 - Yr 10
Kane Brook (S-8 and S-13)	$30.9	
OSBI Replacement and Pope Park Pipe	$11.3	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

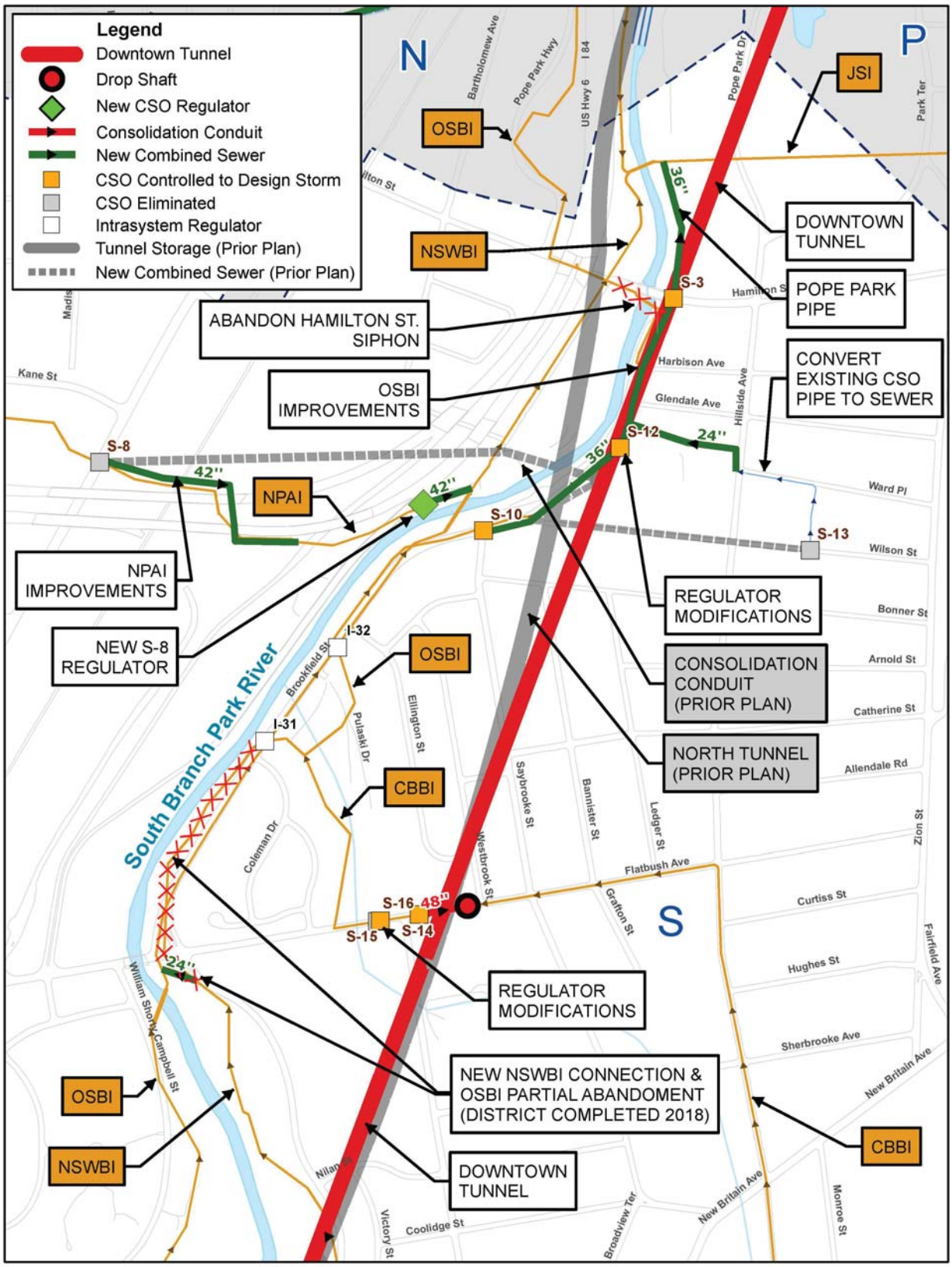


Figure 20 Middle and Northern SBPR CSOs

Note: CBBI=Cemetery Brook Branch Interceptor; JSI=Jefferson St Interceptor; NPAI=New Park Ave Interceptor; NSWBI=New Southwest Branch Interceptor; OSBI=Old South Branch Interceptor.

Total cost of the two projects is **$42.2 million** in 2018 dollars. The actual timing of these projects was evaluated as part of the development of the Integrated Plan schedule, which is discussed later. The Downtown Tunnel and costs/work associated with it are also part of the CSO control plan for these regulators. The Downtown Tunnel is discussed in the Downtown Park River CSOs section of this document. **Completion of these projects will reduce the typical year CSO by 31 MG.**

Implementation Schedule Changes for 2018 CSO LTCP Update

The project scoring and ranking, financial capability assessment, recommended Integrated Plan, and the proposed Implementation Schedule to address the District's current needs and meet regulatory requirements are presented in **Volume 3**. The initial stages of the Integrated Plan development were conducted with direct feedback from, and participation in a series of workshops with, CTDEEP throughout 2018. Additional workshops were held with CTDEEP and the District to collectively score and rank projects. The wastewater collection system, WPCFs, wastewater pumping station, and 2018 CSO LTCP Update projects were scored and ranked using the same process. Although scoring and ranking were not performed for the stormwater projects (excluding flood control projects) that have been identified, these needs were included as part of the Integrated Plan since they represent additional costs incurred by District ratepayers. Refer to EPA's Integrated Municipal Stormwater and Wastewater Planning Approach (https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater). Additional costs not included that will be paid by rate payers during implementation of the Integrated Plan include flood control system improvements and addressing per- and poly-fluoroalkyl substances (PFAS) reduction requirements.

The Implementation Schedule was developed using logic and rationale to prioritize (based on ranking results) and sequence projects to limit the number of active construction projects in any given area and limit the number of similar projects being bid at the same time. To determine an appropriate and realistic schedule, projects were not scheduled based solely on project scoring and ranking. The prioritization and sequencing resulted in some comparatively higher ranked projects needing to be performed later in the implementation timetable for multiple reasons. This includes stabilizing yearly spending to avoid peaks and valleys of spending, except for ongoing CWP projects and the future Downtown Tunnel. The Downtown Tunnel was scheduled after the debt from the HWPCF, RHWPCF, and SHCST projects are substantially paid off with construction of the Downtown Tunnel proposed to commence in the late 2030s. Delaying the Downtown Tunnel design and construction also allows the District to operate the SHCST to gain the benefit of lessons learned prior to designing the second tunnel system. Additionally, flow metering in the 2030s can be completed to determine the actual flow reduction achieved at that time from the sewer rehabilitation and separation work proposed over the next 20 years. This will allow for the proper sizing of the second tunnel system.

Project schedules were further modified to avoid having many similar projects occurring simultaneously and prevent construction market saturation which can result in inflated construction bids by Contractors, which the District has experienced in the past for sewer separation and rehabilitation contracts. Additionally, implementation aims to avoid construction project congestion

to mitigate disruption and traffic impacts to residents. Priority was also given to the rehabilitation and Granby area separation projects, as it was important to have these performed subsequently one after another to keep the many projects involved completed in a timely manner. Using this logic and sequencing rationale to develop the implementation schedule, it became evident that a 40-year schedule would be required. The recommended schedule includes a significant amount of asset renewal that can be achieved earlier in the schedule, while simultaneously achieving progressive CSO reductions.

The full implementation schedule includes both CWP/IP and Capital Improvements Plan (CIP) projects forecasted for 40 years. CWP/IP project costs are directly related to the CO/CD, nitrogen reduction, the SSO Master Plan, and the 2018 CSO LTCP Update, which must be completed to improve the system and attain compliance with the regulatory objectives and requirements. The CIP projects include additional improvements that are not all directly related to CSOs or other regulatory objectives, but which must be completed by the District. These projects may include pump station or WPCF upgrades that are unrelated to CSO, SSO, or nitrogen reduction, as well as facility and other projects that are split between water and sewer as "combined" projects.

The 2018 CSO LTCP projects by CSO grouping and opinion of probable costs are summarized in **Table 21**. The proposed implementation schedule for the 2018 CSO LTCP projects sorted by ranking is included in **Table 22. Appendix B and C** shows the same CSO implementation schedule by drainage area and by year, respectively. Discussions with CTDEEP in 2019/2020 resulted in some modifications to the proposed implementation schedule, per January 6, 2020 discussion with CTDEEP. The Granby separation contracts were moved up in the schedule, with the last separation contract now ending in 2036 as opposed to 2042. The HAI Improvements project has also been moved ahead in the proposed schedule, with design now scheduled to start in 2022 instead of 2027, as originally submitted as requested by CTDEEP in an October 2, 2019 meeting, as it controls N-2, which discharges to NBPR, to greater than 1-Year Design Storm sooner in the program. As a result, some projects were moved later in the schedule than shown in the original 2018 submission in order to maintain affordability to ratepayers. As an example, the Park Street Phase I, II, and III Improvements project was revised to have its completion date extended from 2028 to 2037. Due to ongoing review with CTDEEP, many of the projects originally targeted for 2019 design or construction will be pushed back to 2020 or later depending on the timing of CTDEEP approval of the CSO LTCP/IP. In a similar fashion, should approval be delayed beyond Spring of 2020, scheduling for all projects will be adjusted accordingly.

Figure 21 demonstrates the cash flow per year that is projected from the Integrated Plan implementation schedule (attached as **Appendix D)**, along with yearly spending totals since the beginning of the CWP. This shows the expected reduction in spending from 2023 to the middle of the 40-year program, which will allow the average expenditure to decrease to a more prudent level when construction begins on the Downtown Tunnel and debt from the early part of the program has been largely retired.

Table 21 2018 LTCP Update Recommended Plan Projects and Costs

Recommended Plan Project	Opinion of Probable Cost [1] ($M)
Planned Improvements	
Sewer System Rehabilitation in HWPCF Sewershed[2]	**$385.5**
Granby CSOs	
HAI Replacement and Garden Street (N-4)	$22.4
Sewer Separation (N-2 and N-4)	$117.4
N-2 Outfall Pipe	$13.2
Subtotal	**$153.0**
Farmington and Park Street CSOs	
NNBI Improvements (N-9, N-10, N-22)	$37.5
NNBI Relief Structure	$12.0
Sewer Separation (N-12)	$4.6
Park Street Improvements (N-28A, N-28B, N-29)	$23.9
Consolidation to Downtown Tunnel	$33.1
Subtotal	**$111.1**
Gully Brook CSOs	
Sewer Separation (G-2, G-9/11/23, G-10, G-12)	$83.0
Regulator Modifications	$0.5
Subtotal	**$83.5**
North Meadows CSOs	
Tower Avenue Area Sewer Rehabilitation	$3.4
NEI Replacement	$18.6
Sewer Separation (NM-5/6/7)	$28.4
North Meadows District Satellite Storage Facility	$74.3
Subtotal	**$124.7**
Park River Area CSOs	
Downtown Tunnel and Consolidation Conduits	$338.4
Broad Street Shaft Diversion (P-16 and P-16A)	$9.6
SM2 Valve Chamber Improvements	$1.8
NM-10 Regulator Replacement	$4.2
Sewer Separation (G-19 and G-21)	$7.0
Regulator modifications, new NM-14 combined sewer	$4.1
Subtotal	**$365.1**
South Branch Park River CSOs	
OSBI Replacement and Pope Park Pipe	$10.2
S-13 Elimination	$3.3
S-8 Elimination	$27.6
Consolidation to Downtown Tunnel (S-14/15/16)	$5.8
Regulator modifications, Increase DWF (S-3 and S-12)	$0.9
Subtotal	**$47.8**
Total	**$1.27 Billion**

1. Opinion of probable costs are in 2018 dollars. Costs include estimates for design, construction engineering, and contingencies based on the appropriate level of design for each project.
2. Sewer System Rehabilitation excludes $14.5 million for sewer rehabilitation that is part the sewer separation project costs.

Table 22 2018 CSO LTCP Update Project Schedule

Rank	Assessment Score	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
1	379	Separation	Hartford	G-21 Sewer Separation	$4.5							$0.2	$0.3	$1.0	$3.0																															
2	378	Improvements	Hartford	NNBI Replacement/Relocation Project	$37.5	$0.0	$0.0	$0.0	$9.0	$11.0	$17.5																																			
3	372	Separation	Hartford	N-12 Sewer Separation and CMOM	$4.6	$0.0	$0.0	$0.0	$2.0	$1.2	$1.4																																			
4	369	Improvements	Hartford	Kane Brook (S-8 and S-13)	$30.9	$0.0	$0.0	$9.5	$9.0	$12.4																																			
5	369	Separation	Hartford	G-19 Sewer Separation	$2.5													$0.2	$0.1	$0.9	$1.3																									
6	360	Improvements	Hartford	OSBI Replacement and Pope Park Pipe	$11.3											$0.5	$0.6	$7.0	$3.2																											
7	358	Improvements	Hartford	Park Street Phase I, II, and III Improvements	$23.9																$1.0	$11.5	$4.0	$7.4																					
8	344	Improvements	Hartford	Tower Ave Area Sewer Rehabilitation	$3.4	$0.2	$0.2	$3.0																																					
16	323	Separation	Hartford	G-10/12 Sewer Separation and CMOM (80/20)	$7.4															$0.2	$0.3	$0.3	$1.5	$0.7	$4.4																					
17	320	Improvements	Multiple	SM-2 Improvements (part of Collection System Sewer Gate Replacement Project)[2]	$1.8		$0.2	$1.6																																					
18	320	Separation	Hartford	Granby 7 Sewer Separation and CMOM (80/20)	$13.6	$0.5	$0.5	$0.4	$2.0	$5.2	$5.0																																			
19	320	Separation	Hartford	Granby 9 Sewer Separation and CMOM (80/20)	$11.5					$0.4	$0.4	$0.4	$1.0	$4.3	$5.0																															
20	319	Separation	Hartford	Granby 10 Sewer Separation and CMOM (80/20)	$16.6							$0.5	$0.6	$0.6	$1.1	$5.6	$8.2																													
22	318	Separation	Hartford	Granby 3A Sewer Separation and CMOM (80/20)	$12.7									$0.4	$0.4	$0.4	$2.0	$6.2	$3.3																											
23	318	Separation	Hartford	Granby 3B Sewer Separation and CMOM (80/20)	$12.6											$0.4	$0.5	$0.4	$2.9	$2.3	$6.1																									
24	318	Separation	Hartford	G-9/11/23 Sewer Separation and CMOM (80/20)	$10.6																			$0.3	$0.4	$0.4	$1.0	$3.5	$5.0																	
25	317	Separation	Hartford	Granby 8 Sewer Separation and CMOM (80/20)	$11.5			$0.2	$0.5	$0.4	$1.5	$4.9	$4.0																																	
26	315	Separation	Hartford	Granby 6 Sewer Separation and CMOM (80/20)	$14.6													$0.5	$0.5	$0.5	$6.4	$5.1	$1.6																							
27	315	Improvements	Hartford	Northeast Interceptor (NEI) Replacement	$18.6																												$0.6	$0.6	$0.6	$5.0	$6.8	$5.0							
28	313	Improvements	Hartford	HAI Improvements	$22.4				$0.3	$0.6	$1.6	$5.6	$7.2	$7.1																																	
29	312	Separation	Hartford	NM-5/6/7 North Sewer Separation and CMOM North (80/20)	$12.2																$0.4	$0.4	$0.4	$0.5	$3.9	$6.6																					
30	312	Separation	Hartford	NM-5/6/7 South Sewer Separation and CMOM (80/20)	$16.2																						$0.5	$0.7	$0.5	$4.8	$4.9	$4.8														
31	311	Improvements	Hartford	NM-14 New Combined Sewer	$0.7																																			$0.1	$0.6					
32	310	Small Dia Rehab	Hartford	18-in to 21-in Brick Rehab	$11.5		$0.0	$6.0	$5.5																																				
33	308	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase I	$11.4																																	$0.4	$0.4	$0.4	$3.2	$3.5	$3.5			
34	308	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase II	$11.3																																			$0.4	$0.4	$0.4	$3.2	$3.4	$3.5
36	307	Separation	Hartford	G-2 Sewer Separation and CMOM Phase I (80/20)	$15.2																									$0.5	$0.5	$0.5	$4.5	$4.7	$4.5										
37	307	Separation	Hartford	G-2 Sewer Separation and CMOM Phase II (80/20)	$17.4																													$0.5	$0.6	$0.6	$5.0	$5.7	$5.0						
41	303	Large Dia Rehab	Hartford	Farmington Avenue and Homestead Avenue Area Large Diameter Rehab	$8.4			$0.0	$3.3	$5.1																																			
42	303	Large Dia Rehab	Hartford	Cemetery Brook Area Large Diameter Rehab	$3.8				$0.0	$1.0	$2.8																																			
44	298	Large Dia Rehab	Hartford	Broad Street Area Large Diameter Rehab	$14.2	$0.0	$12.0	$2.2																																					
45	298	Large Dia Rehab	Hartford	Gully Brook Interceptor Area Large Diameter Rehab	$14.5					$0.0	$2.3	$12.2																																		
46	298	Large Dia Rehab	Hartford	Franklin Avenue and Downtown Area Large Diameter Rehab	$16.6						$0.0	$4.9	$11.7																																	
47	298	Large Dia Rehab	Hartford	Newington Large Diameter Rehab	$6.4							$0.0	$1.6	$4.8																																
48	298	Large Dia Rehab	Hartford	North and South Meadows Large Diameter	$6.7										$0.0	$5.0	$1.7																												
49	298	Large Dia Rehab	Hartford	West Hartford North Large Diameter Rehab	$4.7										$0.0	$1.7	$3.0																												
50	294	CSO Storage	Hartford	Downtown Tunnel	$380.0																$2.1	$4.1	$7.4	$18.0	$41.0	$66.5	$77.4	$77.3	$54.6	$31.6															
51	293	Large Dia Rehab	Hartford	Granby Street Area Large Diameter Rehab	$16.3								$0.0	$5.0	$11.3																													
52	293	Small Dia Rehab	Hartford/ Windsor	Windsor Styrene Rehab	$3.5		$0.0	$2.2	$1.3																																				
53	293	Large Dia Rehab	Hartford	Bloomfield Trunk Sewer Area Large Diameter Rehab	$16.4														$0.0	$7.0	$9.4																								
55	293	Large Dia Rehab	Hartford	OSBI and NSWBI Area Large Diameter Rehab	$15.8														$0.0	$10.0	$5.8																								
63	288	Small Dia Rehab	Hartford	North and South Meadows Area Small Diameter Rehab	$3.7				$0.0	$1.0	$2.7																																		
64	288	Small Dia Rehab	Hartford	Bloomfield Styrene Rehab	$2.6				$0.0	$0.5	$2.1																																		

Table 22 2018 CSO LTCP Update Project Schedule (cont.)

