

## Section 11

# Recommended Plan and Implementation Schedule

### 11.1 Overview of the Recommended Plan

The *City Beautiful H<sub>2</sub>O Program Plan* (Program Plan) is a long-term, integrated strategy to address the hydraulic and structural deficiencies of Capital Region Water's (CRW) wastewater and stormwater assets, improve in-stream water quality, and protect public health. Many alternative technologies, specific decentralized green/grey projects, and levels of control were evaluated. This section summarizes the measures recommended by the following sections of the Program Plan:

- Recommended capital projects (Section 8)
- Implementation/adaptive management programs (Section 9)
- Post-construction monitoring measures (Section 10).

This recommended plan and implementation schedule represents the most affordable and cost-effective balance between control of wet weather issues (CSOs, SSOs, and MS4 discharges), rehabilitation of CRW assets, and enhancing service area communities.

The Financial Capability Assessment (FCA) presented in Section 7 is used to identify an affordable level of investment in this Program Plan, one that maintains CRW wastewater rates at no more than two percent of the median household income (MHI) within the City of Harrisburg (\$33,289 in 2015). This level of investment would fund the following components of the Program Plan over the next 20 years:

- CRW's 2018 budgeted and anticipated operational expenses of \$14.3 million annually.
- An estimated bond repayment amount of approximately \$18.8 million annually, used to finance:
  - Past capital improvements (e.g., biological nutrient removal at CRW's AWTF),
  - Up to approximately \$13 million (escalated and in 2017 dollars) for early action wet weather control projects,
  - Up to approximately \$113 million (escalated), or \$102 million (in 2017 dollars) for priority projects to address critical Advanced Wastewater Treatment Facility (AWTF) and conveyance system rehabilitation needs, some that also provide significant CSO control benefits.
  - Up to approximately \$88 million (escalated), or \$64 million (in 2017 dollars) for additional wet weather control projects, and

- Up to \$101 million (escalated), or \$74 million (in 2017 dollars) be expended on collection system rehabilitation projects.

**Table 11-1** defines implementation phases, the anticipated level of CSO volume control achieved, and the estimated available level of expenditure within each phase to maintain CRW wastewater rates at no more than two percent of the MHI. While CSO volume capture is presented as the primary metric for compliance during each implementation time frame, more affordable and cost-effective projects that improve water quality and/or reduce SSOs/unauthorized releases may receive a higher priority for implementation under the integrated stormwater/wastewater planning framework.

**Table 11-1. Implementation Phases, Affordable Costs, and CSO Control Volume Targets**

Phase	Anticipated Time Frame	Projected Type	Affordable Spending (Escalated)	Affordable Spending (2017\$) <sup>2</sup>	CSO Volume Capture <sup>3</sup>
Existing	N/A	N/A	N/A	N/A	53%
Immediate	0-10 years	Rehabilitation	\$165 million	\$146 million	79%
		Wet Weather	\$60 million	\$50 million	
Near-Term	10-20 years	Rehabilitation	\$49 million	\$31 million	80%
		Wet Weather	\$41 million	\$26 million	
<b>Total</b>			<b>\$315 million</b>	<b>\$253 million</b>	

<sup>1</sup> Partially funded via 30-year revenue bond

<sup>2</sup> Includes up to \$5M annual stormwater fee revenue

<sup>3</sup> During the typical year

Specific investments to CRW's stormwater/wastewater assets will be defined periodically through a decision-making process, implemented through the ongoing adaptive management process presented in Section 9, that weighs the following factors:

- The Business Risk Exposure of each asset, established through CRW's asset management program.
- The public health and welfare benefits to CRW ratepayers provided by the investment.
- The degree of water quality enhancement achieved by the investment.
- Synergies with other investments within the City, including opportunities for collaboration with other implementation partners and/or sources of funding.
- The affordability and cost-effectiveness of the investment.
- The effectiveness of previous investments determined through post-construction monitoring and hydrologic and hydraulic (H&H) modeling.
- Appropriate phasing of investments to avoid short-term degradation to current conditions.
- An appropriate investment in the operation and maintenance of the CRW wastewater/stormwater systems and administration of the Program Plan.

- Changes to the financial capabilities of CRW's ratepayers.

The Program Plan is an opportunity to select an alternative to bolster public support for improvements that address modern challenges to managing water resources and infrastructure in a sustainable way. CRW's recommended alternative provides a clear pathway that reinvests and rehabilitates wastewater/stormwater assets; brings community leaders, stakeholders, and residents together; and complies with environmental laws and regulations to improve the health of local waterways.

## 11.2 Primary Objectives of the Program Plan

The primary objectives of the Program Plan, that must be met for the recommended plan, are:

- To address priority risks and achieve regulatory compliance within the financial capabilities of CRW and its ratepayers.
- To rehabilitate wastewater/stormwater assets that have been compromised by deferred maintenance, improve substandard operations of these assets, and restore their structural and operational integrity.
- To reduce pollutant discharges to receiving waters from CSOs, MS4s, and the AWTF.
- To mitigate the effects of hydraulic capacity constraints projected to cause separate sanitary sewer overflows (SSOs) and unauthorized releases from combined sewers, as these impact public health and safety.
- To stabilize streambanks where excessive erosion causes stream degradation.
- To establish an administrative framework with sufficient resources to collaborate with stakeholders affecting, affected by and/or participating in the Program Plan.
- To implement an ongoing operation and maintenance program and an asset management plan, with sufficient budget, labor and equipment resources to protect and preserve the integrity and functionality of the wastewater/stormwater systems.
- To enhance benefits to and minimize impacts on environmental justice populations.

