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Detailed Alternative Analysis and Recommended Control Plan

City of Rock Island, Illinois CSO Long Term Control Plan

To satisfy Item No. 14 Appendix B of the consent decree entered into the United States District Court for the central district of Illinois in the matter of U.S. V. City of Rock Island, Illinois, et al., Civil Action No. 4:00-CF-04076

Symbiont
Project No. W041106.BG500

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REPORT CERTIFICATION

DETAILED ALTERNATIVE ANALYSIS AND RECOMMENDED CONTROL PLAN ROCK ISLAND, ILLINOIS

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the 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.

City of Rock Island

Date

Section 1.0 INTRODUCTION

The United States Environmental Protection Agency (USEPA) brought suit against the City of Rock Island (the City) on August 18, 2000, for alleged violations of the Clean Water Act (CWA). As a result of this suit, the City is required by the EPA to prepare a Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) consistent with the requirements of the Consent Decree entered into the United States District Court for the Central District of Illinois in the matter of U.S. v. City of Rock Island, Illinois, et al., Civil Action Number 4:00-CV-04076. This Detailed Analysis and Recommended Control Plan is part of the LTCP and satisfies Section 14 of Appendix B of the Consent Decree.

The Consent Decree dictates that this report contains detailed development and evaluation of system-wide alternatives based on the control technologies advanced from preliminary screening. This must include consideration of cost effectiveness and water quality improvements. Specifically, the alternatives must be compared according to the cost per unit mass of pollutants removed from the City's CSO discharges. Priority must be given to alternatives that maximize treatment at the WWTP. All of the alternatives presented in this report use the WWTP to the maximum extent possible.

According to the Consent Decree, this report also must include "a description of the measures the City proposes as final CSO discharge control measures, including the construction of all sewer system and facility improvements necessary to achieve compliance with water quality standards."

Section 2.0 GOALS AND OBJECTIVES

The evaluation of the level of and technical options for achieving CSO control is a critical element of long-term planning. As such, goals and objectives must be established and both preliminary and detailed analysis must be performed before a recommended plan can be established. This memo addresses the detailed portion of the analysis and describes the final recommended plan.

The key objectives of the proposed CSO control projects are to

- 1) bring and keep the City in full compliance with the terms and conditions of their National Pollution Discharge Elimination System (NPDES) Permit, and other CSO control requirements of the Illinois Administrative Code and existing Illinois Pollution Control Board rulings specific to Rock Island,
- 2) meet the objectives of USEPA's April 19, 1994, Combined Sewer Overflow Policy and the Clean Water Act,
- 3) satisfy the requirements of the Consent Decree.

To accomplish these objectives the City has set two main goals: (1) eliminate or relocate outfalls located in sensitive areas and (2) meet the USEPA CSO Policy's Presumption Approach. These are both discussed in more detail below.

2.1 OUTFALL ELIMINATION/RELOCATION

The City has identified five of the eight existing combined sewer outfalls for elimination or relocation based on their location in sensitive areas. The City intends to leave three outfalls at their current locations. Table 2-1 lists the City's intention for each CSO outfall location as was indicated in the *Outfall Elimination or Relocation Technical Memorandum*.

Table 2-1 Outfall Elimination or Relocation Summary of Intentions		
Outfall	Location	Intent
001/001A	Mississippi River at Mill Street Wastewater Treatment Plant (also carries WWTP effluent and stormwater)	Outfall to remain. Wet weather treatment options evaluated.
003	Mississippi River at 21 st Street	Outfall to be eliminated or relocated downstream of Sylvan Slough.
004	Mississippi River at 23 rd Street	Outfall to be eliminated or relocated downstream of Sylvan Slough.
005	Mississippi River at 24 th Street (Centennial Bridge)	Outfall to be eliminated or relocated downstream of Sylvan Slough.
006	Mississippi River at 25 th Street	Outfall to be eliminated or relocated downstream of Sylvan Slough.

Table 2-1 Outfall Elimination or Relocation Summary of Intentions		
Outfall	Location	Intent
007	Blackhawk Creek in Blackhawk State Park	Outfall to be eliminated or relocated downstream of Black Hawk State Park.
011	Blackhawk Creek (west branch) at 31 st Avenue	Solids removal and disinfection; Outfall to remain.
012	Blackhawk Creek (east branch) at 28 th Avenue	Solids removal and disinfection; Outfall to remain.

2.2 LTCP APPROACH

To meet regulatory requirements and the goals described above, the City must comply with USEPA and Illinois Environmental Protection Agency (IEPA) CSO policies.

2.2.1 USEPA CSO Policy

According to the USEPA's CSO Policy, there are two approaches for achieving compliance: the Demonstration Approach and the Presumption Approach. The City of Rock Island has decided to use the Presumption Approach.

The Presumption Approach recognizes that a minimum level of control will likely be effective in meeting water quality objectives. The CSO Policy requires that long-term planning consider at least one alternative that would meet the Presumption Approach. Under the Presumption Approach, adopted CSO controls must meet one of the following criteria (59 *Federal Register* 18688 II.C.4.a):

1. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflows per year, or
2. Elimination or capture of no less than 85% by volume of the combined sewage collected in the Combined Sewer System during precipitation events on a system-wide annual average basis, or
3. Elimination or removal of no less than the mass of pollutants identified as causing water quality impairment through sewer characterization, monitoring, and modeling effort for the volumes that would be eliminated or captured for treatment under Criterion 2 above.

