

171471-003  
December 30, 2019

Mr. Michael McManus, General Superintendent  
Holyoke Department of Public Works  
63 Canal Street  
Holyoke, MA 01040

**Re: Draft CSO Long-Term Control Plan Update Report**

Dear Mr. McManus:

Tighe & Bond is pleased to submit to the City of Holyoke the draft Combined Sewer Overflow Long-Term Control Plan (CSO LTCP) Update, which was prepared in accordance with the March 2018 CSO LTCP Update Work Plan that was approved by the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Environmental Protection Agency (EPA). This evaluation was also conducted in accordance with our October 11, 2018 agreement and November 26, 2019 amendment with the City for this effort.

## **Executive Summary**

This report includes the following tasks:

- Sewer system characterization
- Review of changes to water quality standards and CSO policies
- Review of recent wastewater treatment facility and Berkshire Street CSO Treatment Facility flow and operating data
- Review of CSO activity data
- Review of Connecticut River water quality and quantity data
- Update the hydraulic model of the combined sewer system
- Develop and compare CSO abatement alternatives
- Provide CSO abatement recommendations
- Perform a climate vulnerability assessment
- Perform a financial capability assessment
- Develop an implementation schedule based on the results of the financial capability assessment

Phase 2 tasks, which have not yet been performed, include:

- Implementing a Public Participation Program
- Preparing a final report that includes a description of the public participation program and input received from attendees

### **1 Sewer System Characterization**

The City of Holyoke's wastewater collection system consists of approximately 137 miles of sewer mains, approximately 61% of which is combined. These sewers range from brick, concrete and vitrified clay (VC) pipes in the older portions of the sewer system to reinforced concrete (RC), asbestos cement (AC) and polyvinyl chloride (PVC) pipes in the newer sections of the sewer system. Portions of the system are over 100 years old. The system includes

several major interceptor sewers that receive flow from area collector sewers and convey that wastewater flow towards the City’s wastewater treatment facility (WWTF). The interceptor sewers and other key sewers reviewed in greater detail as part of this evaluation include:

- The North Interceptor
- The South Interceptor
- The Front Street Interceptor
- The Highland Park Interceptor
- The Day Brook Sewer
- The Jefferson Street Sewer

These sewer mains were included in the hydraulic model because they are the main lines conveying combined flow from upstream regulators to the WWTF. Refer to the sewer system schematic in Figure EX-1 for the locations of these sewers.

A total of 12 active CSO outfalls still remain in the City and are controlled by 17 regulators. A summary of these CSOs and regulators is presented below in Table EX-1. These CSOs are also shown in the schematic in Figure EX-1.

**TABLE EX-1**  
CSOs Summary

<b>CSO No.</b>	<b>Regulator No.</b>	<b>Location</b>	<b>Receiving Water</b>
2	2	Providence Hospital	Connecticut River
7	7	Northampton St./Glen St. intersection	Connecticut River
8	8	Springdale Park	Connecticut River
9	9 <sup>1</sup>	Berkshire St.	Connecticut River
11	11	Jackson St.	Connecticut River
16	16	Front St./Appleton St. intersection	First Level Canal
17	17	Front St./Lyman St. intersection	First Level Canal
18	18	Walnut St.	Connecticut River
18	18A	Essex St./Walnut St. intersection	Connecticut River
18	18B	Highland Park Pump Station	Connecticut River
19	19	Yale St.	Connecticut River
20	20	Cleveland St.	Connecticut River
21	21 <sup>2</sup>	River Terrace	Connecticut River
21	21B <sup>2</sup>	River Terrace	Connecticut River
23	23A	Jefferson St., between Madison Ave. and Dartmouth St.	Connecticut River <sup>3</sup>
23	23B	Jefferson St. at Dartmouth St.	Connecticut River <sup>3</sup>
23	23C	Dartmouth St., just east of Jefferson St.	Connecticut River <sup>3</sup>

<sup>1</sup>Overflows from this regulator are currently treated at the Berkshire St. CSO Treatment Facility.

<sup>2</sup>There are 2 overflow points within the one regulator.

<sup>3</sup>During an overflow event, a portion of the discharge may infiltrate into the ground before reaching the river.

The major changes within the wastewater collection system that have occurred since the May 2000 Draft CSO LTCP was completed include:

1. Sewer separation projects in the Jones Ferry Road, Appleton Street, and Mosher Street areas (tributary to CSOs 3, 13 and 14, respectively).
2. The removal of Green Brook from the sewer system (tributary to CSO 21).
3. Regulator modifications at CSOs 2, 7, 8, 9, 11, 13, 16, 18A, 19, 20 and 23.
4. The Berkshire Street CSO Treatment Facility was constructed to treat combined overflows from the CSO 9 Regulator.

These changes have resulted in an estimated 66% reduction in annual combined sewer overflow volume since the draft CSO LTCP was prepared.

There are seven wastewater pumping stations in the City: Jones Ferry Road, Smith's Ferry, Mosher Street, Jackson Street, Cabot Street, Highland Park and Springdale Park. These pump stations are shown on Figure EX-1.

The design of sewer separation in the Jackson Street Area, which is tributary to CSO 11, is complete, and construction is expected to begin in the Spring of 2020.

A map of the City of Holyoke's wastewater collection system is included in Appendix A. The map illustrates key features of the sewer system and shows the sewersheds upstream of each active CSO.

## **2 CSO Activity and Wastewater Flow Data**

The City has a comprehensive CSO monitoring program in place to monitor CSO activity and to ensure that the CSO regulators are operating properly that includes block testing and flow monitoring. This program is implemented by Suez, who has a contract with the City to operate and maintain the City's wastewater collection and storm drainage systems, pump stations, WWTF, and flood control systems. This program is in accordance with EPA and MassDEP permits and regulations.

### **2.1 CSO Activity and Flows**

General observations are as follows:

1. The greatest number of CSO activations occur at the CSO 18 (Walnut Street) and CSO 20 (Cleveland Street) Regulators. Suez has reported that the high number of overflows at CSO 20 are related to 1.) an undersized outlet pipe on Oxford Road (a 16-inch diameter sewer with a flat-slope) and 2.) high flows from the Smith's Ferry Pump Station, which discharges into the gravity system a short distance upstream of the CSO 20 Regulator.
2. The greatest quantity of annual untreated CSO volume discharged to the Connecticut River or the First Level Canal is from CSOs 8 (Springdale Park), 9 (Berkshire Street), 18 (Walnut Street) and 21 (River Terrace), with annual overflow volumes ranging from 28.1 to 41.0 million gallons (MG).
3. The smallest quantity of annual untreated CSO volume discharged to the Connecticut River or the First Level Canal is from CSOs 2 (Providence Hospital), 7 (Northampton Street/Glen Street), 19 (Yale Street) and 23 (Jefferson Street), with annual overflow volumes ranging from 0.1 to 0.6 MG.

## 2.2 WWTF Flow Data

Average and maximum daily wastewater flow data measured at the WWTF from 2011 to 2018 was also reviewed as part of this evaluation. The data illustrates that the annual average flows, which ranged from 6.8 to 9.5 MGD, were well below the average daily design flow of the WWTF of 17.5 MGD. The average daily flow entering the WWTF exceeded the average daily design flow of 17.5 MGD an average of 5 times annually over the period from 2011 to 2018. The maximum flow through the WWTF exceeded the peak design flow of 37 MGD an average of 30 times annually over the period from 2011 to 2018.

## 2.3 Berkshire Street CSO Treatment Facility Flow Data

The Berkshire Street CSO Treatment Facility was constructed downstream of the CSO 9 outfall, which conveys the greatest volume of combined sewage/stormwater flow to the Connecticut River annually of the City's CSOs. The CSO Treatment Facility consists of a pump station, screening equipment, and a chlorine contact chamber.

The treatment facility was originally designed so that wastewater flow exceeding the capacity of the influent pumps (103 MGD) would overtop a weir wall in the wetwell, drop into the Return Channel adjacent to the wetwell, and then flow by gravity to the CSO 9 outfall pipe, which conveys the wastewater flow to the Connecticut River. However, shortly after facility startup, it was determined that if the flow level reached the overflow level in the pump station wetwell, basement backups would occur at buildings in the vicinity of the WWTF, and sewage would surcharge in the system to the point that the combined flow would exit the system through manholes on Main Street. In order to address the hydraulic issue described above, a 10-foot wide by 10-foot high opening was cut in the weir wall and was sealed by a new slide gate (Gate 4). Suez has established gate operating parameters to minimize bypasses as described below:

1. Gate 4 is opened when either the flow rate to the CSO Treatment Facility is 165 MGD for 150 seconds or the wastewater level in the pump station wet well is at or above 59.5 feet for 180 seconds.
2. Gate 4 is closed when the flow rate drops to 120 MGD.

