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Minneapolis Interceptor Rehabilitation Phase 2 Facility Plan

Prepared for
Metropolitan Council Environmental Services
St, Paul, Minnesota

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Minneapolis Interceptor Rehabilitation Phase 2
Facility Plan

Prepared for
Metropolitan Council Environmental Services, St, Paul, Minnesota
October 3, 2012

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This is a draft and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report

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List of Abbreviations

ADF	Average Daily Flow
AOR	Allowable Operating Region
APWWF	Allowable Peak Wet Weather Flow
AR/AV	Air Release/Air Vacuum Valves
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
AWWA	American Water Works Association
BC	Brown and Caldwell
C	Hazen-Williams friction factor
CAD	Computer-Aided Design
CCI	Construction Cost Index
CCTV	Closed Circuit Television
cfs	Cubic Feet per Second
CI	Cast Iron
CIP/CIPP	Cured-in-Place/Cured-in-Place Piping
CMP	Corrugated Metal Pipe
C.O.	Clean Out
CPT	Cone Penetration Test
C.R.	County Road
C.S.A.H.	County State Aid Highway
CSO	Combined Sewer Overflow
DI/DIP	Ductile Iron/Ductile Iron Pipe
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
ENR	Engineering News Record
FM	Forcemain
fps	Feet Per Second
gpad	Gallons Per Acre per Day
gpm	Gallons Per Minute
HARN	High Accuracy Reference Network
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene Pipe
HGL	Hydraulic Grade Line
ID	Inside Diameter
L/LS	Lift Station
lf	Lineal Feet
M	Meter
MCES	Metropolitan Council Environmental Services
MCWD	Minnehaha Creek Watershed District
MDNR	Minnesota Department of Natural Resources
MFL	Magnetic Flux Leakage
MGD	Million Gallons per Day
MH	Maintenance Hole
Mn/DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MPVS	Multi Purpose Valve Structure
NAD	North American Datum
NFPA	National Fire Protection Association
OD	Outside Diameter
O&M	Operation and Maintenance
P/A	Peak to Average Flow Ratio
PCCP	Prestressed Concrete Cylinder Pipe
PDS	Preliminary Design Submittal
POR	Preferred Operating Region
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
QA/QC	Quality Assurance / Quality Control
QCP	Quality Control Plan
RCP	Reinforced Concrete Pipe
ROW	Right-Of-Way
rpm	Revolutions Per Minute
RPMP	Reinforced Polymer Mortar Pipe
SCADA	Supervisory Control and Data Acquisition
SPT	Standard Penetration Test
SSO	Sanitary Sewer Overflow
TDH	Total Dynamic Head
TM	Technical Memorandum
WEF	Water Environment Federation
WWTP	Wastewater Treatment Plant

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Executive Summary

ES.1 Basis of Evaluation

This Facility Plan evaluates the need for improvements at seven of the ten remaining regulators in the Metropolitan Council Environmental Services (MCES) collection system, replacement of a reach of badly corroded interceptor tunnel, and rehabilitation of a segment of interceptor 1-MN-344 in south Minneapolis. The regulators were originally constructed along with the first interceptor sewers in the 1930's. Improvements were made in the 1960's to most of the regulators, and in various projects since then. Included as part of the planned improvements are features to further optimize conveyance capacity and minimize overflows. It should be noted that one facility, the 3rd & Commercial Regulator (R02) facility is already being addressed under a separate project. The other two facilities, R14 and R20, not included in this report present complications that will be addressed later in a subsequent analysis(s). Those two regulators, at East 38th Street and 26th Avenue South, and at 5th Street and Oak Street SE, are where sewer separation was accomplished by installing a pipe in a pipe. Additional study related to current and recent City of Minneapolis separation efforts are necessary before improvement decisions can be made at those two sites. Improvements for the seven remaining regulator facilities will upgrade and provide pressure relief for the sanitary sewer system that will be used for emergency relief of the system. The pressure reliefs would be necessary in order to avoid surcharging that could result in catastrophic damage to facilities, the environment, or private property.

The emergency overflow points at these regulator sites that remain in operation will be equipped with positive shut-off (closed sluice gates) and remote operational control. Overflow monitoring devices (level measurement) will also be installed. Overflow gates can only be operated by manual action after consideration of the conditions at hand. Manual action in this case is defined as making a conscious decision to physically operate the gates either on-site or remotely, but shall not include automatic operation based on level.

In addition to the improvements to the seven regulators, two badly corroded segments of interceptor 1-MN-344 will be addressed. One reach of pipe is just downstream of Regulator R04 near Minnehaha Park. It is difficult to access and the recommended remedy is to replace the 1,260' segment with a new tunneled pipe. Discussions of this pipe reach as well as related costs are included in the sections on Regulator R04.

The second reach of 1-MN-344 begins at the farthest upstream maintenance hole in France Avenue in southwest Minneapolis. The pipe ranges in size from 9 inch diameter to 33 inches in diameter where it meets interceptor 1-MN-345. Over 14, 000 feet of pipe will be CIPP lined. In addition, repairs will be made to leaky MH's and pipe joints that have been identified.

ES.2 Recommended Improvements

Recommended improvements at each regulator facility, assuming each site remains in operation, are discussed in detail in Section 4, Recommendations, in this facility plan. It should be noted that the improvements identified herein are preliminary in nature, and may be further refined during follow-on final design activities.

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ES.3 Cost Analysis

Table ES-1 presents the estimated capital costs for improvements at each of the seven regulator sites.

Table ES-1. Summary of Regulator and Interceptor Improvement Costs

Reg. No.	Description/Location	Total OPCC
R04	39th Avenue S. & E. Minnehaha Parkway	$6,786,000
R05	Site 1A, Lake Street Siphon Tailhouse	$612,000
R06	Minneapolis NW Meters	$855,000
R07	Portland & Washington Avenues	$227,000
R08	East 26th Avenue & Seabury Avenue S.	$1,773,000
R10	Minneapolis SW Meters	$662,000
R12	Minneapolis East Meters	$142,000
	1-MN-344 Rehabilitation	$14,980,000
	TOTALS	$26,037,000

The preliminary OPCC developed for each of the seven regulator sites were developed using cost curves and formulas, past construction projects with proportionality adjustments, approximate ratio methods, best engineering judgment, and other adjustments using a National Engineering News Record (ENR) Construction Cost Index (CCI) of 9,351, which represents anticipated construction costs in the third quarter of 2012 (August). These capital costs were elevated using a 30 percent value for undeveloped design details, followed by a 20 percent value for contingency, which is standard protocol on MCES projects at the planning level. Contractor overhead and profit are included in the individual unit costs, and therefore, are not identified separately. Engineering, administration, and legal costs were also added in at 20%. Finally, these preliminary numbers are believed to have accuracy to within plus 50 percent to minus 30 percent based on the Order of Magnitude assumed for a planning type project.

ES.4 Implementation

As outlined in Section 5, Implementation, of this facility plan, the implementation plans and or anticipated schedules to be followed in order to bring the recommended improvements for each regulator into operation are provided. This information should be used as a guide for planning and designing the projects only. The project schedules will be further reviewed and defined during the final design phases of each project.

Section 5 also includes a discussion of grouping of the improvements into separate project packages. While there are advantages to bidding the improvements in up to three separate packages, it is recommended that a single project be implemented to take advantage of the similarities, especially the SCADA improvements, which are critically important to the long-term operation of all of these facilities.

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Section 1
Problem Definition

This Facility Plan proposes improvements for regulator facilities within the City of Minneapolis that will upgrade and provide pressure relief for the sanitary sewer system that will be used for emergency relief of the system. The pressure reliefs would be necessary in order to avoid surcharging that could result in catastrophic damage to facilities, the environment, or private property. In addition, a segment of 1-MN-344 just downstream of Regulator R04 is badly corroded and inaccessible for inspection and rehabilitation. This reach of pipe will need to be repaired or replaced to prevent potential collapse of the tunnel liner and subsequent sewer backup due to debris in the pipe.

The emergency overflow points at these regulator sites that remain in operation will be equipped with positive shut-off (closed sluice gates) and remote operational control. Overflow monitoring devices (level measurement) will also be installed. Overflow gates can only be operated by manual action after consideration of the conditions at hand. Manual action in this case is defined as making a conscious decision to physically operate the gates either on-site or remotely, but shall not include automatic operation based on level. Another benefit of the overflow gates that are normally closed is the prevention of fugitive odors escaping from the sanitary sewer into the storm sewer.

1.1 Introduction – Regulator Improvements

MCES has ten regulators still in operation that are permitted CSO locations in addition to one pressure relief facility (Site 1A). This facility plan addresses seven (7) of these facilities, which were selected based on the type of improvements that were identified to be needed. It should be noted that one facility, the 3rd & Commercial Regulator (R02) facility is already being addressed under a separate project and is not included in this plan. The other two facilities not included in this report, R14 and R20 present complications that will be addressed later in a subsequent analysis(s). Both of those regulators involve a pipe-in-a-pipe configuration – a popular method of sewer separation utilized in the 1960's in Minneapolis. The remaining regulator facilities addressed in this Facility Plan and their respective locations are shown in Table 1-1.

Table 1-1. CSO Regulator Location

Name	Description/Location
R04	39th Avenue S. & E. Minnehaha Pkwy
R05	Site 1A, Lake Street Siphon Tailhouse
R06	Minneapolis Northwest Meters
R07	Portland & Washington Avenues
R08	East 26th Avenue & Seabury Avenue S.
R10	Minneapolis Southwest Meters
R12	Minneapolis East Meters

Figure 1-1 is a map of a portion of Minneapolis identifying the regulator locations.

The objective of this facility plan is to evaluate each of the seven facilities, identify and develop alternatives for improvements, and develop a recommended concept level design for the physical and operational changes that will be necessary for use as emergency relief points. Generally, the

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improvements required consist of a positive shut-off (sluice gate) that will be monitored and operated remotely. One facility, R05, will be eliminated.

1.2 Pipe Rehabilitation

The pipe to be rehabilitated downstream of Regulator R04 is in very bad condition. It is a concrete tunnel in sandstone. A new pipe will be tunneled to replace that pipe. The upstream reach of 1-MN-344 consists mostly of clay pipe that was installed in the 1930's. Much of the clay pipe is cracked and in need of lining to prevent collapse and infiltration. After 1-MN-344 passes along the south end of Lake Harriet in southwest Minneapolis it generally follows Minnehaha Creek to Regulator R04. Some MH's that were abandoned that were in the creek are showing signs of infiltration. Some of the joints have pulled apart or are otherwise leaking and need to be repaired.

1.3 Background

MCES owns and operates an extensive system of sanitary sewer interceptors that convey wastewater from over 100 communities to its regional treatment plants located throughout the Twin Cities area. This facility plan primarily addresses the MCES interceptors that are located within the City of Minneapolis. The City of Minneapolis also owns and operates their respective collection system that eventually connects to the MCES interceptor system. Many of these facilities were originally constructed in the 1930's using best tunneling and sewer design technologies available at the time. Some of the facilities were then upgraded in the 1960's in preparation for emerging CSO discharge permit requirements. Improvements have been implemented in recent years at several of the facilities, where others still remain as originally designed and constructed.

All of the facilities are considered a permitted confined space for MCES staff to enter. MCES does enter and inspect these facilities on a routine basis. Several of these sites have been improved in recent years from a safety perspective, but others are in need of major work to make them safer.

MCES has performed regulator overflow hydraulic calculations to determine the approximate operation of each facility based on various flow conditions. The calculations, which are included in the previous technical memorandum entitled "*MCES Regulators, Transition from Permitted CSO Status to Sanitary Sewer Status with Emergency Bypass Project*", dated September 12, 2010, should be reviewed to understand the hydraulic conditions established for each regulator.[2]

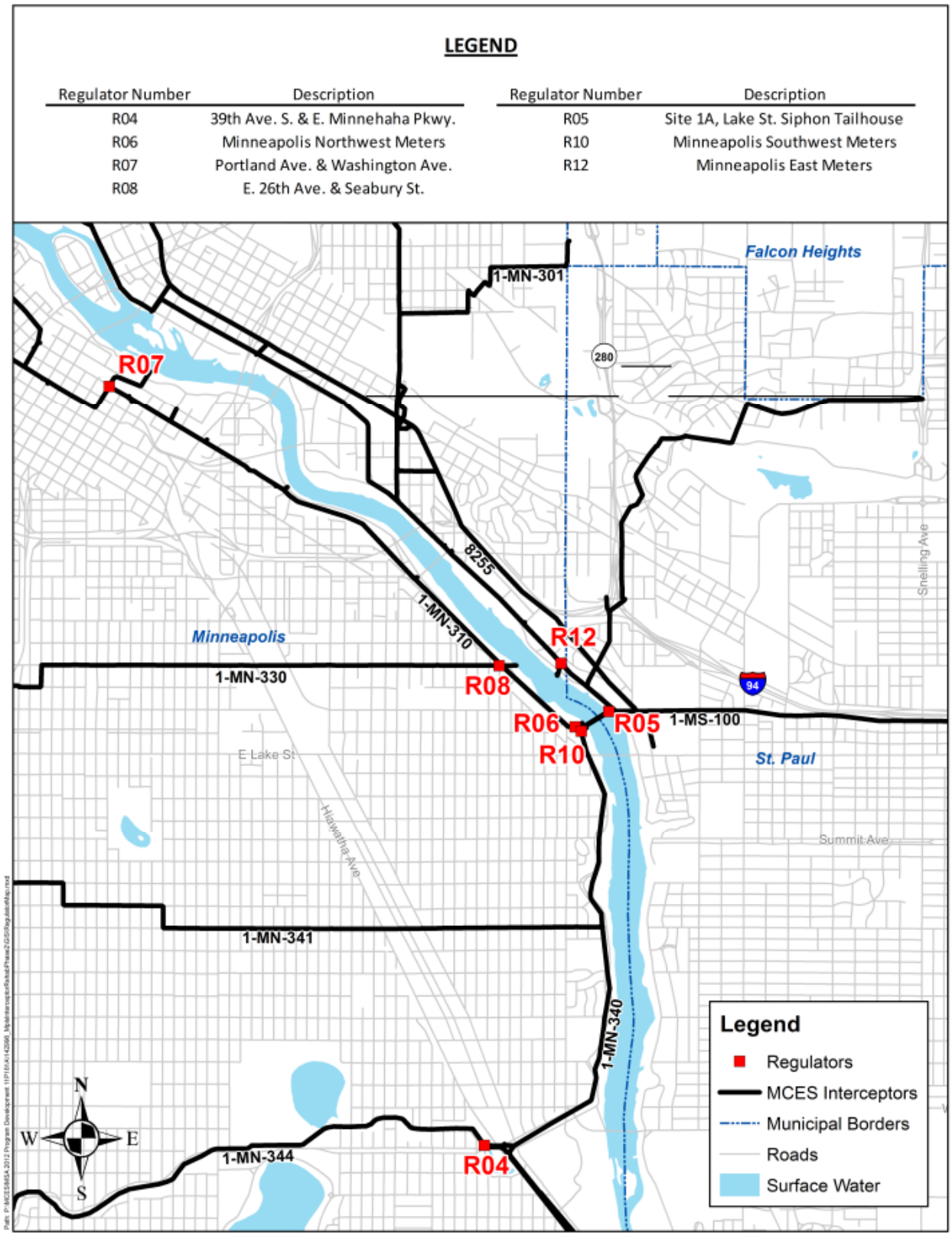

Figure 1-1. Regulator Locations

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Section 2
Development of Project Alternatives

Section 2 of this Facility Plan outlines the improvements needed at each regulator site and develops alternatives for each facility.

2.1 R04 – 39th Avenue S. & E. Minnehaha Parkway

The 39th Avenue South & East Minnehaha Parkway Regulator (R04) is located in a park adjacent Minnehaha Creek in the City of Minneapolis. See Figure 2.1-1 for the Regulator R04 site plan. Plan and section views of the regulator and downstream facilities are presented in Figures 2.1-2 and 2.1-3, respectively. The regulator was originally built in 1935, and is located on the 1-MN-344 Interceptor. Minnehaha Creek, Hiawatha Avenue (Hwy 55), Hiawatha Line (light rail), and other important infrastructure are all located in close proximity. Sanitary sewer flow from this facility is discharged through an orifice gate, travels approximately 127 ft under Minnehaha Creek before dropping approximately 35 feet through a vertical shaft that connects to the downstream interceptor system. A Parshall flume with a 2'-0" throat width exists immediately upstream of the drop shaft, but is not currently used. Wastewater levels can build inside the regulator and overflow a weir to the downstream storm sewer system that discharges to the Mississippi River.

