

City of St. Joseph, Missouri Water Protection Program

Community Advisory Panel Recommendation On Facilities Plan

March 23, 2010



RECOMMENDATIONS

The Community Advisory Panel desires a Water Protection Program plan that improves wastewater infrastructure so that St. Joseph can grow and prosper in the future while meeting regulatory requirements at a reasonable cost to the ratepayer.

The Community Advisory Panel met on March 22, 2010 to conduct a final review of the Facilities Plan for the Water Protection Program. Based on that meeting and the entire Facilities Plan review during the past year, the Community Advisory Panel recommends that the following Facilities Plan assessments be accepted by the City Council:

- Combined Sewer Overflow Control Facilities Assessment
- Wastewater Facilities Assessment
- Whitehead Detention Basin Facilities Assessment

In addition to the general recommendations and guiding principles listed in Table 1, the Community Advisory Panel recommends the following:

- Involve the public and industry to meet changing regulations.
- As projects are planned, consider the triple bottom line analysis including the impacts on economic, social and environmental factors.
- Minimize long-term maintenance costs when planning and designing projects.
- Fund flood protection projects separately from wastewater improvements but look for multiple benefits when implementing both programs.
- Bonds will need to be issued to fund these projects and costs of the program should be spread over several generations because the benefits are intergenerational. Look for financing methods that minimize the cost of interest financing.
- Public education, outreach and involvement are critical to the success of the program and should continue.

BACKGROUND

Purpose of Facilities Plan

The City of St. Joseph's combined sewer system, separate sewer system, and Water Protection Facility are regulated by the Missouri Department of Natural Resources (MDNR) and the United States Environmental Protection Agency (USEPA) to protect water quality in the Missouri River under the federal Clean Water Act. Sewer overflows from the combined sewer system (CSOs) to the Missouri River are permitted but are limited by USEPA regulations. In order to remain compliant with the regulatory agencies, improvements are required for the combined and separate sanitary sewer systems, as well as the Water Protection Facility.

A comprehensive study (Facilities Plan) of the entire sanitary and combined sewer system was conducted to determine what improvements needed to be made. The Facilities Plan provides a framework for the City to implement Water Protection Program projects for three primary drivers: regulatory requirements, system reliability, and City growth needs. During the Facilities Plan study process, a city-appointed group of individuals, the Community Advisory Panel, provided input and feedback to the City on the issues and improvements that were presented to them. Additionally, four public meetings were held and presentations were made to various community or neighborhood groups. The Facilities Plan is subdivided into three separate focus areas:

- Combined Sewer Overflow Control Facilities Assessment
- Wastewater Facilities Assessment
- Whitehead Detention Basin Facilities Assessment

Combined Sewer Overflow Overview

In some parts of St. Joseph, like many older cities, sewer pipes carry both wastewater (used water and sewage that goes down the drain in homes and businesses) and stormwater (rain or snow that washes off streets and parking lots) to a sewage treatment plant. In the western part of St. Joseph, the mixed wastewater and stormwater flow together in a single pipe. This is called a Combined Sewer System. During a heavy rain the pipes may get too full and start to overflow into the Missouri River. When this happens, it is called a Combined Sewer Overflow (CSO). A CSO provides a "safety valve" that prevents back-ups of untreated wastewater into homes and businesses, flooding in city streets, or bursting underground pipes.

Meeting Regulations

Across the country, communities with combined sewer systems are required to develop a

plan to control them to comply with the Clean Water Act. The City of St. Joseph prepared a CSO long term control plan to control combined sewer overflows and submitted it to the regulators in 2008. The City also submitted evidence that showed the costs to fund the CSO improvements and other wastewater improvements created a financial hardship on ratepayers. The regulatory agencies agreed that the ratepayers could not afford to pay for the full plan in 20 years and stated that they are willing to negotiate a longer timeframe if cost-effective controls were put in place during the first 20 years. Since that time, the City has studied the most cost-effective solutions to be implemented in the first 20 years.

Because the City has to meet many regulations to comply with the Clean Water Act, a more comprehensive study of the entire wastewater system was conducted including needed improvements to the separate sanitary sewer system and the treatment plant. Both the combined sewer system and the separate sewer systems are regulated by state and federal agencies. Overflows in the combined system (west side of the City) are permitted, but limited, through a legal agreement called a “Consent Decree.” Overflows from the separate sewer system (eastside of the City) are not permitted. Improvements to both systems as well as new, stricter water quality requirements for the treatment plant must be implemented to remain in compliance with all Clean Water Act regulations. The City has included all of the improvement costs in the affordability analysis presented to the regulators. The total costs of these projects take the wastewater bills of the average household to 2 percent of median household income. This is the affordability target set by the regulators.

COMMUNITY ADVISORY PANEL CHARGE

The Community Advisory Panel is charged with providing input to the recommendations from the perspective of the community. They provide feedback on analysis, alternatives and decisions. The final decision maker is the St. Joseph City Council. The consultant team and City staff have worked with the Community Advisory Panel to keep them informed, listened to and acknowledged concerns, and provided feedback to them on how their input and the other public input gathered influenced the recommendations. The items for discussion include:

1. **Combined Sewer Overflow Control Facilities Assessment** – what priority projects should be included within the first 20 years (i.e., Phase IA projects) of the Combined Sewer Overflow Plan?
2. **Wastewater Facilities Assessment** – what improvements are necessary to meet future collection system and treatment needs for St. Joseph including:
 - How to meet stricter wastewater treatment plant regulations?
 - How to plan for growth in the system?