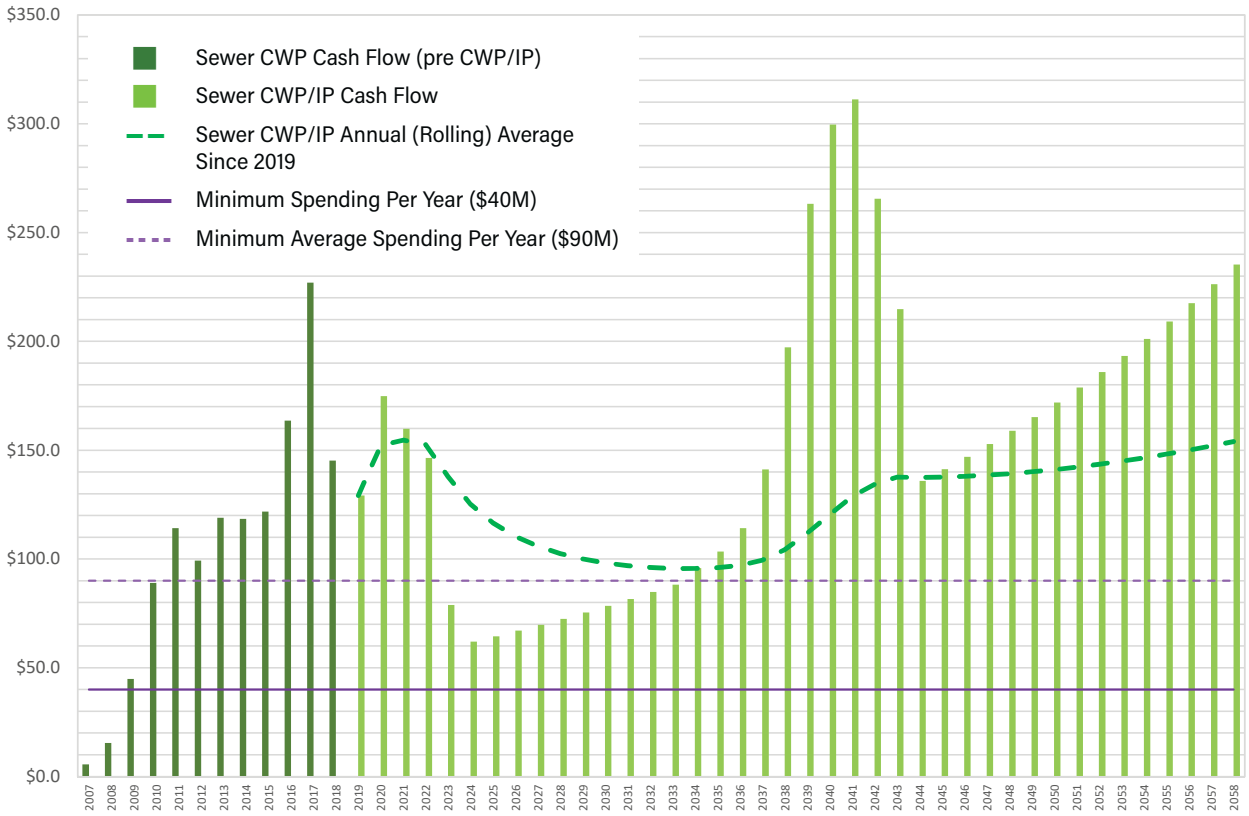
Rank	Assessment Score	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
67	288	Small Dia Rehab	Hartford	West Hartford Styrene Rehab	$2.6							$0.0	$2.6																																	
69	288	Large Dia Rehab	Hartford	Connecticut River Interceptor Large Diameter Rehab	$12.8																$0.0	$4.2	$8.6																							
70	288	Large Dia Rehab	Hartford	West Hartford South Large Diameter Rehab	$11.1																$0.0	$5.6	$5.5																							
76	288	Small Dia Rehab	Hartford	Newington Styrene Rehab	$3.5								$0.0	$1.0	$2.5																														
77	283	Small Dia Rehab	Hartford	I-4 Small Diameter Rehab	$0.2			$0.2																																					
78	283	Small Dia Rehab	Hartford	Gully Brook Area Small Diameter Rehab	$6.9									$0.0	$1.0	$5.9																													
79	283	Small Dia Rehab	Hartford	Lower North Branch Area Small Diameter Rehab	$8.0										$0.0	$5.5	$2.5																													
81	283	SSES	Hartford	Bloomfield SSES Implementation Contract 5	$4.9															$0.5	$2.0	$2.4																							
82	283	SSES	Hartford	Bloomfield SSES Implementation Contract 6	$4.4																	$0.5	$3.9																							
84	283	SSES	Hartford	Windsor SSES Implementation Contract 2012-58	$4.9																							$0.5	$2.2	$2.2																
89	278	Small Dia Rehab	Hartford	Upper North Branch Area Small Diameter Rehab	$6.8												$0.0	$4.3	$2.5																											
92	278	Small Dia Rehab	Hartford	Newington Small Diameter Rehab	$7.3														$0.0	$4.2	$3.1																									
93	278	SSES	Hartford	Bloomfield SSES Implementation Contract 2	$5.7																					$0.6	$1.0	$4.1																		
94	278	SSES	Hartford	Bloomfield SSES Implementation Contract 3	$6.5																							$0.7	$2.9	$2.9																
95	278	SSES	Hartford	Bloomfield SSES Implementation Contract 4	$6.7																									$0.6	$3.0	$3.1														
103	273	SSES	Hartford	West Hartford SSES Implementation Contract 2012-59	$11.0		$7.0	$4.0																																					
104	273	Small Dia Rehab	Hartford	Bloomfield Small Diameter Rehab	$9.6															$0.0	$7.0	$2.6																								
105	273	Small Dia Rehab	Hartford	West Hartford Small Diameter North Rehab	$6.2																$0.0	$6.2																								
106	273	Small Dia Rehab	Hartford	Park River Interceptor Area Small Diameter Rehab	$10.6																	$0.0	$1.9	$8.7																						
108	273	Small Dia Rehab	Hartford	Franklin Avenue Area Small Diameter Rehab	$13.9																	$0.0	$1.6	$12.3																						
109	273	Small Dia Rehab	Multiple	Windsor Small Diameter Rehab	$7.3																			$0.0	$7.3																					
110	273	Large Dia Rehab	Hartford	Jefferson Street Interceptor Large Diameter Rehab	$12.0																			$0.0	$8.0	$4.0																				
111	273	Small Dia Rehab	Hartford	South Branch Area Small Diameter Rehab	$14.3																			$0.0	$5.1	$9.2																				
114	272	Improvements	Hartford	Folly Brook Trunk Sewer South	$9.2																							$0.9	$4.1	$4.1																
117	268	Small Dia Rehab	Hartford	West Hartford Small Diameter South Rehab	$12.7																				$0.0	$3.9	$8.8																			
118	268	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #1	$10.4																						$1.0	$4.7	$4.7																
119	268	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #2	$10.4																							$1.0	$4.7	$4.7																
121	267	Improvements	Hartford	Broad Street Shaft Diversion	$9.6																										$0.5	$0.4	$4.2	$4.5											
123	263	SSES	Hartford	West Hartford Remaining SSES Implementation	$21.6																									$2.2	$9.7	$9.7														
124	263	Improvements	Hartford	Replace NM-10 with Modulated Gate Structure and CRI Low Spot Improvements	$4.2																															$0.2	$0.2	$1.9	$1.9							
126	262	Improvements	Hartford	NNBI Relief Structure	$12.0																						$0.6	$0.6	$5.4	$5.4															
145	233	Private Inflow	Hartford	Gully Brook Area Private Inflow Removal	$10.2																																$1.0	$4.6	$4.6							
149	225	CSO Storage	Hartford	NM-5 Site Storage	$74.3																																			$2.5	$2.5	$2.5	$2.2.3	$2.2.3	$22.3
150	223	Separation	Hartford	Granby 1 Storm Outfall[3]	$13.2													$1.3	$8.2	$3.7	-																									
151	223	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract A	$12.1																							$0.6	$0.6	$5.5	$5.5															
152	223	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract B	$12.1																									$0.6	$0.6	$5.5	$5.5													
Subtotal Future CWP/IP without Downtown Tunnel					**$891**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.7**	**$29.0**	**$24.2**	**$24.3**	**$25.0**	**$18.5**	**$19.9**	**$20.7**	**$29.3**	**$42.8**	**$38.8**	**$29.0**	**$29.9**	**$29.1**	**$24.7**	**$12.9**	**$16.8**	**$28.5**	**$33.5**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$25.8**
Subtotal Future CWP/IP without Downtown Tunnel, with miscellaneous sewer repairs					**$1,271**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.7**	**$29.0**	**$24.2**	**$24.3**	**$25.0**	**$18.5**	**$19.9**	**$20.7**	**$29.3**	**$44.9**	**$42.9**	**$36.4**	**$47.9**	**$70.1**	**$91.2**	**$90.3**	**$94.1**	**$83.1**	**$65.1**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$25.8**

Notes:

1 20% Engineering cost included for all projects, except Large and Small Diameter rehabilitation projects, where engineering is assumed to be performed by in-house MDC staff. All estimated costs are in 2018 million dollars.
2 The total estimate cost of this project is $5.8M, with an additional $4.0M for collection system gates throughout the system.
3 Previously identified as "Granby 1 N-2 Outfall" in earlier documents.
4 An additional project "CRI & PRI Chamber Modification Conceptual Design", estimate at $1.8M, is part of the CSO Update but currently under design already.

$ Design/Bid
$ Construction
- Post construction metering to be performed.

Figure 21 Sewer CWP/IP Spending 2007-2058 (excludes CIP)



Note: All costs are in hundreds of millions. Costs from 2007 to 2018 are nominal costs. Costs from 2019 through 2058 are escalated at a 4% annual rate.

There are 80 individual CSO abatement projects in the 2018 CSO LTCP Update. The proposed schedule includes 26 projects that will be completed by December 2029, including the elimination of CSO regulators N-9 and N-10. These 26 projects, coupled with previously completed and ongoing projects, will result in a 64 percent CSO reduction in a typical year from pre-CWP overflow volume by 2029. A highlighted summary of the system improvements required to meet Consent Order CSO control requirements includes:

- Elimination of all CSOs to Wethersfield Cove completed by December 2023, as required.
- Elimination of the N-9 and N-10 CSOs to NBPR completed by December 2024, exceeding the 2029 CO requirement.
- Elimination of the N-2 and N-4 CSOs to NBPR completed by December 2036 (assuming private I/I removal is not required). However, implementation of Recommended Plan will provide steady progress towards meeting Consent Order goals. For example, discharges from N-4 can be mitigated to greater than 1-Year Design Storm by December 2027 with the HAI Improvements project and N-2 can be mitigated to a greater level of control of a 6-month storm by December 2027 with separation projects. All these interim CSO reduction accomplishments are earlier in the program than the prior North Tunnel alternative from the 2012/2014 CSO LTCP, which cannot be completed, or provide any additional benefit to NBPR, until 2033 at the earliest. **Figure 22** shows the steady progress reducing CSOs that discharge to the NBPR during a typical year from 12 MGs today on average down to zero by 2037.
- By 2044, 94 percent of the CSO will be eliminated in a typical year from pre-CWP overflow volume, while only 14 regulators will be active in the 1-Year Design Storm, compared to 77 today
- Full compliance with all remaining CO requirements to achieve system-wide 1-year CSO level of control (or greater) by 2058.

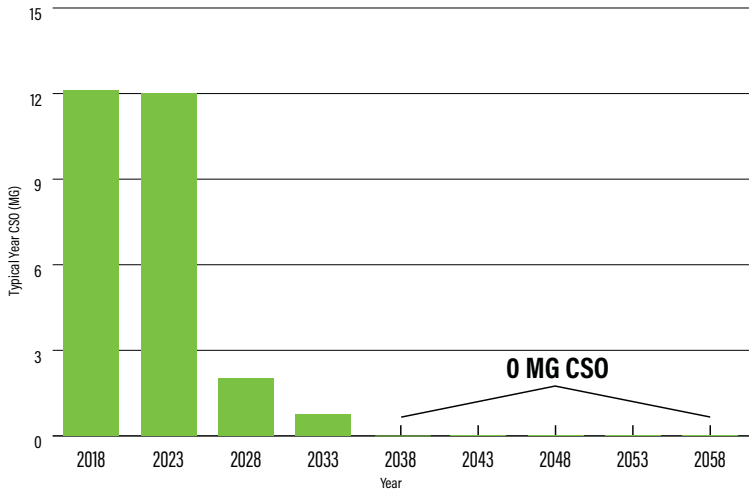


Figure 22 Reduction of CSOs during Typical Year Discharged to NBPR

These dates assume timely CTDEEP approval of the proposed Integrated LTCP so that the District can maintain steady progress toward meeting these goals with implementation of the proposed plan commencing in 2020. Further delay in Integrated Plan approval will delay all dates other than projects currently under construction (i.e., the SHCST project). However, implementation following the requested approval will provide steady progress towards meeting CO obligations. The results of the 1-Year Design Storm simulations are presented in **Figure 23**. **Figure 24** provides the highlights of the 2018 Integrated CSO LTCP in 5-year increments. **Figure 25** provides the typical year CSO reduction across the entire program in 5-year increments, going from 490 MG today to 0 MG in 2058. Each of these figures show similar information in different formats.

Steady progress over time includes approximately 25 percent reduction in remaining CSO volume and 22 fewer active regulators in the 1-Year Design Storm during the first five years of the schedule. SM-2 is also controlled in the 1-Year Design Storm in the first five years through a modulating gate that maximizes flow to the HWPCF and consolidates overflow to P-1 to provide a cumulative reduction between SM-2 and P-1.

By year 2038 other regulators that will be controlled to a 1-year level of control include 9 of 15 regulators in the Gully Brook area, 9 of 15 regulators in the North Branch area, and all but 4 regulators in the South Branch area.

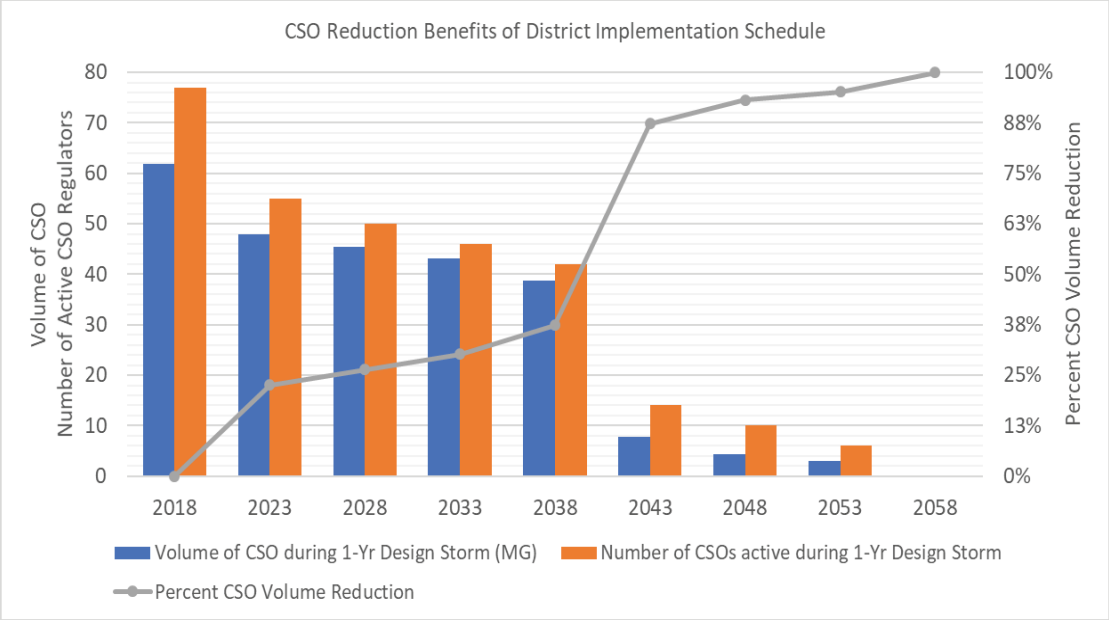


Figure 23 CSO Reduction Benefits Across IP Implementation Schedule, 1-Year Design Storm

The next major improvement in CSO control occurs when the Downtown Tunnel is constructed in years 2039 through 2043. Construction is scheduled after the debt from the HWPCF, RHWPCF, and SHCST projects are substantially paid off. Additional reasons for delaying the Downtown Tunnel includes affordability concerns (see discussion later), the need for public support for large bond referendum, and allowing for lessons learned from operating the SHCST prior to starting the design for the next tunnel system. This addresses the remaining CSOs in the North

Branch District and all but P-16 and P-16A in the Park River District and includes the largest CSOs remaining in the system. A nearly 90 percent reduction in remaining CSO volume is achieved by this milestone leaving only 14 active regulators in the 1-Year Design Storm compared to 77 today. These remaining CSOs include seven regulators in the North Meadows area, five regulators in the Gully Brook area, and P-16 and P-16A. These last regulators are controlled through additional separation, flow diversions, interceptor replacement, and satellite storage at NM-5, the largest of the remaining CSOs to be addressed.

