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Combined Sewer Overflow (CSO) Long-Term Control Plan (LTCP)

Report

City of

Ashland, KY

October 2011

Revised July 2013

Revised May 2015

STRAND ASSOCIATES®

Report for

City of Ashland, Kentucky

Combined Sewer Overflow (CSO) Long-Term Control Plan (LTCP)

STATE OF KENTUCKY
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6/11/15

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October 2011
Revised July 2013
Revised May 2015

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CERTIFICATION

2015 REVISED COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Ryan Eastwood, Director of Engineering and Utilities

5-7-15
Date

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EXECUTIVE SUMMARY

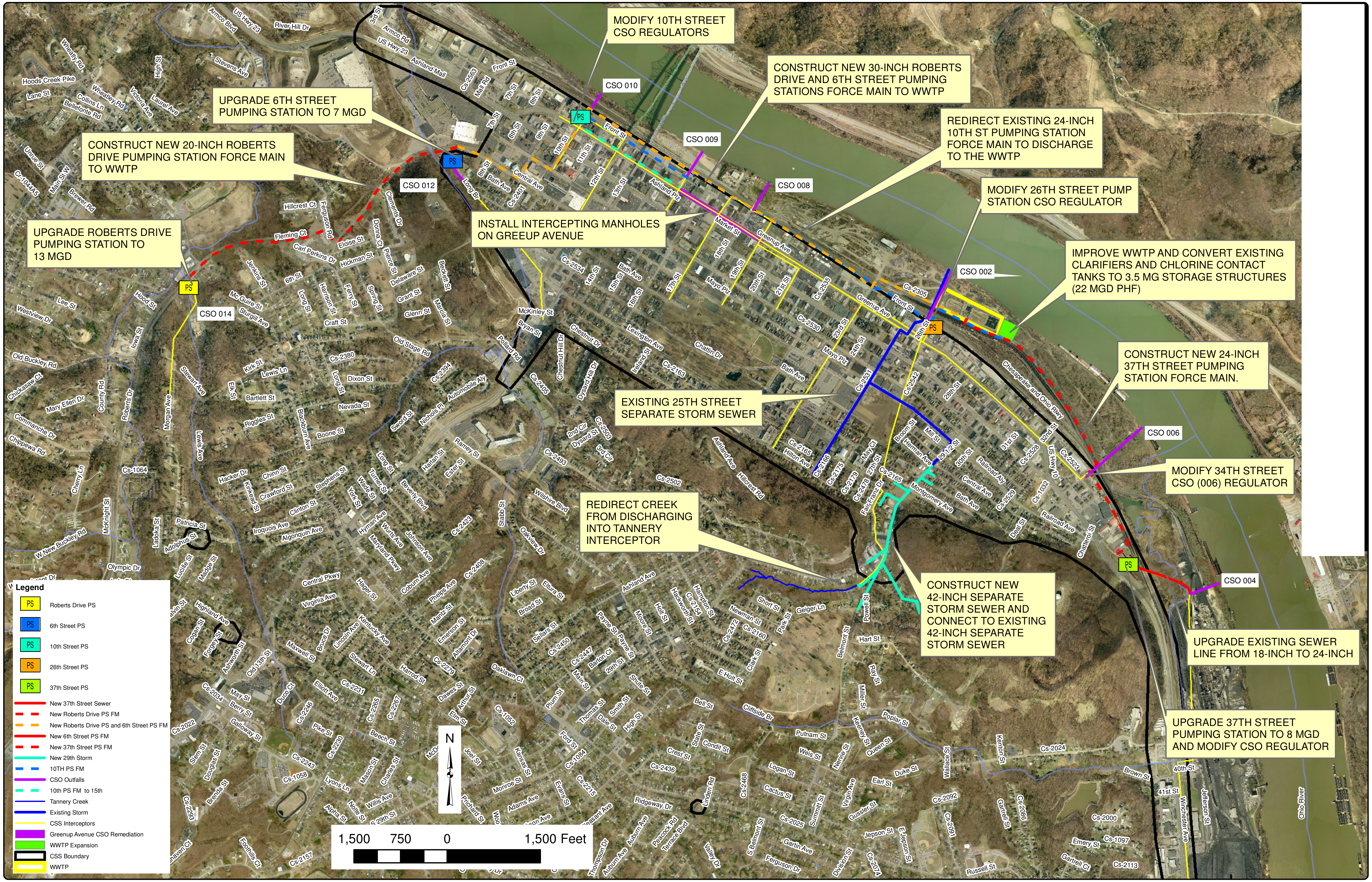
PURPOSE AND BACKGROUND

In 1994, the United States Environmental Protection Agency (USEPA) adopted the National Combined Sewer Overflow (CSO) Control Policy that required combined sewer communities to develop a plan for controlling CSOs, or a Long-Term Control Plan (LTCP). Ashland entered into a Consent Judgment with the state on September 4, 2007. Among other things, the Consent Judgment required Ashland to prepare this LTCP and follow through with the implementation of the approved plan within a specified time. On December 21, 2007, USEPA issued an Administrative Order to Ashland. This CSOP LTCP was developed in accordance with the national and state LTCP guidance and was shaped based on requirements of the Consent Judgment issued to Ashland.

RECOMMENDED PLAN AND IMPLEMENTATION SCHEDULE

Hydraulic modeling indicates that the implementation of the recommended plan projects will result in the elimination or capture for treatment of 93 percent (above the 85 percent required by the CSO policy) by volume of the combined sewage collected in the combined sewer system (CSS) during precipitation events on a systemwide annual basis. The estimated total cost of the recommended plan is about $42.5 million and all projects will be completed by December 31, 2025. Table ES-1 lists the components, schedule, and estimated capital cost of the recommended plan. Figure ES-1 shows the location of the recommended infrastructure.

Modeling indicates that, after completion of the 29th Street Separation Project (scheduled to be completed by December 31, 2016), the City's CSS will be capturing for treatment 85 percent or more of the combined sewage collected in the CSS during precipitation events. However, it must be noted that the collected CSO flow meter data presented in Section 11 and in Appendix U indicates that the City's CSS has consistently been capturing for treatment, over 90 percent of the combined sewage collected in the CSS during precipitation events for the past three years. Thus, the City’s LTCP has met the expectations of the CSO Policy and is consistent with USEPA’s Guidance for Long-Term Control Plan, EPA 832-B-95-002, September 1995 before the December 21, 2017 deadline set by USEPA’s Administrative Order dated December 21, 2007. However, the City will continue with the remaining planned projects in the Recommended Plan to achieve a modeled percent capture of 93 percent. The actual percentage capture may be higher than 93 percent since the model, being conservative tends to underpredict the actual percent capture calculated from flow meters installed on CSO outfalls and WWTP influent flows.



RECOMMENDED PLAN

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE ES-1
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure ES-1

Table ES-1 Recommended Plan Projects Schedule and Total Capital Cost

	Item	Project ID	Rated Capacity	Start Date[3]	Completion Date[3]	Estimated Capital Cost[1,2]
Recommended CSO Projects						
1	Completed Projects					
	Roberts Drive PS and 6th Street PS Improvement	03050	20 mgd	1/1/2010	12/31/2012	$6,800,000
	10th Street Regulator Modifications	03050		1/1/2010	12/31/2012	$200,000
	37th St PS Improvements	03060	8 mgd	1/1/2011	12/31/2014	$2,950,000
	34th Street Regulator Modifications	03060		1/1/2011	12/31/2014	$50,000
	Greenup Avenue Interceptor Manholes	03070		1/1/2014	12/31/2014	$220,000
2	In-Progress Projects					
	29th Street Separation Project	03200		1/1/2014	12/31/2016	$4,000,000
3	Planned Projects (4)					
	WWTP Improvements with 3.5 MG Onsite Storage	03210	22 mgd	1/1/2018	12/31/2025	$27,600,000
	10th Street PS FM Modifications	03220	10 mgd	1/1/2018	12/31/2025	$100,000
	26th Street Regulator Modifications	03230		1/1/2018	12/31/2025	$60,000
	26th Street PS Improvements (Electrical and SCADA)	03230		1/1/2018	12/31/2025	$550,000
	Recommended Plan Total					**$42,530,000**

[1]Includes Contingencies and Technical Services.

[2]All costs for In-Progress and Planned projects in 2nd quarter 2015 dollars.

[3]Start and completion dates depend December 2015 final approval of LTCP by regulators.

[4]Planned projects will likely be combined into one project.

SECTION 1
PURPOSE AND INTENT OF THE CSO LTCP

The City of Ashland, Kentucky (Ashland) is preparing this Combined Sewer Overflow (CSO) Long-Term Control Plan (LTCP) in response to the National Pollutant Discharge Elimination System (NPDES) permit requirements and to comply with the Consent Judgment between Ashland and the Commonwealth of Kentucky, by and through its Environmental and Public Protection Cabinet.

The purpose of this CSO LTCP is to characterize Ashland's Combined Sewer System (CSS) and the water quality impacts of the CSO discharges and to select from a range of alternatives cost-effective CSO abatement controls that will fulfill the requirements of the Clean Water Act (CWA).

This section provides background information on the nation's CSSs, a description of CSSs, water quality impacts of CSOs, regulatory requirements on CSOs, and the project approach used in the development of Ashland's CSO LTCP.

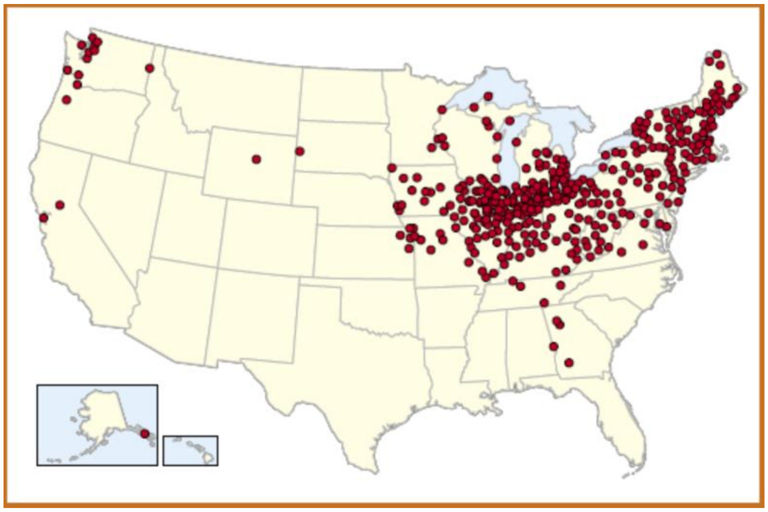


Figure 1.01-1 American CSO Communities

1.01 INTRODUCTION

A. Background Information

Historically, most American cities utilized CSSs to convey both wastewater and stormwater from neighborhoods and businesses, but in 1948 the Water Pollution Control Act (WPCA) was passed to protect surface waters from pollution, which effectively ended the construction of new combined sewers. CSSs are mostly found in older communities located predominantly in the Northeast and Great Lakes regions, and the Pacific Northwest (see Figure 1.01-1). As of 2011, the United States Environmental Protection Agency (USEPA) reports that approximately 772 United States cities have CSSs that serve about 40 million people. In Kentucky, 17 communities still operate CSSs and are considered CSO communities (see Table 1.01-1). The majority of these communities, including Ashland, are currently undergoing programs to reduce or eliminate its CSOs.

Kentucky Combined Sewer Systems

NAME	Associated KPDES Permit	Number of CSOs Listed on Permit	Population Served
Louisville - MSD	KY0022411	115	430,000
Northern KY - Sanitation District No.1	KY0021466	74	335,000
Owensboro	KY0020095	8	54,000
Frankfort	KY0022861	15	50,611
Paducah	KY0022799	11	34,500
Ashland	KY0022373	8	30,000
Henderson	KY0020711	14	29,500
Pikeville	KY0025291	3	10,000
Pineville	KY0024058	3	9,111
Maysville	KY0020257	11	8,950
Prestonsburg	KY0027413	1	4,800
Catlettsburg	KY0035467	17	4,100
Morganfield	KY0021440	2	3,850
Harlan	KY0026093	1	3,786
Worthington	KY0022926	3	2,168
Vanceburg	KY0021512	5	2,038
Loyall	KY0026115	6	1,332

Table 1.01-1 Kentucky CSSs

Ashland is a very industrial community located in Boyd County along the banks of the Ohio River near the confluence of the Big Sandy River. Ashland had a 2010 population of 21,684 people. The Combined System Service Area (CSSA) mainly affects the Ohio River, which drains large areas of Kentucky, Pennsylvania, West Virginia, and Ohio. Figure 1.01-2 is a map of Ashland that shows the CSS and total sewer system and indicates the locations of all CSOs in Ashland. The most upstream CSO is located near Ohio River Mile (RM) 320, and the most downstream CSO on the Ohio River is located near RM 323. To encompass the extent of the CSO impacts, this study included the Ohio River waters from RM 317.2 to RM 327.7.

The study area ended at Ohio RM 327.7, beyond Ironton, Ohio. In addition to the Ohio River, segments of Little Hoods Creek, Hoods Creek, and Long Run before confluence with the Ohio River are included in the study area.

As Figure 1.01-3 shows, Ashland is not the only CSO city located along the Ohio River. Other CSO cities located close to Ashland include Huntington, Cattletsburg, Ironton, Portsmouth, Kenova, and Worthington.

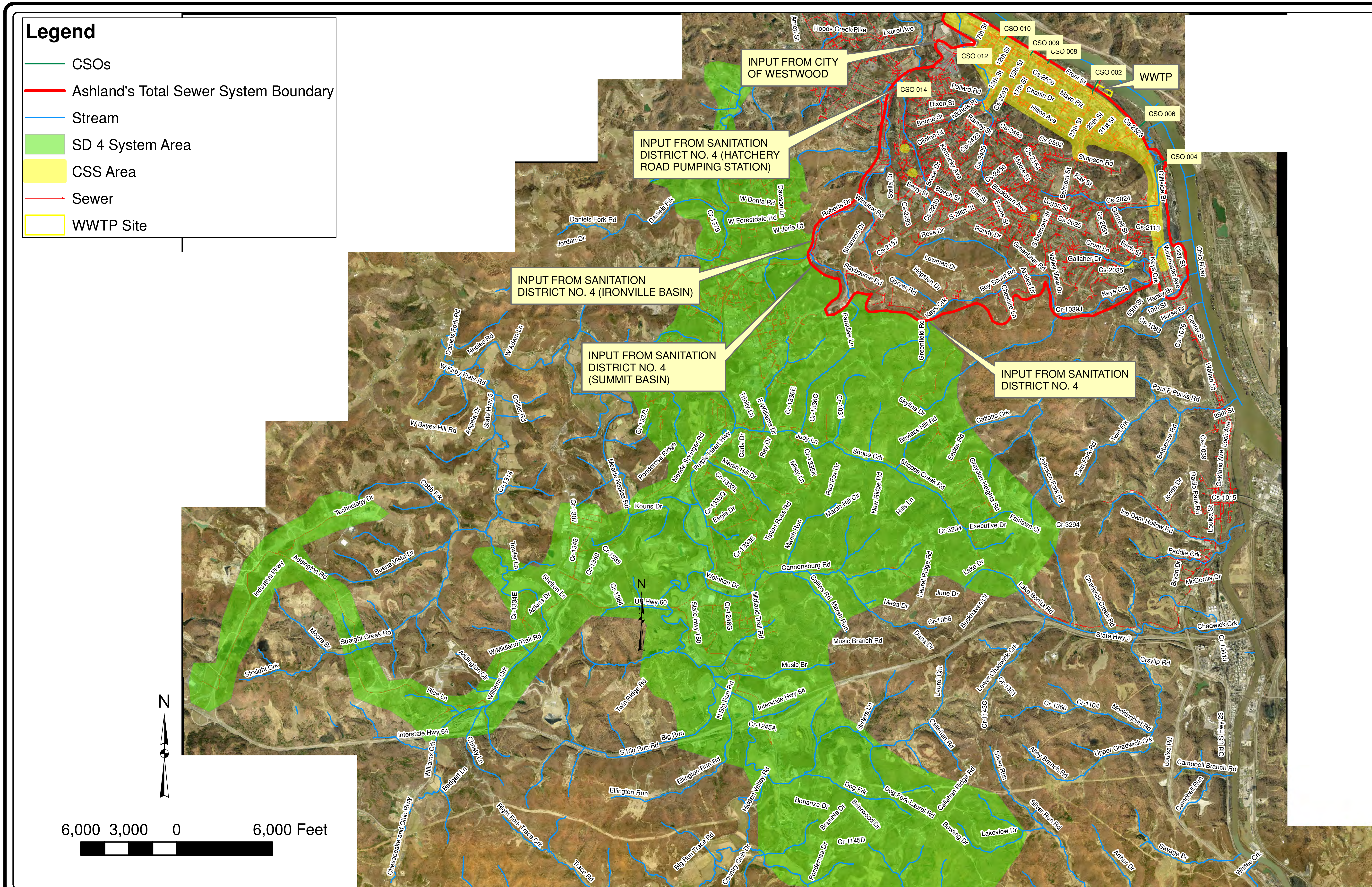
B. <u>CSS Description</u>

CSSs are sewers that are designed to collect rainwater runoff, domestic wastewater, and industrial wastewater in the same pipe. Most of the time, CSSs transport all wastewater to a wastewater treatment plant (WWTP) where it is treated and then discharged to a water body. During periods of heavy rainfall (or snowmelt), however, the wastewater volume in a CSS can exceed the capacity of the sewer system or WWTP. For this reason, CSSs are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies.

During wet weather, at a minimum, the “first flush” should be conveyed to the WWTP. The “first flush” is the initial surge of collected flow in the CSS whose pollutant levels are relatively high because of the cleaning effect of the streets, parking lots, and sewers. When the capacity of the combined sewers and/or WWTP is exceeded during heavy rainfall events, and the excess overflows directly into a water body, it is called a CSO.

C. <u>Water Quality Impacts of CSOs</u>

CSOs can carry pollutants normally found in untreated wastewater and stormwater including bacteria, organic matter, suspended solids, floatables, pathogens, oil, grease, and other contaminants into rivers and streams. All these substances have a negative impact on the overall water quality of the receiving surface waters. The most significant adverse impacts include bacterial contamination and reduced oxygen levels; these problems can cause the waters to be harmful to aquatic life and humans who come in contact with the water body. CSOs are also a threat to drinking water supplies and contribute to aesthetic degradation, shellfish harvesting restrictions, beach closures, and fish kills.



COMBINED SEWER SYSTEM AND TOTAL SEWER SYSTEM BOUNDARIES

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

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FIGURE 1.01-2
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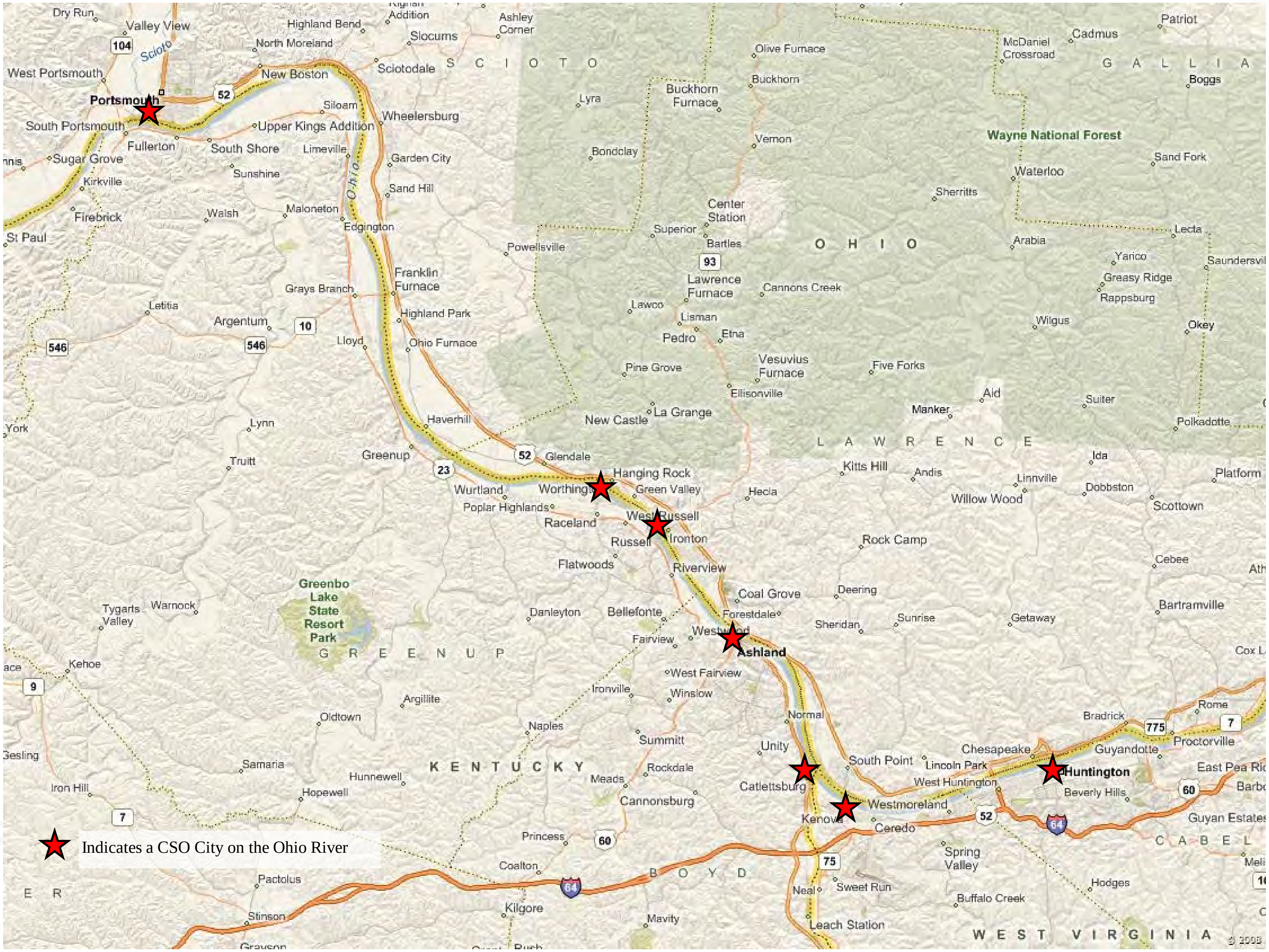


COMBINED SEWER OVERFLOW CITIES
ON THE OHIO RIVER NEAR ASHLAND

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.
ENGINEERS

FIGURE 1.01-3
5102.002

1.02 CSS REGULATIONS

A. CSO Legislation

In 1972, the CWA introduced a system of permitting to regulate point sources of pollution. Point sources include: Industrial facilities (including manufacturing, mining, oil and gas extraction, and service industries), municipal governments and other government facilities, and some agricultural facilities such as concentrated animal feeding operations.

Point source discharges of pollutants to surface waters without a permit from the NPDES are illegal. The NPDES program permits and regulates wastewater discharges by monitoring the concentrations and pollutants being discharged. This system is managed by the USEPA in partnership with state environmental agencies.

On September 30, 1983, the USEPA delegated the NPDES permit program under Section 402 of the CWA to the Kentucky Natural Resources and Environmental Protection Cabinet (NREPC). The program administered by the Kentucky Division of Water (KDOW) of the NREPC is now known as the Kentucky Pollution Discharge Elimination System (KPDES).

The 1972 CWA created a new requirement for technology-based standards for point source discharges called technology-based effluent limits. USEPA develops these standards for categories of dischargers based on the performance of pollution control technologies without regard to the conditions of a particular receiving water body. The standard becomes the minimum regulatory requirement in a permit.

The 1972 CWA authorized continued use of the water quality-based approach but in coordination with the technology-based standards. After application of technology-based standards to a permit, if water quality is still impaired for the particular water body, the permitting agency may add water quality-based limitations to that permit. The additional limitations are to be more stringent than the technology-based limitations and would require the permittee to install additional controls. These are called water quality-based effluent limits.

In 1989, the USEPA published the National Combined Sewer Overflow Control Strategy, and in 1994, adopted the National Combined Sewer Overflow Control Policy (CSOCP) that required CSO communities, such as the Ashland, to implement nine minimum controls (NMC) and develop a CSO LTCP.

The NMC includes the following measures:

1. Proper operation and maintenance programs for the CSS and overflow points.

2. Maximum use of CSS storage.

3. Review and modification of pretreatment requirements to minimize CSO impacts.

4. Maximization of flow to the publicly owned treatment works for treatment.

5. Prohibition of CSOs during dry weather.

6. Control of solid and floatable materials in the CSOs.

7. Pollution prevention of stormwater entering the CSS by transposing the previously adopted storm sewer best management practices (BMPs) to CSSs.

8. Public notification to provide the public with adequate notification of CSO impacts.

9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

See Appendix A for a copy of Ashland's NMCs. Kentucky published the *Kentucky Combined Sewer Overflow Control Strategy* in 1990, which was designed to control CSO discharges throughout the state. After the National CSOCP was adopted in 1994, Kentucky published a new *Kentucky Combined Sewer Overflow Control Strategy* in 1997. The revised strategy incorporated the USEPA's national strategies, as well as the Ohio River Valley Water Sanitation Commission (ORSANCO) strategy for monitoring impacts of CSO on the Ohio River.

B. Consent Judgment and Administrative Order

A Consent Judgment was issued on September 4, 2007, to Ashland from the KDOW under requirements of the USEPA. Among other things, the Consent Judgment also requires the City to prepare this LTCP and follow through with the implementation of the approved plan within a specified time. On December 21, 2007, USEPA issued an Administrative Order to Ashland requiring Ashland to complete all CSO projects by December 21, 2017, unless Ashland can demonstrate additional time is needed as a result of a high financial burden determination consistent with USEPA's *Guidance for Financial Capability Assessment and Schedule Development*, EPA 832-8-97-004, February 1997. A copy of the Consent Judgment and Administrative Order are included in Appendix B.

1.03 PROJECT METHODOLOGY

A. Project Team

To maximize the success of this effort, the project team worked closely to address all areas of the project and to meet the targeted completion dates.

City of Ashland (PO Box 1839 Ashland, KY 41105) is the municipality under the Consent Judgment from KDOW. Ashland contracted with Strand Associates, Inc.® (Strand), and worked closely with Strand to reach the end goals of this effort.

Strand Associates, Inc.® (325 West Main Street, Suite 710 Louisville, KY 40202) was the engineering consultant for the development of this project. Strand's scope of work included efforts necessary to complete the development of this document.

Kentucky Division of Enforcement (KDOE) (200 Fair Oaks Lane, Frankfort, KY 40601) is the administrative organization of the KDOW that issued the Consent Judgment to Ashland. KDOE provided guidance throughout this project.

ORSANCO (Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, West Virginia) is the interstate water pollution control agency dedicated to pollution abatement along the Ohio River. This organization authored documentation on water quality used in this project.

B. Project Approach

The CSO LTCP was developed in accordance with the national and state LTCP guidance and was shaped based on the requirements of the Consent Judgment issued to Ashland. This document was written to demonstrate how Ashland addressed the following critical points in Section 20.b of the Consent Judgment.

1. *The LTCP was developed to meet the following goals*

   I. *Ensure that if CSOs occur, they are only as a result of wet weather;*

   II. *Bring all wet weather CSO discharge points into compliance with the CWA and KRS Chapter 224; and*

   III. *Minimize the impacts of CSOs on water quality, aquatic biota, and human health.*

2. *The LTCP includes consideration of the following elements*

   I. *The results of characterization, monitoring, modeling activities, and design parameters as the basis for selection and design of effective CSO controls;*

   II. *The results of an evaluation of WWTP peak flow treatment capacity for any WWTP that will receive additional flow based on any LTCP project. Such evaluation shall be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach," EPA CERI, October 1984, and Retrofitting POTWs," EPA CERI, July 1989;*

   III. *A report on the public participation process;*

   IV. *Identification of how the LTCP addresses sensitive areas as the highest priority for controlling overflows;*

   V. *A report on the cost analyses of the alternatives considered;*

   VI. *Operational plan revisions to include agreed-upon long-term CSO controls;*

   VII. *Maximization of treatment at the defendant's existing wastewater treatment plants for wet weather flows;*

VIII. Identification of and an implementation schedule for the selected CSO controls;

IX. A post-construction compliance monitoring program adequate to verify compliance with water quality-based CWA requirements and ascertain the effectiveness of CSO controls; and

X. A general description of the land use in the immediate area of the overflow as well as downstream as part of the characterization of the CSOs.

3. *Additionally the LTCP include documentation of alternatives considered in the development of the control strategy.*

Table 1.03-1 lists the elements and goals and where they are addressed in this report.

The Consent Judgment required Ashland to submit an Interim LTCP (ILTCP) to Kentucky Department of Environmental Protection (KDEP), a branch of the Kentucky Environmental and Public Protection Cabinet, by September 5, 2008, for review and approval. Ashland submitted its ILTCP to the KDEP and the USEPA on September 3, 2008. After a joint review of the ILTCP by the KDEP and USEPA, KDEP sent comments to Ashland on July 7, 2009. These comments had to be addressed before the ILTCP will receive regulatory approval. Ashland met with regulators to discuss the ILTCP comments on September 21, 2009. Ashland submitted its response including a partial ILTCP revision on November 30, 2009.

On October 21, 2010, KDEP (with USEPA concurrence) approved the ILTCP. The ILTCP approval letter fixed the date for submitting the Final LTCP as October 21, 2011. Correspondence related to the ILTCP is included in Appendix C. The approved ILTCP formed the basis for this LTCP.

TABLE 1.03-1

ELEMENTS AND GOALS OF THE LTCP AND WHERE ADDRESSED IN THE REPORT

CD Section 20.b	Required Goals/Elements of LTCP in Consent Judgement Section 20.b	Location Addressed in LTCP	Comment
2.i	The results of characterization, monitoring, modeling activities, and design parameters as the basis for selection and design of effective CSO controls.	Section 2	
2.ii	The results of an evaluation of WWTP peak flow treatment capacity for any WWTP that will receive additional flow based on any LTCP project. Such evaluation shall be consistent with the EPA publications "Improving POTW Performance Using the Composite Correction Approach," EPA CERI, October 1984, and Retrofitting POTWs," EPA CERI, July 1989.	Section 7	
2.iii	A report on the public participation process.	Section 3	
2.iv	Identification of how the LTCP addresses sensitive areas as the highest priority for controlling overflows.	Section 4	
2.v	A report on the cost analyses of the alternatives considered.	Section 6	
2.vi	Operational plan revisions to include agreed-upon long-term CSO controls.	Section 10	
2.vii	Maximization of treatment at the defendant's existing wastewater treatment plant for wet weather flows.	Section 7	
2.viii	Identification of and an implementation schedule for the selected CSO controls.	Section 9	
2.ix	A post-construction compliance monitoring program adequate to verify compliance with water quality-based CWA requirements and ascertain the effectiveness of CSO controls.	Section 11	
2.x	A general description of the land use in the immediate area of the overflow as well as downstream as part of the characterization of the CSOs.	Section 2.05	
3	Additionally the LTCP shall include documentation of alternatives considered in the development of the control strategy.	Section 6 and Appendices N and T	

1.04 DEFINITIONS

303(d)	Section of CWA that requires states to list impaired waters ("303(d) list")
305(b)	Section of CWA that requires the USEPA to submit the National Water Quality Inventory Report to Congress (305(b) report).
Ashland	City of Ashland, Kentucky
AVFM	Area-Velocity Flow Meter
BOD	biochemical oxygen demand
BOD_5	five-day biochemical oxygen demand
BMP	best management practices
Ashland	City of Ashland, Kentucky
CPH	cost per household
CSO	combined sewer overflow
CSOCP	Combined Sewer Overflow Control Policy
CSOP	Combined Sewer Operational Plan
CSS	combined sewer system
CSSA	combined system service area
CWA	Clean Water Act
DFW	Department of Fish and Wildlife
FCPS	Flood Control Pump Station
ft	feet
gpm	gallons per minute
I/I	infiltration/inflow
ILTCP	Interim Long-Term Control Plan
KDEP	Kentucky Department for Environmental Protection
KDOE	Kentucky Division of Enforcement
KDOW	Kentucky Division of Water
KIA	Kentucky Infrastructure Authority
KPDES	Kentucky Pollution Discharge Elimination System
LTCP	Long-Term Control Plan
mg/L	milligrams per liter
MHI	median household income
MCC	Midwest Climate Center
NMC	nine minimum controls
NPDES	National Pollutant Discharge Elimination System
NREPC	Natural Resources and Environmental Protection Cabinet
O&M	operation and maintenance
ORSANCO	Ohio River Valley Water Sanitation Commission
PHF	peak hourly flow
PS	pump station
RM	River Mile
SCADA	supervisory control and data acquisition
SSES	sanitary sewer evaluation survey
SSS	separate sanitary system
Strand	Strand Associates, Inc.®
TDH	total dynamic head

TKN	total Kjeldahl nitrogen
TSS	total suspended solids
TMDL	total maximum daily load
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WPCA	Water Pollution Control Act
WQS	water quality standards
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant
xpswmm™	XP Software-Stormwater Management Model ™

1.05 AGENCY COMMENTS AND RESPONSES

Agency comments were received from KDOW and USEPA on the October 2011 Long Term Control Plan. A copy of the January 25, 2013 comment letter is included in Appendix R. Also included is a document that provides a response to all comments. Minor revisions were incorporated throughout the July 2013 LTCP.

On January 26, 2015, the City, together with Strand, had a phone conference with the KDEP and the USEPA regarding the July 2013 revised LTCP. Following the phone conference, KDEP and USEPA sent a follow up letter to Ashland dated February 25, 2015, requesting that the July 2013 revised LTCP be amended to include information agreed upon at the meeting. Minor revisions were incorporated in the Executive Summary and Sections 6, 7, 8, 9, and 11 and several appendices in this May 2015 LTCP.

SECTION 2
SYSTEM CHARACTERIZATION, MONITORING, AND MODELING

2.01 PURPOSE

The purpose of the LTCP is to develop a plan that satisfies the requirements of the CWA by allowing for the attainment of water quality standards (WQS) as defined by the designated use of the CSO receiving streams.

2.02 CHARACTERIZATION OF THE CSS

System characterization is critical in the development of CSO LTCP as it is necessary to understand the operation of the sewer system and its hydraulic response during wet weather events to properly develop an effective plan to mitigate CSOs.

This section describes the characterization of Ashland's Separate Sanitary System (SSS), CSS, and the CSO to receiving streams.

2.03 SERVICE AREAS

A. Total Sewer System

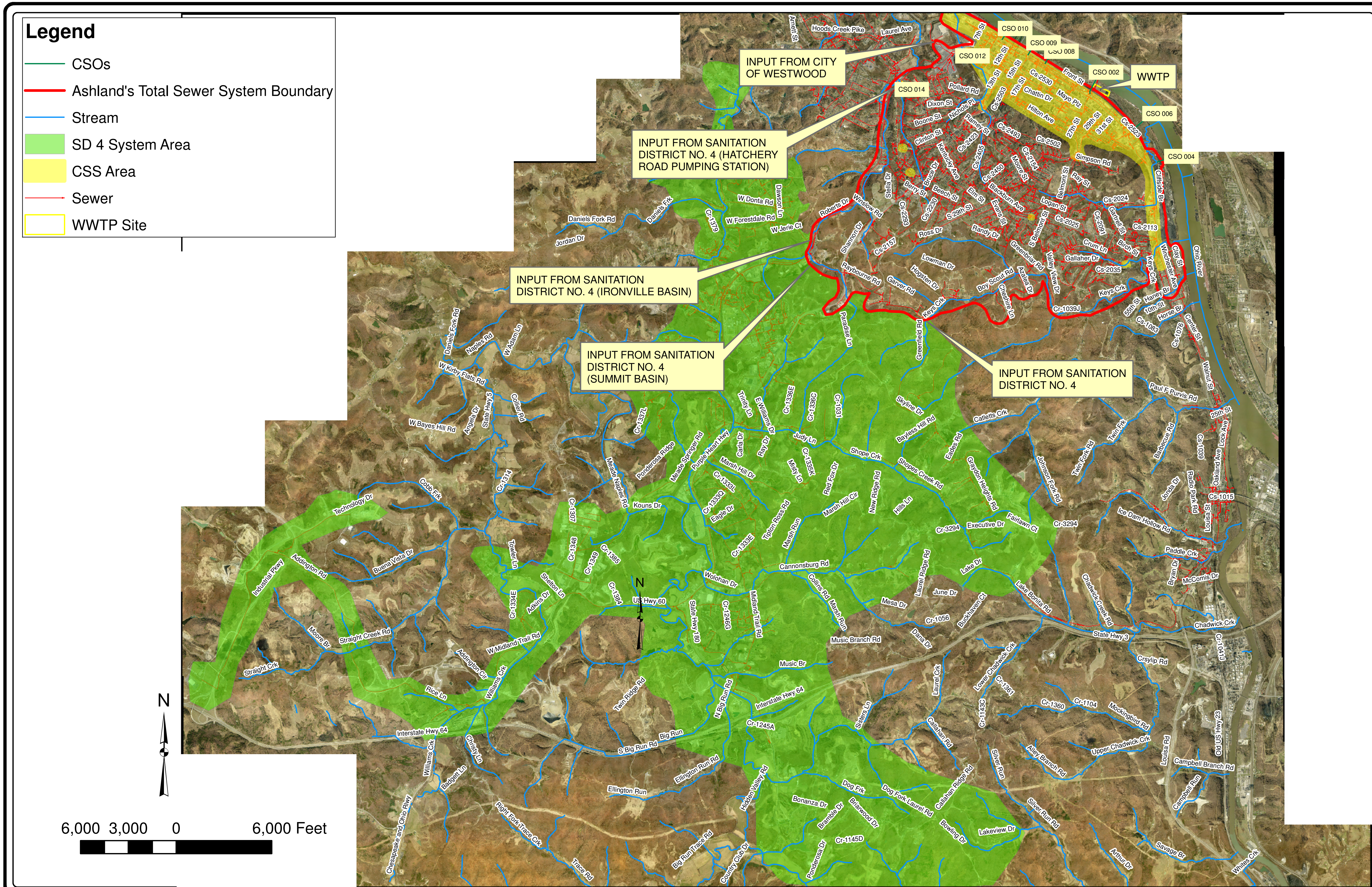
Ashland is located in Boyd County, Kentucky, along the banks of the Ohio River near the confluence of the Big Sandy River. Ashland owns and operates the local collection system and one WWTP. The collection system contains approximately 130 miles of sanitary sewers with a drainage area of approximately 5,750 acres serving a population of 21,684 people. In addition, four satellite sanitary systems, owned by Boyd County Sanitation District No. 4, discharge into Ashland's collection system. Figure 2.03-1 shows the location and boundary of the total sewer system.

B. CSS

Approximately 20 miles of the 130 miles of the collection system is combined sewer with a drainage area of approximately 960 acres. The combined system is generally located in the older downtown area along the Ohio River. Figure 2.03-1 shows the location and boundary of the CSS. Figure 2.03-2 is a schematic of the collection system and the CSS.

C. Previously Completed Stormwater Separation Projects

As part of the proactive approach in reducing CSO volumes, Ashland has implemented several separation projects that have removed approximately 190 acres of stormwater drainage from the CSS. The stormwater separation projects are illustrated in Figure 2.03-3 (refer to Section 7 for more detail).



COMBINED SEWER SYSTEM AND TOTAL SEWER SYSTEM BOUNDARIES

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

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FIGURE 2.03-1
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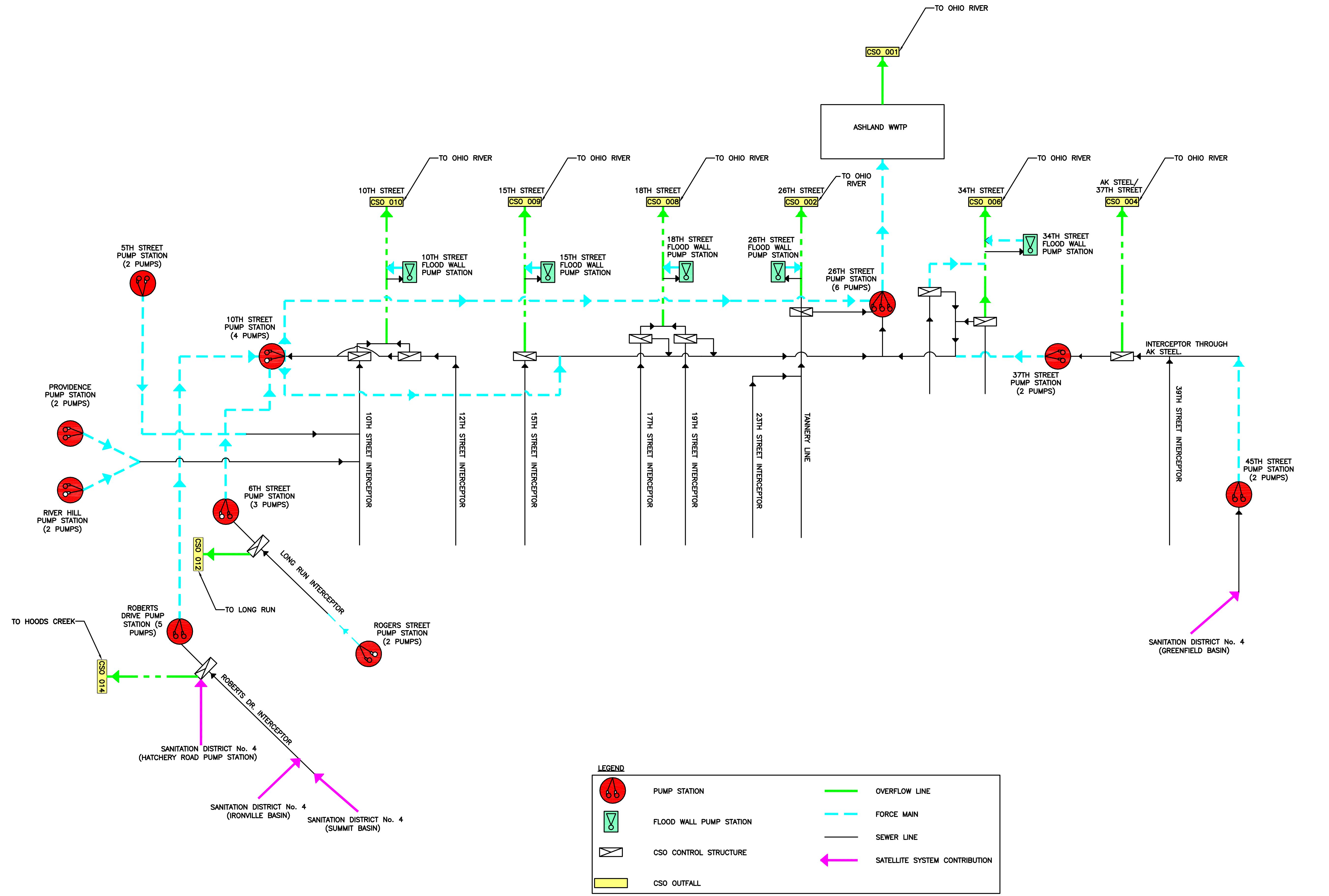

COLLECTION AND COMBINED SYSTEM SCHEMATIC

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 2.03-2

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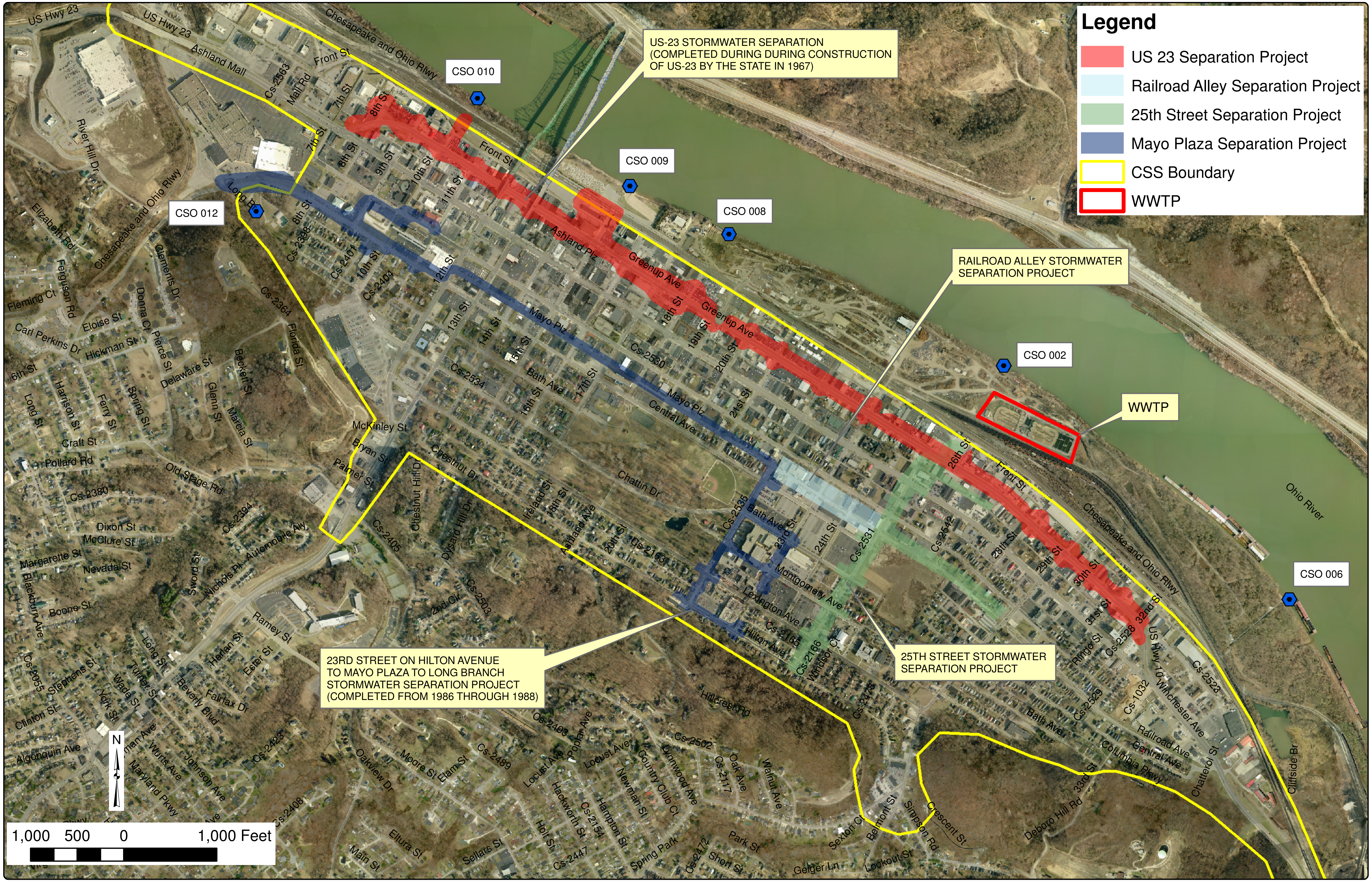


PREVIOUSLY COMPLETED STORMWATER SEPARATION PROJECTS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.03-3
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.03-3

D. SSS Discharging into the CSS

Ashland's collection system contains approximately 110 miles of SSS with a drainage area of approximately 4,790 acres. The CSS conveys all separate sanitary flows to the WWTP. Figure 2.03-4 shows the location and boundary of the Ashland's SSS that discharges into the CSS. Separate service areas that discharge into the CSS are described as follows.

