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Executive Summary

The City of Lafayette's Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) is a 20-year plan that was approved in September 2009. Upon completion of the Greenbush CSO Tank in late 2019, the LTCP reached its halfway point. The LTCP was split into two phases, Phases I and II. Phase I projects were considered Early Action Projects, and included those that were either complete or in progress at the time of approval of the LTCP in 2009. Phase II was further split into four sub-phases, Phase II-A through II-D.

The total estimated capital cost of Phase I of the LTCP is $134,347,000. The sum total contract value of Phase I projects was $129,035,000, producing a savings of $5,312,000. The total original estimated capital cost of Phase II of the LTCP is $142,620,000, whereas the total construction cost of Phase II to-date, including anticipated costs of Phase II-C and II-D, is $133,230,000, when adjusted to May 2008 dollars (*Consistent with the Engineering News-Record Construction Cost Index 8141 used to develop cost for the 2009 LTCP*), producing a savings of $9,390,000. It can be inferred due to savings on earlier LTCP projects, that final cost of the LTCP will be lower than $133,230,000.

To date, constructed LTCP projects have reduced the annual CSO volume based on a typical year storm by 61%. The significant improvement in water quality from LTCP-mandated projects, coupled with the aforementioned capital savings, has allowed for the responsible re-investment of capital funds into additional water quality improvement projects that serve the needs of the Lafayette community.

Section 1 Introduction

The City of Lafayette submitted a Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) report to the Indiana Department of Environmental Management (IDEM) in September 2009 in accordance with the State Judicial Agreement requirements. The LTCP was approved in September 2009 and incorporated into Lafayette's National Pollution Discharge Elimination System (NPDES) permit. In December of 2012, April 2016 and November 2016, respectively, the City reexamined the LTCP Recommended Plan as the result of other infrastructure needs identified in the Earl Avenue area, flow monitoring for right-sizing the CSO storage facility near CSO 001, as well as identifying additional means to more effectively meet their overarching infrastructure improvement needs while maintaining the approved level of control, schedule and marginally increasing program cost.

This progress report summarizes the LTCP work completed as of early 2020 as well as the reinvestment of capital cost savings into completed and future projects, and provides a description of future LTCP projects.

Section 2 Current Approved CSO LTCP

The list of LTCP-mandated projects is split into two phases. All Phase I projects, listed below and shown in **Figure 2-1** consist of early action projects that were initiated prior to the approval of the LTCP in 2009. These projects involved reduction in CSO volumes, frequencies, and durations and helped maximize flows to the WWTP:

- Elimination of Shamrock Park CSO (CSO 008),
- Elimination of Romney Road CSO (CSO 017),
  - Ross Road Lift Station,
  - Prairie Oaks Lift Station,
- Pearl River Lift Station,
  - Backflow prevention at CSOs 006 and 007,
- Elliott Ditch Interceptor Improvements,
- WWTP Upgrade and Expansion,
- Pearl River Storage and Conveyance Tunnel, and
- Parking Lot Lift Station Elimination (Elimination of CSO 004).

