COMBINED SEWER OVERFLOW -
LONG TERM CONTROL PLAN IMPLEMENTATION

NPDES PERMIT# IL0033472
LTCP PROJECT DESCRIPTION AND IMPLEMENTATION SCHEDULE

Prepared for:

City of East St. Louis
301 River Park Drive
East St. Louis, IL 62201

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INTRODUCTION

The City of East St. Louis currently operates a system of sewers under NPDES Permit IL0033472. Special Condition 8, Paragraph G of the City's NPDES Permit issued on September 11, 2019, by the Illinois Environmental Protection Agency (IEPA), required the City of East St. Louis develop and implement a Long Term Control Plan (LTCP) pursuant to Section 301 of the Federal Clean Water Act for assuring that the discharges from their Combined Sewer Overflows (CSOs) shall comply with all applicable standards.

NPDES Permit IL0033472 contains a condition setting the schedule for implementation and provisions for re-evaluating compliance with applicable standards and regulations after implementation.

The goal of all the activities in the LTCP is to limit the number of CSOs to a level that is practically possible. It may be possible that the number of CSO's will be below the regulatory limit with partial separation for the sewers and completion of the storm water alternatives below.

EVENTS SINCE NPDES PERMIT ISSUANCE IN SEPTEMBER 2019

The current NPDES permit was issued September 11, 2019. By the December 2022 deadline, the Pollution prevention Plan has been created, submitted and approved by the USEPA. By the September 2023 deadline, the Operation and Maintenance Plan has been created, submitted and approved by the USEPA.

CSO #003 INVESTIGATION

CSO #003, the outfall at Frank Holten State Park, has been investigated and it was determined that there is no possibility of raw sewage entering the ditch line at the 47th Street lift station, however, the sewer system may be connected to the triple 72" pipes that discharge into the pond at the park. This connection was made when the triple 72" pipes were installed, crossed and blocked the original alignment of the sewer system. The sewer was connected as a means of providing an overflow should the system surcharge. The sewer will overflow and enter the 72" pipe and flow to Frank Holten State Park in lieu of surcharging the entire upstream collection system during wet weather flow. During the duration of the Phase I LTCP, a solution will be investigated and the combined sewer will be disconnected from the storm sewer system.

LANSDOWNE UP DEVELOPMENT

The Lansdowne Up housing complex has been completed and a separate sanitary and storm system constructed. The new storm collection system includes an oversized detention basin that discharges into the combined sewer system. Once sewers in this area are separated, the storm system will be redirected to the storm sewer. The detention basin is over-sized when compared to the volume needed to serve the new development, therefore, this basin may be utilized to store storm run-off from nearby areas and thereby the City will be able to control the release rate into the sewer.

TRANSFER OF OWNERSHIP OF THE CITY'S SYSTEM OF SEWERS

There has been conversation between the City of East St. Louis and Illinois American Water (ILAW) regarding an Asset Purchase Agreement. Should this agreement be reached and executed, ILAW will become the owner and operator of the wastewater system in East St. Louis. ILAW will be the owner of the combined sewer system, sanitary sewer system, and collection system lift stations. The City of East St. Louis will maintain ownership of the municipal separate storm sewer system (MS4). As combined sewers within the City are separated, ownership of the separated storm sewers will be transferred back to the City of East St. Louis; while ILAW will maintain ownership of the sanitary sewer system. The agreement will expand upon the needed modifications to the City of East St. Louis's LTCP to allow for a successful transfer of said LTCP to ILAW.

EAST ST. LOUIS'S LONG TERM CONTROL PLAN

PHASE ONE – January 1, 2024 – December 31, 2027

System Characterization

The City of East St. Louis operates a system of sewers. This system serves a population of approximately 18,000 persons. Total service area is approximately 11.5 square miles. The older, western portion of the City is served by combined sewers which collect and convey both storm water and sanitary sewage. Total area served by combined sewers is approximately 8.67 square miles. The combined sewer service areas utilize the primary collectors to convey dry and some wet weather flow to the American Bottoms Wastewater Treatment Facility (ABWWTF).