1. Blackburn Avenue Service Area

The Blackburn Avenue Service Area is located on the southeastern part of the system with an approximate drainage area of 1,370 acres. The service area is mainly residential with a few commercial users. Most of the flow discharges by gravity to the 45th Street Pumping Station. The 45th Street PS has two pumps each rated at 790 gallons per minute (gpm) at 76 feet total dynamic head (TDH) and two 6-inch force mains. This PS discharges flow to an 18-inch gravity sewer along Blackburn Avenue. The Blackburn Avenue Service Area discharges into the CSS at the intersection of Blackburn Avenue and Winchester Avenue.

2. John R. Oliverio Park Service Area

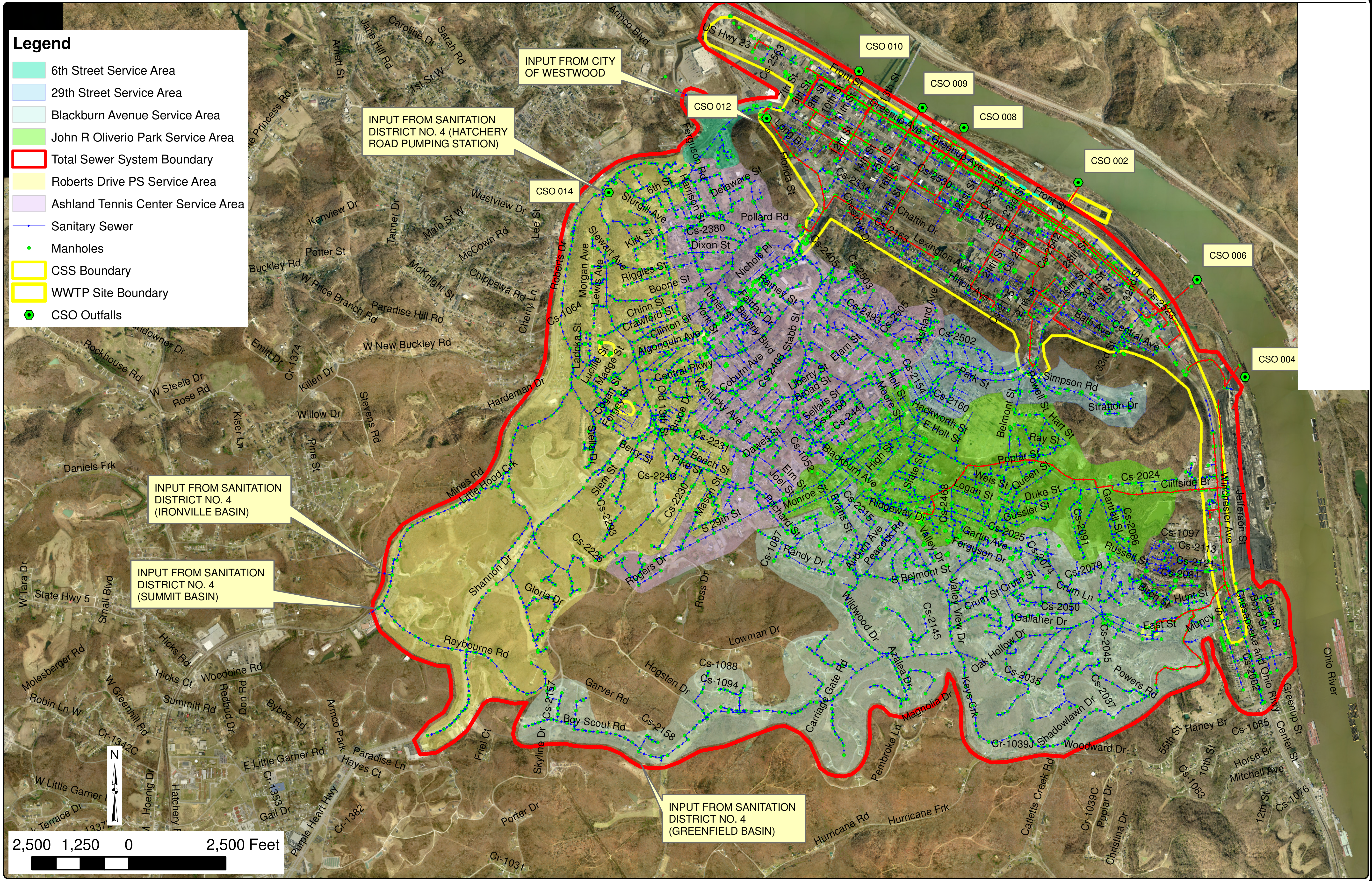
The John R. Oliverio Service Area has a drainage area of approximately 610 acres consisting of mostly residential and a few commercial users. Notable users within this basin are the Boyd County Health Department and the Oakview School. The John R. Oliverio Service Area discharges to the CSS through an 18-inch gravity sewer on Winchester Avenue between 39th and 40th Streets.

3. 29th Street Service Area

This is a relatively small service area of mostly residential users with an approximate drainage area of 190 acres. It is located south of the downtown area. It discharges flow to the CSS at the intersection of 29th and Belmont Streets through a 52-inch brick gravity sewer.

4. Ashland Tennis Center Service Area

The Ashland Tennis Center service area has a drainage area of approximately 850 acres consisting of mostly residential and commercial users. Notable users within this basin are the Ashland Community College, University of Kentucky, Ashland Tennis Center, and George M. Verity Middle School. The Ashland Tennis Center service area discharges to the CSS through an 18-inch gravity sewer at the intersection of Pollard Road and 13th Street.



SEPARATE SANITARY SYSTEM DISCHARGING INTO THE COMBINED SEWER SYSTEM

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.03-4
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.03-4

5. Roberts Drive PS Service Area

The Roberts Drive PS drainage basin is located on the southern and western part of the collection system. The PS is located on Roberts Drive close to the Juvenile Detention Center. The Roberts Drive PS has five variable speed pumps, each rated at 1,119 gpm at 146 feet TDH.

All five pumps can operate simultaneously during wet weather. The Roberts Drive PS drainage basin within Ashland consists of mostly residential and commercial users with an approximate area of 1,370 acres.

There are also three separate sanitary satellite systems that discharge to the Roberts Drive PS basin: (1) the Ironville Basin from the Boyd County Sanitation District No. 4 that discharges to the Roberts Drive PS basin through an 8-inch gravity sewer behind 4627 Roberts Drive; (2) the Summit Basin (satellite input) from the Boyd County Sanitation District No. 4 that discharges to the Roberts Drive PS basin through a 15-inch gravity sewer at the junction of Roberts Drive and Bob McCullough Drive; and (3) the satellite system from the the Boyd County Sanitation District No. 4 that discharges wastewater directly to a manhole at the Roberts Drive PS through a 14-inch force main from the Hatchery Road PS. This is the largest of the satellite systems with an average daily discharge of over 700 gpm. The Federal Corrections Institute, which is a major nondomestic user, discharges to the Hatchery Road PS.

CSO 014 (Roberts Drive) acts as a relief point for the Roberts Drive PS. Discharges from the Federal Corrections Institute can have high biochemical oxygen demand (BOD) and fats, oils, and grease concentrations. Overflows from the CSO 14 (Roberts Drive) CSO (CSO 014) can contain discharges from this nondomestic user and may contribute to water quality impacts in Little Hoods Creek and Hoods Creek.

Some catch basins are connected to some of the upstream sewers to the Roberts Drive PS. Ashland intends to disconnect these catch basins from the system if the upgrade to the Roberts Drive PS does not achieve the desired level of control (one overflow a year).

The Roberts Drive PS currently discharges to the CSS at the Tenth Street PS through a 20-inch ductile iron pipe force main. The proposed Roberts Drive PS improvements would install a larger force main and reroute the force main to discharge flow directly to the WWTP.

6. 6th Street Service Area

The 6th Street Service Area drainage basin is located on the northeastern part of the collection system. The service area has a drainage area of approximately 50 acres consisting of mostly residential and commercial users along 6th Street. The 6th Street Service Area discharges to the CSS through an 18-inch gravity sewer where Central Avenue becomes 6th Street.

E. Main CSS PSs

There are five main PSs within Ashland's CSS. Figure 2.03-5 shows their locations.

1. The Roberts Drive PS

The Roberts Drive PS is located on Roberts Drive about 350 feet south of the intersection of Roberts Drive and Blackburn Avenue close to the Juvenile Detention Center.

The Roberts Drive PS has five variable speed pumps, each rated at 1,119 gallons per minute (gpm) at 146 feet (ft) TDH. All five pumps can operate simultaneously during wet weather. The capacity of all five pumps operating simultaneously was determined to be about 3,000 gpm. CSO 014 (Roberts Drive) is the relief point for this PS.

The Roberts Drive PS service area within Ashland consists of mostly residential and commercial users with an approximate area of 1,370 acres. The Roberts Drive PS discharges to the 10th Street PS through a 20-inch force main.

The Roberts Drive PS improvement project will upgrade the firm capacity of the Roberts Drive PS from about 3,000 gpm to 9,000 gpm. The project also includes the construction of a new 20-inch force main from Roberts Drive PS to parallel the existing 20-inch force main. The new force main will combine with the existing 20-inch force main and a new 20-inch from the 6th Street PS into a 30-inch force main on 6th Street that discharges flow directly to the WWTP.

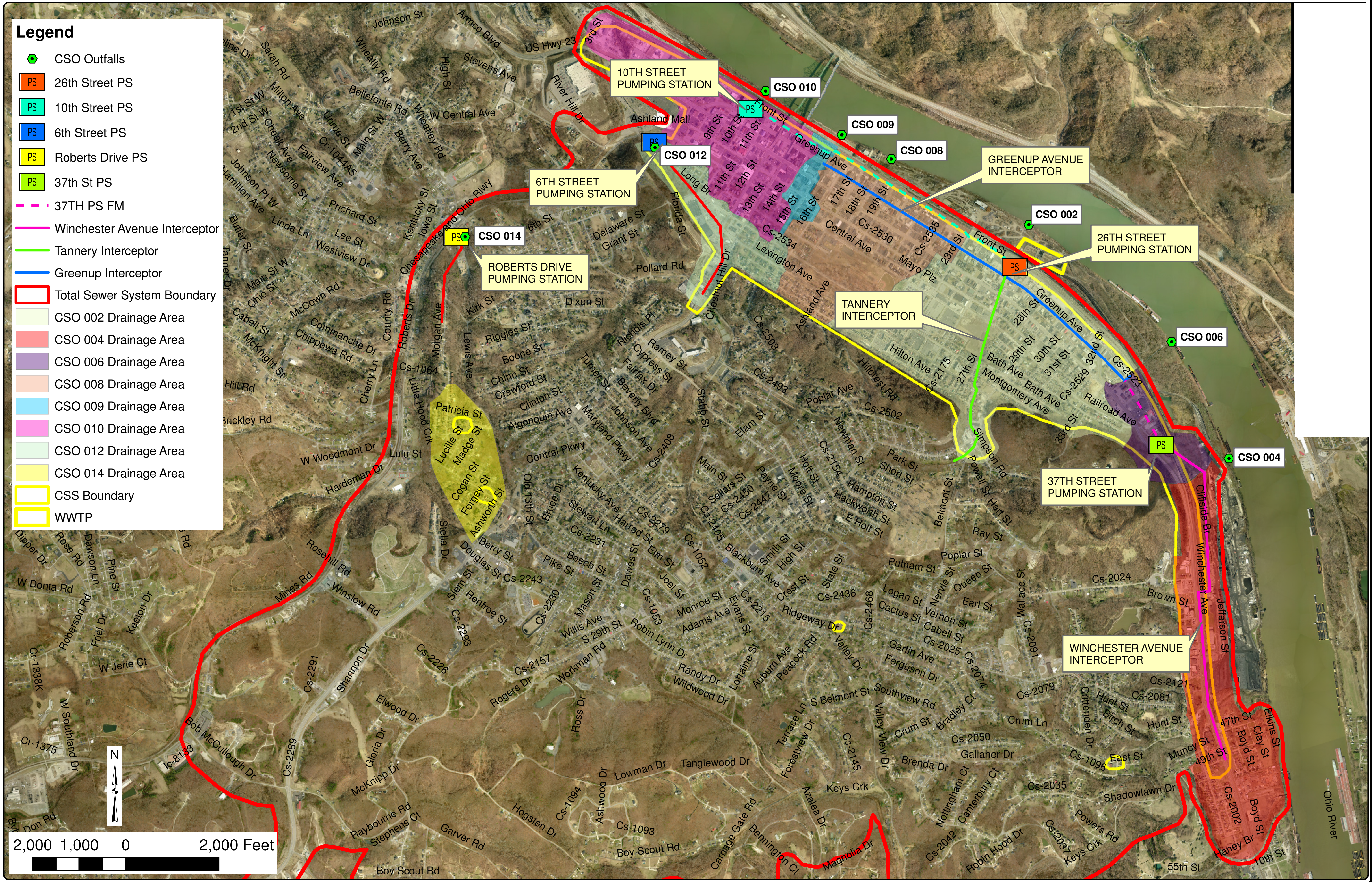
2. The 6th Street PS

The 6th Street PS is located off of 6th Street opposite the Ashland Mall along Long Branch.

The 6th Street Flood PS is also at this location. The 6th Street PS has three variable speed pumps (each rated at 2,600 gpm at 146 feet TDH). All three pumps can operate simultaneously during wet weather. The capacity of all three pumps operating simultaneously was determined to be approximately 2,630 gpm. CSO No. 012 (6th Street) is the relief point for this PS.

All flows from the Ashland Tennis Center service area, approximately 850 acres, discharge to the 6th Street PS. The CSS drainage area that discharges to the 6th Street PS is approximately 145 acres.

The 6th Street PS discharges to the 10th Street PS through a 16-inch force main.



CSO DRAINAGE AREAS, MAIN COMBINED SEWER SYSTEM PUMPING STATIONS AND CSO OUTFALL LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.03-5
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.03-5

The 6th Street PS improvement project will upgrade the firm capacity of the 6th Street PS from about 3.75 million gallons per day (mgd) to 7 mgd. The project also includes the construction of a new 20-inch force main from 6th Street PS. The new force main will combine with the existing Roberts Drive PS 20-inch force main and the new 20-inch from the Roberts Drive PS into a 30-inch force main on 6th Street that discharges flow directly to the WWTP. The existing 16-inch force main that currently discharges to the 10th Street PS will be abandoned.

3. The 10th Street PS

The 10th Street PS is located on 10th Street inside the flood wall. The 10th Street Flood Wall PS is also at this location. The 10th Street PS has four variable speed pumps. Two pumps rated at 2,400 gpm at 64 feet TDH and the other two rated at 2,300 gpm @ 53 feet TDH). All four pumps can operate simultaneously during wet weather. The peak capacity of all four pumps operating simultaneously is approximately 7,000 gpm.

The Roberts Drive PS and the 6th Street PS currently discharge to the 10th Street PS. There is also approximately 210 acres of CSS drainage that discharge directly to the 10th Street PS. Influent flow is split unevenly between two separate wet wells that are not connected. Each wet well has two pumps connected to it. Flow is pumped to a common 14-inch force main before flow is split between a 14-inch force main and a 24-inch force main. The 14-inch force main discharges to the 21-inch Greenup Avenue Interceptor sewer at the junction of 15th Street and Greenup Avenue. The Greenup Avenue Interceptor ultimately discharges to the 26th Street PS. The 24-inch force main discharges directly to the 26th Street PS.

CSO 010 (10th Street), with two regulators and one outfall, acts as the relief point for the 10th Street PS.

4. The 37th Street PS (Winchester Avenue PS)

The 37th Street PS is located off 37th Street along Winchester Avenue on the northeastern part of the collection system. It has two pumps each rated at 1,850 gpm at 63 feet TDH. Only one pump operates during wet weather.

The drainage area includes all flows from the separate sanitary Blackburn Avenue Service Area, approximately 1,370 acres, and the John R. Oliverio Service Area, approximately 610 acres. There is also approximately 330 acres of CSS drainage that discharges to the 37th Street PS through the Winchester Avenue Interceptor.

During wet weather when the capacity of the PS is exceeded, flow can back up and relieve the PS by discharging through the CSO 004 (37th Street) regulator located on AK Steel's property. The 37th Street PS 14-inch force main discharges to the 18-inch Greenup Avenue Interceptor east of the 26th Street PS on 34th Street about 250 feet from the 34th Street Flood Wall PS.

The large volume discharged during wet weather can impact CSO 006 (34th Street) directly. When the capacity of the 18-inch interceptor is exceeded, levels in the discharge manhole rise and flow backs up through the 34th Street Regulator A drop trough orifice and discharges through the 42-inch outfall to the Ohio River.

The 18-inch Greenup Avenue Interceptor east of the 26th Street PS and the 24-inch Greenup Avenue Interceptor west of the 26th Street PS discharge to a common manhole at the junction of 26th Street and Greenup Avenue where they combine to a 36-inch-diameter pipe and discharge by gravity to the 26th Street PS.

5. The 26th Street PS

The 26th Street PS is located at the end of 26th Street close to the flood wall. It has eight variable speed pumps each rated at 3,500 gpm at 65 feet TDH. All eight variable speed drives were installed in 2005 at a cost of $80,000. All eight pumps can operate simultaneously during wet weather.

All flows in Ashland's separate and CSS ultimately discharge to the 26th Street PS into two wet wells. The 26th Street PS then pumps all wastewater to the Ashland WWTP located on the unprotected side of the floodwall.

F. Main CSS Interceptors

Ashland's CSS has three main interceptors that convey CSS flow to the 26th Street PS. The 26th Street PS currently conveys all system flow going to the WWTP. Section 2.02.D. of this report discusses the 26th Street PS in detail. Figure 2.03-5 shows the three main CSS interceptors discussed as follows.

1. Greenup Avenue Interceptor

The Greenup Avenue Interceptor conveys about 60 percent of Ashland's flow to the 26th Street PS. The interceptor starts as a 12-inch reinforced concrete pipe (RCP) on Greenup Avenue from 7th Street. At the intersection of Greenup and 8th Street, it enlarges to a 15inch RCP and discharges its flow to the 10th Street PS picking up again as a 21-inch pipe at the intersection of Greenup Avenue and 15th Street. The 14-inch force main from the 10th Street PS discharges to the interceptor at the intersection of Greenup Avenue and 15th Street. The interceptor continues as a 21-inch sewer on Greenup Avenue and discharges flow to a 36-inch gravity sewer on 26th Street which discharges to the 26th Street PS.

Several trunk sewers running from south to north discharge into the Greenup Avenue Interceptor. The CSO 009 (15th Street) and the CSO 008 (18th Street) are connected to the western half of the Greenup Avenue interceptor to act as relief points during significant surcharging.

The eastern half of the Greenup Avenue Interceptor starts from 34th Street as an 18-inch gravity sewer and ends on 26th Street where it discharges flow to the 36-inch gravity sewer that discharges to the 26th Street PS. The 37th Street PS discharges to the Greenup Avenue interceptor on 34th Street. CSO 006 is connected to the eastern half of Greenup Avenue interceptor on 34th Street to act as a relief point. There are no other CSOs connected to it west of 34th Street.

2. Tannery Interceptor

The Tannery Interceptor, also known as the 29th Street Interceptor, runs south to north. The interceptor starts at the intersection of 29th Street and Belmont Street and ends at the 26th Street PS. The interceptor is made of brick and ranges in size from 52 to 60 inches in diameter conveying approximately 380 acres of commercial and residential drainage. Several trunk sewers running from east or west discharge into the Tannery Interceptor. The CSO 002 (26th Street) is connected to the 26th Street PS to act as a relief point.

3. Winchester Avenue Interceptor

The Winchester Avenue Interceptor runs from east to west and discharges its flow to the 37th Street PS, also known as the Winchester Avenue PS. The Blackburn Avenue separate sanitary drainage basin discharges to the CSS through the Winchester Avenue Interceptor at the intersection of Winchester Avenue and Blackburn Avenue. The John R. Oliverio Park Service Area SSS also discharges to the Winchester Avenue Interceptor. The CSO 004 (37th Street) is connected to the Winchester Avenue Interceptor at the AK Steel property to act as a relief point for the interceptor.

G. CSO Outfalls, Regulators, and Corresponding Drainage Areas.

There are eight permitted CSOs within Ashland. Figure 2.03-5 illustrates the location of each permitted CSO. Table 2.03-1 lists the name, location, latitude, and longitude for each of the eight permitted CSO outfalls.

CSO No.	Outfall Status	Overflow Pipe Diameter (inches)	Latitude	Longitude	Street Location	Diversion Structure	Receiving Water
002	Active	66	38°28'22"N	82°37'30"W	26th Street	Leveling weir with dam	Ohio River
004	Active	24	38°27'45"N	82°36'37"W	37th Street	Overflow Pipe	Ohio River
006	Active	42	38°28'01"N	82°37'01"W	34th Street	Two drop troughs	Ohio River
008	Active	36	38°28'44"N	82°38'09"W	18th Street	Two drop troughs	Ohio River
009	Active	36	38°28'50"N	82°38'09"W	15th Street	Leveling weir w/dam	Ohio River
010	Active	42	38°28'59"N	82°38'43"W	10th Street	A drop trough and a leveling weir with dam	Ohio River
012	Active	10	38°28'54"N	82°39'10"W	6th Street	Overflow Pipe	Long Branch
014	Active	24	38°28'39"N	82°39'46"W	Roberts Drive	Leveling Weir	Little Hoods Creek

Table 2.03-1 CSO Outfall Locations

CSO 002 (26th Street), CSO 004 (37th Street), CSO 009 (15th Street), and CSO 012 (6th Street) consist of one regulator and one outfall pipe.

CSO 006 (34th Street), CSO 008 (18th Street), CSO 010 (Tenth Street), and CSO 014 (Roberts Drive) each have two regulators and one outfall. All but two of the overflows discharge directly to the Ohio River. CSO 012 discharges to Long Branch while CSO 014 discharges to Little Hoods Creek. Both Long Branch and Little Hoods Creek are tributary to the Ohio River.

Flow diagrams and pictures of the CSO regulators and outfalls are included in Appendix D.

A description of each CSO regulator follows:

1. CSO 002 (26th Street)

CSO 002 is located on 26th Street at the 26th Street PS. The regulator consists of a 10-inch by 12-inch rectangular dry weather orifice and a 16-inch high weir. During dry weather, flow from the 60-inch-diameter pipe upstream of the Tannery Interceptor passes through the 10-inch by 12-inch orifice and is conveyed to the 26th Street PS by a 24-inch diversion pipe. During wet weather, when the capacity of the dry weather sewer is exceeded, or the Tannery Interceptor surcharges, or the capacity of the 26th Street PS is exceeded, flow passes over the weir to the outfall sewer. The outfall sewer consists of a 66-inch-diameter pipe that discharges to the Ohio River.

Approximately 300 acres of combined sewer drainage and 190 acres of separate sanitary drainage remain directly upstream of CSO 002. In 2003, the 25th Street Stormwater Separation Project was implemented. The project separated approximately 25 acres of stormwater directly upstream of CSO 002 to reduce the volume of CSO discharge. There have been other separation projects upstream of CSO 002.

The land use in the area of the outfall is mostly industrial. However, the recently constructed Riverfront Park where residents enjoy the aesthetics of the riverfront is approximately 1 RM downstream of this CSO discharge location.

2. CSO 004 (37th Street–AK Steel)

CSO 004 is located on AK Steel property. The regulator consists of a 16-inch by 10-inch rectangular dry weather orifice and an overflow pipe that is offset 8 inches from the invert. During dry weather, flow from the 24-inch-diameter pipe upstream of the Winchester Avenue Interceptor is conveyed to the Winchester Avenue PS by an 18-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded or the capacity of the Winchester Avenue PS is exceeded, flow enters the outfall sewer. The outfall sewer consists of a 24-inch-diameter sewer that discharges to the Ohio River.

Approximately 2,290 acres of combined sewer drainage and separate sewer drainage area excluding the drainage area of the Boyd County Sanitation District No. 4 Basin Satellite input are located upstream of CSO 004.

AK Steel coke plant, which was closed down in summer of 2011, is located in the general discharge location of this CSO. The recently constructed Riverfront Park where residents come to enjoy the aesthetics of the riverfront is approximately 2 RM downstream of this CSO discharge location.

3. CSO 006 (34th Street)

CSO 006 has two regulators located on 34th Street close to the 34th Street Flood PS. The east regulator (Regulator A) is a drop trough that consists of a 6-inch by 14-inch rectangular dry weather orifice that is 20-inches deep. The 42-inch upstream pipe is a stormwater pipe with very low dry weather flow. During wet weather, when the capacity of the dry weather sewer is exceeded, or the 42-inch upstream stormwater pipe surcharges, flow enters the outfall pipe. Also, there is the possibility for the discharges from the 14-inch Winchester Avenue (37th Street) PS force main to back up through the 18-inch dry weather sewer and discharge to the outfall. The outfall consists of a 42-inch pipe that goes through the 34th Street Flood PS and discharges to the Ohio River. Overflow from the west regulator discharges to this outfall at the 34th Street Flood PS.

The west regulator (Regulator B) is also a drop trough that consists of a 14-inch by 12-inch rectangular dry weather orifice that is 14 inches deep. During dry weather, flow from the 24-inch-diameter upstream pipe is conveyed to the Greenup Avenue Interceptor by an 18-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded, or the 24-inch upstream sewer surcharges, flow enters the outfall pipe. The outfall pipe formerly consisted of a 24-inch sewer that discharged directly to the Ohio River. That outfall has been plugged and the overflow was diverted through the 34th Street Flood PS to a 42-inch outfall pipe which discharges to the Ohio River.

Approximately 14 acres of combined drainage area, excluding the drainage area of the Winchester Avenue (37th Street) PS, is located directly upstream of CSO 006.

There is minimal recreational activity in the surrounding area of this CSO discharge location. However, the recently constructed Riverfront Park is approximately 1.5 RM downstream of this CSO discharge location.

4. CSO 008 (18th Street)

CSO 008 has two regulators located on 18th Street and 19th Street. The 18th Street regulator is a drop trough that consists of a 12-inch by 14-inch rectangular dry weather orifice 22 inches deep. During dry weather, flow from the 24-inch-diameter upstream sewer is conveyed to the Greenup Avenue Interceptor by a 15-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded, or the 24-inch upstream pipe surcharges, flow enters the outfall pipe. The outfall consists of a 24-inch pipe that discharges into the 36-inch CSO 008 outfall pipe.

The 19th Street regulator is also a drop trough with a 15-inch by 16-inch rectangular dry weather orifice. During dry weather, flow from the 27-inch-diameter upstream pipe is conveyed to the Greenup Avenue Interceptor by a 15-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded, or the 27-inch upstream pipe surcharges, flow passes over the trough to the outfall pipe. The outfall pipe consists of a 27-inch sewer that discharges into the 36-inch CSO 008 outfall pipe in front of the 18th Street Flood PS. The 36-inch CSO 008 outfall pipe discharges directly to the Ohio River.

Approximately 90 acres of combined sewer drainage area are located directly upstream of CSO 008.

The land use of the general discharge area is mostly industrial. However, the recently constructed Riverfront Park is approximately 0.3 RM downstream of this CSO discharge location.

5. CSO 009 (15th Street)

CSO 009 is located on 15th Street in front of the flood wall gate to the Ashland Boat Ramp. The regulator consists of a 9-inch by 12-inch rectangular dry weather orifice and a 6-inch-high weir that acts as a dam. During dry weather, flow from the 36-inch-diameter upstream sewer is conveyed to the Greenup Avenue Interceptor by a 15-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded, or levels in the 36-inch interceptor rise above 6 inches, or the capacity of the Greenup Avenue Interceptor is exceeded, flow passes over the weir to the outfall sewer. The outfall sewer consists of a 36-inch-diameter sewer that discharges to the Ohio River.

Approximately 15 acres of the combined sewer drainage area are located directly upstream of CSO 009.

The discharge location is just downstream of the boat ramp and the recently constructed Riverfront Park.

6. CSO 010 (10th Street)

CSO 010 has two regulators. Regulator A is located in front of the 10th Street Flood Wall PS. It consists of a drop trough with a 14-inch by 16-inch rectangular dry weather orifice 17 inches deep. During dry weather, flow from the 36-inch-diameter upstream sewer is conveyed to the 10th Street PS by a 12-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded or the 36-inch upstream sewer discharge increases, flow passes over to the outfall pipe. The outfall pipe consists of a 36-inch pipe that discharges into the 42-inch CSO 010 outfall pipe.

Regulator B is located in front of the 10th Street PS in the city's right-of-way across from the Superior Chrysler, Jeep, and Dodge car dealership. The regulator consists of a 6-inch by 6-inch square dry weather orifice and a 6-inch-high weir that acts as a dam. During dry weather, flow from the 36-inch-diameter upstream sewer is conveyed to the 10th Street PS by a 12-inch diversion pipe through the orifice. During wet weather, when the capacity of the dry weather sewer is exceeded, or levels in the 36-inch interceptor rise above six inches, or the capacity of the 10th Street PS is exceeded, flow passes over to the outfall sewer. The outfall pipe consists of a 36-inch pipe that discharges into the 42-inch CSO 010 outfall pipe. The 42-inch CSO 010 outfall pipe discharges directly to the Ohio River.

Approximately 198 acres of the combined sewer drainage area and 50 acres of the separate sewer drainage, excluding the drainage areas of the Roberts Drive PS and the 6th Street PS, are located directly upstream of CSO 010.

The area surrounding the discharge location is mostly industrial with very limited access except by boat.

7. CSO 012 (6th Street)

CSO 012 is located on the 6th Street PS property along Long Branch. The regulator consists of an overflow pipe offset about 4 feet from the manhole invert. During dry weather, flow from the 24-inch upstream interceptor is discharged to the 6th Street PS. During wet weather, when the capacity of the 6th Street PS is exceeded, or when the capacity of the upstream 24-inch interceptor is exceeded, flow backs up to a bypass line into the outfall manhole. If levels rise above 4 feet, flow begins to discharge through the outfall pipe. The outfall consists of a 10-inch pipe that discharges to Long Branch. The Ashland Town Center Mall is located downstream of this CSO discharge location but there is very limited access to Long Branch until it joins the Ohio River.

Approximately 100 acres of the combined sewer drainage area and 830 acres of the separate sewer drainage area are located directly upstream of CSO 009.

The area surrounding the discharge location is mostly commercial and industrial with very limited access.

8. CSO 014 (Roberts Drive)

CSO 014 is located at the Roberts Drive PS property. The regulator (Regulator A) consists of a 20-inch-high weir located in a junction box. During dry weather, flow from the 21-inch-diameter upstream pipe is conveyed to the Roberts Drive PS by a 15-inch diversion pipe that discharges to the 36-inch wet well influent pipe. During wet weather, when the capacity of the dry weather sewer is exceeded, or the capacity of the 36-inch influent is exceeded, or the capacity of the Roberts Drive PS is exceeded, flow passes over the weir to the outfall sewer. The outfall consists of an 18-inch pipe that discharges into the CSO 014 outfall pipe. There is also a second regulator (Regulator B) with an 8-inch secondary overflow pipe that serves as a relief point for the 15-inch and 8-inch sewers. The 8-inch secondary overflow pipe is at a lower elevation than the 20-inch weir and also discharges into the CSO 014 outfall that discharges to Little Hoods Creek.

The surrounding areas of this CSO discharge location are mainly residential. The Big Sandy Baseball Complex is located downstream of this CSO discharge location. According to comments at a June 3, 2010, public meeting (discussed in Section 3.02B - Public Participation), there are times when children have the opportunity to wade in Little Hoods Creek near the baseball park. Therefore, there is an existing use of Little Hoods Creek.

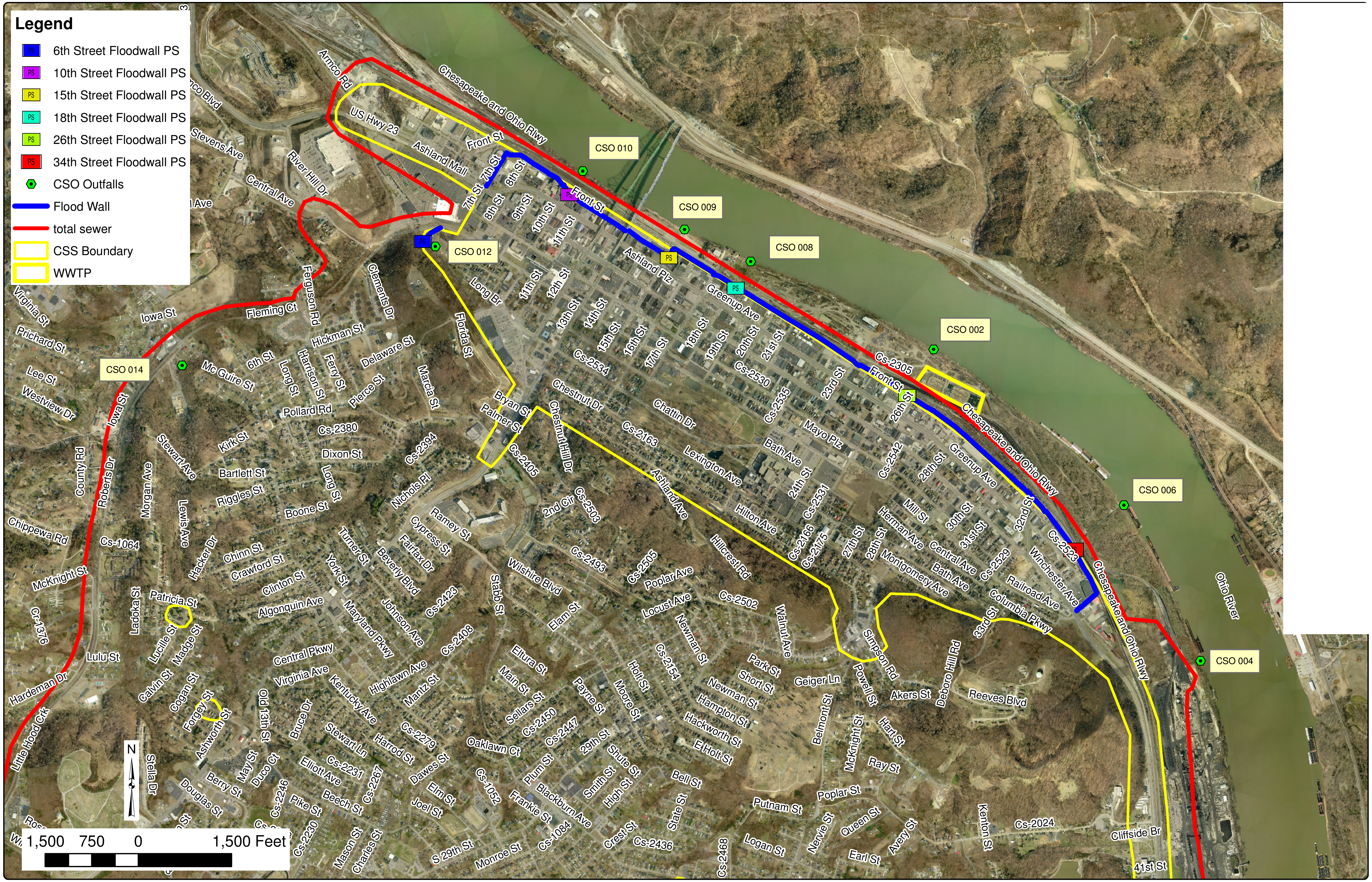
H. <u>WWTP and Influent Control</u>

The WWTP is located just past the end of 26th Street on the river side of the flood wall. Figure 2.03-1 shows the location of the WWTP. The receiving water for the effluent is the Ohio River, RM point 659.7.

All flow to the WWTP is pumped from the 26th Street PS. There are no overflows or bypasses once flow is pumped to the WWTP. The plant was placed into service in 1981 with an average daily capacity of approximately 11 mgd (average daily flow to the WWTP is about 6 mgd) and a wet weather design capacity of 33 mgd. Operational experience has shown that effective treatment cannot be maintained above 18 mgd, even on a short-term basis. The secondary clarifiers are the most hydraulically limiting process at the WWTP. Solids begin to wash out of the clarifiers at this approximate flow rate. More information on the WWTP is provided in Section 8.

I. <u>Flood Control Pump Stations (FCPS)</u>

There are six FCPSs associated with Ashland’s flood protection system. Figure 2.03-6 shows the location of each FCPS. Along with the flood wall, these PS were built by the United States Army Corp of Engineers (USACE) but are operated by Ashland’s FCPS personnel. Portions of the Operation and Maintenance (O&M) Manual for the PS are found in Appendix E.



FLOOD CONTROL PUMPING STATIONS LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.03-6
5102.002

The FCPSs are responsible for pumping flows in excess of existing system capacities into the Ohio River when high river elevations require the CSO and storm sewer outfalls valves to be closed to protect Ashland from flooding. The CSO and storm sewer outfalls are systematically closed whenever the Ohio River threatens to inundate Ashland.

When CSO outfalls are closed, stormwater and combined sewage are diverted to the FCPSs. The FCPSs pump these flows into the existing CSO outfalls downstream of the closed valves.

Descriptions of each FCPS are included as follows.

1. Long Branch FCPS

The Long Branch FCPS is located off 6th Street along Long Branch in the vicinity of the 6th Street PS. It is responsible for pumping Long Branch and overflow from CSO 012 (6th Street) during flood conditions.

2. 10th Street FCPS

The 10th Street FCPS is located at the end of 10th Street and is responsible for pumping stormwater and overflow from CSO 010 (10th Street) during flood conditions. It discharges to the Ohio River through the same outfall sewer as CSO 010.

3. 15th Street FCPS

The 15th Street FCPS is located on 15th Street near the Greyhound bus station. The 15th Street FCPS is responsible for pumping stormwater and overflow from CSO 009 (15th Street) during flood conditions. The 15th Street FCPS discharges to the Ohio River through the same 36-inch CSO 009 outfall sewer.

4. 18th Street FCPS

The 18th Street FCPS is located at the end of 18th Street. It is responsible for pumping stormwater and overflow from the two CSO 008 (18th Street) regulators during flood conditions. The 18th Street FCPS discharges to the Ohio River through the same 36-inch CSO 008 outfall sewer.

5. 26th Street FCPS

The 26th Street FCPS is located off 26th Street in the same vicinity as the 26th Street PS. The 26th Street FCPS is responsible for pumping stormwater and overflow from CSO 002 (26th Street) during flood conditions. The 26th Street FCPS discharges to the Ohio River through the same 66-inch CSO 002 outfall sewer.

6. 34th Street FCPS

The 34th Street FCPS is located at the end of 34th Street inside the flood wall. It is responsible for pumping stormwater and overflow from the two regulators of CSO 006 (34th Street) during flood conditions. The 34th Street FCPS discharges to the Ohio River through the same 42-inch CSO 006 outfall sewer.

2.04 ANTICIPATED GROWTH

Ashland's CSS is not expected to experience significant growth. The CSS is surrounded by the Ohio River and SSSs. There is minimal undeveloped land within the CSS to experience significant growth. Most of the growth that the CSS will experience will come in the form of redevelopment within the CSS.

2.05 LAND USE IN THE VICINITY OF CSO DISCHARGES

The land use in the immediate vicinity and downstream from the CSO outfalls is depicted in Figures 2.05-1 through 2.05-4. There are several existing uses of the Ohio River in Ashland including boating, fishing, skiing, swimming, and transportation of commercial goods.

2.06 MONITORING PROGRAM

In 2006, Ashland did not have flow meters or rain gauges permanently installed within its system. To develop a calibrated computer model of the system, a comprehensive understanding of the system in wet weather was required. CSS, SSS, and CSO flow rates collected during the same rainfall event were needed so that complex hydraulic interactions can be evaluated and modeled. In 2010, Ashland installed permanent area-velocity type flow meters on its active CSO outfalls.

A. Rainfall Data

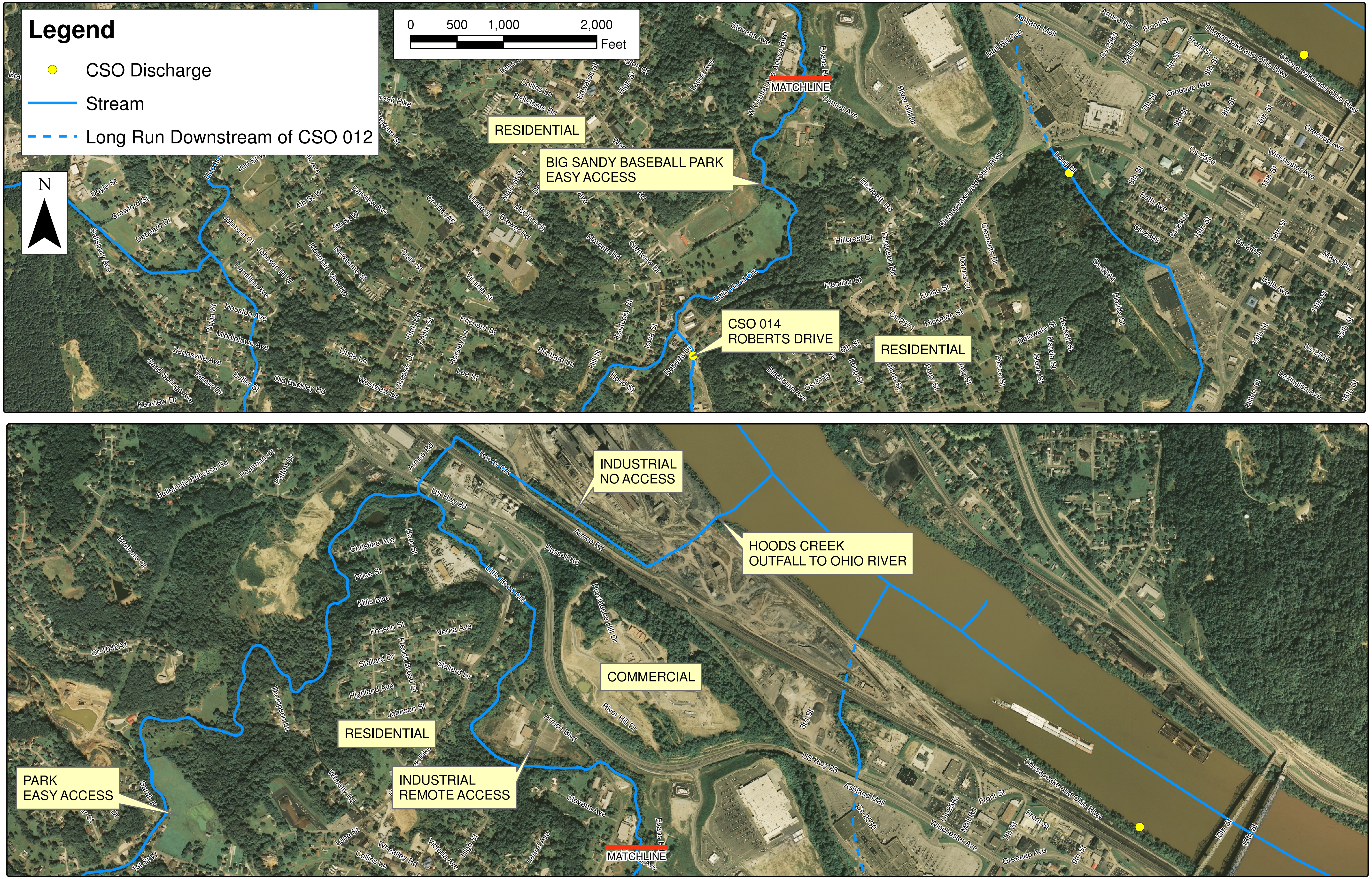
Rainfall data was obtained from four sources to assist in the characterization of the CSS and evaluation of abatement controls.