CSO treatment facility operating data collected from 2009 to 2018 was reviewed as part of this evaluation. An average of 206 million gallons (MG) of combined flow was directed to the Berkshire Street CSO Treatment Facility annually over the last 10 years. Of that amount, an average of 174 MG (84%) was treated annually either through the CSO treatment facility or returned to the WWTF for secondary treatment. The remaining 32 MG of combined flow (16%) bypassed the CSO treatment facility annually and was discharged to the Connecticut River without treatment. The CSO treatment facility was active an average of 42 days/year from 2009 to 2018. On 9 of these days/year, on average, combined flow was discharged to the Connecticut River without treatment.

## 3 Watershed and Receiving Water Characterization

Information on the characteristics of the Connecticut River and its watershed was provided in the CSO LTCP Update report. The Connecticut River, which is approximately 410 miles long, is the longest river in New England. The Connecticut River flows from the Connecticut Lakes in northern New Hampshire, along the Vermont/New Hampshire boundary, and then through Massachusetts and Connecticut, eventually discharging into the Long Island Sound at Old Saybrook.

The Connecticut River Watershed, which is the largest river ecosystem in New England, includes a land area of approximately 11,000 square miles over four New England states (Vermont, New Hampshire, Massachusetts and Connecticut). The Nature Conservancy

named the Connecticut River Watershed one of the "Last Great Places" in 1993. The watershed of the mainstem of the Connecticut River within Massachusetts encompasses 660 square miles and includes all or part of 44 communities, including the City of Holyoke.

The portion of the river along Holyoke is approximately 11 miles long and can be divided into two sections: the portion upstream (north) of the Holyoke Dam, which is approximately 6 miles long and the portion downstream (south) of the Holyoke Dam, which is approximately 5 miles long. Within Holyoke, the watershed north of the Holyoke Dam is generally characterized by rural development, while the watershed south of the dam is more urbanized. There are dikes and floodwalls that restrict access along the southern section of the river and prevent flood damage during high river level periods.

In recognition of the Connecticut River’s significance to the region, several programs and projects have focused on the protection and restoration of the Connecticut River and revitalization of the communities along the river. For example, the entire Connecticut River watershed was designated as a national fish and wildlife refuge in 1991. The Silvio O. Conte National Fish and Wildlife Refuge Act was passed to conserve, protect and enhance the plant, fish and wildlife species within the watershed. In addition, the Connecticut River was designated by the Federal Government in 1998 as one of fourteen “American Heritage Rivers” in the country. Federal support for the protection and restoration of the Connecticut River and revitalization of the communities along it was provided through this program.

Recreational activities in and along the Connecticut River include primary contact recreation (swimming and water skiing), secondary contact recreation (fishing and boating), and hiking/walking. Most of these recreational activities, however, occur upstream of the Holyoke Dam.

Sensitive areas along the river identified during the study include:

1. Near the Holyoke Dam, because the dam acts as a staging area and temporary bottleneck for uprunning fish. CSO 18 is just upstream of the dam.
2. Although there are no designated public swimming areas along the Connecticut River, swimming is common above the dam at Long Pond Cove and at “High Rock”. High Rock is located just downstream of CSO 21 and Long Pond Cove is located downstream of CSO 19.
3. Boating is common in the vicinity of the Sue Panitch River Access Center, an existing public boat launch site at the end of Jones Ferry Road. CSO 2 is just downstream of the boat launch location.

Recent river water quality data confirms that bacteria levels exceed water quality standards.

The Connecticut River is impacted by CSO discharges from the City of Holyoke and other nearby communities along the river, including the Cities of Springfield and Chicopee. Average annual CSO discharges from the three communities are as follows:

<b>Community</b>	<b>Annual CSO Volume (MG)</b>
Holyoke	163 <sup>1</sup>
Chicopee	110 <sup>2</sup>
Springfield	443 <sup>3</sup>

<sup>1</sup>This is the estimated current annual CSO volume. CSO 11 will be eliminated as part of a sewer separation project that has been designed and will soon be bid, which will reduce the total average annual overflow volume by 18 MG to 145 MG.

<sup>2</sup>As reported in Chicopee’s 2017 Integrated Management Plan.

<sup>3</sup>As reported in Springfield’s 2014 Integrated Wastewater Plan.

In addition to the CSO discharges to the Connecticut River, there are stormwater discharges to the river from Holyoke and many other communities along the river that impact water quality. In the early 2000's, Holyoke, Springfield, and Chicopee partnered with MassDEP and the Pioneer Valley Planning Commission (PVPC) to update a Connecticut River water quality model. The development of the model and an analysis of results is provided in Springfield's Final Long Term CSO Control Plan, dated May 2012. Springfield concluded in their Plan that while CSOs contributed to *E. coli* in the river, the overall volume of stormwater into the river is so much greater than CSO volume that the majority of *E. coli* in the river during rain events can be attributed to stormwater, rather than CSOs.

The PVPC, in collaboration with the Connecticut River Conservancy (CRC), has compiled bacteriological (*E. coli*) data collected from 2012 to the present at multiple locations along the river from Vermont to Connecticut. The data shows that water quality standard exceedances for bacteria were measured in the river within each of the communities where samples were taken, regardless of whether the community has a separate sewer system or a combined sewer system with discharges to the river. In addition, there does not appear to be a significant difference in the number of water quality exceedances upstream of the Holyoke Dam vs. downstream of the Dam. This data may also be indicating that stormwater discharges have a significant impact on water quality within the Connecticut River.

#### **4 Wastewater Collection System Modeling**

A hydrologic and hydraulic model of the Holyoke wastewater collection system was developed as part of the draft CSO LTCP. The model simulated CSO activity in the City during storm events of various sizes and was used to develop and evaluate CSO abatement alternatives. At that time, the Storm Water Management Model (SWMM) software was used to create the model. That model software was selected because it was accepted by EPA and MassDEP, was commonly used for sewer system modeling, and was used for the City's sewer system modeling performed as part of the regional CSO study in the late 1980s. The regional model was used, where appropriate, to facilitate the development of the Holyoke sewer system model as part of the May 2000 draft CSO LTCP.

Since 2008, the model developed as part of the draft CSO LTCP has been updated by Suez to reflect CSO abatement projects since the original draft CSO LTCP was prepared in 2000. The City's model was refined as part of this project, and then used to develop and evaluate CSO abatement alternatives. The following changes were made to the sewer system model to improve accuracy:

1. Surface and pipe invert elevation data was collected along the Front Street Interceptor, the Jefferson Street Sewer, and the Day Brook Sewer and used to refine pipe slopes and depths in the model.
2. Record drawings for the North, South, and Highland Park Interceptors were reviewed and the model was adjusted based on this data.
3. Changes were made at the CSO 9 Regulator to better reflect Suez's control of the flow split between the WWTF and the Berkshire Street CSO Treatment Facility.
4. Changes were made at the Highland Park Pump Station to better reflect the actual pump rates based on Suez's pump flow data.
5. An additional sewershed and an existing regulator were added to the model on Dartmouth Street, near Jefferson Street, in Drainage Area 23 to improve model accuracy.
6. An additional CSO (CSO 17), located at the Front Street/Lyman Street intersection, was identified by the City and added to the model.

## 5 CSO Control Policies

National CSO Control Policy – Under EPA’s current (1994) CSO control policy, permittees are required to characterize their sewer systems, demonstrate implementation of the nine minimum controls (NMCs) established by the policy and develop a long-term CSO control plan. Compliance with the NMCs is documented by the City annually, as required by its WWTF National Pollutant Discharge Elimination System (NPDES) permit. The EPA policy also requires that the long-term CSO control plan be developed using either a “presumption” approach or a “demonstration” approach. Under the *presumption approach*, compliance with water quality standards is presumed if one of the following performance criteria is met:

1. No more than an average of four overflow events per year occur on an annual average basis.
2. The elimination or capture for treatment of no less than 85 percent by volume of the combined wastewater flow collected on a system-wide annual average basis during precipitation events, as clarified in the 1995 EPA Guidance for Long-Term Control Plan document.
3. The elimination or removal of no less than the mass of pollutants causing water quality impairment for the volume reductions noted in Item 2 above.

The *presumption approach* does not release municipalities from the overall requirement of meeting applicable water quality standards. If the permitting authority determines that the long-term CSO control plan will not result in attainment of water quality standards, more stringent controls may be required.

Under the *demonstration approach*, compliance with water quality standards is confirmed through the CSO control planning process. This approach provides flexibility in developing a long-term CSO control plan. While not necessarily satisfying the performance criteria of the *presumption approach*, the plan must be proven to adequately meet water quality standards. The *demonstration approach* depends on a detailed assessment of receiving waters and the impacts of CSO discharges and other sources of wet weather pollutants on water quality.