The City has chosen to use criteria No. 1 to meet the Presumption Approach. The presumption approach requires the equivalent of primary treatment and disinfection for wet weather flow exceeding secondary treatment capacity while also allowing an annual average of four and maximum of six untreated CSO events. This approach recognizes that unmet water quality objectives caused by CSO discharge shall be addressed.

2.2.2 State of Illinois Requirements

Combined sewer overflows (CSOs) in Rock Island, Illinois, are subject to a number of rules in the State of Illinois administrative code. Two of the requirements included in the rules state that

- 1) the first flush must receive full secondary treatment (35 Ill. Adm. Code 375.102), and
- 2) additional flows, up to ten times the average dry weather flow for the design year, must receive a minimum of primary treatment and disinfection with adequate retention time (35 Ill. Adm. Code 306.305).

Pursuant to a joint Rock Island/Illinois Environmental Protection Agency (IEPA) petition, the Illinois Pollution Control Board granted an exemption to these requirements for Rock Island CSOs 001, 003, 004, 005, and 006. The exemption does not apply to CSOs 007, 011, and 012.

Section 3.0 ALTERNATIVE IDENTIFICATION AND EVALUATION CRITERIA

Rock Island's alternative evaluation focused on achieving the objectives and goals discussed above. Several assumptions were necessary to evaluate the likely effectiveness of the proposed control technologies. Using these assumptions, the preliminary and detailed analyses were performed. Below is a discussion of the assumptions made, alternatives identified, and screening criteria used to arrive at the recommended plan.

3.1 DESIGN CRITERIA FOR ALTERNATIVE IDENTIFICATION

Three major assumptions were made in order to develop and analyze CSO remediation alternatives:

1. 24 hr CSO interevent period
2. increased pumping capacity required at Mill Street Wastewater Treatment Plant (WWTP) headworks
3. use of a 10-year storm for collection system conveyance capacity evaluation
4. need to address flooding problem at 40th Street & 5th Avenue

These assumptions were discussed in detail in the *Preliminary Screening Summary of Control Technologies and Alternatives*, submitted to the USEPA on March 14, 2006.

3.2 ALTERNATIVE IDENTIFICATION

The first stages of developing the recommended plan involved identifying and evaluating control technologies and preliminary assembled alternatives. The technologies included

- no action,
- partial separation,
- storm water source removal,
- storage/equalization basins,
- new intercepting sewer,
- relief sewers,
- high rate primary treatment,
- full separation,
- and river infiltration removal.

The control technologies were initially combined to form 15 alternatives, each of which could meet the City's goals. Topography, land use, existing sewer system configuration, and construction feasibility were among the factors used to choose specific control technologies to solve individual problems. The City's sewer system is divided into two large sewersheds, the northside and the southside. These sewersheds combine at the WWTP. Because of their isolation from each other, the northside and southside were evaluated independently.

Table 3-1 lists all of the preliminary assembled alternatives that were initially evaluated. From these alternatives seven alternatives (shaded grey on Table 3-1) were selected to undergo

detailed analysis. Four of these alternatives were to address problems on the northside of the city and three of the alternatives were to address problems on the southside of the city. The analysis of the seven final alternatives to choose a recommended plan is discussed in detail in the following sections.

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
NORTHSIDE	
Alternative	Alternative Components
(1) Source Control	(1a) Partial Separation <ul style="list-style-type: none"> • Partial separation of 1138 acres of combined sewers • 1.7 million gallons (MG) storage at 40th St. & 5th Ave. • New influent pump station (84 MGD), fine screens, chemically enhanced primary clarifiers (33 MGD), chlorine disinfection (84 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$57.2 million (+50%/-30%)
	-or-
	(1b) Full Separation <ul style="list-style-type: none"> • Full separation of 1138 acres of combined sewers • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (30 MGD), fine screens, chemically enhanced primary clarifiers (16 MGD), chlorine disinfection (30 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$108.6 million (+50%/-30%)

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
(2) Increased Conveyance to WWTP along Existing Interceptor Route	(2a) New Gravity North Interceptor <ul style="list-style-type: none"> • 13,250' of new 36"-102" interceptor sewer from CSO 006 parallel to existing interceptor • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (281 MGD), fine screens, chemically enhanced primary clarifiers (90 MGD), chlorine disinfection (230 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$74.7 million (+50%/-30%)
	-OR-
(3) New Relief Sewer Along 6th Ave	(2b) New Pumped North Interceptor <ul style="list-style-type: none"> • 113 million gallons per day (MGD) pump station at CSO 005 • 10,985' of new 54" force main from pump station • Partial separation of 70 acres of combined sewers upstream of CSO 006 • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (281 MGD), fine screens, chemically enhanced primary clarifiers (90 MGD), chlorine disinfection (230 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$56.1 million (+50%/-30%)
	(3) New Relief Sewer <ul style="list-style-type: none"> • 6,811' of new 54"-66" relief sewer along 6th Ave • Partial separation of 70 acres of combined sewers upstream of CSO 006 • 2,600' of new 60" interceptor from CSO 005 parallel to existing interceptor • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (281 MGD), fine screens, chemically enhanced primary clarifiers (90 MGD), chlorine disinfection (230 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$48.7 million (+50%/-30%)