1. Historical Rainfall

Two permanent rain gauges were identified as being useful in the characterization of historical rainfall patterns in the area surrounding Ashland's CSS; The Huntington Tri-State Airport collected and recorded hourly rainfall measurements and has data dating back to the early 1960s. The Huntington Federal Building collected and recorded 15-minute rainfall measurements and has data from 1971 to 1989. The rain gauge information was obtained from the National Climatic Data Center. Both rain gauges are located near Ashland's CSS.

The "Huntington Tri-State Airport" rain gauge is located at the Huntington Tri-State Airport in Huntington, West Virginia, which is approximately 11 miles south of Ashland CSS. The instrumentation is owned by the National Weather Service and is operated by the Huntington Tri-State Airport. The gauge has collected hourly rainfall measurements since the beginning of 1962. Hourly rainfalls were measured and recorded in 1/100ths of an inch.

The "Huntington Federal Building" rain gauge is located in downtown Huntington, West Virginia, which is approximately 16 miles southeast of Ashland CSS. The gauge collected 15-minute rainfall measurements from January 1971 to December 1989, recorded in 1/10th of an inch increments.



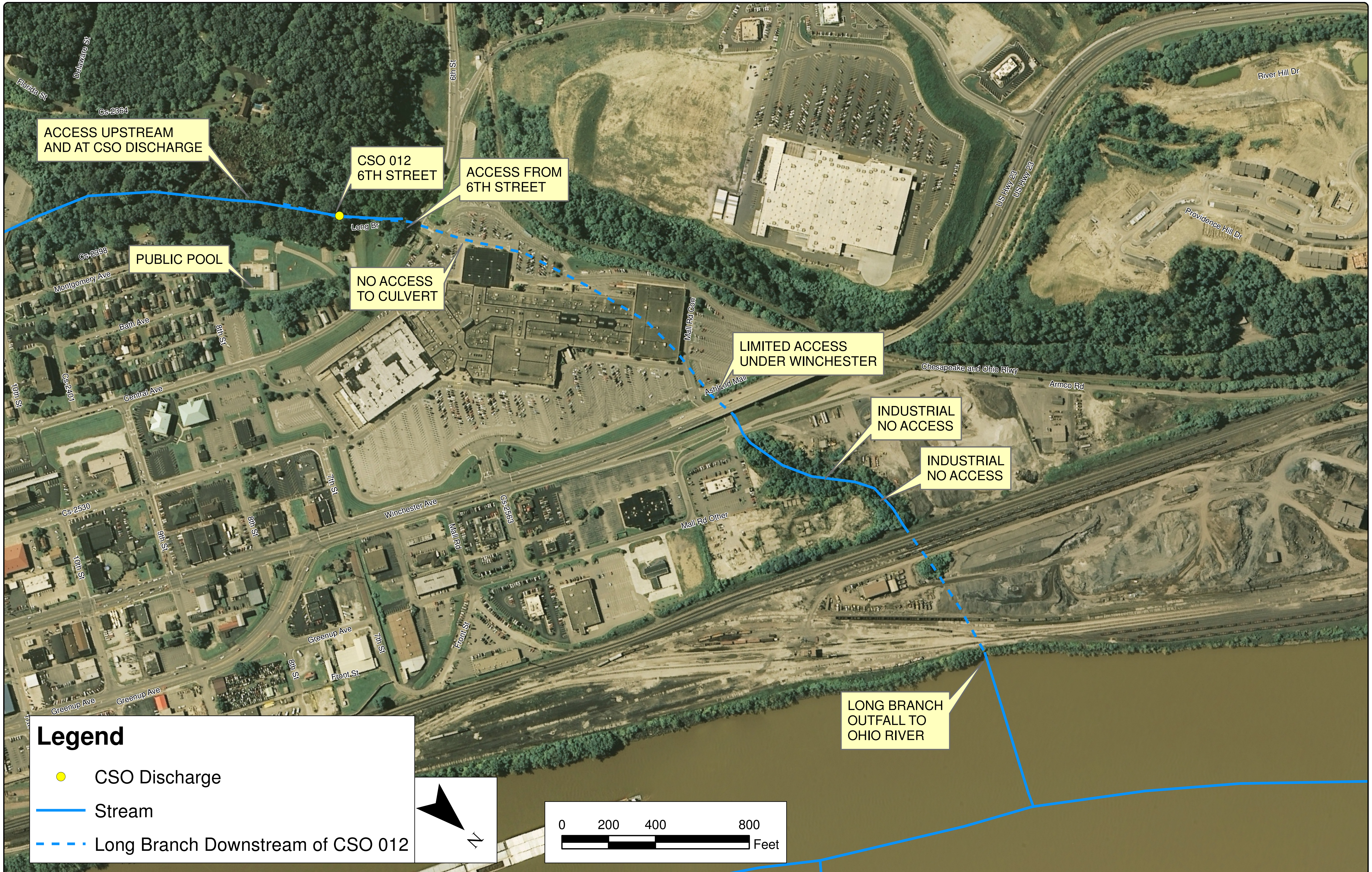
LAND USE NEAR CSO RECEIVING STREAM
LITTLE HOODS CREEK

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.05-1
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.05-1



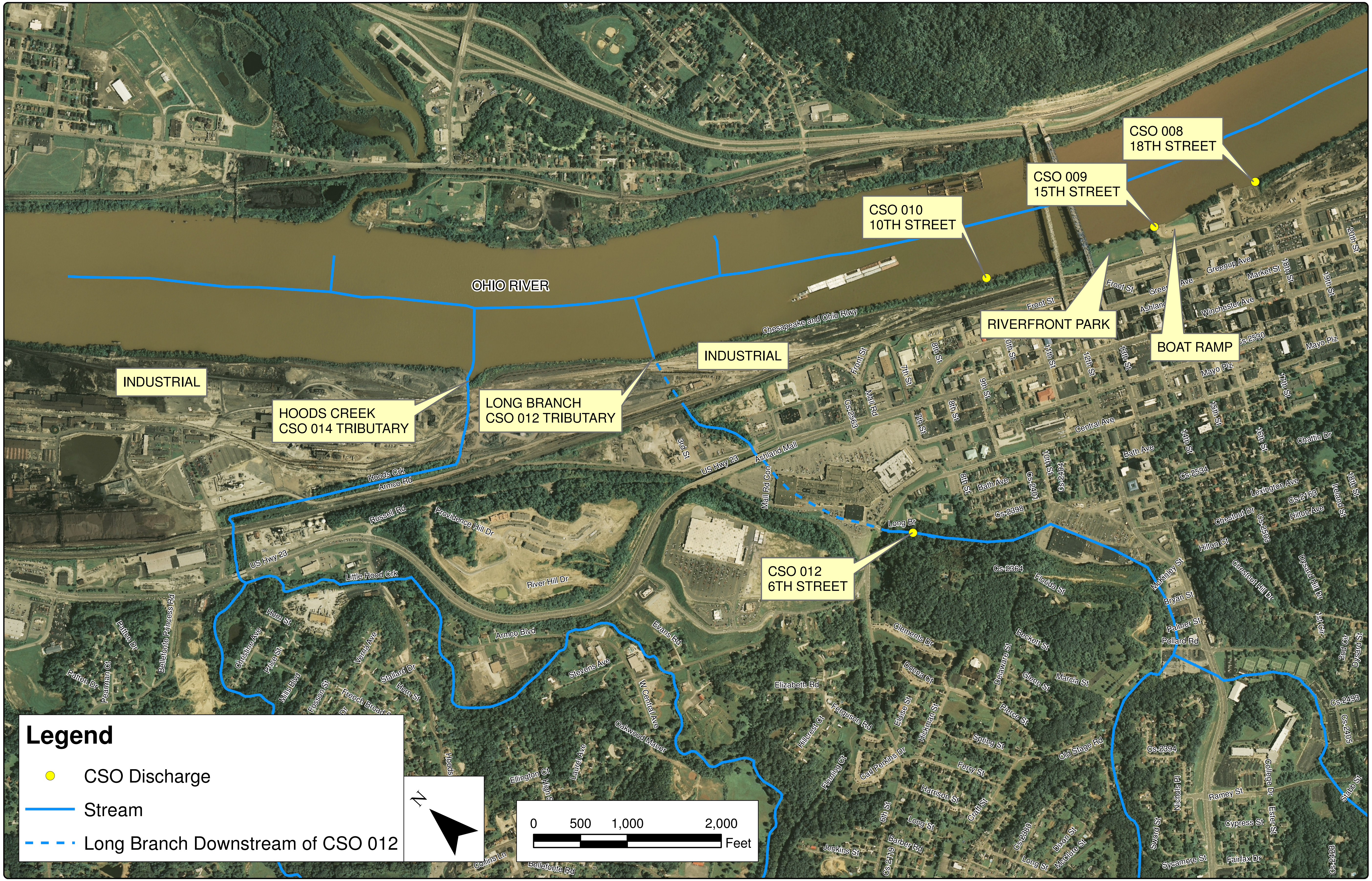
LAND USE NEAR CSO RECEIVING STREAM
LONG BRANCH

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.05-2
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.05-2



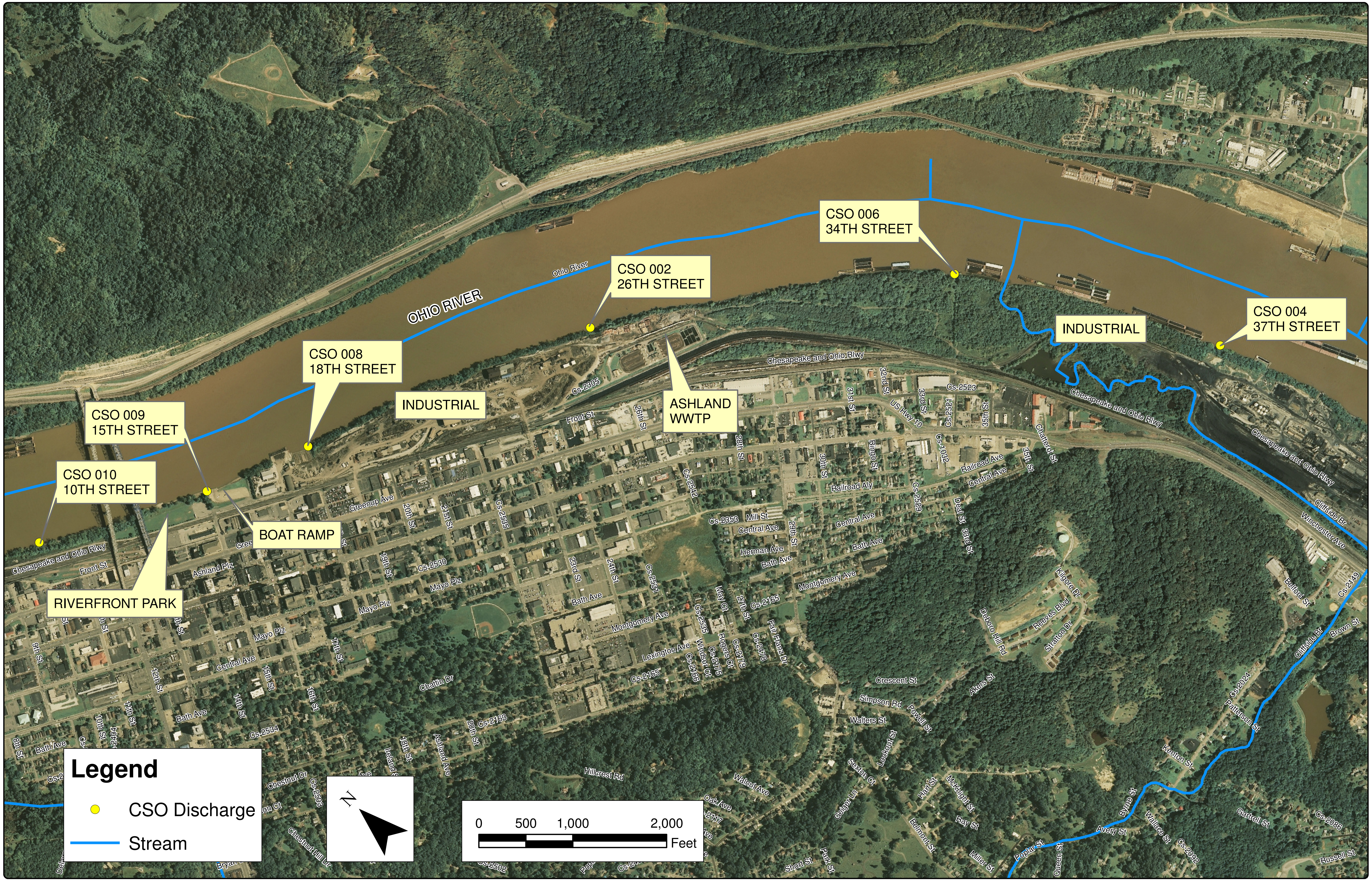
LAND USE NEAR CSO RECEIVING STREAM
DOWNSTREAM OHIO RIVER

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.05-3
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.05-3



LAND USE NEAR CSO RECEIVING STREAM
UPSTREAM OHIO RIVER

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.05-4
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.05-4

It was preferred to use the 15-minute data for typical year model simulation. An in-depth analysis of Huntington Federal Building individual rainfall events determined that 1974 corresponded the closest to a typical year (see Table 2.06-1). However, the monthly rainfall totals were larger than average historical data and were slightly more substantial than what would be expected to occur based on statistics. It was decided that 1974 rainfall data would be modified and used for the typical analysis. Appendix F provides more information on the typical year determination.

Month	Monthly Rainfall Total (in.)			Cumulative Rainfall (in.)		
	Typical Year (Modified 1974 Data)	Historical Ashland Rainfall	Average Huntington WV Data	Typical Year (Modified 1974 Data)	Historical Ashland Rainfall	Average Huntington WV Data
January	4.8	2.7	2.95	4.8	2.7	2.9
February	1.7	2.8	2.86	6.5	5.5	5.8
March	3.9	3.6	3.99	10.4	9.1	9.8
April	2.7	3.6	3.51	13.1	12.7	13.3
May	4.8	4.3	4.21	17.9	17	17.5
June	4.2	3.8	3.51	22.1	20.8	21.0
July	2.9	4.9	4.45	25	25.7	25.5
August	4.5	4	3.77	29.5	29.7	29.3
September	2.8	2.8	3.00	32.3	32.5	32.3
October	4.0	2.9	2.70	36.3	35.4	35.0
November	3.8	3.4	3.28	40.1	38.8	38.2
December	2.8	3.4	3.22	42.9	42.2	41.5
Totals	42.9	42.2	41.5			

Table 2.06-1 Typical Year Monthly Totals Compared to Historical Rainfall Data

According to the *Rainfall Frequency Atlas of the Midwest*, the rainfall events that occurred during the modified typical year (January 1974 to December 1974) had the following statistical definitions:

a. One 2-year 6-hour event.
b. One 1-year 24-hour event.
c. One 9-month 12-hour event.
d. One 6-month 1-hour event.
e. One 6-month 2-hour event.
f. Two 4-month events.
g. Three 3-month events.
h. Seven 2-month events.
i. 38 events less than a 2-month event.

Table 2.06-2 provides more detail of the typical year rainfall statistical events.

Event Start Date	Event End Date	Total Rainfall (in)	Duration (hrs)	Statistical Evaluation						
				2-Mo	3-Mo	4-Mo	6-Mo	9-Mo	1-Yr	2-Yr
1/9/74 23:00	1/11/74 5:45	3.5	30.8	3-hr		6-hr		12-hr	24-hr	
3/6/74 7:45	3/6/74 12:45	1.0	5.0	3-hr						
3/11/74 9:45	3/11/74 18:30	1.4	8.7		6-hr					
4/2/74 12:00	4/2/74 20:15	0.7	8.3	15-Min						
5/11/74 14:45	5/12/74 9:30	2.1	18.8				18-hr			
5/31/74 0:15	5/31/74 15:15	1.5	15.0		30-min		1-hr			
6/15/74 22:15	6/16/74 1:30	0.7	3.3				15-min			
7/10/74 19:15	7/11/74 2:30	0.7	7.3	15-min	30-min					
7/15/74 14:30	7/15/74 22:30	1.1	8.0	15-min						
8/28/74 12:45	8/29/74 23:30	2.4	34.8	15-Min	18-hr					
9/1/74 12:45	9/1/74 13:15	0.6	0.5			15-min				
10/28/74 8:45	10/28/74 16:15	2.4	7.5	1-hr			2-hr			6-hr
			Total	**7**	**4**	**2**	**4**	**1**	**1**	**1**

October 28 event was added to the typical year to incorporate a storm greater than 1-Year.

Table 2.06-2 Typical Year Rainfall Statistical Events

2. Statistical Rainfall

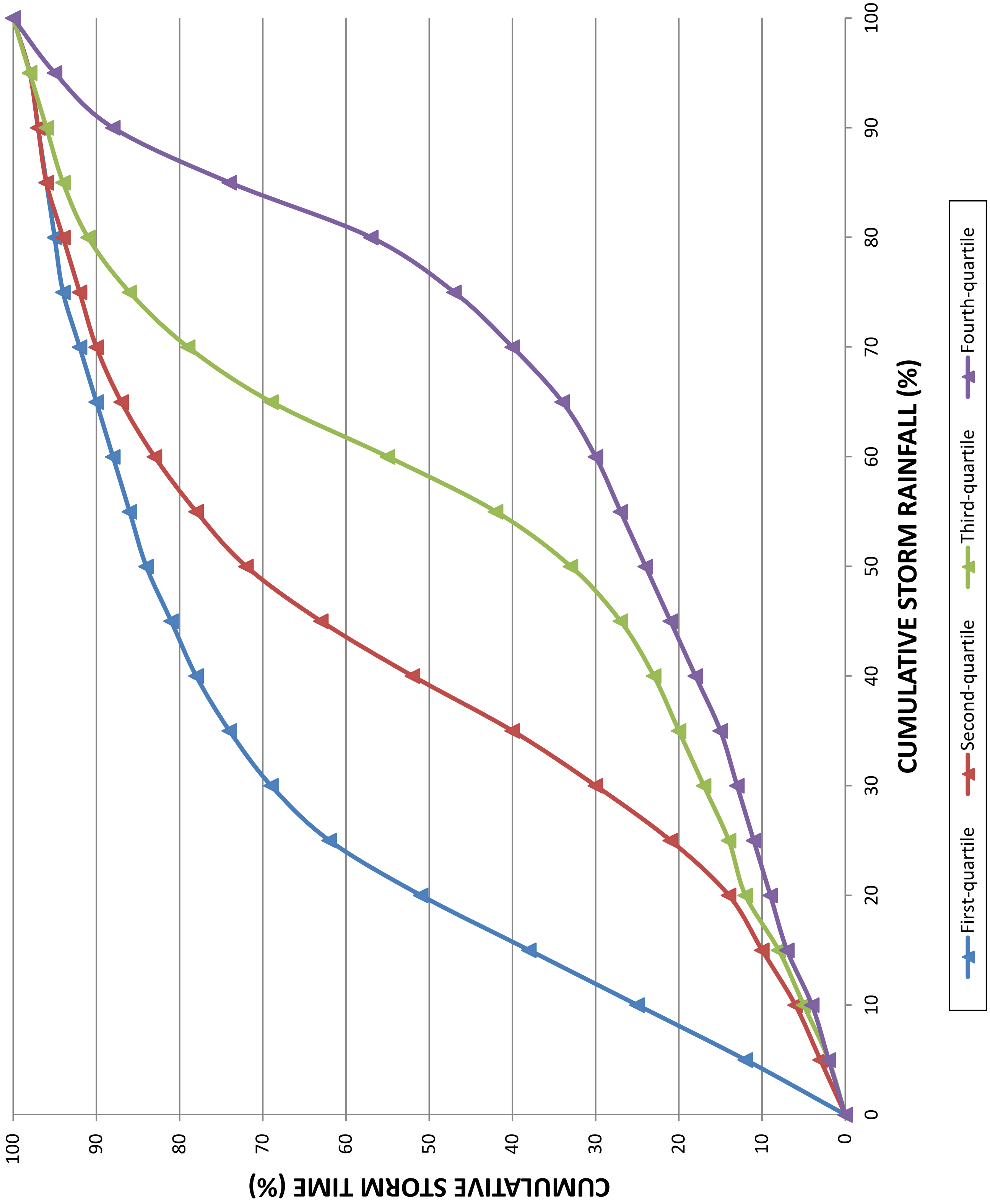
Table 2.06-3 lists the 1-hour and 24-hour regional statistical rainfall data obtained from the Midwestern Climate Center (MCC) *Rainfall Frequency Atlas of the Midwest*. Excerpts of the *Rainfall Frequency Atlas of the Midwest* may be found in Appendix G.

The report developed rainfall totals and typical temporary distributions for recurrence intervals ranging from 2 months to 100 years for durations of 5 minutes to 100 days for several Midwestern states. The statistical rainfall totals were used as CSO abatement control design levels. Rainfall totals for Ashland were obtained from Table 4 Section 04 of the *Rainfall Frequency Atlas of the Midwest.* Table 2.06-3 lists the statistical rainfall totals for 1-hour and 24-hour events for Ashland corresponding to several return intervals.

Return Interval	1-Hour Events	24-Hour Events
2-Month	0.69	1.46
3-Month	0.80	1.70
4-Month	0.88	1.86
6-Month	1.01	2.15
1-Year	1.25	2.65
5-Year	1.75	3.73
10-Year	2.00	4.26
25-Year	2.38	5.06
100-Year	3.07	6.53

Table 2.06-3 Midwestern Climate Center Statistical Rainfalls (Inches)

Figure 2.06-1 illustrates the typical median distributions developed by MCC. As recommended by the report, the first quartile distribution was used to distribute rainfall during 1-hour events while the third quartile distribution was used to distribute rainfall during 24-hour events. Both 1-hour and 24-hour rainfall events were broken down into 20 intervals corresponding to 5 percent increments.



MIDWESTERN CLIMATE CENTER MEDIAN TIME DISTRIBUTIONS OF RAINFALL

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.06-1
5102.002

3. Temporary Rainfall Data

From the beginning of April 2006 to the middle of July 2006 four tipping bucket rain gauges were installed in Ashland's collection system for a period of 90 days. These rain gauges collected and stored 15-minute rainfall data for the period that it was installed. Rainfall data obtained from these rain gauges were used in the calibration and validation of the hydraulic model. Figure 2.06-2 shows the location of the temporary rain gauges that were installed for the development of the LTCP.

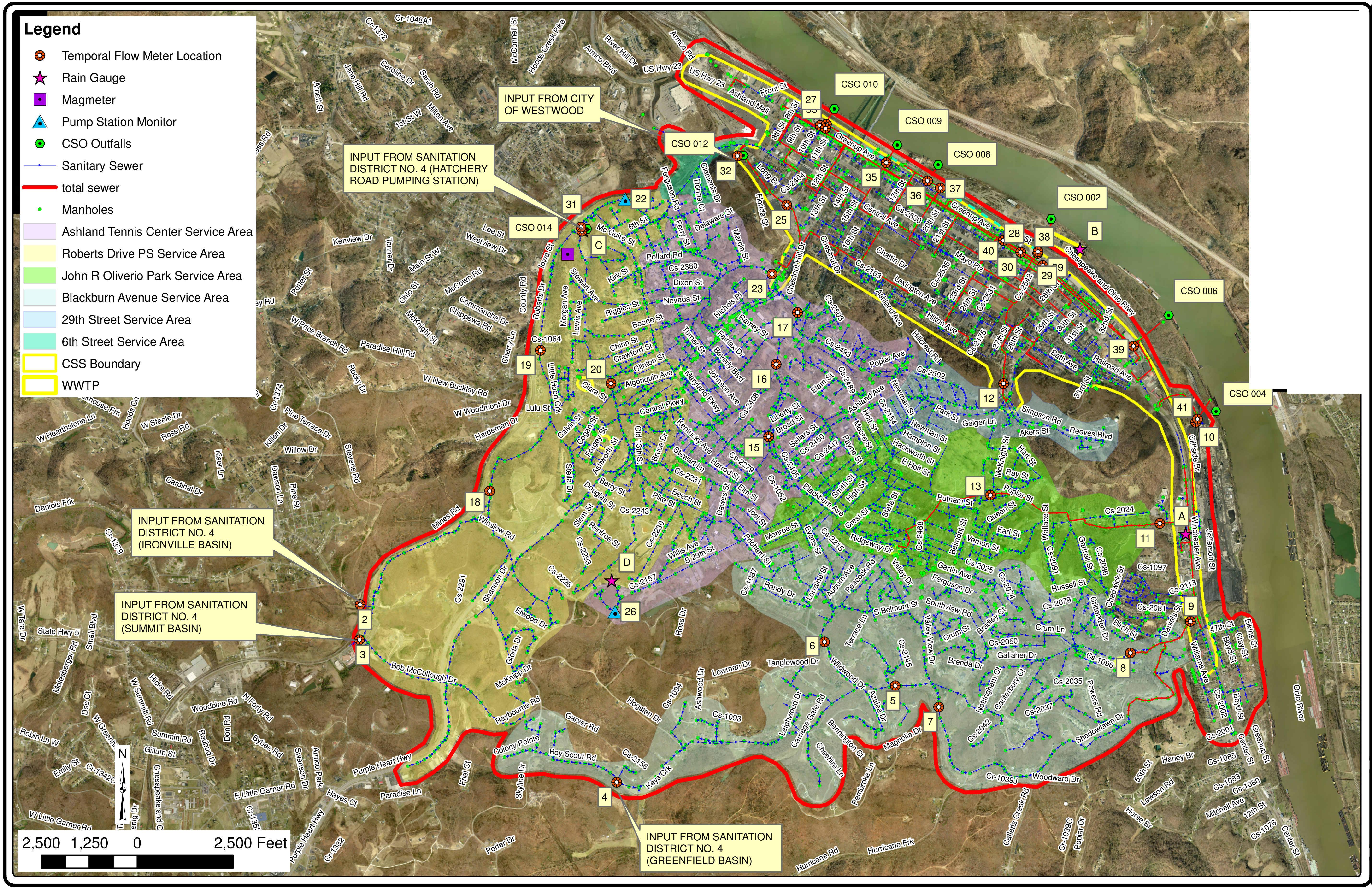
4. Permanent Rain Gauges

In December 2010, three ISCO Model 674 rain gauges were installed by Ashland in and around the CSS. The rain gauges were installed at the Roberts Drive PS (located on the northwestern edge of the collection system), the water treatment plant (to the east of the CSS), and the WWTP (located to the north of the CSS). The data obtained from the rain gauges assisted in the development of a relationship between rainfall and peak and total CSS flows. Rainfall data obtained from these rain gauges were used in the Phase 2 calibration and validation efforts of the hydraulic model.

B. Flow Monitoring In The Sewer Collection System

Flow metering data was collected for the following purposes:

- Document existing CSS and SSS performance under dry weather conditions. This information was used for the xpswmm™ dry weather model calibration and verification. It would also be used to support future SSS capacity analysis and planning efforts. Also needed to isolate wet weather performance.
- Document existing CSS and SSS performance under various wet weather conditions. This information was used for wet weather calibration and verification of the xpswmm™ model. It was also used to develop an understanding of the response of the system to a variety of rainfall scenarios and allow for CSO abatement alternative development.
- Characterize the four satellite SSS dry weather and wet weather discharges into Ashland's CSS.
- Support future sanitary sewer evaluation survey (SSES) efforts to identify sources of extraneous infiltration and inflow (I/I).



WASTEWATER COLLECTION SYSTEM MAP
TEMPORARY FLOW METERS AND RAIN GAUGES LOCATION

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.06-2
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.06-2

1. Phase 1 (Temporary) Flow Monitoring

The Phase 1 flow monitoring effort collected data for the Phase 1 xpswmm™ hydraulic model calibration effort. From the beginning of April 2006 to the middle of July 2006 a total of 37 area velocity flow meters (AVFMs) and four tipping bucket rain gauges were installed in the Ashland's collection system for of 90 days. Flow meters were installed at the following locations:

- Where three of the four satellite SSS discharges into Ashland's collection system.
- Where Ashland's SSS discharges into the CSS.
- On all major CSO regulators.
- At major influent pipes to major PS.
- At several strategic locations within Ashland's SSS and CSS to allow for a more detailed characterization of the flows.

Figure 2.06-2 shows the location of the temporary flow meters that were installed for the development of the LTCP. Table 2.06-4 lists the name, location, and sewer diameter of the flow meter locations.

A total of 37 flow metering devices were installed as follows

- 3 AFVMs were installed in the satellite systems discharge points in the SSS.
- 15 AFVMs were installed in the SSS.
- 9 AFVMs were installed in the CSS.
- 10 AFVMs were installed on CSO regulators.
- 2 PS monitors were installed at the PSs serving the SSS.

Weekly site visits were made at each flow metering and rain gauge location to collect data and perform routine maintenance tasks. Weekly data evaluations were also made to check the accuracy of the data being collected. When necessary, manhole entries were made to check meter calibration, and adjustments were made if the meter readings differed from the field measured values by more than 10 percent. There were also instances where the equipment had to be replaced because of malfunction.

A detailed report summarizing the Phase 1 flow metering results may be found in *Ashland, Kentucky March 2007 Combined Sewer Overflow Long Term Control Plan Flow Metering Results* (Appendix H). See Appendix I for details of the Monitoring and Modeling Plan. Rainfall and flow data from the Phase 1 flow monitoring was used for the Phase 1 calibration and validation of the model.

2. Phase 2 Flow Monitoring

In December 2010, permanent flow meters were installed on all CSO outfalls. Rainfall data from the permanent rain gauges and flow data from the outfall meters were used to recalibrate and validate the model (Phase 2).

TABLE 2.06-4

TEMPORARY FLOW METER LOCATIONS

Meter Number	Meter Location	Flow Being Measured	Purpose	Sewer Diameter (inches)
1 [1]	Roberts Drive PS Influent Chamber	Satellite Input	Calibrate and Validate Model	N/A
2	4627 Roberts Drive	Satellite Input	Model Input	8
3	Intersection of Bob McCullough Drive	Satellite Input	Model Input	15
4	Greenfield Road near Boy Scout Road	Satellite Input	Model Input	8
5	Backyard of 3964 Boy Scout Road	Separate Sanitary Interceptor	Calibrate and Validate Model	12
6	Wildwood Road	Separate Sanitary Interceptor	Calibrate and Validate Model	10
7	Valley View Drive next to driveway bridge	Separate Sanitary Interceptor	Calibrate and Validate Model	12
8	Blackburn Avenue upstream of 45th Street PS	Separate Sanitary Interceptor	Model Input	18
9	Blackburn Avenue near Winchester Avenue upstream of 45th Street PS	Separate Sanitary Input to CSS	Calibrate and Validate Model	18
10	AK Steel Property in Solvay Regulator	CSS Interceptor	Calibrate and Validate Model	24
11	John R. Oliverio Park near pedestrian bridge	Separate Sanitary Input to CSS	Calibrate and Validate Model	18
12	Franz Drive vacant parking lot	Separate Sanitary Input to CSS	Calibrate and Validate Model	52
13	Between 1704 and 1710 39th Street in backyard	Separate Sanitary Interceptor	Calibrate and Validate Model	18
14 [2]	N/A	N/A	N/A	N/A
15	Front of 2337 Oakview Street	Separate Sanitary Interceptor	Calibrate and Validate Model	10
16	Edge of Stabb Street in bend	Separate Sanitary Interceptor	Calibrate and Validate Model	18
17	Ashland Public Tennis Court property	Separate Sanitary Interceptor	Calibrate and Validate Model	18
18	Beside Roberts Drive south of public pool	Separate Sanitary Interceptor	Model Input	15
19	Front of Roberts Drive Apartments	Separate Sanitary Interceptor	Calibrate and Validate Model	15
20	End of McCullough Drive near stream	Separate Sanitary Interceptor	Calibrate and Validate Model	15
21	Roberts Drive PS property	PS Influent	Calibrate and Validate Model	21
22 [3]	Tunnel Hill PS	N/A	N/A	N/A
23	Rite Aid parking lot	Separate Sanitary Input to CSS	Calibrate and Validate Model	18
24 [4]	6th Street near 6th Street PS	Separate Sanitary Input to CSS	Calibrate and Validate Model	18
25	Kroger parking lot	CSS Interceptor	Calibrate and Validate Model	24
26 [3]	Rogers Drive PS	N/A	N/A	N/A
27	Front of 10th Street PS	PS Influent	Calibrate and Validate Model	15
28	Front of 26th Street PS	CSS Interceptor	Calibrate and Validate Model	60
29	26th Street front of auto mechanic shop	CSS Interceptor	Calibrate and Validate Model	18
30	26th Street front of EMS services office	CSS Interceptor	Calibrate and Validate Model	24
31	Roberts Drive PS property	CSO Discharge (CSO 014)	Calibrate and Validate Model	24
32	6th Street PS property	CSO Discharge (CSO 012)	Calibrate and Validate Model	10
33	Front of 10th Street Flood PS	CSO Discharge (CSO 010)	Calibrate and Validate Model	36
34	Front of 10th Street PS on car dealership property	CSO Discharge (CSO 010)	Calibrate and Validate Model	36
35	End of 15th Street in front flood wall gate	CSO Discharge (CSO 009)	Calibrate and Validate Model	36
36	End of 18th Street by the 18th Street Flood Wall PS	CSO Discharge (CSO 008)	Calibrate and Validate Model	24
37	End of 19th Street in front flood wall gate	CSO Discharge (CSO 008)	Calibrate and Validate Model	27
38	Front of 26th Street PS	CSO Discharge (CSO 002)	Calibrate and Validate Model	60
39	End of 34th Street in front of foundry shop	CSO Discharge (CSO 006)	Calibrate and Validate Model	42
40	Winchester Avenue in front of H&H Custom Cycle Supply	CSS Interceptor	Calibrate and Validate Model	24
41	AK Steel Property on Solvay Regulator	CSO Discharge (CSO 004)	Calibrate and Validate Model	30

[1] Meter 1 data obtained from magmeter installed on Hatchery Road PS force main.
[2] Meter 14 could not be installed because of unsuitable site conditions.
[3] Meter 22 and Meter 26 were PS monitors.
[4] Because of unsuitable site conditions, no data was obtained at this location.

2.07 COLLECTION SYSTEM MODELING PROGRAM

In 2006, an xpswmm™ model of the CSS was constructed and calibrated using Phase 1 rainfall and flow data from satellite system, in-system, and CSO outfall meters.

The purpose of this model was to assist Ashland in performing the following tasks:

1. Predict base flows and wet weather flows generated by various wet weather events in the CSS.
2. Predict the hydraulic grade line, volume, and flow rates of wastewater in gravity sewer lines.
3. Predict the flow capacity of each PS.
4. Characterize the existing system performance.
5. Evaluate the ability to maximize the flow to the treatment plant.
6. Evaluate CSO control alternatives as part of the LTCP.

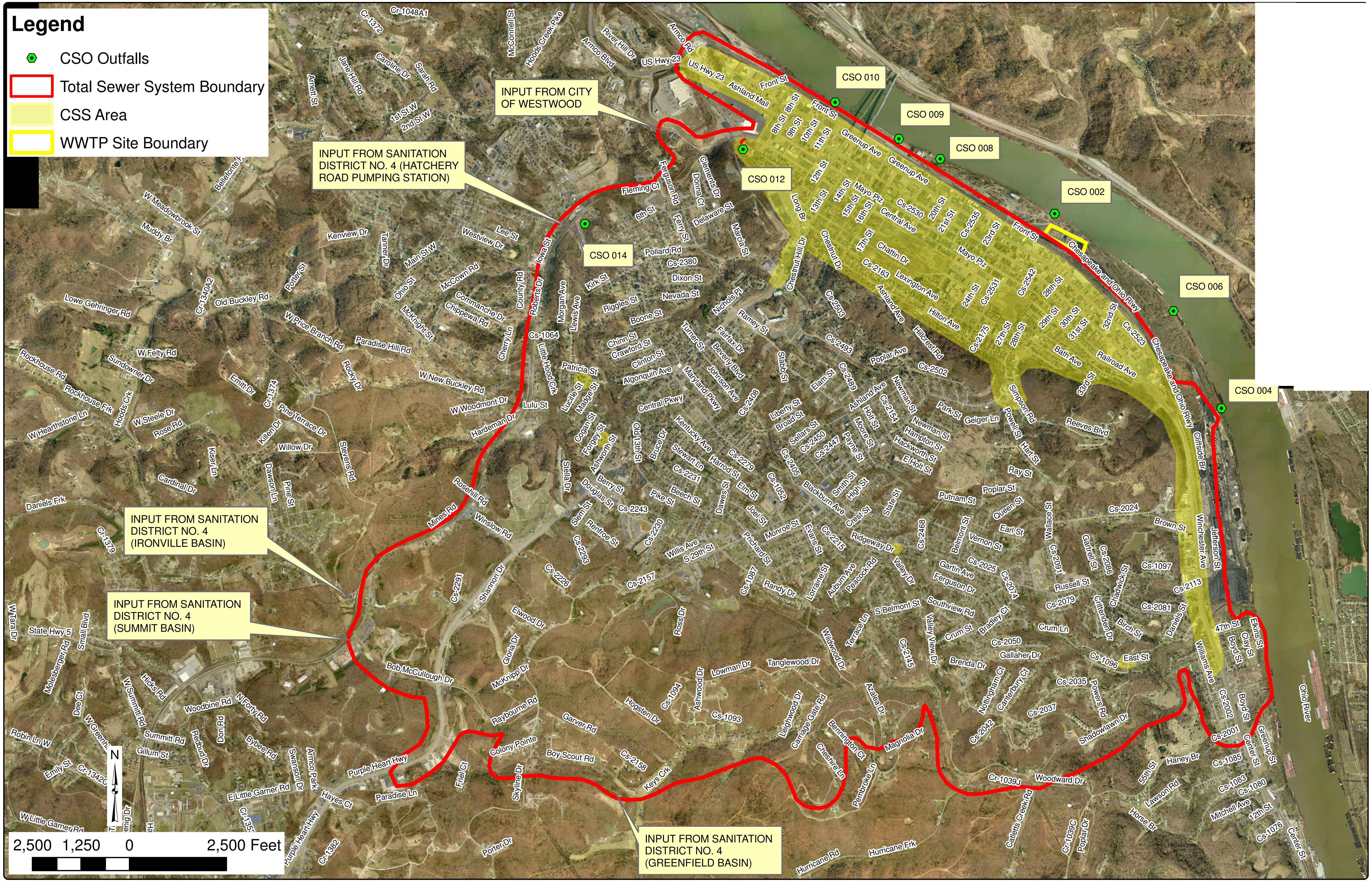
Xpswmm™ is a software program used for storm and wastewater management modeling. It was chosen because of the following characteristics.

1. Xpswmm™ is a dynamic unsteady flow model. Dynamic models allow the effects of storage and backwater in conduits and floodplains and the timing of the hydrographs to yield a better representation of the hydraulic grade line at any point in space and time.
2. Xpswmm™ simulates the complete hydrologic cycle in rural and urban watersheds. All hydrologic processes including infiltration, temporary storage, and ground-surface water exchanges are included in the model.

Xpswmm™ provides a solution for analyzing the design of the most complex hydraulic networks including loops, tidal inflows, hydraulic structures, regulators, multiple time-varying boundary conditions, and distributed storage structures.

A. Scope of the Model

To represent the existing CSS and allow for evaluation of various CSO abatement control alternatives, sufficient detail was incorporated into the model so that dry and wet weather flows at modeled manholes and modeled sewers would be as close to actual as possible. The accuracy of system flows was improved so that CSO abatement alternatives would be able to redirect flows in the system, where required. The system conveyance and storage capacities were accounted for by incorporating detail such as the physical characteristics of the collection system. The dry and wet weather flows were determined by dividing the collection and drainage areas into sufficiently small basins and by accounting for separate sanitary sewer inputs. The CSO discharges were modeled by collecting details on the CSO regulator structures. Figure 2.07-1 shows the extent of the hydraulic model in relation to the entire Ashland sewer system.



EXTENT OF HYDRAULIC MODEL IN RELATION TO SEWER SYSTEM

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.07-1
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.07-1

SEWERS, MANHOLES, AND SUBBASINS INCORPORATED IN THE MODEL

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 2.07-2
5102.002

B. Model Input Data

1. Sewers

The Ashland CSS contains sewers ranging 10 inches to 66 inches in diameter. All combined sewers greater than or equal to 24 inches were included in the model because of their conveyance and storage significance. Some smaller diameter sewers within the CSS were included in the model for their hydraulic significance. Sewers upstream of the CSO regulators were included in the model to increase the accuracy of the hydrographs at the regulators and resulting CSO discharges. Trunk sewers downstream of the CSO regulators were included in the model to allow for capture of dry weather flows and wet weather first flushes. Within the SSS, all major interceptors within delineated sewersheds were included in the model regardless of their size. In all, 541 sewer segments were incorporated in the model. Figure 2.07-2 shows the sewers incorporated into the model.

2. Manholes

Manholes were included in the model wherever there was a dry weather input, wet weather input, change in sewer size, significant change in sewer grade, multiple sewer junction, CSO regulator, CSO outfall, or PS wet well. In all, 541 manholes were incorporated into the model. Manhole rim elevations, inverts, sizes, and locations were obtained mostly through old sewer maps, construction plans, and field inspections. Figure 2.07-2 shows the sewers incorporated into the model.

3. Valves, Orifices, and Weirs

All valves, orifices, and weirs found in the modeled portion of the CSS were incorporated into the model. Information regarding these hydraulic structures was initially obtained from previous reports and diagrams and was verified or modified, if necessary, using information obtained through confined space entry field investigations. The type, invert elevation, shape, area, and estimated discharge coefficients were obtained for the orifices. The type, weir crest elevation, pipe crown elevation, shape, length, and estimated discharge coefficients were obtained for the weirs.

4. Basins

Two main types of basins were incorporated into the model; sanitary collection basins and I/I drainage basins. Sanitary collection basins were used to account for generation of dry weather flows and were delineated based on land use, collector sewer location, and lateral placements. I/I drainage basins were used to account for the generation of wet weather flows and were delineated based on surface topography, collector sewer location, and inlet placement. In all, 128 separate sanitary collection and I/I drainage basins were incorporated into the model. Basin areas, initial shape factors, land uses, slopes, and initial percent imperviousness were obtained through geographical information system mapping, old sewer maps, topographic maps, land use maps, and field inspections. Figure 2.07-2 illustrates the subbasins incorporated into the model.

5. Satellite Systems Discharging to Ashland's System

The discharges from the four satellite systems discharging to Ashland's system were incorporated in the model. Figure 2.03-1 shows the location where these satellite systems discharge to Ashland's system. The drainage basins were calibrated using flow and rainfall data obtained during the Phase 1 flow monitoring period.

6. Separate Sanitary Systems Discharging into the CSS

The discharges from five separate gravity systems were incorporated in the model because they discharge into the CSS. Figure 2.03-4 shows the location of these basins. The properties of these basins were described in Section 2.03D. The drainage basins were calibrated using flow and rainfall data obtained during the Phase 1 flow monitoring period.

7. FCPSs

The six FCPSs associated with the CSS were not incorporated into the model because they are only used in flood conditions.

In addition, since the FCPSs are only employed when the Ohio River is flooded, their significance in the model is limited. The FCPSs will be taken into consideration during CSO abatement alternative development so that Ashland remains protected during flood conditions. A copy of the O&M Manual for the FCPSs may be found in Appendix E.