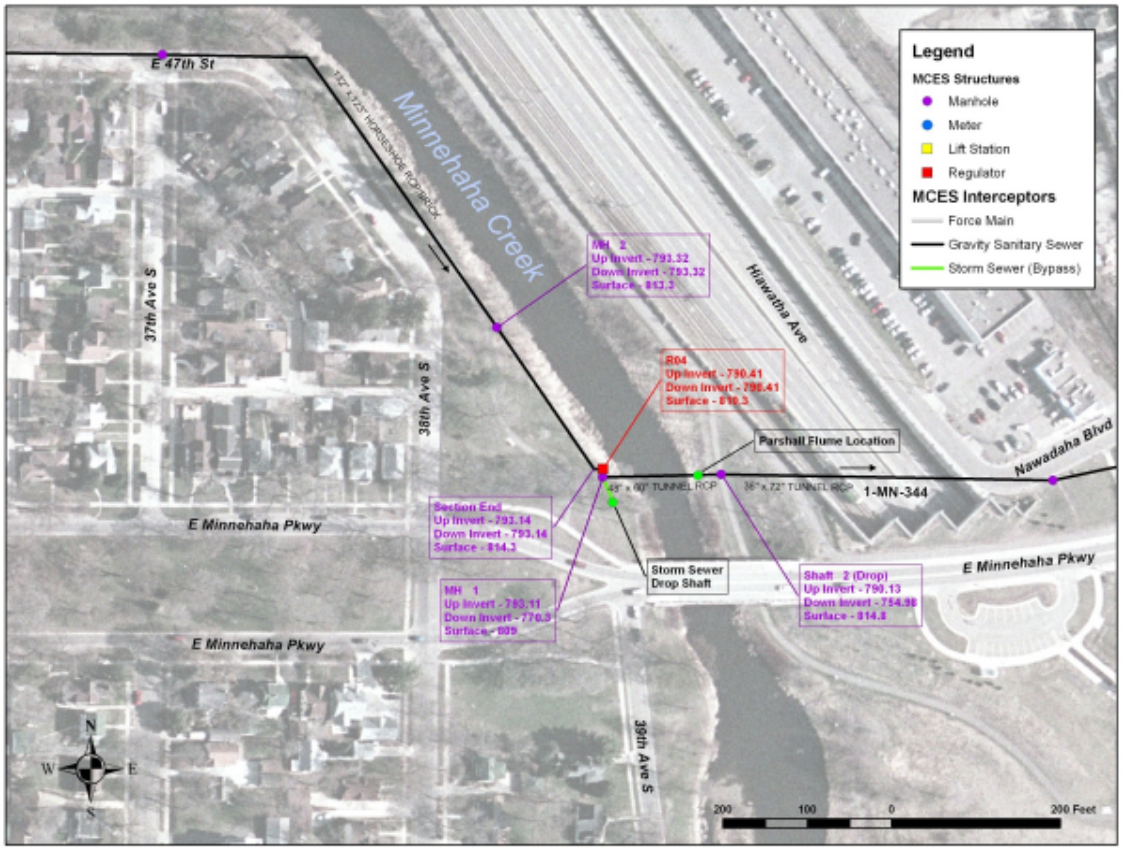

Figure 2.1-1. Regulator R04 Site Plan

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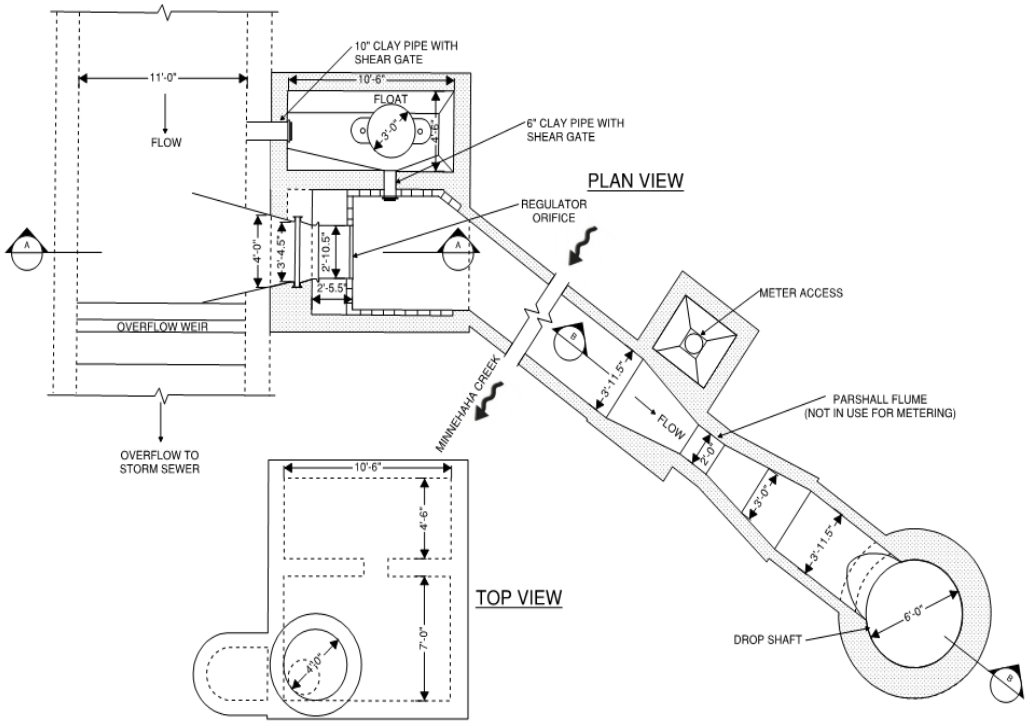

Figure 2.1-2. Regulator R04 Chamber Plan View

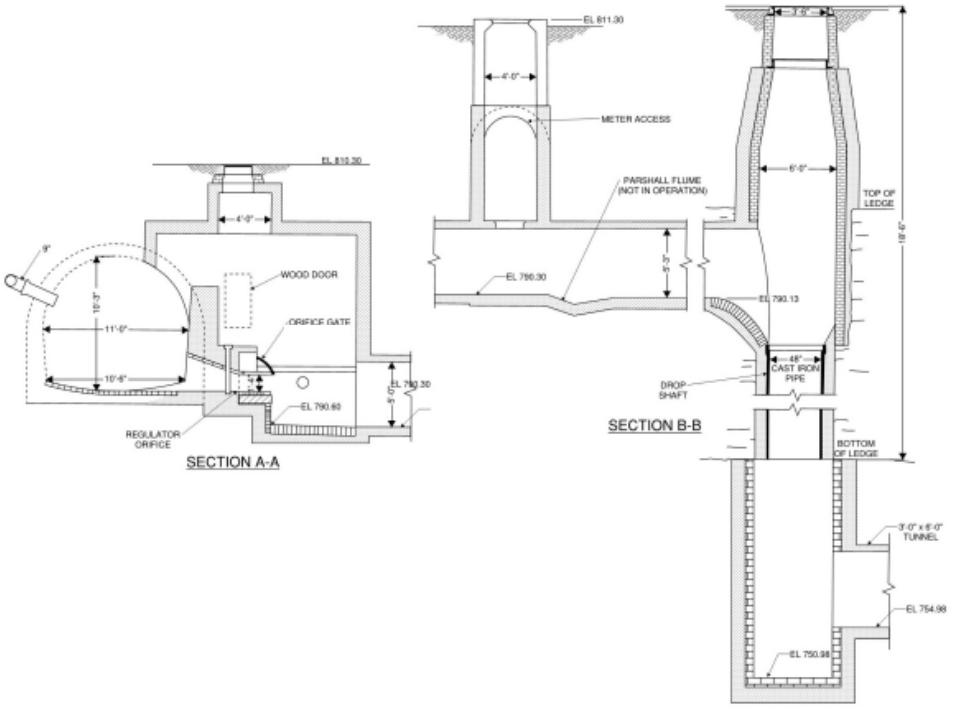

Figure 2.1-3. Regulator R04 Chamber Section Views

2.1.1 Facility Description and Operation

Regulator R04 is equipped with an orifice type regulator structure that is approximately 10'-6" wide by 10'-3" high. The regulator itself is located within the 1-MN-344 Interceptor that consists of an 8 ft. high concrete and block dam immediately downstream of the regulator chamber, which directs sanitary flow through the regulator. Wastewater passes through a 2'-10" wide by 1'-4" high orifice and then to a 4'-0" wide by 5'-0" high tunnel under Minnehaha Creek that is equipped with a Parshall flume flow meter. The Parshall flume is not currently utilized. The tunnel ends at a 35 ft. vertical drop shaft prior to reaching Hiawatha Avenue. A 3'-0" by 6'-0" tunnel exits the drop shaft as the 1-MN-344 Interceptor, which travels easterly under Hiawatha Avenue and the Hiawatha Line (light rail) before connecting to the 1-MN-340 Interceptor near the E. Minnehaha Parkway and Minnehaha Avenue roundabout intersection.

Figure 2.1-4. Regulator R04 Orifice Gate

Figure 2.1-4 shows the regulator orifice gate, which is not currently in use. Figure 2.1-5 shows the overflow weir, or dam, that was installed to restrict sanitary sewer flows from entering the downstream storm sewer. Figure 2.1-6 shows the interior of the 1-MN-344 Interceptor downstream of the drop structure (east of Minnehaha Creek). This interceptor was last inspected in April 1998 by MCES staff to ascertain its overall condition.

Figure 2.1-5. Regulator R04 Overflow Weir

The 3' x 6' sandstone tunnel between the drop shaft and the confluence with 1-MN-340 is in poor condition and has at least one steep segment, making it difficult for maintenance workers to enter. The concrete was reported to be severely deteriorated during the 1998 inspection.

Figure 2.1-6. 1-MN-344 Interceptor Downstream of Regulator R04

2.1.2 Required Improvements

Numerous improvements are necessary to Regulator R04 which will necessitate construction of a new regulator vault. Installation of a gate at the overflow to the storm sewer will require removal of the top of the interceptor pipe and reconfiguring the top of the weir. Construction of new control gates to the sanitary sewer will be most effectively constructed inside a new vault. In addition, an expanded regulator vault will be necessary to house gate and ventilation equipment, MCC's for the gates and other equipment, and control and communication

equipment. Figure 2.1-7 shows a preliminary layout of the suggested improvements at Regulator R04. The proposed underground vault for mechanical and electrical equipment is to be located adjacent to the gate chamber, but with separate entrances – one to the dry side and one to the wet side. Odor control is not planned at this time because odors have not risen to the nuisance level at this location. It should be noted however, that if the SWO gates are normally closed, one route for containment and route of escape for the sewer gases will be eliminated.

It is recommended that this portion of the 1-MN-344 Interceptor should be replaced in its entirety, from the regulator located on the west side of Minnehaha Creek, to the confluence with interceptor 1-MN-340 on the east side. Because of the multiple drops in this portion of the interceptor, slope, and its age, this section of the pipe is difficult to inspect and maintain. Therefore, MCES has determined that this portion of the pipe should be replaced. Table 2.1-1 provides a listing of recommended improvements at this location.

Table 2.1-1 – Recommended Regulator R04 Improvements

No.	Description
1.	Remove existing orifice gate, regulator structure, and weir
2.	Build new regulator structure with sluice gates for isolation
3.	Install flow monitoring
4.	Install ventilation to protect personnel and equipment
5.	SCADA Modifications to allow remote gate operation
6.	Construct new connecting pipe and drop shaft
7.	Construct new tunnel to confluence with 1-MN-340

2.1.3 Development of Alternatives

Several alternatives were considered for improving Regulator R04 that have been determined too costly or dangerous to undertake:

- Rehabilitation of existing structure
- Retrofitting existing structure with new gates
- Removal of Parshall Flume and replacement with new pipe connection to the existing drop shaft
- Rehabilitation of the 3' x 6' tunnel

Extensive demolition of the existing structure would be necessary to install two dry weather outlet (DWO) gates into the interceptor. Two gates are necessary to facilitate maintenance: regular exercise of the gates without danger of spilling if a single gate malfunctioned in the closed position. That is, at low flow one gate can be opened and closed without interrupting the flow. The second gate can subsequently be exercised, again without interrupting the flow. If a single gate was to be installed and it malfunctioned while closed during exercising operations, an emergency situation would be created since the normal flow through the sewer would be prevented.

New storm weather outlet (SWO) gates to the downstream storm sewer would also involve extensive demolition and construction attaching to the old weir wall, which is constructed of concrete and CMU block. The Parshall flume on the east side of the creek is also in an area difficult to access and very close to the Creek. Rehabilitation of the lower tunnel on the 1-MN-344 Interceptor is dangerous at the steep segment on the east side of Minnehaha Creek.

Because of the numerous difficulties identified with trying to rehabilitate the existing regulator and associated downstream piping (and other facilities), constructing a new regulator immediately upstream of the existing regulator is the most feasible alternative. This will allow for the regulator to be

constructed without significant disruption to flows. A new tunnel under Minnehaha Creek, Hiawatha Avenue, and the Hiawatha Line (light rail) will be configured to be less complex and easier to inspect and maintain. A drop structure for the new facilities will be located on the west side of the creek near the new regulator structure. Access to this segment of pipe will be provided by a large (10' diameter) access shaft near the confluence of 1-MN-344 and 1-MN-340.

Figure 2.7-1 below depicts the general layout planned for the replacement of Regulator R04.

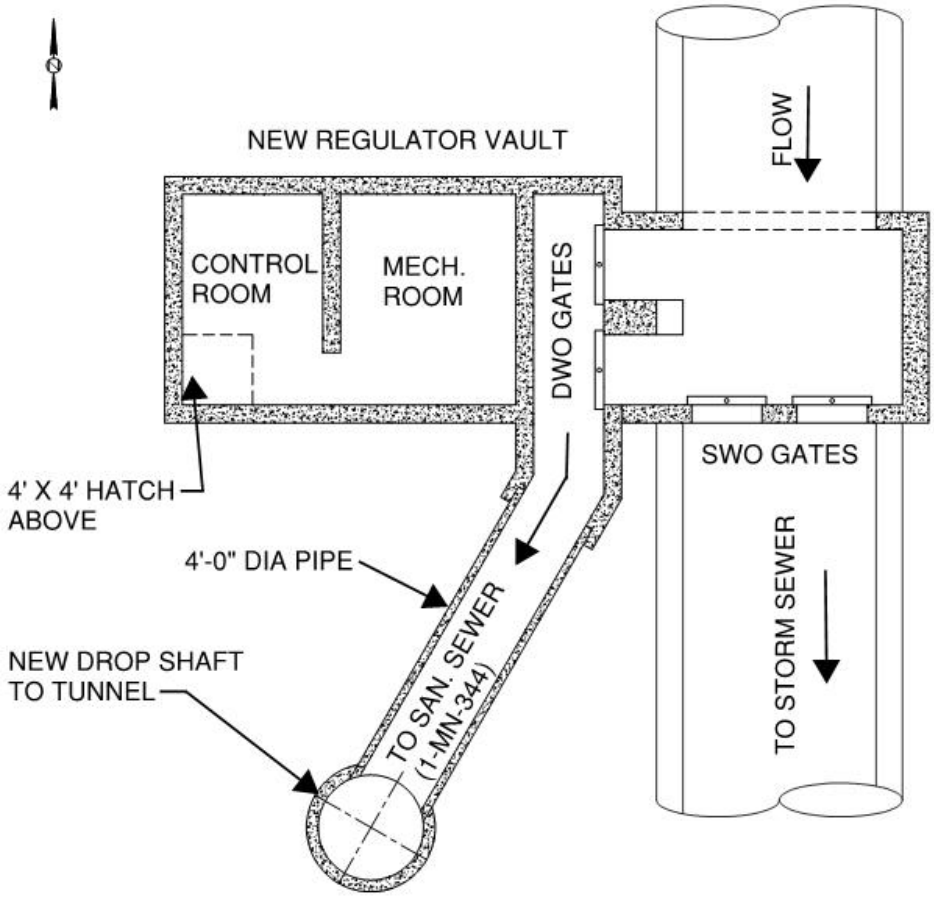

Figure 2.1-7. Plan of new Regulator R04

Figure 2.1-8 on the following page illustrates the site layout of the proposed Regulator R04 replacement relative to the existing regulator location. Included in the figure are the proposed new tunnel alignment and the existing tunnel for 1-MN-344. Note that the existing regulator will be demolished.