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
(4) Consolidation of CSOs 003-006 west of Centennial Bridge	(4a) New Gravity Interceptor to New CSO <ul style="list-style-type: none"> • 6,308' of new 36"-96" interceptor sewer from CSO 006 parallel to existing interceptor • 113 MGD pump station at new CSO • 500' of new 54" force main • New outfall structure • New fine screens, ballasted flocculation treatment (20 MGD), and chlorine disinfection (141 MGD) at new outfall • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (186 MGD), fine screens, chemically enhanced primary clarifiers (60 MGD), chlorine disinfection (130 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$57.4 million (+50%/-30%)
	-or-
	(4b) New Pumped Interceptor to New CSO <ul style="list-style-type: none"> • 4,500' of new 54" force main from CSO 005 • 113 MGD pump station at CSO 005 • 500' of new 54" force main • New outfall structure • New fine screens, ballasted flocculation treatment (20 MGD), and chlorine disinfection (141 MGD) at new outfall • Partial separation of 70 acres of combined sewers upstream of CSO 006 • 1.7 MG storage at 40th St. & 5th Ave. • New influent pump station (186 MGD), fine screens, chemically enhanced primary clarifiers (60 MGD), chlorine disinfection (133 MGD), sludge pump station (0.5 MGD), solids handling equipment, and outfall at WWTP • \$49.0 million (+50%/-30%)

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
SOUTHSIDE	
Alternative	Alternative Components
(5) Source Control	(5) Removal of Stormwater Sources & Relocation of CSO 007 <ul style="list-style-type: none"> • 40,000' of new 15"-24" storm sewer • Private property repairs for up to 40% of all parcels • 1,350' of new 30" outfall pipe • New outfall structure with new fine screens and chlorine disinfection (20 MGD) • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • \$14.3 million (+50%/-30%)
6) Relocation of CSO 007	(6a) New Storage Tank & Relocation of CSO 007 <ul style="list-style-type: none"> • 2.7 MG storage tank at fitness center • 100' of new 36" sewer connecting to storage tank • 1,350' of new 30" outfall pipe • New outfall structure with new fine screens and chlorine disinfection • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • \$8.7 million (+50%/-30%)
	-Or-
	(6b) Increased Conveyance to and from Lift Station & Relocation of CSO 007 <ul style="list-style-type: none"> • 1,100' of new 36" interceptor sewer upstream of BHLS • 387' of two new 36" siphons under Black Hawk Creek • upgrade of BHLS capacity from 20 to 23.5 MGD • 1,350' of new 30" outfall pipe • New outfall structure with new fine screens and chlorine disinfection (20 MGD) • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration Saukie & Franciscan control logic • \$3.6 million (+50%/-30%)

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
(7) Increased Conveyance to WWTP	(7) New South Interceptor <ul style="list-style-type: none"> • 14,768' of new 36"-42" south interceptor sewer • 2.7 MG storage tank at fitness center • 100' of new 36" sewer connecting to storage tank • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration Saukie & Franciscan control logic • 20 MGD of additional pumping, screening, and disinfection at WWTP • \$19.9 million (+50%/-30%)
(8) Increased Diversion at Saukie and Franciscan Treatment Facilities	(8a) New Relief Sewer from Franciscan & Relocation of CSO 007 <ul style="list-style-type: none"> • Upgrade of Franciscan pumps, 3.6 MGD to 18.6 MGD • 11,520' of new 20" force main from Franciscan to south interceptor • 1,350' of new 30" outfall pipe • New outfall structure with new fine screens and chlorine disinfection (20 MGD) • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • 15 MGD of additional pumping, screening, and disinfection at WWTP • \$7.1 million (+50%/-30%)
	-Or-
	(8b) Increased Treatment at Franciscan & Relocation of CSO 007 <ul style="list-style-type: none"> • Upgrade of Franciscan pumps, 3.6 MGD to 18.6 MGD • New fine screens, ballasted flocculation treatment, and chlorine disinfection at Franciscan (15 MGD) • 1350' of new 30" outfall pipe • New outfall structure with new fine screens and chlorine disinfection (20 MGD) • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • \$7.6 million (+50%/-30%)
	-Or-

Table 3-1 Preliminary Assembled Alternatives ENR CCI 7298 (February 2005)	
	<p>(8c) New Relief Sewer from Saukie and Franciscan</p> <ul style="list-style-type: none"> • Upgrade of Franciscan pumps, 3.6 MGD to 18.6 MGD • 11,520' of new 20" force main from Franciscan to south interceptor • Upgrade of Saukie pumps, 3.6 MGD to 13.6 MGD • 6,210' of new 18" force main from Saukie to Franciscan • 25 MGD of additional pumping, screening, and disinfection at WWTP • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • \$7.7 million (+50%/-30%)
	-Or-
	<p>(8d) Increased Treatment at Saukie and Franciscan</p> <ul style="list-style-type: none"> • Upgrade of Franciscan pumps, 3.6 MGD to 18.6 MGD • New fine screens, ballasted flocculation treatment, and chlorine disinfection at Franciscan (15 MGD) • Upgrade of Saukie pumps, 3.6 MGD to 13.6 MGD • New fine screens, ballasted flocculation treatment, and chlorine disinfection at Saukie (10 MGD) • Modifications at Saukie and Franciscan to meet IEPA first flush requirement • Reconfiguration of Saukie & Franciscan control logic • \$9.0 million (+50%/-30%)

3.3 SCREENING AND EVALUATION CRITERIA

The City developed the screening/evaluation criteria shown in Table 3-2. The screening criteria were identified to ensure that an objective comparison of alternatives could be made and that the major concerns of the citizens of Rock Island and the EPA would be accounted for during alternative evaluation. Monetary and non-monetary factors are included in the evaluation criteria. The preliminary assembled alternatives were analyzed and selected or eliminated according to the criteria shown in this table (as discussed in the *Preliminary Screening Summary of Control Technologies and Alternatives*, submitted to the USEPA on March 14, 2006). The detailed analysis further analyzed the remaining alternatives according to these criteria with an in-depth side-by-side comparison for each criterion.