C. Dry Weather Flow Calibration

Dry weather calibration of Ashland's SSS and CSS was accomplished through replication of metered data. This method of calibration involves systematically adjusting model parameters until model results resemble the metered data.

From the beginning of April 2006 to the mid-July 2006, a total of 37 AVFMs and four tipping bucket rain gauges were installed in Ashland's collection system for a period of 90 days. Flow meters were installed where three of the four satellite SSS discharges into Ashland's collection system, where Ashland's SSS discharges into the CSS, on all major CSO regulators, and at major influent pipes to major PSs, and at several strategic locations within Ashland's SSS and CSS to allow for a more detailed characterization of the flows.

During the flow monitoring period, several days of dry weather flow were captured. Flows were considered dry if the effects of previous rainfall were unrecognizable. Average dry weather flows were calculated for each meter by averaging at least five reliable dry weather flow periods. The days used for calculation of average dry weather flows varied from meter to meter, but it was preferable to use the same days for most meters if they have reliable data for the same days. Days were not used when meter errors occurred or abnormally high or low flows were recorded. Refer to the *City of Ashland, Kentucky March 2007 Combined Sewer Overflow Long-Term Control Plan Flow Metering Results* in Appendix H for more detail.

Each meter's incremental sanitary collection area was calibrated using each meter's incremental dry weather flows. The incremental sanitary collection area associated with each meter refers to the collection area upstream of each meter and downstream of any upstream meters. The incremental collection area also does not include any collection area associated with separate sanitary sewer systems that were incorporated into the model using separate inputs. For example, Flow Meter Nos. 12 and 40 were located upstream of Flow Meter No. 28. The incremental collection area associated with Flow Meter No. 28 was obtained by subtracting the collection area upstream of Flow Meter Nos. 12 and 40 from the total collection area upstream of Flow Meter No. 28. Similarly, the incremental dry weather flow associated with each meter refers to the dry weather flow collected by each meter less the dry weather flow collected by any upstream meters.

The average daily dry weather diurnal hydrographs were incorporated into the model as temporary variations. The daily dry weather diurnal hydrographs were calculated by normalizing each meter's average incremental daily dry weather flow.

Significant discharges resulting from industries, commercial facilities, and businesses were not incorporated into the model independently but were included in each meter's incremental collection area calibration. The significant discharges were not incorporated into the model independently because the increase in accuracy gained from precisely locating significant sources of dry weather flow is insignificant compared to equally distributing them over a meter's incremental collection area. Moreover, dry weather flows are somewhat insignificant when compared to the large wet weather flows associated with the CSS.

Daily and seasonal variations in dry weather flows were not incorporated into the model because of the limited amount of flow data and the relative insignificance. Seasonal variations were observed in the data collected by the meters. This is because April 2006 was very wet, and base flows were very high compared to base flows in the remaining months of the flow monitoring period. No data in April was used in estimating average dry weather flows to avoid overpredicting base flows.

See *CSO LTCP xpswmm™ Calibration and Validation Report* (Appendix J) for details of the dry weather flow calibration and validation.

D. <u>Wet Weather Calibration and Validation</u>

Similar to dry weather flow calibration, wet weather calibration of Ashland's CSS model was accomplished using replication of metered data and parameter estimation. Most of Ashland's CSS wet weather calibration was accomplished through replication of metered data.

According to *USEPA Guidance on Monitoring and Modeling* (1999) "for calibration, the most important comparisons are total volumes, peak flows, and shapes of hydrographs." Therefore, the objective of the model calibration was to obtain a good visual comparison of model and metered hydrographs in terms of total volume, peak flow rate, peak flow rate time of occurrence, and shape of the hydrograph for a range of storm sizes.

The goals of the calibration effort consisted of the following tasks:

1. Match modeled volume and metered volume within ±20 percent.
2. Match modeled peaks and metered peaks within ±20 percent.
3. Match model peak-flow rate time of occurrence within ± one hour of metered peak flow rate time of occurrence.

In 2008, an xpswmm model of the SSS and CSS was constructed and calibrated using Phase 1, 2006 rainfall and flow data from satellite system, in-system, and CSO outfall temporary meters. The calibration effort was referred to as Phase 1 Calibration and Verification.

As a result of a delay in the approval process, Ashland had installed permanent flow meters on all CSO outfalls and three permanent rain gauges at the Roberts Drive PS, water treatment plant, and WWTP by the time Ashland was ready to use the calibrated model for the alternative evaluation. To further validate the model, Ashland decided to run some rainfall events through the model and compare the predicted flows with the metered flow data. The predictability of the model for most of the CSO outfalls was satisfactory except for the 18th Street CSO (CSO 009) outfall where the model was consistently underpredicting the metered flow. It was decided to tweak the calibration parameters to better predict the metered flow at the CSO 009 outfall. This calibration and verification effort was referred to as the Phase 2 Calibration and Verification.

In addition to Phase 1 rainfall events, five Phase 2 rain events were selected to be used in the Phase 2 model calibration and validation process, meaning that 10 rainfall events were used for the Phase 2 calibration and validation process. Therefore, the model was calibrated to various ranges of rainfall with various total rainfalls, intensities, and durations. Table 2.07-1 provides a list of the rainfall events used for the Phase 2 calibration, total rainfall recorded by the rain gauges, and their statistical ranking.

	Rainfall Total (in)				Statistical Ranking[1]			
	Rain Gauge				Rain Gauge			
Event Date	A	B	C	D	A	B	C	D
April 25, 2006	**0.51**	**0.63**	**0.61**	**0.52**	**< 2-mo 3-hr**	**< 2-mo 3-hr**	**< 2-mo 3-hr**	**< 2-mo 3-hr**
May 25, 2006	0.95	1.1	0.99	0.62	< 2-mo 24-hr	< 2-mo 2-hr	< 2-mo 24-hr	< 2-mo 24-hr
June 7, 2006	0.14	0.24	0.26	0.12	<< 2-mo	< 2-mo 15-min	< 2-mo 15-min	<< 2-mo
June 11, 2006	**1.13**	**1.11**	**0.99**	**1.26**	**2-mo 6-hr**	**2-mo 6-hr**	**3-mo 6-hr**	**2-mo 2-hr**
July 4, 2006	**2.14**	**1.49**	**1.41**	**1.62**	**3-mo 15-min 6-mo 2-hr 6-mo 24-hr**	**4-mo 15-min 3-mo 1-hr 2-mo 24-hr**	**3-mo 30-min 2-mo 1-hr 2-mo 24-hr**	**4-mo 15-min 3-mo 30-min 3-mo 24-hr**
December 8, 2009	**1.63**	**MF**	**1.58**	**NI**	**4-mo, 12-hr 3-mo, 18-hr 2-mo, 24-hr**	**N/A**	**3-mo, 12-hr 3-mo, 18-hr**	**N/A**
February 5, 2010	1.31	MF	1.02	NI	< 2 mo 48-hr	N/A	< 2-mo	N/A
May 2, 2010	**1.97**	**3.5**	**4.25**	**NI**	**4-mo, 48-hr**	**5-Year, 18-hr 2-year, 12-hr 9-mo, 6-hr 4-mo, 3-hr**	**5-year 12-hr 1-year 6-hr 6-mo 3-hr 3-mo 2-hr 2-mo 1-hr**	**N/A**
July 13, 2010	**1.18**	**1.11**	**1.57**	**NI**	**2-mo, 15-min 2-mo, 6-hr**	**2-mo, 6-hr**	**2-mo, 30-min 4-mo, 6-hr**	**N/A**
August 14, 2010	1.3	1.35	MF	NI	2-year, 15-min 1-year, 30-min 6-mo, 1-hr 4-mo, 2-hr	2-year, 15-min 1-year, 30-min 6-mo, 1-hr 6-mo, 2-hr	N/A	N/A

Table 2.07-1 Rainfall Events and Statistical Rankings

See *CSO LTCP xpswmm™ Calibration and Validation Report* (Appendix J) for details of the wet weather flow calibration and validation.

E. <u>Existing System Performance</u>

Characterization of the existing system performance was accomplished through simulation of statistical rainfall events and a typical rainfall year. To accurately calibrate the model, the configuration of the model was set up to resemble the configuration of the CSS that existed during collection of the calibration flow metering data.

1. Statistical Event Simulation

To simulate the existing system performance for statistical events, the model was run using statistical rainfall data obtained from the MCC Research Report 92-03 *Rainfall Frequency Atlas of the Midwest*. The statistical rainfall data was listed in Table 2.06-3. The peak CSO discharge rates and total CSO discharge volumes resulting from a wide range of 1-hour duration return interval events are listed in Table 2.07-2. The peak CSO discharge rates and total CSO discharge volumes resulting from a wide range of 24-hour duration return interval events are listed in Table 2.07-3.

1-Hr Events		CSO 002 26th Street	CSO 004 37th Street	CSO 006 34th Street	CSO 008 18th Street	CSO 009 15th Street	CSO 010 10th Street	CSO 012 6th Street	CSO 014 Roberts Drive
2-Mo	Peak (gpm)	31,800	1,700	2,400	20,400	4,500	14,600	600	3,400
	Volume (gal)	1,627,000	108,000	473,000	912,000	200,000	633,000	45,000	271,000
3-Mo	Peak (gpm)	34,800	2,400	2,600	20,600	5,400	16,100	700	4,400
	Volume (gal)	1,864,000	198,000	551,000	1,082,000	243,000	773,000	60,000	382,000
4-Mo	Peak (gpm)	34,300	2,900	2,700	20,700	5,600	17,500	700	5,200
	Volume (gal)	2,072,000	261,000	606,000	1,227,000	280,000	881,000	69,000	469,000
6-Mo	Peak (gpm)	37,900	3,800	3,200	21,200	5,500	19,500	700	5,900
	Volume (gal)	2,513,000	354,000	688,000	1,468,000	335,000	1,073,000	81,000	616,000
1-Yr	Peak (gpm)	50,800	5,100	3,600	21,700	7,600	21,100	800	6,200
	Volume (gal)	3,512,000	534,000	814,000	1,918,000	452,000	1,466,000	102,000	865,000
2-Yr	Peak (gpm)	55,600	5,800	4,100	22,000	8,300	22,500	800	6,400
	Volume (gal)	4,491,000	678,000	922,000	2,397,000	545,000	1,798,000	120,000	1,066,000

Table 2.07-2 Existing System Statistical Rainfall Event CSO Discharge (1-Hr Events)

24-Hr Events		CSO 002 26th Street	CSO 004 37th Street	CSO 006 34th Street	CSO 008 18th Street	CSO 009 15th Street	CSO 010 10th Street	CSO 012 6th Street	CSO 014 Roberts Drive
2-Mo	Peak (gpm)	6,400	600	2,300	4,500	800	2,100	100	1,800
	Volume (gal)	1,839,000	150,000	1,200,000	1,952,000	371,000	482,000	11,000	747,000
3-Mo	Peak (gpm)	8,000	1,400	2,400	5,300	900	2,600	600	2,400
	Volume (gal)	2,432,000	319,000	1,443,000	2,522,000	447,000	686,000	119,000	1,054,000
4-Mo	Peak (gpm)	9,000	1,800	2,500	5,700	1,000	3,000	600	2,700
	Volume (gal)	2,866,000	455,000	1,591,000	2,912,000	492,000	828,000	162,000	1,269,000
6-Mo	Peak (gpm)	10,900	2,400	2,500	6,600	1,100	3,900	700	3,400
	Volume (gal)	3,696,000	726,000	1,842,000	3,630,000	581,000	1,096,000	217,000	1,638,000
1-Yr	Peak (gpm)	14,200	3,200	2,600	8,200	1,200	5,300	700	4,500
	Volume (gal)	5,198,000	1,149,000	2,243,000	4,842,000	791,000	1,591,000	294,000	2,263,000
2-Yr	Peak (gpm)	17,200	4,000	2,700	9,600	1,400	6,400	700	5,500
	Volume (gal)	6,579,000	1,552,000	2,576,000	5,943,000	950,000	2,071,000	360,000	2,892,000

Table 2.07-3 Existing System Statistical Rainfall Event CSO Discharge (24-Hr Events)

2. Typical Rainfall Year Simulation

As discussed earlier, the modified rainfall that occurred from January 1, to December 31, 1974, closely represents a typical rainfall year.

The number of CSO occurrences and the total CSO discharge volume during the typical rainfall year for the CSS as it existed in 2010 during the Phase 2 Flow Monitoring and xpswmm™ model calibration are listed in Table 2.07-4.

CSO No.	Number of CSO Occurrences	Total CSO Volume (MG)
002	52	66.0
004	30	6.8
006	50	28.8
008	52	60.0
009	52	10.6
010	52	23.5
012	14	1.5
014	30	19.6
	Total	**216.8**

Table 2.07-4 Existing System Typical Year Rainfall Modeled Annual CSO Discharges

2.08 RECEIVING WATER MONITORING (WATER QUALITY)

Ashland did not conduct a receiving water monitoring and modeling program for the Ohio River, Little Hoods Creek, and Long Branch concurrently with the CSS and SSS monitoring and modeling program. Some wet weather sampling was conducted on CSO quality in the mid-1990s to determine the baseline CSO discharges in Ashland during wet weather. The results of these samples indicated that CSO discharges were high in fecal coliform counts. The results indicated that during wet weather fecal coliform is the pollutant of concern; the results of this effort are shown in Figure 2.08-1. Additional water quality data can be found in Appendix K. Since December 2010, Ashland has been collecting receiving water and CSO samples for fecal coliform analysis to establish baseline bacteriological conditions. Sampling locations are shown in Figure 2.08-2. Table 2.08-1 is a summary of the water quality and CSO quality samples results collected by Ashland since December 2010. Detailed results can be found in Appendix K.

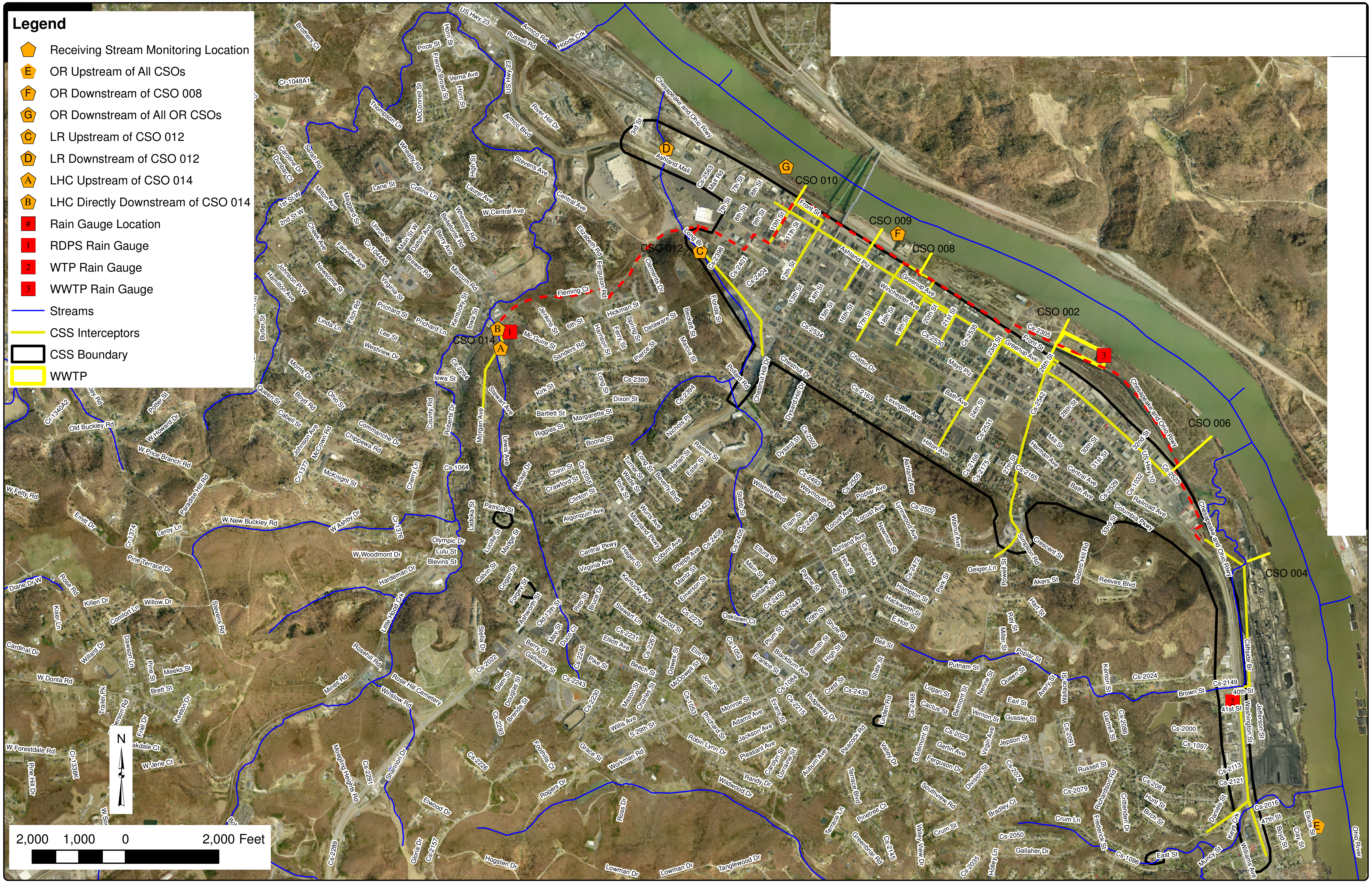
ASHLAND, KENTUCKY CSO SAMPLING		SAMPLING 6TH STREET CSO 012			SAMPLING 10TH STREET CSO 010			SAMPLING 26TH STREET CSO 002			SAMPLING 34TH STREET CSO 006		
GRW ENGINEERS, INC.													
DATE OF COLLECTION: 4/16/96													
COMPOSITE SAMPLE													
**AVERAGE RAINFALL=													
PARAMETER	UNITS	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM
MICROBIOLOGICALS													
BACTERIOLOGICAL, FECAL COLIFORM	C/100ml	1	60000	HIGH	1	60000	HIGH						
GENERAL PARAMETERS													
DIAZINON	ppb	0.03	0.07	HIGH	0.03	N/A							
CYANIDE, TOTAL	mg/L	0.002	N/A		0.002	N/A							
HEM (OIL&GREASE, TOTAL)	mg/L	5	6	HIGH	5	6	HIGH						
NITROGEN AMMONIA	mg/L	0.1	2.1		0.1	24							
OXYGEN DEMAND,BIOCHEMICAL,5-DAY/	mg/L	1	22		1	24							
OXYGEN DEMAND CHEMICAL	mg/L	1	84	HIGH	1	N/A							
pH	S U	N/A	7		N/A	6.8							
SOLIDS,TOTAL SUSPENDED	mg/L	1	28		1	66	HIGH						
DATE OF COLLECTION: 4/23/96													
COMPOSITE SAMPLE													
**AVERAGE RAINFALL=													
PARAMETER	UNITS	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM
MICROBIOLOGICALS													
BACTERIOLOGICAL, FECAL COLIFORM	C/100ml	1	60000	HIGH	1	60000	HIGH	1	60000	HIGH	1	N/A	
GENERAL PARAMETERS													
DIAZINON	ppb	0.03	0.03		0.03	N/A		0.03	N/A		0.03	N/A	
CYANIDE,TOTAL	mg/L	0.002	N/A		0.002	N/A		0.002	N/A		0.002	0.002	
HEM (OIL&GREASE, TOTAL)	mg/L	5	21	HIGH	5	10	HIGH	5	19	HIGH	5	28	HIGH
NITROGEN AMMONIA	mg/L	0.1	N/A		0.1	N/A		0.1	N/A		0.1	N/A	
OXYGEN DEMAND,BIOCHEMICAL,5-DAY/	mg/L	1	91	HIGH	1	37		1	84	HIGH	1	160	HIGH
OXYGEN DEMAND CHEMICAL	mg/L	1	300	HIGH	1	110	HIGH	1	210	HIGH	1	580	HIGH
pH	S U	N/A	6.9		N/A	7.1		N/A	8		N/A	8.7	
SOLIDS,TOTAL SUSPENDED	mg/L	1	490	HIGH	1	116	HIGH	1	378	HIGH	1	562	HIGH
DATE OF COLLECTION:5/06/96													
COMPOSITE SAMPLE													
**AVERAGE RAINFALL=													
PARAMETER	UNITS	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM	DETECT LIMIT	RESULTS	ALARM
MICROBIOLOGICALS													
BACTERIOLOGICAL, FECAL COLIFORM	C/100ml				1	6900	HIGH	1	60000	HIGH	1	510	HIGH
GENERAL PARAMETERS													
DIAZINON	ppb												
CYANIDE,TOTAL	mg/L				0.03	0.03		0.03	N/A		0.03	N/A	
HEM (OIL&GREASE, TOTAL)	mg/L				0.002	0.002		0.002	0.88	HIGH	0.002	4.1	HIGH
NITROGEN AMMONIA	mg/L				5	5		5	5		5	26	HIGH
OXYGEN DEMAND,BIOCHEMICAL,5-DAY/	mg/L				0.1	1.5		0.1	1.7		0.1	7.6	
OXYGEN DEMAND CHEMICAL	mg/L				1	22		1	20		1	230	HIGH
pH	S U				1	87	HIGH	1	46	HIGH	1	530	HIGH
SOLIDS,TOTAL SUSPENDED	mg/L				N/A	6.6		N/A	7.2		N/A	9	
					1	93	HIGH	1	44	HIGH	1	272	HIGH

WET WEATHER COMBINED SEWER OVERFLOW SAMPLING RESULTS

COMBINED SEWER OVERFLOW INTERIM LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.08-1
5102.002



CSO RECEIVING STREAM MONITORING SAMPLING LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE2.08-2
5102.002

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Sample Location	Number of Samples	Minimum Count	Maximum Count	Geometric Mean
Receiving Stream Sampling				
Sample Point A 1	7	81	7,100	909
Sample Point B 2	6	53	35,000	1,691
Sample Point C 3	8	45	19,900	986
Sample Point D 4	6	60	19,750	1,927
Sample Point E 5	9	94	6,500	955
Sample Point F 6	5	23	7,487	482
Sample Point G 7	5	138	31,500	2,910
CSO Sampling				
CSO 004	4	1,200	41,000	5,159
CSO 006	4	600	42,000	3,670
CSO 008	1	22,500	22,500	22,500
CSO 009	3	1,100	4,480	1,783
CSO 010-1	2	20	6,000	346
CSO 010-2	1	6,000	6,000	6,000
CSO 012	4	3,680	40,000	10,903
CSO 014	4	1,200	83,500	9,231

[1] Sample Point A–Directly Upstream of CSO 14 Roberts Dr. CSO on the East Fork of Little Hoods Creek.
[2] Sample Point B–Directly downstream of CSO 14 Roberts Dr. CSO on the East Fork of Little Hoods Creek.
[3] Sample Point C–Directly upstream of CSO 12 6th Street CSO on Long Branch.
[4] Sample Point D–Directly downstream of CSO 12 6th Street CSO on Long Branch.
[5] Sample Point E–47th Street boat ramp on the Ohio River Upstream of CSO 004 37th Street CSO.
[6] Sample Point F–Directly downstream of CSO 010 10th Street CSO on the Ohio River.
[7] Sample Point G–Directly upstream of CSO 009 15th Street CSO on the Ohio River.

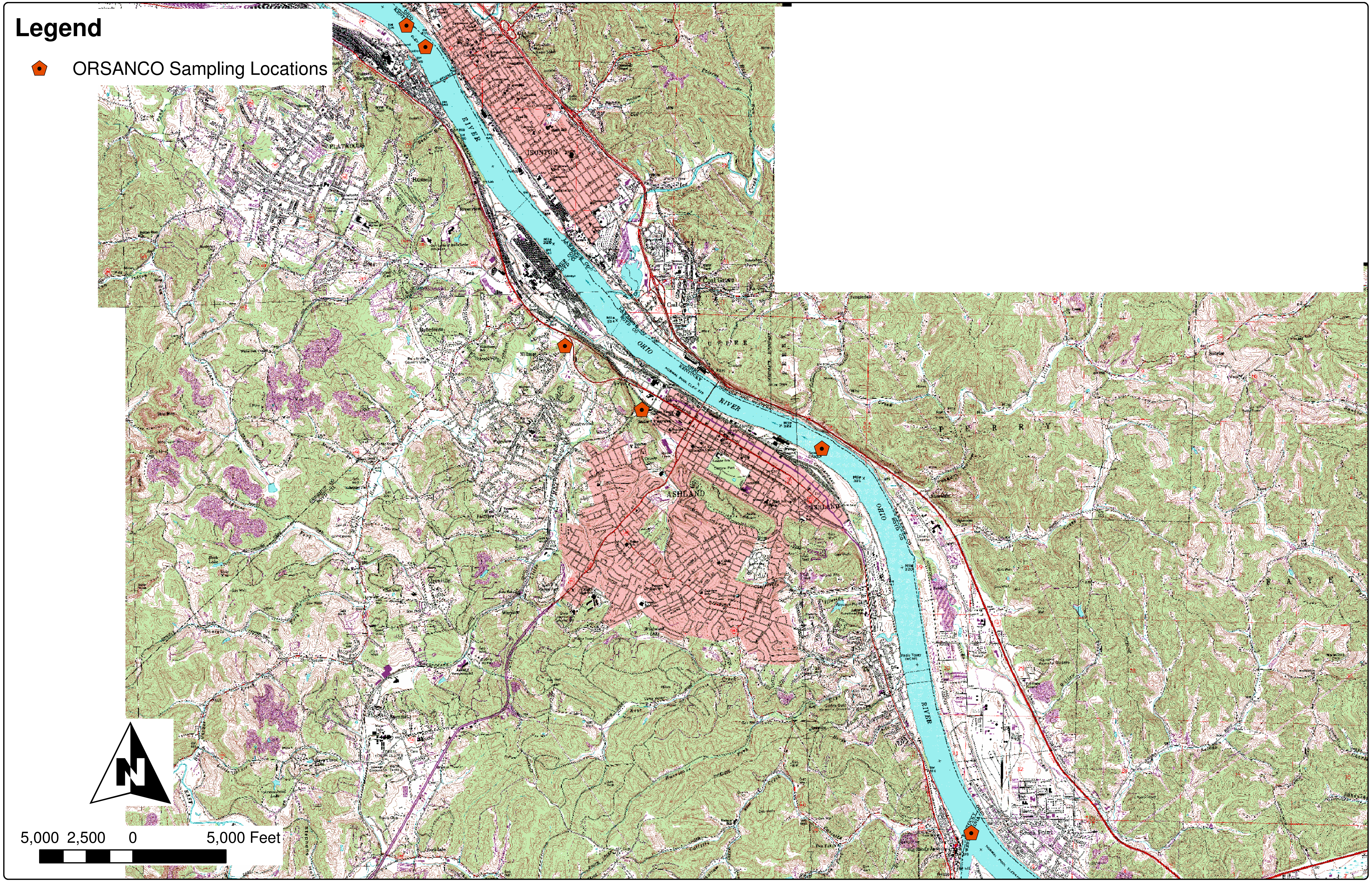
Table 2.08-1 Fecal Coliform Results Collected By Ashland Since December 2010 (cfu/100 mL)

Ashland is currently working toward improved water quality through a number of measures:

1. Anti-litter campaigns.
2. Catch basin cleaning programs.
3. Used oil recycling programs.
4. Pollution prevention programs.
5. Street sweeping.
6. Solids and floatables controls.

ORSANCO collects bacterial data in six urban locations along the Ohio River during contact recreation season (May through October). The closest monitoring point to Ashland is upstream in Huntington, West Virginia; no downstream monitoring points sampled by ORSANCO would provide meaningful data for Ashland. Data that has been collected from the upstream monitoring point is available from 1992 to present. ORSANCO collects samples upstream and downstream of each urban location and analyzes them for fecal coliform and *Escherichia colie (E. coli)* bacteria. The results of ORSANCO's bacterial sampling for 2004 to present can be found in Appendix K.

ORSANCO began collecting longitudinal water quality samples along the Ohio River in 2003, which may be beneficial to Ashland's LTCP efforts. As part of this effort, water quality samples were collected at every 5-mile interval along the length of the river, as well as from the mouths of large tributaries. Each sampling location consisted of a right quarter surface sample, a midstream surface sample, and left quarter surface water sample. All samples were tested using the *Colilert* method that tested for total coliforms and *E. coli.* A smaller subset of samples was tested in an outside lab for *E. coli* and fecal coliform using the filter membrane method. The sampling cycles that began in 2003 covered one-third of the river in four days and then repeated that same third of the river for five consecutive weeks so that five samples were collected from each 5-mile interval. The next one-third of the river was sampled in the same manner the following five weeks; this entire cycle was then completed three times during the next three years. Table 2.08-2 is a summary of the ORSANCO data relevant to Ashland from 2003 to 2007. Figure 2.08-3 shows ORSANCO sampling locations of the *E. coli* data. Detailed results of the ORSANCO *E. coli* data can be found in Appendix K.



ORSANCO E. COLI SAMPLING LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 2.08-3
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 2.08-3

TABLE 2.08-2

ORSANCO *E. COLI* RESULTS (BY COLILERT) 2003 TO 2007 (MPN cfu/100 mL)

			LDB			MID			RDB			Geometric Mean of Cross Section		
RM	Location Relative to Ashland	No. of Samples	Low	Geo Mean	High	Low	Geo Mean	High	Low	Geo Mean	High	Low	Geo Mean	High
317.2	3.7 miles upstream of Ashland's most upstream CSO (004)	16	20	117	1,470	11	45	367	7	36	291	16	57	377
321.5	In Ashland	16	8	76	1,250	15	54	201	2	32	230	9	51	239
327.4	3.4 miles downstream of Ashland's most downstream CSO (014)	15	3	39	375	3	36	361	4	30	204	3	35	236
327.7	3.7 miles downstream of Ashland's most downstream CSO (014)	15	7	66	2,220	5	37	397	4	30	273	6	42	458
Long Branch (323.7)	In Ashland	8	N/A	N/A	N/A	486	1,574	6,130	N/A	N/A	N/A	N/A	N/A	N/A
Little Hood Creek (324)	In Ashland	8	N/A	N/A	N/A	109	628	8,660	N/A	N/A	N/A	N/A	N/A	N/A

SECTION 3
PUBLIC PARTICIPATION

3.01 INTRODUCTION

The public participation section includes information concerning Ashland's efforts to involve the public through informational meetings, solicitation of comments, bill inserts, newspaper articles, and its Web site. Three public meetings have been held as part of the public involvement process. The public meetings gave all impacted groups the opportunity to understand and contribute to the development of the LTCP.

3.02 PUBLIC MEETINGS

Ashland held three public meetings during the development of the LTCP. In addition, presentation were made at several City Council meetings, which were open to the public. A summary of each meeting is presented as follows:

A. <u>City Commission Meetings</u>

On January 18, 2007, Strand made a presentation to the City Commission at its regular meeting. The presentation discussed an introduction to the LTCP process and the Consent Judgment negotiation with the State.

On July 19, 2007, another presentation was made to the City Commission members to update them on the completion of the Consent Judgment negotiations and what the City agreed to in the Consent Judgment. The City Commission had to approve the Consent Judgment before the mayor could sign it and make it binding.

Strand made another presentation to the Commission on February 7, 2008. The presentation updated the City Commission on the progress being made in meeting the requirements of the Consent Judgment. The Commission was also apprised of the requirements of the Administrative Order issued by USEPA.

On April 17, 2008, Strand gave a presentation to update the Commission on the Combined Sewer Overflow Study, State Consent Judgment, and USEPA Administrative Order. The presentation explained that Ashland's CSS must comply with the CWA and that the LTCP construction projects must be completed by December 26, 2017, as required by the USEPA Administrative Order. At the conclusion of the presentation, questions from the Commission were addressed. The Commission endorsed holding special meetings to inform the public of the CSO information and requirements.

On February 11, 2010, a presentation was made to City Commission members to update them on all Consent Judgment and Administrative Order requirements. The 6th Street/Roberts Drive project and the 37th Street improvements have been submitted for Kentucky Infrastructure Authority (KIA) low interest loans. City staff has also submitted for approval a proposed sewer surcharge beginning April 1 to be set aside in a separate account for improvements to the system. There was discussion about the surcharge, how much revenue it should generate. and the estimated cost for the entire project.

On October 20, 2011, a presentation of the LTCP recommended projects, costs and implementation schedule was made to the City Commission. Ashland will request that all projects be completed by the year 2026 as is the case in Ironton, Ohio, and other surrounding CSO communities.

All City Commission meetings were open to the public. There was a question and answer session after each presentation. Information on these meetings, including presentations and handouts, may be found in Appendix L.

B. Public Meeting on Background Information and Sensitive Area Introduction (June 3, 2010)

Ashland hosted a public meeting at the City Police Station Building, adjacent to the City Building, to engage the public in a discussion of sensitive areas. The meeting included a brief overview and background information on CSOs, the LTCP, existing uses, and sensitive areas. A handout was provided for citizens to provide their requested input. Copies of the presentation, handout, and attendance list are included in Appendix L.

C. Public Meeting on CSO Controls and Financial Impacts (July 15, 2010)

A public meeting was held to discuss CSO control technologies applicable for Ashland, preliminary alternatives under consideration by Ashland, and their financial impacts. This meeting was also held at the Police Station Building on July 15, 2010. The meeting included an overview of all CSO abatement alternatives and follow-up discussion with attendees. Information gained during this meeting was used in developing the final alternatives considered in the LTCP. Copies of the presentation, handout, and attendance list are included in Appendix L.

D. Public Meeting on Recommended Plan, Implementation Schedule, and the Draft LTCP

After the draft LTCP was completed, a public meeting was held on September 19, 2011, to discuss the draft LTCP. This meeting also included discussion on the recommended CSO abatement plan and the implementation schedule of the selected projects and their impacts on residents. This meeting was held at the City Building (Commission Chambers). Residents were given an overview of the recommended plan, the implementation schedule, and the draft LTCP. Comments and concerns obtained from this meeting were addressed in the Final LTCP. Copies of the presentation, handout, and attendance list are included in Appendix L.

3.03 PUBLIC EDUCATION

A portion of each public meeting was dedicated to public education. Newspaper articles were written in *The Independent* (Ashland's newspaper) in advance of each public meeting. (see Appendix L). The articles included a degree of basic public education. Additional media coverage will be sought to continue Ashland's efforts to educate the public.

Ashland's Web site includes some information for the general public on the subject of CSOs and the LTCP. Ashland strives to keep this information current.

3.04 PUBLIC INVOLVEMENT

A portion of each public meeting was also dedicated to public involvement. Ashland is committed to involving the public throughout the duration of the LTCP approval and implementation. Copies of the final plan will be made available in the Office of Engineering and Utilities, Room 408, for review by the public.

3.05 CONCLUSION

Ashland has made considerable effort to comply with the public involvement aspects of the CSO LTCP process. The public education and involvement will continue through the approval and implementation phases of the project.

SECTION 4
IDENTIFICATION OF DESIGNATED USES AND SENSITIVE AREAS

4.01 DESIGNATED USES AND WQS

In April 2010, KDOW released the *2010 Integrated Report to Congress on the Condition of Water Resources in Kentucky*. The designated uses are split into the following categories:

1. Warm Water Aquatic Habitat
2. Cold Water Aquatic Habitat
3. Primary Contact Recreation
4. Secondary Contact Recreation
5. Fish Consumption (implied in 401 KAR 10:031)
6. Domestic (Drinking) Water Supply
7. Outstanding National Resource Water

The KDOW monitors Kentucky's water bodies and collects data to determine if designated uses are supported as defined by Kentucky's WQS regulations. KDOW monitoring programs include:

1. Biological, water quality, and bacteriological sampling at 70 long-term sites statewide, called ambient stations.

2. Water quality and bacteriological monitoring at rotating watershed locations.

3. A reference reach biological program to determine least-impaired conditions.

4. Nutrient and trophic status determination of publicly owned reservoirs (lakes monitoring).

5. Fish tissue sampling.

6. A random, statistically based biological survey of wadeable streams, called probabilistic monitoring.

7. Monitoring of nonpoint pollution sources and results of BMP implementation.

8. Monitoring for total maximum daily load (TMDL) development.

Much of the baseline biological data is collected through the probability biosurvey and targeted ambient biological monitoring programs. The probability biosurvey program provides a broad understanding of the overall biological and water quality conditions on both a watershed and statewide level. Targeted ambient biological monitoring allows KDOW to focus intensified data collection efforts on a particular event and/or locale, such as in the case of a toxic spill and its impact on a particular watershed.

When considering waters for assessment, KDOW solicited data from a variety of entities including other local agencies, other state agencies [e.g., Kentucky Department of Fish and Wildlife (DFW)], and federal agencies such as USACE, Fish and Wildlife Service, United States Geological Survey (USGS), and Tennessee Valley Authority (TVA). In addition to these sources, data from universities and ORSANCO were considered. Generally, data older than five years were not considered for assessment; however, assessment decisions were made on a case-by-case basis.

Table 4.01-1 is used by KDOW to determine designated uses in Kentucky waters and the indicators that are used to determine the level of support.

Use	Aquatic Life	Recreation	Fish Consumption[a]	Drinking Water[b]
Core Indicators	Stream: 1-3 biological communities: macroinvertebrates, diatoms and fishes Dissolved oxygen Temperature pH Specific conductance Lake/Reservoir: Dissolved oxygen Temperature pH Specific conductance Fish kills	Stream: Pathogen indicators: fecal coliform; *E. coli* pH Lakes/Reservoir: Pathogen indicators: fecal coliform or *E. coli* pH	Mercury PCBs	Inorganic chemicals Organic chemicals Pathogen indicators: fecal coliform, *E. coli*
Supplemental Indicators	Chlorophyll-*a* Trophic State Index (TSI) Secchi depth Indicator health (vigor) Chemical Sediments	Nuisance macrophytes Nuisance macroscopic algal growth Nuisance algal blooms Suspended sediment	Other chemicals of concern found in water quality standards	Odor Taste Treatment problems caused by poor water quality

[a]Implied designated use per 401 KAR 10:031 Sections 2 and 6
[b]All core indicators are based on "at the tap" MORs received from PWS

Source: DEP Division of Water

Table 4.01-1 Designated Uses in Kentucky Waters and the Indicators Used to Assess Level of Support by KDOW

In addition to KDOW's data collection efforts, ORSANCO conducts water quality assessments on the Ohio River. ORSANCO classifies water quality conditions by four designated uses:

1. Warm water aquatic life.
2. Public water supply.
3. Contact recreation.
4. Fish consumption.

The segments of water that were evaluated for the LTCP include the Ohio River from RM 317.2 (confluence of Big Sandy with Ohio River) down to the next CSO community, Ironton, Ohio at RM 327.7. This stretch of water was chosen because it will provide a representative look at the impacts of CSOs on the receiving waters. Little Hoods Creek from Roberts Drive CSO to its confluence with Hoods Creek, Hoods Creek before its confluence with the Ohio River, and Long Run from 6th Street to its confluence with the Ohio River were also included in this evaluation.

In the *2010 Biennial Assessment of Ohio River Water Quality Conditions*, ORSANCO documented the most recent water quality data for the Ohio River in the area of interest between RM 321 and RM 328. The results of this report indicate the waterway is:

1. Fully supporting public water supply use.
2. Partially supporting contact recreation use (pathogen impairment).
3. Partially supporting use for fish consumption.

ORSANCO did not assess warm water aquatic life use support in the report because of differences in state's approaches to handling data with conflicting results. Kentucky assessed the full length of the Ohio River to be fully supporting warm water aquatic life based on biological data even though total iron criteria violations would indicate impairment.

ORSANCO's sampling methodology and criteria for classifications are included in its 2010 report located in Appendix M. The ORSANCO report identifies this section of the Ohio River as requiring a TMDL. According to KDOW's information, the segment of the Ohio River from RM 317.2 to 319.4 is listed on the 303(d) list of impaired surface waters, and the impairment is identified as partially supporting fish consumption due to the pollutants dioxin and polychlorinated biphenyls. The source of these pollutants is unknown and not suspected to be CSO discharges. ORSANCO identified the Ohio River in this segment does not support primary contact recreation due to elevated *E. Coli*, a pollutant partially attributed to CSO discharge. The KDOW report lists the segment of the Ohio River from RM 319.4 to 340.8 on the 303(d) list of impaired surface waters and the impairment is identified as partially supporting fish consumption due to the pollutants dioxin and polychlorinated biphenyls (pollutants source unknown) and primary contact recreation from *E coli*.

In the *2010 Integrated Report to Congress on Water Quality in Kentucky*, the designated uses for Hoods Creek are warm aquatic habitat, primary and secondary contact recreation, and for fish consumption. According to the water quality assessment from KDOW, Hoods Creek from RM 0.15 to RM 0.9 as not supporting of primary contact recreation and warm/cold aquatic habitat, but this segment was not assessed for drinking water, fish consumption, or secondary contact recreation. Little Hoods Creek and Long Run were not mentioned in the 2010 KDOW assessment. According to Randy Payne with KDOW, if a water body is not listed in the 305(b) report or on the 303(d) list, it is assumed to be designated for primary and secondary contact recreation, fish consumption, and warm aquatic habitat; it is further assumed to be meeting those designations.

The Clean Water Act (CWA) requires compliance with Water Quality Standards (WQS) for all bodies of water. KDOW establishes the water quality criteria that are required for each type of water body. For primary contact recreation waters, Kentucky law states:

> "Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 mL or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 mL in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 mL for Escherichia coli. These limits shall be applicable during the recreation season of May 1 through October 31."

For secondary contact recreation waters, Kentucky requires that:

> "Fecal coliform content shall not exceed 1,000 colonies per 100 ml as a thirty (30) day geometric mean based on not less than five (5) samples; nor exceed 2,000 colonies per 100 mL in twenty (20) percent or more of all samples taken during a thirty (30) day period." This standard applies all year.

The State of Kentucky identifies special use waters that are worthy of additional protection. These special uses include cold water aquatic habitat, exceptional waters, reference reach waters, outstanding state resource waters, outstanding national resource waters, state wild rivers, and federal wild and scenic rivers.

None of the waters evaluated for the LTCP are designated as "special use waters" according to the KDOW documentation in Appendix M.

4.02 SENSITIVE AREAS

In accordance with the CSO Control Policy, it will be necessary for Ashland to give highest priority to controlling overflows to receiving waters considered sensitive. According to the CSO Control Policy, sensitive areas include:

1. Outstanding national resource waters.
2. National marine sanctuaries.
3. Waters with threatened or endangered species or their designated critical habitat.
4. Primary contact recreation waters, such as bathing beaches.
5. Public drinking water intakes or their designated protection areas.
6. Shellfish beds.

The USEPA's CSO Control Policy states that for sensitive areas, the LTCP should:

1. Prohibit new or significantly increased overflows.

2. Eliminate or relocate overflows that discharge to sensitive areas wherever physically possible and economically achievable, except where elimination or relocation would provide less environmental protection than additional treatment, or where elimination or relocation is not physically possible, and economically achievable, or would provide less environmental protection than additional treatment, provide the level of treatment for remaining overflows deemed necessary to meet WQS for full protection of existing and designated uses.

3. Where elimination or relocation has been proven not to be physically possible and economically achievable, permitting authorities should require, for each subsequent permit term, a reassessment based on new or improved techniques to eliminate or relocate, or on changed circumstances that influence economic achievability.

CSOs to sensitive areas are of highest priority, and if physically possible, and economically achievable should be eliminated. Sensitive area criterion includes the following:

1. Outstanding National Resource Waters

KDOW includes outstanding resource waters in its listing of special use waters. KDOW has evaluated the waters of Kentucky to determine any special use waters, and none of the water bodies of concern for the Ashland LTCP are classified as special use waters (see Appendix M). Therefore, none of the waters in this study are considered outstanding resource waters.

2. National Marine Sanctuaries

None of the waters in this study are considered national marine sanctuaries.

3. Waters with Threatened or Endangered Species or Their Designated Critical Habitat

According to the Kentucky DFW, Boyd County is home for three threatened and two endangered species at the state level. No species are threatened or endangered at the federal level.

The *Lampetra appendix*, or the American Brook Lamprey, is a threatened species of Lamprey fish that is known to live in freshwater habitats. According to Fred Howes, biologist for Kentucky DFW, there are no records of the American Brook Lamprey ever existing in the waters of interest for this effort. He also stated the American Brook Lamprey requires a clear water habitat, which is not a characteristic of the waters in this study.

The *Circus cyaneus*, or Northern Harrier, is a threatened species of bird that is threatened by habitat loss. According to Traci Hamberger, an engendered species biologist at Kentucky DFW, the Northern Harrier should not be affected by CSOs in Ashland.