Ultimately, the Recommended Plan will reduce annual average CSO volume from the District's CSS from nearly 1 billion gallons per year in 2005 to zero during a typical year. Annual average CSO discharges, which currently occur 64 times per year, will be reduced to zero during a typical year.

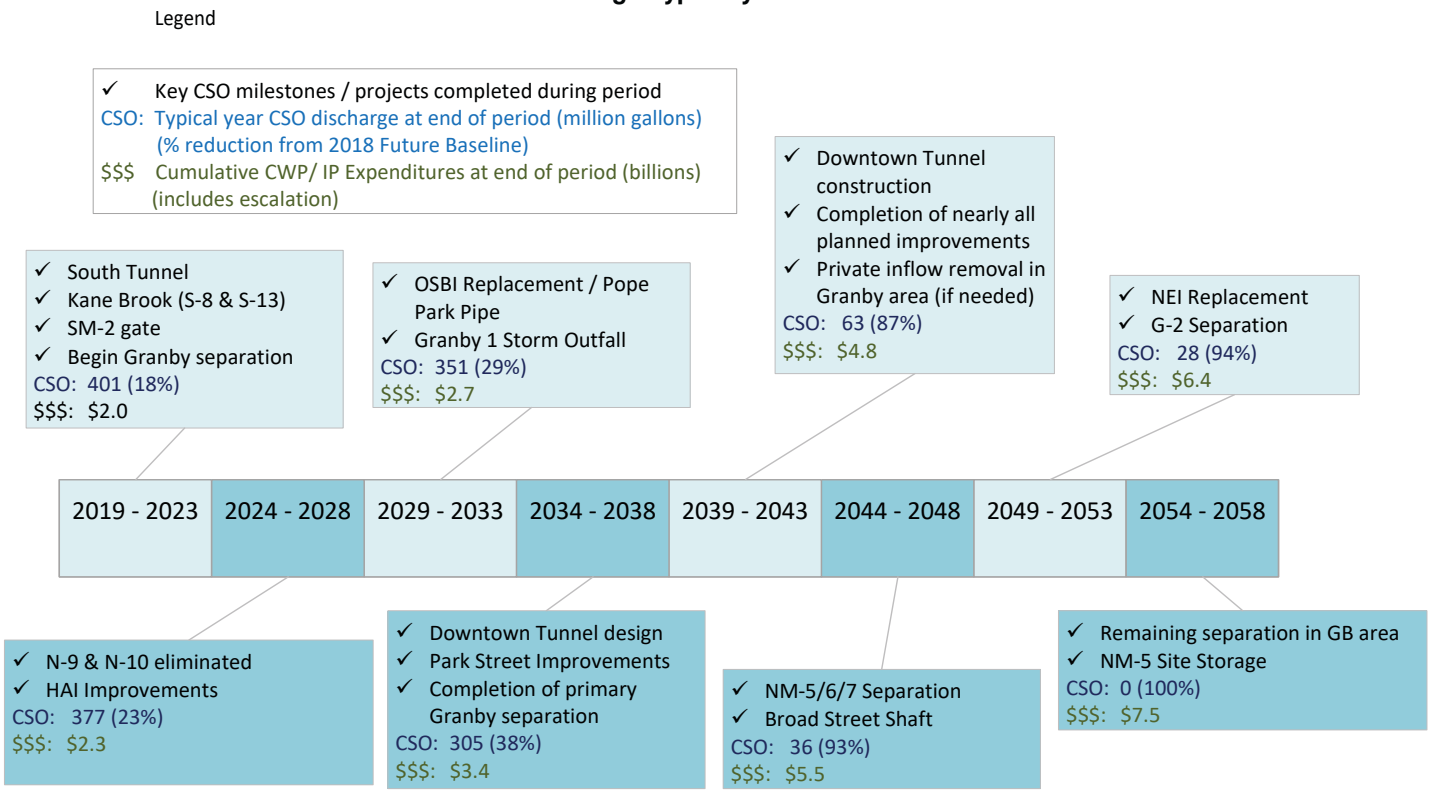
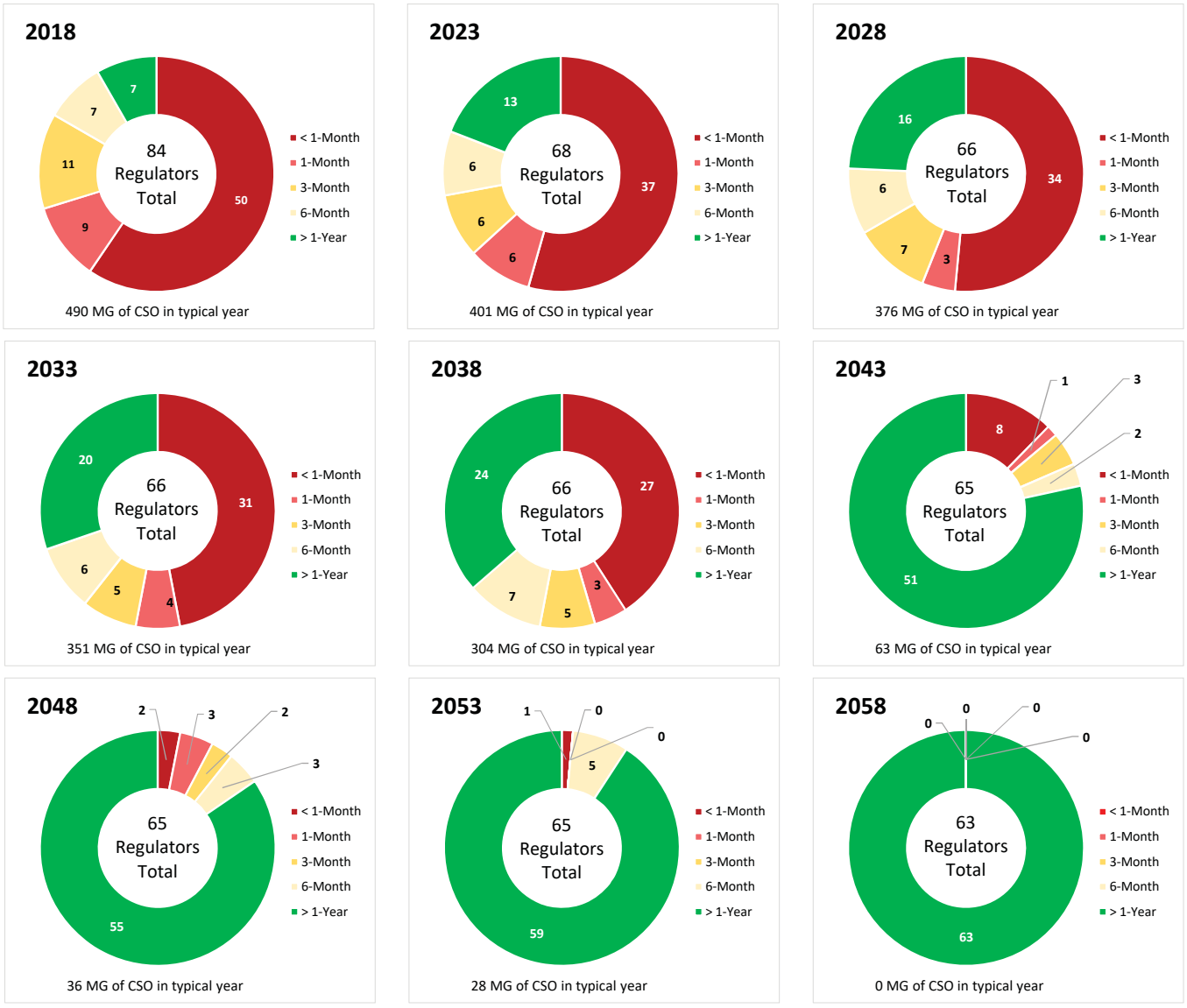


Figure 24 CSO Reduction over CWP/IP Implementation Schedule

Figure 25 CSO Reduction Benefits Across Implementation Schedule, Typical Year



Needs Assessment (Non-CSO Projects)

Volume 1 summarizes the needs assessment for the eight Member Town's wastewater and stormwater systems that encompass the sanitary sewer system, sewer pumping stations, WPCFs, stormwater and flood control systems, SSO control, asset renewal, and operations. These wastewater needs are currently funded by two separate revenue streams. There are non-CSO projects that are related to CD requirements or nitrogen reduction which are funded by the Clean Water Project Charge (CWPC) and then the remainder of the projects, which are unrelated to the CWP, that are capital improvement projects (CIP) funded by the Ad Valorem tax that is levied on the eight Member Towns.

Figure 26 Greater Hartford Service Area

Wastewater Collection System Needs

The District owns and operates a 150-year old combined sewer system (CSS) in Hartford, which includes the oldest portions of the District's wastewater collection system. The CSS dates to the 19th century when it was common for communities to install a single pipe to convey sewer and stormwater flow to the receiving waters for larger sewage conveyance systems. During intense rainstorms, these single pipe systems were designed to discharge excess flow (CSOs) to adjacent waterways and relieve the sewer system. The District also provides sewer collection and treatment services to seven other member communities in Bloomfield, East Hartford, Newington, Rocky Hill, West Hartford, Wethersfield, and Windsor as shown in **Figure 26**. These communities have predominantly separated sewer systems that include a second system for conveyance of stormwater. These systems, which have pipes more than 100 years old, can experience surcharging during intense rainstorms and discharge excess flows (SSOs) to local waterways in Newington, Rocky Hill, and West Hartford. The wastewater collection system needs over the next 40 years and project list/schedule are summarized in **Table 23** and **Table 24.** Non-CSO CWP projects are projects funded by the CWPC in addition to CO compliance. These are CD compliance projects, including SSO Master Plan projects, CMOM, and sewer rehabilitation outside of the HWPCF sewershed, as well as nitrogen reduction projects at the WPCFs. CIP are not funded by the CWPC but rather the Ad Valorem system and include pump station or WPCF upgrades that are unrelated to CSO, SSO, or nitrogen reduction, as well as facility and other projects that are split between the water and sewer divisions as "combined" projects.

Table 23 Wastewater Collection System Needs

Category	Opinion of Probable Cost ($M)		
	Non-CSO CWP	CIP	Total
SSO[1]	$115.9	$0.0	$115.9
Large Diameter Sewer Rehabilitation Projects[2]	$3.2	$0.0	$3.2
Small Diameter Sewer Rehabilitation Projects[2]	$38.5	$0.0	$38.5
Collection System Improvements[1]	$31.5	$21.3	$52.8
Total	**$189.1**	**$21.3**	**$210.4**

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

2. Opinion of probable costs includes 25% contingency only.

Table 24 Wastewater Collection System Project List and Schedule

Project Reference	Opinion of Probable Cost ($M)[1]	Yr 1 – Yr 12
Non-CSO CWP (SSO)[2] (Total of $115.9 Million)		
RH2 & RH2B I/I Reduction	$10.6	
N18 I/I Reduction	$7.8	
N19 I/I Reduction	$5.5	
Wethersfield Trunk & Elm Street Sewer	$28.6	
Decker's Brook Trunk	$6.3	
WH29 I/I Reduction Phase I	$4.3	
WH29 I/I Reduction Phase II	$7.8	
WH30 I/I Reduction Phase I	$5.5	
WH30 I/I Reduction Phase II	$13.4	
WH31 I/I Reduction Phase I	$8.3	
WH31 I/I Reduction Phase II	$15.5	
Montclair/Linnard Sewer	$2.3	
Non-CSO CWP (Large Diameter Rehabilitation) (Total of $3.2 Million)		
Windsor (Poquonock)	$0.9	
East Hartford	$2.3	
Non-CSO CWP (Small Diameter Rehabilitation) (Total of $38.5 Million)		
East Hartford Styrene	$3.0	
Rocky Hill Styrene	$1.4	
Wethersfield Styrene	$3.0	
Rocky Hill	$5.4	
Wethersfield	$1.7	
East Hartford North	$7.1	
East Hartford South	$7.4	
East Hartford Mid	$9.5	
Non-CSO CWP (Collection System Improvements) (Total of $31.5 Million)		
Franklin Avenue 8-in Sewers	$2.5	
Woodside Cir/ NNBI Easement	$2.2	
Bond Sreet Area	$0.5	
Webster Hill Boulevard	$0.3	
Oakwood Avenue Phase II & IIA	$2.8	
Oakwood Avenue Phase I	$4.5	
Saybrooke and Bonner Street	$2.1	
Folly Brook Trunk Sewer North	$16.6	
CIP (Collection System Improvements) (Total of $21.3 Million)		
Dividend Brook Phase I	$5.5	
Dividend Brook Phase II	$5.3	
Mountain Farms Area	$10.5	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering
2. West Hartford SSES (2012-59) is included as part of the small diameter portion of the Planned Improvements, but is a part of the SSO control plan as well.

Design/Bid Construction

Stormwater and Flood Control Systems

The District service areas include stormwater and flood control systems that are owned and operated by each Member Town. Like the wastewater collection system, the stormwater and flood control systems have been constructed over time as the city of Hartford grew and the regional area expanded. Initially, the stormwater and wastewater collection system were built as a single CSS in Hartford. As the system expanded, separate sanitary and stormwater conduits were constructed in the surrounding Member Towns.

The stormwater system in Hartford includes a series of local and collector storm drains conveying flow to major storm drains that discharge to receiving waters, including Wethersfield Cove, Folly Brook, Meadow Brook, Tower Brook, Gully Brook, Cemetery Brook, Kane Brook, and the Park River. Each of these receiving waters ultimately discharges to the Connecticut River (see **Figure 27**).

Figure 27 Connecticut River

The city of Hartford and town of East Hartford are protected by a flood control system that is the largest in New England. Several CSO regulators interconnect with the major storm drains in Hartford and the CSS also interconnects with the Hartford flood control system with CSO discharges to the Gully Brook Conduit, Folly Brook Conduit, Park River Conduit, and Park River Auxiliary Conduit, which are the major storm drain conduits within the flood control system. This system provides flood protection for nearly 3,000 acres of developed urban area, including protection for the Park River during high river conditions. Like the wastewater collection system, the stormwater and flood control systems are aging and in need of repair to function as intended and maintain regulatory compliance. Potential loss of integrity of the stormwater and flood control systems is a threat to the District's existing infrastructure and the significant capital investments being made with the CWP.

The eight member communities in the District incur ongoing costs to operate and maintain their stormwater drainage systems and fulfill the requirements of the state's Municipal Separate Storm Sewer System (MS4) Permit. East Hartford and Hartford also face additional costs to operate and maintain the flood control systems built by the United States Army Corps of Engineers. The costs for stormwater infrastructure renewal and MS4 compliance were estimated for the next 40 years in each Member Town. The costs for East Hartford and Hartford to maintain flood control compliance for the next 40 years were also estimated. These costs (in 2018 dollars) are included in **Table 25**.

Table 25 Member Town Stormwater and Flood Control Needs

Category	Opinion of Probable Cost ($M)[1]
Stormwater System Improvements	$192.5
MS4 Implementation	$152.8
Flood Control	$392.5[2]
Total	$737.8

1. Opinion of probable cost based on 40-year projections.
2. Excluded from Integrated Plan Affordability Analysis

Figure 28 Hartford WPCF

Water Pollution Control Facilities

The District operates and maintains four WPCFs in the wastewater collection system. Six of the eight Member Towns contribute flow to the HWPCF. These six communities include Hartford, West Hartford, most of Bloomfield and Newington, and portions of the Wethersfield and Windsor sewer systems. The District also operates sewage collection and WPCFs in East Hartford, Rocky Hill, and Windsor (Poquonock). The description of current systems, deficiencies, and recommended improvement projects are summarized for each WPCF in **Volume 1**. The opinion of probable costs (2018 dollars) for the recommended projects at each WCPF are summarized in **Table 26**. A project list and the schedule for WPCF projects are included in **Table 27**. A schedule was only provided for the non-CSO CWP projects.