The *presumption approach* was used in this evaluation.

Massachusetts CSO Control Policy - MassDEP’s August 1997 CSO policy established the following goals:

1. Elimination of receiving water impacts is the primary goal.
2. Where the elimination of CSOs is not feasible, the goal is minimization of impacts to the maximum extent feasible and attaining the highest water quality achievable. In these areas, the identification and protection of critical uses is essential.



## 6 Development of CSO Abatement Alternatives

A wide variety of technologies and approaches for the abatement of CSO impacts on receiving water quality were considered as part of this evaluation. The CSO abatement technologies ranged from relatively low-cost, “soft” approaches, such as street sweeping and catch basin cleaning, to high-cost, high-tech approaches, such as the construction of satellite treatment or storage facilities to abate CSO discharges. The different types of available CSO abatement technologies and approaches are generally classified under one of the categories listed below, as recommended in EPA’s 1995 *Combined Sewer Overflows: Guidance for Long-Term Control Plan*:

- Source controls
- Collection system controls
- Storage technologies
- Treatment technologies

Although it is recommended that the City pursue many of the source controls and collection system controls described in the report, such as the removal of infiltration/inflow (I/I) sources previously identified in the wastewater collection system, the majority of the source controls and collection system controls identified are expected to provide only a small (or no) reduction in CSO discharges. As such, the abatement alternatives developed in this report have focused on those abatement measures that are expected to have a significant impact on CSO discharges, including sewer separation, stormwater storage, CSO storage, satellite CSO treatment and upgrading the existing wastewater treatment facility.

### 6.1 Screening Level Analysis

A screening level analysis was performed that compared the screening level costs for sewer separation, storage and treatment for each CSO. In accordance with the approved Work Plan, costs were developed for CSO storage and treatment facilities that reduce the number of untreated overflows per year to no greater than 0, 4, or 8 in this screening level analysis. This comparison was used to identify alternatives that could be eliminated from further review. Generally, sewer separation is the preferred abatement alternative, where affordable, as noted in the 1997 Massachusetts Guidance for Abatement of Pollution from CSO Discharges. As such, where sewer separation was determined to be a lower cost than storing or treating CSO discharges (or a similar cost to CSO storage or treatment), then sewer separation was recommended. Note that the sewer separation costs were primarily compared to the cost of CSO facilities that reduce the number of untreated overflows per year to no greater than 4. As noted previously, one of the Federal CSO policy performance criteria under the *presumption approach* is that no more than an average of 4 overflow events per year occur on an annual average basis.

The screening level costs include estimated capital costs and operation and maintenance costs over a 20-year period. The capital costs include construction costs and engineering costs. The construction costs include material costs, installation costs, general conditions costs, the contractor's overhead and profit, and a 30% contingency. The sewer separation costs include the cost of rehabilitating existing combined sewer piping that will either be converted to a storm drain or a sanitary sewer. The inclusion of these costs is appropriate since during design some existing piping is typically found to be in poor condition, requiring rehabilitation. In order to compare CSO treatment/storage facility alternatives to sewer separation alternatives on an equivalent basis, the cost of rehabilitating existing piping was also included in the CSO facility alternatives since these piping improvements will still be needed.



Sewer separation was determined to be the least expensive alternative for CSOs 2, 8, 18A, 19, 20 and 23. CSO storage and treatment facilities were less expensive for CSO 18 and a CSO treatment facility was less expensive for CSO 21. Conveyance of the CSO 7 overflows to the South Interceptor was determined to be less expensive than sewer separation, storage or treatment.

Where CSO storage or treatment was determined to be a lower cost, a siting analysis was performed to determine whether there is available land that is suitable for construction of a storage or treatment facility. The siting analysis considered land ownership, space available, neighborhood impacts, and necessary site improvements.

## **6.2 CSO 18 Alternatives Analysis**

For CSO 18, The only open land identified near the CSO regulator and outfall large enough to accommodate a storage or treatment facility is park land owned by the City (Pulaski Park). The park is bordered by a residential neighborhood to the south, Route 202 to the west, and the Connecticut River and the First Level Canal to the north and east. Pulaski Park is over 14 acres in size and includes walking paths, benches, a playground, a spray park, a basketball court, a volleyball court and a skate board park. The majority of these park facilities are located at the eastern end of the park. The Highland Park Wastewater Pump Station is located at the western end of the park. The most western section of the park is located between the pump station and Route 202 and is a wooded area adjacent to the railroad tracks. Because there are currently no developed recreational facilities within this wooded section of the park, this location was selected for a proposed CSO treatment or storage facility.

Concerns related to siting a CSO facility at this location include:

1. The park land is protected under Article 97 of the Amendments to the Constitution of the Commonwealth, EOAA Land Disposition Policies, and a change in its use would require special legislation. As such, acquisition of this land for a CSO facility may be difficult.
2. Pulaski Park was placed on the National Historic Register in 2004. Because the park is a historic location, construction of a CSO facility at the park may not be allowed.
3. Pulaski Park has been the focus of restoration efforts by the City, as is noted in the City's 2013-2018 Open Space and Recreation Plan. As evidence of this, over the last 10 years the City constructed a new playground, spray park, skate park, a cross-fit training facility, and benches.
4. A new CSO facility at the park could have a negative aesthetic impact on park users and the adjacent residential neighborhood.
5. There is the potential for odors associated with storing and/or treating wastewater flow, which may impact park users and the adjacent residential neighborhood.

Because of the siting concerns noted, additional abatement alternatives for CSO 18 were considered through supplemental analyses.

### **6.2.1 Supplemental CSO 18 Analyses**

A more detailed analysis of CSO abatement alternatives for Drainage Area 18 was performed that included refining CSO storage and treatment costs. In addition, because of the concerns noted regarding siting a CSO facility in Drainage Area 18, at Pulaski Park, partial sewer separation alternatives were developed that result in 4, 8 and 16 overflows per year. The

alternatives that would result in 4 or 8 overflows per year were established based on the Work Plan. The remaining partial sewer separation alternative was developed to reduce costs based on the configuration of the existing piping in this drainage area. Hydraulic modeling simulations indicate that this lower cost partial sewer separation alternative results in 16 overflows per year.

Complete sewer separation provides the greatest level of abatement but is the most expensive alternative. Partial sewer separation alternatives provide the advantage of allowing the City to more easily implement additional abatement in this drainage area, if determined to be necessary, when compared to CSO storage/treatment alternatives. In addition, the sewer separation alternatives provide the benefit of not requiring the construction of a CSO facility in Pulaski Park, which may not be allowed because the park is protected land and a historic location. Partial sewer separation that results in 8 overflows per year is not recommended since it provides a lower level of abatement than sewer separation that results in 4 overflow per year with only a small reduction in cost.

As noted above, there are significant siting concerns related to construction of a storage or treatment facility at Pulaski Park. The CSO 18 alternatives were reviewed in greater detail as part of the development of system-wide alternatives.

### **6.3 CSO 21 Alternatives Analysis**

For CSO 21, because the CSO 21 Regulator is located at the bottom of a steep embankment, the most appropriate location for a CSO treatment facility is at the bottom of this embankment. However, flat ground at the bottom of the embankment is limited. As such, significant earthwork/regrading would be needed in order to construct a treatment facility at this location and provide vehicle access to it. The cost of a CSO treatment facility at this location was increased to reflect the difficult site conditions.

Concerns related to siting a CSO facility at this location include:

1. The property where the CSO 21 Regulator is located and the proposed location of the CSO 21 treatment facility is privately owned; the property owner may not be willing to sell the property to the City. If the City were to attempt to take the land by eminent domain, significant legal action may be necessary.
2. Construction of a CSO treatment facility at this location will be challenging due to the small area of flat land and the steep slopes.
3. The treatment facility would be located in a residential neighborhood; the construction of a CSO treatment facility at this location may not be accepted by the nearby residents.
4. There is the potential for odors associated with treating wastewater flow at this location, which may impact the adjacent residential neighborhood.

Considering the above concerns and the fact that there is only a small difference in cost between sewer separation in Drainage Area 21 and the cost of constructing a CSO treatment facility (1% difference), sewer separation is recommended over construction of a CSO treatment facility at CSO 21.

Sending additional combined flow to the WWTF or the Berkshire Street CSO Treatment Facility were also considered during the screening level analysis. It was determined that neither facility has surplus capacity to accommodate additional flow and that there is little space available to expand these facilities. In addition, it was noted in the report that improvements at the WWTF to provide additional nitrogen removal may be necessary in the future and that these improvements may require use of the little space available to

construct additional tankage to meet nitrogen removal requirements. In addition, in order to convey additional combined flow from upstream areas (CSOs 18, 19, 20, 21 and 23) to the existing treatment facilities, a new interceptor would need to be constructed because the Front Street Interceptor has insufficient surplus capacity to accommodate the upstream CSO discharges.