## 11.3 Recommended Program Plan

This section summarizes the primary recommendations of the Program Plan and describes how the recommended program plan will meet the primary objectives itemized above.

### 11.3.1 CRW's Financial Capabilities

A financial capability assessment for the Program Plan was prepared using criteria suggested by the US Environmental Protection Agency (US-EPA) (see Section 7). The US-EPA's approach calls for an evaluation of costs of the proposed improvements against Harrisburg citizen's MHI. In general, the US-EPA considers wastewater costs above two percent of median household income to be an unacceptable cost burden to ratepayers. The affordability and financial capability analysis presented in Section 7 identifies an upper limit on the level of spending that CRW and its

ratepayers can sustain without severe hardship. Socioeconomic analyses generally point to slow economic growth in the Harrisburg region for the next 20 years. The trends highlighted in the analysis provided in Section 7 are predictive of an increasing burden on ratepayers for wastewater treatment costs prior to the enactment of any wet weather compliance measures by CRW. It is important for CRW, the Pennsylvania Department of Environmental Protection (PA-DEP) and the US-EPA to negotiate a level of wet weather control and an implementation schedule that recognizes the financial burden on ratepayers and the permittee that will result from wet weather compliance measures, and that the affordability of the selected alternative must be one of the considerations in selecting the preferred alternative. This recommended plan serves as an optimal starting point for those negotiations.

### 11.3.2 A Recommended Program Plan Defined by CRW's Financial Capabilities

CRW's recommended plan, based upon an Affordable Level of Control laid out in Section 8, is the combination of the Baseline Control Strategy, a decentralized control (green-grey) strategy, and a rehabilitation and renewal strategy that can be implemented within reasonable limits of affordability for the ratepayers of CRW. The Affordable Level of Control establishes a cap to investments in the operation, maintenance, rehabilitation, and enhancement of CRW stormwater / wastewater assets under the recommended program plan. This cap on the investment for regulatory compliance retains sufficient resources for the rehabilitation of critical sewer system facilities and sustains a healthy balance between environmental compliance and system renewal.

CRW is progressing through broad scale capital improvements to the wastewater collection, conveyance, and treatment system. These investments are to improve system function and performance to ensure reliable operation of system components. In addition to these renewal and remedial costs, CRW is committed to addressing requirements under the Clean Water Act while recognizing the financial burden imposed on ratepayers for these improvements.

For some customers within the City, the cost as a percentage of income will far exceed two percent. The cost as a percentage of income for some Census tracts within the City, representing approximately 17 percent of the population, are anticipated to exceed three percent, of MHI, and several census tracts, representing an additional four percent of the population, will be in the 2.5 – 3.0 percent range. This indicates that increases in wastewater and stormwater costs to residential customers within the City would result in an unreasonably high economic burden for some customers, even if the cost as a percentage of the MHI stays near two percent.

### 11.3.3 Rehabilitation of Wastewater/Stormwater Assets

A primary objective of the recommended Program Plan is the rehabilitation of wastewater/stormwater assets to resolve deferred maintenance of these assets, improve substandard operations of these assets, and restore their structural integrity. Improvements listed in **Table 11-2**, considered to be the baseline level of control in Chapter 8, strive to rehabilitate and repair the most critical system assets during the Immediate Implementation Phase. The recommended projects will both restore the structural integrity of these systems (minimizing failures that could potentially threaten severe water quality degradation and public safety) and optimize conveyance to the AWTF, increasing CSO capture from 53 to 78 percent during the typical year. CRW anticipates investing up to \$113 million (escalated), or \$102 million (in 2017 dollars) on these projects during the 20-year planning horizon of the Program Plan. It is

anticipated that additional AWTF and conveyance system assets may require rehabilitation and renewal over the next 20 years beyond that programmed in Table 11-2. These costs also cannot be projected at this time, and any costs that do emerge must also be funded through CRW's remaining financial capabilities.