- Should the City construct a new treatment plant on the east side of town to accommodate growth or should wastewater continue to be pumped over the ridge to the Missouri River treatment plant?
 - What are the most critical parts of the system to address?
- 3. Whitehead Stormwater Detention Basin Facilities Assessment** – Should a detention basin or a series of detention basins be built? One way to reduce overflows in the combined system is to keep water from entering the combined system. Whitehead Creek flows directly into the combined system. There are also downstream flooding issues that could potentially be addressed through detention basin(s). Could this be a way to address multiple problems with one investment? Should this be agreed to in the agreement with the regulators as part of the Combined Sewer Overflow Plan or implemented outside of that agreement as a community priority?
- 4. Other** – what are some appropriate funding options? What should be done to educate the public about this issue?

Guiding Principles

The Community Advisory Panel developed a list of guiding principles based upon what they felt were the community's values. These guiding principles help them to develop recommendations regarding the implementation of the Water Protection Program. The guiding principles are described in Table 1:

Table 1 - Guiding Principles

Value	Guiding Principles
Administrative Ease	The cost of administration is minimized and uncomplicated processes are used.
Fairness	Costs are directly linked to the user of the service.
Community Prosperity	Provide public infrastructure to increase community prosperity. Establish a system of funding infrastructure that supports economic development but recognizes the need for parity in funding between tax/ratepayers and developers. Maximize economic, social, and environmental benefits.
Innovation	Foster learning and adjustments to the problems. Let experience form future plans. As the plan evolves over time, we learn from what we have implemented and make adjustments. Think more broadly when developing solutions.
Financial Responsibility	Public dollars will be spent wisely, thinking long-term and broadly.
Optimization	Use existing infrastructure to its best purpose.
Planning	Cultivate long-term thinking and innovative problem solving. Be stewards of the infrastructure investments made and community quality of life.
Public Acceptance	Public perception is that the program is fair and has the right approach. Decision-making is open and is influenced by public input.
Public Benefit	The public needs to see a direct benefit from the investments made. Look for opportunities for added value through investment in amenities and coordinated efforts.
Environmental Stewardship	Meet or exceed all applicable regulations.
Understandability	Ratepayers understand how the program improves water quality and how it is being funded.

Combined Sewer Overflow (CSO) Control Facilities Assessment

Regulators have a number of metrics that can be used to predict if a City’s CSO Long Term Control Plan will improve receiving stream water quality adequately. Cities are required to provide improvements that: control the frequency of combined system overflows, reduce the total annual volume of untreated sewage that overflows from the sewer system, or reduce the annual pollutant loading to the receiving stream. The 2008 LTCP was focused to reduce the total annual number of overflows to 4 or less. Based upon regulatory feedback, the 2008 LTCP recommendations were updated to provide volumetric control rather than frequency control. The proposed improvements are now focused to provide 85% wet

weather combined sewage capture. By achieving an 85% wet weather capture, the regulators presume that the recommended LTCP improvements will provide adequate water quality improvements in the Missouri River. Currently, the existing sewer system only provides a 12% wet weather capture.

Phase IA: The City is proposing a target of 60% wet weather capture with the Phase 1A projects. Currently, approximately 4.1 billion gallons of combined sewer overflow is discharged to the streams untreated annually. The proposed Phase 1A project should reduce that amount by 2.4 billion gallons annually. The strategy for Phase IA is to separate some areas keeping stormwater from entering the combined sewer system while increasing the treatment and conveyance capacity by upgrading the existing Whitehead Pump Station and building additional high rate treatment and disinfection facilities. The following bullets describe the Phase IA projects in more detail.

- **CSO Control Facilities Plan** - the plan will serve as an addendum to the 2008 CSO LTCP. The cost of CSO Control Facilities Plan is \$1.3 million.
- **Roy’s Branch Sewer Separation** - install new pipes to carry stormwater to the streams, keeping it out of the existing wastewater system which is currently a combined sewer system. This project is already underway. It should reduce the annual volume of combined sewer overflow by 0.23 billion gallons. The estimated cost of this project is \$1.0 million.
- **Blacksnake and Whitehead Stormwater Separation Conduits** - remove approximately 85% of the stormwater entering the combined system from the Whitehead and Blacksnake basins by installing a new stormwater separation conduit to carry creek flows to the Missouri River. These two projects will reduce the annual volume of combined sewer overflow by approximately 1.35 billion gallons. The estimated cost of these two projects is \$61.1 million.
- **Whitehead Pump Station Improvements and Diversion Structure Modifications** - increase the diversion structure, pump station, and force main capacities so that 80 million gallons per day (mgd) can be delivered to the Water Protection Facility (WPF) (wastewater treatment plant) Headworks. The estimated cost of this project is \$25.5 million.
- **Water Protection Facility Headworks Improvements** - increase the screening and grit removal capacity of the WPF to 88 mgd. The estimated cost of this project allocated to the CSO program is \$11.3 million.