There are separate sewers in the easterly portion of the City. The total area served by separated sewers is approximately 2.83 square miles. East St. Louis also provides conveyance of wastewater for treatment for portions of the Village of Cahokia Heights which operates separated sewer systems.

The combined sewer system has three permitted CSOs which are described further below.

The collection system consists of pipe made of brick, vitrified clay pipe, concrete pipe, polyvinylchloride pipe and high-density polyethylene pipe. Sizes range from 8-inch to102-inch diameter. Thre are two box sections that are 10.5' square and 12.5 feet square. Structures on the system consist of brick manholes, poured-in-place concrete manholes and precast concrete and poured-in-place inlets.

The City operates 18 sanitary pump stations and 1 storm pump station within the collection system. These consist of duplex, sub-surface stations in precast wetwells and triplex above ground stations with building enclosures. These stations are monitored remotely via a SCADA system and are inspected regularly by City Public Works personnel.

CSO #001 COLLECTION SYSTEM

CSO # 001 serves an area of approximately 11.5 square miles Flow from the combined sewer system area during dry weather conditions and low flow wet weather conditions collect in the upstream portion of a 12.5 X 12.5-foot box culvert and is conveyed to the ABWWTF. During wet weather conditions, flows from the combined area are also discharged directly to the Mississippi River at CSO #001 location via the downstream portion of the 12.5' x 12.5' box, when the depth of combined sewage in the box exceeds 5 feet and overflows a (weir width) weir.

The current method of measurement for reporting is done with a weir calculation based on the data provided the City by ABWWTF. The data gives the duration and average depth for the flow over the weir. Inputting this data into the weir formula gives a total volume of combined flow that enters the Mississippi River.

ABWWTF has provided data to the City beginning in November of 2022. On average, the City experiences approximately 2 CSO's a month at the CSO #001 location. Currently the volume of each overflow is not quantified. The report provides the duration that the weir elevation is topped. The City is planning on installing it's own monitoring equipment that will hopefully provide this information.

CSO #002 COLLECTION SYSTEM

The City has a secondary collection trunkline that is listed as CSO #002. It is a 9.5' pipe. This pipe is tied to the 12.5' box. At the connection location of the box and pipe, there is a 24" weir. Once the 12.5' x 12.5' box is backed-up to a depth of 24" the 9.5 pipe bypasses the connection and is discharged directly to the Mississippi River. This only to occur during wet-weather flow. CSO #002 is an overflow for CSO #001 and covers the same area of the City as CSO #001.

There currently is no system in place to monitor or measure the flow over the 24" weir. The City will explore options for more accurately measuring the total volume discharged at this location. This will be done with technologies that may include transducer measured flows, ultrasonic measuring devices, or something similar.

CSO #003 COLLECTION SYSTEM

The City has a cross connection in the southern part of the City at 47th Street and State Street. There are three 72" diameter storm sewer pipes that cross the sanitary sewer. It is believed that the sanitary sewer was connected to the storm sewer as a means to provide an overflow should the sanitary system become surcharged. There is currently no system in place to monitor or measure the flow through this connection.

COMBINED SEWER OUTFALL MONITORING

During Phase One, the City will investigate the connection of pipes to Outfall 003 and determine a means to eliminate it and CSO #003.The City will also investigate monitoring equipment and locations for flow monitoring in the system that will provide an understanding of the flow contributions to Outfall 001 and Outfall 002.

Once the transducers or other measuring/monitoring equipment are in place and the outfalls can be monitored and overflows quantified, a monitoring plan will be developed and added to the LTCP via an amendment. This plan will lay out the collection and reporting of the CSO volumes which will lead to a better understanding of where flow can be removed to reduce the number of CSOs to the Mississippi River from Outfalls 001 and 002.