Table 26 Water Pollution Control Facilities Needs

Facility	Year Built	Major Upgrades Years	Average Design Flow (MGD)	Peak Wet Weather Flow (MGD)	Number of Projects	Opinion of Probable Cost ($M)[1]		
						Non-CSO CWP	CIP	Total
Hartford WPCF	1938	1969, 1986, 1994, 2010s	60-90	200	6	$60.0	$61.2	$121.2
East Hartford WPCF	1950s	1990s, 2000s	12.5	-	4	$7.7	$14.8	$22.5
Poquonock WPCF	1962	1979, 1990	5	-	2	$8.0	$0.0	$8.0
Rocky Hill WPCF	1950s	1970s, 2010s	7.5	27	4	$11.0	$4.5	$15.5
				Total	**16**	**$86.7**	**$80.5**	**$167.2**

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.
2. Note that two other potential projects (Renewable Energy Projects – Sewer Facilities and Air Permit Compliance Upgrades, with opinion of probable costs of $3.0 million and $4.1 million, respectively) were carried in the Integrated Planning schedule, but are not accounted for in the above table. Additionally, $61.2 million for CIP spending in Hartford includes $12.5 million of Dissolved Air Flotation Thickener (DAFT) Tanks Rehabilitation/Contract No. 2016B-19, which has since been awarded and therefore is not carried in the Integrated Plan schedule but was included in the needs assessment total for Hartford at the time of the original document.

Table 27 Water Pollution Control Facilities Project List and Schedule

Project Reference	WPCF	Opinion of Probable Cost ($M)[1]	Yr 1 – Yr 6
Non-CSO CWP			
BNR Phase III	Hartford	$60.0	
Phase 3B (Aer./RSPS/Infl./Disin./Admin/ Effl.)	East Hartford	$7.7	
Trickling Filter and Screenings Upgrades	Poquonock	$8.0	
Headworks and Sludge	Rocky Hill	$8.0	
Stormwater Pump Station	Rocky Hill	$3.0	
CIP			
DAFT Tanks Rehabilitation/Contract No. 2016B-19	Hartford	$12.5	
Sludge Cake Receiving, Screening and Equalization	Hartford	$20.0	
Centrifuge Replacement and Overhead Crane	Hartford	$4.0	
Ash Lagoon Closure Project	Hartford	$4.7	
Air Permit Compliance Upgrades (Potential)	Hartford	$4.1	
Site Wrap-Up Contract (WWEP)	Hartford	$20.0	
Solids Handling	East Hartford	$8.5	
Plant Infrastructure Renewal and Replacements	East Hartford	$5.8	
Sludge Pumping/Force Main Assessment	East Hartford	$0.5	
Sludge Pumping/Force Main Assessment	Rocky Hill	$0.5	
Environmental Clean-up	Rocky Hill	$4.0	

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

Wastewater Pumping Stations

The District operates and maintains 77 wastewater pumping stations throughout the service area. Twenty-seven of these stations are tributary to the CSS with seven stations located in Hartford. The remaining pump stations are in Bloomfield (10), East Hartford (11), Rocky Hill (11), Newington (9), West Hartford (12), Wethersfield (3), and Windsor (14). The District's wastewater pumping stations vary greatly in size, age, and type. The average station flow rates are as low as 500 gallons per day and as high as 5.7 mgd. The stations were built between 1958 and 2014, although most stations were built prior to 1980. The wastewater pumping stations include three different types that are categorized as walk-in, package, and submersible.

The District completed several assessments of the wastewater pumping stations in an ongoing effort to maintain these critical facilities. These assessments included an initial assessment in 2006 to evaluate the general condition of all pumping stations which was followed by more recent assessments of each station under the District's Asset Management Plan (AMP) finalized in March 2018. The AMP provided an initial ranking of stations based on age and risk including system impact. A schedule was developed to replace or rehabilitate each pumping station based on this assessment and the District's past approach to fund these CIPs.

Table 28 shows the three scheduling groups, the number of stations in each group, and the approximate cost of each group. Twenty-three stations are included in the District's current rehabilitation schedule; the remaining 54 stations are either newer or have smaller capacity. A project list and schedule of pump station projects are included in **Table 29.** A schedule was only provided for the non-CSO CWP projects.

Table 28 Wastewater Pumping Stations Needs

Category	Number of Stations	Opinion of Probable Cost ($M)[1]		
		Non-CSO CWP	CIP	Total
CIP Years 1-5	3	$0.0	$5.2	$5.2
CIP Years 6-10	12	$3.0	$22.5	$25.5
CIP Years 11+	8	$0.0	$18.8	$18.8
Total	**23**	**$3.0**	**$46.5**	**$49.5**

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Table 29 Wastewater Pumping Stations Project List and Schedule

Project Name	Opinion of Probable Cost ($M)[1]	Yr 1 – Yr 3		
Non-CSO CWP				
Stonehedge Drive	$2.0			
Carr Avenue	$1.0			
CIP				
Main Street	$2.2			
Meadow Road	$1.1			
Governor Street	$1.4			
Brookside Road	$3.1			
Rainbow Trunk	$2.9			
Burnham Street	$1.0			
Belamose Avenue	$3.0			
Burr Road	$1.1			
Windy Hill	$1.0			
Island Road	$2.5			
Eighth Street	$1.4			
Merriman Road	$1.0			
Mohawk Drive	$3.1			
Ridge Street	$3.0			
High Street	$3.9			
Wethersfield Trunk	$4.1			
Porter Street	$1.0			
Fishfry	$6.0			
Motts	$1.0			
Southwood Drive	$1.2			
Weston Street	$1.5			

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

Design/Bid Construction

Summary

The existing wastewater collection system, stormwater and flood control systems, WPCFs, and wastewater pumping stations all have significant non-CSO needs. These needs have been assessed and summarized in Volume 1 of the 2018 Integrated CSO LTCP Update, which focuses on the District's obligations that are not directly related to CSO control. The collective opinion of probable costs (2018 dollars) for these needs is presented in **Table 30**.

Table 30 Summary of All Wastewater and Stormwater Needs

Category	Opinion of Probable Cost ($M)[1]		
	Non-CSO CWP	CIP	Total
Wastewater Collection System Projects	$189.4	$21.4	$210.8
WPCF Projects	$86.7	$80.5	$167.2
Wastewater Pumping Station Projects	$3.0	$46.5	$49.5
Subtotal for Wastewater Needs	$279.1	$148.4	$427.5
Stormwater (40 Year)[2]	$0.0	$345.3	$345.3
Total	**$279.1**	**$493.7**	**$772.8**

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.
2. Does not include $393 million for flood control system improvements.

Affordability Analysis

An affordability analysis and financial capability assessment (FCA) was completed for District's 2018 Integrated CSO LTCP Update. This analysis includes CWA compliance costs based on the guidelines as outlined by the EPA in the "Combined Sewer Overflows, Guidance for Financial Assessment and Schedule Development" from March 1997, which was subsequently modified in November 2014. The original guidelines allowed for wastewater infrastructure assessment and repair in the overall cost evaluation and not just for CSOs. The 2014 modifications added stormwater costs to fully assess the burden of CWA requirements on households, and states the following:

> *"The FCA Guidance has since been recognized as equally suitable for considering other municipal CWA obligations as well, such as those related to separate sanitary sewer systems. With the release of EPA's 2012 Integrated Planning Framework, the Agency clarified that the financial capability analysis could include costs of: stormwater and wastewater; ongoing asset management or system rehabilitation programs; existing CWA related capital improvements programs; collection systems and treatment facilities; and other CWA obligations required by state or other regulators."*

The FCA completed for this update focuses on the long-term financial impacts of the District's 2018 CSO LTCP, SSO Master Plan, nitrogen reduction, and CIP. The completed analysis is consistent with the EPA guidance on financial capability and based on prior financial and affordability work. Consistent with EPA's November 2014 update, this evaluation takes a broader view than previous evaluations by including wastewater and stormwater management costs.

The total escalated annual average expenditure for wastewater projects over the 40 years of the recommended Integrated Plan will be approximately $154 million and the annual expenditure will never be lower than $62 million. The average and minimum expenditures proposed in the Integrated Plan exceed the current CO requirement by more than 50 percent. Due to the large expenditures between 2010 and 2023 that are primarily driven by the SHCST, HWPCF, and RHWPCF construction, a short-term reduction in spending is necessary while debt from those expenditures is retired, and before the Downtown Tunnel can be constructed.

Financial Capability Assessment

A financial capability assessment for the $3.65 billion (2018 dollars) Integrated Plan over the next 40 years was developed for the District. The District did not include in the FCA the additional $2.4 billion (2018 dollars) investment in its water infrastructure over the same period, which is discussed later.

The EPA Guidance methodology consists of two phases. Phase 1 focuses on assessing the impact of the proposed CSO program on revenue requirements and household bills, relative to median household income (MHI). The result is a "residential indicator", which establishes the severity of the impact on customer bills by measuring the ratio of cost for sewer service spent per average household to MHI. Phase 2 helps to evaluate the ability to issue enough debt to fund the program and focuses on the socioeconomic profile of the District compared to EPA benchmarks. Phase 2 focuses on a relatively small set of debt, socioeconomic, and financial management indicators.

District residential customers in Member Towns that have both District water and sewer services pay for sewer service through two avenues:

1. Residential Ad Valorem tax on their property tax bill and property valuation, and
2. Clean Water Project Charge (CWPC) on their water bill based on water consumption.

For the FCA, the total residential sewer bill (both Ad Valorem and CWPC) was estimated by town. Based on the average of all District Member Towns, the results of the Phase 1 FCA analysis determined that the average peak residential burden is approximately 1.2 percent of MHI, which is an indicator of mid-range burden according to EPA. Additionally, when considering Phase 2 of the FCA analysis, based on widespread impact indicators, on a relative score from 1 to 3 across six key indicators, the Member Towns collectively received an average score of 2.17, which also represents mid-range burden. Also, some towns are experiencing stormwater flooding issues, notably Hartford, West Hartford, and Wethersfield. Addressing these stormwater issues will further burden the same rate payers. The flooding may also impact the home values, which could decrease the revenue from taxes unless residential tax rates are raised to provide funding to address these stormwater issues.

The journey to implement the CWP to date has already required the residential sewer costs to more than double, and the total annual sewer bill to implement the Recommended Plan is projected to double again. A sewer rate that more than quadruples to implement the necessary sewer infrastructure repairs is substantial, and the residents and Town Councils

of each community have noted the hardship that raising sewer rates has already caused to them. Additionally, just looking at the average of all eight Member Towns does not tell the whole story given the financial disparity among the Member Towns. The Member Towns of the District have a dramatic disparity in income, with MHI ranging from $32,095 (Hartford) to $91,875 (West Hartford), per 2016 5-year estimates from the Census American Community Survey that can be found at **data.census.gov**. Evaluating the communities collectively as a whole may be overstating the financial capabilities of the lower income communities within the service area.

Calculating the residential burden for only the city of Hartford, the burden essentially reaches 2 percent by 2026, which is **considered by EPA to be high burden**. Hartford's population of about 125,000 represents approximately a third of the population of the eight Member Towns. The town of East Hartford also has a higher projected burden over time than the District average and their population is approximately 51,000. This indicates the lower income communities will likely be disproportionately affected by increases in sewer rates and bills and in total they represent almost one half of the population in the eight Member Towns.

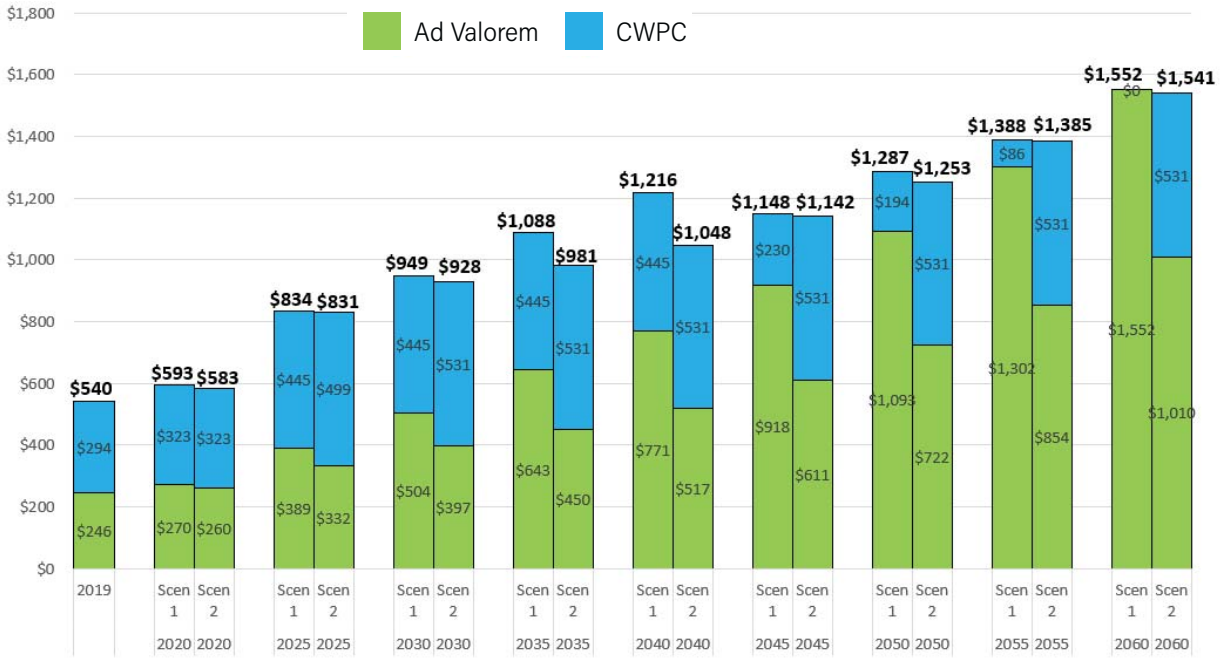
The burdens described above are for households at the median. In Hartford, the lowest two quartiles are estimated to earn approximately $26,000 per year, per 2016 5-year estimates from the Census American Community Survey that can be found at **data.census.gov**, and currently have a sewer cost burden of nearly 1.8 percent. **For this vulnerable population, this burden is projected to increase to more 2.5 percent in the next 10 years, far greater than EPA's affordability guidelines.** This presents a major challenge for these households and for the District as it moves forward with this aggressive and expensive program.

The city of Hartford recently nearly went into bankruptcy. The relatively lower levels of educational attainment in Hartford, as well as the staggering rate of residents that are not in the labor force, complicates long-term earnings trends for its residents. Continuation of these trends over time suggest that Hartford's MHI will continue to be lower than national averages and further complicate the financial situation for the City and its residents.

Prior Plan (2012/2014 CSO LTCP) versus Recommended Plan (2018 CSO LTCP)

Figure 29 provides a financial comparison of the average residential household bill between the Prior (labeled as Scenario 1) and the Recommended Plan (labeled as Scenario 2). On the figure, the green bar is the estimated average the residential customer would pay through Ad Valorem (on their tax bill based on property value) and the blue bar is the estimated average the residential customer would pay through the CWPC (on their water bill based on metered water consumption). As evidenced by the graph, the average resident would pay about the same under both scenarios, with the Recommended Plan (Scenario 2) being slightly less than the Prior Plan (Scenario 1).

Figure 29 District Average Residential Household Bill Prior Plan versus Recommended Plan



Drinking Water

The District drinking water system serves approximately 400,000 people in the eight Member Towns and non-Member Towns (parts of Berlin, Cromwell, East Granby, Farmington, Glastonbury, Manchester, Portland, and South Windsor). The system is supplied by reservoirs within the Farmington River Watershed, where the District owns more than 31,000 acres of watershed land. A series of reservoirs were formed with dams, associated with two large terminal reservoirs, the Barkhamsted (30.3 billion gallons) and Nepaug (9.5 billion gallons). The water then flows by gravity to the District's two water treatment facilities, the Reservoir No. 6 Water Treatment Plant (WTP) and West Hartford Filters WTP, with a combined average production of 47 to 50 mgd. Water then flows to the distribution system, which consists of transmission mains, approximately 1,500 miles of water mains, 18 pump stations, 26 water storage tanks, 100,000 water meters, 11,000 hydrants, and 214 control valves.

Figure 30
Barkhamstead Reservoir

Like the sewer collection system, the District's drinking water system dates to the mid-1800s, is aging, and in need of rehabilitation/replacement. The drinking water system requires significant capital improvements to ensure the long-term, efficient, safe, and reliable operation of the treatment and delivery systems. The needs assessment is based on several rounds of meetings and workshops with the District and its drinking water specialists. Other key sources for drinking water projects and costs were the District's Asset Management Plan and Water Treatment Plant Master Plan, both of which were completed in 2018.

Table 31 provides an opinion of probable cost (2018 dollars) for the drinking water system improvements over the next 40 years.

Table 31 Drinking Water System Needs

Category	Opinion of Probable Cost ($M)[1]
Watershed	$20.0
Dams	$96.9
Hydroelectric	$2.5
Water Treatment Facilities and Transmission Mains	$671.8
Water Mains	$1,371.0
Pump Stations	$35.9
Water Storage Tanks (WTP and distribution system)	$58.5
Water Meters, Hydrants and Control Valves	$100.0
Total	**$2,356.0[2]**

1. Opinion of probable cost includes 25% construction contingency and 20% engineering.

2. Excludes an additional approximately $324 million from "combined" water and sewer projects.

The ability of households across the District to afford the sewer program will be further challenged by the anticipated increases in water utility costs because of the significant CIP identified for its drinking water systems.