Guiding Principle – Optimization

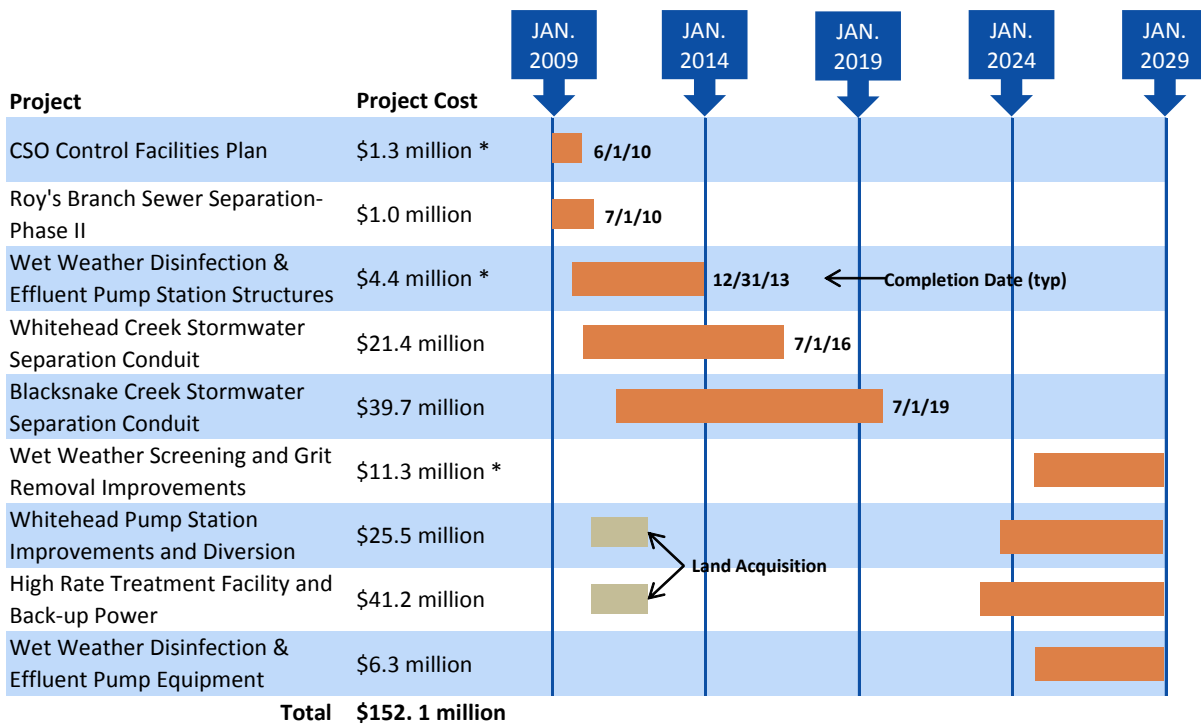
“Use existing infrastructure to its best purpose.”

The City will utilize and upgrade existing infrastructure in Phase IA to comply with regulations.

- High Rate Treatment and Disinfection** - provide high rate treatment (HRT), disinfection, and effluent pump station facilities and equipment for an additional 61 mgd to be treated. The estimated cost of this project allocated to the CSO program is \$51.9 million.

Figure 1 presents the implementation schedule for the Phase IA projects which are recommended to reach the target of 60% wet weather capture in the next 20 years for approximately \$152 million.

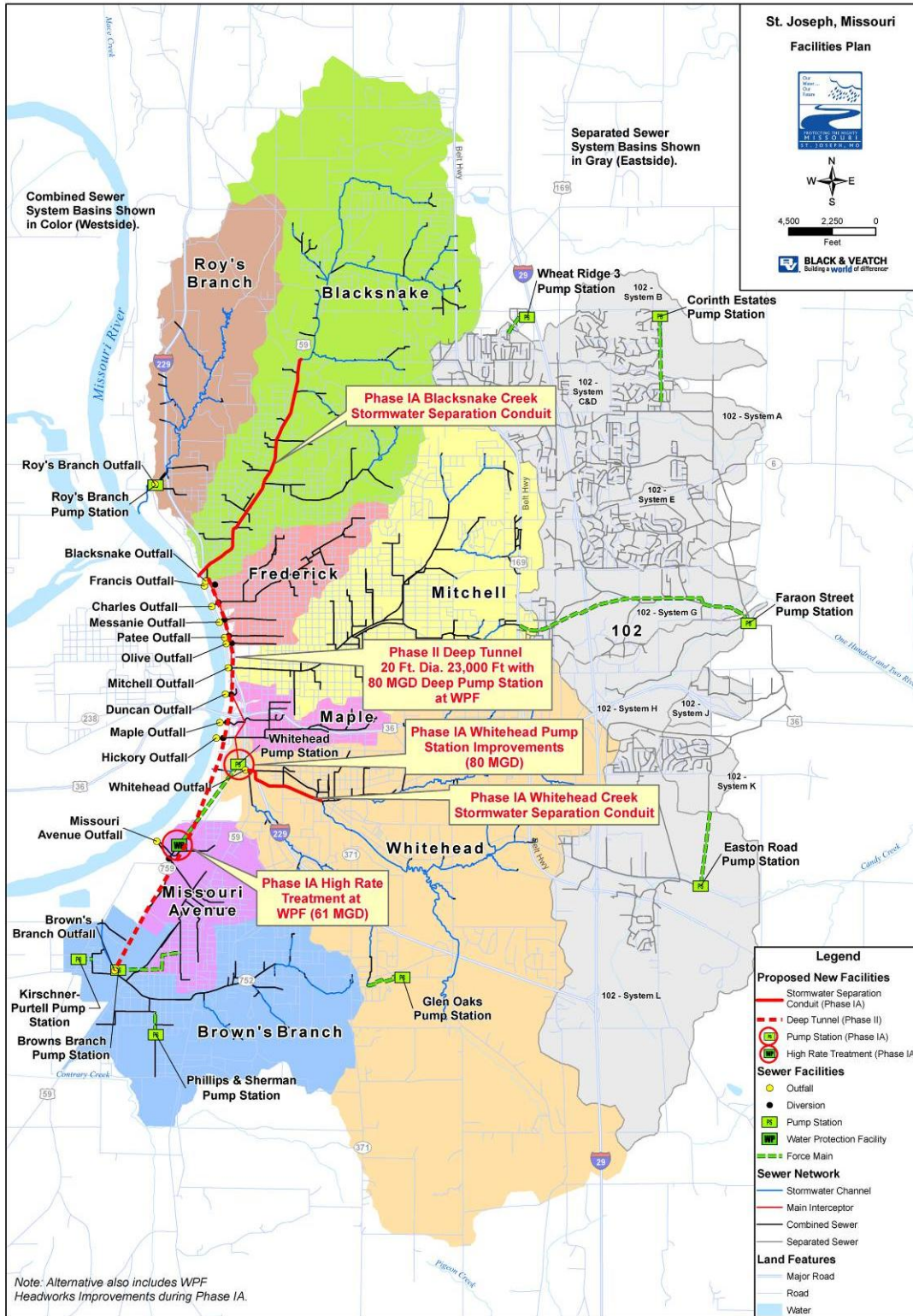
Figure 1 - Phase IA CSO Control Implementation Schedule and Project Costs (in 2009 dollars)



* Includes CSO-allocated portion of facility costs only.