The City will also investigate having the combined sewer areas hydraulic modeled to assist in creating a priority list for the installation of BMPs. Once BMPs are installed, the monitoring will show how successful the BMPs were in reducing the volume and occurrences of overflows.

TIMEFRAMES:

1. Investigate flow monitoring equipment and purchase equipment – January 1, 2024-June 30, 2024.
2. Identify local rain gauges that can be used for the analysis of the CSO number and volume – January 1, 2024 – June 30, 2024.
3. Develop database for flow information – January 1, 2024 – June 30, 2024.
4. Monitor flow in the system and add to database – July 1, 2024 – ongoing.

NINE MINIMUM CONTROL PLAN

The City does not currently have an NMC Plan on file. It is intended to produce this plan during phase 1 of the LTCP. The City will utilize the guidance document at https://www3.epa.gov/npdes/pubs/owm0030.pdf to prepare this plan. It is planned to complete this document during the phase 1 LTCP timeframe and it be completed by December 31, 2027.

SENSITIVE AREAS DETERMINATION

During Phase One, the City will investigate the receiving waterways for designation as a sensitive area. The Frank Holten State Park Lake is already designated as a sensitive area.
This evaluation will consider whether any of the SAs identified in the CSO Policy are present:

- Outstanding National Resource Waters
- National Marine Sanctuaries
- Waters with threatened or endangered species or their designated critical habitat
- Primary contact recreation waters, such as bathing beaches
- Public drinking water intakes or their designated protection areas
- Shellfish beds.

TIMEFRAMES:

1 Discuss with Illinois EPA Bureau of Water and US Fish & Wildlife USFW on any known sensitive areas by June 1, 2024.
2 Investigate all receiving waterways for all of the above-listed types of SA, by September 30, 2024.
3 Prepare a report (Attachment B) and provide the report to EPA by December 31, 2024.

INVESTIGATION OF STORAGE

Storage is used to reduce CSO discharge activation frequency and volume by attenuating peak combined sewer flows and retaining the volume of combined sewage associated with those peak flows for treatment after the peak flows have abated. Storage facilities have historically been widely used and continue to be widely used by many combined sewer systems for Combined Sewer Overflow (CSO) control.

Specific CSO storage methods include deep underground storage (e.g., tunnels), near surface storage and above-ground storage. Near surface storage can be both in-line and off-line, and surface storage can be in both open and covered tankage.

In most cases, it is advantageous for the storage to be configured to allow gravity fill, with pumped emptying, if necessary, to avoid the substantial pumping capacity typically needed by pump-to-fill storage.

During Phase One, the City will investigate the potential for storage of combined sewage either below, or above ground. Specific configurations to be considered will include in-line and off-line large diameter pipe/box culvert storage, as well as open and covered storage basins. The City will look for City-owned property that could be turned into a storage basin.

TIMEFRAMES:
1. Investigation of property that could be used as below ground storage by December 31, 2024.
2. Investigation of property that could be used as above ground storage by December 31, 2024.
3. Prepare a report on the capacity and costs associated with storage and provided to EPA by June 30, 2025.

INVESTIGATION OF "SMART" SEWER SYSTEM

Real Time Control (RTC)has been recognized as an effective form of CSO source control for many years. Historically, RTC has been implemented as individual installations consisting of a control structure, such as a motorized gate or inflatable dam, that is located so as to allow the selective impoundment of combined sewage in a large-diameter sewer, combined with a level sensor that is used to control the operation of that control structure. These installations function as storage structures.

Recent advances in this approach to CSO control have involved the integration of multiple such installations using a "smart" central control. The computerized controls use various algorithms and machine-learning methodologies to maximize the ability of the sewer system to store wet weather flows and avoid/minimize CSO discharges, particularly in spatially variable precipitation events.

During Phase One, the City will investigate the potential use of a smart sewer system by investigating companies that provide equipment and installation and invite companies to visit the City for an evaluation of the City's sewers for this concept.