Summary of Sewer/Water Program

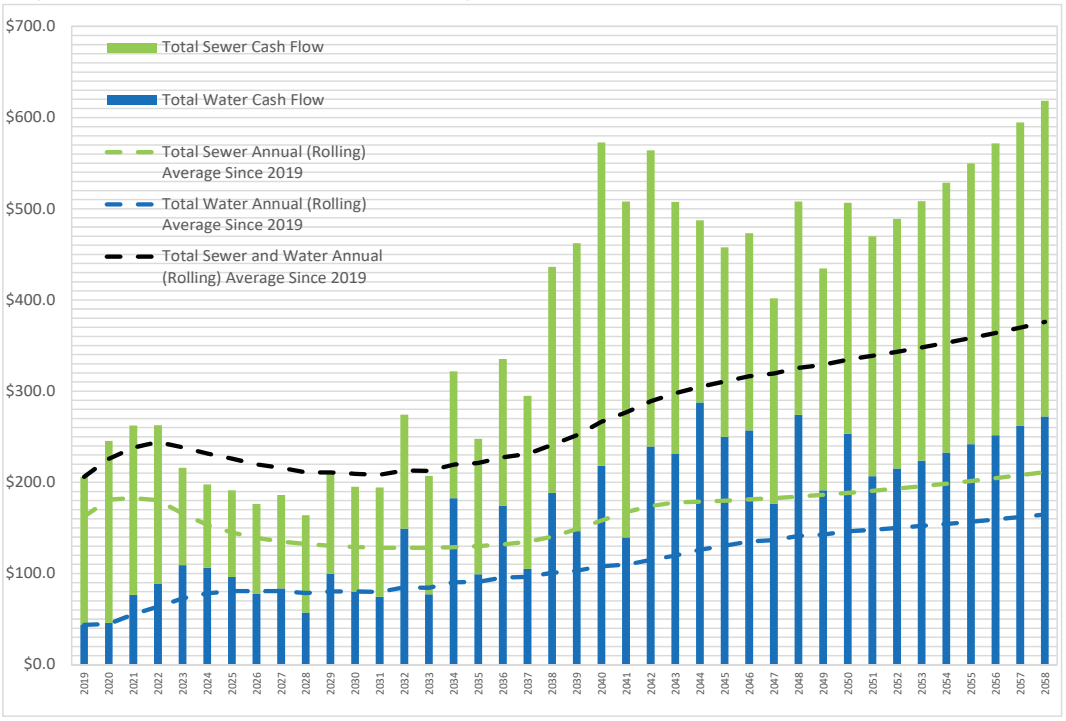
In addition to the estimated $3.7 billion (2018 dollars) investment in future sewer capital projects over the next 40 years, the District also anticipates an additional $2.7 billion (2018 dollars) investment in its water infrastructure over the same period, which includes an additional $0.3 billion in funds allocated for projects that are split between the water and sewer as "combined" projects**. A program of this magnitude will require significant increases in water bills for the District's commercial and residential customers, potentially negatively impacting businesses. These increases will be in addition to the major increases anticipated for sewer bills.**

Since the District's water and sewer customer bases are essentially the same, the cumulative increase will strain the typical customer's ability to afford these basic services. Based on an analysis of the impact of the anticipated water infrastructure renewal program, the water revenue requirement will nearly triple over the next 20 years, with an average annual increase of 5.6 percent. Coupled with the significant increase in sewer expenses due to the CWP, these increase levels will be problematic for residents, particularly lower income households.

The District evaluated its Drinking Water System needs for informational purposes so that CTDEEP, other stakeholders, and the public can fully appreciate the future burden of the CWA and Safe Drinking Water Act (SDWA) requirements on the ratepayers. The affordability analysis considers only the CWA costs and requirements and does not include the SDWA costs and requirements. Although the Drinking Water System projects were not ranked or included in the affordability analysis, a similar implementation schedule was prepared for

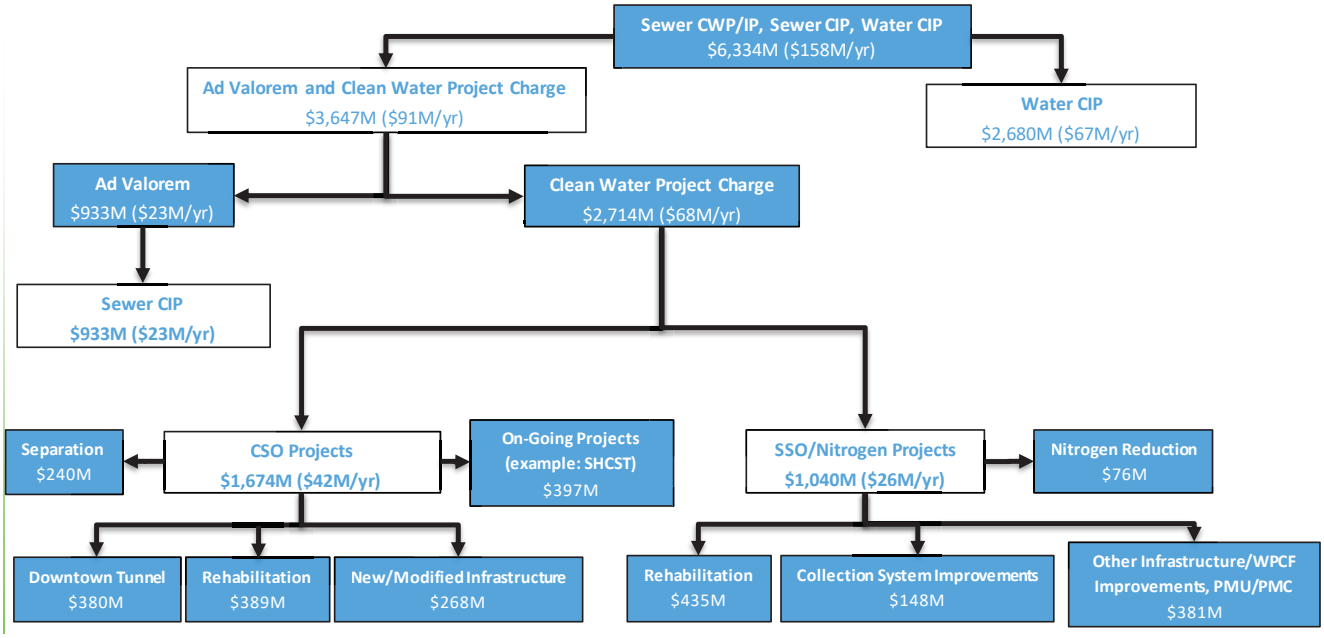
all expected water needs through the next 40 years. **Figure 31** shows the total anticipated water and sewer (both CWP/IP and CIP) spending per year as forecasted by the full implementation schedule. **Figure 32** provides a summary of the $6.3 billion (2018 dollars) of anticipated water and sewer infrastructure spending over the next 40-years, which is an average of $158 million per year, with a breakdown on how each of the programs are funded.

Figure 31 Sewer & Water Spending 2019-2058



Note: All costs are in hundreds of millions. Costs are escalated at a 4% annual rate.

Figure 32 Summary of 40-Year Need for Water and Sewer Programs (2019-2058)



Receiving Water Quality

Discharges to state of Connecticut waters should meet the requirements of the federal CWA and the Connecticut Water Quality Standards. However, control of CSO outfalls and compliance with these standards is a significant challenge as CSO water quality impacts are periodic (limited to wet weather events) and temporary (typically lasting only several days). Accordingly, improvements for CSO control could be considered expensive for the level of benefit achieved. In addition, many studies indicate that CSO control alone may not meet receiving water quality standards as stormwater runoff also adversely affects water quality during and after wet weather conditions. The District acknowledges that these stormwater discharges are intended to be addressed through municipalities' compliance with the CTDEEP's municipal separate storm sewer systems (MS4) requirements.

Figure 33 North Branch Park River during April 13-16, 2018 Rain Event

Both federal and state agencies recognize that compliance with state quality standards for CSO discharges is costly and the process can be long. For example, the state of Connecticut CSO Strategy (May 1990) identifies that "Most likely the current standard of C/B will be maintained through the lengthy period of time required for CSO control". Connecticut's CSO Strategy and federal guidelines also allow for a public reclassification of the receiving water if it is expected that the receiving water uses cannot be attained through cost-effective discharge mitigation.

The District's 2018 LTCP Update intends to implement system improvements that meet the Connecticut CSO Strategy. Accordingly, while the state CSO Strategy and federal guidelines do allow for consideration of reclassification of water bodies as part of the LTCP process, **the District has not requested reclassification of impacted waterbodies, including the North Branch Park River, in the 2018 CSO LTCP Update.** However, the District has performed extensive water quality monitoring program that demonstrated that CSO discharges represent less than 30 percent in an average year of the bacterial load to the NBPR. Thus, even after complete elimination of these CSO discharges, the NBPR will not meet the state's established Class A water quality goals due to other pollutants sources such as from stormwater.

Climate Change

The Clean Water Fund Memorandum (2017-001) Storm Resiliency of Municipal Wastewater Infrastructure identifies the need to consider the impact of climate change on sea level rise and flood protection of wastewater facilities. Sea level rise poses minimal risk for the District's wastewater collection system and typical CSO operation. While the Connecticut River in Hartford is subject to tidal fluctuation during low river conditions, the existing city of Hartford Flood Control System protects the city from flooding for river conditions up to a 500-year stage. During high river stage conditions in the Park River Conduit or Connecticut River, gates to the rivers are closed, and CSO is routed to the flood control pump stations, which are owned and operated by the city of Hartford.

The 2018 CSO LTCP Update includes sewer separation of existing combined sewer areas that will divert excess stormwater flow from the sewer system (reducing or eliminating CSO discharges) into the drainage system. However, CSOs and stormwater ultimately discharge to the same receiving waters that are protected by the same flood control system.

Climate change may increase the magnitude of extreme river flows, impacting the performance of the flood control system and possibly result in more frequent operation of the flood control pumps and flood storage facilities. The District is concerned with the reported viability of the City's existing flood protection system during extreme events. For example, failure of the earthen dike or pumping system during a flood, a scenario outside the District's control or purview, could result in inundation of the its infrastructure, including the HWPCF.

The 1-Year Design Storm and the typical year used in the 2018 CSO LTCP Update remain the same as those evaluation conditions presented in the 2004 Baseline Conditions Report. They will be used in subsequent facilities planning throughout the duration of the CWP, as approved by CTDEEP. Regarding storm resiliency and the potential increase in annual precipitation totals and intensities, an analysis of storm frequencies will be included as part of the design of the future Downtown Tunnel. Peak storm intensity analysis is not anticipated to be needed for design of sewer rehabilitation or separation projects as the intent of these projects is to remove the inflow from the sewer system and redirect it to a drainage system.

Green Infrastructure

The District is a proponent of green infrastructure (GI) and has demonstrated a willingness to work with the city of Hartford and other groups on GI projects for CSO control. The District advocates public awareness of GI, including distributing informational flyers to increase their knowledge of potential green initiatives that could be implemented on private property to help remove stormwater from the CSS.

Figure 34 Green Capitols Project in Hartford

Figure 35 MDC Headquarters Goes Green Project

The District has actively participated in several green projects during the CWP, including:

- Hartford "Green Capitols" Project, completed around the State Capitol building, included a rainwater harvesting system which captures roof water for irrigation, permeable pavers and pervious concrete walkways (see **Figure 34**), porous asphalt parking areas, rain gardens, and a green roof.
- Ongoing program offering rain barrels to residents of Hartford, including nearly 100 rain barrels distributed to residents in 2018.
- MDC Headquarters Goes Green project completed in 2019, included installing porous concrete sidewalks, permeable concrete pavers, and rain gardens (see **Figure 35**).
- North Beacon Street Green Demonstration project with two types of pervious concrete pavers within the right-of-way. Hartford approved the pavers but did not agree to maintain them.

System-wide GI was considered in the 2018 CSO LTCP but it was not a cost-effective or feasible strategy to achieve a 1-year CSO level of control compared to other alternatives. References to other municipalities implementing large scale GI for CSO control are not true comparisons, as their level of control requirements are lower than what is included in the District's CO. GI could be considered as a supplemental strategy, but the District has experienced resistance to date from Hartford or other entities to assume ownership and maintenance. This posture has made it difficult to incorporate GI projects that could be cost-effective for CSO abatement.

As a sewer and water utility, the District does not intend to take responsibility for the maintenance of GI projects since the District does not own the property within the right-of-way, does not control stormwater, and does not control local regulations, as all of these rely with the eight Member Towns. However, **the District is open to contributing to the planning and construction of GI projects provided they are cost-effective for CSO control and another entity accepts ownership and the responsibility for future maintenance.**

Post-Construction Monitoring Program

The District already has an extensive and comprehensive system monitoring program, the Overflow Alarm and Monitoring System, at each of its CSO and SSO outfalls. In addition, the District has monitoring equipment at 12 locations where flow from the regional communities is discharged into the Hartford system.

Activation and flow level data from each of these locations are continuously sent to the District's Supervisory Control and Data Acquisition (SCADA) system. The SCADA system is monitored by District staff and PipeCAST, a separate system data analytics software. This software evaluates data trends and activation frequencies and automatically notifies the District of any non-typical data that might suggest the need for further staff review. The District is continuing to work on ways to improve the use of these systems. Past notifications have resulted in District actions to clean sewers or modify regulator settings to avoid dry weather overflows and reduce SSOs/CSOs.

The District's Post Construction Monitoring Program will continue to monitor all CSO regulators/outfalls and will assess the benefits achieved in the interim periods on a continuous basis as the CSO LTCP is implemented. As part of the SHCST construction, the District will install new equipment to monitor and operate the tunnel regulators and associated CSO regulators for system optimization. A similar approach will be used for the future Downtown Tunnel design/construction.

The District will also conduct water quality sampling and monitoring after major components of the CWP (such as Wethersfield Cove CSOs eliminated, NBPR CSOs eliminated, and conclusion of improvements at the HWPCF) are completed to determine the water quality benefits associated with the CSO elimination and control measures. The water quality sampling plan will be discussed and reviewed with CTDEEP prior to implementing.

Figure 36 Connecticut River

Conclusion

In conclusion, after more than 2 years of extensive effort to develop the three volumes of the 2018 Integrated CSO LTCP Update previously submitted to CTDEEP in December 2018, the District has attempted to shorten the three volumes into a single high-level summary. The District's 2018 Integrated CSO LTCP has adapted to the changing needs of their assets coupled with providing the public improved watersheds for recreational uses to balance all needs (see **Figure 37**). The benefits include:

- Stabilizing spending and corresponding customer rates to maintain affordability
- Achieving Consent Order compliance for CSO abatement, including eliminating CSOs to Wethersfield Cove and NBPR
- Meeting all regulatory requirements
- Addressing the aging infrastructure (that dates to the mid-1800s) in a planned approach, rather than an emergency, reactionary approach
- Achieving incremental water quality benefits
- Maximizing use of existing collection system and WPCF assets

Figure 37 District's 2018 Integrated CSO LTCP

While public feedback was varied, a common theme emerged that rate increases have been substantial and the public supported extending the schedule, reducing and prioritizing future annual spending, and addressing the aging infrastructure and other initiatives, including CSO/SSO abatement, in an Integrated Plan via a thorough priority ranking system. The Integrated Planning process did not change or alter the previous environmental goals set forth in the CO and committed to by the MDC; rather, it only considered the method and schedule to achieve these same goals. This 2018 Integrated CSO LTCP is the new framework for the District's infrastructure strategy for decades to come.