Figure 2 presents a map of the Phase IA CSO improvements recommended as part of the CSO Facilities Plan.

Figure 2 - Alternative 1: Phase IA Improvements and Phase II 20 foot diameter deep tunnel



Green Solutions: Green solutions will also be encouraged on private property and public property. Green solutions such as rain gardens are depressions on the land that hold stormwater, allowing it to soak into the ground or pass through native plants cleaning pollutants prior to running off. Another strategy that will be encouraged will be disconnecting downspouts, area drains and sump pumps on private property. These strategies can improve water quality and provide a factor of safety for the CSO Long-Term Control Plan. Green solution projects are not included within the City’s mandated Phase IA improvement projects and remain optional for the City to implement as they see fit.

Guiding Principle – Innovation & Public Benefit

“Think more broadly when developing solutions.”

“The public needs to see a direct benefit from the investments made. Look for opportunities for added value through investment in amenities and coordinated efforts.”

Green solutions are an innovative strategy that involves the public in solving problems.

Future phases of the CSO Long-Term Control Plan planned beyond the Phase IA 20 year implementation schedule include:

- Phase IB: Water Quality Study
- Phase II: Deep Tunnel Storage

Phase IB: Upon completion of the Phase IA improvements, a two-year monitoring and evaluation study of Missouri River water quality will be performed to demonstrate the effectiveness of the Phase IA improvements. This study phase, Phase IB, will help establish the water quality benefits of the Phase IA improvements and further refine the future Phase II recommendations, perhaps reducing both the scope and cost of the work envisioned in the future.

Guiding Principle – Innovation

“Foster learning and adjustments to the problems. Let experience form future plans. As the plan evolves over time, we learn from what we have implemented and make adjustments.”

Phasing the program and doing water quality and capture evaluation before implementing the next phase is basing future plans on experience.

Phase IB would be completed in 2029-2030. The phase is part of an overall adaptive management approach for the City’s CSO control program to ensure that funding continues to be optimized now and in the future for the improvement of Missouri River water quality. If it is determined that the Phase IA improvements can capture more than 60% of wet weather flows or exceed anticipated water quality requirements, it may be possible to reduce the size of the deep tunnel recommended for Phase II. The anticipated cost to perform the Phase IB water quality study is approximately \$1 million (in 2009 dollars); however, the final cost is dependent on the actual scope and level of effort for this project.

Phase II: The Phase II CSO control projects, in combination with the Phase IA improvements, will allow the City to capture 85% of wet weather flows and meet the required treatment goals of the CSO Program. Phase II consists of a 20 foot diameter, 23,000 foot long, deep tunnel that can hold 54 million gallons of water. In addition, the deep tunnel system would also require supporting infrastructure elements such as a pump station and additional sewer pipes. Furthermore, the facilities constructed in Phase IA will be able to treat, disinfect, and convey the flows captured by the deep tunnel. The anticipated project cost for the Phase II deep tunnel and deep pump station system is \$310 million (in 2009 dollars). The Phase II implementation timeline will be developed upon conclusion of the Phase IB water quality study. Figure 2 shows the Phase IA and Phase II improvements.

Guiding Principle – Planning

“Cultivate long-term thinking and innovative problem solving. Be stewards of the infrastructure investments made and community quality of life.”

This program will take decades to complete. A long-term view is critical.

The overall project cost summary by phase for the St. Joseph CSO Control Program is shown in Table 2.

Table 2 - St. Joseph CSO Control Implementation Plan Cost Summary (in 2009 dollars)

Phase	Project Cost
Phase IA	\$152.1 million
Phase IB	\$1.0 million
Phase II	\$310.6 million
Total CSO Control Program Cost	\$463.7 million

Wastewater Facilities Assessment

The purpose of the Wastewater Facilities Assessment is to determine the collection system and treatment improvements required for the City of St. Joseph to meet regulatory requirements, system reliability, and City growth needs. Mandates regulated by the Missouri Department of Natural Resources that are driving the assessment include mandates for ammonia removal and effluent (treated wastewater) disinfection. Upgrades to existing pump stations and wastewater treatment equipment are recommended to improve system reliability needs and prevent potential future regulatory violations. Finally, a wastewater master plan was developed to outline future wastewater improvements through year 2030.

Mandated Regulatory Wastewater Projects: The Water Protection Facility is regulated through the National Pollutant Discharge Elimination System (NPDES). NPDES permits are renewed every five years. Many times the permit renewals require more stringent effluent requirements. Two projects are recommended to meet current mandated regulatory requirements – constructing a new Disinfection Facility and a new Ammonia Removal Facility both located at the existing Water Protection Facility site.

Guiding Principle – Community Prosperity

“Provide public infrastructure to increase community prosperity.”

The assessment looked at the wastewater facilities required for St. Joseph to grow and prosper – continuing to meet current and future regulations.