Table 3-2 Screening/Evaluation Criteria	
<p>Cost Construction O& M</p>	<p>Socioeconomic Impacts Construction disruption (business, etc) Landuse compatibility</p>
<p>Constructability Space Geotech Impact to other facilities Local construction capabilities</p>	<p>Aesthetics Parks/Recreation Property requirements/acquisition Historic Archaeologic Resources</p>
<p>Operations Reliability and Redundancy Compatible with existing system(s) Staffing Energy usage Chemical usage</p>	<p>Environmental Impacts Water Quality Wetlands Aquatic Habitat Hydrology Air Quality Threatened and Endangered Species</p>

Section 4.0 RECOMMENDED PLAN SELECTION

The four final alternatives for the northside and three final alternatives for the southside are evaluated below according to the criteria described above. All of the alternatives eliminate or relocate outfalls in sensitive areas and meet the requirements of the USEPA presumption approach.

4.1 NORTHSIDE

Table 4-1 illustrates the differences between the four northside alternatives according to cost, constructability, operations, socioeconomic impacts, and environmental impacts. Table 4-2 evaluates each alternative based on the information in Table 4-1. Treatment costs are included in the northside alternative definition.

<<insert table 4-1 here>>

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Table 4-2 Northside Alternative Evaluation	
Alternative	Evaluation
1A. Partial Separation	At \$57.2 million, partial separation is the most expensive option to construct and would cause far more construction disruption throughout the city than the other alternatives. The benefits of this alternative are that it requires less land acquisition and may reduce flooding and basement backups more than the other options. This alternative is also tied with Alternative 3 for having the lowest operation and maintenance costs.
2B. New Pumped North Interceptor	The new pumped north interceptor has the second highest construction cost and does not outperform the other alternatives in any evaluation category.
3. New Relief Sewer Along 6 th Ave.	At \$48.7 million the relief sewer has the lowest construction cost and ties with Alternative 1A for having the lowest operation and maintenance costs. Construction disruption in road miles for this alternative is the second lowest with 2.6 miles disrupted compared to Alternative 4B at 1.6 miles disrupted. This alternative will affect more residential and commercial properties, but less industrial properties during construction than Alternatives 2B and 4B. Because it does not require a collection system pump station for stormwater or combined sewage, as the other alternatives do, this alternative is considered more reliable than the others. It will also experience lower energy costs and less long-term disruption to the levee bike path (along which the pump stations for the other alternatives would be located).
4B. New Pumped Interceptor to New CSO	At \$49.0 million the new pumped interceptor to the new CSO has the second lowest construction cost. This alternative also boasts the fewest number of road miles impacted by construction (1.6 miles). The major disadvantage of this alternative is that it requires a new CSO on the northside, where as the other alternatives eliminate all northside CSOs. The new CSO would cause greater chemical usage than the other alternatives which, along with the energy usage, makes this the most expensive alternative to operate and maintain. An additional concern is that the new CSO would have to be located in an area where the city is planning high end residential and commercial development. The Water Resources Action Committee did not support placement of new treatment facilities in an area of redevelopment potential.

Considering the factors discussed in Table 4-2, Alternative 3, the 6th Ave Relief Sewer, was preferred by city staff, the consulting team, and citizen advisors. Alternative 1A was eliminated based on high cost and the amount of construction disruption. Although there is more construction disruption with Alternative 3 than with Alternatives 2B and 4B, Alternative 2B costs \$7.4 million more than Alternative 3 and Alternative 4B has operation and maintenance

concerns and land use incompatibility issues not present with Alternative 3. The conveyance and treatment components of Alternative 3 are recommended as the northside component of the Recommended CSO LTCP.

4.2 SOUTHSIDE

Table 4-3 illustrates the differences between the three southside alternatives according to cost, constructability, operations, socioeconomic impacts, and environmental impacts. Table 4-4 evaluates each alternative based on the information in Table 4-3.

<<insert Table 4-3 here>>

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Table 4-4 Southside Alternative Evaluation	
Alternative	Evaluation
6B. Increased Conveyance to and from Lift Station and Relocation of CSO 007	At \$3.6 million Alternative 6B is less than half the construction cost of the other alternatives. This alternative is tied with Alternative 8C for operation and maintenance costs and poses the least amount of disruption by both road miles and number of properties affected. The disadvantages of this alternative are that it requires the acquisition of about 0.2 acres of land for the relocation of CSO 007. The relocated outfall may disrupt archeologically significant features and have a negative impact on mussels in the river.
8A. New Relief Sewer from Franciscan and Relocation of CSO 007	Alternative 8A has the same disadvantages as Alternative 6B related to the relocation of CSO 007, but also has much higher costs, energy requirements, and construction disruption.
8C. New Relief Sewer from Saukie and Franciscan	The Saukie and Franciscan relief sewers avoid the negative impacts from relocating CSO 007 experienced by the other alternatives. However, this is the most expensive alternative to construct and involves the greatest disturbance during construction.

Selection of a southside alternative requires consideration of the relative environmental impact of infrequent screened and disinfected relocated CSOs compared to the cost of alternatives that reduce or eliminate the relocated discharge. Potential environmental impacts include consideration of fresh water mussels present in the vicinity of the relocated outfall and any water quality impacts. A mussel survey (included as Appendix A) was conducted to ascertain if an outfall could be located such that mussels are not adversely impacted. A mixing model to evaluate the extent and potential impact to water quality (see Appendix B) was also used assess impacts. From these analyses, it can be concluded that a relocated CSO outfall infrequently discharging screened and disinfected wet weather flow can be implemented.