#### **6.4 Day Brook Alternatives Analysis**

Day Brook is a significant water course that enters the combined sewer system at the upstream end of the CSO 9 Drainage Area. In order to reduce untreated CSO 9 discharges, detention and removal of Day Brook from the sewer system were evaluated in this study. The cost to detain flow peaks from Day Brook during wet weather events was estimated as approximately \$2.0 million and this alternative would reduce the annual volume of overflow during a typical year by 6.8 MG. Several Day Brook removal pipeline alternatives were considered in this evaluation. The estimated capital cost of the preferred layout for a new storm drain that would convey Day Brook to the canal system is \$12.8 million. The removal of Day Brook from the sewer system would reduce the annual overflow volume by approximately 7.9 MG during a typical year and reduce the average daily flow to the WWTF by approximately 1.2 MGD.

#### **6.5 System-Wide Alternatives Analysis**

A total of six system-wide alternatives to reduce the annual number of CSO activations and volume were developed and are summarized in Table EX-2.

Model simulations indicate that during a typical year each of the six alternatives will reduce the total City-wide CSO flow volume by 90% or more. In addition, model simulations indicate that each alternative will result in the elimination or capture for treatment of no less than 85 percent by volume of the combined wastewater flow collected on a system-wide annual average basis.

The Federal CSO policy indicates that under the *presumption approach* compliance with water quality standards is achieved if one of the following performance criteria is met:

1. No more than an average of four overflow events per year occur on an annual average basis.
2. The elimination or capture for treatment of no less than 85 percent by volume of the combined wastewater flow collected on a system-wide annual average basis (during precipitation events), as clarified in the 1995 EPA Guidance for Long-Term Control Plan document.
3. The elimination or removal of no less than the mass of pollutants causing water quality impairment for the volume reductions noted in Item 2 above.

Based on Criteria 2 above, each of the six system-wide alternatives developed meets the CSO policy goals.

**TABLE EX-2**  
Summary of System-Wide Alternatives<sup>8</sup>

System-Wide Alternatives (Costs in \$M)	Capital Cost (\$M) <sup>1,3,4</sup>	Total Project Cost (\$M) <sup>2,3,4</sup>	No. of Overflow Activations Remaining	Annual CSO Volume Removed (MG)	% CSO Removal <sup>5</sup>	Annual % of System Flow Removed/Captured <sup>6</sup>	Advantages	Disadvantages
<b>Alternative 1</b>								
7 - Sewer separation -	\$4.7	\$4.7	0				-Greatest level of abatement	
Day Brook - Remove Flow From Sewer System <sup>7</sup> -	\$12.8	\$10.2	3	131	93%	94%	-Greatest reduction in flow to the WWTF	-Highest cost alternative
18 - Full Sewer Separation -	\$51.5	\$51.5	0				-Eliminates CSO discharges to a sensitive area of the river (just upstream of dam at CSO 18)	-Will likely take the longest to complete
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0					
<b>Subtotal</b>	<b>\$120.1</b>	<b>\$117.5</b>					<b>\$/gal: \$0.90</b>	
<b>Alternative 2</b>								
7 - Convey overflow to the South Interceptor -	\$0.2	\$0.7	4				-≤4 activations/year achieved at all CSOs	-Area 18 storage facility would be located on Parks & Rec land; change in use requires special state legislation
Day Brook - Detention -	\$1.4	\$1.8	3	124	92%	95%	-Reduces CSO discharges to a sensitive area of the river (just upstream of dam at CSO 18)	
18 - Storage - 4 Activations (2.5 MG) -	\$20.8	\$31.6	4					
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0					
<b>Subtotal</b>	<b>\$73.6</b>	<b>\$85.2</b>					<b>\$/gal: \$0.68</b>	
<b>Alternative 3</b>								
7 - Convey overflow to the South Interceptor -	\$0.2	\$0.7	4				- ≤4 activations/year achieved at all CSOs	-Area 18 treatment facility would be located on Parks & Rec land; change in use requires special state legislation
Day Brook - Do Nothing -	\$0.0	\$0.0	3	122	91%	95%	-Lower cost than Alts 1 & 2	-Does not reduce the number of CSO discharges to the river, although treatment would be provided
18 - Treatment - 4 Activations (62 MGD) -	\$20.5	\$33.8	4					
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0					
<b>Subtotal</b>	<b>\$71.9</b>	<b>\$85.7</b>					<b>\$/gal: \$0.70</b>	
<b>Alternative 4</b>								
7 - Convey overflow to the South Interceptor -	\$0.2	\$0.7	4				-≤4 activations/year achieved at all CSOs	-Area 18 storage facility located on Parks & Rec land; change in use requires special state legislation
Day Brook - Do Nothing -	\$0.0	\$0.0	3	117	90%	94%	-Lower cost than Alts 1, 2, & 3	
18 - Storage - 4 Activations (2.5 MG) -	\$20.8	\$31.6	4					
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0					
<b>Subtotal</b>	<b>\$72.2</b>	<b>\$83.5</b>					<b>\$/gal: \$0.71</b>	
<b>Alternative 5</b>								
7 - Convey overflow to the South Interceptor -	\$0.2	\$0.7	4				-≤4 activations/year achieved at all CSOs	
Day Brook - Do Nothing -	\$0.0	\$0.0	3	122	91%	95%	-Reduces CSO discharges	-High cost
18 - Partial Sewer Separation - 4 Activations -	\$39.5	\$40.8	4				-Does not rely on obtaining Parks & Rec land for siting a CSO facility	
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0				-Additional abatement is more easily implemented	
<b>Subtotal</b>	<b>\$90.9</b>	<b>\$92.6</b>					<b>\$/gal: \$0.76</b>	
<b>Alternative 6</b>								
7 - Convey overflow to the South Interceptor -	\$0.2	\$0.7	4				-Lowest cost alternative	
Day Brook - Do Nothing -	\$0.0	\$0.0	3	116	90%	93%	-May be completed in a shorter timeframe	-CSO 18 still >4 activations per year; contingent on approval of 85% reduction
18 - Partial Sewer Separation - 16 Activations -	\$25.4	\$27.8	16				-Does not rely on obtaining Parks & Rec land for siting a CSO facility	
Separation of 2, 8, 18A, 19, 20, 21, 23 -	\$51.2	\$51.2	0				-Additional abatement is more easily implemented	
<b>Subtotal</b>	<b>\$76.8</b>	<b>\$79.7</b>					<b>\$/gal: \$0.69</b>	

<sup>1</sup>Capital cost estimates include construction costs, engineering costs (20%) and a construction contingency (30%).

<sup>2</sup>Total cost includes total capital cost, O&M, and an allowance for routine sewer system lining/replacement.

<sup>3</sup>Costs are based on a December 2019 Engineering News Record Construction Cost Index of 11,381.

<sup>4</sup>These are Engineer's Opinions of Probable Costs. Tighe & Bond has no control over the cost or availability of contractor's labor, equipment or materials, or over market conditions or the contractor's method of pricing, and the Opinions of Probable Cost are made on the basis of Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the cost of the Work will not vary from the Opinions of Probable Cost.

<sup>5</sup>Percentage of 1976 annual total combined sewer system flow that is no longer released untreated to the river. The original volume, prior to any CSO abatement (subsequent to the 2000 draft CSO LTCP), is estimated to be 475 MG per the 2019 model results.

<sup>6</sup>Percentage of 1976 annual total combined sewer system flow that will be captured for treatment or eliminated during storm events, based on the sewer system flows in place prior to the implementation of CSO improvements after the 2000 draft CSO LTCP was completed. The dry weather flow is not included in the calculation.

<sup>7</sup>The total project cost includes the reduction in operation and maintenance costs at the WWTF related to the reduction in average daily flow once Day Brook is removed from the sewer system.

<sup>8</sup>This comparison excludes abatement of CSO 11 since the abatement approach will be the same for each alternative. Sewer separation has been designed for Drainage Area 11 and construction is expected to begin in 2020.