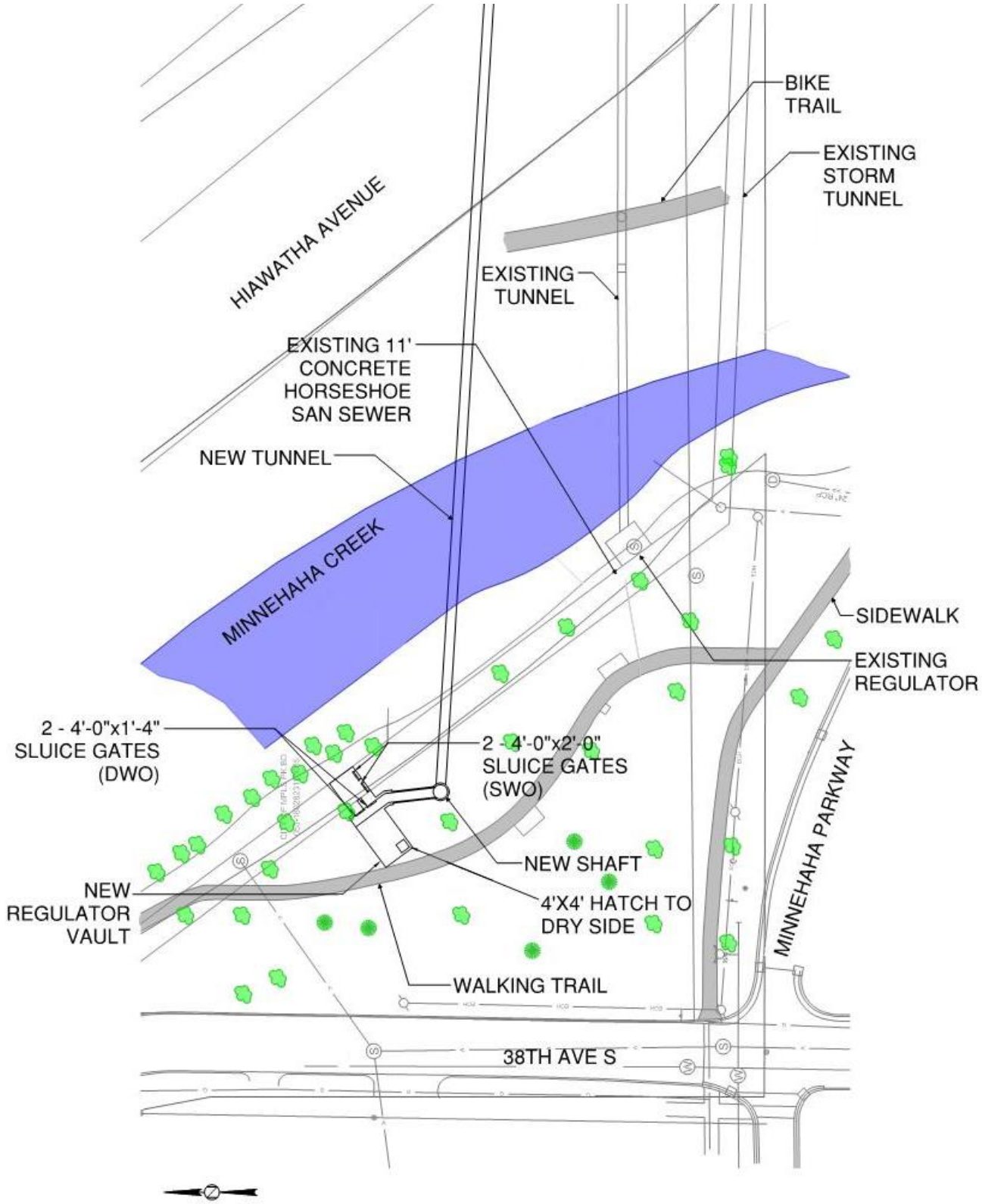

Figure 2.1-8. Site Plan of new Regulator R04

The tunnel will be approximately 1,260' between shafts and is expected to be constructed as a two-pass tunnel with initial support and a Reinforced Polymer Mortar Pipe (RPMP) carrier pipe. A two-pass tunnel is accomplished by a tunnel boring machine or hand excavation, installation of an intitial support system such as ring beams and lagging or rock bolts and mesh, followed by installation of a final carrier pipe. In this case, it is expected that the tunnel in the sandstone may be accomplished by water lancing and the initial support with rock bolts and mesh. A local sewer connection at Nawadaha Boulevard will be connected to the new tunnel. A plan of the proposed tunnel alignment is shown in Figure 2.1-9 below.

Abandonment of the existing facilities will involve demolition of portions of the existing R04 structure: the overflow weir to allow free flow of diverted wastewater to the storm sewer, and the top of the structure. The openings in the pipe to the regulator will be sealed up. The remaining structure will be backfilled and buried. The pipe under Minnehaha Creek will be filled with grout. The drop shaft and interceptor tunnel on the east side of the creek will be filled with sand or grout and bulkheaded.

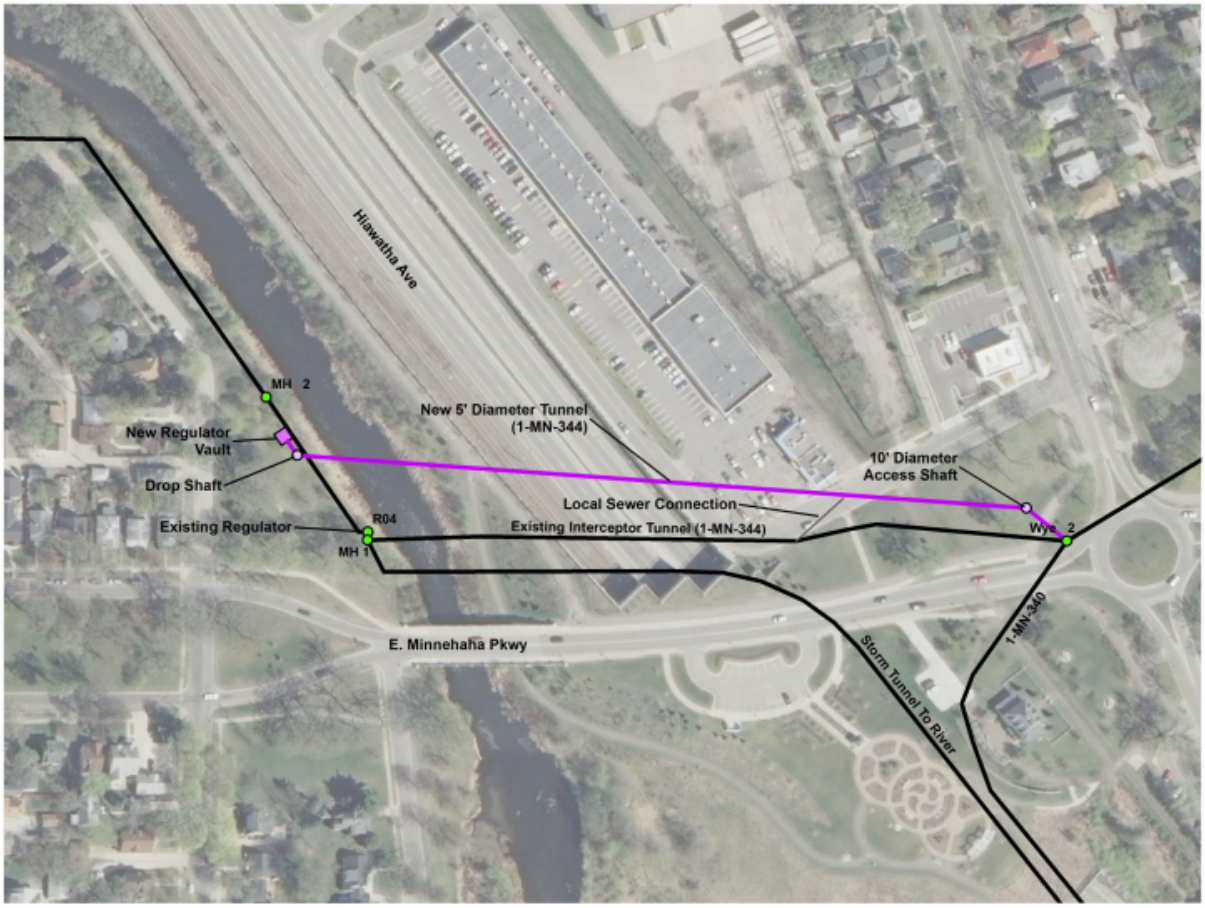

Figure 2.1-9. Proposed Tunnel Alignment

2.2 R05 – Lake Street Siphon Tailhouse

Regulator R05, also known as the Lake Street Siphon Tailhouse or Site 1A, is located on the east side of the Mississippi River crossing, just north of the E. Lake Street/Marshall Avenue Bridge in Minneapolis. Prior to the river crossing, the 3-barrel siphon collects flows from the 1-MN-310 and 1-MN-340 Interceptors. Upon crossing, the 3-barrel siphon combines at this point into one common barrel. The siphon tail house is located on the east bank of the river upstream of a connection to the 1-MS-100 and MEI Interceptors. Figure 2.2-1 shows the Regulator R05 vicinity plan. Figure 2.2-2 shows a plan view of the siphon tailhouse. Figures 2.2-3 and 2.2-4 show various section views of the tailhouse.

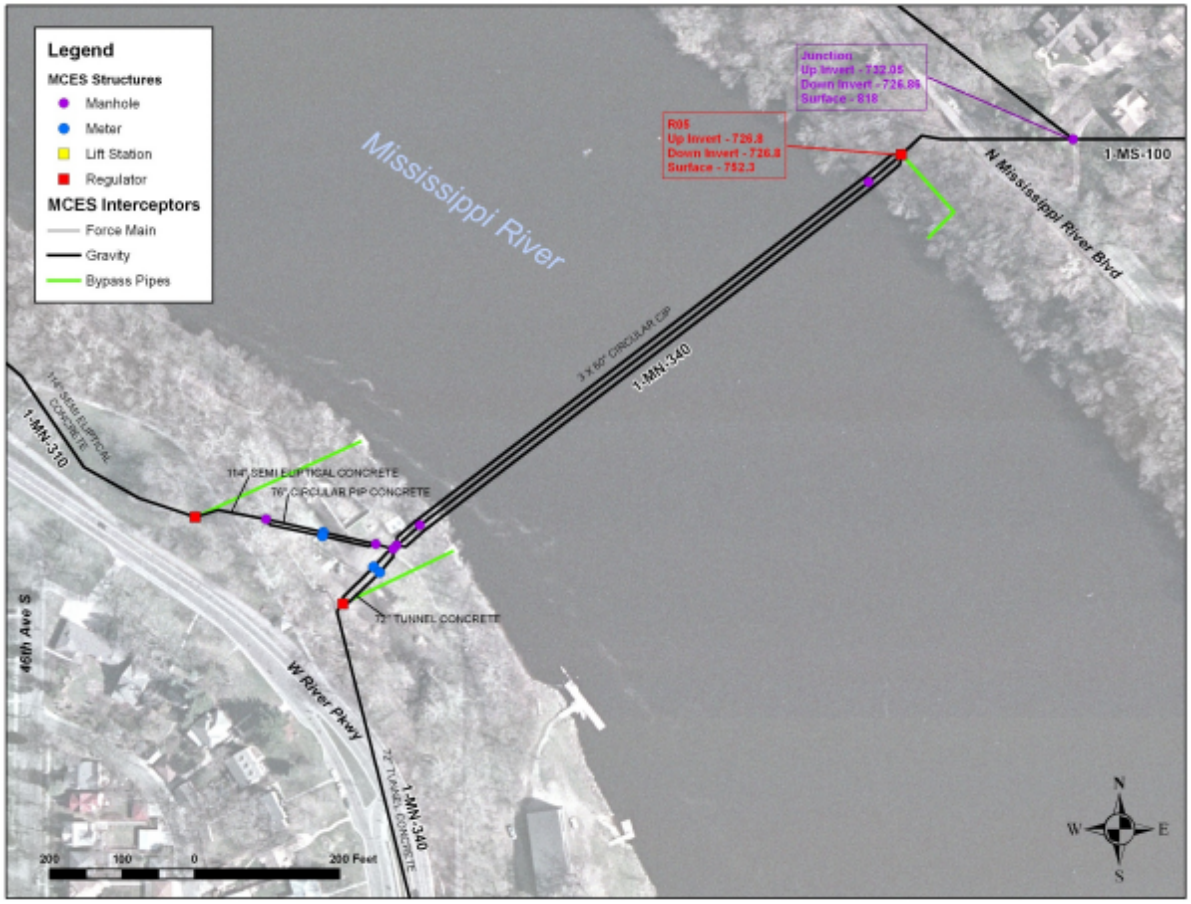

Figure 2.2-1. Regulator R05 (Siphon Tailhouse) Vicinity Plan

Two relief points, Regulators R06 and R10, are located upstream of the siphon, on the west bank of the Mississippi River, making R05 largely redundant. In addition, a hydraulic analysis has been conducted that showed that this regulator facility is not necessary as an emergency relief point. It has therefore been determined that the overflow structure should be decommissioned and removed from service to prevent any potential for overflow to the Mississippi River. This can be simply accomplished by permanently walling off the existing overflow chamber to prevent flows from reaching the Mississippi River under any condition. However, it is recommended to remove the concrete overflow and drop chamber that was constructed adjacent to the tailhouse to minimize liability, as this area has been known to be vandalized.

2.2.1 Facility Description and Operation

Regulator R05 is located on the east side of the Mississippi River, just north of the East Lake Street/Marshall Avenue Bridge. The siphon comprises three (3) 5-foot diameter barrels that are each 854 feet long. The 3 siphon barrels crossing the river combine at this location and carry flows on to the Metropolitan WWTP. The tailhouse includes the siphon barrel sluice gates and a transition chamber connecting the siphon tail to the 10.25" x 10.25" horseshoe tunnel downstream, which is sloped at approximately 0.097%. Overflows are currently possible at this location, although highly unlikely, and are based on the quantity of flow traveling through the siphons and hydraulic conditions downstream in Interceptor 1-MS-100 at the MEI connection. Potential overflow from this location travels through a chamber for relief back to the river.

The R05 overflow structure is a rectangular concrete tunnel, 8-foot wide, and is sloped back toward the river at about 5%. It is connected to the upper part of the tailhouse transition chamber side wall at EL 738.5. At this elevation, the downstream tunnel is estimated to be flowing full. If the flow level rises above EL 738.5, the side overflow begins from the siphon tailhouse to the overflow tunnel.

It should be noted that the overflow weir levels at the West Meter (R06 and R10) site provide relief to the sewer system just upstream of the siphon facility, making R05 redundant. Therefore, R05 can safely be eliminated.