From Table 4-3 it is clear that the cost advantage of Alternative 6B makes it a better choice than Alternative 8A. The \$4.1 million difference in construction cost between Alternative 6B and Alternative 8C suggests that Alternative 6B is again the better alternative. It would have to cost more than \$4.1 million to deal with the archeological and mussel issues associated with Alternative 6B (in addition to the money already budgeted for this alternative) to make Alternative 8C a better option. This is unlikely to be the case. If the infrequent discharges at the relocated CSO 007 would still present a problem, a wet weather treatment facility could be added for significantly less cost than the conveyance construction proposed in Alternative 8C. Consequently, Alternative 6B is the southside component selected for the Recommended CSO LTCP. Construction of Alternative 6B does not preclude reinforcement of the South Side conveyance facilities at a future date.

Section 5.0 RECOMMENDED PLAN SUMMARY

5.1 OVERVIEW OF RECOMMENDED PLAN

In the Recommended Plan, corrective actions center on several key approaches:

1. Flow control through storage
2. Peak Flow reduction through partial separation
3. Added conveyance capacity for peak wet weather flow
4. Relocation of CSO 007 with screening and disinfection
5. Headworks pumping at WWTP for added capacity
6. Storm water pumping at WWTP with existing facility
7. Screening, enhanced primary treatment, and disinfection for wet weather flows at WWTP

Figures 5-1 and 5-2 show the various components of the recommended plan on the north and south sides of the city.

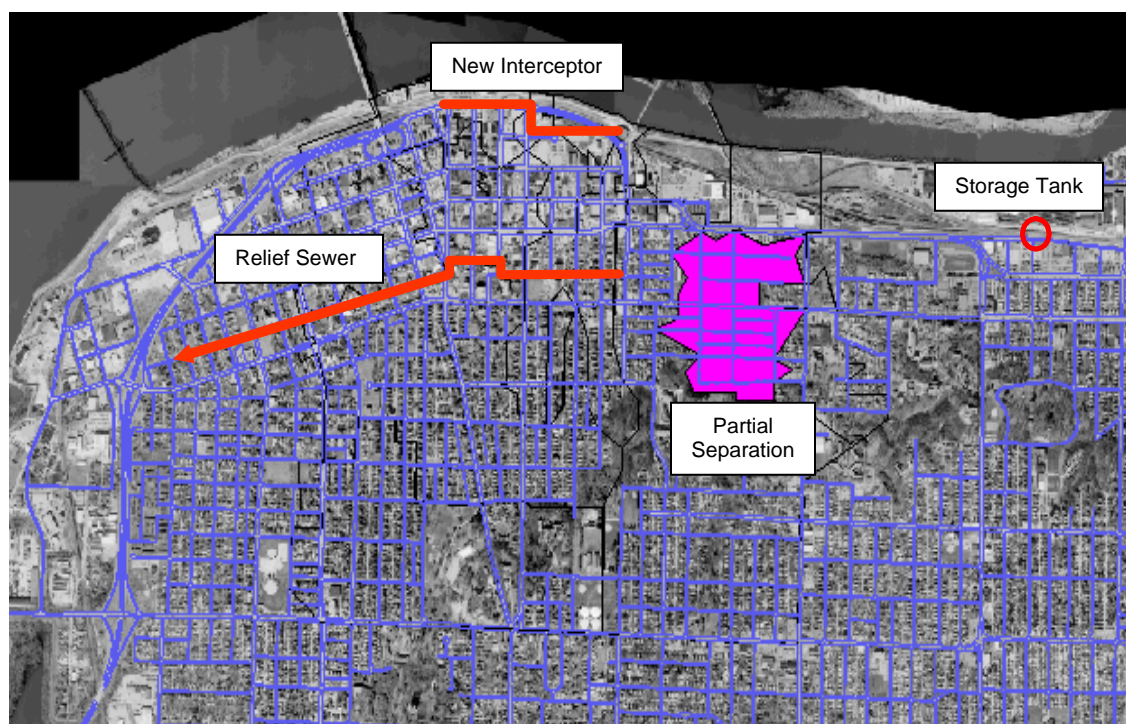


Figure 5-1: Recommended CSO LTCP north side components.