**Table 11-2: Recommended Projects for Rehabilitation of Wastewater/Stormwater Assets**

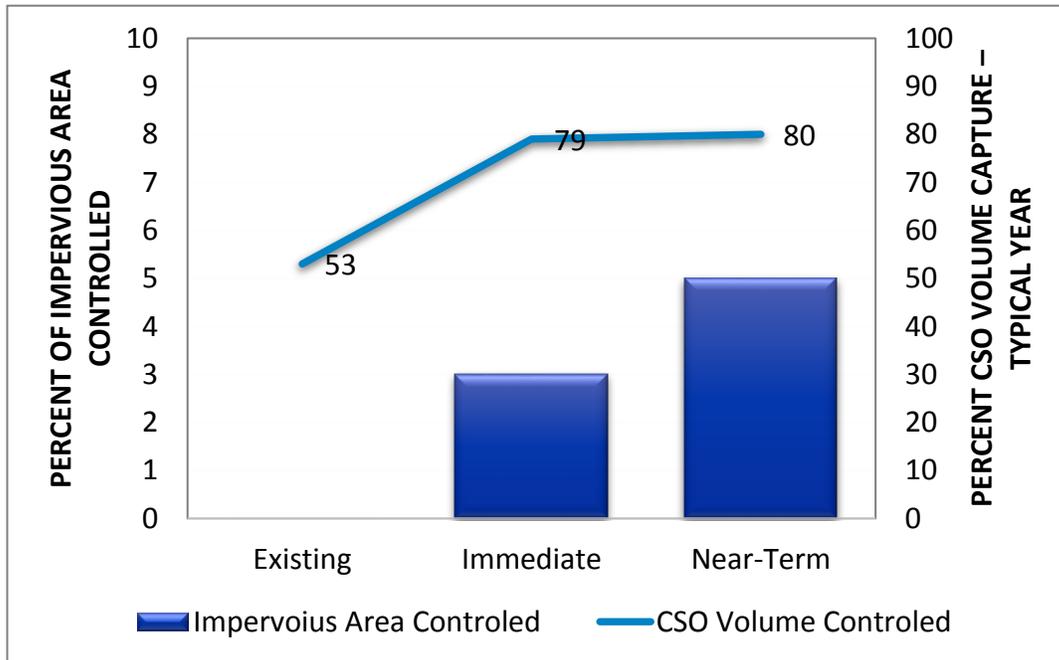
Project	Existing/ Planned Project?	Implementation Phase	Wet Weather Control?
Paxton Creek Interceptor Rehabilitation	Yes	Immediate	Yes
Asylum Run Rehabilitation	Yes	Immediate	Yes
Front St. Rehabilitation	Yes	Immediate	Yes
Spring Creek Rehabilitation	Yes	Immediate	Yes
Headworks Screening	Yes	Immediate	Yes
Primary Clarifier Improvements/Repair	Yes	Immediate	Yes
Front St. Pump Station	Yes	Immediate	Yes
Spring Creek Pump Stations	Yes	Near-Term	Yes
City Island Pump Stations	Yes	Near-Term	No
Other WWTP Rehabilitation (not wet weather)	Yes	Immediate	No
CSO Regulator Enhancements	No	Immediate	Yes
Collection System Rehabilitation (known)	Yes	Immediate	Yes
Collection System Rehabilitation (unknown)	No	Both	Yes
Long-Term AWTF/Conveyance System Renewal	No	Near-Term	Yes

CRW is unable to provide an accurate estimate of the anticipated cost to rehabilitate collection system assets. The rapid assessment described in Section 4 developed an initial estimate of over \$100 million (in 2017 dollars) to repair collection system assets. These estimates and their repair priority are considered preliminary based on the limited visibility of pole zoom camera technology. A comprehensive CCTV inspection of the entire collection system is underway, prioritized based on the rapid inspection findings, and critical collection system rehabilitation projects have already been identified for implementation in 2018. Additional projects are anticipated; however, the scope, breadth, timing, and cost of these projects cannot be determined at this time. As a result, a significant portion of CRW's remaining financial capability will be required indefinitely to support critical collection system repair, diminishing opportunities for wet weather control beyond that achieved through baseline improvements.

### 11.3.4 Reduce Pollutant Discharges to Receiving Waters

Reducing pollutant discharges to receiving waters from CSOs, MS4s, and the AWTF is a core objective of CRW's recommended Program Plan. In addition to requirements of achieving compliance with the National CSO Policy, CRW must also address the objectives of the Pennsylvania Chesapeake Watershed Implementation Plan. Decentralized control (green-grey) supplements the control achieved through conveyance/treatment system rehabilitation, further

controlling pollutant releases from CSOs and MS4s. This is the primary recommendation to reduce pollutants to address these separate objectives. **Figure 11-1** illustrates the amount of green stormwater infrastructure that can be installed within CRW’s financial capabilities, and the level of CSO control achieved through this investment. For example, **Table 11-3** lists pilot decentralized control (green-grey) and streambank stabilization projects that CRW is committed to build during the Immediate Implementation Phase, estimated to cost approximately \$13 million (escalated and in 3017 dollars). CRW anticipates that other public works and development projects will emerge during this period where decentralized controls are feasibly



**Figure 11-1. Typical Year CSO Volume Controlled through Phased implementation of Decentralized Controls (Green-Grey)**

integrated.

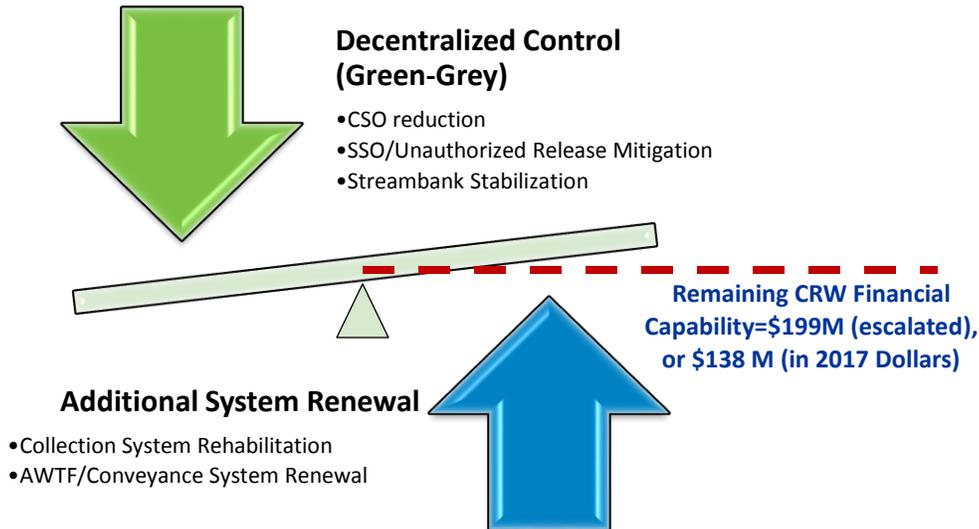
**Table 11-3. Recommended Early Action Wet Weather Control Projects**