The system-wide analysis evaluated, through hydraulic modeling, the total impact on the wastewater collection system of the proposed improvements under each alternative. The following components of the system-wide alternatives were considered for this analysis:

- **Day Brook** – Three alternatives were considered for Day Brook: do nothing, detention to reduce peak flows during storm events, or completely removing the brook flow from the sewer system through the construction of a drain pipe to convey the brook to the Connecticut River or the canal system. Model results indicate that if Day Brook is not detained or removed from the sewer system, the number of untreated discharges to the Connecticut River at CSO 9 would still be reduced to 4 per year, on average, due to the proposed improvements in other areas.
- **WWTF Upgrades** - Similar to the above, if no improvements to the WWTF are made to accommodate additional flow, the number of untreated discharges to the Connecticut River at CSO 9 would still be reduced to 4 per year, on average, due to the proposed improvements in other areas.
- **CSO 7** - The South Interceptor is expected to have the capacity to accommodate the overflow from CSO 7 since the flow removed through separation in Drainage Areas 2 and 8 is predicted to be greater than the flow added by the CSO 7 overflow during each of the storms measured in 1976 (the typical year used for the model simulation).
- **CSO 18** – As discussed above, CSO abatement through complete sewer separation, partial sewer separation, storage, and satellite treatment, was considered.
- **CSOs 2, 8, 18A, 19, 20, 21, and 23** - Each alternative included the complete sewer separation of Drainage Areas 2, 8, 18A, 19, 20, 21 and 23, which were determined to be more appropriate and/or cost effective than satellite treatment or storage alternatives during the screening analysis.

Note that System-Wide Alternative 1 was developed to represent the alternative that is expected to provide the greatest level of abatement. However, this alternative would have the highest cost.

### 6.5.1 System-Wide Alternative Selection

The system-wide alternatives analysis determined that the most cost-effective approach to achieving the CSO policy goals is to implement all or part of Alternative 6, which includes the following components listed in Table EX-2:

**TABLE EX-3**  
Alternative 6 Components<sup>2</sup>

Drainage Area	Recommended Abatement	Capital Cost (\$M)	Total Project Cost (\$M)
11 <sup>1</sup>	Sewer separation	\$8.6	\$8.6
2, 8, 18A, 19, 20, 21 & 23	Sewer separation	\$51.2	\$51.2
7	Divert flow to South Interceptor	\$0.2	\$0.7
18	Partial sewer separation (≤16 overflows/year)	\$25.4	\$27.8
<b>TOTAL</b>		<b>\$85.4</b>	<b>\$88.3</b>

<sup>1</sup>Design of sewer separation in this area is complete and construction is expected to begin in the spring of 2020.

<sup>2</sup>This alternative will eliminate or capture for treatment no less than 85 percent by volume of the combined wastewater flow collected on a system-wide annual average basis, which is one of the acceptable performance criteria described in the National CSO policy under the *presumption approach*.

Alternative 6 is the lowest cost system-wide alternative and meets the federal CSO policy goal under the *presumption approach* of eliminating or capturing for treatment of no less than 85 percent by volume of the combined wastewater flow collected during rain events on a system-wide annual average basis. Alternative 6 results in a 90% reduction in overflow volume annually and results in the capture or elimination of 93% by volume of the combined wastewater flow collected on a system-wide annual average basis.

Advantages of this system-wide alternative include:

1. Lowest cost.
2. Meets the water quality goals under the *presumption approach*.
3. Likely to be more quickly implemented than more expensive alternatives.
4. It does not require the construction of a CSO treatment or storage facility at Pulaski Park in Drainage Area 18, which might not be allowed because the park is a historic site and is protected land in accordance with under Article 97 of the Amendments to the Constitution of the Commonwealth, EOAA Land Disposition Policies (a change in its use would require special legislation). In addition, the construction of a CSO facility at Pulaski Park has the potential to impact the adjacent neighborhood and park users.
5. Partial sewer separation of Drainage Area 18 removes more overflow volume than treatment or storage for the same number of overflows.
6. Additional abatement is more easily implemented with sewer separation alternatives, if determined to be necessary in the future.

In addition, to the above, note that Alternative 6 provides only a slightly lower level of abatement than Alternative 1, which provides the greatest level of abatement, as shown below:

Alternative	Total Project Cost (\$M) <sup>1</sup>	% CSO removal
1	\$126.1	93%
6	\$88.3	90%

<sup>1</sup>Includes capital costs, operation & maintenance costs over a 20-year period, and an allowance for sewer lining/replacement over the 20-year period. Costs include Drainage Area 11 sewer separation.

## 6.6 Recommended CSO Abatement

A more detailed assessment of System-Wide Alternative 6 revealed that not all of the CSOs in the City would need to be abated in order to comply with the federal CSO control policy using the *presumption approach*.

The City proposes to implement the abatement projects described in Table EX-4, which would comply with federal CSO policy goals by achieving 87% capture or elimination of the combined flow within the wastewater collection system during wet weather events on an average annual basis, when considered in conjunction with prior CSO abatement projects. The abatement of these CSOs would also result in an 86% reduction in annual CSO volume, when considered in conjunction with prior CSO abatement projects.

**TABLE EX-4**

Recommended CSO Abatement Plan – 86% CSO Removal and 87% Capture

<b>CSO No.</b>	<b>CSO Description</b>	<b>Recommended Abatement</b>	<b>Capital Cost (\$M)</b>	<b>Annual CSO Volume Removed (MG)<sup>1</sup></b>	<b>Cumulative % CSO Volume Reduction</b>	<b>\$/CSO Gal Removed Annually</b>
Previously Implemented CSO Abatement Projects				316.3	66.0%	---
11	Jackson St.	Sewer Separation	\$8.60	17.8	69.7%	\$0.48
8	Springdale Park	Sewer Separation	\$9.56	21.4	74.2%	\$0.45
21	River Terrace	Sewer Separation	\$16.67	58.4	86.4%	\$0.29
<b>TOTAL</b>	---		<b>\$34.83</b>	<b>413.9</b>	---	---

<sup>1</sup>Based on a total annual overflow volume of 479.2 MG in 2000.

These three areas were selected for abatement because their implementation is the most cost-effective and would eliminate 3 of the 4 CSOs with the greatest overflow volume.

No further CSO abatement is proposed or required to comply with the federal CSO control policy.

## **7 Climate Vulnerability Assessment**

The impact of climate change on the selection of CSO abatement alternatives was considered in this report. As part of this effort, historical rainfall and river level/flow data in the Holyoke area were reviewed. In addition, reports on regional rainfall and river level/flow trends were reviewed. This data and literature review confirmed that rainfall amounts and river flows have increased over the last 70+ years. In addition, the data indicates that there has been an increase in the number of extreme rain events.

The impact of climate change on the CSO abatement alternatives was evaluated as part of this assessment. Sewer separation is typically performed by installing new sewers to convey sanitary sewage and converting the existing combined sewers to storm drains. Generally, the quantity of sewage flow is not expected to be impacted by climate change and, correspondingly, the cost of sewer separation is not expected to be impacted by climate change. In addition, the level of abatement provided by sewer separation is not expected to be impacted by climate change.

Both the CSO treatment and storage facilities would be sized to prevent more than 4 overflows during a typical year. Climate change has resulted in an increase in the number of larger, more intense rain events. If this trend continues, a CSO treatment or storage facility sized based on the storms experienced today may not be large enough to prevent more than 4 overflows/year in the future. As such, a CSO treatment or storage facility is more likely to be impacted by climate change than sewer separation alternatives.

## **8 Affordability Analysis**

The affordability of the recommended CSO abatement plan and the City's other non-CSO wastewater needs has been assessed as part of this study. The affordability analysis includes an evaluation of the financial impacts of CSO abatement on an "average" community based on income using an approach specifically developed by EPA for the CSO abatement program. The EPA analysis is commonly used as a first step in evaluating



project affordability. However, it is important to note that Holyoke is not an “average” community and this approach does not fully portray actual cost impacts. Since Holyoke is one of the most economically disadvantaged communities in the Commonwealth of Massachusetts, other considerations that assess Holyoke’s ability to fund CSO abatement are also presented in this report (based primarily on the 2017 American Community Survey).

The following information confirms the greater financial challenges facing the City of Holyoke and its residents than an “average” community (based on economic conditions):

- Holyoke’s median household income (MHI) of \$37,954 is the third lowest in Massachusetts; Holyoke’s MHI is only half of the state average of \$74,167.
- Holyoke has the second highest poverty rate in Massachusetts; 29% of Holyoke’s residents live below the poverty level vs. the state average of 11%.
- The number of Holyoke residents below the poverty level has nearly doubled since 1970.
- One quarter of the City’s population that lives in the downtown area is especially impoverished with a median household income of \$16,450; 55% of these residents live below the poverty level.
- Holyoke is one of only ten public school systems statewide that applied for and received approval for its schools to provide universal free lunch due to high poverty levels.
- Holyoke’s unemployment rate of 10.2% is almost double the state average of 6.0%; in addition, Holyoke’s Labor Participation Rate of 57% is well below the state average of 67%.
- Approximately 53% of the City’s revenue is from state aid, which is well above the state average of 14%.
- 21% of the housing in Holyoke is subsidized or available for low-income residents.