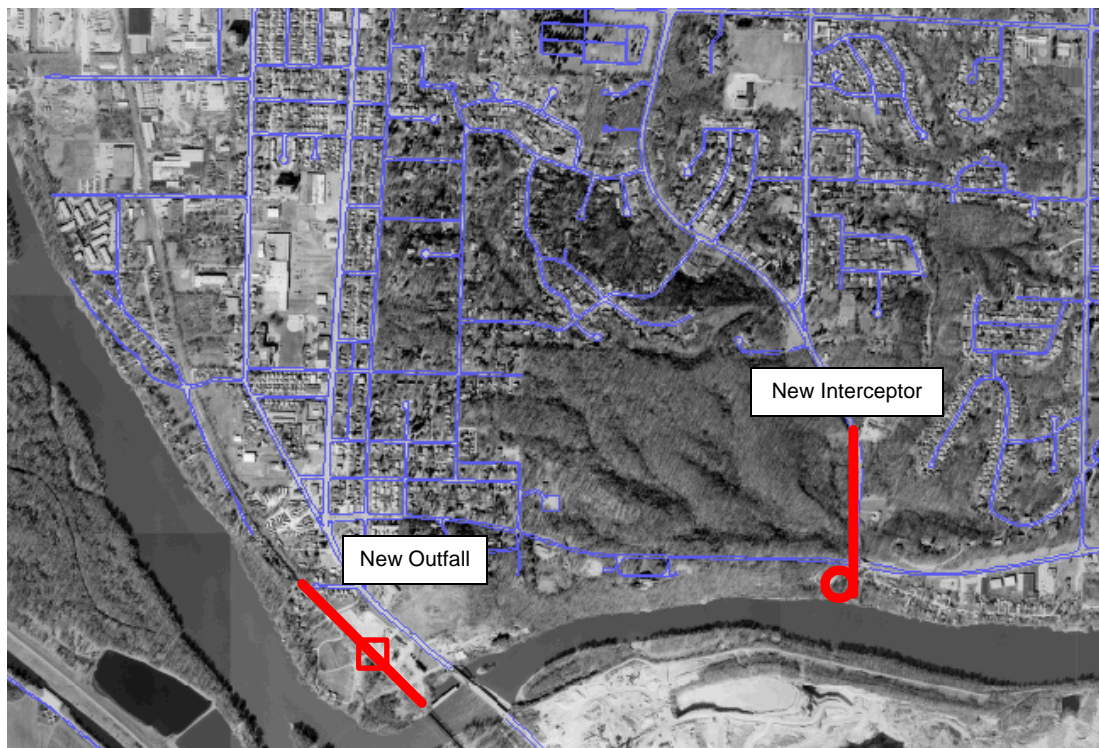


Figure 5-2: Recommended CSO LTCP south side components.

5.1.1 Flow Control Through Storage

Constructing facilities to hold water can allow for the storage of sewage that would otherwise overflow. After a storm has passed and capacity in the sewers is restored, the sewage from the tank is pumped or drained back into the sewer system and delivered to the WWTP.

The Recommended Plan includes one storage tank at the Farmall Viaduct and continued operation of the Saukie and Franciscan storage and treatment facilities. Primary treatment tanks to be constructed at the Mill Street WWTP will first provide storage before functioning as treatment units and will fully retain some rainfall/runoff events.

5.1.2 Peak Flow Reduction Through Partial Separation

Partially separating sewers involves turning the existing combined sewers into sanitary sewers and installing storm sewers. Street stormwater inlets are disconnected from the existing combined sewers and reconnected to the new storm sewers. Foundations drains from private properties remain connected to the combined sewer system, making the system only partially separated as opposed to fully separated. With the removal of a substantial amount of stormwater from the combined sewer system, the sewers are less likely to be filled to capacity and overflow.

The Recommended Plan includes partial separation of sewers tributary to CSO 006, which will eliminate that outfall.

5.1.3 Added Conveyance Capacity for Peak Wet Weather Flow

To prevent overflows and/or flooding in a specific area, conveyance capacity can be increased to move water away from the area faster. This is typically accomplished by replacing existing sewers with larger sewers or by constructing additional sewers to drain the sewage.

The Recommended Plan includes increased conveyance capacity to eliminate CSOs 003, 004, 005, and to move CSO 007. New sewers will be built in several places on the northside to move more water to the WWTP and thereby eliminate overflows at CSOs 003, 004, and 005. A larger sewer will also be constructed on the southside around CSO 007 to move more water to the Black Hawk Lift Station (BHLS) and thus eliminate CSOs there. The pumps at the BHLS will be upgraded so that they can pump the additional sewage delivered by the new sewers.

5.1.4 Relocation of CSO 007 with Treatment

The south interceptor does not have capacity to accept the amount of flow that the BHLS can currently pump. To eliminate the existing CSO 007 the BHLS must pump even more water than it does now. As such, CSO 007 will be relocated downstream of the BHLS but upstream of the south interceptor to relieve the interceptor of this additional flow. To meet water quality requirements, all discharges from the new CSO 007 will be screened and discharges during the recreation season will be disinfected.

5.1.5 Headworks Pumping for Added Capacity/Storm Water Pumping with Existing Facility

In order to eliminate the existing pumping capacity problem and to handle the additional flow that will be conveyed to the plant from the northside of the city, new pumps will be installed at the WWTP exclusively for CSO flow. The existing pumps will remain in service for stormwater pumping.

5.1.6 Screening, Enhanced Primary Treatment, and Disinfection for Wet Weather Flows

The two remaining outfalls in the city, CSO 001 and relocated CSO 007, will be outfitted with facilities to treat overflows to meet water quality goals. All overflows will be screened and overflows during the recreation season will be disinfected using chlorine gas. At CSO 001 the majority of overflows will receive primary treatment as well. Primary treatment will be provided by chemically enhanced primary clarifiers, similar to what currently exists at the WWTP. Chemically enhanced primary treatment utilizes conventional primary treatment (i.e., clarifiers) with chemical addition to facilitate solids settling at higher peak overflow rates.

5.2 PROJECT DESCRIPTIONS

5.2.1 Northside

Farmall Viaduct Storage

The Farmall Viaduct storage tank will be constructed under the existing parking lots at the southwest corner of 40th Street and 5th Avenue. The tank will be approximately ten feet deep and cover about 0.65 acres. It will be designed to hold 1.7 million gallons of sewage, which should be sufficient for the 10-yr storm event. The tank will fill by gravity and drain using a 1.7 million gallons per day (MGD) pump.