Project Name	Existing/ Planned Project?	Implementation Phase
Third St. Multi-Modal GSI	Yes	Immediate
Parks GSI	Yes	Immediate
Summit Terrace Green Neighborhood GSI	Yes	Immediate
Camp Curtain Big Green Block GSI	Yes	Immediate
MulDer Square GSI	Yes	Immediate
South Allison Hill GSI	Yes	Immediate
2 <sup>nd</sup> St. / 7 <sup>th</sup> St. Multi-Modal GSI	Yes	Immediate
Paxton Creek Stream Restoration	Yes	Immediate

While CRW expects to implement this recommended level of green stormwater infrastructure (GSI) over the Immediate and Near-Term Implementation Phases of this Program Plan, competing uncertainties may affect the level of implementation CRW is able to implement:

- The cost and risk associated with collection system structural rehabilitation discovered via the CCTV program.
- The amount of outside funding (e.g., development contributions, grant funds, public-private partnerships) that emerge to implement GSI over the 20-year implementation period.

Adaptive management will monitor these unknown factors and adjust CRW's ability to meet this demand. This process is illustrated in **Figure 11-2**, which indicates the routine decision-making process required to properly balance the risks associated with unmet system rehabilitation and renewal, and the opportunities, benefits, and outside funding potential of decentralized control projects.



**Figure 11-2. Adaptive Management Strategy for Additional, Affordable Investments**

According to the Financial Capabilities Assessment presented in Section 7, CRW's remaining annual financial capability is approximately \$199 million (escalated), or \$138 million (in 2017 dollars) over the next 20 years. Remaining financial capability is defined as the revenue CRW wastewater rates can generate within a median household indicator of two percent to provide funding for project/programs, beyond its existing commitments, (as reflected in CRW's 2018 operational budget) and existing/known capital improvements (reflected in CRW's latest Consulting Engineers Assessment Report).

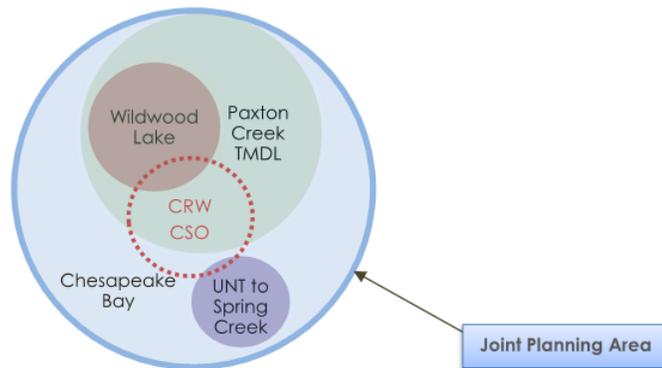
### 11.3.5 Mitigate Unauthorized Releases

The recommended Program Plan also seeks to mitigate the effects of hydraulic capacity constraints projected to cause SSOs and unauthorized releases from combined sewers, as these impact public health and safety. Hydrologic and hydraulic modeling was used to quantify and characterize the hydraulic performance of the sewer system and identify locations for potential

SSO discharges and/or unauthorized releases from the combined sewer system. System inspection data and subsequent analyses were used to characterize the condition of the existing conveyance and collection systems, and to identify critical defects and hydraulic bottlenecks that need to be corrected as part of the Program Plan. Together these analyses identify the most critical areas to address and mitigate unauthorized releases from the sewer systems. CRW will prioritize projects to address these releases along with achieving other objectives of the Program Plan. A decentralized control (green-grey) strategy allows capital improvements to control both pollution and unauthorized releases at several scales, from basement to street flooding. Resources can be shared with multi-objective projects that reduce CSO volumes and repair and rehabilitate existing assets.

### 11.3.6 Stabilization of Streambanks

An additional objective of CRW's recommended Program Plan is to stabilize streambanks where excessive erosion causes stream degradation. During the immediate implementation phase, CRW has teamed with Lower Paxton and Susquehanna Townships on a Joint Pollution Reduction Plan (PRP), a requirement of PA-DEP's MS4 permitting program. The Joint PRP commits CRW and its partner



jurisdictions to implement nearly 18,000 feet of bank stabilization, at an estimated cost of \$8,220,000 (in 2017 dollars) over the next 5-year MS4 permit term, with CRW responsible for approximately 23 percent of this cost. This recommended level of stream restoration, in conjunction with meeting MS4 minimum control measures and CSO minimum controls, is projected to achieve full compliance with the Paxton Creek Sediment Total Maximum Daily Load (TMDL). Successful implementation of the PRP is projected to reduce sediment loads by nearly 2.7M pounds per year. This represents a 35 percent reduction in average annual sediment loads, as well as meeting initial 5-year PRP requirements to achieve a ten percent sediment load reduction and five percent nutrient load reduction to Chesapeake Bay and a small tributary to Spring Creek. Additional streambank restoration will be examined during future implementation phases.