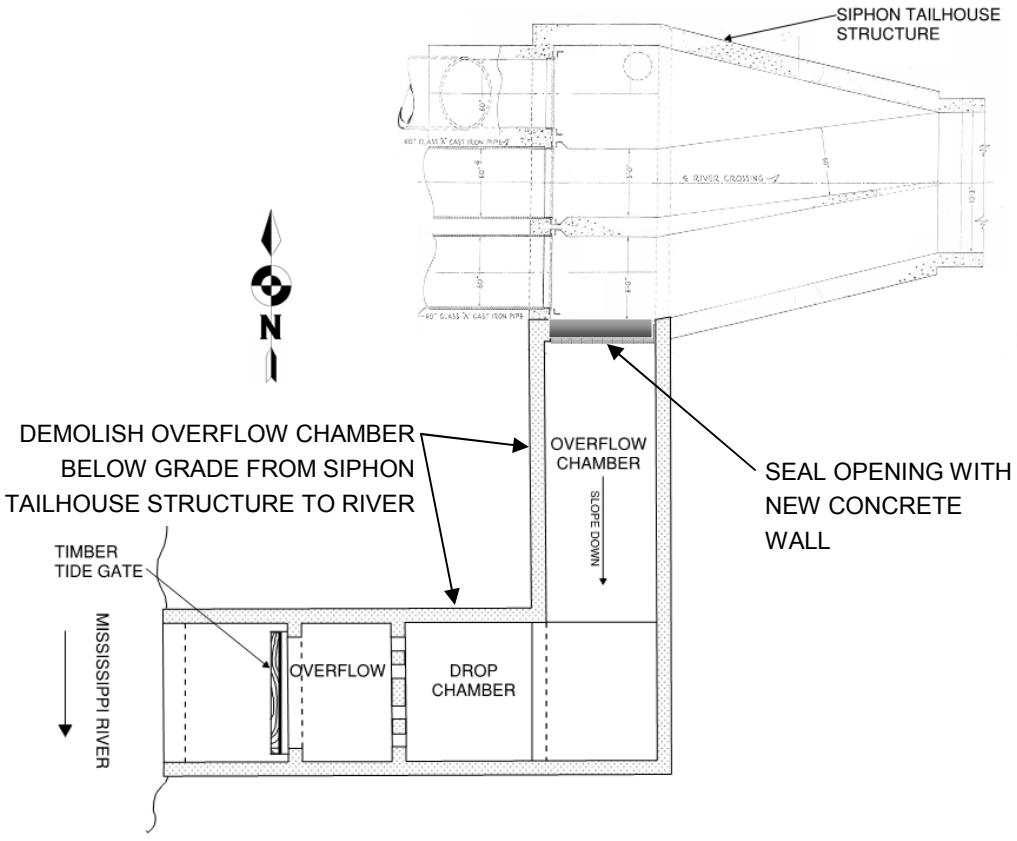

Figure 2.2-2. Siphon Tailhouse Chamber Plan View

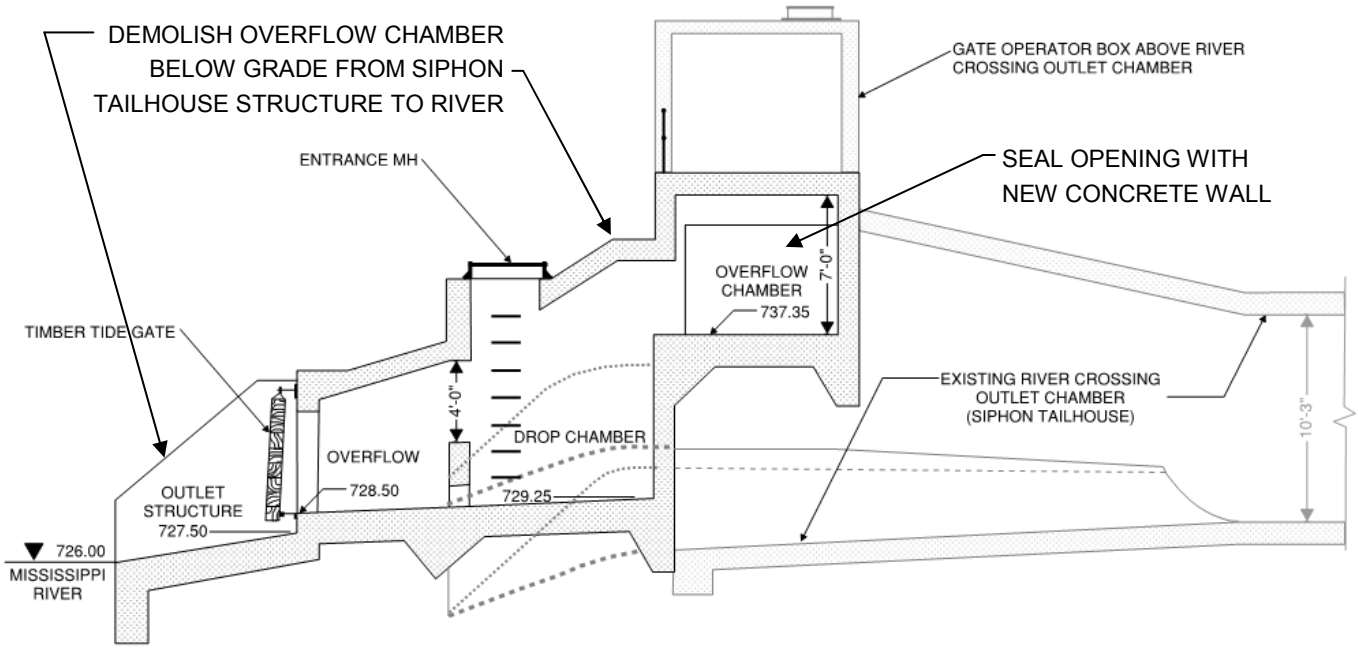

Figure 2.2-3. Siphon Tailhouse Chamber Section View I

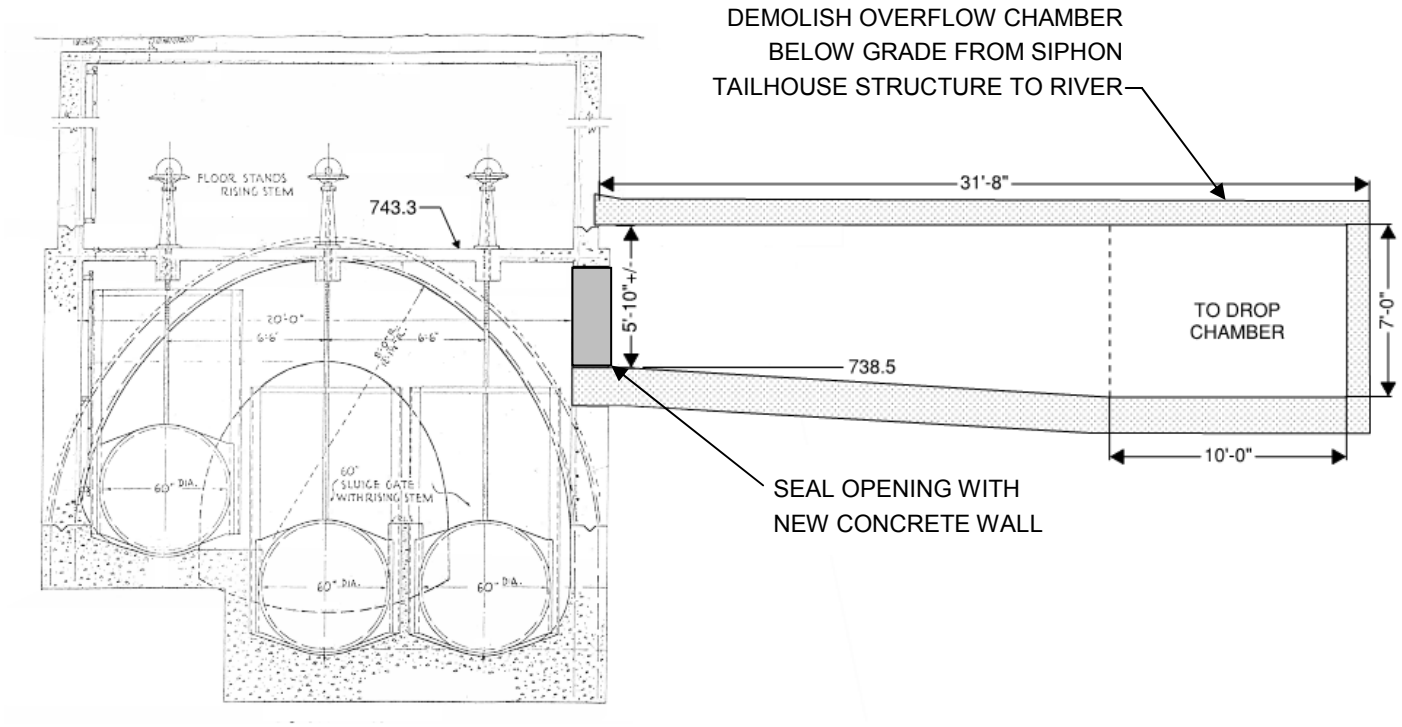

Figure 2.2-4. Siphon Tailhouse Chamber Section View II

2.2.2 Required Improvements

Emergency pressure relief facilities at this site can be eliminated based on the hydraulic analysis showing that the downstream 1-MS-100 interceptor can handle the anticipated peak flows. It is recommended that a cast-in-place concrete wall be constructed in the chamber that will prevent overflows to the river. Additional work to remove the Overflow Chamber and other faculties should be included to reduce the impact to the area and improve safety concerns. These conceptual improvements generally consist of demolition of the overflow structure to minimize potential liability to MCES. The recommended improvements are noted in Figures 2.2-2 through 2.2-4.

Table 2.2-1. Recommended Regulator R05 Improvements

No.	Description
1.	Demolish overflow structure below grade
2.	Seal overflow access with concrete bulkhead
3.	Backfill and restore river bank

2.3 R06 – Minneapolis Northwest Meters

The Minneapolis Northwest Meters Regulator (R06) is located north of E. Lake Street along W. River Parkway in the City of Minneapolis. The regulator serves the northwest portion of the Twin Cities on the 1-MN-310 Interceptor and combines downstream of this location with flows from the southwest 1-MN-340 Interceptor before crossing the Mississippi River through a 3-barrel siphon on its way to the Metropolitan WWTP. Overflows at this location are discharged to a tunnel that drains to the Mississippi River. The R06, along with the R10, facilities were improved under a design-build project in 2002. Improvements included separating the wet-side from the dry-side and improvements to the flow regulator structures and odor control. Dry-side improvements included controls, metering facilities, mechanical/hydraulic equipment, and other appurtenances. See Figure 2.3-1 for the Regulator R06 site plan.

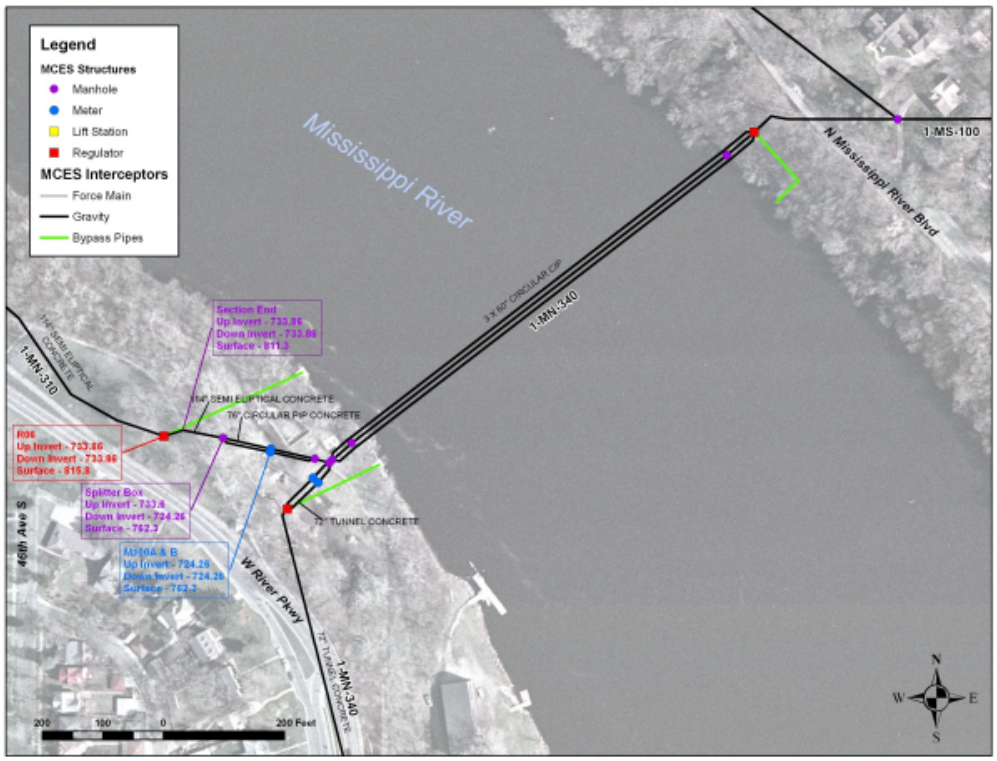

Figure 2.3-1. Regulator R06 Site Plan

2.3.1 Facility Description and Operation

The side weir type Regulator R06 is located on the 1-MN-310 Interceptor upstream of the northwest meters M100A and M100B. The Interceptor tunnel upstream has a 9.5' x 9.5' horseshoe type channel at 0.054 percent slope. Three side weir sections, each 6 ft long, separate the Interceptor tunnel and an overflow chamber that is connected to the diversion tunnel. The side weir height is 8.85 ft. See Figures 2.3-2, 2.3-3, and 2.3-4 for plan and section views for R06. If the flow depth in the Interceptor channel exceeds the weir height, the overflow is sent to the Mississippi River.

The opening above the weir is small due to the proximity of the chamber floor. The SWO gate is normally open to allow for passive relief. Consideration will be given during design to removal of one stop log in one of the three bays of the overflow weir, while keeping the SWO gate normally closed. Remote gate operation would be accomplished by SCADA modifications.