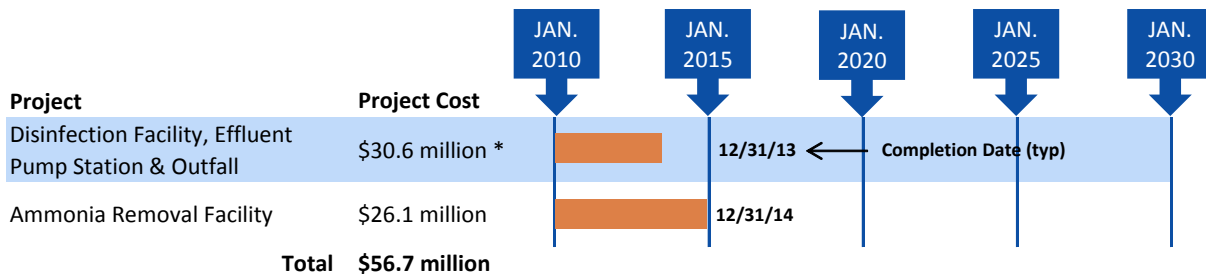
A preliminary implementation schedule and project costs for these regulatory projects are shown in Figure 3. The City is required by the regulatory agencies to complete the Disinfection Facility and its supporting infrastructure by December 31, 2013. Ammonia limits are already specified in the current NPDES permit, however, it is anticipated these limitations will become more stringent in the near future. The Ammonia Removal Facility would be required in order to meet the more stringent limits that are expected. The actual compliance deadline for this project will be negotiated with regulators.

Guiding Principle – Environmental Stewardship

“Meet or exceed all applicable regulations.”

Combined Sewer Overflow regulations are not the only regulations the City must comply with as regulatory changes at the Water Protection Facility are eminent.

Figure 3 - Water Protection Facility Schedule and Project Costs (in 2009 dollars)



* Includes WPF-allocated portion of facility costs only

Additional Wastewater Projects: Additional wastewater projects, beyond the current mandated requirements, will be necessary for the Water Protection Facility. These projects, the associated driver, and the preliminary project cost are summarized in Table 3.

Table 3 - Additional Wastewater Facilities Assessment Projects, Costs (in 2009 dollars), and Drivers

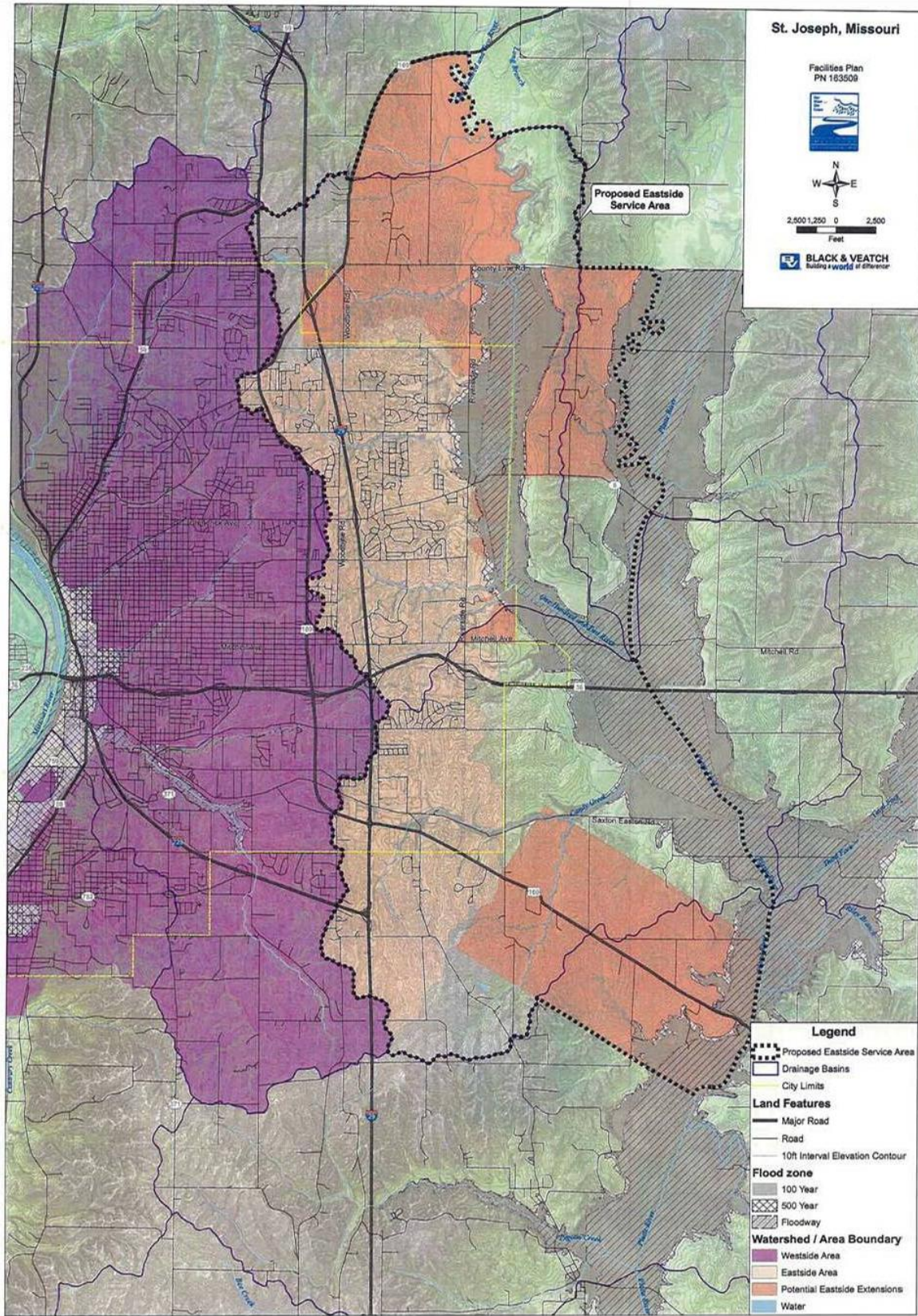
Project	Project Cost	Project Driver
Screening & Grit Removal Facilities	\$15.5 million ¹	<ul style="list-style-type: none"> Existing facilities are beyond their useful life Reduce operations & maintenance costs Required for future high rate treatment technology
Total Phosphorous Removal Facilities	\$3.3 million	<ul style="list-style-type: none"> Anticipated regulatory requirement
Total Nitrogen Removal Facilities	\$31.2 million	<ul style="list-style-type: none"> Anticipated regulatory requirement
Ancillary Facilities	\$5.1 million	<ul style="list-style-type: none"> KCP&L power upgrade provides redundancy Support facility upgrades required for recommended improvements
Total	\$55.1 million	