### 11.3.7 Stakeholder Engagement

Engaging the Harrisburg community is a key component of effectively implementing the recommended Program Plan. Not only does public involvement improve the plan itself, effective stakeholder engagement builds partnerships to collaboratively maximize multi-objective opportunities and share funding, leveraging the affordable financial contribution of CRW's ratepayers. CRW's engagement for the Program Plan is a multifaceted approach including advisory committees, individual stakeholder meetings, media outreach, public meetings, neighborhood and community meetings, digital outreach, and printed communications. Establishing an administrative framework with sufficient resources to collaborate with stakeholders is an additional objective of the Plan.

### 11.3.8 Sustainable Asset Management

CRW is implementing an asset management program to define the risk presented by the condition and criticality of its various assets, and to make risk-based investment decisions to prioritize remedial repairs, balance remedial repair and regulatory compliance investments, support proactive system maintenance and renewal, and maintain a reasonable level of resiliency within its assets. As new assets are added to the system to address wet weather issues, CRW will continue to make decisions about rehabilitation and renewal of assets using the asset management program. Ensuring sufficient budget, labor, and equipment resources are available to protect and preserve the integrity and functionality of the wastewater/stormwater systems is an additional objective of the recommended Program Plan. **Table 11-4** tabulates CRW's existing / future annual program to properly maintain its system, administer its capital improvements program, and guide adaptive management decision-making on future investments in system rehabilitation and decentralized controls.

**Table 11-4 Existing and Anticipated Future CRW Administrative and Operational Components**

Projects and Services		Existing Service?	Phase
Program Administration	Asset Management	Yes	Immediate
	GIS Mapping	Yes	Immediate
	Stakeholder Engagement Services	Yes	Immediate
	Development Review/Stormwater Control Inspections	Yes	Immediate
	Precipitation/Flow/Receiving Water Monitoring Services	Yes	Immediate
	Updates to Plan Documents (NMC Plan, OMM, LTCP, etc.)	Yes	Immediate
	Semi-annual progress reporting / CSO Volume estimates	Yes	Immediate
	Coordination with Regulatory Agencies	Yes	Immediate
	Neighborhood Planning and Concept Development	No	Immediate
	Integrated CRW Regulations/Technical Guidelines	Yes	Immediate
	Other Wastewater/Stormwater Administrative Components	Yes	Immediate
Operations & Maintenance	AWTF O&M	Yes	Immediate
	Pump Station O&M	Yes	Immediate
	Interceptor O&M	Yes	Immediate
	Collection System O&M	Yes	Immediate
	Contracted CCTV/Pipe Cleaning	No	Immediate
	Interceptor Inspection / Cleaning	No	Near-Term
	Street Sweeping	Yes	Immediate
	Environmental Compliance/Illicit Discharge Investigations	No	Immediate
	Other Operations Management	Yes	Immediate
	Green Stormwater Infrastructure O&M (average for first 20 years)	No	Immediate

### 11.3.9 Maximization of Benefits

The final objective of the recommended Program Plan is to enhance benefits to and minimize impacts on environmental justice populations. As part of the Plan, CRW has undertaken a Triple Bottom Line (TBL) analysis of the environmental, social, and economic benefits of the program. This TBL accounting means expanding the traditional financial reporting framework to take into account ecological and social performance so that the total benefits can be evaluated against the financial investment. TBL accounting attempts to describe the social and environmental impact of CRW's proposed infrastructure investment such that they can account for not only the water quality benefit that the infrastructure would produce, but also the additional environmental and societal benefits generated by the various alternatives evaluated.

The decentralized control (green-grey) strategy will yield water quality benefits and improvements uniformly to the aquatic habitat and living resources of the City's waterways, restoring resources long forsaken as assets by most residents. The decentralized nature of green stormwater infrastructure implementation tends to distribute its expected environmental, social, and economic benefits. In that way, the program is designed to maximize return on investment to benefit the residents across all neighborhoods, to strive for a more fair and equitable distribution of those benefits, and to garner maximum popular support. This keystone socioeconomic aspect of the recommended Program Plan lays the groundwork for the revitalization of the City in areas of public health, recreation, housing, and neighborhood values.