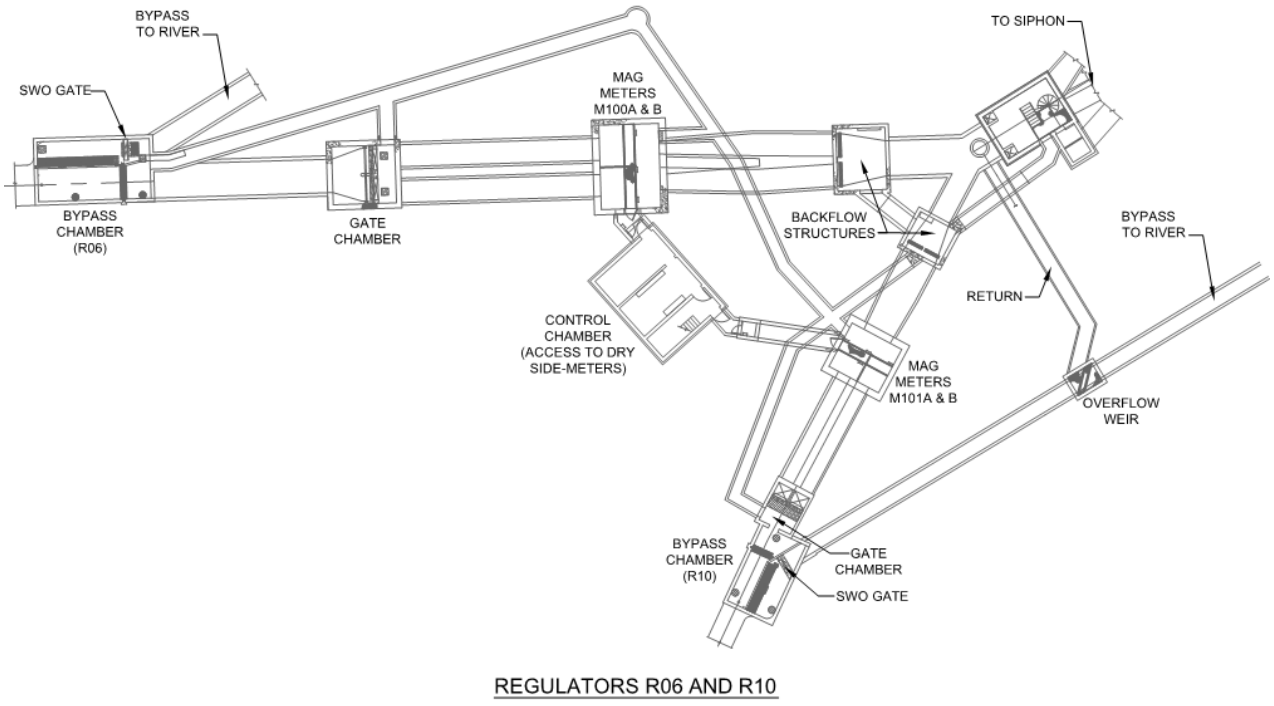

Figure 2.3-2. Minneapolis NW & SW Meters Site Plan

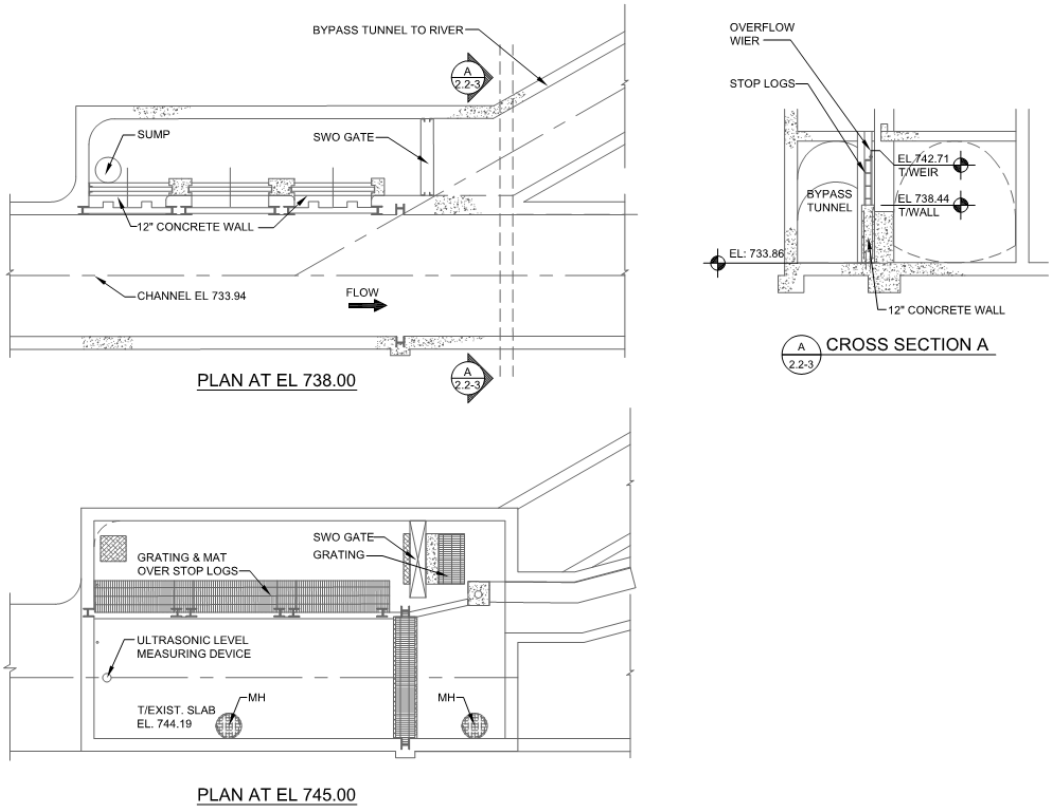

Figure 2.3-3. Regulator R06 Chamber Plan & Section Views

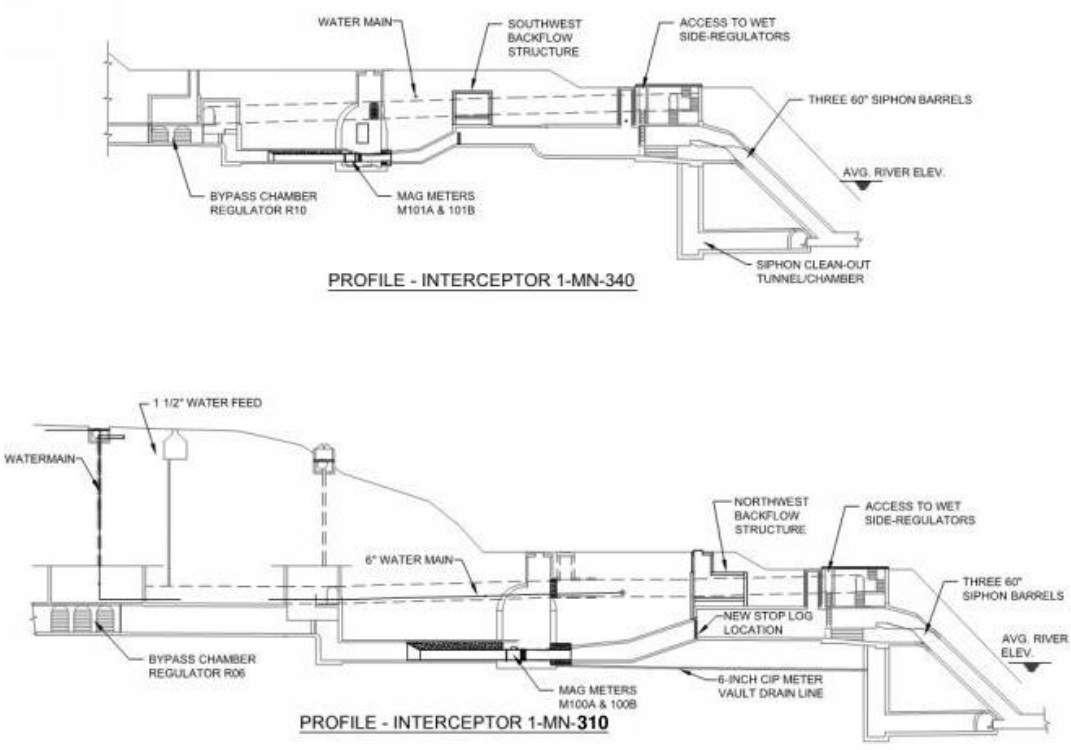

Figure 2.3-4. Regulator R06 & R10 Chamber Section Views

2.3.2 Required Improvements

SCADA modifications will be required for the remote monitoring and control system that will be used to operate the isolation gates under an emergency situation. In addition, the existing biofilter has been ineffective and expensive to operate. It is recommended that the biofilter be replaced with a carbon unit for odor control. A summary of the required and recommended improvements for Regulator R06 is included in Table 2.3-1.

Table 2.3-1. Recommended Regulator R06 Improvements

No.	Description
1.	SCADA Modifications
2.	Replace Biofilter with Carbon Filter for odor control

2.3.3 Development of Alternatives

Minimal alternatives were identified for this site since physical improvements have already been made to this site in a previous project. The existing biofilter is difficult to maintain in its current configuration due to rapid deterioration of the media and the difficulty changing the media. Alternate media was considered as well as installation of a standard carbon unit. One significant advantage of the carbon unit is the lower cost of operating the fan at lower pressures with the carbon media. The operational savings more than offsets the higher cost of the media. Therefore, replacement of the biofilter with a carbon unit is recommended. Additionally, SCADA modifications are recommended.

2.4 R07 – Portland & Washington Avenues

The Portland & Washington Avenue Regulator (R07) is located at the intersection of Portland Avenue S. and Washington Avenue S. in downtown Minneapolis. The facility is located underground and includes a sewer overflow gate system, control structure, metering systems, electrical room, carbon filter for odor control, mechanical (hydraulics) room, and other associated appurtenances. The facility was originally constructed in the 1930's. Access improvements, including new flow control sluice gates, odor control equipment and ductwork, electrical lighting, and other improvements were completed in 2007. See Figure 2.4-1 for the Regulator R07 site plan.

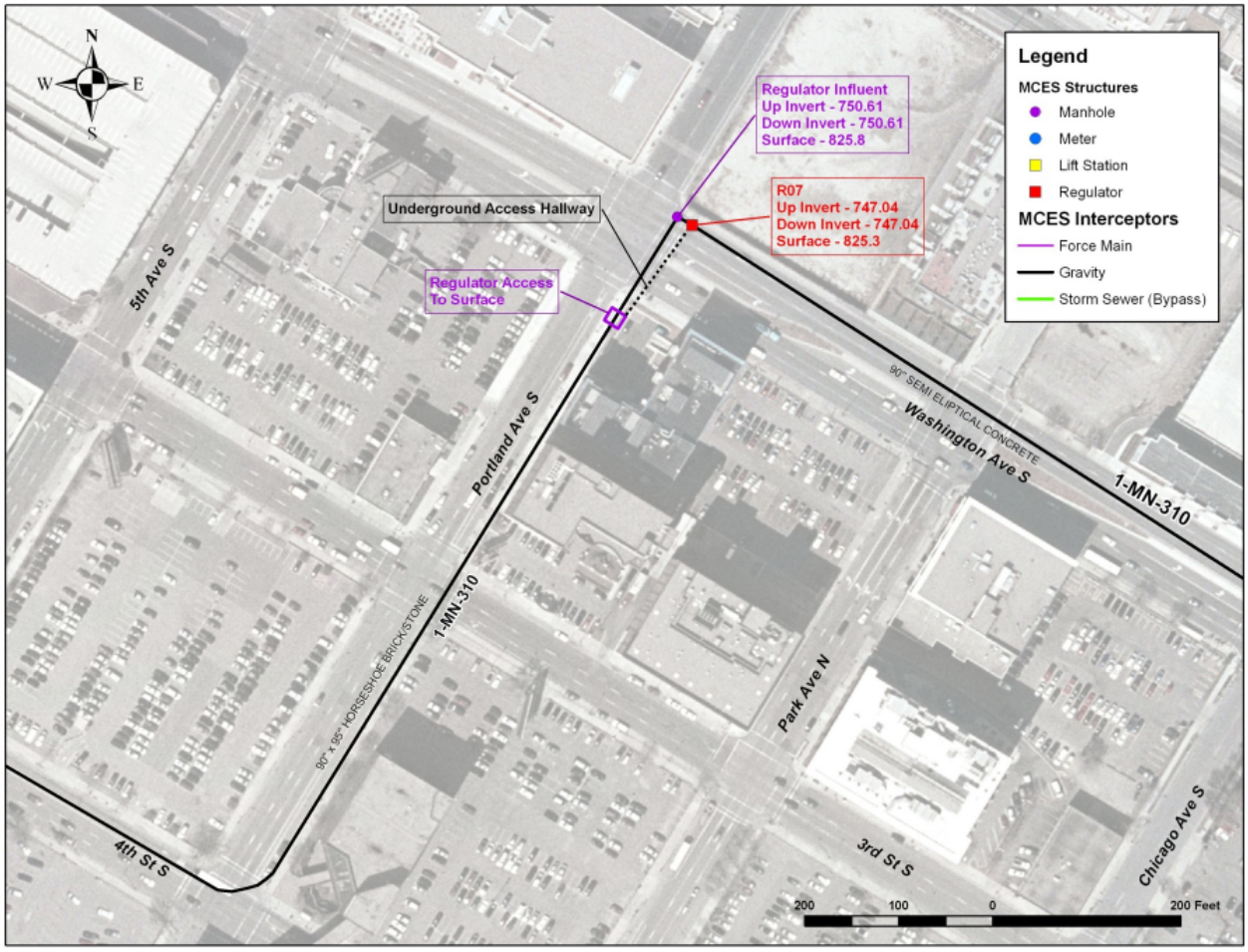

Figure 2.4-1. Regulator R07 Site Plan

2.4.1 Facility Description and Operation

The Portland & Washington Regulator is a gate type regulator on a 90-degree turn on the 1-MN-310 Interceptor that is downstream of the confluence with the 1-MN-320 Interceptor. The regulator is equipped with a level monitoring system and unique local control scheme that isolates the sanitary sewer from high storm side levels. The gate chamber includes two Dry Weather Outlet (DWO) gates and two Storm Weather Outlet (SWO) gates. Each of the DWO gates is 4' wide x 5' high. Each of the SWO gates is 3' wide x 5' high. The DWO gates direct flow to the downstream 1-MN-310 Interceptor. The SWO gates divert flows to the Minneapolis storm sewer tunnel, which has an outlet to the Mississippi River located approximately one-half mile away. The invert of the SWO gates is 3 ft above the invert of the DWO gates. Each gate can be fully open or fully closed. All gates are automatically controlled from the supervisory control system. See Figure 2.4-2 for a plan view of the R07 flow control structure. Figure 2.4-3 shows the respective section views.

The 1-MN-310 Interceptor upstream of the regulator is a horseshoe type tunnel, 7'-6" wide by 7'-11" high at 0.0909 percent slope. During normal flow, one DWO gate is open, while one is closed. As rain events start the DWO closed gate will hold back some of the flow as long as possible in an effort to

reduce the risk of an overflow event at the Minneapolis NW Meters site (R06) downstream. The lag DWO gate opens if the flow depth exceeds 5.92 ft.

If flow keeps rising, and the flow depth exceeds 7.92 ft, the lead SWO gate will open. At this point the inlet trunk sewer at the DWO gates is full. If flow keeps rising, the second SWO gate will open at 8.42 ft. They will all close sequentially with programmed delay times as flow recedes.

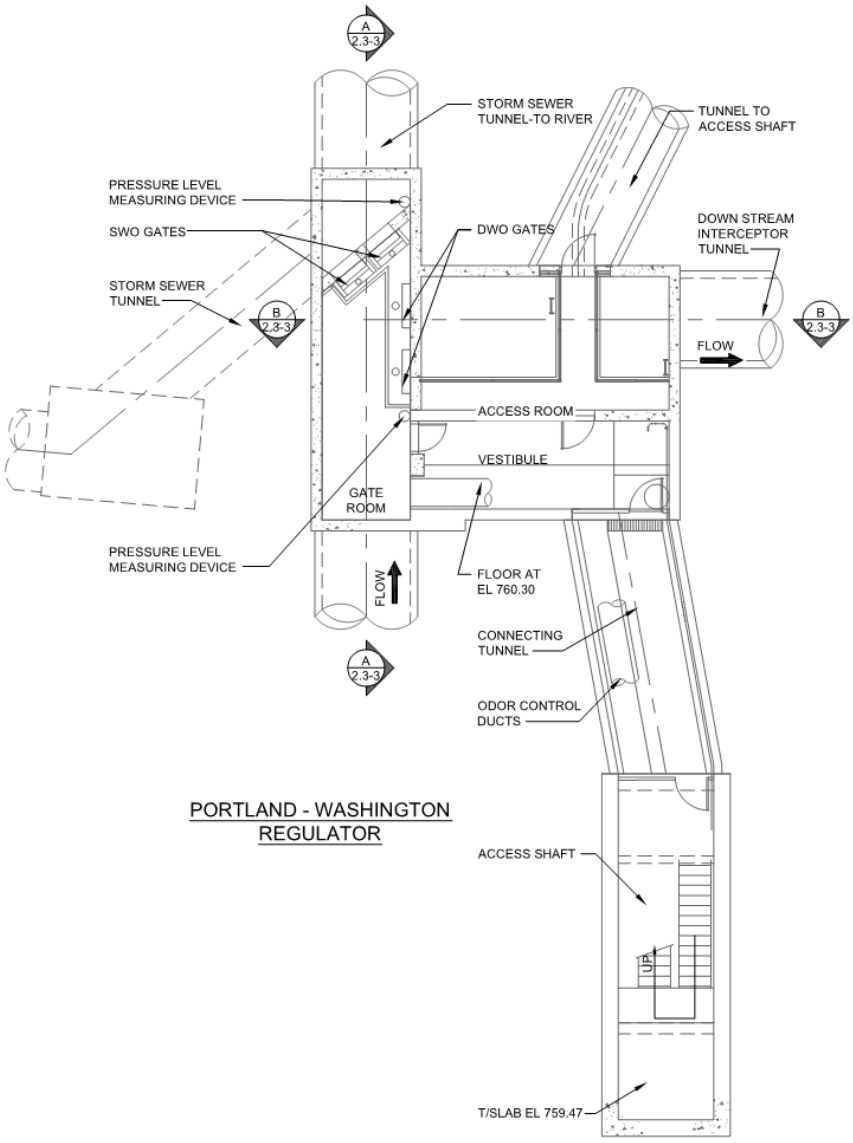

Figure 2.4-2. Regulator R07 Chamber Plan View

When the flow depth at gates is at the SWO invert (3 ft of flow depth), the correlated upstream Interceptor flow is equal to 109 CFS (70.5 MGD). In case of emergency maintenance work downstream of the regulator with the DWO gates closed, the dry weather interceptor flow up to the above rate would be diverted through the SWO gates to the bypass storm sewer.

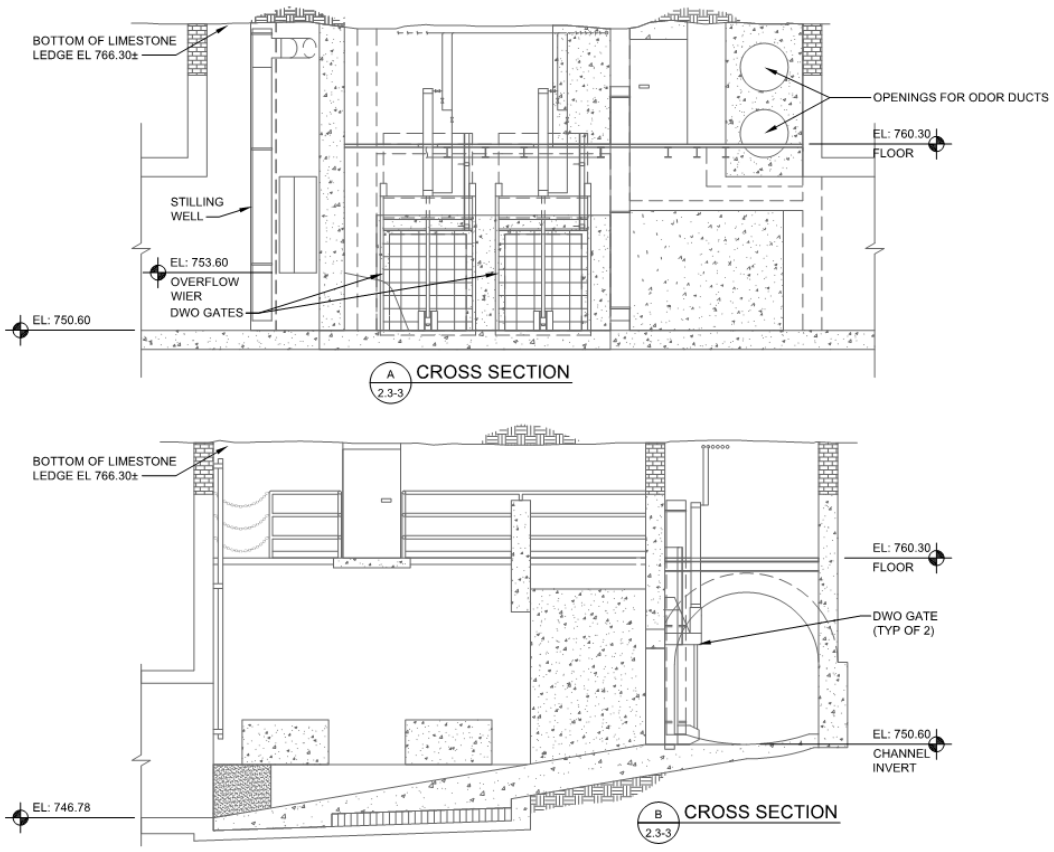

Figure 2.4-3. Regulator R07 Chamber Section Views

A new operational scheme will be developed for gate operation as part of SCADA modifications. Gate control will be available both locally and remotely. Whether the SWO gates remain programmed to open automatically, or are changed to operate only manually (either local or remote control) is a decision to be made during final design.

2.4.2 Required Improvements

Improvements that will be required are the modification of the SCADA programming that will be used to operate the isolation gates under an emergency situation. Other non-critical improvements were identified that included replacing the existing aluminum guardrails with a more corrosion resistant material, such as fiberglass, and concrete repair around the mist eliminator drain in the Odor Control Room. A corrosion resistant treatment will be added to prevent future damage. Table 2.4-1 includes a summary of the required and recommended improvements.

Table 2.4-1. Recommended Regulator R07 Improvements

No.	Description
1.	SCADA Modifications
2.	Install Fiberglass guardrails
3.	Concrete rehab and corrosion protection in the Odor Control Room

2.4.3 Development of Alternatives

Minimal alternatives were identified for this site since physical improvements have already been made to this site. Alternatives for guardrail materials included aluminum, stainless steel and fiberglass. The highly corrosive atmosphere in the wet side of this facility has already deteriorated aluminum guardrails installed only five years ago. The only material option that can withstand that atmosphere on a long-term basis is fiberglass.