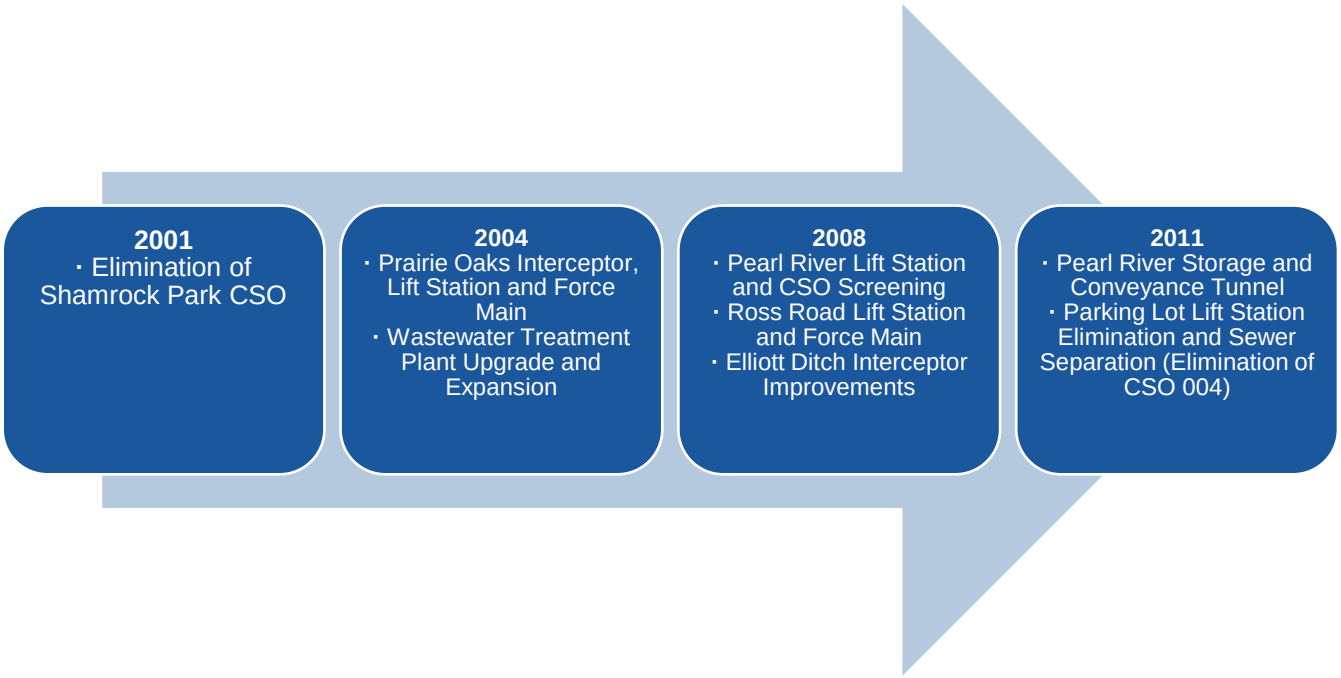


Figure 2-1: City of Lafayette CSO LTCP Phase I Projects and Completion Years

Once the construction of the Phase I improvements was complete, a period of monitoring was conducted, prior to moving on to Phase II of the recommended plan.

The recommended plan for Phase II, as approved during the most recent update to the LTCP in November 2016, was selected based on feasibility and capital cost. The recommended level of control of four overflows per year was selected, with project areas shown on Figure 8.2-1 of **Appendix A**. Phase II is divided into four sub-phases, Phases II-A, II-B, II-C, and II-D, to include the implementation of the integrated CSO control alternatives. **Table 2-1** reflects all changes to Phase II during the various updates to the LTCP between 2012 and 2016.

Table 2-1: Updates to the Original CSO LTCP

	Original Approved LTCP	December 2012 Update	April 2016 Update	November 2016 Update
Phase II-A	Sewer separation in the Earl Avenue area (approx. 103 acres)	Sewer separation in the Earl Avenue area (approx. 900 acres)		Sewer separation in the Earl Avenue area (final acreage of the separated area was approximately 808 acres)
	48-inch parallel interceptor along Durkees Run creek	Rehabilitation of Durkees Run creek sewer from CSO 012 to CSO 009		
	Tunnel extension from North Street to Cincinnati Street CSO			
	36-inch parallel throttle pipe at CSO 010	Need for 36-inch throttle pipe at CSO 010 eliminated due to diversion structure modifications.		
Phase II-B	96-inch conveyance sewer along the railroad corridor		Utilization of existing Railroad Corridor Sewer along Erie Street combined with new conveyance sewer along Brown Street	
	5.9 MG CSO storage facility near CSO 001 with separate screening facility			4.2 MG CSO storage facility near CSO 001 with on-site screening
Phase II-C	Wet-weather expansion of 55 MGD of the Pearl River Lift Station			
	5.3 MG CSO storage facility at CSO 006			
	72-inch conveyance sewer from CSO 007 to CSO 006 storage facility			
Phase II-D	119 MGD High-Rate treatment facility near CSO 009			
	60-inch force main from the Pearl River Lift Station to the WWTP			

After implementation of Phase II-D of the recommended alternative a two-year post-construction compliance monitoring program will be conducted.