Appendices

Appendix A Recommended Optimized Plan (1-Year plus NBPR CSO Elimination)

Appendix B 2018 CSO LTCP Update and Project Schedule by Drainage Area

Rank	Assessment Score	Drainage Area	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
18	320	Granby	Separation	Hartford	Granby 7 Sewer Separation and CMOM (80/20)	$13.6	$0.5	$0.5	$0.4	$2.0	$5.2	$5.0																																					
25	317	Granby	Separation	Hartford	Granby 8 Sewer Separation and CMOM (80/20)	$11.5			$0.2	$0.5	$0.4	$1.5	$4.9	$4.0																																			
28	313	Granby	Improvements	Hartford	HAI Improvements	$22.4				$0.3	$0.6	$1.6	$5.6	$7.2	$7.1																																	
19	320	Granby	Separation	Hartford	Granby 9 Sewer Separation and CMOM (80/20)	$11.5					$0.4	$0.4	$0.4	$1.0	$4.3	$5.0																																	
20	319	Granby	Separation	Hartford	Granby 10 Sewer Separation and CMOM (80/20)	$16.6							$0.5	$0.6	$0.6	$1.1	$5.6	$8.2																													
22	318	Granby	Separation	Hartford	Granby 3A Sewer Separation and CMOM (80/20)	$12.7									$0.4	$0.4	$0.4	$2.0	$6.2	$3.3																											
23	318	Granby	Separation	Hartford	Granby 3B Sewer Separation and CMOM (80/20)	$12.6											$0.4	$0.5	$0.4	$2.9	$2.3	$6.1																									
26	315	Granby	Separation	Hartford	Granby 6 Sewer Separation and CMOM (80/20)	$14.6													$0.5	$0.5	$0.5	$6.4	$5.1	$1.6																									
150	223	Granby	Separation	Hartford	Granby 1 Storm Outfall[3]	$13.2													$1.3	$8.2	$3.7	-																									
151	223	Granby	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract A[4]	$12.1																							$0.6	$0.6	$5.5	$5.5															
152	223	Granby	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract B[4]	$12.1																									$0.6	$0.6	$5.5	$5.5													
16	323	Gully	Separation	Hartford	G-10/12 Sewer Separation and CMOM (80/20)	$7.4															$0.2	$0.3	$0.3	$1.5	$0.7	$4.4																					
24	318	Gully	Separation	Hartford	G-9/11/23 Sewer Separation and CMOM (80/20)	$10.6																			$0.3	$0.4	$0.4	$1.0	$3.5	$5.0															
36	307	Gully	Separation	Hartford	G-2 Sewer Separation and CMOM Phase I (80/20)	$15.2																									$0.5	$0.5	$0.5	$4.5	$4.7	$4.5											
37	307	Gully	Separation	Hartford	G-2 Sewer Separation and CMOM Phase II (80/20)	$17.4																														$0.5	$0.6	$0.6	$5.0	$5.7	$5.0						
145	233	Gully	Private Inflow	Hartford	Gully Brook Area Private Inflow Removal	$10.2																																$1.0	$4.6	$4.6							
33	308	Gully	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase I	$11.4																																$0.4	$0.4	$0.4	$3.2	$3.5	$3.5				
34	308	Gully	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase II	$11.3																																				$0.4	$0.4	$0.4	$3.2	$3.4	$3.5
8	344	North Meadows	Improvements	Hartford	Tower Ave Area Sewer Rehabilitation	$3.4	$0.2	$0.2	$3.0																																					
29	312	North Meadows	Separation	Hartford	NM-5/6/7 North Sewer Separation and CMOM North (80/20)	$12.2																$0.4	$0.4	$0.4	$0.5	$3.9	$6.6																				
30	312	North Meadows	Separation	Hartford	NM-5/6/7 South Sewer Separation and CMOM (80/20)	$16.2																						$0.5	$0.7	$0.5	$4.8	$4.9	$4.8													
27	315	North Meadows	Improvements	Hartford	Northeast Interceptor (NEI) Replacement	$18.6																													$0.6	$0.6	$0.6	$5.0	$6.8	$5.0						
149	225	North Meadows	CSO Storage	Hartford	NM-5 Site Storage	$74.3																																				$2.5	$2.5	$2.5	$22.3	$22.3	$22.3
2	378	Farmington	Improvements	Hartford	NNBI Replacement/Relocation Project	$37.5	$0.0	$0.0	$0.0	$9.0	$11.0	$17.5																																			
3	372	Farmington	Separation	Hartford	N-12 Sewer Separation and CMOM	$4.6	$0.0	$0.0	$0.0	$2.0	$1.2	$1.4																																			
126	262	Farmington	Improvements	Hartford	NNBI Relief Structure	$12.0																						$0.6	$0.6	$5.4	$5.4															
121	267	Upstream Park	Improvements	Hartford	Broad Street Shaft Diversion	$9.6																										$0.5	$0.4	$4.2	$4.5											
7	358	Park Street	Improvements	Hartford	Park Street Phase I, II, and III Improvements	$23.9																$1.0	$11.5	$4.0	$7.4																					
17	320	Downtown Park	Improvements	Multiple	SM-2 Improvements (part of Collection System Sewer Gate Replacement Project)[2]	$1.8		$0.2	$1.6																																					
1	379	Downtown Park	Separation	Hartford	G-21 Sewer Separation	$4.5							$0.2	$0.3	$1.0	$3.0																														
5	369	Downtown Park	Separation	Hartford	G-19 Sewer Separation	$2.5													$0.2	$0.1	$0.9	$1.3																								
50	294	Downtown Park	CSO Storage	Hartford	Downtown Tunnel	$380.0																$2.1	$4.1	$7.4	$18.0	$41.0	$66.5	$77.4	$77.3	$54.6	$31.6														
124	263	Downtown Park	Improvements	Hartford	Replace NM-10 with Modulated Gate Structure and CRI Low Spot Improvements	$4.2																																$0.2	$0.2	$1.9	$1.9						
31	311	Downtown Park	Improvements	Hartford	NM-14 New Combined Sewer	$0.7																																				$0.1	$0.6				
4	369	South Branch	Improvements	Hartford	Kane Brook (5-8 and 5-13)	$30.9	$0.0	$0.0	$9.5	$9.0	$12.4																																			
6	360	South Branch	Improvements	Hartford	OSBI Replacement and Pope Park Pipe	$11.3											$0.5	$0.6	$7.0	$3.2																										
44	298	Planned Improvements	Large Dia Rehab	Hartford	Broad Street Area Large Diameter Rehab	$14.2	$0.0	$12.0	$2.2																																					
103	273	Planned Improvements	SSES	Hartford	West Hartford SSES Implementation Contract 2012-59	$11.0		$7.0	$4.0																																					
52	293	Planned Improvements	Small Dia Rehab	Hartford/ Windsor	Windsor Styrene Rehab	$3.5		$0.0	$2.2	$1.3																																			
32	310	Planned Improvements	Small Dia Rehab	Hartford	18-in to 21-in Brick Rehab	$11.5		$0.0	$6.0	$5.5																																			
77	283	Planned Improvements	Small Dia Rehab	Hartford	I-4 Small Diameter Rehab	$0.2			$0.2																																				
41	303	Planned Improvements	Large Dia Rehab	Hartford	Farmington Avenue and Homestead Avenue Area Large Diameter Rehab	$8.4			$0.0	$3.3	$5.1																																			
42	303	Planned Improvements	Large Dia Rehab	Hartford	Cemetery Brook Area Large Diameter Rehab	$3.8				$0.0	$1.0	$2.8																																		
63	288	Planned Improvements	Small Dia Rehab	Hartford	North and South Meadows Area Small Diameter Rehab	$3.7				$0.0	$1.0	$2.7																																		
64	288	Planned Improvements	Small Dia Rehab	Hartford	Bloomfield Styrene Rehab	$2.6				$0.0	$0.5	$2.1																																		

Rank	Assessment Score	Drainage Area	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
45	298	Planned Improvements	Large Dia Rehab	Hartford	Gully Brook Interceptor Area Large Diameter Rehab	$14.5					$0.0	$2.3	$12.2																																				
46	298	Planned Improvements	Large Dia Rehab	Hartford	Franklin Avenue and Downtown Area Large Diameter Rehab	$16.6						$0.0	$4.9	$11.7																																				
67	288	Planned Improvements	Small Dia Rehab	Hartford	West Hartford Styrene Rehab	$2.6							$0.0	$2.6																																			
47	298	Planned Improvements	Large Dia Rehab	Hartford	Newington Large Diameter Rehab	$6.4							$0.0	$1.6	$4.8																																		
76	288	Planned Improvements	Small Dia Rehab	Hartford	Newington Styrene Rehab	$3.5								$0.0	$1.0	$2.5																																
51	293	Planned Improvements	Large Dia Rehab	Hartford	Granby Street Area Large Diameter Rehab	$16.3								$0.0	$5.0	$11.3																																
78	283	Planned Improvements	Small Dia Rehab	Hartford	Gully Brook Area Small Diameter Rehab	$6.9									$0.0	$1.0	$5.9																														
79	283	Planned Improvements	Small Dia Rehab	Hartford	Lower North Branch Area Small Diameter Rehab	$8.0										$0.0	$5.5	$2.5																														
48	298	Planned Improvements	Large Dia Rehab	Hartford	North and South Meadows Large Diameter	$6.7										$0.0	$5.0	$1.7																														
49	298	Planned Improvements	Large Dia Rehab	Hartford	West Hartford North Large Diameter Rehab	$4.7										$0.0	$1.7	$3.0																														
89	278	Planned Improvements	Small Dia Rehab	Hartford	Upper North Branch Area Small Diameter Rehab	$6.8											$0.0	$4.3	$2.5																														
92	278	Planned Improvements	Small Dia Rehab	Hartford	Newington Small Diameter Rehab	$7.3													$0.0	$4.2	$3.1																										
53	293	Planned Improvements	Large Dia Rehab	Hartford	Bloomfield Trunk Sewer Area Large Diameter Rehab	$16.4													$0.0	$7.0	$9.4																										
55	293	Planned Improvements	Large Dia Rehab	Hartford	OSBI and NSWBI Area Large Diameter Rehab	$15.8													$0.0	$10.0	$5.8																										
81	283	Planned Improvements	SSES	Hartford	Bloomfield SSES Implementation Contract 5	$4.9														$0.5	$2.0	$2.4																									
104	273	Planned Improvements	Small Dia Rehab	Hartford	Bloomfield Small Diameter Rehab	$9.6														$0.0	$7.0	$2.6																									
105	273	Planned Improvements	Small Dia Rehab	Hartford	West Hartford Small Diameter North Rehab	$6.2															$0.0	$6.2																									
69	288	Planned Improvements	Large Dia Rehab	Hartford	Connecticut River Interceptor Large Diameter Rehab	$12.8															$0.0	$4.2	$8.6																								
70	288	Planned Improvements	Large Dia Rehab	Hartford	West Hartford South Large Diameter Rehab	$11.1															$0.0	$5.6	$5.5																								
82	283	Planned Improvements	SSES	Hartford	Bloomfield SSES Implementation Contract 6	$4.4																$0.5	$3.9																								
106	273	Planned Improvements	Small Dia Rehab	Hartford	Park River Interceptor Area Small Diameter Rehab	$10.6																$0.0	$1.9	$8.7																							
108	273	Planned Improvements	Small Dia Rehab	Hartford	Franklin Avenue Area Small Diameter Rehab	$13.9																$0.0	$1.6	$12.3																							
109	273	Planned Improvements	Small Dia Rehab	Multiple	Windsor Small Diameter Rehab	$7.3																			$0.0	$7.3																				
110	273	Planned Improvements	Large Dia Rehab	Hartford	Jefferson Street Interceptor Large Diameter Rehab	$12.0																			$0.0	$8.0	$4.0																			
111	273	Planned Improvements	Small Dia Rehab	Hartford	South Branch Area Small Diameter Rehab	$14.3																			$0.0	$5.1	$9.2																			
117	268	Planned Improvements	Small Dia Rehab	Hartford	West Hartford Small Diameter South Rehab	$12.7																				$0.0	$3.9	$8.8																		
93	278	Planned Improvements	SSES	Hartford	Bloomfield SSES Implementation Contract 2	$5.7																					$0.6	$1.0	$4.1																	
118	268	Planned Improvements	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #1	$10.4																						$1.0	$4.7	$4.7																
119	268	Planned Improvements	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #2	$10.4																							$1.0	$4.7	$4.7															
94	278	Planned Improvements	SSES	Hartford	Bloomfield SSES Implementation Contract 3	$6.5																							$0.7	$2.9	$2.9															
114	272	Planned Improvements	Improvements	Hartford	Folly Brook Trunk Sewer South	$9.2																							$0.9	$4.1	$4.1															
84	283	Planned Improvements	SSES	Hartford	Windsor SSES Implementation Contract 2012-58	$4.9																								$0.5	$2.2	$2.2														
95	278	Planned Improvements	SSES	Hartford	Bloomfield SSES Implementation Contract 4	$6.7																									$0.6	$3.0	$3.1													
123	263	Planned Improvements	SSES	Hartford	West Hartford Remaining SSES Implementation	$21.6																									$2.2	$9.7	$9.7													
Subtotal Future CWP/IP without Downtown Tunnel						**$891**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.7**	**$29.0**	**$24.2**	**$24.3**	**$25.0**	**$18.5**	**$19.9**	**$20.7**	**$29.3**	**$42.8**	**$38.8**	**$29.0**	**$29.9**	**$29.1**	**$24.7**	**$12.9**	**$16.8**	**$28.5**	**$33.5**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$22.3**
Subtotal Future CWP/IP without Downtown Tunnel, with miscellaneous sewer repairs						**$1,271**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.7**	**$29.0**	**$24.2**	**$24.3**	**$25.0**	**$18.5**	**$19.9**	**$20.7**	**$29.3**	**$44.9**	**$42.9**	**$36.4**	**$47.9**	**$70.1**	**$91.2**	**$90.3**	**$94.1**	**$83.1**	**$65.1**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$22.3**

1 20% Engineering cost included for all projects, except Large and Small Diameter rehabilitation projects, where engineering is assumed to be performed by in-house MDC staff. All estimated costs are in 2018 million dollars.
2 The total estimate cost of this project is $5.8M, with an additional $4.0M for collection system gates throughout the system.
3 Previously identified as "Granby 1 N-2 Outfall" in earlier documents.
4 Only implemented if deemed necessary.
5 An additional project "CRI & PRI Chamber Modification Conceptual Design", estimate at $1.8M, is part of the CSO Update but currently under design already.

$ Design/Bid
$ Construction
- Post construction metering to be performed.

Appendix C 2018 CSO LTCP Update and Project Schedule by Year

Year	Rank	Assessment Score	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
2019	2	378	Improvements	Hartford	NNBI Replacement/Relocation Project	$37.5	$0.0	$0.0	$0.0	$9.0	$11.0	$17.5																																				
	3	372	Separation	Hartford	N-12 Sewer Separation and CMOM	$4.6	$0.0	$0.0	$0.0	$2.0	$1.2	$1.4																																				
	4	369	Improvements	Hartford	Kane Brook (S-8 and S-13)	$30.9	$0.0	$0.0	$9.5	$9.0	$12.4																																				
	8	344	Improvements	Hartford	Tower Ave Area Sewer Rehabilitation	$3.4	$0.2	$0.2	$3.0																																						
	18	320	Separation	Hartford	Granby 7 Sewer Separation and CMOM (80/20)	$13.6	$0.5	$0.5	$0.4	$2.0	$5.2	$5.0																																				
	44	298	Large Dia Rehab	Hartford	Broad Street Area Large Diameter Rehab	$14.2	$0.0	$12.0	$2.2																																						
2020	103	273	SSES	Hartford	West Hartford SSES Implementation Contract 2012-59	$11.0		$7.0	$4.0																																						
	17	320	Improvements	Multiple	SM-2 Improvements (part of Collection System Sewer Gate Replacement Project)[2]	$1.8		$0.2	$1.6																																						
	32	310	Small Dia Rehab	Hartford	18-in to 21-in Brick Rehab	$11.5		$0.0	$6.0	$5.5																																					
	52	293	Small Dia Rehab	Hartford/ Windsor	Windsor Styrene Rehab	$3.5		$0.0	$2.2	$1.3																																					
2021	77	283	Small Dia Rehab	Hartford	I-4 Small Diameter Rehab	$0.2			$0.2																																						
	41	303	Large Dia Rehab	Hartford	Farmington Avenue and Homestead Avenue Area Large Diameter Rehab	$8.4			$0.0	$3.3	$5.1																																					
	25	317	Separation	Hartford	Granby 8 Sewer Separation and CMOM (80/20)	$11.5			$0.2	$0.5	$0.4	$1.5	$4.9	$4.0																																			
2022	28	313	Improvements	Hartford	HAI Improvements	$22.4				$0.3	$0.6	$1.6	$5.6	$7.2	$7.1																																	
	42	303	Large Dia Rehab	Hartford	Cemetery Brook Area Large Diameter Rehab	$3.8				$0.0	$1.0	$2.8																																				
	63	288	Small Dia Rehab	Hartford	North and South Meadows Area Small Diameter Rehab	$3.7				$0.0	$1.0	$2.7																																				
	64	288	Small Dia Rehab	Hartford	Bloomfield Styrene Rehab	$2.6				$0.0	$0.5	$2.1																																				
2023	19	320	Separation	Hartford	Granby 9 Sewer Separation and CMOM (80/20)	$11.5					$0.4	$0.4	$0.4	$1.0	$4.3	$5.0																																	
	45	298	Large Dia Rehab	Hartford	Gully Brook Interceptor Area Large Diameter Rehab	$14.5					$0.0	$2.3	$12.2																																			
2024	46	298	Large Dia Rehab	Hartford	Franklin Avenue and Downtown Area Large Diameter Rehab	$16.6						$0.0	$4.9	$11.7																																			
2025	20	319	Separation	Hartford	Granby 10 Sewer Separation and CMOM (80/20)	$16.6							$0.2	$0.3	$0.3	$1.5	$0.7	$4.4																													
	1	379	Separation	Hartford	G-21 Sewer Separation	$4.5							$0.2	$0.3	$1.0	$3.0																															
	47	298	Large Dia Rehab	Hartford	Newington Large Diameter Rehab	$6.4							$0.0	$1.6	$4.8																																	
	67	288	Small Dia Rehab	Hartford	West Hartford Styrene Rehab	$2.6							$0.0	$2.6																																	
2026	51	293	Large Dia Rehab	Hartford	Granby Street Area Large Diameter Rehab	$16.3								$0.0	$5.0	$11.3																															
	76	288	Small Dia Rehab	Hartford	Newington Styrene Rehab	$3.5								$0.0	$1.0	$2.5																															
2027	22	318	Separation	Hartford	Granby 3A Sewer Separation and CMOM (80/20)	$12.7									$0.4	$0.4	$0.4	$2.0	$6.2	$3.3																											
	78	283	Small Dia Rehab	Hartford	Gully Brook Area Small Diameter Rehab	$6.9									$0.0	$1.0	$5.9																													
2028	48	298	Large Dia Rehab	Hartford	North and South Meadows Large Diameter	$6.7										$0.0	$5.0	$1.7																													
	49	298	Large Dia Rehab	Hartford	West Hartford North Large Diameter Rehab	$4.7										$0.0	$1.7	$3.0																													
	79	283	Small Dia Rehab	Hartford	Lower North Branch Area Small Diameter Rehab	$8.0										$0.0	$5.5	$2.5																													
2029	23	318	Separation	Hartford	Granby 3B Sewer Separation and CMOM (80/20)	$12.6											$0.4	$0.5	$0.4	$2.9	$2.3	$6.1																									
	55	293	Large Dia Rehab	Hartford	OSBI and NSWBI Area Large Diameter Rehab	$15.8											$0.5	$0.6	$7.0	$3.2																											
2030	89	278	Small Dia Rehab	Hartford	Upper North Branch Area Small Diameter Rehab	$6.8												$0.0	$4.3	$2.5																											
2031	5	369	Separation	Hartford	G-19 Sewer Separation	$2.5													$0.2	$0.1	$0.9	$1.3																									
	26	315	Separation	Hartford	Granby 6 Sewer Separation and CMOM (80/20)	$14.6													$0.5	$0.5	$0.5	$6.4	$5.1	$1.6																							
	150	223	Separation	Hartford	Granby 1 Storm Outfall[3]	$13.2													$1.3	$8.2	$3.7	-																								
2032	53	293	Large Dia Rehab	Hartford	Bloomfield Trunk Sewer Area Large Diameter Rehab	$16.4														$0.0	$7.0	$9.4																									
	92	278	Small Dia Rehab	Hartford	Newington Small Diameter Rehab	$7.3														$0.0	$4.2	$3.1																									
2033	16	323	Separation	Hartford	G-10/12 Sewer Separation and CMOM (80/20)	$7.4															$0.2	$0.3	$0.3	$2.7	$0.5	$3.4																				
	81	283	SSES	Hartford	Bloomfield SSES Implementation Contract 5	$4.9															$0.5	$2.0	$2.4																							
	104	273	Small Dia Rehab	Hartford	Bloomfield Small Diameter Rehab	$9.6															$0.0	$7.0	$2.6																							
2034	29	312	Separation	Hartford	NM-5/6/7 North Sewer Separation and CMOM North (80/20)	$12.2																$0.4	$0.4	$0.4	$0.5	$3.9	$6.6																			
	7	358	Improvements	Hartford	Park Street Phase I, II, and III Improvements	$23.9																$1.0	$11.5	$4.0	$7.4																				
	50	294	CSO Storage	Hartford	Downtown Tunnel	$380.0																$2.1	$4.1	$7.4	$18.0	$41.0	$66.5	$77.4	$77.3	$54.6	$31.6													
	69	288	Large Dia Rehab	Hartford	Connecticut River Interceptor Large Diameter Rehab	$12.8																$0.0	$4.2	$8.6																				
	70	288	Large Dia Rehab	Hartford	West Hartford South Large Diameter Rehab	$11.1																$0.0	$5.6	$5.5																				
	105	273	Small Dia Rehab	Hartford	West Hartford Small Diameter North Rehab	$6.2																$0.0	$6.2																				

Appendix C 2018 CSO LTCP Update and Project Schedule by Year (cont.)