2.5 R08 – East 26th Avenue & Seabury Avenue S.

The East 26th Avenue & Seabury Avenue S. Regulator R08 is located just west of W. River Parkway, at the intersection of East 26th Avenue and Seabury Avenue S. in Minneapolis. The regulator is located on the downstream end of 1-MN-330 Interceptor. See Figure 2.5-1 for a site plan of the R08 location.

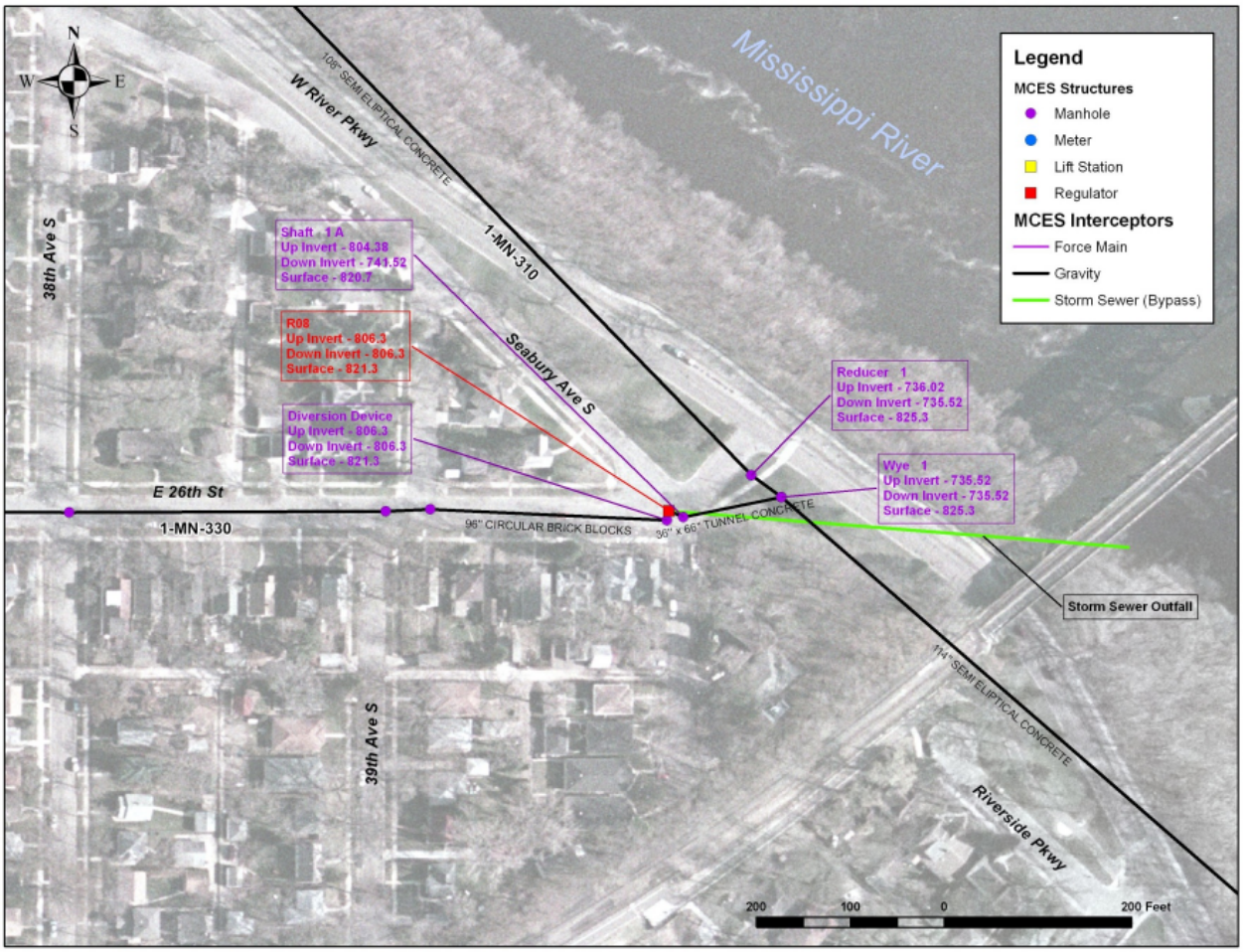

Figure 2.5-1. Regulator R08 Site Plan

2.5.1 Facility Description and Operation

The 1-MN-330 Interceptor's 8-foot circular brick trunk sewer is at 0.25 percent slope, has a concrete overflow weir that is 4 ft high, diverting flow to the regulator orifice which is 48" wide by 28" high. Normal sanitary flow turns a 90 degree corner at the regulator chamber and goes through the orifice gate to a 36-inch diameter pipe that conveys flow through a drop shaft to the 1-MN-310 Interceptor.

Peak flows at the regulator chamber overtop the weir and are conveyed by the storm sewer system to the Mississippi River. See Figure 2.5-2 and 2.5-3 for plan, sections and details of this structure.

Normally, the regulator channel flows partially full. If the interceptor flow rises and its depth at the weir exceeds 20" (1.67 ft), the regulator channel flows full. Starting at a flow depth in the trunk sewer of approximately 5.5 ft, the downstream 36-inch pipe flows full. When the depth in the trunk sewer exceeds 6 ft, wastewater overflows the weir and is conveyed to the storm sewer.

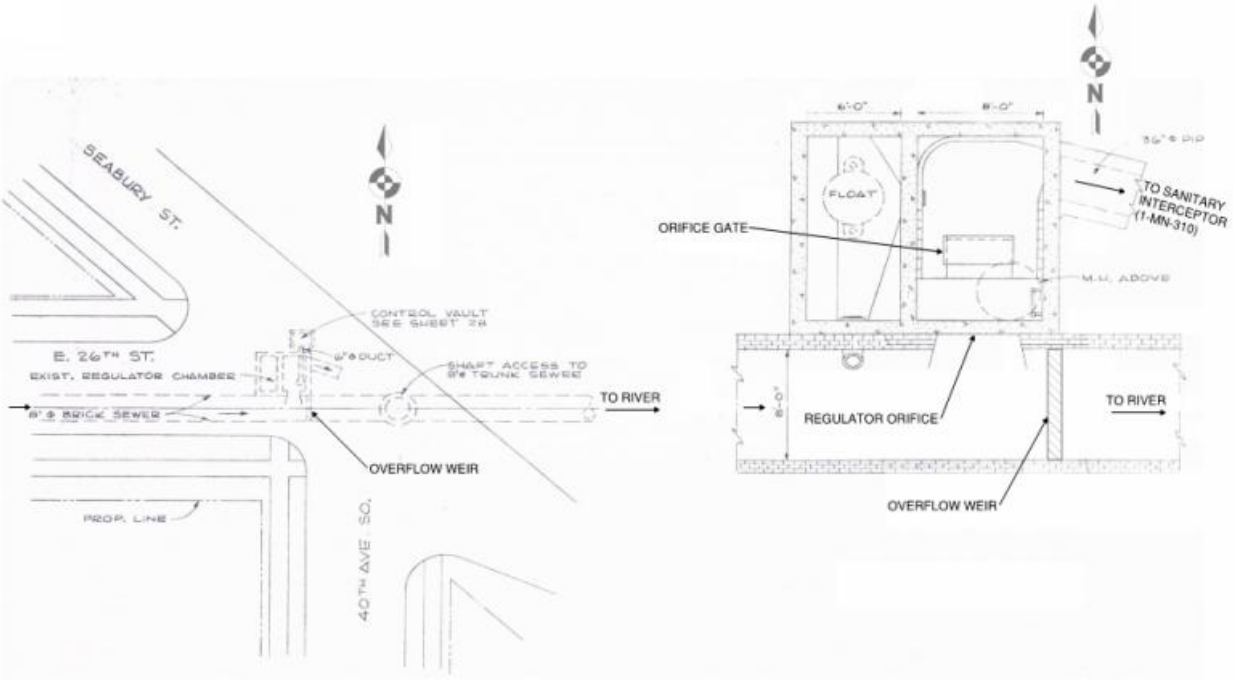

Figure 2.5-2. Regulator R08 Chamber Plan Views

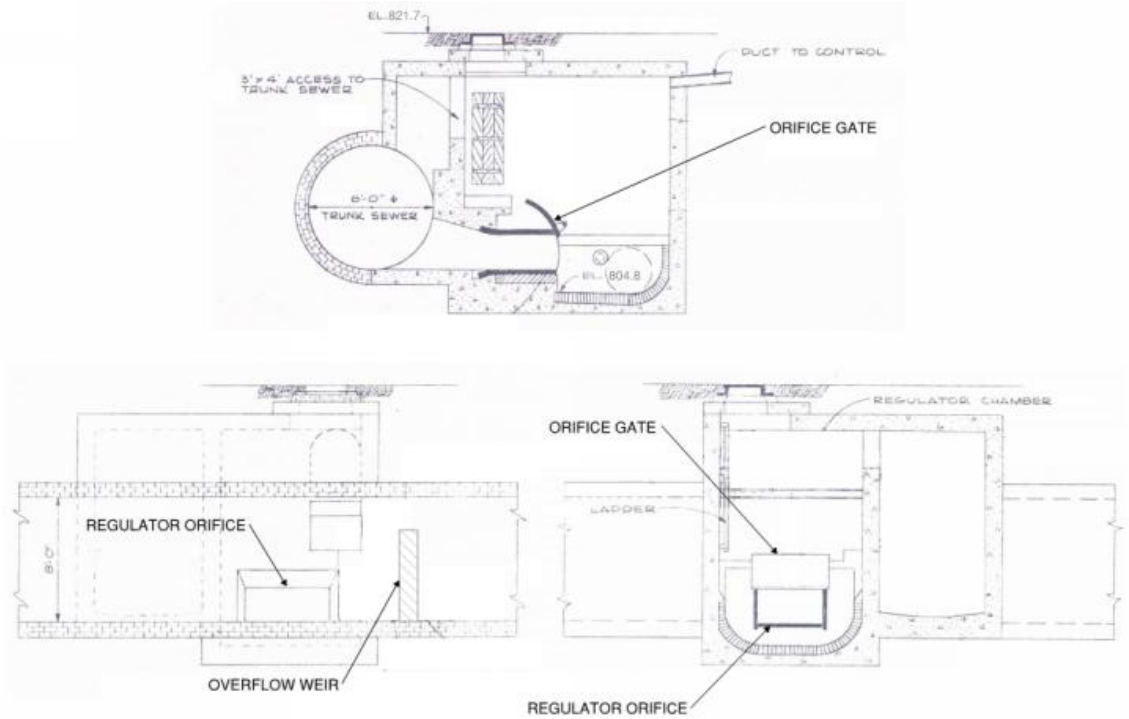

Figure 2.5-3. Regulator R08 Chamber Section Views

2.5.2 Required Improvements

The only separation between the sanitary sewer and the storm sewer at R08 is the overflow weir. Improvements will be necessary to change the outlet to an emergency relief facility with isolation sluice gates. Interceptor sewer level is measured at this location with a bubbler system, so any quantity of sewage that overflows to the storm sewer system can be calculated using the gate opening size and the level measurement for the time that the gate is open. Figure 2.5-4 on the following page shows the proposed improvements to the Regulator R08 facility. Table 2.5-1 provides a listing of recommended improvements.

Table 2.5-1. Recommended Regulator R08 Improvements

No.	Description
1.	Seal existing orifice gate; partial demo of regulator structure; remove weir
2.	Build new regulator structure with sluice gates for isolation
3.	Install flow monitoring
4.	Install ventilation to protect personnel and equipment
5.	SCADA Modifications to allow remote gate operation
6.	Construct new channel through old regulator to downstream pipe

2.5.3 Development of Alternatives

Several alternatives were considered for improving Regulator R08 that have been determined to be too costly and inadequate to improve functionality of the facility, including rehabilitation of existing structure and retrofitting existing structure with new gates.

Extensive demolition of the existing structure would be necessary to install two gates to the interceptor. Two gates are necessary to facilitate maintenance: regular exercise of the gates without danger of spilling if the gate malfunctioned in the closed position. That is, at low flow one gate can be opened and closed without interrupting the flow. The second gate can subsequently be exercised, again without interrupting the flow. If a single gate was to be installed and it malfunctioned while closed during exercising operations, an emergency situation would be created since the normal flow through the sewer would be prevented.

A new gate to the downstream storm sewer would also involve extensive demolition and construction attaching to the old weir wall. Because of the numerous difficulties identified with trying to rehabilitate and retrofit the existing regulator, the most feasible alternative is to construct a new regulator immediately upstream of the existing regulator.

To accomplish the recommended improvements, wastewater will need to be diverted around the existing and proposed structures. A MH approximately one block west of the regulator site will be utilized for diversion pumping. Another MH, between the regulator and the one a block to the west, will need to be constructed in order to facilitate diversion pumping. At that location a plug would be inserted to stop the flow, and back it up to the MH to the west. After diversion pumping is complete, the opening cut into the pipe will be repaired by the construction of a new maintenance structure. In addition, the top of the MH to the west that will serve as a suction tub will need to be reconstructed. The new regulator may be nearly complete prior to beginning diversion pumping, minimizing one large cost component for this type of project.

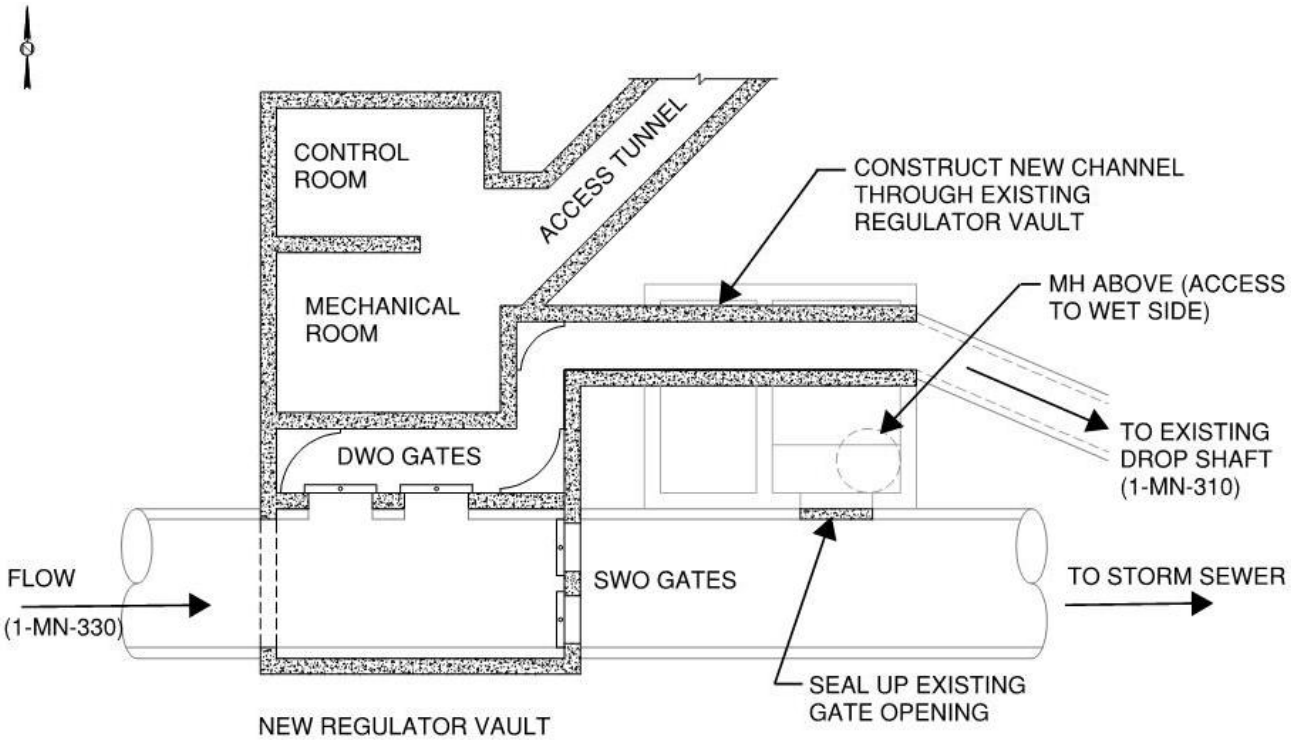

Figure 2.5-4. Conceptual Recommended Improvements at Regulator R08

2.6 R10 – Minneapolis Southwest Meters

The Minneapolis Southwest Meters Regulator (R10) is located north of E. Lake Street along W. River Parkway in the City of Minneapolis. The regulator serves the southwest portion of the Twin Cities on the 1-MN-340 Interceptor and combines downstream of this location with flows from the northwest 1-MN-310 Interceptor before crossing the Mississippi River through a 3-barrel siphon on its way to the Metropolitan WWTP. Overflows at this location are discharged to a diversion system that drains to the Mississippi River. Renovations to the R10, and, facilities were completed in 2002 under a design-build project. Improvements included separating the wet-side tunnel system from the dry-side, improving flow regulator structures, controls, metering facilities, mechanical/hydraulic equipment, and other appurtenances. See Figure 2.6-1 for the Regulator R10 vicinity plan.