## 11.4 Implementation Approach

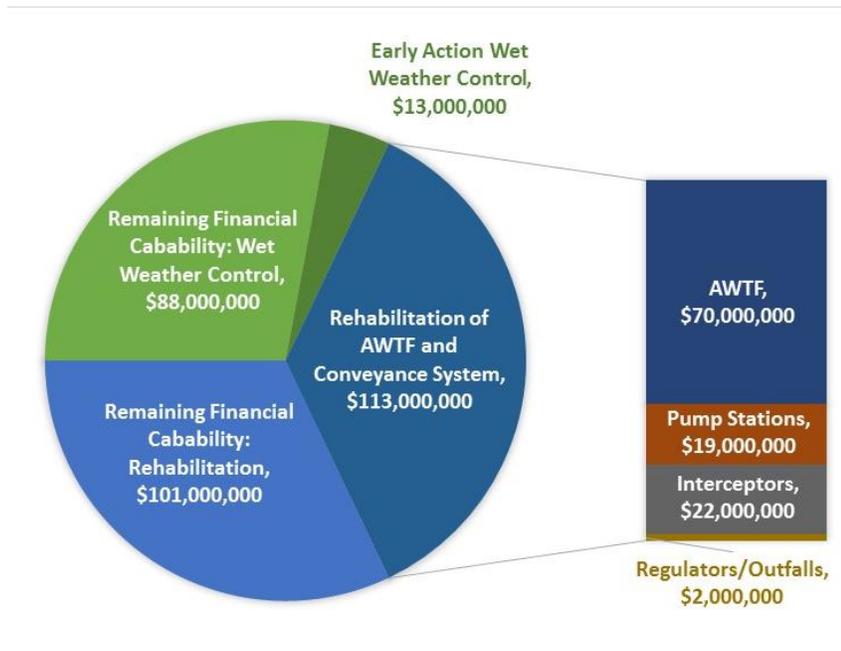
The Financial Capability Assessment (FCA) presented in Section 7 is used to identify an affordable level of investment in this Program Plan, one that maintains CRW wastewater rates at no more than two percent of the mean annual household income (MHI) within the City of Harrisburg (\$33,289 in 2015). Level of investment would fund the following four components of the Program Plan over the next 20 years:

- CRW's 2018 budgeted and anticipated operational expenses of \$14.3 million annually.
- An estimated bond repayment amount of approximately \$18.8 million annually, used to finance:
  - Past capital improvements (e.g., biological nutrient removal at CRW's AWTF),
  - Up to approximately \$13 million (escalated and in 2017dollars) for early action wet weather control projects,
  - Up to approximately \$113 million (escalated), or \$102 million (in 2017dollars) for priority projects to address critical Advanced Wastewater Treatment Facility (AWTF) and conveyance system rehabilitation needs, some that also provide significant CSO control benefits.
  - Up to approximately \$88 million (escalated), or \$64 million (in 2017dollars) for additional wet weather control projects, and

- Up to \$101 million (escalated), or \$74 million (in 2017 dollars) be expended on collection system rehabilitation projects.

**Figure 11-3** illustrates how the projected capital cost of \$315 million (escalated), or \$253 million (in 2017 dollars) are allocated between rehabilitation projects and wet weather control projects.

Specific investments to CRW's stormwater / wastewater assets will be defined periodically



**Figure 11-3. Estimated Capital Cost of Affordable Rehabilitation and Wet Weather Control Projects over the 20-year Planning Horizon**

through a decision-making process, implemented through an ongoing adaptive management process, presented in Section 9, that weighs the following factors:

- The Business Risk Exposure of each asset, established through CRW's asset management program.
- The public health and welfare benefits to CRW ratepayers provided by the investment.
- The degree of water quality enhancement achieved by the investment.
- Synergies with other investments within the City, including opportunities for collaboration with other implementation partners and/or sources of funding.
- The affordability and cost-effectiveness of the investment.
- The effectiveness of previous investments determined through post-construction monitoring and hydrologic and hydraulic (H&H) modeling.
- Appropriate phasing of investments to avoid short-term degradation to current conditions.

- An appropriate investment in the operation and maintenance of the CRW wastewater/stormwater systems and administration of the Program Plan.
- Changes to the financial capabilities of CRW's ratepayers.

## 11.5 Implementation Schedule

Implementation of the recommended Program Plan is divided into two major phases based upon the priorities established by the Plan:

- An **Immediate Implementation Phase**, expected to occur within the first ten years of Program Plan approval by US-EPA and PA-DEP.
- A **Near-Term Implementation Phase**, expected to occur 11 to 20 years following Program Plan approval by US-EPA and PA-DEP.

CRW does not expect to achieve compliance with water quality objectives for designated uses of receiving waters within this 20-year time frame for three primary reasons:

- The severe limitations in CRW's financial capabilities,
- The significant financial commitment required to restore the effective function of CRW's existing wastewater/stormwater assets after years of deferred maintenance, and
- The heightened risk of SSOs and unauthorized releases from CRW's combined collection system, a priority control need to protect public health and safety.

The following sections describe the project and program implementation priorities within each phase.

### 11.5.1 Immediate Implementation Phase Schedule

This section summarizes the Immediate Implementation Phase, to be accomplished during the first 10 years of the Program; significant priority functions and projects include:

- The minimum controls defined in CRW's Nine Minimum Control (NMC) Plan for its combined sewer system, and in the six minimum control measures under its MS4 permit (included in existing annual O&M budget, see **Table 11-5**).
- Complete the CCTV inspection of the CRW collection system, use the findings to establish the CRW's Business Risk Exposure and priorities for system rehabilitation, (CCTV included in annual O&M program, see **Table 11-5**).
- Complete the inspection, cleaning and rehabilitation of the network of catch basins and storm inlets so stormwater is adequately captured and conveyed to the interceptor system (included in annual O&M program, see **Table 11-5**).
- Complete the rehabilitation of CRW's interceptors, pumping stations, and AWTF to minimize the risk of catastrophic failure and, where possible, enhance their hydraulic capacity (capital projects presented in **Table 11-2**).