The total estimated construction cost for Phase II-A through Phase II-D of the LTCP is $142,260,000. The total estimated cost of projects in Phase II-A and II-B is $59,740,000. The total spent on LTCP-mandated projects in Phase II-A and II-B is $50,940,000 (*Note: Construction costs are adjusted to May 2008 dollars, consistent with the cost year used to develop 2009 LTCP estimates*). Phase II is currently on time and under budget, with savings to-date of $8,800,000. Section 3 provides a breakdown of project costs.

Section 3 Current Status

Among the various projects listed in Section 2, construction of Phase I, Phase II-A and Phase II-B are complete in their entirety. The projects have all been implemented on-schedule or ahead of schedule. The Implementation Schedule in Table 8.3-1 of **Appendix A** shows the approved 20-year CSO LTCP project schedule. 18 years of this schedule include the planning, green infrastructure evaluation, design, citizen's advisory committee (CAC) meetings, construction, and post-construction monitoring for each phase. The final two years of the 20-year plan are set aside for the Post-Construction Compliance Monitoring Program, with the purpose of determining the effectiveness of the LTCP in meeting the design and performance objectives. It is important to note that the majority of Phase I projects listed in Section 2 of this report are absent from this schedule, with the exception of the 114" Tunnel and Parking Lot Lift Station Elimination Projects, due to the fact that the early Phase I projects were completed prior to the approval of the LTCP in 2009.

Refer to **Table 3-1** for total construction cost of completed projects in Phase I in relation to anticipated construction costs as laid out in the LTCP.

Table 3-1: CSO LTCP Phase I Project Dates and Cost

	Start	End	LTCP Est. Cost	Construction Cost
Shamrock Park CSO Elimination	2001	2001	$150,000	$150,000
Romney Road CSO Elimination (Prairie Oaks Lift Station, Force Main and Interceptor, and Ross Road Lift Station, Force Main and Interceptor)	2002	2008	$32,597,000	$32,597,000
Wastewater Treatment Plant Expansion Project	2001	2004	$62,000,000	$62,000,000
Pearl River CSO Projects				
Division A - 114" Storage and Conveyance Tunnel	2008	2011	$19,000,000	$18,957,000
Division B - Pearl River Lift Station, Parking Lot LS Demo, and CSO Screening	2006	2008	$10,000,000	$10,044,000
Division C - Parking Lot Lift Station Elimination and Sewer Separation (CSO 004 Elimination)	2009	2011	$600,000	$614,000
Elliott Ditch Interceptor Improvements	2008	2008	$10,000,000	$4,673,000
Total Phase I			***$134,347,000***	***$129,035,000***

Table 3-2 provides a description of each project in Phase II with a comparison of projects that were in the original LTCP versus those that were constructed. As mentioned earlier in this report, Phase II-A and II-B are complete in their entirety. Construction of Phase II-C is underway, with the completion of the Williams Street Sewer in early 2020. The cost savings displayed in Phase I and II projects have resulted in the ability to invest in a variety of infrastructure projects, as explained in Section 4.