¹ Includes WPF-allocated portion of facility costs only.

Wastewater Improvements on Eastside of St. Joseph: The area on the Eastside of St. Joseph is a separate sanitary sewer system which means that one pipe carries stormwater (rain or melted snow runoff) and one carries wastewater (used water and sewage that goes down the drain in homes and businesses). The wastewater infrastructure on the Eastside requires immediate attention because the two key pump stations serving this area have critical issues. The Faraon Street Pump Station is aging and beyond its useful life, while the Easton Road Pump Station is at capacity and its location does not allow service to the future industrial park. Future system failures that could result in regulatory violations as sanitary sewer overflows (SSOs) are not permitted.

The City wanted to determine if a water protection facility or new pump station should be built east of the Belt Highway in order to best serve the current and future Eastside wastewater service area as well as address current Eastside infrastructure issues. Figure 4 shows the proposed Eastside service area used to determine wastewater improvements required in the next 20 years.

Figure 4 - Proposed Eastside Service Area



The study results indicate that building a new Eastside pump station and pumping flow to the existing Water Protection Facility is at least 20% less expensive than building a new water protection facility on the Eastside. In addition, the pump station alternative was determined to be the highest ranking when examined on the basis of total value from a social, environmental, and economic perspective (triple bottom line analysis). This approach would allow the existing Faraon Street and Easton Road Pump Stations on the Eastside to be replaced by one new larger pump station, located to serve future growth areas in the east. The estimated cost for the initial phase of improvements to the wastewater system serving the Eastside, including sewer interceptors, pump station, and flow equalization basin, is \$103 million. The total project cost for all phases to implement the Eastside wastewater system for the proposed wastewater service area is \$230 million.

At this time, a specific location has not been determined for any facilities, although the location will likely be in the southeast portion of the growth area. The site will be designed so that it can accommodate any wastewater facility needs beyond the 20-year planning timeframe, including constructing an Eastside Water Protection Facility in the future. The assessment also recommends constructing the new pump station facilities so they may be of dual purpose and utilized in the future as components of a future water protection facility.

The results of the assessment show that construction of an Eastside Pump Station is the highest value alternative at this time. This alternative represents a lower cost option to serve the current and future wastewater service area. The new Eastside Pump Station also allows for the replacement of two existing pump stations (Faraon Street and Easton Road) to avoid continuing maintenance issues and any potential future system failures. Future system failures that could result in regulatory violations as SSOs are not permitted.

Guiding Principle – Planning

“Cultivate long-term thinking and innovative problem solving. Be stewards of the infrastructure investments made and community quality of life.”

New pump station facilities offer highest value to the community at the lowest cost. They will be sized and located so that they can accommodate future growth and a future treatment plant.

Financial Capability Analysis: The USEPA utilizes a financial indicator to determine the economic burden on a community resulting from large, expensive CSO and wastewater program costs. The financial burden indicator is considered to be a “high burden” if the total CSO costs and wastewater costs are higher than 2% of the City’s median household income. USEPA therefore targets a value of 2% to determine an acceptable funding level.

For St. Joseph, the 2% indicator suggests the City is capable of spending approximately \$270 million dollars on wastewater and CSO control improvements over a 20-year period (based on March 2010 analysis). As previously presented, the Phase IA CSO improvements will

require an expenditure of \$152 million over 20 years. In order to remain within the 2% funding level, approximately \$118 million dollars is left for all other utility costs, including routine operations and maintenance, replacement of aging infrastructure, and implementation of any regulatory driven or improvement projects.

If all of the Facilities Plan recommendations were implemented, the financial indicator would reach 2.73%. As a result, lower cost, interim solution projects were developed to address the most critical needs until funding allows all of the recommended Wastewater Facilities Assessment projects to be implemented. Table 4 summarizes the proposed interim solution projects as compared with the full Facilities Plan recommendations discussed previously.

Guiding Principle – Fiscal Responsibility

“Public dollars will be spent wisely, thinking long-term and broadly.”

Interim solutions proposed to address critical infrastructure needs while remaining within the 2% financial indicator.

Table 4- Interim Solution Wastewater Projects (in 2009 dollars) Compared to Full Facilities Plan Recommendations

Project	Project Cost (Full Facilities Plan Recommendations)	Project Cost (Interim Solution)
Screening & Grit Removal Facilities	\$15.5 million	\$2.3 million
Total Phosphorous Removal Facilities	\$3.3 million	\$0.0 million
Total Nitrogen Removal Facilities	\$31.2 million	\$0.0 million
Ancillary Facilities	\$5.1 million	\$5.1 million
Eastside Wastewater Improvements	\$102.6 million	\$26.0 million
Total	\$157.7 million	\$33.4 million

The existing grit basin equipment at the Water Protection Facility is beyond its useful life, requiring frequent repairs, and resulting in increased downstream basin cleaning costs due to poor performance. The grit basin interim solution provides for replacement of equipment within the existing grit basins.