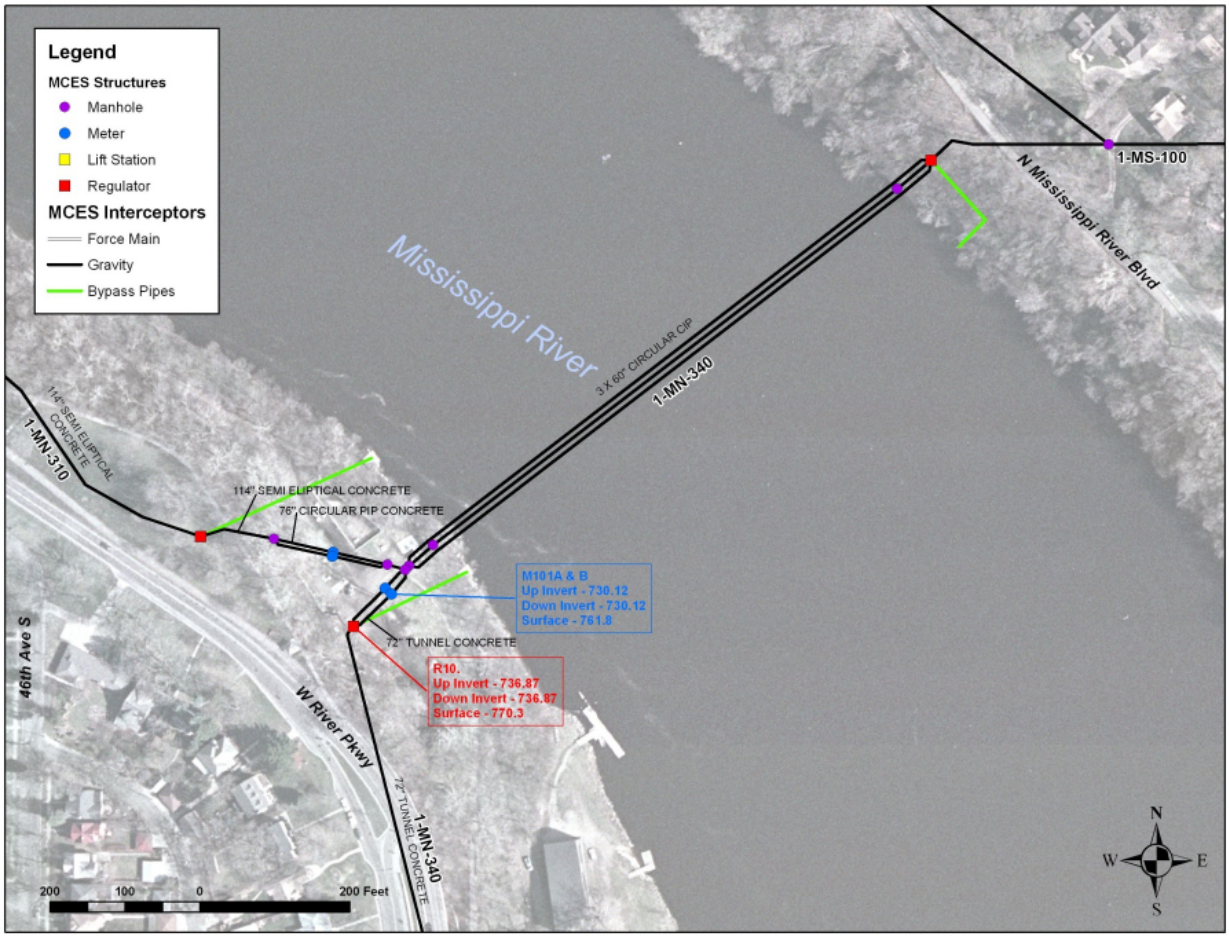

Figure 2.6-1. Regulator R10 Vicinity Plan

2.6.1 Facility Description and Operation

The Regulator R10 is located upstream of southwest Meters M101A and M101B on the 1-MN-340 Interceptor. The upstream interceptor is a 6 ft x 6 ft horseshoe type pipe at 0.0711 percent slope. The regulator chamber is separated from the wastewater flow by a side weir with two sections: 6'-3" and 6'-0" long. The weir height is equal to 5.51' (66.1"). See Figures 2.3-4, 2.6-2 and 2.6-3 for plan and section views of Regulator R10.

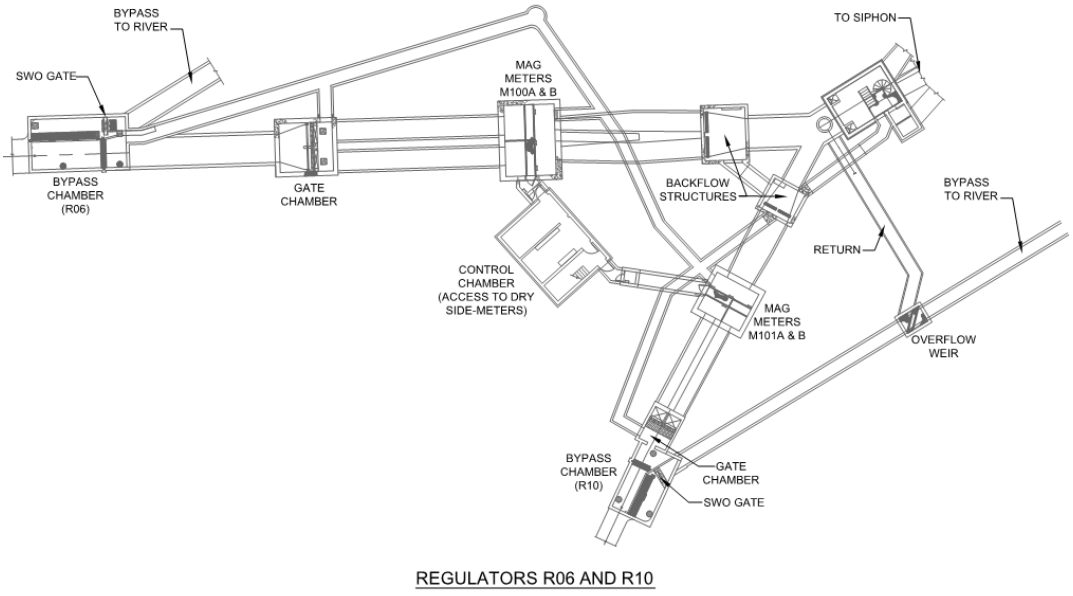

Figure 2.6-2. Regulator R10 Chamber Plan View

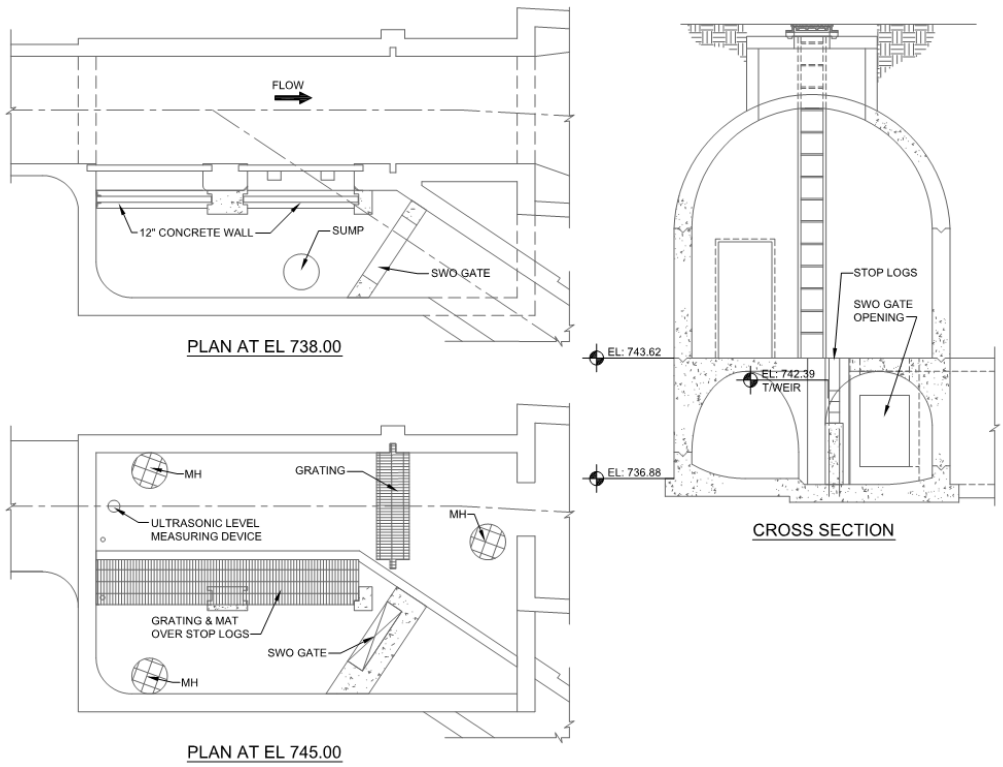

Figure 2.6-3. Regulator R10 Chamber Section Views

If the flow depth at the meter gates exceeds the weir height, the overflow on both sections starts, however, flow is not immediately diverted to the Mississippi River. The flow over the two side weirs is directed through the diversion tunnel that connects with a 48" diameter concrete pipe connected to the Lake Street Siphon Headhouse. An overflow weir (stop logs) at the maintenance hole where the 48" pipe connects to the diversion tunnel is set at elevation 742.53, which is the top of the stop logs. If the flow does not exceed that elevation, it is redirected back into the interceptor, just upstream of the siphon inlet. That flow is not measured by meters M101A and M101B. The overflow volume may be computed using the water elevation measurement at the overflow weir and the time that it exceeds the weir elevation.

Figure 2.6-4. Additional odor control will reduce humidity and corrosion in the tunnels

The opening above the weir is small due to the proximity of the chamber floor. The SWO gate is normally open to allow for passive relief. Consideration will be given during design to removal of one stop log in one of the two bays of the overflow weir, while keeping the SWO gate normally closed. Remote gate operation would be accomplished by SCADA improvements.

2.6.2 Required Improvements

Improvements that will be required include the installation of a SCADA/remote monitoring and control system that will be used to operate the isolation gates under an emergency situation and installation of an odor control system. Odor control was installed for the Northwest Meters (R06) as part of the last improvements project but a second system that was planned for the R10 facilities was never installed. Odor control will reduce humidity and corrosion and the escape of fugitive odors. A carbon unit is recommended. Table 2.6-1 provides a listing of the recommended improvements to Regulator R10.

Table 2.6-1. Recommended Regulator R10 Improvements

No.	Description
1.	SCADA Modifications
2.	Add carbon unit for odor control

2.6.3 Development of Alternatives

Minimal alternatives were identified for this site since physical improvements have already been made to this site. Improvements to the existing controls for remote monitoring and operation, consisting of programming the existing PLC, are recommended. The second recommended alternative, a second odor control system, will improve the atmosphere in the south west tunnels, reducing corrosion, and reduce the release of fugitive odors from the facility.

2.7 R12 – Minneapolis East Meters

The Minneapolis East Meters Regulator (R12) is located on the 1-MN-300 Interceptor on the east side of the Mississippi River at the intersection of East River Terrace and Emerald Street SE, which is just north of the E. Lake Street/Marshall Avenue Bridge and siphon river crossing. Recent improvements to this facility were completed to provide better and safer access to the regulators, meters, and other facilities. A network of walking tunnels exists at this location, which were used to visit the equipment. Figure 2.7-1 shows the R12 site plan.

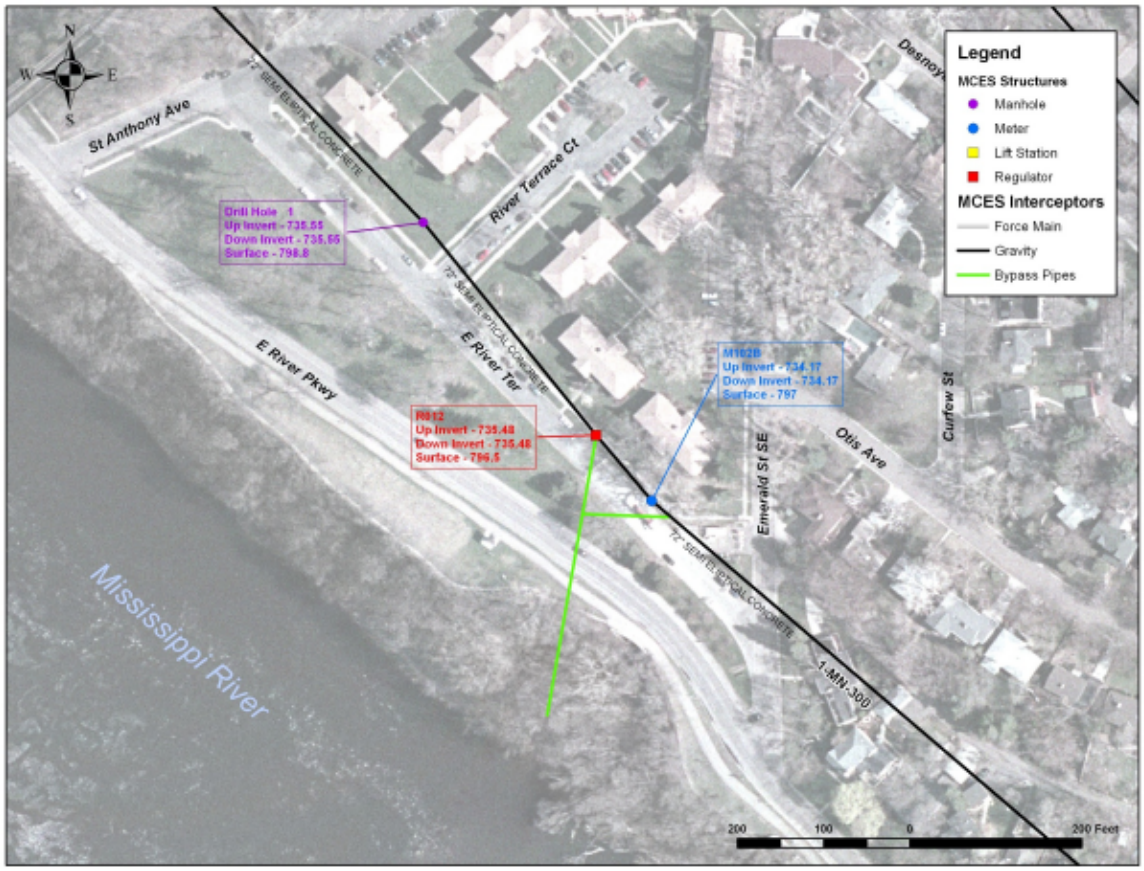

Figure 2.7-1. Regulator R12 Site Plan

2.7.1 Facility Description and Operation

The Regulator R12 is located on the 1-MN-300 Interceptor upstream of the East Meters M102A and M102B. The upstream interceptor is a 6' x 6' horseshoe type channel at 0.095 percent slope. The regulator includes a chamber with the side weir in two sections, 6 ft long and 5.5 ft (66") high each. The regulator chamber is connected to a tunnel that directs overflow to the River. See Figures 2.7-2 and 2.7-3 for plan and section views of Regulator R12.

In 2007 a capacity restoration tunnel was constructed to divert flow around the flow constriction at the meters. A side weir 9 feet wide and 37 inches high separates the meter capacity restoration tunnel entrance from the interceptor sewer. This allows the full capacity of the upstream and downstream interceptor to be fully utilized without overflows.

The meters nominal flow capacity is estimated at 30 MGD (46.7 CFS) with both meters on line. The correlated flow depth in the Interceptor tunnel upstream is 2.25 ft. When the flow depth at the meter gates exceeds 37", the overflow to the meter diversion begins. At this point the flow through the meter structure is about 35 MGD.

When the flow depth at the gates reaches 5.5ft (66"), the overflow to the river begins in addition to the meter diversion tunnel overflow. At this point the flow diverted around the meters reaches about 71 MGD, in addition to the 35 MGD flow through the meters.

In most high flow events the diversion tunnel combined with two open meter gates, provide enough flow capacity to avoid overflow to the river.