Table 3-2: CSO LTCP Phase II Project Dates and Cost

	LTCP Project Description	Start	End	Original LTCP Est. Cost[4]	Installed Project Description	Construction Cost[5]	Savings from Original LTCP
Phase II-A	▪Sewer Separation in Earl Avenue area (approx. 103 acres) ▪ 48-inch parallel interceptor along Durkees Run creek ▪ Tunnel extension from North Street to Cincinnati Street CSO ▪36-inch parallel throttle pipe at CSO 010 ▪24-inch parallel throttle pipe at CSO 015	2012	2016	$12,620,000	▪ Sewer separation in Earl Avenue area (approx. 808 acres)[1] ▪ Rehabilitation of Durkees Run creek sewer from CSO 012 to CSO 009 ▪ Tunnel extension from North Street to Cincinnati Street CSO	$24,250,000	-$11,630,000[2]
Phase II-B	▪ New 96-inch conveyance sewer along the railroad corridor ▪ 5.9 MG CSO storage facility near CSO 001 with separate screening facility	2017	2019	$47,120,000	▪ Utilization of existing railroad corridor sewer along Erie Street combined with new conveyance sewer along Brown Street, Pave Drain ▪ 4.2 MG CSO Storage Tank with on-site screening (Greenbush CSO Storage Tank)	$26,690,000	$20,430,000
Phase II-C	▪ 72-inch conveyance sewer from CSO 007 to CSO 006 storage facility ▪ 5.3 MG CSO storage facility at CSO 006 ▪ Wet-weather expansion of 55 MGD of Pearl River Lift Station	2019	-	$36,580,000	▪ 72-inch conveyance sewer from CSO 007 to future CSO 006 storage facility (Williams Street Sewer) ▪ *5.3 MG CSO storage facility at CSO 006[3]* ▪ *Wet-weather expansion of 55 MGD of Pearl River Lift Station[3]*	$35,990,000	$590,000
Phase II-D	▪ 119 MGD High-Rate treatment facility near CSO 009 ▪ 60-inch force main from Pearl River Lift Station to WWTP	-	-	*$46,300,000*	▪ *119 MGD High-Rate treatment facility near CSO 009[3]* ▪ *60-inch force main from Pearl River Lift Station to WWTP[3]*	*$46,300,000*	-
Total Phase II				***$142,620,000***		***$133,230,000***	***$9,390,000***

[1]Cost of Earl Avenue Sewer Separation Projects were offset using TIF funding in the amount of $8 Million
[2]Earl Avenue Sewer Separation Projects included additional improvements to address Sagamore Parkway flooding
[3]These projects have not yet been designed. Construction cost represents anticipated cost based on Original LTCP Estimated Cost
[4]Original LTCP Estimate Cost includes Capital Cost + 25% Contingency
[5]Adjusted using Engineering News-Record (ENR) Construction Cost Index (CCI) 8141 (May 2008) that was used to develop cost for original LTCP

Section 4 Capital Cost Savings

As described in Section 3, there were significant savings captured throughout the construction of LTCP projects, made possible by post-construction flow monitoring of various projects, as well as various value-engineering tools. Because of the significant capital cost savings on LTCP-mandated projects, several additional infrastructure projects were able to be installed that result in reduction in CSO volumes, frequencies, and durations. While not included in the original LTCP schedule or cost estimate, the following projects were installed that directly relate to the LTCP:

Table 4-1: List of Projects Directly Related to LTCP

Project	Cost[1]
Elmwood, Greenbush to 27th Street, Vinton Elementary Stormwater Park	$2,194,500
Greenbush Street Sewer Extension	$3,593,000
Brown Street Sewer Project Phase I	$3,670,600
Durkees Run Stormwater Park	$1,600,000
North Street Pavers	$1,969,379
Main Street Improvements	$461,886
Valley Street Drainage Improvements	$3,491,900
9th Street Sewer Separation and Stormwater Pump Station	$6,697,500
Wastewater Treatment Plant Capacity Increase Improvements	$1,939,000
Total	**$25,617,765**

[1]Cost reflects actual Contract Value and is not adjusted using ENR CCI

Furthermore, various improvements to required LTCP projects were made possible due to savings captured during design and construction. For example, during the Brown Street Sewer Project Phase 2 project, PaveDrain permeable paving system was included in lieu of traditional pavement to decrease stormwater runoff and further reduce CSO volume.