The *Simpsonaias ambigua*, or Salamander Mussel, is a threatened species of freshwater mussel. No additional information was provided to indicate whether this mussel may be located in the waters of interest, but if it were, it may be negatively affected by CSOs. Any CSO abatement would enhance the environment of this threatened species.

The *Phalacrocorax auritus*, or Double-crested Cormorant, is an endangered bird species in Kentucky. This species is not federally endangered because it has large breeding range in North America and rapidly increasing populations. The threats to this species in Kentucky are being hunted, pesticides, and habitat loss. This species feeds on small fish, so it may be negatively affected if the water quality impairments reduced the small fish populations in the water bodies.

The *Acipenser fulvescens*, or Lake Sturgeon, is an endangered bony fish species. Fred Howes stated that the Lake Sturgeon was sighted in the Ohio River in Boyd County once before 1984, and it is possible that this species could exist in the Ohio River between RM 321 and RM 328. If this species did exist in the Ohio River, CSO pollution may have a negative affect on its habitat. Any CSO abatement would enhance the environment of this endangered species.

4. Primary Contact Recreation Waters, Such as Bathing Beaches

A survey of Little Hoods Creek, which is the receiving stream of CSO 014 (Roberts Drive), identified several places with access to the receiving stream. Field observations and interviews with parents at the Big Sandy Baseball Complex revealed that children access the creek “on a daily basis." Therefore portions of Little Hoods Creek, downstream of Roberts Drive CSO (CSO 014) discharge location were designated as sensitive areas.

Figure 4.02-1 shows the sensitive areas for the Ashland CSO affected waters.

5. Public Drinking Water Intakes or Their Designated Protection Areas

Ashland owns and operates the potable water distribution systems that serve Ashland as well as other consumers throughout Boyd County including the City of Catlettsburg. The Ashland Municipal Water Works intake, located at RM 319.7, provides water service to approximately 35,900 residential and commercial customers. This intake is located on the Ohio River located near 41st Street, upstream of all Ashland CSOs.

Water is pumped from the river to a 25-million-gallon reservoir and transferred to the Ashland WWTP, as needed. It is important to investigate drinking water intakes to ensure the water quality of this water is not impaired. In this case, Ashland's CSOs will not have a significant impact on the drinking water intake because it is located upstream of the CSOs. The next downstream drinking water intakes are located approximately 8 miles downstream in Russell, Kentucky, and Ironton, Ohio. Russell's intake is located at RM 327.5, serves 14,500 people, and is operated by the Russell WWTP. Ironton's intake is located at RM 327.0 and serves 12,700 people. See Figure 4.03-1 for a map of the drinking water intakes.

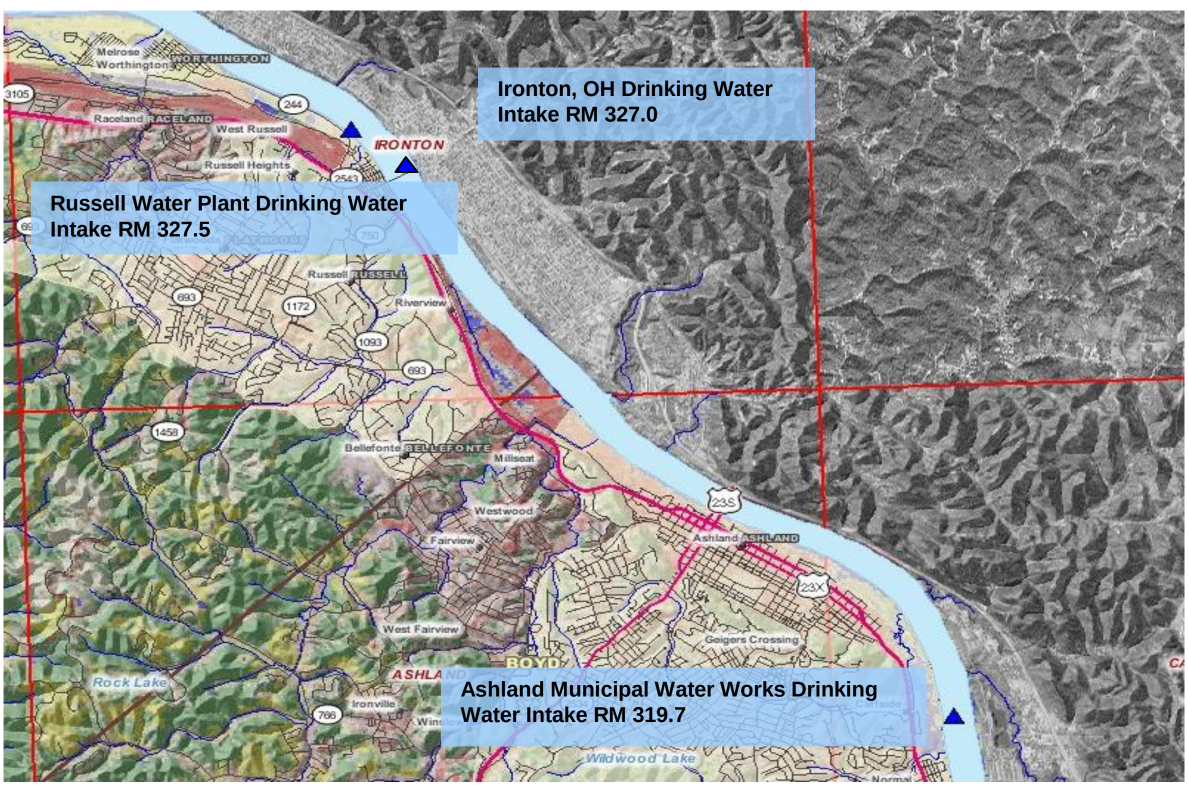
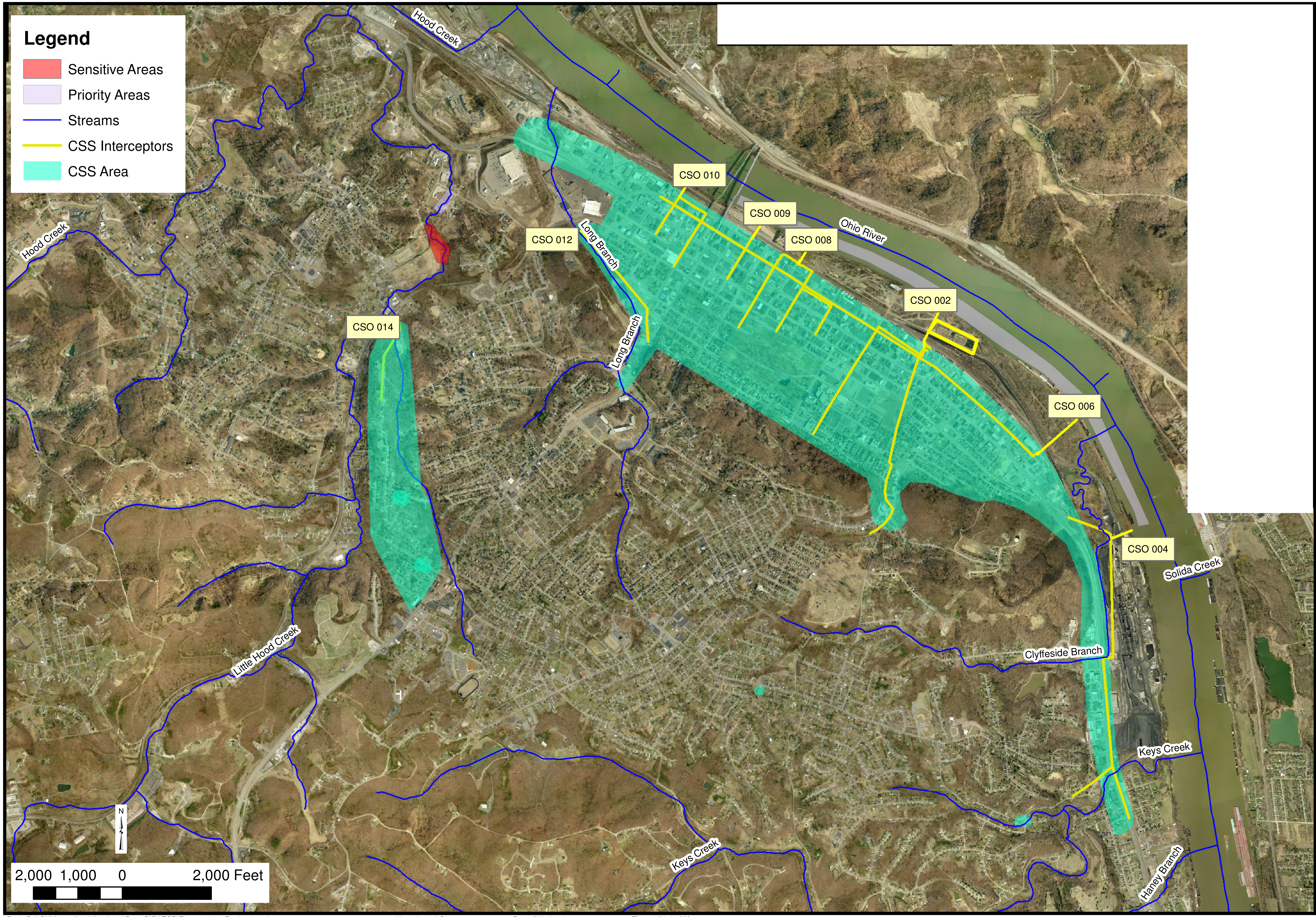


Figure 4.03-1 Drinking Water Intakes on the Ohio River Near Ashland



SENSITIVE AND PRIORITY AREAS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 4.02-1
5102.002

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6. Shellfish Bed

No shellfish beds are known to exist on the waters in this study.

4.03 PRIORITY AREAS

1. Hoods Creek

Little Hoods Creek discharges into Hoods Creek, where flows are conveyed 0.8 miles to the Ohio River. There is minimal access to Hoods Creek from this point until its confluence with the Ohio River at RM 324. The public concluded this portion of Hoods Creek is not a priority area.

2. Long Branch

A survey of Long Branch (sometimes referred to locally as Long Run), which is the receiving stream for CSO 012 (6th Street), found limited access or no access downstream of the CSO discharge location until Long Branch discharges to the Ohio River at RM 323.7. The public concluded that Long Branch is not a priority area.

3. Ohio River

With the completion of the Riverfront Park, Ashland considers areas along the Ohio River upstream of CSO 009 as priority areas.

Figure 4.02-1 shows the priority areas for the Ashland CSO affected waters.

4.04 RECOMMENDED PLAN CONSIDERATION OF SENSITIVE AND PRIORITY AREAS

During the public involvement process it was decided that CSOs discharging to smaller streams should be given the highest priority. As mentioned earlier, the Big Sandy Baseball Complex is located downstream of Roberts Drive (CSO 014) discharge where kids have access and occasionally play in Little Hoods Creek. Therefore the first two early action projects addressed discharges to the Little Hoods Creek (1-year level of control) and Long Branch (4-month level of control). The rerouting of the 37th Street force main that has been causing occasional dry weather overflows at the 34th Street CSO is the next project to be implemented according to the recommended plan of this LTCP.

SECTION 5
PREVIOUSLY COMPLETED CSO CONTROL PROJECTS

5.01 INTRODUCTION

This section describes the previously completed CSO projects that have been implemented by Ashland as part of Ashland's proactive approach toward reducing and controlling CSO discharges.

A. 23rd on Hilton Avenue to Mayo Plaza to Long Branch Stormwater Separation Project

The Hilton Avenue to Mayo Plaza to Long Branch Stormwater Separation Project started in 1986 and was completed in 1988 at a cost of $298,200. This was a stormwater separation project that relocated catch basins from Hilton Avenue to 12th Street along Mayo Plaza to a new storm sewer ranging in size from 15 inches to 42 inches and removed approximately 36 acres of stormwater drainage from the CSS. Figure 2.03-3 in Section 2 of this report shows the location of this project.

B. Railroad Alley Stormwater Separation Project

The Railroad Alley Storm Sewer Project from the 60-inch Tannery Interceptor to 35th Street was completed in four phases from 1995 to 1998. The total cost of this separation project was $946,719. This project created a separate storm sewer and removed stormwater from the CSS.

A fifth phase of the Railroad Alley Separation project was completed in 2005 at a cost of $186,400. This phase of the project relocated catch basins from 22nd to 25th Streets to a new 36-inch storm sewer and removed approximately 7 acres of stormwater drainage from the CSS tributary to CSO 002 (26th Street). Figure 2.03-3 in Section 2 of this report shows the location of this project.

C. 25th Street Stormwater Separation Project

In 2003, the 25th Street Stormwater Separation project was completed at the cost of $2,171,706 to decrease the volume of CSO discharge at CSO 002. The stormwater separation efforts removed approximately 23 acres of combined sewer drainage from the CSS along 25th Street. The project consisted of the construction of a 24-inch storm sewer along 25th Street from Hilton Avenue to Railroad Alley. At the intersection of 25th Street and Railroad Alley, a new 48-inch by 76-inch elliptical RCP discharges to a 66-inch pipe. It remains a 66-inch pipe from Railroad Alley to Carter Avenue where it picks up more flow and increases to a 72-inch pipe. It remains a 72-inch pipe until it discharges to the 66-inch CSO 002 outfall pipe downstream of the regulator through the 26th Street Flood Wall Pump Station. Figure 2.03-3 in Section 2 of this report shows the location of this project.

D. Replacement of Sanitary Sewers to Reduce/Eliminate Infiltration

Ashland has undertaken projects to address infiltration in areas where infiltration problems were identified, which include the following:

- Kirk Street: Blackburn Avenue to Maynard Road completed in 2005 at the cost of $25,000.
- 39th Street: Between Belmont Street and Queen Street completed in 2004 at the cost of $105,781.

- Coburn Avenue: Blackburn Avenue to Stabb Street.

- Hilton Avenue: Stormwater drainage (five blocks) completed in 2008 at the cost of $425,000.

E. Installation of Variable Speed Drives on Pump Stations Within the Combined Sewer System

The City has installed variable speed drives on pump stations within the CSS to control pumping rate. The pump stations with variable speed drives include:

- 6th Street Pump Station: Installation of three variable speed drives on three pumps completed in 2003 at the cost of $66,000.

- 10th Street Pump Station: Installation of four variable speed drives on four pumps completed in 2002/2003 at the cost of $100,000.

- 26th Street Pump Station: Installation of eight variable speed drives on eight pumps at the cost of $80,000.

- 37th Street Pump Station: Installation of one variable speed drive on one of the two new pumps at the cost of $100,000.

- Roberts Drive Pump Station: Installation of five variable speed drives on five pumps completed in 2004 at the cost of $50,000.

SECTION 6
EVALUATION OF CSO CONTROL ALTERNATIVES

6.01 INTRODUCTION

This section describes the criteria and process used to identify, screen, and evaluate CSO abatement controls for Ashland's LTCP.

The "no action" alternative was considered and found to be unacceptable to Ashland and to regulatory agencies.

Initially, several site-specific CSO control projects were identified and recommended for implementation. These site-specific projects were recognizable, cost-effective solutions for CSO abatement and/or required for the protection of priority areas. These projects are recommended regardless of the final CSO abatement control alternatives and will be considered common to all alternatives. The common CSO control projects were incorporated into the system hydraulic model to determine the requirements for the ultimate CSO abatement control alternatives. These projects are considered common to all alternatives.

After the common projects were identified, several potential CSO control concepts were identified to comply with regulatory requirements. The potential CSO control concepts were screened using several criteria and comments from several sources. The potential CSO control concepts were screened to remove the least feasible alternatives so that efforts could be focused on only the applicable, acceptable, and feasible alternative solutions. The feasible alternatives were evaluated to determine the most cost-effective alternative. The selected alternative was evaluated in detail to determine the most cost-effective CSO abatement plan. The recommended and accepted plan is summarized in Section 9.

6.02 EVALUATION CRITERIA

A. <u>Regulatory Approaches</u>

The national CSOCP identifies two approaches for CSO mitigation to achieve compliance with the CWA: The demonstration approach and the presumption approach.

1. Demonstration Approach

The demonstration approach is particularly appropriate where attainment of WQS cannot be achieved through CSO control alone because of the impacts of natural background conditions or pollution sources other than CSOs. Under the demonstration approach, Ashland would be required to successfully demonstrate compliance with each of the following criteria:

a. The planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs.

b. The CSO discharges remaining after implementation of the proposed abatement program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment. Where WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs and TMDLs including a wasteload allocation, a load allocation or other means should be used to apportion pollutant loads.

c. The planned control program will provide the maximum pollution reduction benefits reasonably attainable.

d. The planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS to support designated uses.

2. Presumption Approach

The presumption approach is based on the assumption a LTCP that meets certain minimum defined performance criteria "… would be presumed to provide adequate level of control to meet water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas…". Under the presumption approach, controls adopted by Ashland in the LTCP should be required to meet one of the following criteria:

a. No more than an average of four overflows events per year, provided the permitting authority may allow up two additional overflow events a year. For the purposes of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the "minimum" treatment specified (see definition of minimum treatment below).

b. The elimination or the capture for the treatment of no less than 85 percent by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual average basis.

c. The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort for the volumes eliminated or captured for treatment under paragraph b above.

The minimum level of treatment is defined in the CSO Control Policy as follows:

a. Primary Clarification: Removal of floatable and settleable solids may be achieved by any combination of treatment technologies or methods shown to be equivalent to primary clarification.

b. Solids and floatables disposal.

c. Disinfection of effluent, if necessary, to meet WQS, protect designated uses, and protect human health, including removal of harmful chemical residuals, where necessary.

Regardless of the approach, the CSO controls should be flexible and allow for cost-effective expansion if additional CSO controls are necessary to meet WQS.

B. The Ashland Approach for Planning

Ashland does not have sufficient water quality and flow data to demonstrate that the proposed plan would result in appropriate level of control. Therefore, Ashland will use the presumption approach. In using the presumption approach, Ashland will develop the LTCP to meet the following criterion:

"The elimination or the capture for the treatment of no less than 85 percent by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis".

Ashland will use the following formula to compute percent capture:

$$\text{Percent Capture} = \frac{X-Y}{X}$$

Where:

X = Total annual combined sewage flow in the CSS during precipitation events and the 24-hour period following the end of the precipitation event. For future reporting the flow on the calendar day following a measureable rainfall will be used to reflect the 24 hours following the end of a precipitation event. During planning, this flow will be based on hydraulic model results.

Y = Total annual CSO discharge volume. During planning, this flow will be based on the hydraulic model results.

Under this criterion, the 85 percent applies to the volume of flow collected in the CSS during precipitation events on a systemwide, average basis and not 85 percent of the volume being discharged. Therefore, no more than 15 percent of the total flow collected in the CSS during storm events should be discharged without receiving the minimum level of treatment. CSS modeling results indicate that once Ashland implements all projects in the recommended plan, it will meet this criterion on an average annual basis.

Ashland will begin to monitor and record overflow volume and treated (or captured) volume, which will be used as the basis to compute percent capture in the future.

C. Protection of Sensitive and Priority Areas

An additional goal of the LTCP is to meet the regulatory requirements associated with sensitive areas. Sensitive areas must be given the highest priority for CSO abatement control. Once sensitive areas have been addressed, priority areas are determined to be the next highest priority for CSO abatement. Refer to Section 4 for more detail. CSO LTCP guidance requires the CSO controls accomplish the following task's sensitive areas:

1. Prohibit new or significant increases in overflow volumes into sensitive areas.

2. Eliminate or relocate overflows that discharge to sensitive areas wherever physically possible and economically achievable.

3. Provide treatment necessary to meet WQS where elimination or relocation is not physically possible or economically achievable and reevaluate elimination or relocation during each subsequent permit cycle.

A survey of Little Hoods Creek, which is the receiving stream of CSO 014 (Roberts Drive), identified several places with access to the receiving stream. Field observations and interviews with parents at the Big Sandy Baseball Complex revealed that children access the creek "on a daily basis." Therefore portions of Little Hoods Creek were designated as sensitive areas.

Through the public participation process, Little Hoods Creek downstream of CSO 012 (Roberts Drive) discharge location and areas upstream of the new Riverfront Park along the Ohio River were identified as priority areas. Therefore CSO outfalls discharging in the vicinity or upstream of these areas were given special considerations.

D. Capture of the First Flush

The "first flush" is the volume of wet weather flow generated during the initial period of a rainfall event that contains sediment washed off the paved surfaces and resuspended solids that have accumulated in the oversized combined sewers. The first flush usually contains the most concentrated amount of pollutants. The CSO abatement controls were evaluated for the capture of the first flush.

E. Capital Cost and Present Worth

The CSO abatement controls were evaluated based on total capital cost and net present worth. The capital costs are "planning-level" costs and include the engineering services, administrative services, and construction contingencies. The CSO abatement controls were evaluated for capital costs because they represent the initial investment required by Ashland. Present worth is the cost in today's dollars required to construct, operate, and possibly replace the facilities for a given period of time. The CSO abatement controls were evaluated for 20-year net present worth. Capital and present worth costs were also used to determine the "knee-of-the-curve" of the considered CSO control alternatives. The knee-of-the-curve corresponds to the point where the incremental change in the cost of the control alternative according to change in performance of the control alternative changes most rapidly.

F. Implementation and Operational Issues

The CSO abatement controls were screened and evaluated for implementation and operational issues. Implementation issues include construction feasibility, flexibility, expandability, land availability, potential unknowns, and whether or not the controls can be implemented in phases. Operational issues include complexity, reliability, maintenance, and replacement concerns.

G. Citizen Input

Ashland personnel and residents were actively involved in the identification of existing uses, sensitive areas, priority areas, and development and screening of the CSO abatement concepts. Ideas for additional CSO abatement projects and alternatives were solicited from Ashland residents.

Public meetings were held to obtain input from concerned citizens on viable alternatives and alternative rankings. Refer to Section 3 for more details on the public meetings.

H. Input from Ashland Management and Staff

Ashland operates and maintains the wastewater collection system and treatment facilities. Ashland management and staff were consulted in the development and review of alternatives.

I. Public Works Department Input

Ashland Public Works Department was involved in identifying existing flood control facilities. The department is responsible for the flood wall, flood control PS, and flood control operations during high Ohio River elevations for Ashland. CSO abatement controls were evaluated for their adverse affect on flood control operations to avoid overloading any of the flood control PS. CSO abatement controls were also evaluated for their adherence to flood control operations. For example, new stormwater separation projects should be equipped with valves (sluice gates) near the flood wall to avoid inundation of the collection system during Ohio River flood conditions.

J. Public Acceptance

Public acceptance of the physical inconveniences and financial burdens associated with construction and operation of new facilities, as well as the effect new CSO control facilities will have on the landscape of Ashland, was used to evaluate CSO control alternatives.

6.03 AVAILABLE CSO CONTROL TECHNOLOGIES

A wide range of CSO control technologies is available to CSO communities.

Table 6.03-1 lists the CSO control technologies considered by Ashland.

Source Controls	Inflow Reduction
	Stormwater Separation
	Catch Basin Cleaning
	Street Sweeping
	Education
Storage Controls	In-line Storage
	Real Time Control
	Storage Basins
	Storage Tanks
	Deep Storage Tunnels
Treatment Controls	Peak Excess Flow Treatment Facilities
	Vortex Separation
	Screens
	Nets
	Floatable Baffles
	Complete Secondary Treatment

Table 6.03-1 Available CSO Control Technologies

6.04 CSO CONTROL PROJECTS COMMON TO ALL ALTERNATIVES

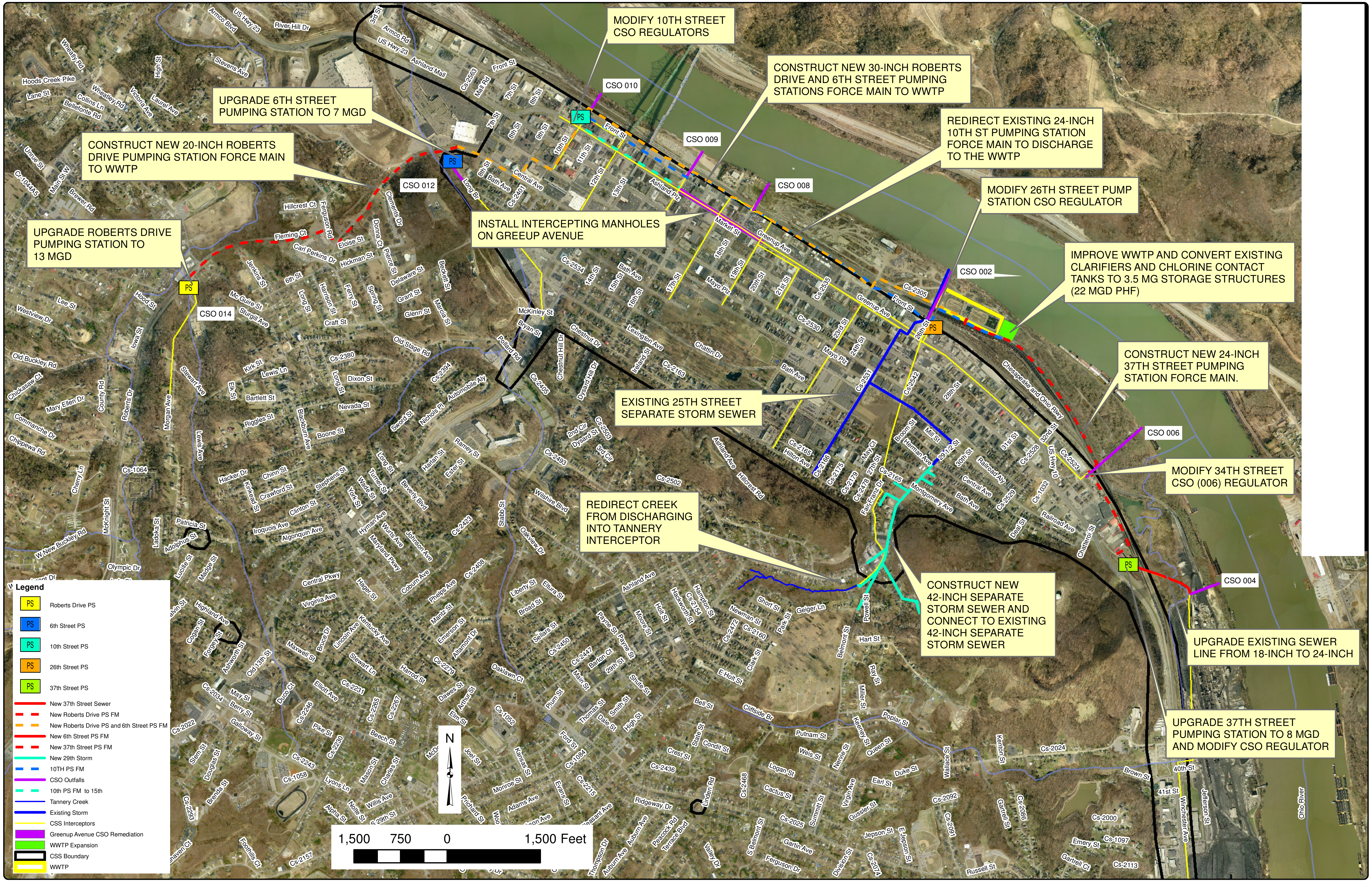
Based on the available CSO control technologies, several CSO abatement projects were identified as being beneficial regardless of the final CSO abatement control alternative selected. The projects are site-specific solutions whereby CSO abatement effectiveness, regulatory compliance, environmental benefits, and/or community benefits are easily justifiable for the costs or are necessary given the requirements of the LTCP.

Figure 6.04-1 illustrates the projects common to all alternatives. Table 6.04-1 lists the common projects total capital cost. Table 6.04-2 compares the typical year simulation result of the hydraulic model during existing conditions with the results after implementation of common projects. A description of each of the common projects follows.

Project Name	Project ID	Opinion of Probable Cost ($ Millions) [1, 2]	Start Date[3]	Completion Date[3]
Recommended Plan Projects				
Roberts Drive PS and 6th Street PS Improvement	03050	6.80	1/1/2010	12/31/2012
10th Street Regulator Modifications	03050	0.20	1/1/2010	12/31/2012
37th St PS Improvements	03060	2.95	1/1/2011	12/31/2014
34th Street Regulator Modifications	03060	0.05	1/1/2011	12/31/2014
Greenup Avenue Interceptor Manholes	03070	0.22	1/1/2014	12/31/2014
29th Street Separation Project	03200	4.00	1/1/2014	12/31/2016
WWTP Improvements with 3.5 MG Onsite Storage	03210	27.60	1/1/2018	12/31/2025
10th Street PS FM Modifications	03220	0.10	1/1/2018	12/31/2025
26th Street Regulator Modifications	03230	0.06	1/1/2018	12/31/2025
26th Street PS Improvements (Electrical and SCADA)	03230	0.55	1/1/2018	12/31/2025
Common Projects Total		**42.53**		

[1]Includes Contingencies and Technical Services.
[2]All costs for In-Progress and Planned projects in 2nd quarter 2015 dollars.
[3]Start and completion dates depend December 2015 final approval of LTCP by regulators.

Table 6.04-1 Common Projects Total Capital Cost and Rated Capacities



PROJECTS COMMON TO ALL ALTERNATIVES

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 6.04-1
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 6.04-1

TABLE 6.04-2–CALCULATION OF PERCENTAGE OF COMBINED SEWAGE CAPTURED OR TREATED IN CSS

Street	CSO	Average Annual I/I Volume to Interceptor (MG)	Average Annual Dry-Weather Component to Interceptor During Wet-Weather (MG)	Average Annual Wet-Weather Interceptor Volume to CSO Regulator (MG)	Average Annual CSO Discharge Volume (MG)	Total Annual Wet-Weather Volume in the Combined Sewer System Captured or Treated (MG)	Percent Capture of Existing Interceptor
		1	2	3 = (1+2)	4	5 = (3-4)	4 = (5/3)
EXISTING SYSTEM (WWTP PHF CAPACITY = 21 MGD)							
26th Street	CSO 002	141.7	23.0	164.7	66.0	98.7	60%
37th Street	CSO 004	61.9	20.1	82.0	6.8	75.2	92%
34th Street	CSO 006	8.4	34.4	42.8	28.8	14.0	33%
18th Street	CSO 008	94.9	24.3	119.3	60.0	59.3	50%
15th Street	CSO 009	6.0	2.7	8.7	10.5	-1.8	-21%
10th Street	CSO 010	50.8	5.4	56.2	23.5	32.7	58%
6th Street	CSO 012	50.0	20.4	70.4	1.5	68.9	98%
Roberts Drive	CSO 014	131.5	56.6	188.1	19.6	168.5	90%
	Systemwide	**545.3**	**187.0**	**732.3**	**216.8**	**515.5**	**70%**
AFTER 6TH STREET AND ROBERTS DRIVE PS IMPROVEMENTS AND 10TH ST REGULATOR MODIFICATIONS PROJECTS (WWTP PHF CAPACITY = 21 MGD)							
26th Street	CSO 002	141.7	23.0	164.7	93.1	71.6	43%
37th Street	CSO 004	61.9	20.1	82.0	6.8	75.2	92%
34th Street	CSO 006	8.4	34.4	42.8	28.0	14.9	35%
18th Street	CSO 008	94.9	24.3	119.3	41.3	77.9	65%
15th Street	CSO 009	6.0	2.7	8.7	4.3	4.5	51%
10th Street	CSO 010	50.8	5.4	56.2	3.4	52.8	94%
6th Street	CSO 012	50.0	20.4	70.4	0.0	70.4	100%
Roberts Drive	CSO 014	131.5	56.6	188.1	0.1	188.0	100%
	Systemwide	**545.3**	**187.0**	**732.3**	**176.9**	**555.4**	**76%**
AFTER 6TH ST, ROBERTS DR AND 37TH ST PS IMPROVEMENTS AND 10TH AND 34TH ST REGULATOR MODIFICATIONS PROJECTS (WWTP PHF CAPACITY = 25 MGD)							
26th Street	CSO 002	141.7	23.0	164.7	86.4	78.3	48%
37th Street	CSO 004	61.9	20.1	82.0	1.1	80.9	99%
34th Street	CSO 006	8.4	34.4	42.8	0.1	42.7	100%
18th Street	CSO 008	94.9	24.3	119.3	39.8	79.5	67%
15th Street	CSO 009	6.0	2.7	8.7	4.3	4.5	51%
10th Street	CSO 010	50.8	5.4	56.2	3.2	53.0	94%
6th Street	CSO 012	50.0	20.4	70.4	0.0	70.4	100%
Roberts Drive	CSO 014	131.5	56.6	188.1	0.1	188.0	100%
	Systemwide	**545.3**	**187.0**	**732.3**	**135.0**	**597.3**	**82%**
AFTER 6TH ST, ROBERTS DR , 37TH ST ,10TH AND 34TH, GREENUP INTERCEPTOR MANHOLES AND 29TH ST SEPARATION PROJECTS (WWTP PHF CAPACITY = 25 MGD)							
26th Street	CSO 002	79.4	23.0	102.4	54.15	48.3	47%
37th Street	CSO 004	61.9	20.1	82.0	0.40	81.6	100%
34th Street	CSO 006	8.4	34.4	42.8	0.03	42.8	100%
18th Street	CSO 008	94.9	24.3	119.3	27.13	92.1	77%
15th Street	CSO 009	6.0	2.7	8.7	10.58	-1.9	-21%
10th Street	CSO 010	50.8	5.4	56.2	3.23	53.0	94%
6th Street	CSO 012	50.0	20.4	70.4	0.00	70.4	100%
Roberts Drive	CSO 014	131.5	56.6	188.1	0.09	188.0	100%
	Systemwide	**483.0**	**187.0**	**670.0**	**95.6**	**574.4**	**86%**
AFTER 6TH ST, ROBERTS DR, 37TH ST, 10TH , 26TH ST, 29TH, GREENUP AND WWTP IMPROVEMENTS PROJECTS (WWTP PHF CAPACITY = 22 MGD, 3.5 MG WET-WEATHER STORAGE)							
26th Street	CSO 002	79.4	23.0	102.4	12.48	90.0	88%
37th Street	CSO 004	61.9	20.1	82.0	0.40	81.6	100%
34th Street	CSO 006	8.4	34.4	42.8	0.04	42.8	100%
18th Street	CSO 008	94.9	24.3	119.3	23.27	96.0	80%
15th Street	CSO 009	6.0	2.7	8.7	3.88	4.8	56%
10th Street	CSO 010	50.8	5.4	56.2	3.92	52.3	93%
6th Street	CSO 012	50.0	20.4	70.4	0.00	70.4	100%
Roberts Drive	CSO 014	131.5	56.6	188.1	0.09	188.0	100%
	Systemwide	**483.0**	**187.0**	**670.0**	**44.1**	**625.9**	**93%**

All results are based on hydraulic model predictions.

A. Roberts Drive and 6th Street PS and Force Main Improvements (Project ID 03050)

The Roberts Drive PS is located on Roberts Drive about 350 feet south of the intersection of Roberts Drive and Blackburn Avenue. The 6th Street PS is located on Central Avenue where 6th Street turns into Central Avenue along Long Branch, across from the Ashland Mall. The Long Branch Flood Control PS is located next to the 6th Street PS. Figure 6.04-1 shows the location of the Roberts Drive PS and the 6th Street PS.

The project consists of upgrading the firm capacity of the Roberts Drive PS from about 4.3 million gallons per day (mgd) to 13 mgd and the 6th Street PS from about 3.75 mgd to 7 mgd. The project also includes the construction of a new 20-inch force main from Roberts Drive PS and a new 20-inch force main from the 6th Street PS that combine into a common 30-inch force main that discharges flow directly to Ashland's WWTP.

The intent of this project is to reduce the frequency and volume of the overflows at CSO 014 (Roberts Drive) and CSO 012 (6th Street). These CSO outfalls are the only outfalls located within Ashland's CSS that discharge to small streams. CSO 014 discharges to Little Hoods Creek while CSO 012 discharges to Long Branch. Upgrading the firm capacity of the Roberts Drive PS to 13 mgd should correspond to a 1-year (0 to 1 overflow a year) level of control according to the model. Upgrading the firm capacity of the 6th Street PS to 7 mgd should correspond to a 6-month (2 to 3 overflows a year) level of control according the model. The pumping upgrades will increase the percent capture to nearly 100 percent during wet weather on an annual average basis for both CSO 014 and CSO 012. The project is also intended to eliminate triple pumping of wastewater. Currently, the existing force mains from the Roberts Drive PS and the 6th Street PS discharge to the 10th Street PS. Flow is then pumped from the 10th Street PS to the 26th Street PS. The 26th Street PS discharges flow to the WWTP. By redirecting flow directly to the WWTP, the more concentrated flow from these PSs will bypass the existing CSS and eliminate subsequent triple pumping of this wastewater at the 10th Street PS and 26th Street PS.

Although the intent of this project is to reduce the frequency and volume of the overflows at CSO 014 (Roberts Drive) and CSO 012 (6th Street), hydraulic modeling indicates the annual volume of CSO discharged through CSO 010 (10th Street) will be significantly reduced.

Table 6.04-2 shows typical year simulation results from the hydraulic modeling under existing conditions and with this project incorporated into the model. Figure 6.04-1 shows existing and proposed structures.

B. Tenth Street CSO Regulator Modifications (Project ID 03050)

The 10th Street CSO regulator modifications project is being completed as part of the Roberts Drive PS and 6th Street PS improvements project.

The project consists of the construction of a junction box downstream of the two CSO 010 regulators and the construction of 42 linear feet of 36-inch pipe to discharge overflow from the two regulators to the 10th Street PS. When the capacity of the PS or the new 36-inch sewer is exceeded, the combined sewer will overflow through the existing 14-inch by 16-inch rectangular dry weather orifice

(Regulator "A") 36-inch outfall pipe. This project will reduce the volume, duration, and frequency of CSO 010 and is mainly to utilize the excess capacity created at the 10th Street PS by the elimination of the Roberts Drive PS and 6th Street PS's discharges.

Table 6.04-2 shows the results of the hydraulic modeling with the 10th Street CSO regulator modification project incorporated into the model. Figure 6.04-1 shows existing and proposed structures. The 10th street regulator modifications will increase the percent capture in in the 10th Street CSO basin to 94 percent.

The systemwide percent capture after this project will increase to 76 percent after the implementation of the Roberts Drive PS and 6th Street PS upgrades and the 10th Street regulator modification projects.

The maximum PHF that the WWTP could handle before completion of the projects listed above was 21 mgd. After completion of the two projects listed above, the City has continued to make minor modifications to the WWTP and can now accept instantaneous peaks flows of up to 33 mgd. However, at sustained flows at 33 mgd, solids begin to washout of the clarifiers and the WWTP is not able to meet the permitted TSS limits. The existing secondary clarifiers are the most limiting process at the WWTP. The WWTP does not accept more than about 25 mgd on a peak flow basis. The WWTP capacity was changed to 25 mgd from 21 mgd in the City's hydraulic model for typical year evaluation of remaining projects.

C. <u>37th Street PS and Force Main Improvements and 34th Street CSO Regulator Modifications Project (Project ID 03060).</u>

The 37th Street PS is located off 37th Street along Winchester Avenue on the northeastern part of the collection system. Currently, there are two pumps each rated at 1,850 gpm (2.66 mgd) at 63 feet TDH. Only one pump operates during wet weather.

The project consists of relocating and upgrading the capacity of the PS and upsizing and extending the force main. Current plans are for the existing capacity of the PS to be upgraded from 2,800 gpm (4.0 mgd) to 5,500 gpm (7.9 mgd). The 37th Street CSO orifice regulator will be removed and the approximately 1,100 LF of 18-inch regulator effluent sewer which is the influent sewer for the 37th Street PS will be replaced with a 24-inch sewer. The project also involves the construction of approximately 6,500 feet of 24-inch force main from the 37th Street PS to the WWTP. The new force main replaces the existing 14-inch force main that currently discharges to the CSS at 34th Street, which can contribute to other CSOs within the system. After redirection of the force main, the size of the 6-inch by 14-inch orifice (Regulator A) will be increased. The 12-inch effluent pipe of Regulator A will be replaced with an 18-inch pipe. This project will reduce the frequency, volume, and duration of CSOs from the 37th Street CSO (Permitted Outfall 004) and 34th Street CSO (Permitted Outfall 006), which discharge to the Ohio River.

Table 6.04-2 shows the results of the hydraulic modeling with the 37th Street PS upgrade and the 34th Street CSO regulator modifications project incorporated into the model. Figure 6.04-1 shows existing and proposed structures.

This project increases the percent capture for the system for CSO 004 (37th Street) to nearly 99 percent and for CSO 006 (34th Street) to nearly 100 percent. The 37th street Pumping Station was sized to pump a rate of 7.9 mgd in accordance with a 3-month level of control.

D. Greenup Avenue Interceptor Manholes (Project ID 03070).

The Greenup Avenue Interceptor is one of the three main interceptors within the City's CSS that conveys flow to the 26th Street PS. The interceptor starts as a 12-inch reinforced concrete pipe (RCP) on Greenup Avenue at 7th Street. At the intersection of Greenup and 8th Street, it changes to a 15-inch RCP and discharges its flow to the 10th Street PS, then increasing to a 21-inch pipe at the intersection of Greenup Avenue and 15th Street. Several trunk sewers running from south to north discharge into the Greenup Avenue Interceptor. CSO 009 (15th Street) and CSO 008 (18th Street) are connected to the western half of the Greenup Avenue interceptor to act as relief points during significant surcharging.

The 30-inch-diameter combined trunk sewer on 15th Street is conveyed to the Greenup Avenue Interceptor by a 15-inch diversion pipe through the orifice without connecting to the interceptor on Greenup Avenue. Combined sewers on 17th Street (24-inch) and 19th Street (24-inch) do not connect with the Greenup Avenue Interceptor on Greenup Avenue but head north to Front Avenue where flows are diverted by CSO regulators located on Front Street through smaller pipes to discharge back to the Greenup Avenue Interceptor.

The intent of this project is to intercept flow from the trunk sewers on 15th Street, 17th Street, and 19th Street so that they discharge directly to the Greenup Avenue Interceptor on Greenup Avenue without going through the regulators. The project consist of installing intercepting manholes at the intersection of Greenup Avenue with 15th Street, 17th Street, and 19th Street. Figure 6.04-1 shows existing and proposed structures.

Hydraulic modeling indicates that this project is very beneficial during low intensity rainfall events when there is capacity available in the Greenup Avenue Interceptor but that the regulators limit the flow that can be discharged from these trunk sewers to the Greenup Avenue interceptor. By intercepting these flows, the City is maximizing flow to the WWTP.

E. Tannery Line and 29th Street Stormwater Separation (Project ID 03200)

The Tannery Interceptor is one of the major interceptors in Ashland's combined system. A creek directly upstream of this interceptor discharges to the Tannery Combined Sewer. Ashland experiences flooding issues during significant rainfall events around the intersection of 29th Street and Lexington Avenue. To address this flooding issue, Ashland intends to construct a separate storm sewer for this area to discharge directly to the Ohio River.

The project consists of the construction of approximately 2,500 LF of 42-inch separate storm sewer. This storm sewer will pick up catch basins along the alignment and discharge directly to the Ohio River thorough the existing storm sewer at the intersection of 29th Street and Central Avenue. This project will reduce the frequency, volume, and duration of CSOs from the

26th Street CSO (Permitted Outfall 002). It will also reduce treatment cost since Ashland will no longer be treating a creek.

Table 6.04-2 shows the results of the hydraulic modeling with the Tannery Storm Sewer project incorporated into the model. Figure 6.04-1 shows existing and proposed structures.

The modeled systemwide percent capture increases to 86 percent following this and earlier projects. The percent capture at the 26th street CSO increases to 47 percent as a result of this project.

F. Improve WWTP to Treat 22 MGD PHF and Provide 3.5 MG of Wet Weather Storage (Project ID 03210)

The Ashland WWTP is located along the Ohio River on the river side of the flood wall at the end of 26th Street. The WWTP can currently treat up to 25 mgd on a peak hourly basis with no wet weather storage facility on-site.

The project consists of improving the peak flow treatment capacity of the WWTP to accept 40 mgd PHF (22 mgd will undergo full biological treatment and additional flows up to a rate of 18 mgd will be stored for treatment after storm event) by the construction of new headworks, two new circular clarifiers, a new UV disinfection, new gravity thickeners, and a new outfall. A detailed description with a process flow schematic is provided in Section 7. Full secondary treatment would be provided for all flow received at the WWTP. The current secondary clarifiers, which have a capacity of approximately three million gallons, and the existing chlorine contact tank, which has a capacity of approximately 0.5 million gallons, will be converted to wet weather storage. The stored flow will be pumped back to the oxidation ditch for secondary treatment when capacity is available as storm flows subside.