The EPA financial capability approach compares the total annual residential costs for wastewater collection, treatment and CSO abatement with the median household income. In addition, certain indicators of the City’s economic health are rated individually, and then combined for an overall rating. These two factors, the average annual residential sewer cost expressed as a percentage of the median household income (the Residential Indicator) and the consolidated rating of the economic indicators are then used to provide information on the impact of a project on the community, using the criteria established by EPA and summarized in Table EX-5.

**TABLE EX-5**  
EPA Financial Capability Matrix

Permittee Financial Capability Indicator (Socio-economic, Debt and Financial Indicators)	Residential Indicator (cost per household as a % of median household income)		
	Low (< 1.0%)	Mid-Range (1.0 - 2.0%)	High (> 2.0%)
	Weak (< 1.5)	Medium Burden	High Burden
Mid-Range (1.5 - 2.5)	Low Burden	Medium Burden	High Burden
Strong (> 2.5)	Low Burden	Low Burden	Medium Burden

The City’s Permittee Financial Capability Indicator score is 1.5 (at the low end of Mid-Range), based on its current bond rating, unemployment rate, median household income (MHI), and sewer enterprise system fee collection rate. This Permittee Financial Capability rating of Mid-Range is the result of the A1 bond rating score being “Strong”. However, the other indicators that consider unemployment rate, MHI, and the sewer enterprise system fee collection rate are all considered weak, with scores of 1.0. The unemployment rate, MHI, and the sewer enterprise system fee collection rate provide a more accurate indication of how economically depressed the City is and therefore a “Weak” rating should be applied to Holyoke.

With a Permittee Financial Capability Indicator that is “Weak”, the EPA methodology indicates that a High Burden is placed on a community when the Residential Indicator is greater than or equal to 1%, as shown in Table EX-5.

The City’s current Residential Indicator is 1.0, based on its current wastewater operation and maintenance and debt service costs. This indicates that the City’s wastewater costs currently place a High Burden on households earning the median household income. Note that the existing wastewater costs place an even higher burden on the City’s large low-income population which earn well below the City’s MHI of \$37,954 (per the 2017 American Community Survey). As noted above, one quarter of the City’s population that lives in the downtown area has a median household income of only \$16,450.

The City’s future wastewater costs were projected in this evaluation and included in the affordability assessment. Future wastewater costs include improvements expected to be necessary at the WWTF and within the wastewater collection system over the next 20 years, as well as the recommended CSO abatement. The most significant WWTF improvement anticipated is the potential need for nitrogen removal upgrades to comply with anticipated changes in permit requirements. The cost of these upgrades is estimated to be approximately \$137 million based on a prior study performed for MassDEP. Within the wastewater collection system, we have assumed that 2% of the separated sewers and the combined sewers that are not included in the recommended plan will need to be rehabilitated or replaced over the next 20 years. In addition, we have assumed that rehabilitation of the Front Street Interceptor and the Day Brook Sewer will be needed over the next 20 years. Portions of these major sewer mains are over 150 years old. We also assumed that the Springdale Park Pump Station will be replaced during this 20-year period.

The calculated Residential Indicator values using the EPA affordability methodology are shown in Table EX-6 and illustrate that even if CSO abatement costs are not considered, the anticipated wastewater costs will place a High Burden on City residents. If WWTF nitrogen removal upgrades are required, the projected wastewater costs will be unaffordable without

supplemental grant funding assistance (regardless of whether CSO abatement is implemented).

**TABLE EX-6**  
Residential Indicator Summary<sup>1</sup>

Condition	Residential Indicator-without WWTF Nitrogen Removal Upgrades	Residential Indicator-with WWTF Nitrogen Removal Upgrades
Existing WW Costs	1.0	1.0
Future WW Costs (Non-CSO only)	1.7	2.8
Future WW Costs (NON-CSO + CSO)	2.0	3.0

<sup>1</sup>The Residential Indicator is calculated as the estimated wastewater cost per household divided into the median household income.

More detailed financial models were also developed that confirmed the significant impacts that the CSO abatement projects and other anticipated wastewater needs will have on City residents, as described below.

1. A supplemental analysis of affordability was performed using the EPA methodology described above, modified as follows:
  - a. Annual wastewater costs were developed based on proposed implementation and payback periods for each anticipated wastewater project and proposed CSO abatement project, rather than assuming equal annual costs over the implementation period. Design and construction periods were assumed using this approach. Refer to Figure EX-2.
  - b. Longer implementation periods than 20 years were considered to reduce impacts to residents and businesses.
  - c. It was assumed that CSO abatement projects will receive State Revolving Fund (SRF) loans at a 2% interest rate and that significant projects that are not expected to receive SRF loans will be funded with a 4.5% interest loan; 20-year bond periods were assumed.
  - d. Construction costs were escalated from present day costs based on the change in the ENR Construction Cost Index from 2009 to 2018.
  - e. Wastewater operation and maintenance (O&M) costs were escalated from present day costs based on the changes in the City’s wastewater O&M costs from Fiscal Year 2000 to Fiscal Year 2018.
  - f. The median household income (MHI) in Holyoke was escalated from present day costs based on the average percent change in the MHI from 2009 to 2017.

Note that funding from supplemental special grants is not included in the analysis.

The financial impacts are illustrated in Figure EX-3 and confirm that the proposed CSO abatement projects will place a High Burden on City residents with Residential Indicator values exceeding 1.5. In addition, Figure EX-3 confirms the need for significant funding assistance in the form of grants in order to implement either CSO abatement improvements or WWTF nitrogen removal upgrades (beyond an SRF loan, which has already been considered in the analysis).

2. A supplemental analysis of affordability was performed using an alternate methodology developed by several consultants for the American Water Works Association (AWWA), the National Association of Clean Water Agencies (NACWA), and the Water Environment Federation (WEF). This effort was prepared in anticipation of the EPA updating its financial capability assessment guidelines. This approach determines affordability using the following two indicators:
  - a. Household Burden Indicator (HBI) - The HBI is calculated as the basic household water service costs (water and sewer combined) as a percentage of the 20<sup>th</sup> percentile household income (the Lowest Quintile of Income (LQI) for the service area). The basic water services costs per household are based on an assumed 50 gallons per person per day. The HBI attempts to reflect the economic impact on relatively low-income households. The benefit of using the fixed water consumption value noted is that it allows the analysis to focus on non-discretionary, basic water service costs, rather than average costs, which are more relevant to low-income households.
  - b. Poverty Prevalence Indicator (PPI) - The PPI is calculated as the percentage of community households at or below 200% of the Federal Poverty Level (the Federal Poverty Level is \$24,600 for a family of four). The PPI reflects the degree to which poverty is prevalent in a community, which indicates the prevalence of economic distress across the community. In Holyoke, 50% of the population live below 200% of the federal poverty level, per the 2017 American Community Survey Census data. This methodology indicates that PPI's greater than 35% place the highest burden on a community in this category.

In combination, the HBI and PPI metrics reflect both the household burden and the financial health of the community. The matrix presented in Table EX-7 provides benchmarks for determining the water/wastewater cost impacts on those households with incomes at or below the LQI. Note that for communities such as Holyoke with a PPI of greater than 35%, an HBI greater than 7% would place a High Burden on its residents.

**TABLE EX-7**  
Benchmarks for Recommended Household Affordability Metrics

HBI <sup>1</sup>	PPI <sup>2</sup>		
	>35%	20% to 35%	<20%
>10%	Very High Burden	High Burden	Moderate-High Burden
7% to 10%	High Burden	Moderate-High Burden	Moderate-Low Burden
<7%	Moderate-High Burden	Moderate-Low Burden	Low Burden

<sup>1</sup>The Household Burden Indicator (HBI) is calculated as the basic household water service costs (water and sewer combined) as a percentage of the 20<sup>th</sup> percentile household income (the Lowest Quintile of Income for the service area).

<sup>2</sup>The Poverty Prevalence Indicator (PPI) is calculated as the percentage of community households at or below 200% of the Federal Poverty Level.

The financial impacts using this alternate methodology are illustrated in Figure EX-4 and confirm that the proposed CSO abatement projects will place a High Burden on City residents with Household Burden Indicator values exceeding 7.0 and, if WWTF nitrogen upgrades are implemented, exceeding 10.0. Similar to the supplemental EPA methodology, this alternate analysis confirms the need for significant funding assistance in order to implement either CSO abatement improvements or WWTF nitrogen removal upgrades.