The Greenbush CSO Storage Tank is a prime example of capturing cost savings during design and construction, and utilizing the savings to improve the site while also making available funding for many of the projects listed in **Table 4-1**. The project was initially planned as a 5.9 MG storage facility that was to include a separate upstream screening structure. The total estimated cost for this project was $35,900,000. Through accurate and updated modeling and the use of Value Engineering, the tank was reduced in size to 4.2 MG, and the previously planned separate screening structure was revised such that mechanical screens would be installed within the storage tank. The final cost for this project, which was delivered via Guaranteed Savings Approach method, was $23,100,932, resulting in a savings of $12,799,068. During construction, there was a savings capture of $1 Million by keeping excavated soil on site and reusing this soil for a future sledding hill and amphitheater.

As future LTCP projects are designed and implemented, the City will continue to strive toward Value Engineering of these projects to ensure the requirements of the plan are met with improvements to the community and water quality.

Section 5 Water Quality Impacts

The implementation of the CSO LTCP has contributed to substantial improvement in water quality of Lafayette waterways, most notable the Wabash River. Since the construction of LTCP projects began, the annual CSO volume based on a typical year storm has decreased by 61%. See **Figure 5-1** and **Figure 5-2** for the total CSO event and volume reduction, with the latest available data from the XPSWMM collection system model following completion of the Greenbush CSO Storage Tank in 2019. For a breakdown of CSO event and volume reduction per outfall, see **Table 5-1**.

Figure 5-1: Annual Average Overflow Events in a Typical Year

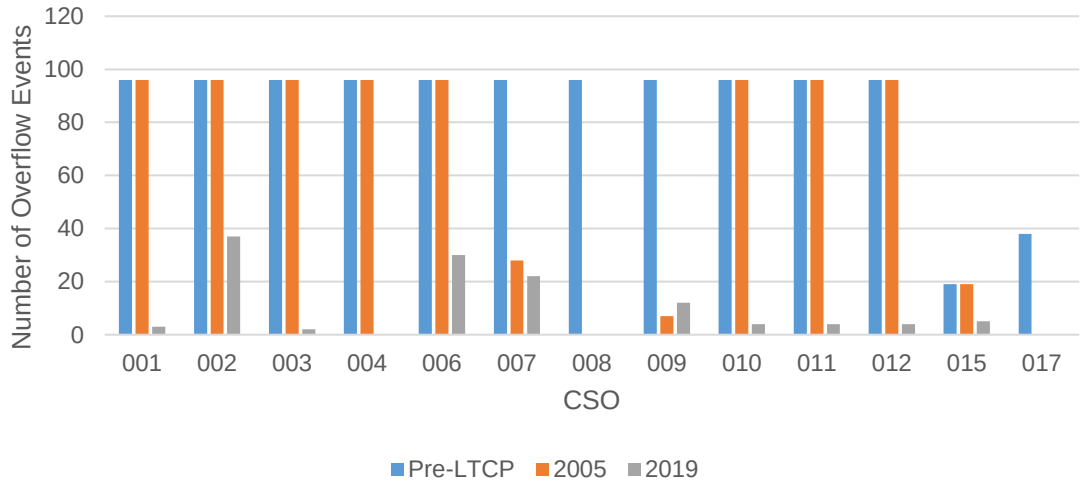
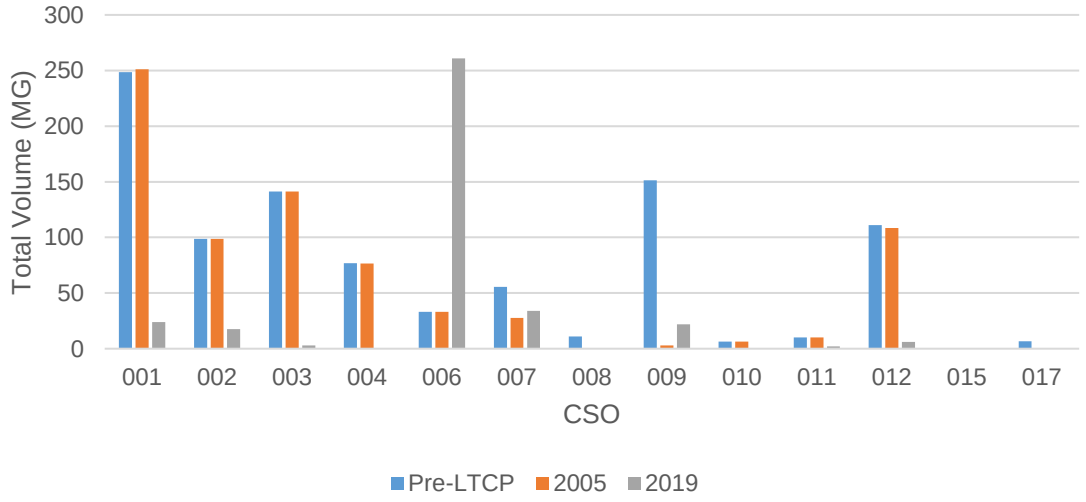