Separation of CSO 006 Basin

Separation of the combined sewers upstream of CSO 006 involves the placement of approximately 0.8 miles of new storm sewers that are 12"-48" in diameter and associated new manholes. Existing catchbasins will have to be disconnected from the combined sewer system and reconnected to the new storm sewers. The storm sewers will drain out the existing storm pipes to the river (at CSO 006). Once these tasks are complete the overflow weir which constitutes CSO 006 can be sealed off.

The increased stormwater flow and its potential environmental impacts will be addressed under the City's NPDES stormwater permitting program.

North Interceptor Reinforcement

This project increases the conveyance capacity of the north interceptor downstream of CSO 005. At CSO 005 (at 24th Street) the north interceptor is currently 36" in diameter. Downstream of CSO 005 the interceptor gradually increases in size until it is 60" at 18th Street. In order to increase the interceptor's capacity, a parallel 60" sewer will be added between 24th Street and 18th Street. The sewer will run along Highway 92 and have a total length of about 0.4 miles.

6th Avenue Relief Sewer

The 6th Ave relief sewer will run about 1.3 miles along 6th Ave from 24th Street to 6th Street where it will connect with the existing 72" sewer on 6th Avenue. The sewer will vary in size from 54" to 66". Increased conveyance for flows upstream of CSOs 003, 004, and 005 will be provided by the relief sewer, thus reducing the amount of overflows at those outfalls. Once the relief sewer and the north interceptor reinforcement sewer are constructed, CSOs 003, 004, and 005 can be closed.

5.2.2 Southside

Blackhawk Lift Station Improvements

Capacity of the Black Hawk Lift Station will be increased from 20 MGD to 23.5 MGD. This will be done by replacing two of the four pumps that currently occupy the lift station. To handle the

increased flow, the approximately 24' of 16" force main that is directly downstream of the station will be replaced with 24" force main.

Conveyance Improvements by CSO 007

To increase conveyance around the existing CSO 007 a new parallel sewer and parallel siphons will be constructed from the fitness center to the BHLS. The 0.35 miles of new 36" sewer will run next to 24th Street

Relocation of 007, Screening and Disinfection

Before the full capacity of the BHLS can be utilized such that the existing CSO 007 can be eliminated, the new CSO 007 outfall and associated structures must be constructed. The new outfall is likely to consist of a 30", 1100' long sewer with an apron end wall at the river. One or two properties in the southwest corner of the city will have to be purchased to locate screening and disinfection facilities and the outfall. The outfall will be located close to the west end of 49th Avenue, as shown on Figure 5-3. Ecological Specialists, Incorporated surveyed the eastern 1/3 of the Rock River from approximately Vandruff's Island to 42nd Avenue for the presence of threatened mussels and threatened mussel habitat (see Appendix A). The survey identified the presence of freshwater mussels including species considered threatened in Illinois. However, the survey further indicated that locations are available for installation of an outfall where mussel habitat is naturally limited and mussels are not likely to be impacted by infrequent discharges.

Additionally, fine screening and disinfection facilities will be constructed upstream of the outfall. A typical fine screen removes particles larger than ¼ inch in size. It is assumed the disinfection facility will utilize chlorine gas, although alternate disinfection processes will be examined in design. During the recreation season (May through October), disinfection is expected to reduce bacteria concentration to a level that is protective of public health. Wet weather discharges in the other months of the year will not be disinfected. The average total suspended solids (TSS) concentration in the discharge is expected to be 87 milligrams per liter (mg/L) and the average biochemical oxygen demand (BOD) concentration is expected to be 42 mg/L. These are the average recorded concentrations in WWTP influent during periods when the influent flow was greater than the WWTP capacity (i.e. when an overflow was occurring). When chlorine gas is used, the residual chlorine concentration in the discharge is expected to be less than 0.5 mg/L.

Wet weather discharge at the relocated outfall is anticipated about one time a year. Based on historical rainfall records and the LTCP SWMM model, a maximum of four discharges are predicted for any one year. An average overflow event will last six hours with the shortest event lasting less than one hour and the longest event from the period of record lasting 26 hours. An average overflow event will discharge 1.4 million gallons (MG). The smallest predicted wet weather discharge is 0.1 MG and the largest is 3.9 MG.

Considering the above figures along with historical rainfall data, the expected average annual pollutant load from Outfall 007 is 950 pounds (lbs) of TSS and 450 lbs of BOD. Adverse water quality impacts are not anticipated from these discharges.

The proposed relocated Outfall 007 is on the Rock River about 2.0 miles upstream from its confluence with the Mississippi River. As such, Rock River flow or stage are only marginally

influenced by precipitation in the Rock Island area. Flows are controlled by precipitation throughout the watershed and stage may be affected by backwater from elevated flow in the Mississippi River. For this reason three potential flow/river stage occurrences were examined to assess potential impacts.

Symbiont used the CORMIX model to calculate the vertical and horizontal distribution of the discharge plume under three different Rock River flow conditions: 7Q10, average, and 90% probability peak flow. For each case, the discharge plume was not projected to extend over mussel habitat, indicating that solids are unlikely to adversely affect sensitive habitat areas. Figures 5-3, 5-4, and 5-5 show the modeled plume locations under each of the three river level conditions. More details on the CORMIX model results are located in Appendix B.

As shown on Figure 5-6, the majority of overflows occur when the river is at average flow or greater. Even when the flow is below average (7Q10 Flow = 1520 cfs), there is still a significant amount of flow in comparison to the maximum of 20 MGD (31 cfs) that will be discharged from Outfall 007.