TIMEFRAMES:
1. Investigate and invite companies for evaluations by December 31, 2024.
2. Prepare a report on the City's plan (if any) to utilize this technology by June, 30 2025.

DEVELOP AND BEGIN TO IMPLEMENT A PUBLIC PARTICIPATION PROGRAM

During Phase One, the City will develop a plan and schedule for providing information on any projects to take place during the implementation of the LTCP and a method to engage with the public. The Public Participation Plan could include special public meetings, agenda items on the regularly scheduled City Council meetings, signage to be posted at any project site with contact information on the sign, bill inserts, and postings on the City web site Any concerns by the citizens of the City and the City's response will be documented and retained.

TIMEFRAMES:
1 Design a public outreach plan.
2 Design a repository for public comments and the City's response.
3 Begin implementation of program including first public meeting by March 31, 2024 and hold quarterly meetings forward from that date.

DISCUSSION OF LEVEL OF CONTROL

During Phase One, the City will engage in discussions with Illinois EPA and US EPA on the required level of control for the CSO system. These discussions will inform Phase Two of the LTCP.

It is anticipated that these discussions will focus on the utilization of the Presumption Approach as provided for in Section II.C. 4 of the CSO Policy.

TIMEFRAMES:
1. Begin discussions when the sensitive areas analysis has been completed and there is a sufficient volume of data to estimate the number of CSOs the City can be expected to have given rainfall – January 1, 2026 – December 31, 2026.

POST CONSTRUCTION MONITORING

Following the completion of the measure(s) implemented to eliminate CSO #003, it is anticipated that CSO #003 may be monitored for 1 – 2 years prior to the physical sealing of the connection, to assure that sealing of the connection will not result in SSOs or flooding on private property.

During Phase One, the City will also continue monitoring flow in the system after any projects that would reduce the number of CSOs are completed. These projects include any separation projects, installation of storage, or removal of illegal connections.

TIMEFRAMES: Ongoing once equipment is installed.

DEVELOPMENT OF PHASE TWO PLAN

During Phase One, the City will develop a Phase Two Plan that presumes to reduce the number and volume of CSOs to the level that was agreed to with the Agencies. The Phase Two Plan will also have a Public Participation Plan, and Post Construction Monitoring.

TIMEFRAME: Provide the Phase Two Plan to EPA by December 31, 2027.

ADDITIONAL EFFORTS TO REDUCE CSOs

SEWER SEPARATION PLAN

At the present time, the City is also planning to carry out a long-term sewer separation/sewer renewal plan as described below.

The process of separating the City's combined sewers will require significant time and money. As funding becomes available, the City would like to approach this process by starting near the trunk lines, as close to the Mississippi River as possible. The plan is to make the CSO #002 trunkline a storm water only sewer. The CSO #001 trunkline will become primarily a sanitary sewer but may contain a portion of the City's combined sewer system flows. The separation is planned to be completed by sewer subdistrict as shown on the City's Sanitary Sewer Evaluation System (SSES) plan.

The process for investigating and separating these sewers is as follow:

* Survey the existing combined sewer system,
* Manhole scans,
* Smoke testing,
* Hydraulic modeling,
* System analysis,
* Separation plan development and
* Separation plan implementation.

It is estimated that the duration for completion of a subdistrict will be approximately 5 years. This is based on completing all the items required to develop the construction documents, funding of the design/construction and completion of the construction activities.

If funding is available for sewer separation projects, they would be completed in this order of priority. To fully separate the combined system, provided that funding was available, would require 125 years.