## 9 Funding

Funding sources that may be available for CSO abatement projects include:

- The State Revolving Fund (SRF) Loan Program for wastewater improvements
- Federal/state grant funding

The State Revolving Fund (SRF) loan program for wastewater improvements has been established by the Commonwealth to assist communities in funding a wide variety of wastewater projects, including replacing/rehabilitating sewers, pump stations and wastewater treatment facilities. CSO improvements would also be eligible for funding under this program. Communities currently compete for low interest loans (2% for a 20-year loan) under this program. Disadvantaged communities can also qualify to receive partial loan forgiveness on the loan principal.

Over the past 20 years, limited federal and state grants have been made available for CSO abatement along the Connecticut River. The Mosher Street area, Jones Ferry Road area and Appleton Street area sewer separation projects were partially funded through federal grants. These grants funded 55% of the proposed improvements.

Grant funding is available to communities through the Community Development Block Grant (CDBG) program. The Community Development Fund (CDF) awards grants to eligible cities and towns to meet a broad range of community development needs in housing, infrastructure, revitalization, economic development and public social services. These grants could be applied to a future wastewater improvement project such as CSO abatement.

**Due to the economic distress of the City and its extremely high poverty levels, supplemental grant funding will be required in order for the proposed CSO abatement improvements to be affordable. Without additional funding, it will be very difficult for the City to afford the three CSO projects, regular sewer rehabilitation and replacement, and regular wastewater system operation and maintenance; and it will not be possible to afford the WWTF nitrogen removal upgrades. In addition, it may be necessary to extend the implementation schedule beyond 20 years to lessen the financial burden on the City, depending on the amount of funding assistance available.**

## 10 Recommended Plan

The City of Holyoke has been reducing CSO discharges over the last 20 years since the draft CSO LTCP was prepared. Completed CSO abatement projects include the Green Brook Separation Project that reduced CSO 21 discharges (2001), the Mosher Street Area Sewer Separation project that eliminated CSO 14 (2007), the Berkshire Street Satellite Treatment Facility that reduced untreated CSO 9 discharges (2007), the Front Street/Appleton Street CSO Regulator Adjustment (2007) that reduced CSO 16 discharges, the Jones Ferry Road Area Sewer Separation Project that eliminated CSO 3 (2012), and the Appleton Street Area Sewer Separation Project that eliminated CSO 13 (2012). These projects have reduced the annual CSO volume by approximately 316 million gallons (66%).

Proposed CSO abatement projects based on the results of this CSO LTCP Update include:

- Jackson Street Area (CSO 11) Sewer Separation
- Springdale Park (CSO 8) Sewer Separation
- Riverview Terrace (CSO 21) Sewer Separation

Design of the Jackson Street Area Sewer Separation Project has been completed and construction is scheduled to commence in 2020.

Abatement of CSO discharges from CSOs 8, 11, and 21 is recommended because:

1. Abatement of these three CSOs provides the lowest cost per gallon of CSO volume removed (“the biggest bang for the buck”) and would eliminate 3 of the 4 CSOs with the greatest overflow volume.
2. Elimination of these CSOs, along with the prior CSO abatement described above, will result in greater than 85% removal of annual CSO volume over the next 20± years (86%). This abatement goal has been recommended by EPA for other CSO communities.
3. Elimination of these CSOs, along with the prior CSO abatement described above, will result in the elimination or capture for treatment of greater than 85 percent by volume of the combined wastewater flow collected on a system-wide annual average basis (from 76% under current conditions to 87%), which complies with the federal CSO abatement policy.

We recommend that CSOs 8, 11 and 21 abatement be implemented over the next 20 years, as summarized in Table EX-8. However, it is important to note that because Holyoke is one of the most economically disadvantaged communities in the state, significant grant funding assistance is needed in order for the City to afford either the proposed CSO abatement or WWTF nitrogen removal upgrades. In addition, it may be necessary to extend the implementation schedule beyond 20 years to lessen the financial burden on the City, depending on the amount of funding assistance available.

**TABLE EX-8**  
Recommended CSO Abatement Plan

<b>CSO No.</b>	<b>CSO Abatement Description</b>	<b>Capital Cost (\$M)</b>	<b>Annual CSO Volume Removed (MG)</b>	<b>Cumulative % CSO Volume Reduction<sup>2</sup></b>	<b>Implementation Schedule<sup>1</sup></b>
Previously Implemented CSO Abatement Projects			316.3	66.0%	---
11	Jackson St. sewer separation	\$8.60	17.8	69.7%	2020-2022
8	Springdale Park sewer separation	\$9.56	21.4	74.2%	2025-2029
21	River Terrace sewer separation	\$16.67	58.4	86.4%	2035-2039
<b>TOTAL</b>	<b>---</b>	<b>\$34.83</b>	<b>413.9</b>	<b>---</b>	<b>---</b>

<sup>1</sup>Includes design and construction.

<sup>2</sup>Based on a total annual overflow volume of 479.2 MG in 2000.

No further CSO abatement is proposed or required to comply with the federal CSO control policy.

## **Acknowledgments**

We wish to thank you and Robert Peirent for your assistance throughout the project and the development of this report.

This report was prepared by Tighe & Bond personnel under the general supervision of William Hardy, PE and David Popielarczyk, PE.