Hydraulic modeling indicated that maintaining the peak capacity at 22 mgd and converting the existing rectangular clarifiers and chlorine contact tanks to wet weather storage facilities with a volume of 3.5 MG will improve the systemwide percent capture to 93 percent, which is above the 85 percent recommended by the presumptive approach. Since collected flow meter data indicate that the City's CSS has consistently been capturing over 90 percent of the wet weather flow in the CSS for treatment for the past three years, increasing the peak hourly flow beyond 22 mgd was not economical. However, the project provides the WWTP to be expandable to treat a PHF of 33 mgd should monitoring indicate that water quality limits are still not being met. The storage and treatment design combinations for Ashland's CSS indicated that providing peak hourly flow capacity of 22 mgd and storing any excess flow is the most economical approach as of now.

G. 10th Street PS Force Main Modification Project (Project ID 03220)

CSO 010, which serves as a relief point for the 10th Street PS, is the most downstream of Ashland's Ohio River CSOs.

The project consists of extending the 24-inch force main of the 10th Street PS that currently discharges to the 26th Street PS to discharge directly to the WWTP. This project also involves abandoning the PS's 14-inch force main that discharges to the Greenup Avenue Interceptor sewer at the junction of

15th Street and Greenup Avenue. This project will avoid double pumping and restores capacity at the 26th Street PS, which will reduce the volume, duration, and frequency of overflow from CSO 002.

H. 26th Street CSO Regulator Modifications Project (Project ID 03230)

This project involves removing the orifice and replacing the 24-inch 26th Street PS influent sewer with a 42-inch sewer.

This project will reduce the volume, duration, and frequency of overflow from CSO 002 and is mainly to utilize the excess capacity created at the 26th Street PS by the elimination of the 10th Street PS discharge and the 37th Street PS contributions. It will also allow more flow to the 26th Street PS should it be upgraded in the future.

I. 26th Street PS Improvements Project (Project ID 03230)

The project includes installing a supervisory control and data acquisition (SCADA) system at the 26th Street PS and integrating it with the new SCADA system at the WWTP. The integrated SCADA will be used to control the flow being pumped by the 26th Street PS to the WWTP during peak-flow wet weather events. When flows to the WWTP exceed 22 mgd and the 3.5 MG storage facility is full, the 26th Street PS will be throttled down to allow more overflow to occur at the 26th Street CSO (CSO 002) and prevent the WWTP from being overloaded.

The WWTP project, 10th Street PS Force Main Modification Project, the 26th Street CSO regulator modifications project, and the 26th Street PS Improvements Project will likely be combined as one capital project.

Hydraulic modeling indicates that after completion of all these common projects, Ashland will be capturing 93 percent of the combined sewer collected in the CSS during precipitation events on a systemwide annual average basis, which exceeds the 85 percent capture required by the Presumption Approach stated in the CSOCP. Hence, Ashland does not plan to construct any more projects beyond the common projects. However, Ashland continued with an alternative evaluation process to evaluate if additional benefits could be obtained from increasing the percent capture above 93 percent should water quality standard not be met after these common projects. The alternative evaluation beyond the common projects is presented in Appendix T. The alternative evaluation in appendix T was performed based on the common projects in the first print of the LTCP and will have to be updated to include all common projects recommended in this updated version of the LTCP.

The recommended plan is presented in Section 9.

SECTION 7
MAXIMIZING EXISTING TREATMENT FACILITIES

7.01 INTRODUCTION

Communities are required to maximize the treatment of wet weather flows at the WWTP as part of an LTCP. Maximizing the treatment of wet weather flows can be a cost-effective readily implemented method to achieve an overall reduction in pollutant loading to receiving waters by reducing the magnitude, frequency, and duration of CSOs.

USEPA considers the maximization of treatment plant flow capacity within two contexts. First, the CSO municipality must evaluate the expansion of its primary and secondary treatment capacity in the evaluation of long-term control alternatives. Second, the CSO municipality must address the specific case when existing primary treatment capacity at a WWTP exceeds the secondary treatment capacity, therefore, effectively disabling full primary treatment capacity without overloading the secondary treatment facilities. The Ashland WWTP is designed as a secondary treatment facility with an extended aeration treatment process only. Therefore, the lack of a defined primary treatment component within the system actually negates any required consideration by the USEPA of the two separate treatment components.

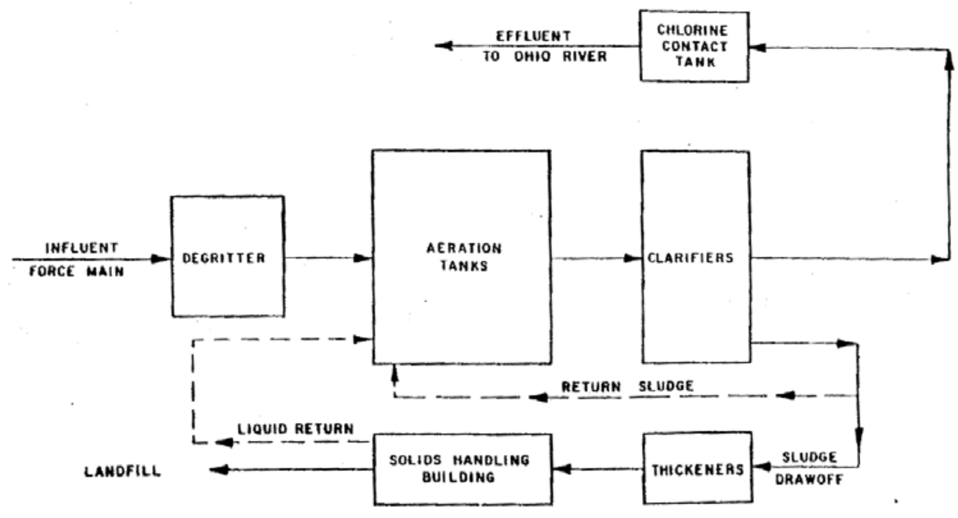
7.02 EXISTING ASHLAND WASTEWATER TREATMENT FACILITIES

A. Plant Information

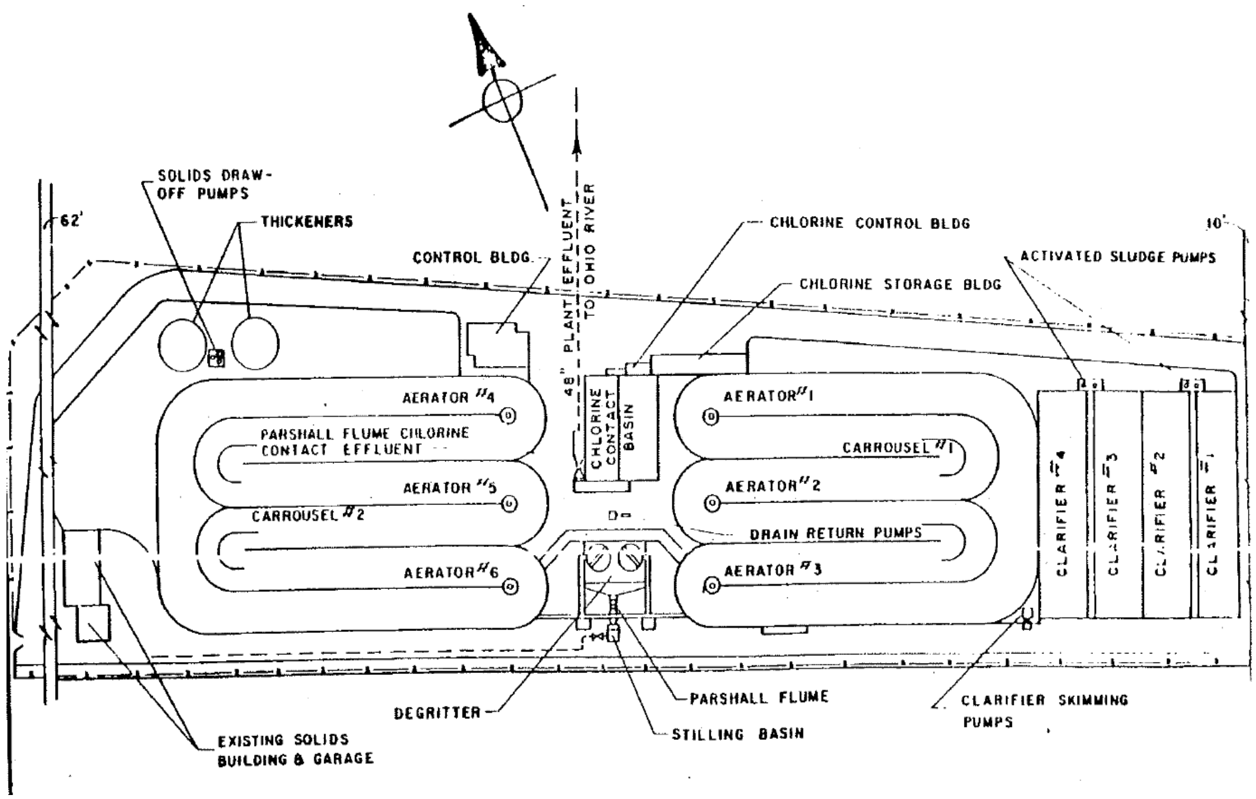
The Ashland WWTP is owned by the City and operated by the Engineering and Utilities Department. The WWTP is located adjacent to the Ohio River between 25th and 29th Streets, on the north side of the CSX Railroad. The plant was constructed in 1960 to provide primary treatment and reconstructed in 1982 to provide more advanced secondary treatment as a result of the increased treatment requirements advanced by the USEPA. The current average daily flow design capacity of the plant is 11.0 mgd; the plant was designed to treat up to 33 mgd at peak hourly conditions.

The Ashland WWTP is in compliance with the KPDES permit limitations and operates an authorized discharge point into the Ohio River. A copy of the KPDES permit is found in Appendix O. The plant was designed to meet loading requirements based on an estimated 38,590 people and 11 mgd; the estimated population for 2010 was approximately 21,684 and the average daily flow in 2009 to 2010 was 5.9 mgd. Under the design conditions (11 mgd), the plant is designed to treat five-day biochemical oxygen demand (BOD_5) of 206 milligrams per liter (mg/L), total suspended solids (TSS) of 270 mg/L, and Total Kjeldahl nitrogen (TKN) of 88 mg/L. Average BOD_5 loadings are approximately 42 percent of design capacity; average daily TKN loadings are 11 percent of design capacity. The KPDES permit requires that Ashland meet specific monthly and weekly limitations for biochemical oxygen demand (BOD), TSS, fecal coliform, and ammonia. These limits are found in Table 7.02-1.

All flow is pumped to the WWTP by the 26th Street Pumping Station. The WWTP process consists of grit removal chambers, carrousel aeration chambers (oxidation ditches), rectangular final clarification, sludge thickening and recycle, chlorine contact disinfection, dechlorination facilities, sludge return pumps, sludge thickeners, sludge conditioning systems, sludge dewatering, and sludge removal to the landfill. A process diagram and a site plan of the WWTP are included in Figure 7.02-1.



PROCESS BLOCK DIAGRAM



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EXISTING ASHLAND WASTEWATER TREATMENT PLANT
PROCESS DIAGRAM AND SITE PLAN

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 7.02-1
5102.002

	Monthly Avg. (lbs/day)	Weekly Avg. (lbs/day)	Monthly Avg. (mg/L)	Weekly Avg. (mg/L)
BOD_5	2,752	4,128	30	45
TSS	2,752	4,128	30	45
Fecal Coliform Bacteria N/100	N/A	N/A	200	200
Ammonia (as Nitrogen)	1,835	2,752	20	30

Table 7.02-1 Ashland WWTP KPDES Pollutant Limits (KY0022373)

B. Wet Weather Operations

Ashland's WWTP serves a CSS, which carries both sanitary water and stormwater. Although the average treatment capacity is 11 mgd, the peak hydraulic capacity is 33 mgd to account for wet weather events. This means that Ashland has the ability to accept a wet weather more than six times the current average daily flow and three times the rated average daily flow capacity.

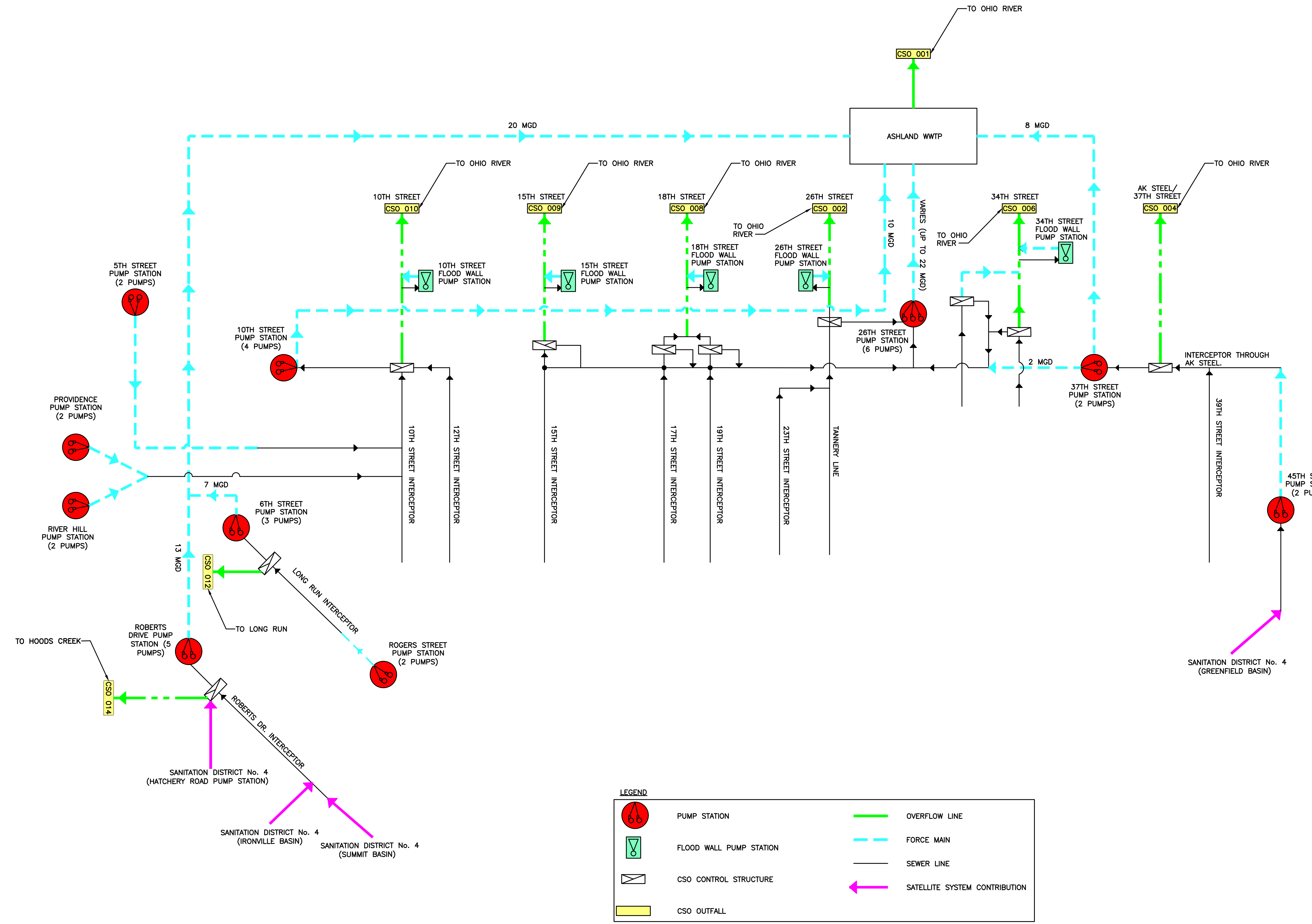
As a result of wet weather events, the highest average flow in one day in 2007 was recorded on November 14 at 17.05 mgd. The peak instantaneous flow in 2008 was recorded at 25 mgd for a 15 minute period.

Process and hydraulic concerns within the WWTP are limiting the amount of peak flow that can be treated. For a long period before the development of the LTCP, operational experience showed that effective treatment could not be maintained above 18 mgd even on a short-term basis. The City has since continued to make minor modifications to the WWTP and can now accept instantaneous peak flows of up to 33 mgd. However, at sustained flows of 33 mgd, solids begin to wash out of the clarifiers and the WWTP is not able to meet permit. The existing secondary clarifiers are the most limiting process at the WWTP. Based on this operational experience, the WWTP does not accept more than about 25 mgd on a peak flow basis.

7.03 PROPOSED WET WEATHER FLOW OPERATIONS

The proposed collection system modifications will result in additional wet weather flow reaching the WWTP. In addition to the 26th Street PS, the Roberts Drive, 6th Street, 10th Street, and the 37th Street PSs will discharge flow directly to the WWTP. Figure 7.03-1 shows a schematic of the collection system after the proposed collection system modifications in the recommended plan. The recommended plan is discussed in detail in Section 9.

Maximizing hydraulic treatment capacity at the Ashland WWTP requires an assessment of multiple aspects of the overall CSS. The concept is to maximize the use of the existing infrastructure that is currently in service before investing in new infrastructure. To maximize the hydraulic treatment capacity, it is necessary to understand all aspects of the existing treatment system including the hydraulic loadings, the organic loadings, and the solid loadings to each treatment process and address bottlenecks, if they exist.



COLLECTION AND COMBINED SYSTEM SCHEMATIC
AFTER COLLECTION SYSTEM MODIFICATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 7.03-1
5102.002

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By their nature, biological systems are not stable when extreme hydraulic loadings with low organic loadings are applied. Therefore expanding the biological system to treat large volumes of combined wastewater with low organic and ammonia concentrations may destabilize the treatment system and negatively impact the treatment efficiency long after the wet weather event has ended. It is not practical to expand or upgrade the treatment facilities to treat all the combined wastewater flows received during the wet weather events.

Several treatment alternatives have been considered for treating combined wastewater during the wet weather. Using existing rectangular clarifiers and disinfection facilities for storage of higher peak flow during wet weather events appears to be the most economical and most effective alternative for Ashland. The scenario considered for implementation at the Ashland WWTP includes new circular final clarification (to replace existing rectangular clarifiers that are a challenge to reliable operation), new disinfection, a new outfall, and additional solids handling capacity. The existing rectangular clarifiers and chlorine contact tank will be converted to storage structures with a combined volume of approximately 3.5 million gallons. The new PHF capacity of the WWTP will be 22 mgd, but the WWTP will have 3.5 million gallons of additional volume to store flows above 22 mgd during wet weather events. Also, provisions will be made to make the full-treatment PHF of the WWTP expandable to 33 mgd should it be needed. An evaluation of flows for three significant rain events (2-month, 3-month, and 6-month) was completed to determine if the upgraded treatment plant could actually treat more total flow than the current treatment plant. The evaluation indicated that, for the three events evaluated, the upgraded treatment plant will result in the discharge of approximately 1.6 MG of overflow at CSO 002 (26th Street) compared to an overflow of approximately 5.2 MG at the current WWTP configuration. As mentioned earlier, although the treatment plant is designed for a PHF of 33 mgd, at sustained flows of 33 mgd, solids wash out of the clarifiers and the WWTP is not able to meet permit. The maximum PHF that the existing WWTP can reliably treat to meet permit is approximately 25 mgd.

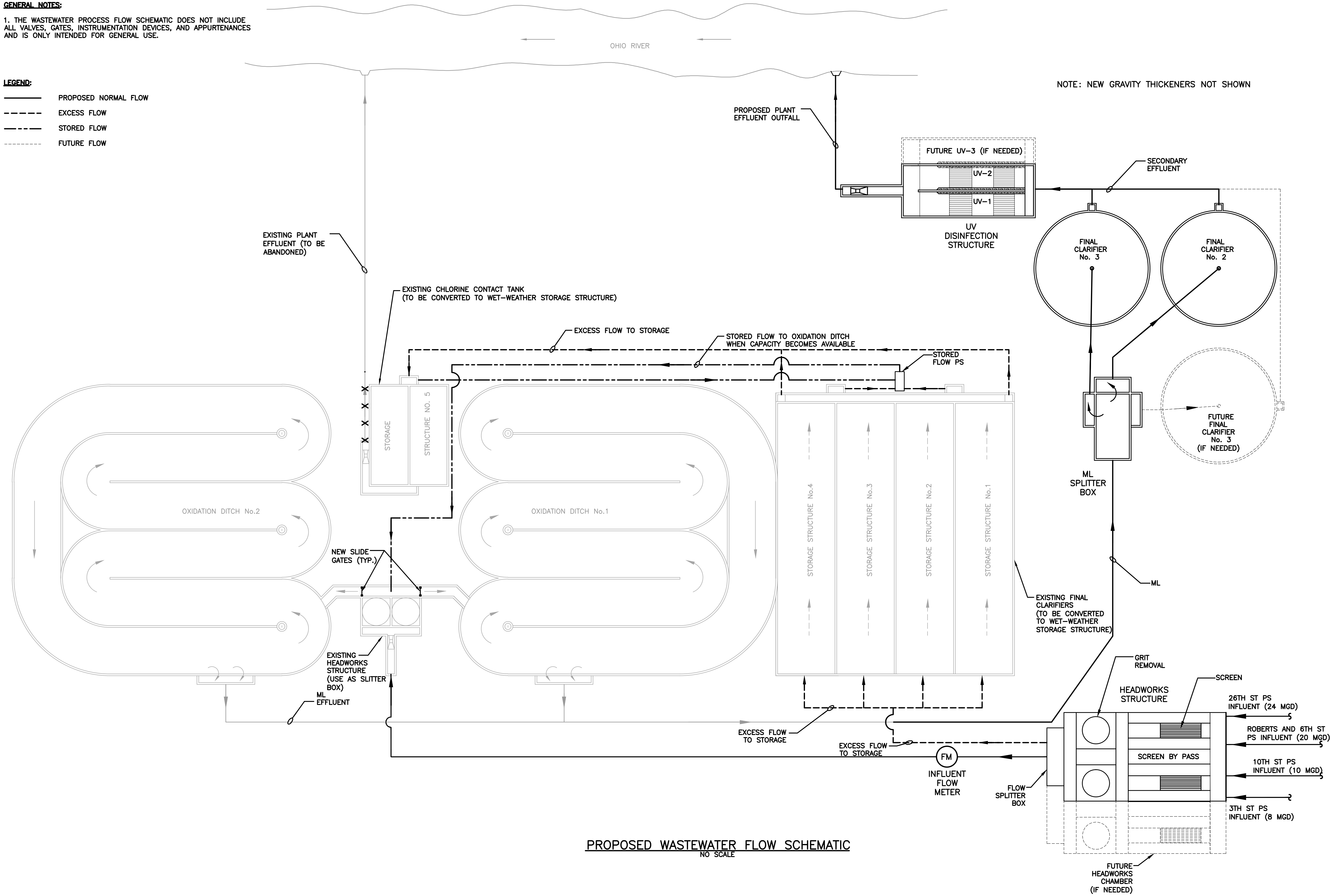
The proposed WWTP improvements include construction of a new headworks (PHF capacity of 40 mgd expandable to 60 mgd), two new circular final clarifiers (PHF capacity of 22 mgd expandable to 33 mgd), new UV disinfection structure (PHF capacity of 22 mgd expandable to 33 mgd), new plant outfall that will provide treatment for the peak hourly flows up to 33 mgd, and new thickeners for sludge handling. The system will start to divert influent flow to storage in the existing rectangular clarifiers and chlorine contact tank when influent flow exceeds 22 mgd. As storm flows subside, stored flows will be pumped back to the oxidation ditch for full biological treatment. The proposed wastewater flow process schematic is presented in Figure 7.03-2. Figure 7.03-3 shows the proposed and existing structures. An opinion of probable cost of the proposed alternative improvements is presented in Table 7.03-1.

GENERAL NOTES:

1. THE WASTEWATER PROCESS FLOW SCHEMATIC DOES NOT INCLUDE ALL VALVES, GATES, INSTRUMENTATION DEVICES, AND APPURTENANCES AND IS ONLY INTENDED FOR GENERAL USE.

LEGEND:

- (solid line) PROPOSED NORMAL FLOW
- (dashed line) EXCESS FLOW
- (dash-dot line) STORED FLOW
- (light dashed line) FUTURE FLOW



PROPOSED WASTEWATER FLOW SCHEMATIC
NO SCALE

PROPOSED WASTEWATER FLOW SCHEMATIC

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 7.03-2
5102.002

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PROPOSED WWTP IMPROVEMENTS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 7.03-3
5102.002

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Unit Process	Forward Flow Capacity	Cost
New Headworks (40 mgd expandable to 60 mgd)	40 mgd	$ 4,250,000
ML Split	33 mgd	$ 330,000
Final Clarifiers (22 mgd expandable to 33 mgd)	22 mgd	$ 2,780,000
UV (22 mgd expandable to 33 mgd)	22 mgd	$ 1,100,000
RAS	16.5 mgd	$ 1,030,000
RAS Splitter	33 mgd	$ 110,000
Existing Equipment Upgrade		$ 2,100,000
Other Solids Processes Improvements		$ 1,500,000
Emergency Power and SCADA System		$ 2,450,000
Site Piping Improvements and New Outfall Sewer		$ 2,220,000
Site Work		$ 1,790,000
Subtotal		**$ 19,660,000**
General Conditions		$ 1,570,000
Subtotal Construction Cost		**$ 21,230,000**
Contingencies & Technical Services		$ 6,370,000
Total Project Budget		***$ 27,600,000***

Note: Cost in 2nd quarter 2015 dollars.

Table 7.03-1 Opinion of Probable Cost for Ashland WWTP Peak Flow and Storage Expansion

It must be noted that, after the Recommended Plan Projects are completed, the Roberts Drive, 6th Street, 10th Street, 37th Street, and 26th Street pump stations will all discharge directly to the WWTP with capacities of 13 mgd, 7 mgd, 10 mgd, 8 mgd, and 24 mgd, respectively, for a total capacity of 62 mgd. This exceeds the proposed 40 mgd headworks capacity and 22 mgd peak capacity of the WWTP. As discussed earlier, when flows to the WWTP exceed 22 mgd and the 3.5 million gallons storage is full, the 26th Street PS will be throttled down to allow more overflow to occur at the 26th Street CSO (CSO 002) and prevent the WWTP from being overloaded.

It is unlikely that all pump stations will be pumping at their peak capacity at the same time. Also, historical data indicates that peak flows from system pumping stations are not sustained for long periods of time. In a March 2013 1.6 inch rain event (24 hour–2 month rain), the Roberts Drive and the 6th Street PSs reached peak capacity for only 60 minutes, after which their output dropped to 75 percent of capacity for 4 hours.

SECTION 8
AFFORDABILITY AND FINANCIAL CAPABILITY ANALYSIS

8.01 INTRODUCTION

The financial capability assessment for a CSO LTCP provides information to develop a proposed CSO control implementation schedule and apply for permanent or temporary suspension of a designated use and corresponding WQS. One of the most challenging aspects that CSO communities face lies in the equitable financing of CSO programs without placing an unreasonable burden on ratepayers. Therefore, a detailed affordability analysis for assessing the impact of CSO control costs on Ashland is crucial to the success of the program. The *Combined Sewer Overflows Guidance for Financial Capability Assessment and Schedule Development* (Guidance) published by USEPA in February of 1997 presents a two-phase approach for financial capability assessment. This procedure was followed to perform an in-depth assessment for Ashland. Phase 1 of the approach involves a residential indicator that evaluates the burden the wastewater and CSO program places on individual households throughout the Ashland's service area. Phase 2 addresses a permittee's financial capability indicator that examines the debt, socioeconomic, and financial capability of the permittee. Information from each phase is then utilized in a financial capability matrix to aid in establishing an implementation schedule for the CSO abatement projects. In addition to the indicators from Phase 1 and 2, unique local economic conditions can also impact the implementation schedule for CSO control.

8.02 RESIDENTIAL INDICATOR

According to the USEPA, this indicator measures the financial impact of the current and proposed wastewater treatment and CSO control costs on all residential users in the service area. As the first phase of the financial capability assessment, the residential indicator evaluates the total annual cost per household (CPH) based upon current costs and projected costs for future capital projects as well as O&M. It also examines the CPH as a percentage of the median household income (MHI) in the service area.

A. Cost Per Household

The first step in developing the residential indicator involves calculation of the estimated CPH. This requires determination of the current wastewater treatment costs, projected wastewater treatment and CSO costs, the residential share of total wastewater flow during dry weather conditions, and the number of households in the service area. Worksheet 1 from the Guidance document was utilized to develop the CPH. Table 8.02-1 shows Worksheet 1.

Current annual operation and maintenance expenses are available through the *City of Ashland Final Budget Report Utility Fund–2015 Fiscal Budget*, which can be found in Appendix P. Annual O&M expenses include expenditures for the utility director, utility cashier, meter services, water production, water distribution, WWTP, wastewater collection, and unclassified expenses. Each of these categories include costs related to items such as labor, chemicals, utilities, administration, and equipment replacement. Furthermore, the current annual debt service, as documented in the *City of Ashland, Kentucky Comprehensive Annual Financial Report Fiscal Year Ended June 30, 2014,* includes the general fund, utility fund, and capital purchase improvement fund for the 2014 fiscal year. This report can be found in Appendix P.

Current Wastewater Treatment Costs		Line
Annual Operations and Maintenance Expenses (excluding depreciation) - 2010 Actual Amount	$3,017,560	100
Annual Debt Service (principal and interest)	$417,635	101
Subtotal	$3,435,195	102
Projected Wastewater Treatment and CSO Costs (Current Dollars)		
Estimated Annual Operations and Maintenance Expenses (excluding depreciation)	$476,500	103
Annual Debt Service (principal and interest)	$2,851,019	104
Subtotal	$3,327,519	105
Total Current and Projected Wastewater Treatment and CSO Costs	$6,762,714	106
Residential Share of Total Wastewater Treatment and CSO Costs	$5,410,171	107
Total Number of Households in Service Area		
2010 Census	9,379	108
Cost Per Household	$577	109

Table 8.02-1 Cost Per Household (Worksheet 1)

The opinion of probable cost for the recommended plan is $42,530,000 with an annual debt service of $2,851,019 and the annual O&M cost is estimated at $476,500 for remaining recommended projects.

The residential share of total wastewater and CSO costs is calculated by multiplying the percent of total residential wastewater flow by the total annual costs. The residential share of overall costs is $5,410,171. With this residential share of costs and the total number of households in the City service area, the CPH is $577.

B. MHI Estimate

Estimation of the MHI in the service area is the next step to developing the residential indicator. Refer to Table 8.02-2, the Residential Indicator (Worksheet 2), for further information regarding the development of the MHI and the residential indicator.

Description		Line
MHI		
2013 Census MHI	$35,435	201
MHI Adjustment Factor	1.01	202
Adjusted MHI (2015)	$35,599	203
Annual Wastewater Treatment and CSO Control Cost per Household	$577	204
Residential Indicator		
Annual WW and CSO control CPH as a percent of adjusted MHI	1.62	205

Table 8.02-2 Residential Indicator (Worksheet 2)

The 2013 United States Census reports that the MHI of Ashland is $35,435. A MHI adjustment factor was applied to this value to bring it to 2015 dollars. The consumer price index inflation rate for the past two years, which is available from the United States Bureau of Labor Statistics, was used to develop the MHI adjustment factor. Refer to Appendix P for further information regarding the MHI calculations. The adjusted MHI for Ashland is $35,599.

As shown in Table 8.02-2, the annual wastewater and CSO control CPH as a percent of the adjusted MHI is 1.62.

The residential indicator, which is the first phase of the financial capability analysis, plays a significant factor in the final determination of the proposed CSO control implementation schedule. Based on previous experience with CSO control programs, the USEPA has developed ranges for the financial impact that CSO controls may have on the permittee's residential users. Refer to Table 8.02-3 for further information regarding these ranges. The data in Table 8.02.3 shows Ashland's financial impact will be midrange. The residential indicator defines the total financial impact range that will have a role in the financial capability matrix found in Subsection 8.05.

Financial Impact	Residential Indicator (CPH as % of MHI)
Low	Less than 1.0 percent of MHI
Midrange	1.0 to 2.0 percent of MHI
High	Greater than 2.0 percent of MHI

Table 8.02-3 Residential Indicator

8.03 PERMITTEE FINANCIAL CAPABILITY INDICATORS

The second phase of the financial capability assessment involves the development of a financial capability indicator. This phase of the financial capability assessment examines the community's ability as a whole to finance the program. It includes debt indicators, socioeconomic indicators, and financial management indicators. Based on a ranking of weak, midrange, or strong, each indicator is given a score ranging from one to three. This score determines the overall classification for the financial capability indicator in the financial capability matrix.

A. Debt Indicators

With the evaluation of bond ratings and overall net debt as a percentage of full market property value, this indicator examines the debt burden of the community as well as its ability to issue debt. Worksheet 3 and Worksheet 4 of the guidance were used to evaluate the bond rating and overall net debt as a percent of full market property value.

1. Bond Rating

Bond rating agencies can evaluate a community's credit capacity through evaluation of its general obligation bonds and revenue bonds. General obligation bonds are issued by a local government and repaid with local property taxes. They exemplify the community's general financial and socioeconomic conditions. Revenue bonds, which are also known as water or sewer bonds, are repaid with user fee revenues and exemplify the financial conditions and management capability of the wastewater utility.

In September 2011, Moody's Investors Service downgraded City of Ashland, Kentucky–Water and Sewer System Revenue Refunding and Improvements Bonds, Series 2004, from A1 to A2. The downgrade was because of the City's water and sewer system weak cash position that greatly reduces financial flexibility and other factors. Furthermore, in February 2015, Moody assigned a bond rating of A2 to the City's $3.62M Water and Sewer System Revenue Bonds, Series 2015. See Table 8.03-1 for further information. Refer to Appendix P for more information regarding these bond ratings.

Description		Line
Most Recent General Obligation Bond Rating		
Date	2015	
Rating Agency	Moody's Investors Service	
Rating	A2	301
Most Recent Revenue (Water/Sewer or Sewer) Bond		
Date	2015	
Rating Agency	Moody's Investors Service	
Bond Insurance (Yes/No)	Yes	
Rating	A2	302
Summary Bond Rating (most recent)	A2	303

Table 8.03-1 Bond Rating (Worksheet 3)

The guidance sets forth benchmarks for this indicator of weak, midrange, and strong. Moody's Investor Services Ratings of Ba, B, Caa, Ca, and C are considered weak, Baa rating is considered midrange, and Aaa, AA and A ratings are considered strong. Ashland's bond rating of A2 is considered strong and will be given a score of three in the final determination of the financial capability indicator.

2. Overall Net Debt as a Percentage of Full Market Property Value

The debt repaid by property taxes in the service area is considered to be the overall net debt. The net debt measures both the debt burden on residents in the service area and the ability of the local government to issue additional debt. Furthermore, according to the guidance, this indicator compares the level of debt owed by the service area population with the full market value of real property used to support that debt and serves as a measure of financial wealth in the permittee's service area. Worksheet 4 from the guidance summarizes this information.

The *City of Ashland, Kentucky Comprehensive Annual Financial Report Fiscal Year Ended on June 30, 2014*, in Appendix P, documents information pertinent to the development of this indicator. For the fiscal year ending June 30, 2014, the general obligation bond debt total was $2,570,000. The City has no overlapping percentages chargeable to Ashland's service area.

Another important aspect of this indicator is the market value of property in the permittee's service area. According to the guidance, this value should reflect the full market value of property within the permittee's service area. The *City of Ashland, Kentucky Comprehensive Annual Financial Report Fiscal Year Ended on June 30, 2014*, reports the total taxable assessed value of property within Ashland amounts to $838,362,243. See Table 8.03-2 for Ashland's overall net debt as a percent of full market property value.

Direct Net Debt		**Line**
G.O. Bonds Excluding Double Barreled Bonds	$2,570,000	401
Debt of Overlapping Entities		
Proportionate Share of Multijurisdictional Debt	$0	402
Overall Net Debt	$2,570,000	403
Market Value of Property	$838,362,243	404
Overall Net Debt as a Percent of Full Market Property Value	0.31%	405

Source: City of Ashland, Kentucky Annual Financial Report for the Fiscal Year That Ended June 30, 2010.

Table 8.03-2 Overall Net Debt as a Percent of Full Market Property Value (Worksheet 4)

The Guidance sets forth benchmarks for this indicator of weak, midrange, and strong. Overall Net Debt as Percent of Full Market Property Value above 5 percent is considered weak, those between 2 percent and 5 percent are considered midrange, and those below 2 percent are considered strong. Ashland's value of 0.31 percent for the overall net debt as a percent of full market property value is considered to be strong because it is below 2 percent. The overall net debt as a percent of full market property value will be given a score of three in the final determination of the financial capability indicator.

B. Socioeconomic Indicators

1. Unemployment Rate

This indicator utilizes the unemployment rate and MHI of Ashland to evaluate the social well-being of the residential users in the service area. Additional socioeconomic data such as poverty rate, population growth, and employment projections can also aid in defining the socioeconomic status of these residential users and ultimately determine its ability to fund the CSO control solution. This indicator also has an important role in determining the financial capability indicator for the city.

The seasonally adjusted unemployment rate for Ashland, as reported by the Bureau of Labor Statistics is 6.8 percent for March 2015. This rate is higher than both the national rate of 5.6 percent and the State of Kentucky's unemployment rate of 5.4 percent. See Table 8.03-3 for Ashland's unemployment rate calculation.

Description	Percentage Rate	Line
Unemployment Rate–City of Ashland (2011)	6.8%	501
Unemployment Rate–Kentucky (2011)	5.4%	502
Average National Unemployment Rate (2011 benchmark)	5.6%	503

Source: Bureau of Labor Statistics–June 2011 Unemployment Rates (www.bls.gov).

Table 8.03-3 Unemployment Rate (Worksheet 5)

The Guidance sets forth benchmarks for the unemployment rate when compared to the national unemployment rate of weak, midrange, and strong. Unemployment rates more than one percentage point above the national unemployment are considered weak, those between ± one percentage point of the national unemployment rate are considered midrange, and those above one percentage point of the national unemployment rate are considered strong, Ashland's unemployment rate of 6.8 percent is approximately 1.2 percentage point higher than the national average and is considered to be weak. It will be given a score of one for determination of the final financial capability indicator.

2. MHI

The MHI assesses the community earning capacity. This value was also used to evaluate the residential indicator during phase one of this two-phase approach. The 2015 adjusted MHI for Ashland is $35,599 (adjusted from 2013). This value is significantly lower than the national MHI of $53,292. The MHI adjustment factor, which was calculated on Worksheet 2 in Section 8.02, was also applied to the 2013 Census values. Refer to Table 8.03-4 for further information.

Description		Line
Adjusted Median Household Income–City of Ashland (2011)	$35,599	601
Benchmark–National Census Data		
National MHI (2013)	$53,046	602
MHI Adjustment Factor	1.01	603
Adjusted National MHI (2015)	$53,292	604

Source: US Census data from 2013 Census.

Table 8.03-4 MHI (Worksheet 6)

The Guidance sets forth three ranges for which Ashland's MHI can fall between when compared to the adjusted national MHI. The ranges are weak, midrange, and strong. MHI more than 25 percent below adjusted national MHI is considered weak, those between ±25 percent of adjusted national MHI are considered midrange, and those above 25 percent are considered strong. With a national benchmark value of $53,292, Ashland's MHI is 33 percent below the adjusted national MHI. Therefore, this indicator is considered weak and given a score of 1 for the final evaluation.

C. Financial Management Indicators

1. Property Tax Revenues as a Percent of Full Market Property Value

Property tax revenue as a percent of full market value of real property and property tax revenue collection rate are the factors that determine the financial management indicator. This evaluation determines the permittee's financial management ability.

The guidance defines the property tax revenues as a percent of full market property value as the "property tax burden" since it indicates the funding capacity available to support debt based on the wealth of the community. This indicator also evaluates the permittee's ability to manage and provide community services. The *City of Ashland Kentucky Comprehensive Annual Financial Report Fiscal Year Ended June 30, 2014,* documents the assessed value of total taxable property throughout Ashland amounts to $838,362,243 for 2014 and $826,561,756 for 2013 fiscal year. This document also reports the property tax revenues for the fiscal year ending June 30, 2013, were $3,085,671.

Table 8.03-5 shows Ashland's property tax revenues as a percent of full market property value. In comparison to benchmarks provided by the guidance, a value of 0.37 percent for the property tax revenue as a percent of full market property value is rated as strong for the financial capability indicator. For this indicator, any value below 2 percent is considered strong and will be given a score of 3 in the development of the financial capability indicator.

Description		Line
Full Market Value of Real Property	$838,362,243	701
Property Tax Revenues	$3,085,671	702
Property Tax Revenue as a Percent of Full Market Property Value	0.37%	703

Source: City of Ashland, Kentucky Annual Financial Report for the Fiscal Year Ended June 30, 2014.

Table 8.03-5 Property Tax Revenues as a Percent of Full Market Property Value (Worksheet 7)

2. Property Tax Revenue Collection Rate

The property tax revenue collection rate assesses the efficiency of the tax collection system and the acceptability of tax levels to residents. Various factors including the property tax revenues collected and property taxes levied are utilized to determine this indicator. As mentioned previously, the property tax revenues collected during the 2014 fiscal year were $3,085,671. Furthermore, as reported in the *City of Ashland Kentucky Comprehensive Annual Financial Report Fiscal Year Ended on June 30, 2014,* the property taxes levied for the 2013 fiscal year was $3,306,870. See Table 8.03-6 for further information.

Description		Line
Property Tax Revenue Collected	$3,085,671	801
Property Taxes Levied	$3,306,870	802
Property Tax Revenue Collection Rate	93%	803

Source: City of Ashland, Kentucky Annual Financial Report for the Fiscal Year Ended June 30, 2014.

Table 8.03-6 Property Tax Revenue Collection Rate (Worksheet 8)

The Guidance sets forth benchmarks for this indicator of weak, midrange, and strong. Property tax revenue collection rates below 94 percent are considered weak, those between 94 percent and 98 percent are considered midrange, and anything above 98 percent is considered strong. Therefore 93 percent is considered weak and will be given a score of 1 in the final determination of the financial capability indicator.

D. Analysis of Financial Capability Indicators

Each of the aforementioned financial capability indicators was compared to benchmark data and given a score of one, two, or three for the development of the final financial capability indicator. Table 8.03-7 shows Ashland's financial capability indicator benchmarks as shaded text.

Indicator	Strong (3)	Midrange (2)	Weak (1)
Bond Rating	AAA-A Standard & Poor's (S&P) or Aaa (Moody's)	BBB (S&P) Baa (Moody's)	BB-D (S&P) Ba-C (Moody's)
Overall Net Debt as a Percent of Full Market Property Value	Below 2%	2% to 5%	Above 5%
Unemployment Rate	More than 1 Percentage Point Below the National Average	Approximately 1 Percentage Point of National Average	More than 1 Percentage Point Above the National Average
MHI	More than 25% Above the Adjusted National MHI	Approximately 25 % of Adjusted National MHI	More than 25% Below Adjusted National MHI
Property Tax Revenues as a Percent of Full Market Property Value	Below 2%	2% to 4%	Above 4%
Property Tax Collection Rate	Above 98%	94% to 98%	Below 94%

Table 8.03-7 Ashland's Permittee Financial Capability Indicator Benchmarks

Table 8.03-8 summarizes Ashland's financial capability indicator scores with the average indicator score shaded.

Indicator	Actual Value	Score	Line
Bond Rating (Line 303)	A2	3	901
Overall Net Debt as a Percent of Full Market Property Value (Line 405)	0.31%	3	902
Unemployment Rate Benchmark (Line 501)	1.2%	1	903
Median Household Income (Line 601)	-33%	1	904
Property Tax Revenues as a Percent of Full Market Property Value (Line 703)	0.37%	3	905
Property Tax Revenue Collection Rate (Line 803)	93%	1	906
Ashland's Indicators Score		2.0	907

Table 8.03-8 Summary of Ashland's Financial Capability Indicators (Worksheet 9)

Table 8.03-9 shows Ashland's financial capability matrix score. The evaluation documents that Ashland qualifies as a Medium Burden community as supported in Table 8.04-1.

Description		Line
Residential Indicator Score	1.62	1001
Ashland's Financial Capability Indicators Score	2.0	1002
Financial Capability Matrix Category	Medium Burden	1003

Table 8.03-9 Financial Capability Matrix Score (Worksheet 10)

8.04 THE FINANCIAL CAPABILITY MATRIX

Results of this affordability analysis are applied to the financial capability matrix, shown in Table 8.04-1, to determine the level of burden the CSO controls may inflict on Ashland. The residential indicator, the permittee financial capability indicator, and additional considerations play important roles in the financial capability matrix. This matrix is utilized by permittees, the USEPA, and state NPDES authorities to establish a reasonable and financially feasible CSO control implementation schedule.