Figure 5-2: Annual Average Overflow Volume in a Typical Year[1]



[1]Completed projects have conveyed and consolidated flow to CSO 006 as this is the outfall for the future 5.3 MG CSO storage tank planned for Phase II-C. Upon completion of Phase II-C, the total CSO volume will be greatly reduced.

Table 5-1: Annual Average Overflows (Typical Year)

	Receiving Stream	Wabash River								Durkees Run Ditch				Elliott Ditch	
	CSO Number	001	002	003	004	006[1]	007	008	009	010	011	012	015	017	Total
Pre-LTCP	Total Volume (MG)	248	99	141	77	33	55	11	151	6	10	111	1	7	952
	# of Overflow Events	96	96	96	96	96	96	96	96	96	96	96	19	38	96
2005	Total Volume (MG)	251	99	141	77	33	28	0	3	6	10	109	1	0	757
	# of Overflow Events	96	96	96	96	96	28	0	7	96	96	96	19	0	96
2019	Total Volume (MG)	24	17	3	0	261	34	0	22	0	2	6	0	0	370
	# of Overflow Events	3	37	2	0	30	22	0	12	4	4	4	5	0	37

[1]*Completed projects have conveyed and consolidated flow to CSO 006 as this is the outfall for the future 5.3 MG CSO storage tank planned for Phase II-C. Upon completion of Phase II-C, the total CSO volume will be greatly reduced.*

Section 6 Future CSO LTCP Work

As indicated previously in this report, Phase II-C and II-D are the final phases of the approved CSO LTCP to be completed by the City. Phase II-C currently includes a 55 MGD wet weather expansion of the Pearl River Lift Station and a 5.3 MG CSO Storage Tank near the CSO 006 site. Phase II-D currently includes a High Rate Treatment (HRT) Facility in the area near the CSO 009 site, adjacent to the WWTP. As was done throughout the completion of previous and current LTCP-mandated projects, the City is constantly striving to perform Value Engineering (VE) on future LTCP-mandated projects in order to optimize the current approved CSO LTCP and be able to reinvest savings from past infrastructure projects in future work to best fit the needs of the community.

Preliminary modeling analysis of the collection system determined that it may be possible to combine the CSO Storage Tank and HRT Facility into a single facility, thereby reducing the total capital cost while maintaining the same level of control. The potential to combine these facilities is currently being evaluated through collection system hydraulic modeling, including but not limited to, flow monitoring, model recalibration and CSO Control Facility alternatives cost and footprint analysis.

Appendix A