Summit Avenue Flood Mitigation/Sewer Surcharge	**Completion Date**
Summit Ave. ROW Survey	Dec. 12, 2022
Property Survey	March 31, 2024
Sewer System Modification	Dec. 31, 2024

32nd Street and Geitz Ave. Drainage Study	Completion Date
Topo Survey	Oct. 31, 2023
Smoke Test Sewer and Scan Manholes	Jan. 31, 2024
Clean 60” trunk line	Mar. 31, 2024
Clean local sewer mains	May 31, 2024
Eliminate CSO #003	Dec. 31, 2024

ALTERNATIVES TO SEWER SEPARATION

There are several alternatives to sewer separation that will continue to be explored and investigated within the City of East St. Louis, both in Phase 1 and phase 2 of the LTCP. One of which is that all new developments must construct a storm water control system. This results in the construction of detention/retention basins or systems to slow the discharge of storm water into the combined sewer system. Once the systems are separated in the area of the new developments, the storm water systems are connected to the stormwater conveyance system.

The city is planning on investigating the use of detention basins and other green infrastructure as a means to improve the absorption and run-off water quality for large storm events. These will be constructed on City property and will be used to collect the storm run-off and facilitate absorption into the soil.

Having a system to monitor the reduction of storm water to the combined system from these alternatives will allow the City to incorporate them into the plan for Phase Two.

Detention Basin & Water Quality

Detention basins are usually located in new residential, commercial, and industrial developments, helping control potential flooding. Detention basins require regular maintenance to ensure proper function. Poorly maintained basins lose their ability to control flooding and pollution, allowing sediments, fertilizers, and pesticides to enter creeks and streams. Homeowner’s associations and property owners are responsible for maintaining their detention basins.

Detention Basin Types

- Dry detention basins — typically dry depressions that temporarily fill with stormwater after a major rainstorm. Dry detention basins are less effective at removing pollutants because the stormwater passes through quickly.
- Wet detention basins — typically have a permanent pool of water and more native wetland plant life. These basins are more effective at removing pollutants.
- Stormwater wetlands — Similar to wet detention basins but contain more wetland native plants. They also provide fish and wildlife habitat.

Water Quality Best Management Practices

Water quality best management practices (BMP) help protect water quality by removing pollutants from stormwater.

- Stormwater ponds–have a combination of permanent pool, extended detention, or shallow wetland.
- Stormwater wetlands–include significant shallow wetland areas to treat stormwater but often may also incorporate small permanent pools and/or extended detention storage.
- Infiltration practices–capture and temporarily store stormwater before allowing it to infiltrate into the soil over a two-day period.
- Filtering practices (bioretention)–capture and temporarily store the stormwater and pass it through a filter bed of sand, organic matter, soil, or other media.
- Open channel practices–typically designed to capture and treat stormwater within swales formed by checkdams or other means.

Better Site Design

Better site design includes a series of techniques that reduce impervious cover, conserve natural areas, and use pervious areas to treat stormwater runoff and promote the treatment train approach to runoff management more effectively.

Green Infrastructure

The goal of better site design is to reduce runoff volume and mitigate site impacts when decisions are being made about proposed layout of a development site. These techniques are known by many different names, such as low impact development (LID), design with nature, sustainable development, sustainable site design (for LEED certification) and conservation design.

Better site design techniques have been promoted in earlier state and regional stormwater manuals. The state and local regulations and design standards should be checked to ensure that all requirements have been met.

When applied early in the design and layout process, better site design techniques can sharply reduce stormwater runoff and pollutants generated at a development site and reduce the size and cost of both the stormwater conveyance system and stormwater management practices.

More than a dozen site design tools and design techniques can be applied early in the design process at development sites. While not all the site design techniques will apply to every development site, the goal is to apply as many of them as possible to maximize stormwater reduction benefits.

Preserving natural areas:

- Natural area conservation
- Site reforestation
- Stream and shoreline buffers
- Open space design

Disconnecting and distributing runoff:

- Soil compost amendments
- Disconnection of surface impervious cover
- Rooftop disconnection
- Grass channels
- Stormwater landscaping

Reducing impervious cover in site design:

- Narrower streets
- Slimmer sidewalks
- Smaller cul-de-sacs
- Shorter driveways
- Smaller parking lots

Some of the stormwater management tools that can be implemented into site design are:

- Rain Gardens
- Grassed Swales
- Pervious Pavement
- Parking Lot Filter Strips
- Bioretention Basins
- Underground Storage
- Stream Buffers

Rain Gardens

Rain Gardens are gardens containing flowering plants and grasses (preferably native species of both) that can survive in soil soaked with water from rainstorms. However, they are not gardens that have standing water. Rain Gardens collect and slow stormwater runoff and increase its infiltration into the soil.