If for any reason, discharges from the relocated Outfall 007 are found to be causing unanticipated negative water quality impacts, additional treatment facilities, flow storage, or conveyance facilities can be installed to further abate the impacts of the infrequent discharge.

Modifications at Saukie and Franciscan to Meet IEPA First Flush Requirements

IEPA requires that the sewer system first flush receive full secondary treatment. The current configuration of Saukie and Franciscan storage/treatment facilities could allow some first flush water to discharge at CSO 011 and CSO 012 during very high flow events. To ensure that the entire first flush is captured, one of the tanks at the Franciscan site will be converted into a first flush storage tank. The remaining tank will be used for storing and treating overflows. At the Saukie site, the existing tank will be divided into two sections by installing a concrete wall. One section will be for first flush storage and the other section will be used to store and treat overflows.

5.2.3 WWTP Improvements

A number of different improvements will be made at the WWTP as described below.

Headworks Pumping & Yard Piping Modifications

A new 281 MGD headworks pumping station will be constructed at the WWTP to handle existing and increased flows from the sewer system. In order for this to be constructed, the WWTP solids handling facilities will have to be relocated.

Screening

A new 265 MGD capacity fine screening facility will be installed at the wastewater treatment plant to screen CSO discharges. A new 16 MGD capacity fine screening facility will be installed to screen WWTP influent flow.

Enhanced Primary Treatment

Chemically enhanced primary treatment facilities will be constructed at the WWTP with a total of 4 million gallons of storage and an outflow rate capacity of 90 MGD.

Disinfection

Chlorine gas disinfection facilities with 230 MGD capacity will be constructed at the WWTP to treat all CSO discharges.

Solids Handling

Increasing the treatment capacity at the WWTP will require new solids handling equipment. This equipment will include a 0.6 MGD sludge pump station.

New Outfall

To handle the increased flow rate passing through the WWTP, the capacity of the existing outfall will have to be increased. This is likely to be accomplished by installing a new outfall sewer parallel to the existing outfall pipe. The new outfall sewer will have to pass under the levee.

5.3 ENVIRONMENTAL ASSESSMENT

5.3.1 Water Quality

The Recommended Plan will reduce the number of combined sewer overflows at CSO 001 by approximately 90%. Overflows at CSOs 003, 004, 005, and 006 will be eliminated. These changes will result in the following approximate reductions in pollutant loading on an average annual basis: 3% TSS, 12% BOD, and 18% fecal coliform. The average annual fecal coliform load during the recreation season (May – October) will be reduced by approximately 87%.

5.3.2 Natural Environment

The pollutant reductions listed above will have positive benefits for the environment as a whole. More specifically, elimination of the northside outfalls will remove a potential source of impact to the protected mussels in Sylvan Slough.

5.4 SOCIOECONOMIC IMPACTS

Construction of the new sewer system facilities may result in short term adverse socioeconomic impacts to businesses and residential property caused by adjacent construction. Impacts could include traffic disruption, noise and dust. These impacts can be mitigated to acceptable levels. Other impacts will include increased user fees which are necessary to finance the improvements and property acquisition which will be required for facility construction.

5.5 COST SUMMARY

5.5.1 Construction

The construction cost of the overall recommended plan is approximately \$52.3 million. This cost includes land acquisition, engineering, legal, and administrative costs in addition to the construction costs. When the plan is constructed, it will be divided into three separate construction projects: northside conveyance improvements, southside conveyance improvements, and WWTP improvements. The costs to construct the various aspects of each project are shown in Table 5-1 below.

Table 5-1 Individual Project Costs <i>(in millions)</i> ENR CCI 7298 (February 2005)	
NORTHSIDE	
Farmall Viaduct Storage	\$3.3
Separation of CSO 006 Basin	\$0.9
North Interceptor Reinforcement	\$2.1
6 th Avenue Relief Sewer	\$5.2
Subtotal	\$11.5
SOUTHSIDE	
Blackhawk Lift Station Improvements	\$0.2
Conveyance Improvements by CSO 007	\$0.6
Relocation of CSO 007, Screening, Disinfection	\$2.6
Modifications at Saukie & Franciscan	\$0.2
Subtotal	\$3.6
WASTEWATER TREATMENT PLANT	
Headworks Pumping & Yard Piping Modifications	\$13.8
Screening	\$2.4
Enhanced Primary Treatment	\$12.7
Disinfection	\$6.4
Solids Handling	\$0.9
New Outfall Sewer	\$1.0
Subtotal	\$37.2
TOTAL	\$52.3

5.5.2 Annual Operations

The recommended plan will also include annual operation and maintenance costs that the City must account for. These costs include electrical power to operate the new treatment plant equipment, chemicals for the enhanced primary clarifiers, chlorine for disinfection, and maintenance costs to ensure that the new facilities are operating properly. On an annual basis the City will spend approximately \$400,000 operating and maintaining the new facilities installed as part of the recommended CSO LTCP. This includes the addition of two full time staff members.

5.5.3 Present Worth

When the annual operation costs are combined with the initial construction costs, a present worth cost can be calculated for the recommended plan. The present worth calculation is used to combine the cost to construct the various elements of the recommended plan today with the future cost to operate and maintain those elements to develop an overall present cost. The calculation assumes a 20-year timeline and utilizes a project evaluation and formulation rate (discount rate) set by the federal government. The discount rate for fiscal year 2005 is 4.9%. When combining the construction cost with the annual operation and maintenance cost, the present worth value of the recommended plan is approximately \$57.3 million.