- Paxton Creek Interceptor Rehabilitation
- Asylum Run Interceptor Rehabilitation
- Front St. Interceptor Rehabilitation
- Spring Creek Interceptor Rehabilitation
- Headworks Screening
- Primary Clarifier Improvements/Repair
- Front St. Pump Station
- Other WWTP Rehabilitation (not wet weather)
- Rehabilitate CRW regulators, diversion dams, fixed and variable orifice controls, flap gates, and outfalls to increase conveyance to interceptor / AWTF, minimize interceptor backflow into the regulator, improve structural integrity, and minimize river intrusion.
- Implement early-action pilot green stormwater infrastructure (GSI) projects and decentralized stormwater management controls (SCMs) to serve as an example of such projects to the community.
- Within CRW's remaining annual financial capability:
  - Implement rehabilitation projects for collection system sewers with critical structural defects defined as grade 5 under the NASSCO PACP grading scale.
  - Implement the following levels of decentralized green-gray stormwater controls within the three priority planning areas for CSO control:
    - *Uptown: up to 4 percent of impervious area controlled*
    - *Lower Front Street: up to 15 percent of impervious area controlled*
    - *Lower Paxton Creek: up to 5 percent of impervious area controlled*
  - Collaborate with developers, transportation projects, and other stakeholders to capitalize on opportunities to implement green stormwater infrastructure.
- Enhance engineering and administrative functions as necessary to implement the Program Plan (included in annual O&M program, see **Table 11-5**).
- Assess the costs and effectiveness of controls implemented and refine Program Plan objectives and priority controls for the next phase of program implementation (included in annual O&M program, see **Table 11-5**).

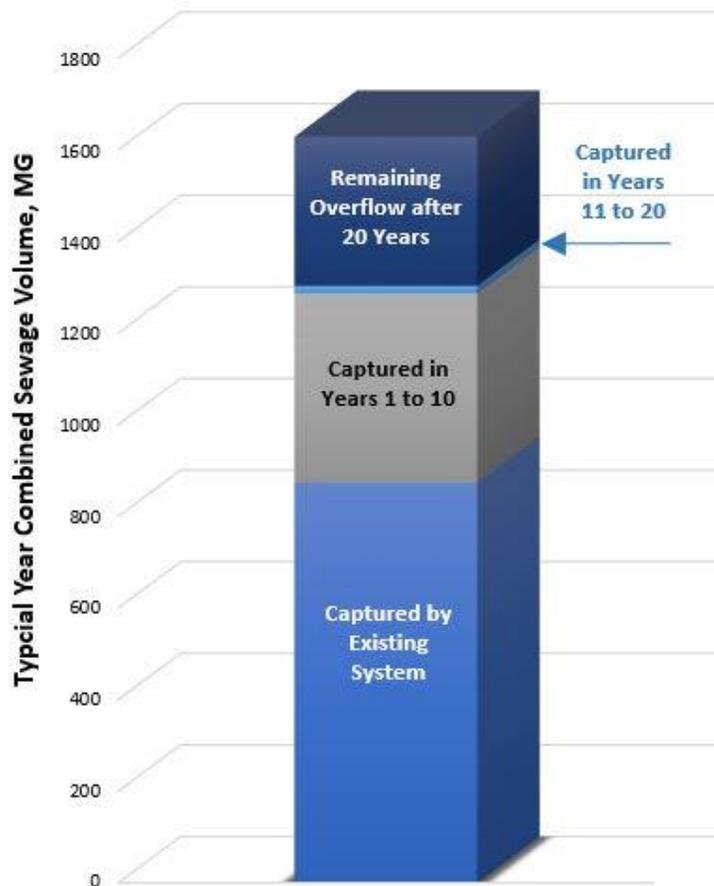
The early part of the implementation phasing for this recommended Program Plan is based on the 2017 Consulting Engineer's Annual Report and commitments identified in the Nine Minimum

Controls. After the early part of the program implementation (year 5, presently year 2022) wet weather capital projects begin implementation through the ongoing adaptive management process presented in Section 9. As described in Section 9, there is a 10-year evaluation and reporting milestone where progress towards wet weather performance is summarized in an Evaluation and Adaptation Plan and any changes to the program plan for the next 5 years is summarized.

### 11.5.2 Performance of the Immediate Implementation Priorities

Implementing the Baseline Control Strategy with decentralized stormwater infrastructure is efficient at reducing the volume of CSOs, increasing percent capture of combined sewage, and reducing surface flooding and unauthorized releases. The selected alternative will result in both immediate and continuous progress in increasing percent capture, resulting in approximately 79 percent capture after ten years, as illustrated in **Figure 11-4**.

The 79 percent capture represents a reduction in volume of CSOs of 446 million gallons per year, a significant decrease in the amount of combined sewage discharged to Harrisburg's waterways. This also represents a mean reduction in the duration of overflows of 131 hours per year across all outfalls in the city, a 75 percent reduction in duration of CSOs.



**Figure 11-4. Projected CSO Volume Control over the 20-year Planning Horizon.**

### 11.5.3 Near-Term Implementation Priorities

This section summarizes the Near-Term Implementation priorities to be accomplished during years 11 to 20 of the Program, intended to partially achieve the affordable level of control:

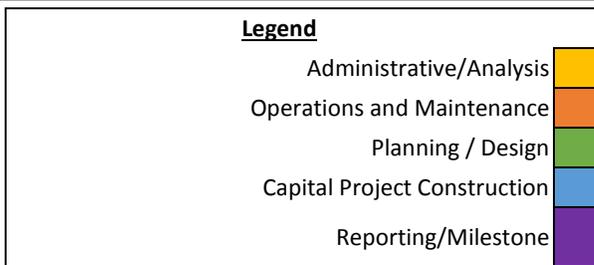
- Implement SSO controls in the following planning areas, defined in **Table 11-2**:
  - Spring Creek: Install a 0.43 MG storage facility to control rainfall-related infiltration-inflow from separate sanitary sewer areas outside the City of Harrisburg.