Eastside wastewater improvements are required in fiscal year 2011 to address issues at the Faraon Street and Easton Road Pump Stations as previously discussed. Failure by either of these stations to pump the required flow would result in an SSO regulatory violation. The interim solution provides structural rehabilitation and odor control improvements for the

Faraon Street Pump Station, an interceptor sewer for a future growth area, and a new pump station located further east.

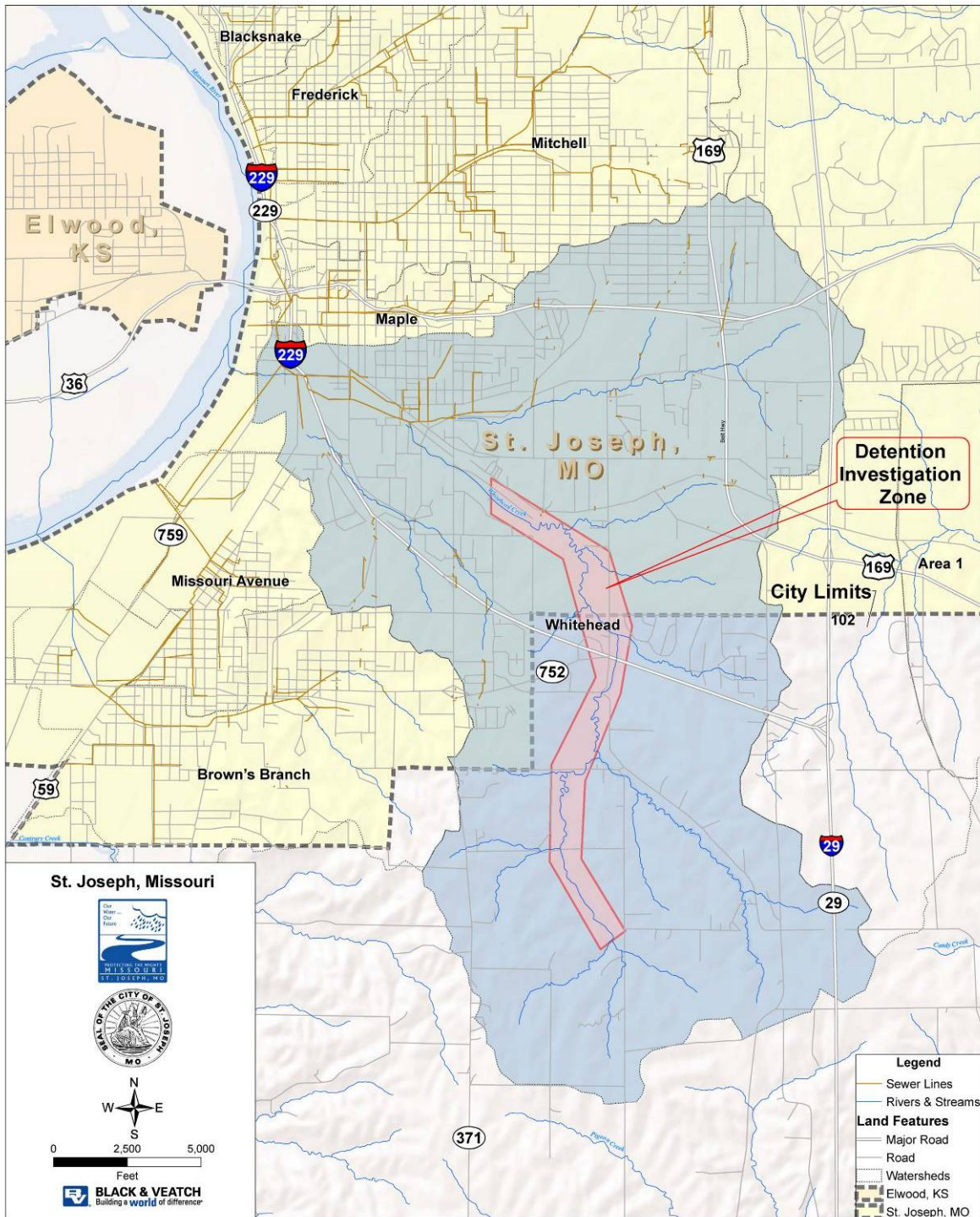
The interim solution wastewater projects presented in Table 4 will aid the City in maintaining a financial indicator value of 2%.

Whitehead Stormwater Detention Basin Facilities Assessment

The use of stormwater detention basins was evaluated for flood control in the Whitehead drainage basin. Recommended improvements considered the potential for added benefits and community amenities and coordinated with the combined sewer overflow and stormwater programs. The goals of the assessment were to determine the general feasibility of a detention basin in the Whitehead Basin, to reduce overall CSO improvement costs, to investigate solutions for flood control, and to look at stormwater buy-up opportunities in the watershed.

Three tributaries (sub-basins) were investigated in the Whitehead Creek Basin for locating a detention basin. The north and south sub-basins did not provide opportunities due to various constraints. However, opportunities were found to be feasible in the middle sub-basin. Figure 5 provides an overview of the Whitehead Basin and shows the region in the middle-subbasin where detention basin opportunities were further investigated. The potential opportunities included solutions for combined sewer overflow improvement and flood control. Multiple sites were investigated in the middle sub-basin and one preferred location was identified.