These attractive gardens help reduce the rapid flow of stormwater from homes and businesses to storm drains and thus protect streams and lakes from pollutants that are washed from house roofs and paved areas.

Grassed Swales

A grassed swale is a graded and engineered landscape feature appearing as a linear, shallow, open channel with trapezoidal or parabolic shape. The swale is vegetated with flood tolerant, erosion resistant plants.

The design of grassed swales promotes the conveyance of storm water at a slower, controlled rate and acts as a filter medium removing pollutants and allowing stormwater infiltration.

When properly designed to accommodate a predetermined storm event volume, a grassed swale results in a significant improvement over the traditional drainage ditch in both slowing and cleaning of water.

In swales, stormwater is slowed by strategic placement of check-dams, which encourage ponding and these ponds in turn facilitate water quality improvements through infiltration, filtration, and sedimentary deposition. Collected stormwater is expected to drain away through the soil within several hours or days.

Pervious Pavement

Pervious pavement is designed to allow percolation or infiltration of stormwater through the surface into the soil below where the water is naturally filtered and pollutants are removed. In contrast normal pavement is an impervious surface that sheds rainfall and associated surface pollutants forcing the water to run off paved surfaces directly into nearby storm drains and then into streams and lakes.

Parking Lot Filter Strips

Filter strips are gently sloping, vegetated areas adjacent to impervious surfaces. They are intended to reduce impacts of sheet flow and velocity of stormwater and help improve its water quality. Sometimes referred to as vegetated filter strips, grassed filter strips, grassed filters, or buffer strips, they help remove sediments, other pollutants and increase infiltration.

Although there are few studies on effectiveness of urban filter strips in pollutant removal, properly designed and constructed, urban filter strips are thought capable of removing a minimum of 35% of solids and 40% of nutrients. Pollutant removal appears to depend on the width of the filter, a 150 feet wide strip being superior to a 75 feet wide strip.

Applications

Originally developed as an agricultural treatment practice, filter strips have now become a common urban stormwater management practice. In an urban setting, filter strips are often utilized to treat stormwater from small parking lots. Other uses include treatment of stormwater from roadways, roof downspouts, pretreatment associated with another stormwater treatment such as a grassed swale or as part of a buffer zone to protect streams.

The advantages of grassed filter strips include:

- Partial removal of sediments and associated contaminants from stormwater runoff
- Increased infiltration of stormwater runoff and some deposition of soluble contaminants
- Relatively inexpensive and simple to design and build.
- Require a relatively low maintenance effort.
- Add a visually appealing green effect to parking lots.

The potential for use of grassed filter strips is dependent on recognition of site requirements for this form of a stormwater Best Management Practice:

1. Grassed parking lot filter strips can be utilized in most regions. However:
    - Impermeable clay soils limit treatment effectiveness

- To increase permeability:
  - Soil porosity can be increased by amending soil.
  - Optional under-drains can be incorporated to improve infiltration and help dry out filter strips after storms.
- Cold climates result in frozen ground that minimizes infiltration and treatment effectiveness. Also, the use of sand and salt in parking areas for deicing can negatively impact the functioning of the strip. These conditions must be addressed before proceeding with installation.

2. When properly designed they require large areas of land:
   - Rule of thumb –one acre of impervious surface requires a filter strip of 580 feet wide by 75 feet long to be effective.

Therefore, filter strips are not good options for ultra-urban areas; likewise, they are not good solutions to stormwater retrofits (usually lacking space) or stormwater hot spots (such as a gas station where gas pollutants would be encouraged to infiltrate with possible contamination of ground water or leaching into nearby streams).