Very truly yours,

**TIGHE & BOND, INC.**



William N. Hardy, PE  
Chief Operating Officer

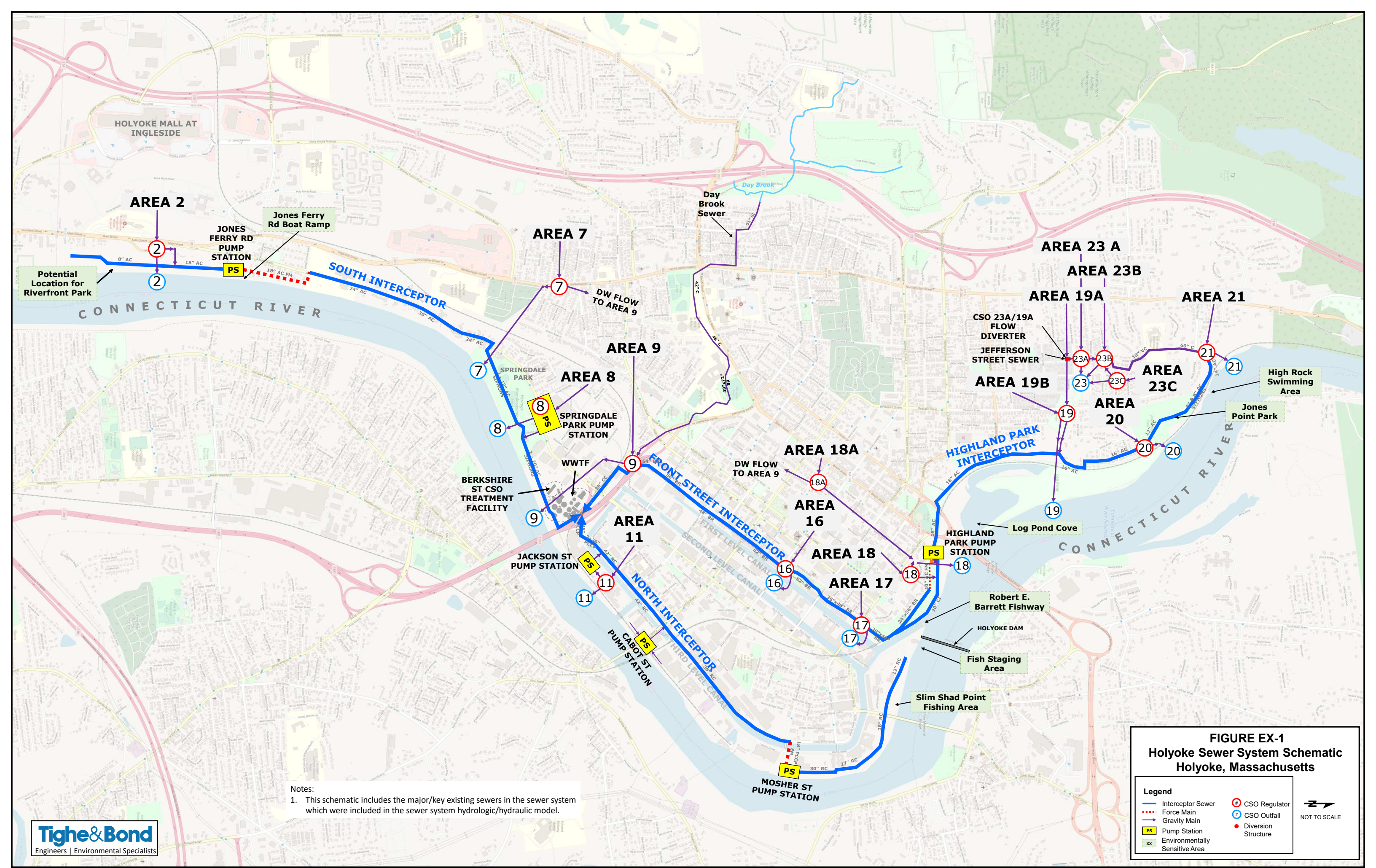
**TIGHE & BOND, INC.**



David J. Popielarczyk, PE  
Principal Engineer/Associate

Enclosure





**FIGURE EX-1**  
**Holyoke Sewer System Schematic**  
**Holyoke, Massachusetts**

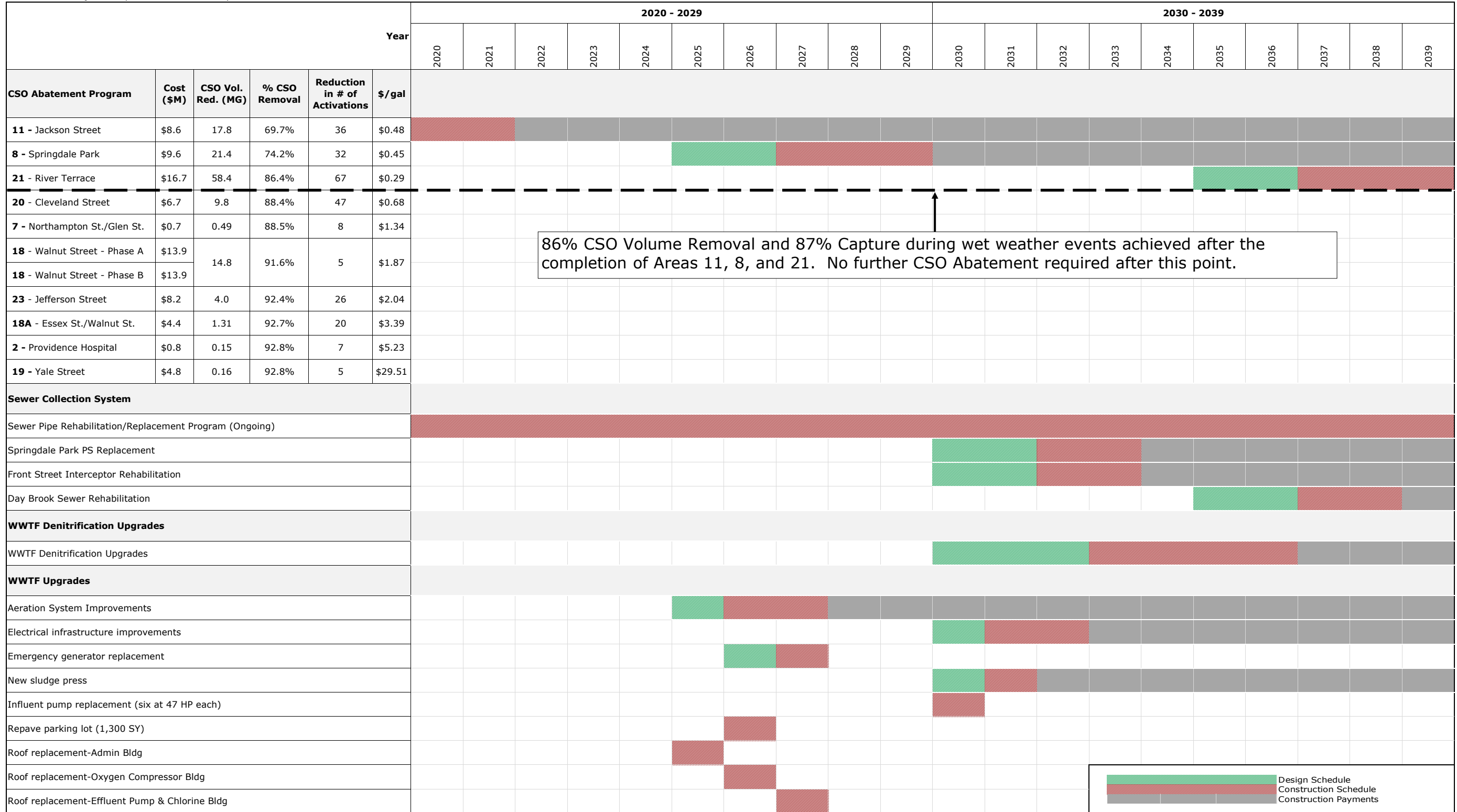
Legend	
	Interceptor Sewer
	Force Main
	Gravity Main
	Pump Station
	Environmentally Sensitive Area
	CSO Regulator
	CSO Outfall
	Diversion Structure

NOT TO SCALE

Notes:  
 1. This schematic includes the major/key existing sewers in the sewer system which were included in the sewer system hydrologic/hydraulic model.



**FIGURE EX-2**  
Wastewater Projects Implementation and Payment Schedule





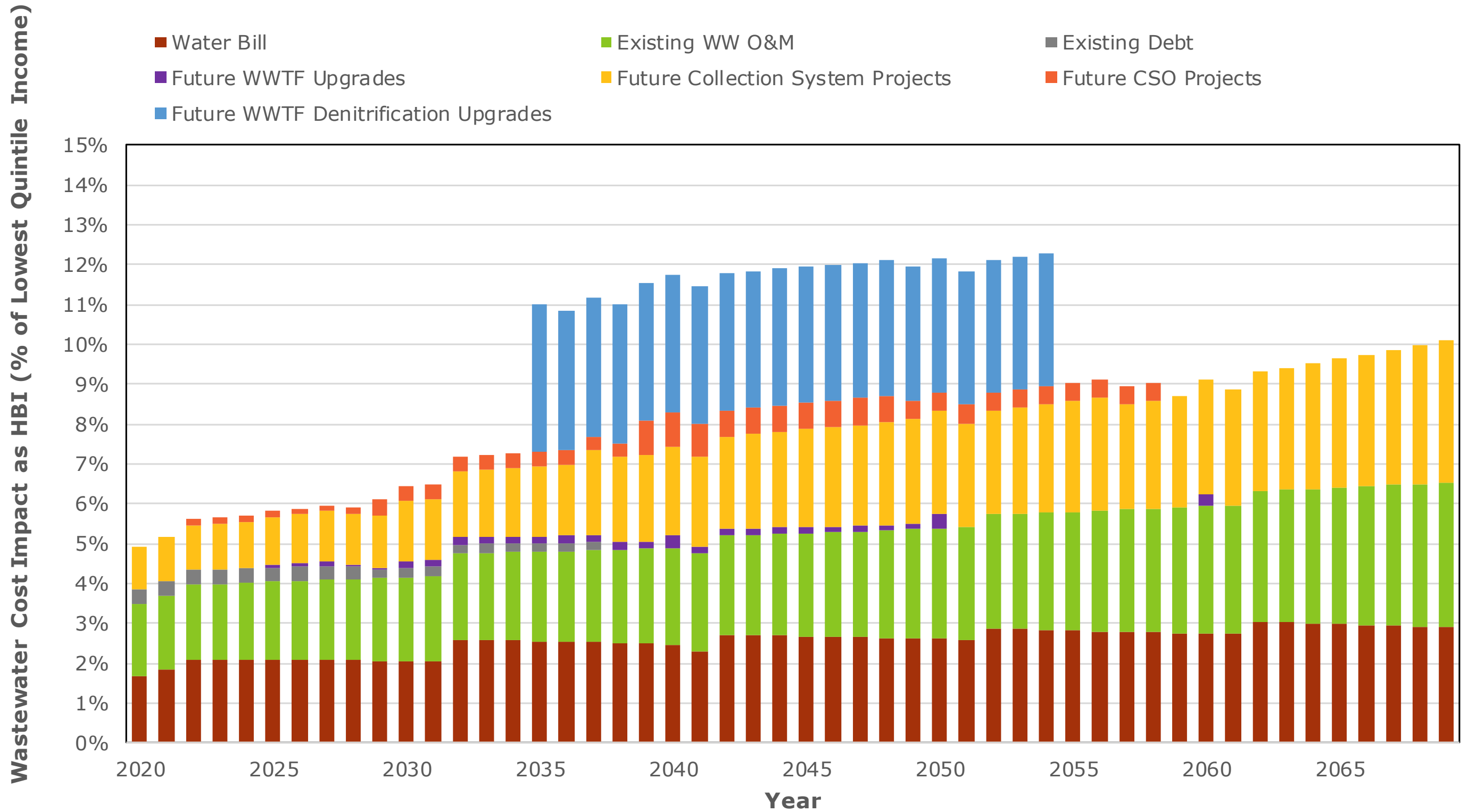


Figure EX-4

Annual Combined Water & Sewer Cost as Percent LQI