Figure 5 – Whitehead Basin and Detention Investigation Zone



Once the preferred site was selected, four detention facility alternatives were developed to determine the impact of a facility on the downstream residents and infrastructure. Of these four alternatives, two alternatives targeted CSO rainfall events and two alternatives targeted larger flood control events. CSO events are smaller and more frequent, while flood control events are much larger and less frequent. The intent of the two CSO facility alternatives is to detain storm runoff, thereby reducing the cost of downstream CSO improvements. The flood control event alternatives sought to reduce flooding by a significant amount by attenuating peak stream flows. All of the alternatives considered include the installation of a combined sewer overflow pipe located at the downstream end of the middle sub-basin to attenuate peak flows from CSO sized events (i.e., small events) for the benefit of the CSO program.

The four alternatives include:

- 1. Build a detention basin for combined sewer overflow control without a permanent pool.** This alternative greatly reduces the runoff entering the combined sewer system from a small rain storm. This alternative does not provide flood control for large rain storms. This would reduce the total volume and frequency of combined sewer overflows. The facility would be an 18 foot tall dam with no upstream permanent pool and a one foot pipe at the bottom slowly discharging the water retained during a rainfall event. The design rain event for this facility would occur, on average, once every three months.
- 2. Build a detention basin for combined sewer overflow control with a permanent pool.** This alternative greatly reduces the runoff entering the combined sewer system from a small rain storm. It would improve water quality and stream habitat, but this alternative does not provide flood control for large rain storms. This would reduce the total volume and frequency of combined sewer overflows. The facility would be a pond with a 12 foot tall dam and a one foot pipe at the bottom slowly discharging the water retained during a rainfall event. The design rain event for this facility would occur, on average, once every three months.
- 3. Build a detention basin for a 25-year flood event¹.** This alternative would reduce downstream flooding and protect the watershed from increased flows due to upstream development. The facility would be a 20-acre permanent pool with a 25 foot tall dam. It would also provide community amenities (fishing, trails, etc.) and would improve water quality and stream habitat. However, this alternative does not offer very much control for combined sewer overflow events.
- 4. Build a detention basin for a 100-year flood event².** This alternative would reduce downstream flooding and protect the watershed from increased flows due to

¹ 25-year flood event: A 25-year flood event has a 4% chance of occurring in a given year.

² 100-year flood event: A 100-year flood event has a 1% chance of occurring in a given year.

upstream development. The facility would be a 20-acre permanent pool with a 29 foot tall dam. It would also provide community amenities (fishing, trails, etc.) and would improve water quality and stream habitat. This alternative does not offer very much control for combined sewer overflow events, however. The main difference between this detention basin and that designed for the 25-year flood event would be the size of the dam and outlet works.

Anticipated project costs for each of the four alternatives were developed as presented in Table 5. The cost of the CSO facilities alternatives were compared to cost reductions created by reducing the size of a stormwater separation conduit due to potentially reduced flows. Based on this analysis, the construction of a CSO facility is not cost effective and cannot be recommended. This conclusion does not consider additional benefits of the detention facility beyond reducing flows.

Table 5- Summary of Whitehead Detention Basin Alternative Features, Benefits, Drawbacks, and Costs (in 2009 dollars)

Alternative	Features	Benefit	Drawback	Project Cost
CSO Rainfall Event without Pool	18' Dam	CSO Improvement	Sedimentation, No Flood Improvement	\$9.9 million
CSO Rainfall Event with Pool	12' Dam, 20-acre pool	CSO Improvement, Water Amenity	No Flood Improvement	\$19.4 million
25-Year Flood Event	25' Dam, 20-acre pool	Flood Protection, Water Amenity	No CSO Improvement, Permitting Requirements	\$44.8 million
100-Year Flood Event	29' Dam, 20-acre pool	Flood Protection, Water Amenity	No CSO Improvement, Permitting Requirements	\$53.0 million

Flood control facilities were considered on a cost-to-benefit basis. This analysis of flood control facilities was based solely upon the flood control aspects of the facility, specifically ignoring habitat, water-quality, and recreational benefits of a flood control facility. Based on this cost-to-benefit analysis, construction of a flood control facility likewise cannot be recommended, from a technical standpoint alone.

To potentially be a beneficial investment for the City, the preferred detention facility site would have to be developed as an amenity to the City. Therefore, it is recommended that the City consider a triple bottom line social, environmental, and economic analysis that incorporates the value of water quality, habitat, and recreational benefits provided by this

facility and site. The results of this analysis would help the City determine if the multiple benefits of the preferred detention facility site outweigh the costs.

Funding & Public Education

The Community Advisory Panel made several recommendations regarding funding of the Water Protection Program in the future. They discussed several revenue sources including:

- Wastewater Rates
- Property Tax
- Sales Tax
- Stormwater Utility Fees
- Federal/State Grants, Loans & Partnerships

Bonds will need to be issued to fund these projects and costs of the program should be spread over several generations because the benefits are intergenerational. Look for financing methods that minimize the cost of interest financing.

The following guiding principles should be considered when developing a funding plan.

- **Administrative Ease:** The cost of administration is minimized and uncomplicated processes are used.
- **Fairness:** Costs are directly linked to the user of the service.
- **Community Prosperity:** Public infrastructure is provided to increase community prosperity. A system of funding infrastructure is established that supports economic development but recognizes the need for parity in funding between tax/ratepayers and developers. Economic, social, and environmental benefits are maximized.
- **Understandability:** Ratepayers understand how the program improves water quality and how it is being funded.

The Community Advisory Panel provided input into the plan developed. It is important that the program and expenditures are publicly accepted. The City should continue to provide a Water Protection Program where decision-making is open and is influenced by public input.

Outreach activities may include workshops and presentations, particularly about green solutions and actions that citizens can implement on private property to reduce stormwater and improve water quality.

Additionally, the City may choose to install green solutions project(s) on public property as an example for the community.

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