3. Filter strips can be used to treat small parking lots or drainage areas. To achieve optimal effectiveness of grass filter strips, the length of the stormwater flow path to the strip must not exceed critical distances where characteristics of sheet water flow change.
4. Site topography is important. To avoid standing water and encourage treatment, grassed filter strips must have a slight slope of between two and six percent. Steeper slopes will encourage water flows with too great of a velocity.

Bioretention Basins

Bioretention basins are landscaped depressions or shallow basins used to slow and treat on-site stormwater runoff. Stormwater is directed to the basin and then percolates through the system where it is treated by a few physical, chemical, and biological processes. The slowed, cleaned water is allowed to infiltrate native soils or directed to nearby stormwater drains or receiving waters.

Underground Storage

On-site, underground stormwater retention /detention accomplishes the capture and storage of stormwater collected from surrounding impervious areas. Riser pipes or curb cuts lead surface storm water to subsurface vaults or systems of large diameter interconnected storage pipes or chambers. Stored water is then released directly through an outlet pipe back into natural waters at rates designed to reduce peak water flows during storms to mimic pre-development conditions. In some cases, stored water can be allowed to infiltrate to recharge groundwater (if soil types are suitable and the groundwater table is located sufficiently below the water storage units).

Underground stormwater storage provides minimal stormwater quality benefits but can be a successful segment to a development's overall stormwater management plan, when coupled in-line with other stormwater BMPs. The addition of pretreatment features at the system's inlet can facilitate improvements to water quality by removing floatable, skimming of oils and grease and trapping some level of sediments through deposition. Pretreatment is most important if stored water is to be allowed to infiltrate into the soil, otherwise rapid clogging of the system could occur. Pretreatment features can be designed and built into the system or there are commercially available, prefabricated units that can be incorporated within the system during initial planning and design.

Subsurface storage relies on construction of water storage structures made of concrete (vaults) or large diameter, rigid pipes or arches with capped ends and made of plastic, steel, or aluminum. Concrete Stormwater Storage System. Several pre-built, modular systems are commercially available. Storage structures, inlet and outlet pipes and maintenance access (manholes) are fitted and attached in a predetermined excavated area and then the entire area is backfilled to surrounding landscape surface height with gravel and subsequently surfaced. Because of ongoing maintenance requirements and the potential of needed repairs at some later date, underground storage facilities should not be built over and preferably should be in areas where large sized maintenance vehicles can easily operate and excavation remains possible, if required.

Stream Buffers

The strip of land adjacent to a natural water course such as a river or stream is called the riparian zone. Stream, or riparian buffers, are vegetated areas within the riparian zone. These buffers slow down rain and snow melt runoff that can add nutrients, sediments, and other pollutants to streams. Slowing down runoff water also reduces flooding and stabilizes stream flows. Buffers stabilize stream banks, increase groundwater infiltration, and provide cooler water and air temperatures and habitat for many plants and animals.

Natural riparian buffers are composed of grasses, shrubs, and trees. If riparian buffers are maintained or restored, they can exist under most land uses: natural, agricultural, forested, suburban, and urban.

Protecting Riparian Buffers

There is little or no cost involved in protecting existing riparian buffers. Existing buffers can be protected through ordinance requirements, through easement agreements or simply through a conscious effort to decrease mowing and maintain trees and shrubs. All landowners (individuals, businesses, and municipalities) should make every effort to preserve riparian buffers and improve them.

Restoring Riparian Buffers

Stream damage can be minimized, and water quality enhanced through installing riparian buffers where they have been previously removed. Landowners can plant trees and shrubs in the riparian buffer to begin a restoration project. Restoring forest buffers requires an initial investment in plant materials, tools, and labor. However, the long-term cost savings due to decreased mowing requirements for a restored buffered area can be quite significant.

EXHIBIT 1

CSO #001 AND #002 LOCATION MAP

CSO #003 LOCATION MAP