Year	Rank	Assessment Score	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
2035	82	283	SSES	Hartford	Bloomfield SSES Implementation Contract 6	$4.4																	$0.5	$3.9																								
	106	273	Small Dia Rehab	Hartford	Park River Interceptor Area Small Diameter Rehab	$10.6																	$0.0	$1.9	$8.7																								
	108	273	Small Dia Rehab	Hartford	Franklin Avenue Area Small Diameter Rehab	$13.9																	$0.0	$1.6	$12.3																								
2037	110	273	Large Dia Rehab	Hartford	Jefferson Street Interceptor Large Diameter Rehab	$12.0																			$0.0	$8.0	$4.0																							
	6	360	Improvements	Hartford	OSBI Replacement and Pope Park Pipe	$11.3																			$0.5	$0.6	$1.0	$9.2																				
	24	318	Separation	Hartford	G-9/11/23 Sewer Separation and CMOM (80/20)	$10.6																			$0.3	$0.4	$0.4	$1.0	$3.5	$5.0																		
	109	273	Small Dia Rehab	Multiple	Windsor Small Diameter Rehab	$7.3																			$0.0	$7.3																						
	111	273	Small Dia Rehab	Hartford	South Branch Area Small Diameter Rehab	$14.3																			$0.0	$5.1	$9.2																						
2038	117	268	Small Dia Rehab	Hartford	West Hartford Small Diameter South Rehab	$12.7																				$0.0	$3.9	$8.8																				
2039	93	278	SSES	Hartford	Bloomfield SSES Implementation Contract 2	$5.7																					$0.6	$1.0	$4.1																			
2040	30	312	Separation	Hartford	NM-5/6/7 South Sewer Separation and CMOM (80/20)	$16.2																						$0.5	$0.7	$0.5	$4.8	$4.9	$4.8															
	118	268	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #1	$10.4																						$1.0	$4.7	$4.7																		
	126	262	Improvements	Hartford	NNBI Relief Structure	$12.0																						$0.6	$0.6	$5.4	$5.4																	
2041	94	278	SSES	Hartford	Bloomfield SSES Implementation Contract 3	$6.5																							$0.7	$2.9	$2.9																
	114	272	Improvements	Hartford	Folly Brook Trunk Sewer South	$9.2																							$0.9	$4.1	$4.1																
	119	268	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #2	$10.4																							$1.0	$4.7	$4.7																
	151	223	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract A[4]	$12.1																							$0.6	$0.6	$5.5	$5.5															
2042	84	283	SSES	Hartford	Windsor SSES Implementation Contract 2012-58	$4.9																								$0.5	$2.2	$2.2															
2043	36	307	Separation	Hartford	G-2 Sewer Separation and CMOM Phase I (80/20)	$15.2																									$0.5	$0.5	$0.5	$4.5	$4.7	$4.5										
	95	278	SSES	Hartford	Bloomfield SSES Implementation Contract 4	$6.7																									$0.6	$3.0	$3.1													
	123	263	SSES	Hartford	West Hartford Remaining SSES Implementation	$21.6																									$2.2	$9.7	$9.7													
	152	223	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract B[4]	$12.1																									$0.6	$0.6	$5.5	$5.5												
2044	121	267	Improvements	Hartford	Broad Street Shaft Diversion	$9.6																										$0.5	$0.4	$4.2	$4.5											
2046	27	315	Improvements	Hartford	Northeast Interceptor (NEI) Replacement	$18.6																												$0.6	$0.6	$0.6	$5.0	$6.8	$5.0							
2047	37	307	Separation	Hartford	G-2 Sewer Separation and CMOM Phase II (80/20)	$17.4																													$0.5	$0.6	$0.6	$5.0	$5.7	$5.0						
2049	124	263	Improvements	Hartford	Replace NM-10 with Modulated Gate Structure and CRI Low Spot Improvements	$4.2																															$0.2	$0.2	$1.9	$1.9						
2050	33	308	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase I	$11.4																																$0.4	$0.4	$0.4	$3.2	$3.5	$3.5				
	145	233	Private Inflow	Hartford	Gully Brook Area Private Inflow Removal	$10.2																																$1.0	$4.6	$4.6							
2053	31	311	Improvements	Hartford	NM-14 New Combined Sewer	$0.7																																			$0.1	$0.6					
	34	308	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase II	$11.3																																			$0.4	$0.4	$0.4	$3.2	$3.4	$3.5		
	149	225	CSO Storage	Hartford	NM-5 Site Storage	$74.3																																			$2.5	$2.5	$2.5	$22.3	$22.3	$22.3		
Subtotal Future CWP/IP without Downtown Tunnel						**$891**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.4**	**$28.7**	**$23.9**	**$24.7**	**$20.1**	**$14.7**	**$19.9**	**$20.7**	**$19.3**	**$37.0**	**$38.8**	**$30.2**	**$30.2**	**$28.7**	**$25.7**	**$22.1**	**$16.8**	**$28.5**	**$33.5**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$25.8**		
Subtotal Future CWP/IP without Downtown Tunnel, with miscellaneous sewer repairs						**$1,271**	**$0.7**	**$19.9**	**$29.3**	**$32.9**	**$38.8**	**$37.3**	**$28.4**	**$28.7**	**$23.9**	**$24.7**	**$20.1**	**$14.7**	**$19.9**	**$20.7**	**$19.3**	**$39.1**	**$42.9**	**$37.6**	**$48.2**	**$69.7**	**$92.2**	**$99.5**	**$94.1**	**$83.1**	**$65.1**	**$26.9**	**$24.0**	**$14.8**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$25.8**		

1 20% Engineering cost included for all projects, except Large and Small Diameter rehabilitation projects, where engineering is assumed to be performed by in-house MDC staff. All estimated costs are in 2018 million dollars.
2 The total estimate cost of this project is $5.8M, with an additional $4.0M for collection system gates throughout the system.
3 Previously identified as "Granby 1 N-2 Outfall" in earlier documents.
4 Only implemented if deemed necessary.
5 An additional project "CRI & PRI Chamber Modification Conceptual Design", estimate at $1.8M, is part of the CSO Update but currently under design already.

$ Design/Bid
$ Construction
- Post construction metering to be performed.

Appendix D Sewer CWP & CIP Project List

Rank	Assessment Score	Bucket	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
Current CWP																																															
N/A	N/A	N/A	N/A	Multiple	Current CWP[2]	**$396.6**	$102.4	$110.5	$91.9	$76.0	$15.8																																						
Future CWP/IP																																															
1	379	CSO LTCP	Separation	Hartford	G-21 Sewer Separation	$4.5							$0.2	$0.3	$1.0	$3.0																																
2	378	CSO LTCP	Improvements	Hartford	NNBI Replacement/Relocation Project	$37.5	$0.0	$0.0	$0.0	$9.0	$11.0	$17.5																																					
3	372	CSO LTCP	Separation	Hartford	N-12 Sewer Separation and CMOM	$4.6	$0.0	$0.0	$0.0	$2.0	$1.2	$1.4																																					
4	369	CSO LTCP	Improvements	Hartford	Kane Brook (S-8 and S-13)	$30.9	$0.0	$0.0	$9.5	$9.0	$12.4																																					
5	369	CSO LTCP	Separation	Hartford	G-19 Sewer Separation	$2.5													$0.2	$0.1	$0.9	$1.3																									
6	360	CSO LTCP	Improvements	Hartford	OSBI Replacement and Pope Park Pipe	$11.3											$0.5	$0.6	$7.0	$3.2																											
7	358	CSO LTCP	Improvements	Hartford	Park Street Phase I, II, and III Improvements	$23.9																$1.0	$11.5	$4.0	$7.4																					
8	344	CSO LTCP	Improvements	Hartford	Tower Ave Area Sewer Rehabilitation	$3.4	$0.2	$0.2	$3.0																																					
10	335	Collection System	SSO	Hartford	Franklin Avenue 8-in Sewer Relocations	$2.5	$0.1	$0.2	$2.2																																					
11	332	Collection System	SSO	Rocky Hill	RH2 & RH2B I/I Reduction	$10.6	$0.5	$0.5	$2.9	$6.7	-																																			
12	328	Collection System	SSO	Hartford	N18 I/I Reduction	$7.8				$0.4	$0.3	$1.5	$5.6	-																																	
13	328	Collection System	SSO	Hartford	N19 I/I Reduction	$5.5						$0.2	$0.3	$3.0	$2.0	-																															
14	328	Sewer Pumping Stations	Pumping Stations	Hartford	Carr Avenue	$1.0									$0.1	$0.1	$0.8																													
15	326	WPCF	WPCF	Rocky Hill	Headworks and Sludge	$8.0	$4.0	$4.0																																					
16	323	CSO LTCP	Separation	Hartford	G-10/12 Sewer Separation and CMOM (80/20)	$7.4															$0.2	$0.3	$0.3	$1.5	$0.7	$4.4																				
17	320	CSO LTCP	Improvements	Multiple	Collection System Sewer Gate Replacement	$5.8		$0.6	$5.2																																					
18	320	CSO LTCP	Separation	Hartford	Granby 7 Sewer Separation and CMOM (80/20)	$13.6	$0.5	$0.5	$0.4	$2.0	$5.2	$5.0																																					
19	320	CSO LTCP	Separation	Hartford	Granby 9 Sewer Separation and CMOM (80/20)	$11.5					$0.4	$0.4	$0.4	$1.0	$4.3	$5.0																																
20	319	CSO LTCP	Separation	Hartford	Granby 10 Sewer Separation and CMOM (80/20)	$16.6							$0.5	$0.6	$0.6	$1.1	$5.6	$8.2																													
21	318	Sewer Pumping Stations	Pumping Stations	Hartford	Stonehedge Drive	$2.0								$0.1	$0.1	$1.8																														
22	318	CSO LTCP	Separation	Hartford	Granby 3A Sewer Separation and CMOM (80/20)	$12.7									$0.4	$0.4	$0.4	$2.0	$6.2	$3.3																											
23	318	CSO LTCP	Separation	Hartford	Granby 3B Sewer Separation and CMOM (80/20)	$12.6											$0.4	$0.5	$0.4	$2.9	$2.3	$6.1																									
24	318	CSO LTCP	Separation	Hartford	G-9/11/23 Sewer Separation and CMOM (80/20)	$10.6																			$0.3	$0.4	$0.4	$1.0	$3.5	$5.0																
25	317	CSO LTCP	Separation	Hartford	Granby 8 Sewer Separation and CMOM (80/20)	$11.5			$0.2	$0.5	$0.4	$1.5	$4.9	$4.0																																	
26	315	CSO LTCP	Separation	Hartford	Granby 6 Sewer Separation and CMOM (80/20)	$14.6													$0.5	$0.5	$0.5	$3.2	$5.1	$4.8																							
27	315	CSO LTCP	Improvements	Hartford	Northeast Interceptor (NEI) Replacement	$18.6																														$0.6	$0.6	$0.6	$5.0	$6.8	$5.0						
28	313	CSO LTCP	Improvements	Hartford	HAI Improvements	$22.4				$0.3	$0.6	$1.6	$5.6	$7.2	$7.1																																
29	312	CSO LTCP	Separation	Hartford	NM-5/6/7 North Sewer Separation and CMOM North (80/20)	$12.2																$0.4	$0.4	$0.4	$0.5	$3.9	$6.6																				
30	312	CSO LTCP	Separation	Hartford	NM-5/6/7 South Sewer Separation and CMOM (80/20)	$16.2																						$0.5	$0.7	$0.5	$4.8	$4.9	$4.8													
31	311	CSO LTCP	Improvements	Hartford	NM-14 New Combined Sewer	$0.7																																				$0.1	$0.6					
32	310	CSO LTCP	Small Dia Rehab	Hartford	18-in to 21-in Brick Rehab	$11.5		$0.0	$6.0	$5.5																																					
33	308	CSO LTCP	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase I	$11.4																																		$0.4	$0.4	$0.4	$3.2	$3.5	$3.5				
34	308	CSO LTCP	Separation	Hartford	Additional Sewer Separation in Gully Brook Phase II	$11.3																																				$0.4	$0.4	$0.4	$3.2	$3.4	$3.5
35	307	Collection System	SSO	Rocky Hill	Wethersfield Trunk Sewer Redirection & Elm St Sewer Improvements	$28.6					$0.9	$1.0	$1.0	$4.9	$10.3	$10.5																															
36	307	CSO LTCP	Separation	Hartford	G-2 Sewer Separation and CMOM Phase I (80/20)	$15.2																										$0.5	$0.5	$0.5	$4.5	$4.7	$4.5									
37	307	CSO LTCP	Separation	Hartford	G-2 Sewer Separation and CMOM Phase II (80/20)	$17.4																														$0.5	$0.6	$0.6	$5.0	$5.7	$5.0						
38	306	WPCF	WPCF	Poquonock	Trickling Filter and Screenings Upgrades	$8.0		$6.0	$2.0																																					
40	305	Collection System	SSO	Hartford	Decker's Brook Trunk Sewer Improvements	$6.3									$0.3	$0.3	$2.9	$2.8																											
41	303	CSO LTCP	Large Dia Rehab	Hartford	Farmington Avenue and Homestead Avenue Area Large Diameter Rehab	$8.4			$0.0	$3.3	$5.1																																				
42	303	CSO LTCP	Large Dia Rehab	Hartford	Cemetery Brook Area Large Diameter Rehab	$3.8				$0.0	$1.0	$2.8																																			
43	301	WPCF	WPCF	Hartford	BNR Phase III	$60.0									$3.0	$3.0	$11.3	$15.9	$16.4	$9.4																									
44	298	CSO LTCP	Large Dia Rehab	Hartford	Broad Street Area Large Diameter Rehab	$14.2	$0.0	$12.0	$2.2																																					
45	298	CSO LTCP	Large Dia Rehab	Hartford	Gully Brook Interceptor Area Large Diameter Rehab	$14.5					$0.0	$2.3	$12.2																																		
46	298	CSO LTCP	Large Dia Rehab	Hartford	Franklin Avenue and Downtown Area Large Diameter Rehab	$16.6						$0.0	$4.9	$11.7																																	

Appendix D Sewer CWP & CIP Project List (cont.)