Financial Capability Matrix Score (Socioeconomic, Debt and Financial Indicators)	**Residential Indicator (Cost Per Household as a % of MHI)**		
	Low (Below 1%)	**Medium (Between 1% and 2%)**	**High (Above 2%)**
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Midrange (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

Table 8.04-1 Permittee Financial Capability Indicators Score Matrix

8.05 ADDITIONAL CONSIDERATIONS

The Guidance document stresses the distinctive economic situation of the community must be assessed. The guidance states "It must be emphasized that the financial indicators found in this guidance might not present the most complete picture of a permittee's financial capability to fund the CSO controls. Since flexibility is an important aspect of the CSO policy, permittees are encouraged to submit any additional documentation that would create a more accurate and complete picture of their financial capability." Therefore, a discussion of socioeconomic trends in the Ashland service area is essential in assessing affordability and financial capacity.

A. Population

Population data from the US Census Bureau indicates the population of Ashland peaked in 1960 and has been decreasing ever since. Table 8.05-1 shows Ashland's population for the historic period of 1940 to 2010. Therefore, unless there is a reversal of this trend, the estimated revenue from the CSO surcharge might have to be adjusted downward, which will affect Ashland's ability to fund proposed projects in the recommended plan.

B. Poverty Level

The families below poverty level in Ashland increased from 14 percent in 2000 to 16 percent in 2009. For individuals below poverty level, it increased from 18.4 percent in 2000 to 20.4 percent in 2009. Nationally for the same period, the percentage of families below poverty line increased from 9.2 percent to 9.9 percent and the percentage of individuals below poverty line increased from 12.4 percent to 13.5 percent. Ashland's poverty level has consistently been above national levels. With the current economic environment, it is possible that in the near future the number of people in Ashland living below the poverty level could increase further.

Census	Population	% ±
1870	1,459	-
1880	3,280	124.8
1890	4,195	27.9
1900	6,800	62.1
1910	8,688	27.8
1920	14,729	69.5
1930	29,074	97.4
1940	29,537	1.6
1950	31,131	5.4
1960	31,283	0.5
1970	29,245	-6.5
1980	27,064	-7.5
1990	23,622	-12.7
2000	21,981	-6.9
2010	21,684	-1.4

Table 8.05-1 Ashland Population Trend

C. Number of Households

The number of households is another factor that would significantly affect the ability of Ashland to fund CSO projects. In 2000 there were 9,688 households, and in 2010 there were 9,486 households. The decrease in number of households is not surprising giving the general decline in Ashland's population.

D. Employment Trends in Ashland

The ability of Ashland to finance the projects in the LTCP is tied to future income which is driven largely by employment. In 2011, AK Steel, one of the major employers in Ashland, shut down its coke plant impacting about 268 workers. The closure of AK Steel eliminated approximately $400,000 (excludes CSO surcharge) in revenue to the Ashland's WWTP operations. Ashland officials have estimated that the plant's closure will have an annual impact of about $1.5 million on Ashland's overall revenues. Closure also increases local unemployment.

8.06 IMPLEMENTATION SCHEDULE

Ashland's classification is "Medium Burden" and, as shown in Table 8.06-1 (Table 4 of the USEPA guidance document), Ashland will have up to 10 years from the date of the approval of the LTCP to complete all projects in the recommended plan. However, Ashland is requesting that it be given to December 31, 2025, to implement all recommended plan projects because of the socioeconomic trends discussed in Section 8.05 such a falling population, high poverty levels, and loss of major industries in the City. Moreover, the City does not have the personnel to manage all the projects if the projects are not scheduled over ample time. In addition, other CSO communities in the vicinity of Ashland have similar completion deadlines. Ironton, Ohio, a city just across the river from Ashland (USEPA Region 5), has until 2026 to implement CSO LTCP projects and Huntington, West Virginia (USEPA Region 3) has until December 31, 2035. The 2026 deadline will prevent Ashland and its residents from being economically disadvantaged in terms of sewer rates within the Huntington-Ashland, West Virginia-Kentucky-Ohio, Metropolitan Area.

Financial Capability Matrix Category	Implementation Period
Low Burden	Normal Engineering/Construction
Medium Burden	Up to 10 Years
High Burden	Up to 15 Years*
	*(Schedule up to 20 years based on negotiation with USEPA and state NPDES authorities)

Table 8.06-1 Financial Capability General Scheduling Boundaries

SECTION 9
RECOMMENDED PLAN AND IMPLEMENTATION SCHEDULE

9.01 INTRODUCTION

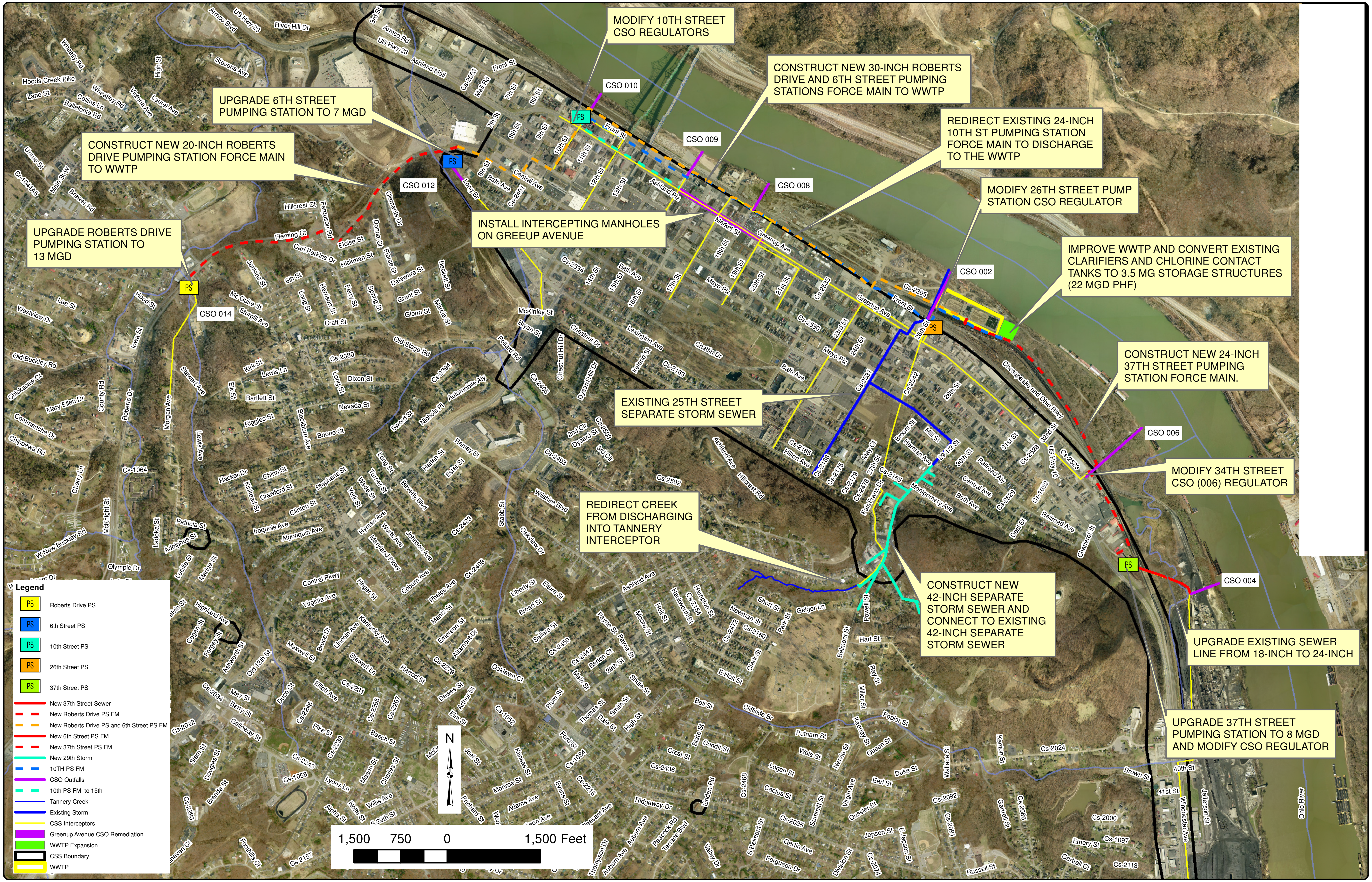
To allow for the fulfillment of the CWA, the USEPA and KDOW LTCP guidance requires all LTCPs to attain water quality to support the designated use or not preclude attainment of water quality to support the designated use of all CSO receiving waters.

This section describes the recommended plan that Ashland selected. The recommended plan is based on existing regulatory requirements, current enforcement actions, the alternatives evaluation, public input, and the financial capability analysis described in previous sections.

9.02 RECOMMENDED PLAN AND IMPLEMENTATION SCHEDULE

Hydraulic modeling indicates that Ashland will capture 93 percent by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual basis after the implementation of projects common to all alternatives. The alternative analysis indicated that significant benefits would not be obtained after implementation of the common projects and, considering the financial capability of the residents, Ashland decided to not implement additional projects after the common projects are completed.

The recommended plan increases the systemwide percent capture from 70 percent (no action) to approximately 93 percent. This capture is above the 85 percent capture stated in item (2) of the presumptive approach. Table 9.02-1 lists the components of the recommended plan. Figure 9.02-1 shows the location of the recommended infrastructure.



RECOMMENDED PLAN

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 9.02-1
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 9.02-1

Table 9.02-1 Recommended Plan Projects Schedule and Total Capital Cost

	Item	Project ID	Rated Capacity	Start Date[3]	Completion Date[3]	Estimated Capital Cost[1,2]
Recommended CSO Projects						
1	Completed Projects					
	Roberts Drive PS and 6th Street PS Improvement	03050	20 mgd	1/1/2010	12/31/2012	$6,800,000
	10th Street Regulator Modifications	03050		1/1/2010	12/31/2012	$200,000
	37th St PS Improvements	03060	8 mgd	1/1/2011	12/31/2014	$2,950,000
	34th Street Regulator Modifications	03060		1/1/2011	12/31/2014	$50,000
	Greenup Avenue Interceptor Manholes	03070		1/1/2014	12/31/2014	$220,000
2	In-Progress Projects					
	29th Street Separation Project	03200		1/1/2014	12/31/2016	$4,000,000
3	Planned Projects (4)					
	WWTP Improvements with 3.5 MG Onsite Storage	03210	22 mgd	1/1/2018	12/31/2025	$27,600,000
	10th Street PS FM Modifications	03220	10 mgd	1/1/2018	12/31/2025	$100,000
	26th Street Regulator Modifications	03230		1/1/2018	12/31/2025	$60,000
	26th Street PS Improvements (SCADA)	03230		1/1/2018	12/31/2025	$550,000
	Recommended Plan Projects Subtotal					**$42,530,000**

[1]Includes Contingencies and Technical Services.
[2]All costs for In-Progress and Planned projects in 2nd quarter 2015 dollars.
[3]Start and completion dates depend on the date of final approval of LTCP by regulators.
[4]Planned projects will likely be combined into one project.

Figure 9.02-2 shows the recommended LTCP implementation schedule. The dates indicated in the implementation schedule are subject to change depending on the final approval date of the LTCP. Ashland intends to delay recommended plan projects until final approval of the LTCP is received from regulators.

Detailed descriptions of the individual projects in the recommended plan follow.

A. Roberts Drive PS and 6th Street PS and Force Main Improvements (Project ID 03050)

The Roberts Drive PS is located on Roberts Drive about 350 feet south of the intersection of Roberts Drive and Blackburn Avenue. The 6th Street PS is located on Central Avenue where 6th Street turns into Central Avenue along Long Branch, across from the Ashland Mall. The Long Branch Flood Control PS is located next to the 6th Street PS. Figure 9.02-3 shows the location of the Roberts Drive PS and the 6th Street PS.

The project consists of upgrading the firm capacity of the Roberts Drive PS from about 4.3 mgd to 13 mgd and the 6th Street PS from about 3.75 mgd to 7 mgd. The project also includes the construction of a new 20-inch force main from Roberts Drive PS and a new 20-inch force main from the 6th Street PS that combine into a common 30-inch force main that discharges flow directly to Ashland's WWTP.

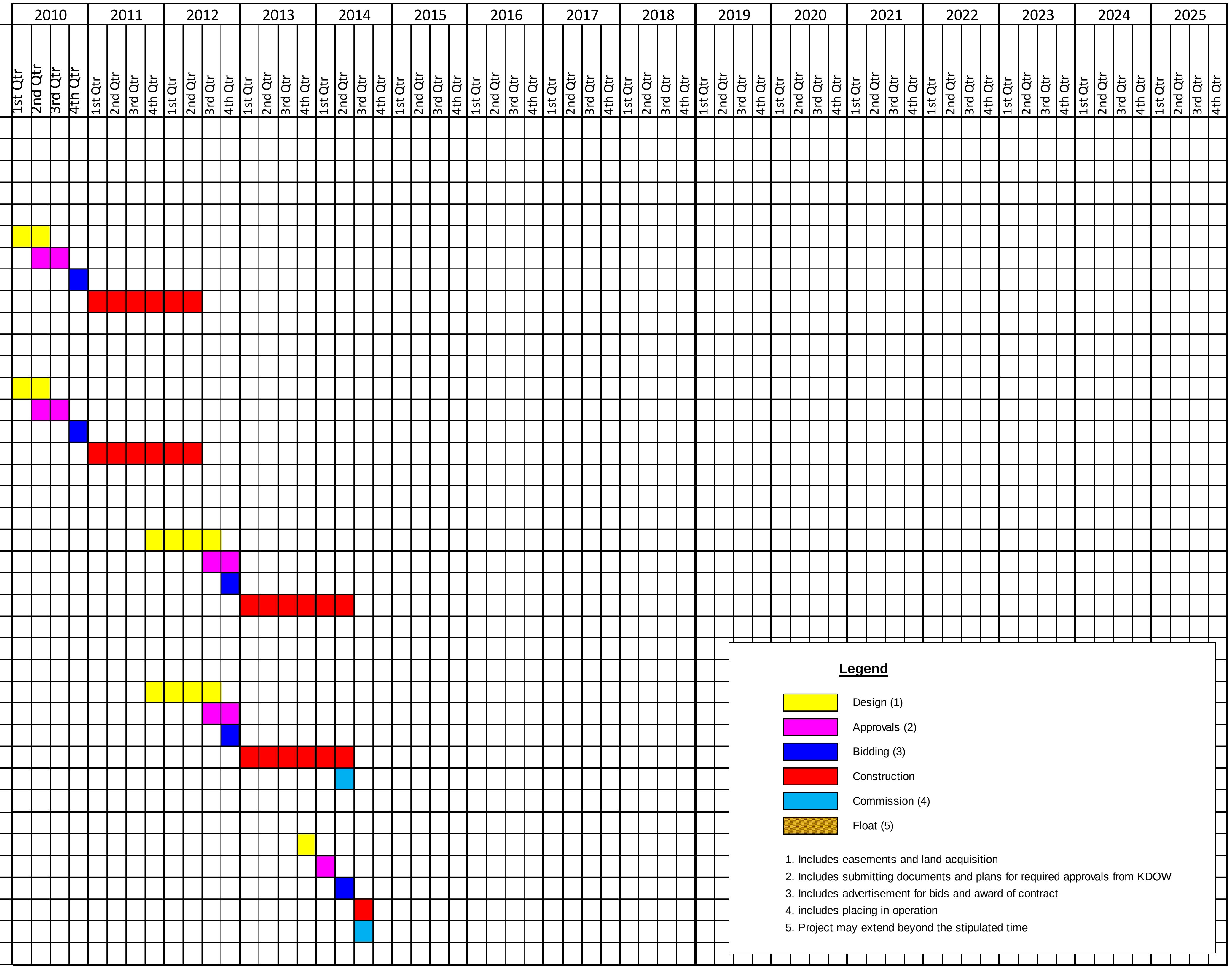
The goal of this project is to reduce the frequency and volume of the overflows at CSO 014 (Roberts Drive) and CSO 012 (6th Street). These CSO outfalls are the only outfalls located within Ashland's CSS that discharge to small streams. CSO 014 discharges to Little Hoods Creek while CSO 012 discharges to Long Branch. Upgrading the firm capacity of the Roberts Drive PS to 13 mgd should correspond to a 1-year (0 to 1 overflow a year) level of control according to the model. Upgrading the firm capacity of the 6th Street PS to 7 mgd should correspond to a 6-month (2 to 3 overflows a year) level of control according the model. The pumping upgrades will increase the percent capture to nearly 100 percent during wet weather on an annual average basis for both CSO 014 and CSO 012. The project is also intended to eliminate triple pumping of wastewater. Currently, the existing force mains from the Roberts Drive PS and the 6th Street PS discharge to the 10th Street PS. Flow is then pumped from the 10th Street PS to the 26th Street PS. The 26th Street PS discharges flow to the WWTP. By redirecting flow directly to the WWTP, the more concentrated flow from these pumping stations will bypass the CSS and eliminate subsequent triple pumping of this wastewater at the 10th Street PS and 26th Street PS.

Although, the intent of this project is to reduce the frequency and volume of the overflows at CSO 014 (Roberts Drive) and CSO 012 (6th Street), hydraulic modeling indicates that the annual volume of CSO discharged through CSO 010 (10th Street) will be significantly reduced.

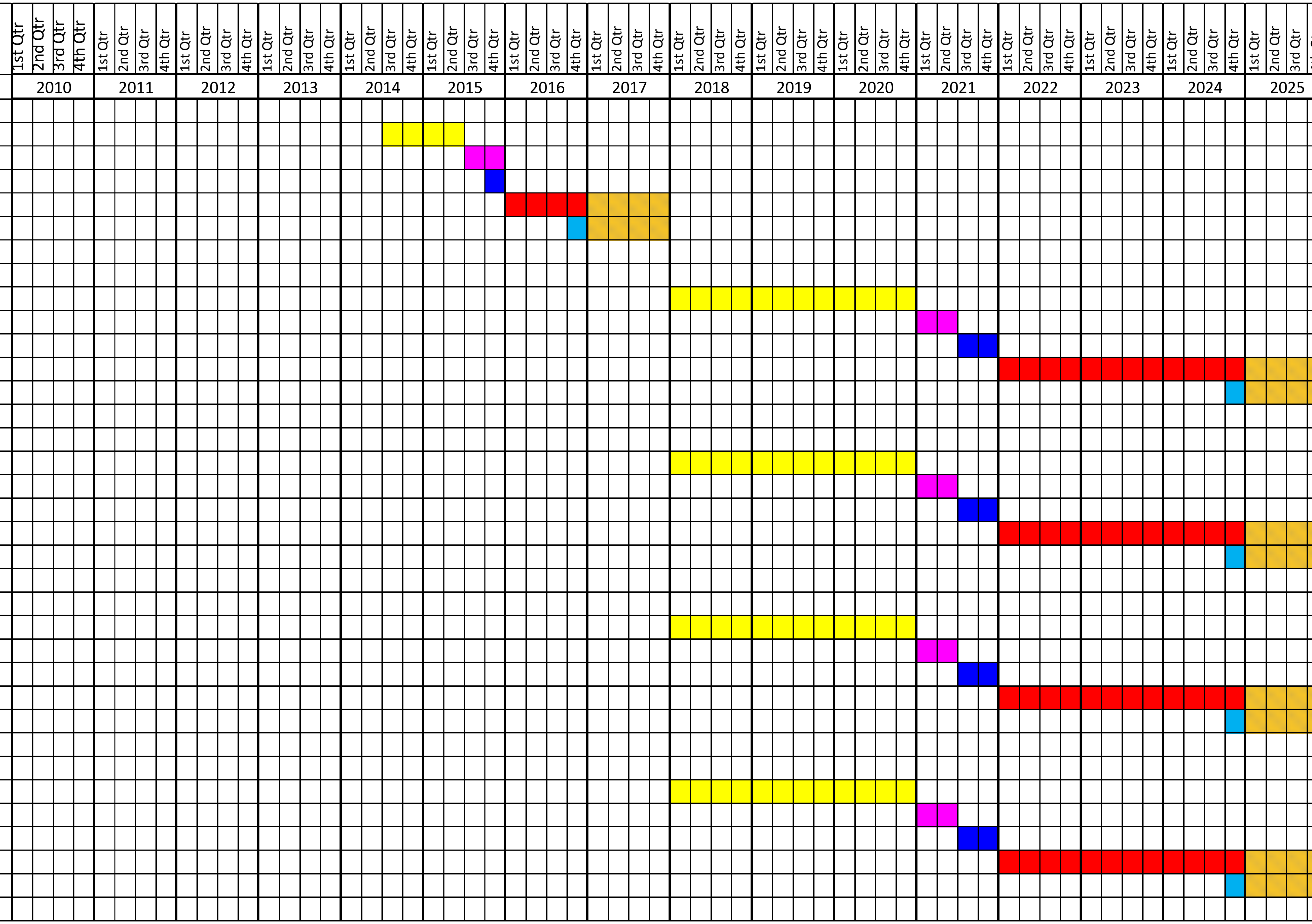
Figure 9.02-3 shows existing and proposed structures. The systemwide percent capture will increase to 76 percent after the implementation of the Roberts Drive PS and 6th Street PS upgrades and the 10th Street regulator modification (further described) projects.

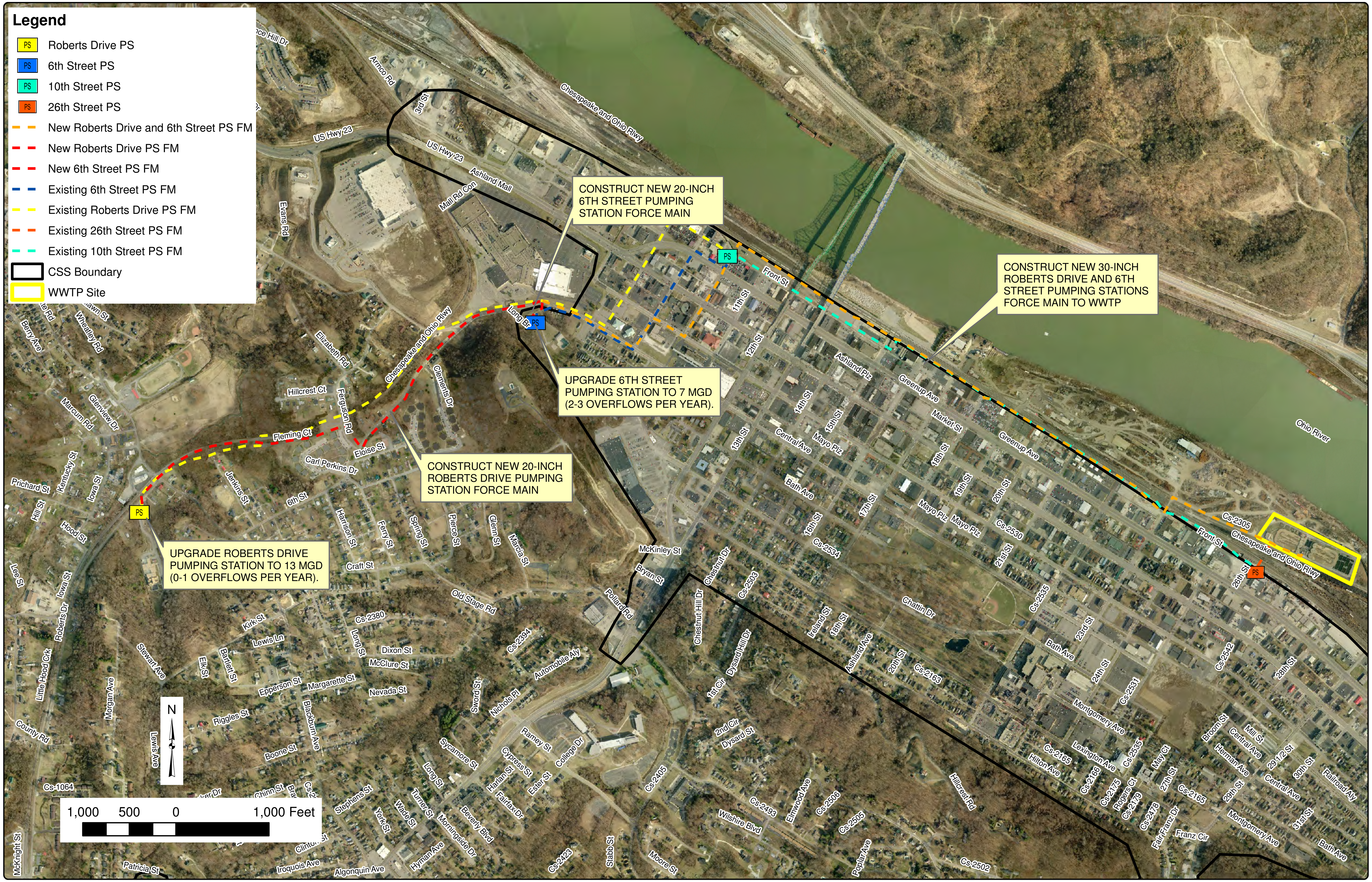
Figure 9.02-2 Recommended LTCP Implementation Schedule

Project ID	Subtask	Funding Status	Opinion of Total Capital Cost
Recommended Plan Projects			
03050	Roberts Dr and 6th St PS Improvement	Funded (SRF)	6.8M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
03050	10th Street Regulator Modifications	Funded(SRF)	0.2M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
03060	37th St PS Improvements	Funded (SRF)	2.95M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	34th Street Regulator Modifications	Funded (SRF)	0.05M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	Greenup Ave Interceprtor Manholes	City	0.22M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		



Project ID	Subtask	Funding Status	Opinion of Total Capital Cost
	29th Street Separation Project	Future	3.2M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	Expand WWTP to treat 40 mgd PHF	Future	30M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	10th Street PS Improvements	Future	0.1M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	26th Street Regulator Modifications	Future	0.06M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		
	26th Street PS Improvements	Future	$0.55M
	Design		
	Approval		
	Bidding		
	Construction		
	Commission		





RECOMMENDED PLAN
ROBERTS DRIVE AND 6TH STREET PUMPING STATION IMPROVEMENTS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 9.02-3
5102.002

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\Figure 9.02-3

B. 10th Street CSO Regulator Modifications (Project ID 03050)

The 10th Street CSO regulator modifications project is being completed as part of the Roberts Drive PS and 6th Street PS improvements project.

The project consists of the construction of a junction box downstream of the two CSO 010 regulators and the construction of 42 LF of 36-inch pipe to discharge overflow from the two regulators to the 10th Street PS. When the capacity of the PS or the new 36-inch sewer is exceeded, the combined sewer will overflow through the existing 14-inch by 16-inch rectangular dry weather orifice (Regulator A) 36-inch outfall pipe. This project will reduce the volume, duration, and frequency of CSO 010 and mainly utilize the excess capacity created at the 10th Street PS by the elimination of the Roberts Drive PS and 6th Street PS discharges.

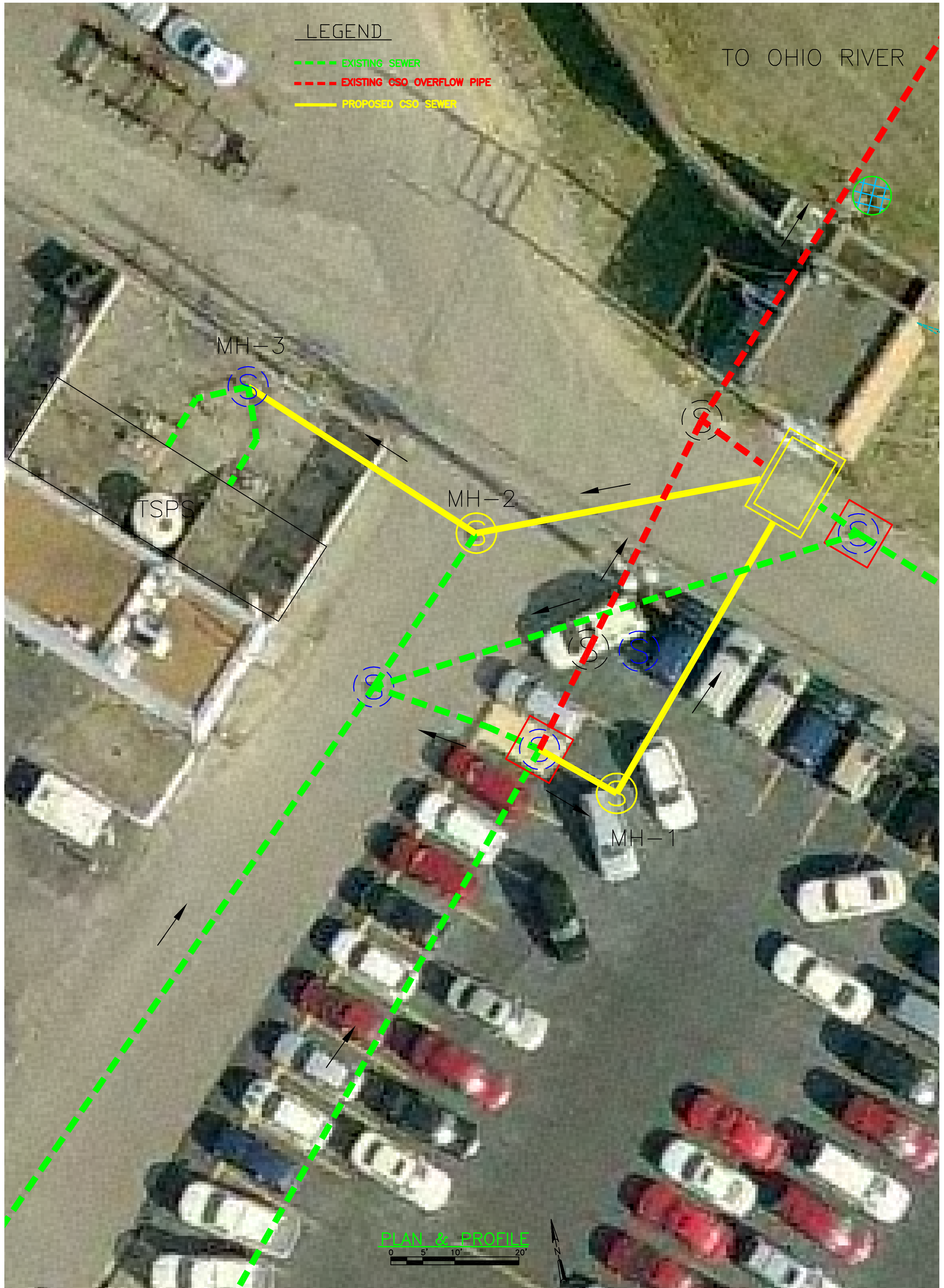
Figure 9.02-4 shows existing and proposed structures. The 10th Street regulator modifications will increase the modeled percent capture in in the 10th Street CSO basin to 94 percent. The modeled systemwide percent capture will increase to 76 percent after the implementation of the Roberts Drive PS and 6th Street PS upgrades and the 10th Street regulator modification projects.

The maximum PHF that the WWTP could handle before completion of the projects listed above was 21 mgd. After completion of the two projects listed above, the City has continued to make minor modifications to the WWTP and can now accept instantaneous peaks flows of up to 33 mgd. However, at sustained flows at 33 mgd, solids begin to washout of the clarifiers and the WWTP is not able to meet the permitted TSS limits. The existing secondary clarifiers are the most limiting process at the WWTP. The WWTP does not accept more than about 25 mgd on a peak flow basis. The WWTP capacity was changed to 25 mgd from 21 mgd in the City's hydraulic model for typical year evaluation of remaining projects.

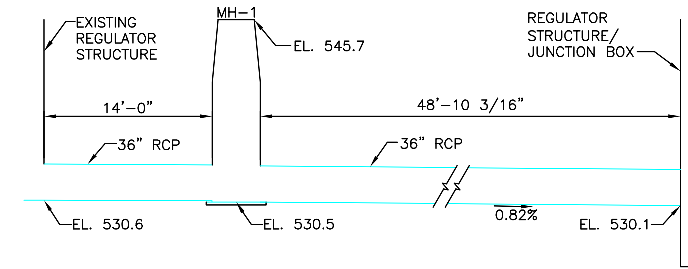
C. 37th Street PS and Force Main Improvements and 34th Street CSO Regulator Modifications Project (Project ID 03060).

The 37th Street PS is located off 37th Street along Winchester Avenue on the northeastern part of the collection system. Currently, there are two pumps with a 1,850 gpm (2.66 mgd) at 63 feet TDH rating. Only one pump operates during wet weather.

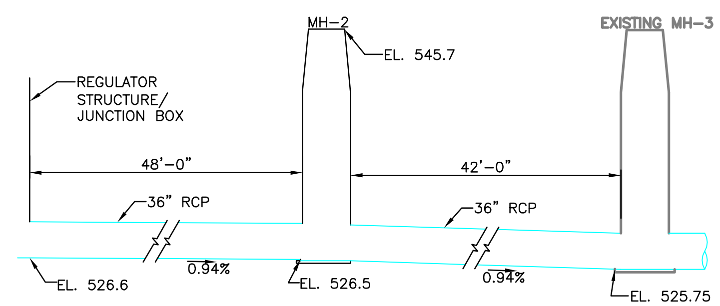
The project consists of relocating and upgrading the capacity of the PS and upsizing and extending the force main. Current plans are to upgrade the existing capacity of the PS from 2,800 gpm (4.0 mgd) to 5,500 gpm (7.9 mgd). The project also involves the construction of approximately 6,500 feet of 24-inch force main from the 37th Street PS to the WWTP. The new force main replaces the existing 14-inch force main that currently discharges to the combined sewer system at 34th Street, which can contribute to other CSOs within the system. After redirection of the force main, the size of the 6-inch by 14-inch orifice (Regulator A) will be increased. The 12-inch effluent pipe of Regulator A will be replaced with an 18-inch pipe. This project will reduce the frequency, volume, and duration of CSOs from the 37th Street CSO (Permitted Outfall 004) and 34th Street CSO (Permitted Outfall 006) that discharge to the Ohio River.



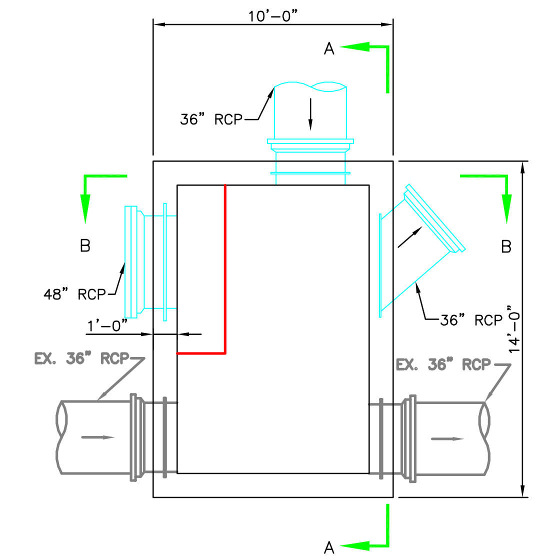
PLAN & PROFILE



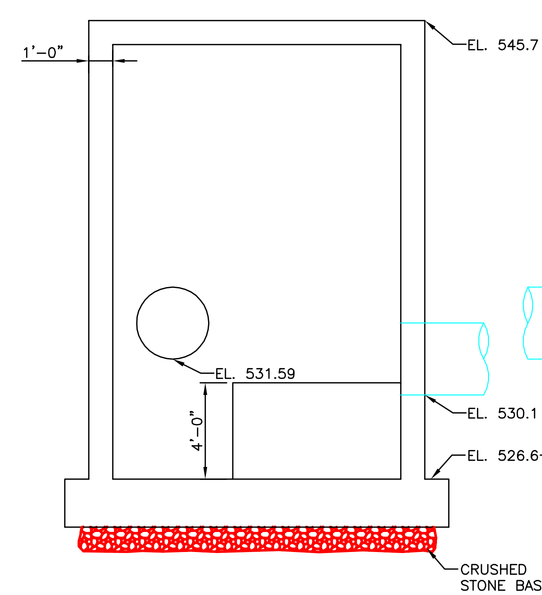
LINE FROM REGULATOR PROFILE



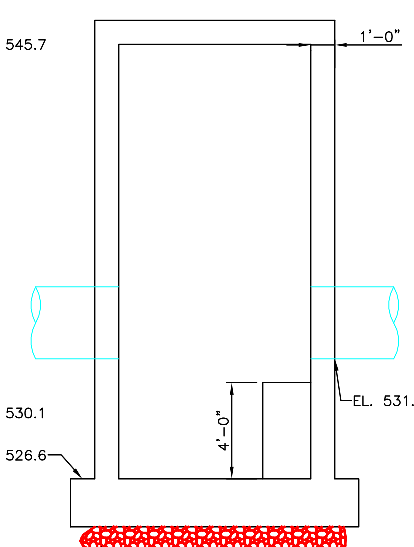
LINE FROM REGULATOR PROFILE



PLAN



SECTION A-A



SECTION B-B

10TH STREET CSO REGULATOR MODIFICATION PROJECT

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 9.02-4
5102.002

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Figure 9.02-5 shows existing and proposed structures. This project increases the modeled percent capture for the system for CSO 004 (37th Street) to nearly 99 percent and for CSO 006 (34th Street) to nearly 100 percent.

D. Greenup Avenue Interceptor Manholes (Project ID 03070).

The Greenup Avenue Interceptor is one of the three main interceptors within the City's CSS that conveys flow to the 26th Street PS. The interceptor starts as a 12-inch reinforced concrete pipe (RCP) on Greenup Avenue at 7th Street. At the intersection of Greenup and 8th Street, it changes to a 15-inch RCP and discharges its flow to the 10th Street PS, then increasing to a 21-inch pipe at the intersection of Greenup Avenue and 15th Street. Several trunk sewers running from south to north discharge into the Greenup Avenue Interceptor. CSO 009 (15th Street) and CSO 008 (18th Street) are connected to the western half of the Greenup Avenue interceptor to act as relief points during significant surcharging.

The 30-inch-diameter combined trunk sewer on 15th Street is conveyed to the Greenup Avenue Interceptor by a 15-inch diversion pipe through the orifice without connecting to the interceptor on Greenup Avenue. Combined sewers on 17th Street (24-inch) and 19th Street (24-inch) do not connect with the Greenup Avenue Interceptor on Greenup Avenue but head north to Front Avenue where flows are diverted by CSO regulators located on Front Street through smaller pipes to discharge back to the Greenup Avenue Interceptor.

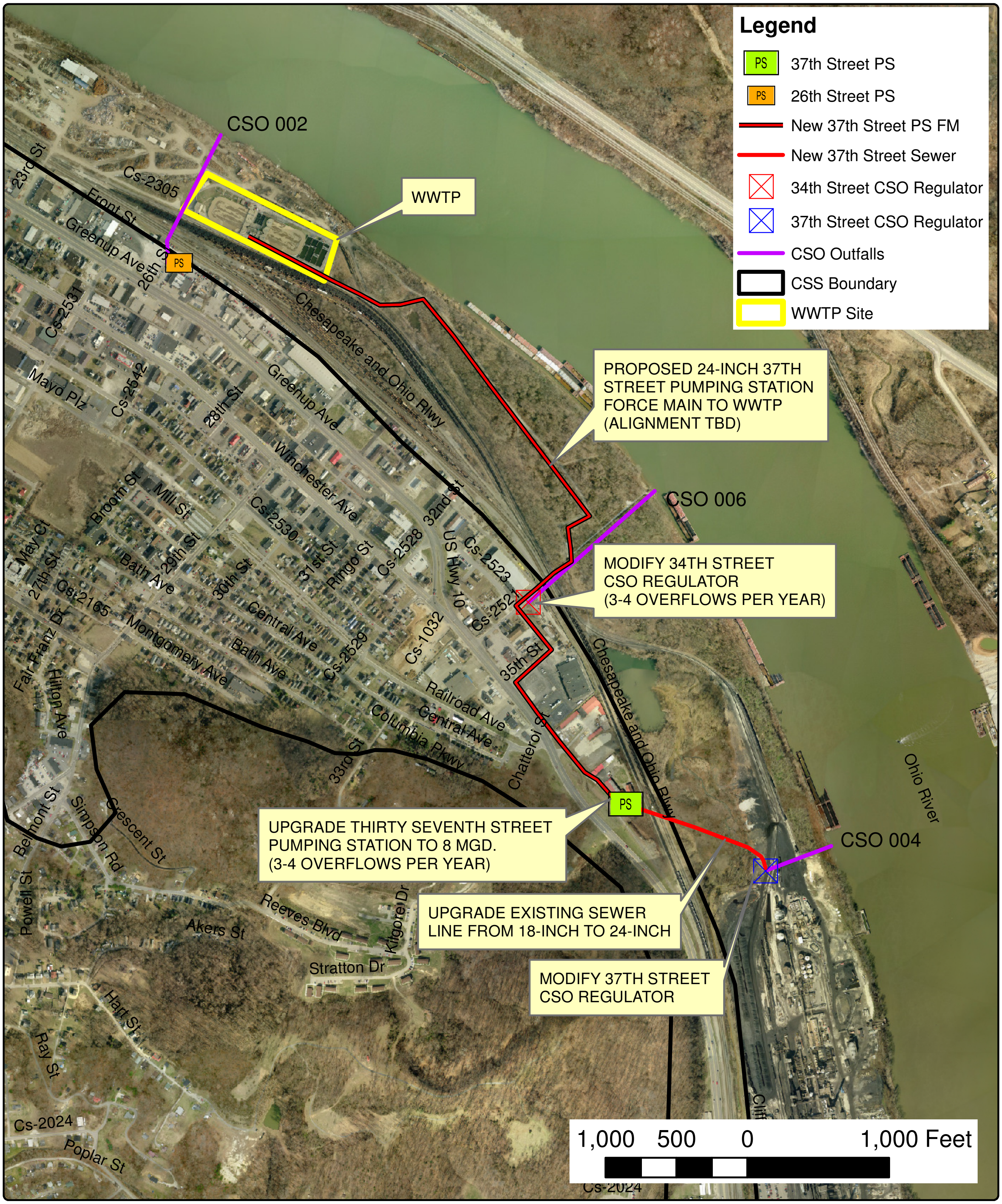
The intent of this project is to intercept flow from the trunk sewers on 15th Street, 17th Street, and 19th Street to discharge directly to the Greenup Avenue Interceptor on Greenup Avenue without going through the regulators. The project consist of installing intercepting manholes at the intersection of Greenup Avenue with 15th Street, 17th Street, and 19th Street. Figure 9.02-6 shows existing and proposed structures.

Hydraulic modeling indicates that this project is very beneficial during low intensity rainfall events when there is capacity available in the Greenup Avenue Interceptor but the regulators limit the flow that can be discharge from these trunk sewers to the Greenup Avenue interceptor. By intercepting these flows, the City is maximizing flow to the WWTP.

E. Tannery Line and 29th Street Stormwater Separation (Project ID 03200)

The Tannery Interceptor is one of the major interceptors in Ashland's combined system. A creek directly upstream of this interceptor discharges to the Tannery Combined Sewer. Ashland experiences flooding issues during significant rainfall events around the intersection of 29th Street and Lexington Avenue. Ashland intends to construct a separate storm sewer for this area to discharge directly to the Ohio River to address this flooding issue.