- Industrial Road: Rehabilitate 4,900 ft. of separate sanitary sewer to reduce groundwater infiltration, and divert away from CSO 021 regulator to Paxton Creek Interceptor.
- Reinvest and rehabilitate the following pump stations, defined in **Table 11-2**:
  - Rehabilitate/Repair/Replace Spring Creek Pump Station.
  - Rehabilitate/Repair/Replace City Island Pump Station.
- Reassess the remaining structural defects identified under the CCTV inspections and risk management analyses. Reassess the balance between the level of investment in system renewal and the corresponding level of investment for environmental compliance as part of the adaptive management plan (CCTV included in existing annual O&M program, see **Table 11-4**).
- Within CRW's remaining annual financial capability:
  - Implement rehabilitation projects for collection system sewers with critical structural defects defined as grade 5 and, where budget allows, grade 4, under the NASSCO PACP grading scale.
  - Implement the following levels of decentralized green-gray stormwater controls within the three priority planning areas for CSO control:
    - *Uptown: up to 4 percent of additional impervious area controlled, total of 8 percent.*
    - *Lower Paxton Creek: up to 4 percent of additional impervious area controlled, total of 9 percent.*
  - Collaborate with developers, transportation projects, and other stakeholders to capitalize on opportunities to implement green stormwater infrastructure.
- Enhance engineering and administrative functions as necessary to implement the Program Plan (included in annual O&M program, see **Table 11-4**).
- Assess the costs and effectiveness of controls implemented and refine Program Plan objectives and priority controls for the next phase of program implementation (included in annual O&M program, see **Table 11-4**).

A proposed implementation phasing and schedule of the wastewater and wet weather-related program elements during the near-term implementation phase is presented in **Table 11-6**. The wet weather capital projects continue implementation, with priorities developed and implemented through the ongoing adaptive management process presented in Section 9. As described in Section 9, there are 5-year reporting milestones where progress towards wet weather performance is summarized in an Evaluation and Adaptation Plan and any changes to the program plan for the next five years are summarized.

**Table 11-6 Program Implementation Phasing – Near-Term**

Description	Function or Projects	Years after Program Plan Approval									
		11	12	13	14	15	16	17	18	19	20
Policy and Program Administration	Wastewater/Stormwater Program Administration										
	Private Development Stormwater Program										
	SCADA and Real-Time Control Systems										
AWTF	AWTF O&M										
Conveyance System	Conveyance System/Pump Station O&M										
Collection System	Ongoing Collection System Renewal										
	Inlet/Catch Basin Repair/Floatable Control										
	Collection System O&M										
Green/Gray Stormwater Management	Planning and Concept Development										
	Decentralized Projects - Strategic										
	Decentralized Projects - Priority Areas										
	GSI O&M										



**11.5.4 Performance of the Near-Term Implementation Priorities**

The recommended Program Plan will result in both immediate and continuous progress in increasing percent capture, resulting in approximately 80percent capture after 20 years, as illustrated in **Figure 11-4**.

The 80 percent capture represents a reduction in volume of CSOs of 460 million gallons per year, a significant decrease in the amount of combined sewage discharged to Harrisburg’s waterways. This also represents a mean reduction in the duration of overflows of 125 hours per year across all outfalls in the city.

**11.5.5 Post-Construction Monitoring**

As described in Section 10, the Post Construction Monitoring Plan (PCMP) will be developed to verify that activity commitments have been implemented at reporting milestones and to quantify and characterize the effectiveness of CRW’s recommended Program Plan improvements. The PCMP monitoring and reporting activities presented in this section will document the progress made at meeting Program Plan objectives during the Immediate Implementation Phase and the Near-Term Implementation Phase. PCMP reporting will have two aspects:

- The first will be conducted on an annual basis and implemented through the existing series of annual Section 94 reports submitted by CRW to US-EPA and PA-DEP.

- The second aspect will be the preparation and submission of a comprehensive report after the Immediate Implementation Phase of the Program Plan has been implemented, anticipated approximately ten years following approval of this Program Plan, and at five-year intervals thereafter.

Eight categories of monitoring and reporting are included in the PCMP (and described in Section 10):

- Administrative Monitoring and Reporting
- Precipitation Monitoring and Assessment
- Interceptor Monitoring and Assessment
- Suburban Community System Monitoring and Assessment
- CSO Regulator Structure Monitoring and Assessment
- CSO Discharge Projections through H&H Modeling
- Water Quality Monitoring and Assessment
- Paxton Creek Use Attainability Assessment

Upon completion of the Immediate Implementation Phase of the recommended Program Plan and annual PCMP reporting activities, a comprehensive Post Construction Monitoring Report will be prepared and submitted to the US-EPA and the PA-DEP to estimate the effectiveness of the control measures implemented under the Immediate Implementation Phase of the recommended *City Beautiful H<sub>2</sub>O Program Plan*.