Rank	Assessment Score	Bucket	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
47	298	CSO LTCP	Large Dia Rehab	Hartford	Newington Large Diameter Rehab	$6.4							$0.0	$1.6	$4.8																																	
48	298	CSO LTCP	Large Dia Rehab	Hartford	North and South Meadows Large Diameter	$6.7										$0.0	$5.0	$1.7																													
49	298	CSO LTCP	Large Dia Rehab	Hartford	West Hartford North Large Diameter Rehab	$4.7										$0.0	$1.7	$3.0																													
51	293	CSO LTCP	Large Dia Rehab	Hartford	Granby Street Area Large Diameter Rehab	$16.3								$0.0	$5.0	$11.3																															
52	293	CSO LTCP	Small Dia Rehab	Hartford/ Windsor	Windsor Styrene Rehab	$3.5		$0.0	$2.2	$1.3																																				
53	293	CSO LTCP	Large Dia Rehab	Hartford	Bloomfield Trunk Sewer Area Large Diameter Rehab	$16.4														$0.0	$7.0	$9.4																									
54	293	Collection System	SSO	Hartford	WH29 I/I Reduction Phase II	$7.8															$0.3	$0.4	$1.0	$6.1	-																					
55	293	CSO LTCP	Large Dia Rehab	Hartford	OSBI and NSWBI Area Large Diameter Rehab	$15.8														$0.0	$10.0	$5.8																									
56	291	Collection System	Improvements	Hartford	Madison Ave Water Main and Sewer Replacement	$0.5	$0.5																																							
57	291	WPCF	WPCF	East Hartford	Phase 3B (Aeration, RSPS, Influent PS, Disin., Admin, Effluent)	$7.7												$0.3	$0.4	$3.7	$3.3																										
63	288	CSO LTCP	Small Dia Rehab	Hartford	North and South Meadows Area Small Diameter Rehab	$3.7				$0.0	$1.0	$2.7																																			
64	288	CSO LTCP	Small Dia Rehab	Hartford	Bloomfield Styrene Rehab	$2.6				$0.0	$0.5	$2.1																																			
65	288	Collection System	Small Dia Rehab	East Hartford	East Hartford Styrene Rehab	$3.0						$0.0	$3.0																																		
66	288	Collection System	Small Dia Rehab	Multiple	Rocky Hill Styrene Rehab	$1.4						$0.0	$1.4																																		
67	288	CSO LTCP	Small Dia Rehab	Hartford	West Hartford Styrene Rehab	$2.6							$0.0	$2.6																																
68	288	Collection System	Small Dia Rehab	Hartford/ Rocky Hill	Wethersfield Styrene Rehab	$3.0							$0.0	$3.0																																
69	288	CSO LTCP	Large Dia Rehab	Hartford	Connecticut River Interceptor Large Diameter Rehab	$12.8																$0.0	$4.2	$8.6																						
70	288	CSO LTCP	Large Dia Rehab	Hartford	West Hartford South Large Diameter Rehab	$11.1																$0.0	$5.6	$5.5																						
71	288	Collection System	Large Dia Rehab	Hartford/ Windsor	Windsor Large Diameter Rehab	$0.9																		$0.0	$0.9																					
72	288	Collection System	Large Dia Rehab	East Hartford	East Hartford Large Diameter Rehab	$2.3																		$0.0	$2.3																					
73	288	Collection System	SSO	Hartford	WH29 I/I Reduction Phase I	$4.3																	$0.2	$0.2	$0.2	$3.7	-																		
74	288	Collection System	SSO	Hartford	WH30 I/I Reduction Phase II	$13.4																			$0.6	$0.7	$2.0	$10.1	-																
75	288	Collection System	SSO	Hartford	WH31 I/I Reduction Phase II	$15.5																				$0.8	$0.8	$3.6	$10.3	-																
76	288	CSO LTCP	Small Dia Rehab	Hartford	Newington Styrene Rehab	$3.5							$0.0	$1.0	$2.5																															
77	283	CSO LTCP	Small Dia Rehab	Hartford	I-4 Small Diameter Rehab	$0.2			$0.2																																					
78	283	CSO LTCP	Small Dia Rehab	Hartford	Gully Brook Area Small Diameter Rehab	$6.9									$0.0	$1.0	$5.9																													
79	283	CSO LTCP	Small Dia Rehab	Hartford	Lower North Branch Area Small Diameter Rehab	$8.0										$0.0	$5.5	$2.5																													
80	283	Collection System	SSO	Hartford	WH30 I/I Reduction Phase I	$5.5																			$0.5	$2.9	$2.1	-																	
81	283	CSO LTCP	SSES	Hartford	Bloomfield SSES Implementation Contract 5	$4.9															$0.5	$2.0	$2.4																						
82	283	CSO LTCP	SSES	Hartford	Bloomfield SSES Implementation Contract 6	$4.4																	$0.5	$3.9																					
83	283	Collection System	Improvements	Hartford	Woodside Cir & NNBI Siphons - Sewer Easement Improvements	$2.2																										$0.2	$1.0	$1.0											
84	283	CSO LTCP	SSES	Hartford	Windsor SSES Implementation Contract 2012-58	$4.9																								$0.5	$2.2	$2.2													
85	281	Collection System	Improvements	Hartford	Bond St Area Water Main Replacement & Sewer Rehab	$0.5	$0.5																																						
86	281	Collection System	Improvements	Hartford	Webster Hill Blvd Water Main Replacement & Sewer Rehab	$0.3		$0.3																																						
88	278	Collection System	Small Dia Rehab	Rocky Hill	Rocky Hill Small Diameter Rehab	$5.4											$0.0	$2.5	$2.9																											
89	278	CSO LTCP	Small Dia Rehab	Hartford	Upper North Branch Area Small Diameter Rehab	$6.8												$0.0	$4.3	$2.5																										
90	278	Collection System	Small Dia Rehab	East Hartford	East Hartford South Small Diameter Rehab	$7.4													$0.0	$2.7	$4.9																									
91	278	Collection System	Small Dia Rehab	Rocky Hill	Wethersfield Small Diameter Rehab	$1.7													$0.0	$1.7																										
92	278	CSO LTCP	Small Dia Rehab	Hartford	Newington Small Diameter Rehab	$7.3														$0.0	$4.2	$3.1																								
93	278	CSO LTCP	SSES	Hartford	Bloomfield SSES Implementation Contract 2	$5.7																					$0.6	$1.0	$4.1																
94	278	CSO LTCP	SSES	Hartford	Bloomfield SSES Implementation Contract 3	$6.5																							$0.7	$2.9	$2.9														
95	278	CSO LTCP	SSES	Hartford	Bloomfield SSES Implementation Contract 4	$6.7																									$0.6	$3.0	$3.1												
96	276	WPCF	WPCF	Rocky Hill	Stormwater Pump Station	$3.0	$1.5	$1.5																																					
97	276	Collection System	Improvements	Hartford	Oakwood Ave Sewer and Water Improvements - Phase II & IIa	$2.8		$2.8																																						
98	276	Collection System	Improvements	Hartford	Oakwood Ave Sewer and Water Improvements - Phase I	$4.5													$0.5	$1.8	$2.2																									
103	273	CSO LTCP	SSES	Hartford	West Hartford SSES Implementation Contract 2012-59	$11.0		$7.0	$4.0																																				
104	273	CSO LTCP	Small Dia Rehab	Hartford	Bloomfield Small Diameter Rehab	$9.6															$0.0	$7.0	$2.6																						

Appendix D Sewer CWP & CIP Project List (cont.)

Rank	Assessment Score	Bucket	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
105	273	CSO LTCP	Small Dia Rehab	Hartford	West Hartford Small Diameter North Rehab	$6.2																$0.0	$6.2																									
106	273	CSO LTCP	Small Dia Rehab	Hartford	Park River Interceptor Area Small Diameter Rehab	$10.6																	$0.0	$1.9	$8.7																								
107	273	Collection System	Small Dia Rehab	EHWPCF	East Hartford North Small Diameter Rehab	$7.1																	$0.0	$1.5	$5.6																								
108	273	CSO LTCP	Small Dia Rehab	Hartford	Franklin Avenue Area Small Diameter Rehab	$13.9																	$0.0	$1.6	$12.3																								
109	273	CSO LTCP	Small Dia Rehab	Multiple	Windsor Small Diameter Rehab	$7.3																			$0.0	$7.3																							
110	273	CSO LTCP	Large Dia Rehab	Hartford	Jefferson Street Interceptor Large Diameter Rehab	$12.0																			$0.0	$8.0	$4.0																						
111	273	CSO LTCP	Small Dia Rehab	Hartford	South Branch Area Small Diameter Rehab	$14.3																			$0.0	$5.1	$9.2																					
112	273	Collection System	Small Dia Rehab	East Hartford	East Hartford Mid Small Diameter Rehab	$9.5																			$0.0	$2.0	$7.5																					
113	273	Collection System	SSO	Hartford	WH31 I/I Reduction Phase I	$8.3																				$0.8	$2.6	$4.9	-																		
114	272	CSO LTCP	Improvements	Hartford	Folly Brook Trunk Sewer South	$9.2																							$0.9	$4.1	$4.1																	
117	268	CSO LTCP	Small Dia Rehab	Hartford	West Hartford Small Diameter South Rehab	$12.7																				$0.0	$3.9	$8.8																			
118	268	CSO LTCP	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #1	$10.4																						$1.0	$4.7	$4.7																	
119	268	CSO LTCP	SSES	Hartford	Folly Brook Area SSES Wethersfield, Project #2	$10.4																							$1.0	$4.7	$4.7																
120	268	CSO LTCP	Improvements	Hartford	CRI & PRI Siphon Chamber Modification Conceptual Design	$1.8	$1.8																																								
121	267	CSO LTCP	Improvements	Hartford	Broad Street Shaft Diversion	$9.6																										$0.5	$0.4	$4.2	$4.5												
122	266	Collection System	Improvements	Hartford	Saybrooke and Bonner St Area Water Main Replacement and Sewer Rehab	$2.1		$2.1																																							
123	263	CSO LTCP	SSES	Hartford	West Hartford Remaining SSES Implementation	$21.6																									$2.2	$9.7	$9.7														
124	263	CSO LTCP	Improvements	Hartford	Replace NM-10 with Modulated Gate Structure and CRI Low Spot Improvements	$4.2																																$0.2	$0.2	$1.9	$1.9						
125	262	Collection System	Improvements	Hartford	Folly Brook Trunk Sewer North	$16.6																									$1.7	$7.5	$7.5													
126	262	CSO LTCP	Improvements	Hartford	NNBI Relief Structure	$12.0																						$0.6	$0.6	$5.4	$5.4															
145	233	CSO LTCP	Private Inflow	Hartford	Gully Brook Area Private Inflow Removal	$10.2																																$1.0	$4.6	$4.6						
146	233	Collection System	SSO	Hartford	Montclair/Linnard Sewer Improvements	$2.3																					$0.3	$0.5	$1.5																	
149	225	CSO LTCP	CSO Storage	Hartford	NM-5 Site Storage	$74.3																																					$2.5	$2.5	$2.5	$22.3	$22.3	$22.3
150	223	CSO LTCP	Separation	Hartford	Granby 1 Storm Outfall[3]	$13.2													$1.3	$8.2	$3.7	-																								
151	223	CSO LTCP	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract A[4]	$12.1																							$0.6	$0.6	$5.5	$5.5														
152	223	CSO LTCP	Private Inflow	Hartford	Granby Area Private Inflow Removal Contract B[4]	$12.1																									$0.6	$0.6	$5.5	$5.5												
N/A	N/A	N/A	N/A	Multiple	Miscellaneous Future CWP/IP Sewer Repairs/ Rehab	$394.1	-	$2.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.1	$8.0	$11.4	$11.5	$4.8	$5.4	$7.5	$24.3	$29.7	$34.3	$34.2	$26.6	$22.4	$28.1	$33.8	$33.0	$33.6	$14.5	$14.3	$14.2
Subtotal Future CWP/IP without Downtown Tunnel						**$1,176**	**$9.6**	**$37.7**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$39.9**	**$32.0**	**$28.6**	**$28.5**	**$35.2**	**$34.6**	**$32.5**	**$15.7**	**$10.3**	**$5.7**	**$5.8**	**$13.4**	**$17.6**	**$11.9**	**$6.2**	**$7.0**	**$6.4**	**$25.5**	**$25.7**	**$25.8**
Subtotal Future CWP/IP without Downtown Tunnel, with miscellaneous sewer repairs						**$1,570**	**$9.6**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**	**$40.0**
N/A	N/A	N/A	N/A	Multiple	PMU/PMC	$366.8	$12.2	$11.2	$10.2	$9.2	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0	$9.0
50	294	CSO LTCP	CSO Storage	Hartford	Downtown Tunnel	$380.0																$2.1	$4.1	$7.4	$18.0	$41.0	$66.5	$77.4	$77.3	$54.6	$31.6															
Total Current + Future CWP/IP with Downtown Tunnel						**$2,714**	**$124.2**	**$161.7**	**$142.1**	**$125.2**	**$64.8**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$51.1**	**$53.1**	**$56.4**	**$67.0**	**$90.0**	**$115.5**	**$126.4**	**$126.3**	**$103.6**	**$80.6**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**	**$49.0**
Combined Sewer CIP																																														
N/A	N/A	N/A	N/A	Multiple	Combined Water/Wastewater CIP	**$324.0**	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1	$8.1
Future CIP																																														
N/A	N/A	WPCF	WPCF	Multiple	WPC Infrastructure Rehabilitation, Upgrades, & Replacements	$200.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0	$5.0
9	338	Sewer Pumping Stations	Pumping Stations	Rocky Hill	Main Street	$2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	306	WPCF	WPCF	Hartford	Sludge Cake Receiving, Screening and Equalization	$20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	291	WPCF	WPCF	Hartford	Centrifuge Replacement and Overhead Crane	$4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	291	Collection System	Improvements	Rocky Hill	Dividend Brook Drainage Area (Phase I)	$5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	291	Collection System	Improvements	Rocky Hill	Dividend Brook Drainage Area (Phase II)	$5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	291	WPCF	WPCF	East Hartford	Solids Handling	$8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	290	Collection System	Flood Control (Wastewater)	Hartford	Levee Protection System Improvements (Wastewater)	$1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	281	Sewer Pumping Stations	Pumping Stations	Hartford	Meadow Road	$1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix D Sewer CWP & CIP Project List (cont.)

Rank	Assessment Score	Bucket	Project Type	WPCF	Project Name	Opinion of Probable Cost[1]	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
99	276	Sewer Pumping Stations	Pumping Stations	East Hartford	Governor Street	$1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	276	Sewer Pumping Stations	Pumping Stations	Hartford	Brookside Road	$3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
101	276	Sewer Pumping Stations	Pumping Stations	Poquonock	Rainbow Trunk	$2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	274	WPCF	WPCF	Hartford	Ash Lagoon Closure Project	$4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
115	271	Sewer Pumping Stations	Pumping Stations	East Hartford	Burnham Street	$1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
116	269	WPCF	WPCF	Rocky Hill	Environmental Clean-up	$4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
127	256	Sewer Pumping Stations	Pumping Stations	Rocky Hill	Belamose Ave	$3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
128	256	Sewer Pumping Stations	Pumping Stations	Hartford	Burr Road	$1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	256	Sewer Pumping Stations	Pumping Stations	Rocky Hill	Windy Hill	$1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	256	WPCF	WPCF	East Hartford	Plant Infrastructure Renewal and Replacements	$5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	251	Sewer Pumping Stations	Pumping Stations	Hartford	Island Road	$2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	251	Sewer Pumping Stations	Pumping Stations	Hartford	Eighth Street	$1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
133	251	Sewer Pumping Stations	Pumping Stations	Poquonock	Merriman Road	$1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
134	251	Sewer Pumping Stations	Pumping Stations	East Hartford	Mohawk Drive	$3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135	251	Sewer Pumping Stations	Pumping Stations	Poquonock	Ridge Street	$3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136	251	Sewer Pumping Stations	Pumping Stations	East Hartford	High Street	$3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
137	251	Sewer Pumping Stations	Pumping Stations	Rocky Hill	Wethersfield Trunk	$4.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
138	251	Sewer Pumping Stations	Pumping Stations	East Hartford	Porter Street	$1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
139	246	Sewer Pumping Stations	Pumping Stations	Hartford	Fishfry	$6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	246	Sewer Pumping Stations	Pumping Stations	Rocky Hill	Motts	$1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
141	246	Sewer Pumping Stations	Pumping Stations	Hartford	Southwood Drive	$1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
142	246	Sewer Pumping Stations	Pumping Stations	Hartford	Weston Street	$1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
143	238	WPCF	WPCF	Hartford	Air Permit Compliance Upgrades (Potential)	$4.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
144	236	WPCF	WPCF	Hartford	Site Wrap-Up Contract (WWEP)	$20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
147	228	WPCF	WPCF	East Hartford	Sludge Pumping/Force Main Assessment	$0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
148	228	WPCF	WPCF	Rocky Hill	Sludge Pumping/Force Main Assessment	$0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
153	201	WPCF	WPCF	Multiple	Renewable Energy Projects – Sewer Facilities	$3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
154	181	Collection System	Improvements	Hartford	Mountain Farms Area Sewer Main Extension	$10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N/A	N/A	Collection System	Improvements	Multiple	Miscellaneous CIP projects	$264.5		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Subtotal Future Sewer CIP	**$609**	$23.9	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0	$15.0
					Total CIP	**$933**	**$32.0**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**	**$23.1**
					Total Sewer Cash Flow																																										
					Total Sewer Cash Flow	**$3,647**	**$156.2**	**$184.8**	**$165.2**	**$148.3**	**$87.9**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$74.2**	**$76.2**	**$79.5**	**$90.1**	**$113.1**	**$138.6**	**$149.5**	**$149.4**	**$126.7**	**$103.7**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**	**$72.1**

1 20% Engineering cost included for all projects, except Large and Small Diameter rehabilitation projects, where engineering is assumed to be performed by in-house MDC staff. All estimated costs are in 2018 million dollars.
2 Completion of ongoing projects, including: HWPCF upgrades, SHCST (Contracts 2 through 5), miscellaneous planning/designs, Bartholomew Avenue, Green Infrastructure at 555 Main Street, Cedar Street, Goff Brook SSO closure, & RHWPCF upgrade
3 Previously identified as "Granby 1 N-2 Outfall" in earlier documents.
4 Only implemented if deemed necessary.

$ Design/Bid
$ Construction
- Post construction metering to be performed.

CDM Smith®

cdmsmith.com