The project consists of the construction of approximately 2,500 LF of 42-inch separate storm sewer. This storm sewer will pick up catch basins along the alignment and discharge directly to the Ohio River through the existing storm sewer at the intersection of 29th Street and Central Avenue. This project will reduce the frequency, volume, and duration of CSOs from the 26th Street CSO

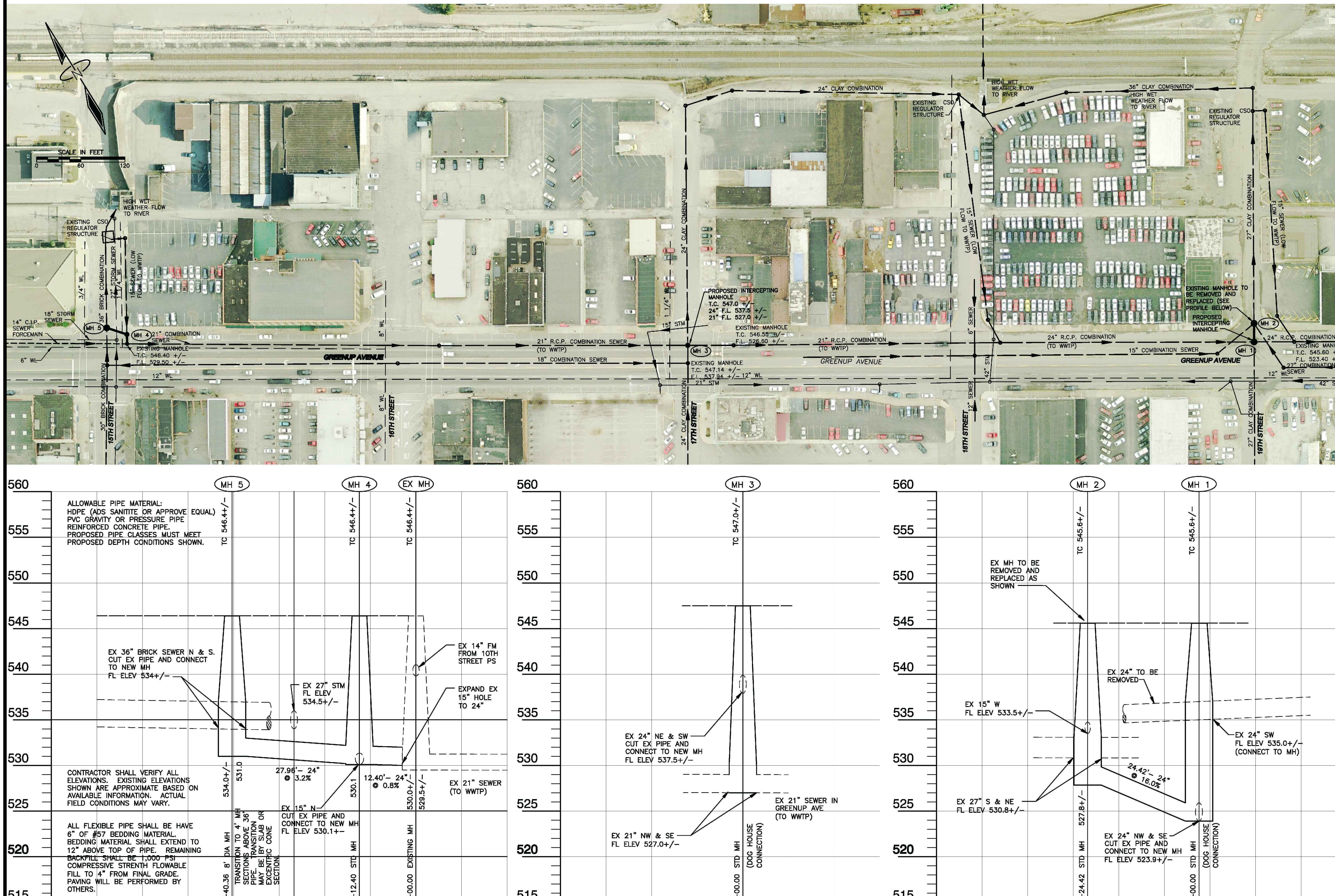


RECOMMENDED PLAN
37TH STREET PUMPING STATION UPGRADE AND 34TH STREET REGULATOR MODIFICATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 9.02-5
5102.002



RECOMMENDED PLAN
GREENUP AVENUE INTERCEPTOR MANHOLES

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 9.02-6

5102.002

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(Permitted Outfall 002). It will also reduce treatment cost since Ashland will no longer be treating a creek.

Figure 9.02-7 shows existing and proposed structures. The modeled systemwide percent capture increases to 86 percent following this and earlier projects. The percent capture at the 26th Street CSO increases to 47 percent as a result of this project.

F. Improve WWTP to Treat 22 mgd PHF and Provide 3.5 MG of Wet Weather Storage (Project ID 03210)

The Ashland WWTP is located along the Ohio River on the river side of the flood wall at the end of 26th Street. The WWTP can currently treat up to 18 mgd on a peak hourly basis.

The project consists of improving the peak flow treatment capacity of the WWTP to accept 40 mgd PHF (22 mgd will undergo full biological treatment and 18 mgd will be stored for treatment after storm event) by the construction of new headworks, two new circular clarifiers, a new UV disinfection, new gravity thickeners, and a new outfall. A detailed description with a process flow schematic is provided in Section 7. Full secondary treatment would be provided for all flow received at the WWTP. The current secondary clarifiers (approximately three million gallons capacity) and the existing chlorine contact tank (approximately 0.5 million gallons capacity) will be converted to wet weather storage. The stored flow will be pumped back to the oxidation ditch for secondary treatment when capacity is available as storm flows subside.

Figure 9.02-8 shows existing and proposed structures.

G. 10th Street PS and Force Main Improvements (Project ID 03220)

The project consists of extending the 24-inch force main of the 10th Street PS that currently discharges to the 26th Street PS, to discharge directly to the WWTP. Project also involves abandoning the PS's 14-inch force main that discharges to the Greenup Avenue Interceptor sewer at the junction of 15 Street and Greenup Avenue. This project will avoid double pumping and restores capacity at the 26th Street PS, which will reduce the volume, duration, and frequency of overflow from CSO 002.

Figure 9.02-9 shows existing and proposed structures.

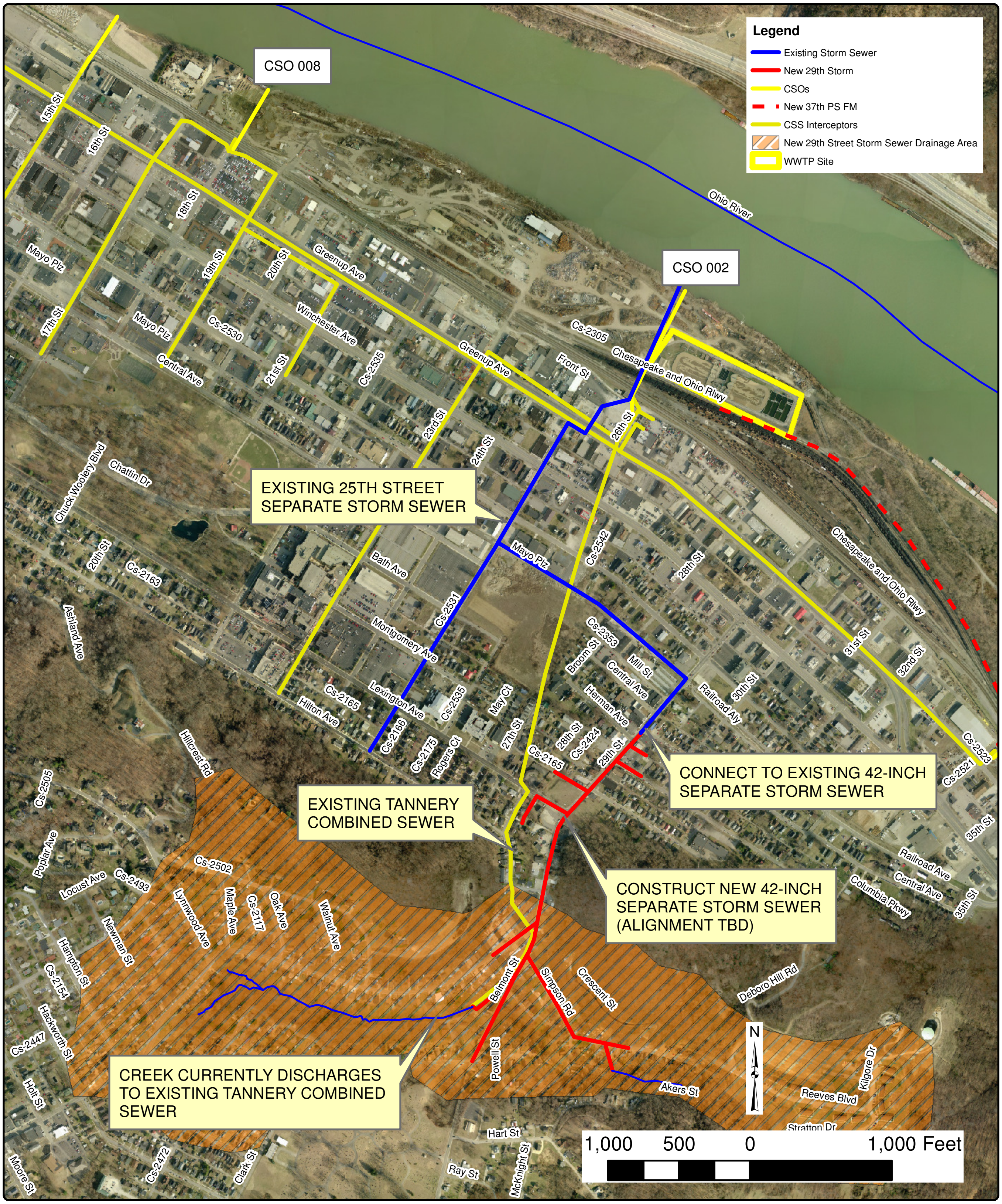
H. 26th Street CSO Regulator Modifications Project (Project ID 03230)

This project involves removing the orifice and replacing the 24-inch 26th Street PS influent sewer with a 42-inch sewer.

This project will reduce the volume, duration, and frequency of overflow from CSO 002 and is mainly to utilize the excess capacity created at the 26th Street PS by the elimination of the 10th Street PS discharge and the 37th Street PS contributions. It will also allow more flow to the 26th Street PS should it be upgraded in the future.

Figure 9.02-10 shows existing and proposed structures.

S:\LOU\5100--5199\5102\002\Data\GIS\LTCP\2015 Revisions\FIGURE 9.02-7



RECOMMENDED PLAN
29TH STREET STORM WATER SEPARATION PROJECT

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.®
ENGINEERS

FIGURE 9.02-7
5102.002

RECOMMEND PLAN
PROPOSED WWTP IMPROVEMENTS PRO□ECT

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

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FIGURE 9.02-8
5102.002

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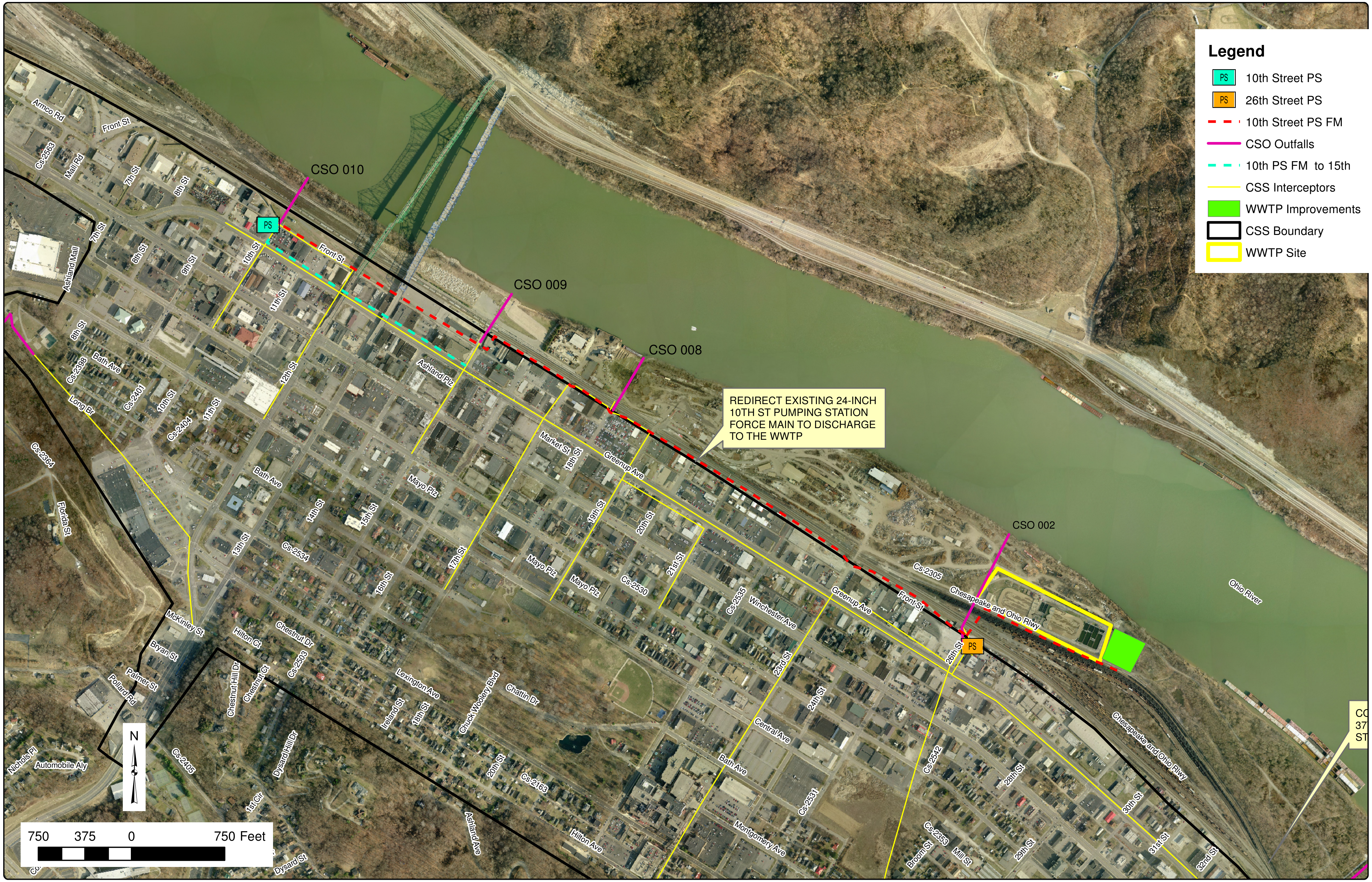

RECOMMENDED PLAN

10TH STREET PUMPING STATION FORCE MAIN IMPROVEMENTS PROJECT

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN

CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 9.02-9
5102.002

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RECOMMENDED PLAN
26TH STREET PUMP STATION IMPROVEMENTS PROJECT

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES, INC.® ENGINEERS

FIGURE 9.02-10
5102.002

I. 26th Street PS Improvements Project (Project ID 03230)

The project also includes installing a SCADA system at the 26th Street PS and integrating it with the new SCADA system at the WWTP. The integrated SCADA system will be used to control the flow being pumped by the 26th Street PS to the WWTP during peak flow wet weather events. When flows to the WWTP exceed 22 mgd and the 3.5 MG storage facility is full, the 26th Street PS will be throttled down to allow more overflow to occur at 26th Street CSO (CSO 002) and prevent the WWTP from being overloaded.

Figure 9.02-10 shows existing and proposed structures. The modeled systemwide percent capture increases to 93 percent following this and earlier projects. The percent capture at the 26th street CSO increases to 88 percent as a result of this project.

The WWTP project, 10th Street PS Force Main Modification Project, the 26th Street CSO regulator modifications project, and the 26th Street PS Improvements Project will likely be combined as one capital project.

9.03 POLLUTANT REDUCTION

The Recommended Plan will achieve a significant capture for treatment of combined sewage in the typical year, 93 percent, as modeled and noted in Table 6.04-2. The improved capture of combined sewage will reduce CSO volume and result in a measureable reduction of the pollutant discharge to the environment. Table 9.03-1 shows the overall reduction in equivalent annual mass discharges of fecal coliform from the existing system (2006) to the system after implementation of the Recommended Plan. Fecal coliform concentrations were assumed based on USEPA published data for both the raw sewage and stormwater fractions. The hydraulic model was used to simulate discrete overflows for the typical year from both the 2006 and 2026 systems. A modeled systemwide net reduction of 89 percent of the current equivalent annual mass discharge of fecal coliform is predicted. Discharges to Little Hoods Creek and Long Branch are nearly 100 percent lower following the recommended improvements; while discharges to the Ohio River are 86 percent lower after the Recommended Plan. This calculation should not be confused with the presumptive approach Condition II.C.4.a (iii). The average CSO discharge concentrations shown in the Table 9.03-1 support advancing work on the Roberts Drive (CSO 014), 6th Street (CSO 012) and 37th Street (CSO 004) projects since these CSOs have the highest concentrations of pollutants.

CSO Name	Location	Fecal Coliform Mass Equivalent Annual Discharge (lb×10^{10}) Existing System (2006)[1 2]	Post Recommended Plan (2026)[1 2]	Percent Reduction in Annual Mass Equivalent Discharge	CSO Average Fecal Coliform Concentration (cfu/100 ml×10^7)[1 2]
Ohio River CSOs					
002	26th Street	912	166	82%	62.3
004	37th Street	187	7	96%	61.7
006	34th Street	438	3	99%	51.2
008	18th Street	1970	339	83%	29.1
009	15th Street	221	30	86%	12.4
010	10th Street	98	9	91%	4.1
		3826	**553**	**86%**	
Long Branch					
012	6th Street	54	0	100%	63.9
Little Hoods Creek					
014	Roberts Drive	1241	3	100%	68.9
Systemwide		**5121**	**556**	**89%**	

[1]Raw Sewage Fecal Coliform Concentation = 1×10^9 cfu/100 ml (Source: USEPA (2004). Report to Congress: Impacts and Control of CSOs and SSOs. Report No. EPA 833-R-04-001)

[2]Urban Storm Water Fecal Coliform Concentation = 5.23×10^9 cfu/100 ml (Source: USEPA (2004). Report to Congress: Impacts and Control of CSOs and SSOs. Report No. EPA 833-R-04-001)

Table 9.03-1 Pollutant Load Reduction Predictions

9.04 CONCLUSION

The recommended LTCP was prepared to fulfill the requirements of the CWA, USEPA, and KDOW LTCP guidance and comply with the City's Consent Judgment and Administrative Order. According to the CSS hydraulic model, the recommended plan should result in the elimination or the capture for the treatment of 93 percent (> 85 percent) by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual average basis. The percent capture of treated combined sewage collected in the CSS in a typical year will be used as the measure for performance of the completed improvements.

Local endorsement of the recommended LTCP has been obtained. The City Commission is in agreement with the recommended plan. The alternative evaluation was discussed at a public meeting held on July 15, 2010. The immediate financial needs were discussed at a City Commission meeting on February 11, 2010, and at a public meeting held on July 15, 2010. The Draft LTCP was presented to the public at a meeting held on September 19, 2011, and made available for public review at the office of Engineering and Utilities.

The proposed implementation schedule results in all recommended LTCP projects being completed by December 31, 2025. The completion objective matches the deadline for Ashland's neighboring community, Ironton, Ohio, as agreed to in its Consent Decree (filed March 17, 2009) with the USEPA and United States Department of Justice of December 31, 2026. This proposed schedule supersedes the date set by USEPA in the Administrative Order of December 26, 2017 since the City's collection system currently meets the requirements set forth by the Administrative Order (more than 85 percent capture).

SECTION 10
COMBINED SEWER OPERATION PLAN (CSOP) REVISIONS

10.01 INTRODUCTION

A CSOP was initially prepared for Ashland in 1996. The original CSOP can be found as Appendix Q of this document. Since that time, Ashland has submitted a CSO annual report each year as an update to the CSOP.

10.02 CSOP REVISIONS

The CSOP will continue to be revised and updated as major capital projects progress. The CSOP revisions will account for all modifications to the infrastructure and operation of the CSS. The LTCP will be acting as a catalyst for many improvements and changes in Ashland’s system, and revising the CSOP during this process is critical. It is important for Ashland to keep the CSOP updated to reflect current conditions, problems, and objectives. This will ensure that the problems can be prioritized and resolved in an effective and timely manner.

Ashland understands the CSOP is a living document intended to reflect improvements in the daily operation of the collection and treatment components of Ashland’s wastewater system. Ashland will report on any updates made to its CSOP in annual reports due by February 28 of each year in accordance with its Consent Judgment and Administrative Order.

SECTION 11
POSTCONSTRUCTION COMPLIANCE MONITORING

11.01 INTRODUCTION

A postconstruction compliance monitoring program is required by current regulations to monitor the effectiveness of CSO controls and to verify protection of water quality to support the designated use. Federal CSO policy requires a postconstruction compliance monitoring program.

The goals of this postconstruction compliance monitoring is to collect data that can be used by Ashland to:

- Confirm the effectiveness of CSO Controls.
- Demonstrate compliance with WQS, protection of designated uses and sensitive areas.

Every five years, an update of the LTCP is recommended. The update will include an assessment of the data collected in this monitoring program and address any modifications to the postconstruction compliance monitoring program.

The recommended plan includes providing additional conveyance and storage to reduce the number of overflows while providing full biological (secondary) treatment of combined sewage at the WWTP. According to the collection system hydraulic model, the recommended plan will result in the capture for treatment of 93 percent by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual average basis. The percent capture in a typical year will be used as a measure of performance for the completed improvements. The actual percent capture in any year is dependent on the continuum and magnitude of precipitation events. The model-predicted performance of the improvements for the “typical year” (January 1974–December 1974) was a 93 percent capture.

This Postconstruction Compliance Monitoring Plan will detail data collection intended to measure the effectiveness of controls and the impacts on water quality in the receiving streams. Data collection efforts are presented for the following items:

1. CSO occurrence and flow monitoring
2. Rainfall monitoring
3. CSO sampling
4. Discharge stream sampling
5. WWTP compliance.

A Quality Assurance Project Plan for the Postconstruction Compliance Monitoring Plan is found in Appendix S.

11.02 CSO FLOW MONITORING

Ashland has installed and maintains flow meters on its active CSO discharges. Data is collected on the time of discharge, duration of discharge, and volume of discharge. This data was required by the LTCP hydraulic model calibration process and the KPDES permit. This Post-Construction

Compliance Monitoring Plan includes maintaining the ability to collect this information with flow meters on each active outfall.

Table 11.02-1 indicates the recommended data collection for CSO flow monitoring.

CSO Outfall	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
002 (26th Street)	Automatic flow meters.	Continuous for each discharge event.	Through 2026 or longer as may be required by KPDES permit.	Meters are installed and will be maintained.
004 (37th Street)				
006 (34th Street)				
008 (18th Street)				
009 (15th Street)				
010 (10th Street)				
012 (6th Street)				
014 (Roberts Drive)				

Table 11.02-1 Recommended CSO Flow Monitoring

11.03 RAINFALL MONITORING

Ashland has installed and maintains three tipping bucket rain gauges in the vicinity of its combined sewer collection system to record the time-specific intensity of rainfall. Rainfall data is collected and stored in the instrument for later download. This data was required by the LTCP hydraulic model calibration process and the KPDES permit. This Post-Construction Compliance Monitoring Plan includes maintaining the ability to collect this information with strategically located rain gauges. Table 11.03-1 indicates the recommended data collection for rainfall monitoring.

Location	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
Roberts Drive PS	Tipping bucket rain gauges.	Continuous	Through 2026 or longer as may be required by KPDES permit.	Ashland may adjust locations, but a minimum of three gauges are recommended.
Wastewater Treatment Plant				
Water Treatment Plant				

Table 11.03-1 Recommended Rainfall Monitoring

11.04 CSO SAMPLING

Ashland will not perform CSO sampling.

11.05 RECEIVING STREAM SAMPLING

The water quality pollutant of concern is bacteria. Water quality standards exist for each receiving stream from its respective regulatory agency (KDOW or ORSANCO). Table 11.05-1 identifies the standard in place at this time (2011).

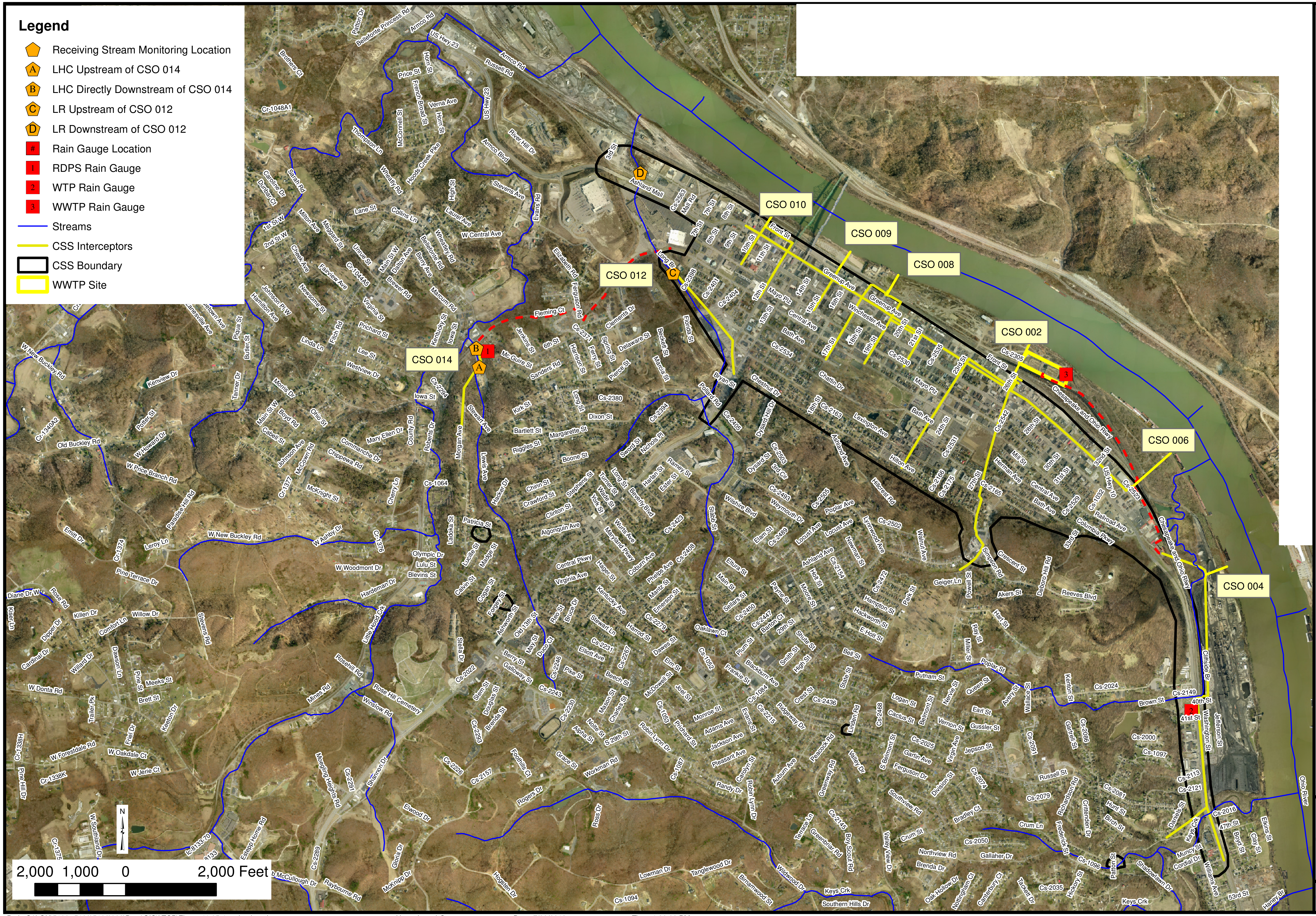
Receiving Stream	Kentucky	ORSANCO
Ohio River		
E. coli in Recreational Season (May through October)		
Monthly Average Geometric Mean	130/100 mL based on a minimum of five samples a month.	130/100 mL based on a minimum of five samples a month.
Monthly Maximum	240/100 mL in more than 20 percent of the samples taken during the month.	N/A
Single Sample Maximum	N/A	240/100 mL
Fecal Coliform in Recreational Season (May through October)		
Monthly Average	200/100 mL based on a minimum of five samples.	200/100 mL based on a minimum of five samples.
Monthly Maximum	400/100 mL in more than 20 percent of the samples taken during the month.	400/100 mL in more than 10 percent of the samples taken during the month.
Single Sample Maximum	N/A	N/A
Fecal Coliform in non Recreational Season (November through April)		
Monthly Average Geometric Mean	1,000/100 mL based on a minimum of five samples a month.	2,000/100 mL based on a minimum of five samples.
Monthly Maximum	2,000/100 mL in more than 20 percent of the samples taken during the month.	N/A
Little Hoods Creek and Long Branch		
E. coli in Recreational Season (May through October)		
Monthly Average Geometric Mean	130/100 mL based on a minimum of five samples a month.	N/A
Monthly Maximum Geometric Mean	240/100 mL in more than 20 percent of the samples taken during the month.	N/A
Single Sample Maximum	N/A	N/A

Table 11.05-1 Water Quality Standards

Samples should be collected regularly from the upstream and downstream locations in Long Branch and Little Hoods Creek. Sampling frequency is proposed to allow for a comparison of water quality for trending purposes. Recreational water sampling is recommended for a minimum of two days a year. Long Branch should be sampled twice between May through October upstream of the CSO discharge point and downstream. The accessible downstream location is on Mall Road underneath the US 23 overpass. Little Hoods Creek should be sampled twice between May through October upstream and downstream of the CSO discharge point. During dry weather conditions, Long Branch and Little Hoods Creek may have very little flow and sampling may not be representative.

ORSANCO regularly collects water quality information from the Ohio River as part of its yearly contact recreation sampling program. Data from this program is available from 2002 to the present. Ashland plans to use this data to evaluate the City's impact to the water quality in the Ohio River. Ashland does not have the resources available to collect water quality samples from the Ohio River during or immediately after wet weather events. This use of ORSANCO data will provide a more robust dataset to evaluate the impacts of CSOs to the Ohio River.

The safety of staff is important to Ashland. Ashland may elect to temporarily suspend sampling while conditions are deemed unsafe. Figure 11.05-1 identifies the recommended sampling locations. Table 11.05-2 lists the recommended receiving stream sampling program.



POST CONSTRUCTION COMPLIANCE MONITORING SAMPLING LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF ASHLAND, KENTUCKY

STRAND ASSOCIATES®

FIGURE 11.05-1
5102.002

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TABLE 11.05-2–RECOMMENDED RECEIVING STREAM SAMPLING

CSO Outfall	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
Little Hoods Creek				
Upstream Site (Behind RDPS fence) Site A on Figure 11.05-1	Grab sampling for E. *coli* .	Quaterly	Through 2026	Use the latest approved analytical method.
Downstream Site (at junction box) Site B on Figure 11.05-1	Grab sampling for E. *coli.*			
Long Branch				
Upstream Site (Behind Public Pool) Site C on Figure 11.05-1	Grab sampling for E. *coli* .	Quaterly	Through 2026	Use the latest approved analytical method.
Downstream Site (Mall Road under US 23 overpass) Site D on Figure 11.05-1	Grab sampling for E. *coli.*			
Ohio River				
Upstream of all CSOs Site E on Figure 11.05-1	None	No sampling	Through 2026	Utilize ORSANCO data.
Downstream of 18th Street CSO (008) Site F on Figure 11.05-1				
Downstream Site (Downstream of CSO 010) Site G on Figure 11.05-1				

11.06 WWTP DISCHARGE MONITORING

Ashland will utilize sampling and flow data collection as required by its KPDES permit to demonstrate the adequacy of treatment. The existing permit requires reporting of daily flows and sampling three days a week for conventional pollutant parameters (BOD, TSS, and ammonia nitrogen), bacterial contamination (*E. coli*), and other parameters (pH and dissolved oxygen). The sampling and reporting required by permit is adequate to monitor the effectiveness of treatment as part of the LTCP.

11.07 PERFORMANCE MEASURE COMPARISONS

The data collected will be used to compare the actual conditions to anticipated conditions and WQS.

The following performance measure comparisons will be used to indicate the overall success of the improvements. These will be completed once each year and the results will be included in the annual report.

1. Percent Capture: This is the performance measure of significant interest to Ashland since Ashland is using the 85 percent capture requirement of the presumptive approach. Percent capture will be calculated directly using existing CSO flow meters and treated volume at the WWTP during wet weather events.

   Ashland will use the following formula to compute percent capture based on measured flows:

$$\text{Percent Capture} = \frac{X}{X+Y}$$

Where:

X = Total metered annual WWTP flow during precipitation events and the 24-hour period following the end of the precipitation event. For future reporting, the flow on the calendar day following a measureable rainfall will be used to reflect the 24 hours following the end of a precipitation event. It must be noted that all flow to the WWTP during wet weather is CSS flow since all dry weather flow passes through the CSS before discharging to the WWTP.

Y = Total annual CSO discharge volume recorded by CSO outfall flow meters.

During precipitation events in the postconstruction monitoring program, the following data will be collected for each event: 5-minute rainfall data from an appropriate number and distribution of rain gauges; and overflow volumes, duration, and frequency at each CSO location, and WWTP flow.

WWTP flow will be obtained by measuring flow at the headworks of the WWTP. CSO volume will be obtained from the flow meters located on the CSO outfalls. The actual annual percent capture of combined sewage can be computed and compared to the anticipated percent capture.

Ashland is using criterion ii of the Presumption Approach, which states that Ashland will capture no less than 85 percent by volume of the combined sewage collected in the CSS during precipitation events on an annual average basis. Therefore, Ashland will present and average 4 years worth of data on percent capture to allow an evaluation of compliance with this Approach. To demonstrate compliance, Ashland will calculate annual percent capture for 4 years worth of data, calculate the annual average over the 4-year period for use in evaluating criterion ii of the Presumption Approach.

If the calculated percent capture, averaged over a 4-year period is greater than or equal to 85 percent, the LTCP-defined performance is deemed as met. If the calculated percent capture, averaged over a 4-year period is less than 85 percent, the LTCP-defined performance will be deemed as not met.

Ashland may determine the need to revise this proposed Postconstruction Compliance Monitoring Plan as improvements are made and conditions change. In the event Ashland increases the amount of monitoring, the results will be reported in an annual report. In the event Ashland proposes to decrease the amount of sampling, approval from USEPA and KDOW will be sought.

Lastly, the residual overflows will need to be evaluated if sampling has indicated water quality is still not met, which will require resolution with state and federal regulators to determine whether additional work is warranted.

2. Number of untreated CSO discharges in a typical year: This will be monitored and trended.

3. Total CSO Volume: The annual volume of CSO will be used to calculate the annual percent capture The actual annual volume of CSO will be totaled and compared to historical volumes.

4. Water Quality: The water quality data collected can be used to trend against historical water quality. Improvement as a result of the LTCP should be discernible over time.

Rainfall patterns and intensities vary from year to year and the results from any one year cannot be expected to demonstrate compliance. Ashland will average annual data from at least four consecutive years to compare to expected benchmarks.

11.08 DOCUMENTATION OF SYSTEM PERFORMANCE AFTER COMPLETED PROJECTS

Ashland installed permanent flow meters on all of its CSO outfalls in December 2009 and has since been using data collected by these meters to document the performance of the combined sewer system. Ashland has completed several of the recommended projects in the LTCP, and data collected by the CSO flow meters and flow measurement influent to the WWTP indicate the City has consistently been capturing over 85 percent by volume of the combined sewage collected in the CSS during precipitation events on a systemwide annual average basis for the past three years. Table 11.08-1 presents a summary of the data collected by the flow meters and the calculated present capture.

It must be noted from the table that there were some months where the sum of the monthly CSO total is less than the CSO volume used to calculate the percent capture. This is due to the fact the CSO volume used to calculate the percent capture is the CSO volume on days that there was a rainfall event and the next day after that. However, the City’s collection system is such that some outfalls will continue to experience the effects of a rainfall event up to four days after the rainfall event. Thus the volume of CSO that occurs two days after a rainfall event is not used in the calculation of the percent capture. By using only the day after the rainfall event and not the entire duration of the overflow, the City is taking a conservative approach. The percent capture two or three days after the rain event will most likely be higher than the percent capture a day after the rain event and will tend to increase the overall percent capture if it is used in the percent capture calculation.

The collected CSO flow meter data indicates that the City's CSS has consistently been capturing for treatment over 85 percent of the combined sewage collected in the CSS during precipitation events for the past three years. Thus, the City’s LTCP has met the requirements of the CSO Policy and is consistent with USEPA’s Guidance for Long-Term Control Plan, EPA 832-B-95-002, September 1995 before the December 21, 2017 deadline set by USEPA’s Administrative Order dated December 21, 2007. However, the City will continue with the remaining projects in the Recommended Plan to bring the final percent capture to 93 percent or higher.

11.09 REPORTING

Ashland is required by the Consent Judgment to prepare and submit annual reports to KDOW. This reporting mechanism will be used to summarize data collected and the performance measure evaluation. Ashland anticipates summarizing the efforts made in each annual report and documenting the results and assessment for the previous calendar year in its February 28 annual reporting.

TABLE 11.08-1 CALCULATION OF PERCENT OF CAPTURE USING ACTUAL WWTP AND CSO FLOW DATA

Site Name	CSO 012 6th Street	CSO 010 10th Street	CSO 009 15th Street	CSO 008 18th Street	CSO 002 26th Street	CSO 006 34th Street	CSO 004 37th Street	CSO 014 Roberts Drive	Total Annual CSO Volume (MG)	Total Annual WWTP Wet Weather Influent Flow (MG)	Total Annual Wet Weather CSS Volume (MG)	Wet Weather Percent Capture	Total Rainfall (in.)
									1	2	3 = 1+2	4= (2/3)	
2011 Meter CSO Volumes													
January	128,401	149,706	18,224	568,587	38,754	1,927,152	8,681	1,097,841	3.75	129.87	133.62	97.2%	1.77
February	1,520,179	961,307	611,783	2,425,154	500,034	4,850,598	2,768,583	5,595,114	19.22	165.93	185.15	89.6%	3.01
March	1,799,129	19,353,127	385,537	5,826,265	4,692,951	2,244,452	49,983,732	5,550,809	73.95	154.64	228.59	67.7%	3.90
April	487,729	9,567,097	3,562,816	21,728,108	1,850	16,843,184	56,419,871	12,933,989	108.36	192.27	300.63	64.0%	7.96
May	63,818	5,077,793	2,267,711	6,416,261	1,207	8,257,557	12,777,926	3,198,039	37.85	190.48	228.33	83.4%	6.20
June	2,150	1,001,870	289,379	5,317,330	0	1,674,963	214,565	2,315,682	10.81	136.55	147.36	92.7%	1.51
July	11,000	1,691,000	340,000	4,518,000	8,000	1,346,000	110,000	1,640,000	9.66	83.02	92.68	89.6%	0.09
August	1,000	122,000	172,000	1,318,000	0	925,000	3,604,000	299,000	6.23	118.36	124.59	95.0%	3.22
September	0	1,795,026	869,000	22,602,701	269,728	0	546,867	6,131,322	35.25	135.42	170.67	79.3%	0.00
October	82	1,031,427	549,201	7,632,406	96,843	2,420,510	296,915	1,750,696	13.78	163.81	177.59	92.2%	0.00
November	8,085	4,209,473	1,022,852	9,981,584	0	5,229,003	10,979,888	4,020,004	25.69	150.64	176.33	85.4%	4.46
December	8,218	1,200,470	552,874	7,097,000	547,100	5,635,584	5,577,335	745,938	14.20	140.82	155.02	90.8%	2.68
Total Annual CSO Volume	**4,029,790**	**46,160,296**	**10,641,377**	**95,431,396**	**6,156,466**	**51,354,003**	**143,288,363**	**45,278,435**	**358.76**	**1761.81**	**2120.57**	**83.1%**	**34.80**
% of total CSO	1%	7%	3%	19%	0%	14%	36%	12%					
2012 Meter CSO Volumes													
Roberts Drive PS and Force Main to WWTP Project Complete (Bypass Pumping)													
January	392	376,533	277,957	5,324,622	686,165	2,303,922	111,783	201,342	7.52	106.76	114.28	93.4%	1.93
February	169	272,817	397,799	6,478,141	42,010	1,276,919	251,656	17,168	6.78	144.03	150.81	95.5%	2.61
March	0	430,785	461,551	2,621,709	13,440	4,277,738	8,656,236	0	13.37	143.26	156.63	91.5%	2.2
Roberts and 6th PS Upgrades and FM to WWTP Complete (Permanent Installation)													
April	0	575,246	816,637	1,789,149	12,387	937,083	8,068	348,370	3.86	85.22	89.08	95.7%	2.63
May	0	864,462	1,482,736	4,421,850	98,171	1,712,128	3,121,767	406	11.54	115.54	127.08	90.9%	4.39
June	0	14,181	22,237	1,989,436	6,005	16,167	15,527	1,643	1.94	68.28	70.22	97.2%	1.09
July	0	920,644	1,433,043	5,359,845	795,526	2,709,326	410,357	1,030,333	12.29	101.95	114.24	89.2%	5.41
August	0	448,320	707,745	1,845,003	60,495	796,549	946,917	59,204	4.47	63.55	68.02	93.4%	2.58
September	0	896,461	1,574,831	11,913	96,752	2,429,758	3,433,062	449,680	8.08	93.95	102.03	92.1%	4.91
October	0	177,151	123,649	4,863,127	15,098	363,055	491,444	69,046	6.07	98.32	104.39	94.2%	0.21
November	0	34,753	36,964	233,364	569	4,350	1,146	48,237	0.34	49.32	49.66	99.3%	0.47
December	0	704,911	1,448,589	2,124,429	161,590	1,496,673	1,051,772	123,042	6.38	180.11	186.49	96.6%	1.65
Total Annual Volume	**561**	**5,716,264**	**8,783,739**	**37,062,589**	**1,988,207**	**18,323,668**	**18,499,735**	**2,348,472**	**82.64**	**1250.29**	**1332.93**	**93.80%**	**30.08**
% of total CSO	0%	3%	10%	30%	2%	17%	21%	3%					

2013 Meter CSO Volumes													
January	0	654,278	1,141,613	6,226,017	220,522	6,327,114	8,633,932	463,492	19.78	163.46	183.24	89.2%	3.82
February	0	97,405	192,860	339,811	209,612	3,050,683	13,056,444	133,419	14.21	125.59	139.80	89.8%	1.13
March	0	625,475	1,218,499	3,499,414	202,018	8,492,303	2,355,623	571,749	14.00	148.67	162.67	91.4%	3.80
April	0	536,855	519,676	900,712	193,793	743,367	132,702	201,906	3.11	87.51	90.62	96.6%	2.11
May	0	388,498	492,105	928,386	0	165,342	6,390	111,161	2.09	103.18	105.27	98.0%	1.82
June	0	717,886	941,189	1,399,503	977,394	1,551,018	189,739	78,889	5.52	114.41	119.93	95.4%	3.82
10th Street CSO Regulator Modifications Complete													
July	0	2,319,728	1,888,395	7,276,981	1,546,725	1,381,411	447,943	74,992	14.62	152.89	167.51	91.3%	6.59
August	0	1,295,438	1,606,826	5,150,192	1,263,020	634,147	607,720	246,515	10.71	106.02	116.73	90.8%	4.11
Roberts Drive CSO Regulator Modifications Complete													
September	0	71,712	385,507	452,806	57,427	42,033	78,112	2,988	1.05	60.05	61.10	98.3%	1.19
October	0	0	222,329	1,149,250	1,149,249	67,641	52,346	1,991	2.64	118.49	121.13	97.8%	2.00
18th Street Sewer Separation from Greenup to Carter Complete													
November	0	188,685	362,755	1,267,456	63,112	0	12,781,904	5,585	12.67	104.77	117.44	89.2%	2.75
December	0	146,506	667,134	11,658,259	864,425	0	31,526,972	11,735	33.57	127.23	160.80	79.1%	4.48
Total Annual Volume	**0**	**7,042,465**	**9,638,888**	**40,248,789**	**6,747,298**	**22,455,059**	**69,869,826**	**1,904,422**	**133.99**	**1412.27**	**1546.26**	**91.3%**	**33.80**
% of total CSO	0%	5%	6%	26%	4%	15%	45%	1%					
2014 Meter CSO Volumes													
January	0	0	259,354	2,014,956	179,346	0	303,856	18,342	2.69	114.61	117.30	97.7%	1.62
February	0	235,295	768,735	10,309,257	964,138	929,876	27,807,621	1,107,576	41.26	196.97	238.23	82.7%	4.00
March	0	0	304,249	1,867,664	80,244	0	17,686,127	108,300	15.25	113.92	129.17	88.2%	1.98
April	0	207,551	903,719	2,112,982	317,556	0	6,727,496	29,343	8.04	106.66	114.70	93.0%	4.34
37th Street PS Upgrades and FM to WWTP Project Complete													
May	0	59,618	984,741	18,243,153	55,280	65	0	22,040	11.39	70.82	82.21	86.1%	1.22
June	0	954,062	747,912	2,687,047	579,608	54,808	0	17,274	4.80	77.58	82.38	94.2%	3.27
July	0	342,189	752,844	1,929,900	715,729	48,202	256	31,253	3.74	93.05	96.79	96.1%	2.49
August	0	1,393,099	1,669,217	4,771,123	2,386,321	97,901	214,553	391,766	10.74	122.48	133.22	91.9%	7.63
September	0	1,048,764	1,225,665	5,373,082	1,551,554	40,038	135,941	137,584	9.02	85.94	94.96	90.5%	2.39
Greenup Avenue Interceptor Manholes													
October	0	470,128	783,822	1,658,269	1,036,742	5,499	206,460	18,919	4.12	129.40	133.52	96.9%	4.20
November	0	26	37,037	118,352	1,122,476	46	0	6,433	1.06	88.23	89.29	98.8%	1.82
December	0	3,182	257,955	1,999,395	1,262,017	238	0	101,623	3.62	139.05	142.67	97.5%	3.41
Total Annual Volume	**0**	**4,713,914**	**8,695,250**	**53,085,179**	**10,251,011**	**1,176,673**	**53,082,308**	**1,990,452**	**115.74**	**1338.71**	**1454.45**	**92.0%**	**38.37**
% of total CSO	0%	4%	7%	40%	8%	1%	40%	1%					