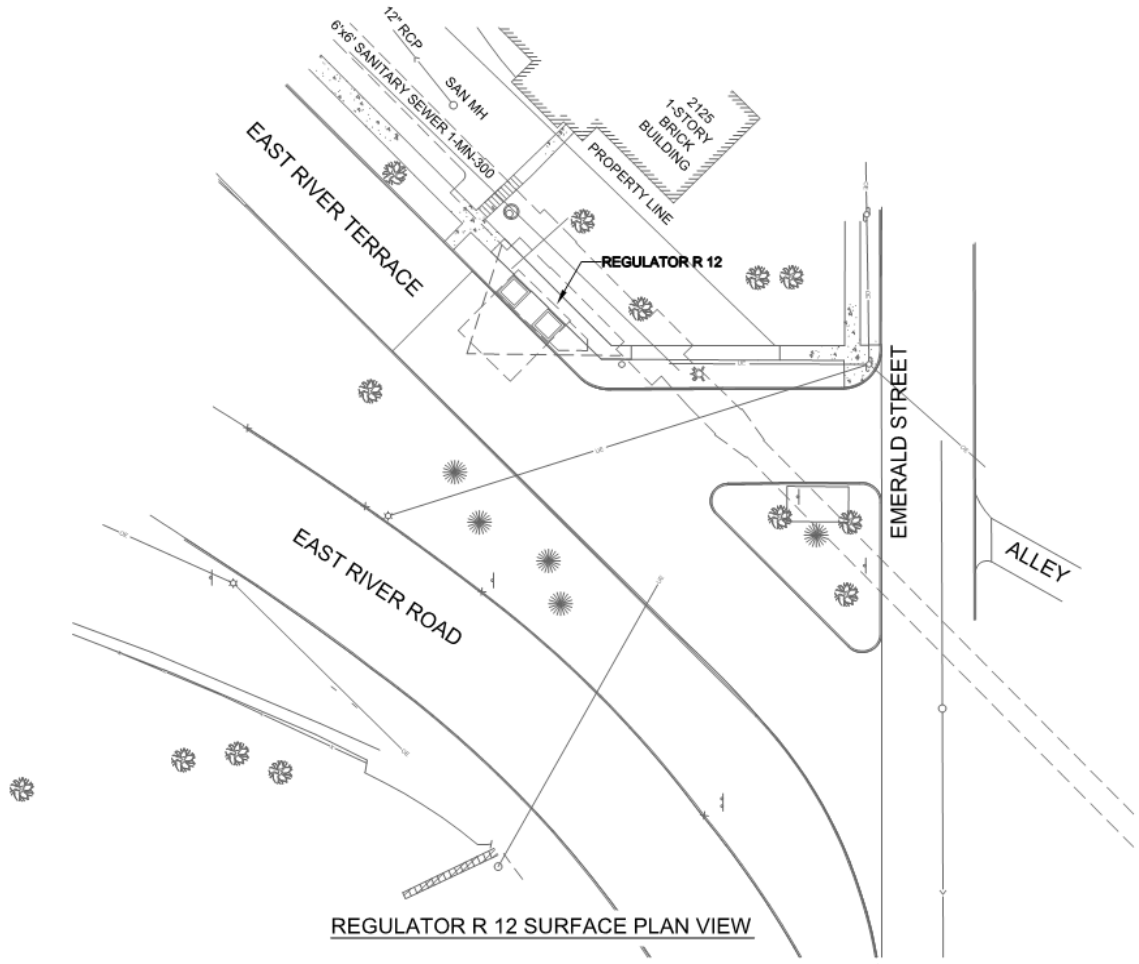

Figure 2.7-2. Regulator R12 Site Plan

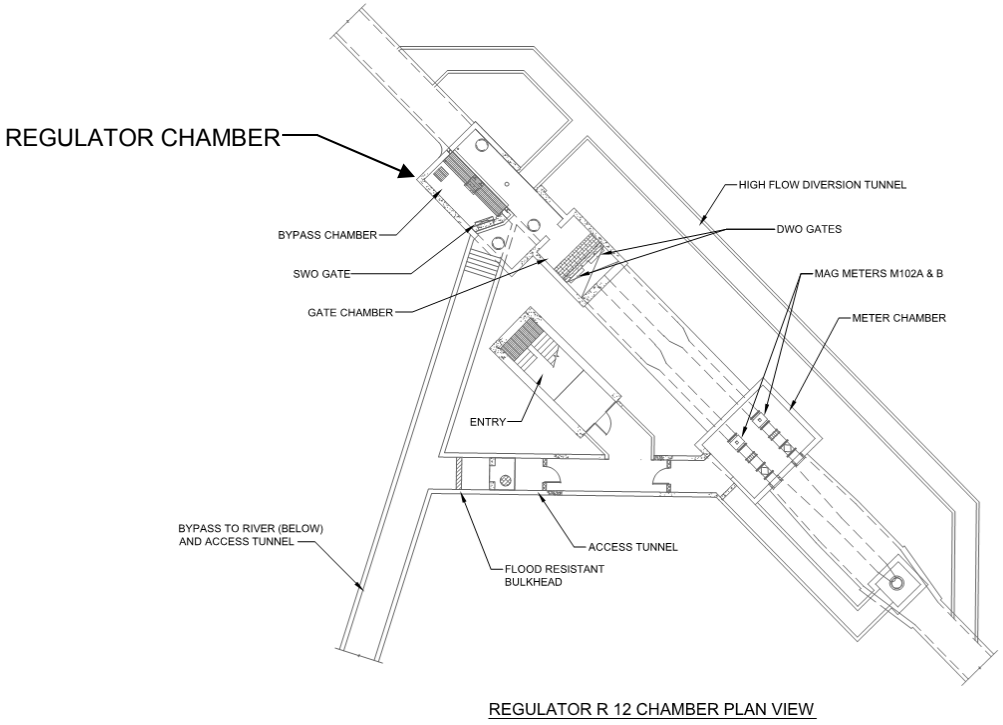

Figure 2.7-3. Regulator R12 Tunnel System Plan View

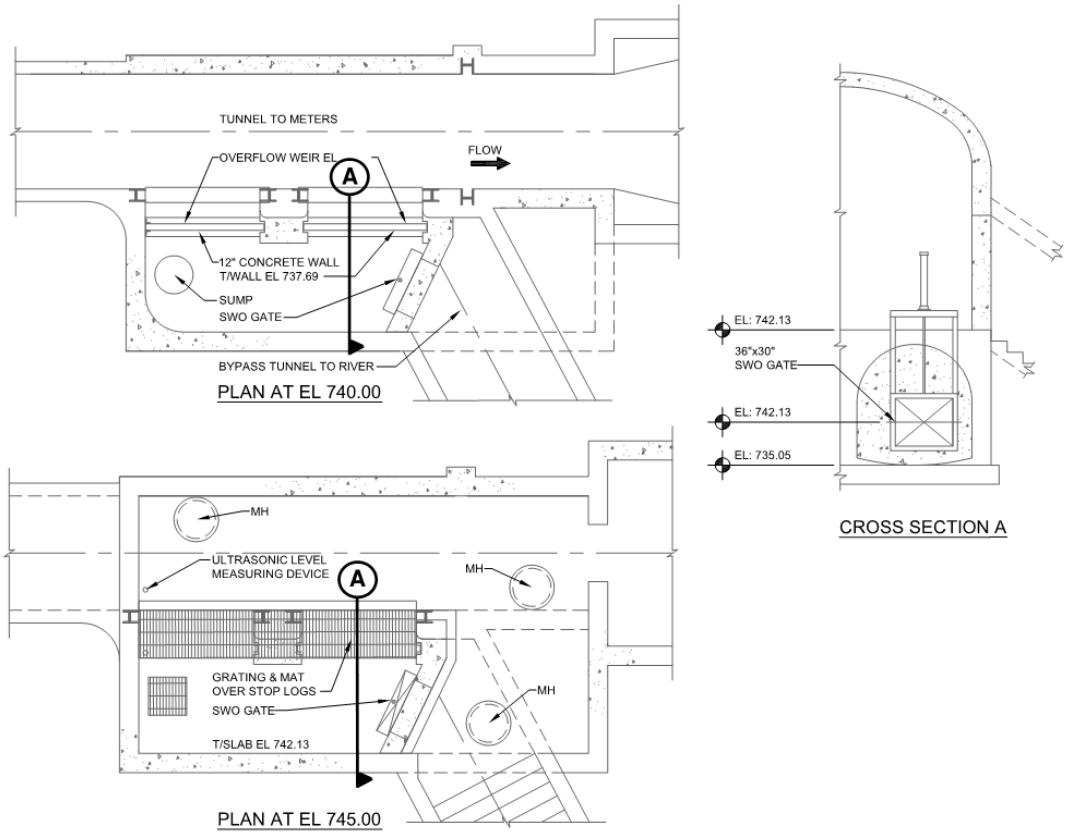

Figure 2.7-4. Regulator R12 Chamber Plan & Section Views

2.7.2 Required Improvements

The only improvements that will be required are the installation of a SCADA/remote monitoring and control system that will be used to operate the isolation gates under an emergency situation. Table 2.7-1 provides a listing of the recommended improvements.

Table 2.7-1. Recommended Regulator R12 Improvements

No.	Description
1.	SCADA Modifications

2.7.3 Development of Alternatives

Minimal alternatives were identified for this site since physical improvements have already been made to this site. The only work that is required is improvements to the existing controls for remote monitoring and operation.

2.8 Rehabilitation of 1-MN-344

2.8.1 Facility Description and Operation

1-MN-344 conveys sewage from the Morningside neighborhood of Edina through southwest Minneapolis to 1-MN-340 near Minnehaha Park and ultimately to the Metropolitan Wastewater Treatment Plant. The far upstream segment of the interceptor consists of 9, 12, 15, 18, 20, 21, 22, and 24-inch diameter vitrified clay pipe (VCP). The last 2,291 feet of pipe upstream of 1-MN-345 consists of lined 24-inch and 33-inch pipe, and a short stretch of unlined 40-inch RCP. Table 2.8-1 summarizes the various sizes of pipe between MH 171 and the confluence at MH 73:

Table 2.8-1. 1-MN-344 Pipe Segments

Shape	Dimension	Length in Feet	Year Built	Material
Circular	9 in	662.5	1930	Vitrified Clay Pipe (VCP)
Circular	12 in	646.8	1930	Vitrified Clay Pipe (VCP)
Circular	15 in	971.3	1930	Vitrified Clay Pipe (VCP)
Circular	18 in	499.7	1961, 63	RCP
Circular	18 in	159.4	1930	Vitrified Clay Pipe (VCP)
Circular	20 in	691.6	1930	Vitrified Clay Pipe (VCP)
Circular	21 in	774.3	1940	Vitrified Clay Pipe (VCP)
Circular	22 in	513.0	1929	Vitrified Clay Pipe (VCP)
Circular	24 in	6,917.4	1928, 29, 57	Vitrified Clay Pipe (VCP)
Circular	24 in	1,284.2	1928	VCP with 15mm Liner
Circular	33 in	950.8	1928	VCP with 18mm Liner
Circular	40 in	56.0	1928	RCP with Brick Invert
	Total Length	14,127		

2.8.2 Required Improvements

Much of this pipe is cracked and in need of replacement or structural lining to prevent potential collapse and to eliminate infiltration through the cracks. A segment of 24" and 33-inch pipe, just upstream of the confluence with 1-MN-345, has been lined previously; however the liner is in poor condition and displays leaking at the manholes. It is recommended that even these pipe segments be re-lined. The 40-inch diameter RCP will be the last reach of pipe to be lined.

From MH 73 to Regulator R04 the pipe is generally in acceptable condition; not in need of rehabilitation. There are however a number of leaky joints that will require repair. In addition, some maintenance structures that were previously abandoned and sealed are experiencing infiltration. Those structures will be rehabilitated to prevent further infiltration.

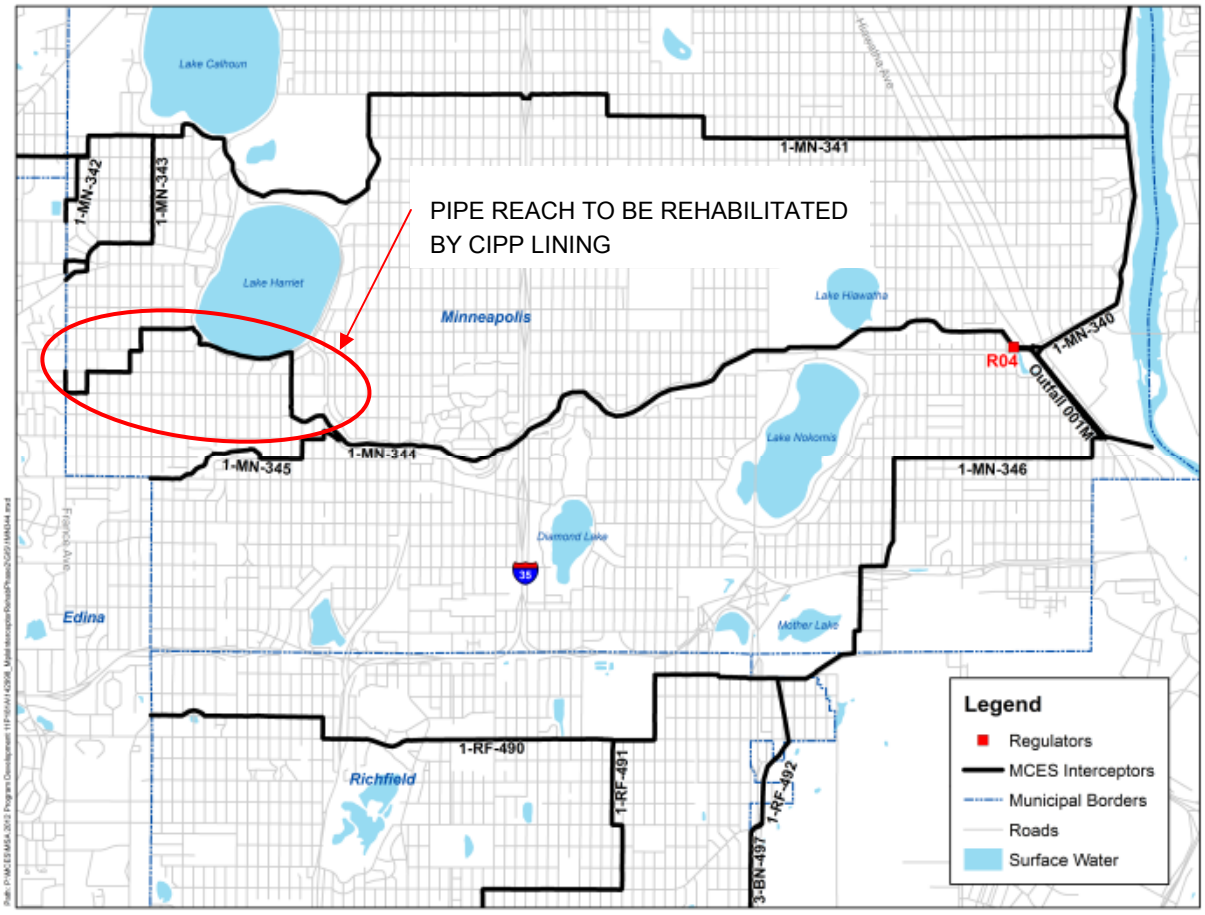

Figure 2.8-1. Map of Interceptor 1-MN-344

In conjunction with the rehabilitation of the upper 14,000 feet of 1-MN-344, some MH rehabilitation will be required. It is not known the extent of the damage to the MH's, nor how many will require rehab. For the purposes of this facility plan, and to reserve capital funding for this necessary portion of the work, it is assumed that 20% of the maintenance holes (MHs) will require minor rehabilitation. Minor repairs might consist of replacement of concrete rings, castings and/or covers, installation of chimney seals, etc. Major repairs might involve removal and replacement of the cone section as well as the frame and casting. Another major repair may be insertion and grouting of a fiberglass liner inside a badly corroded MH. It is assumed that 10% of the 100 MHs along the 14,000 feet of pipe to be rehabilitated will require

major rehabilitation. Finally, it is assumed that 5% of the MHs will require full removal and replacement. Polymer mortar concrete or fiberglass manholes have been utilized extensively by MCES on recent projects for MH replacements.

2.8.3 Development of Alternatives

Two repair options were considered: replace or CIPP lining. The segments of pipe that are listed in Table 2.8-1 are generally in alignment and not sagged. In addition, capacity is not an issue for this interceptor, so the pipe size does not need to be increased to maintain the desired level of service. Based on those criteria, CIPP lining is more cost effective than pipe replacement.

Many MH rehabilitation methods are in practice today and all will be considered during final design. The condition of the existing structure, surrounding soils, surface conditions and other factors are considered when selecting a rehab method. Most of the MH's in the pipe rehab reach are over 80 years old and are in the street. If a MH in the street fails, usually immediate repairs are undertaken. If no damage is conspicuous, damage to these MH's is usually at the street level – cracked frames, deteriorated leveling rings, I/I at the bottom of the frame, etc.

Repair of pipe joints can be accomplished by spot repair by grouting or by installation of internal seals. Either method is acceptable and similar in cost. A final determination of repair method will be made during final design.

Table 2.8-1. Recommended Rehabilitation of 1-MN-344

No.	Description
1.	CIPP liner from upper end to confluence with 1-MN-345
2.	Rehabilitate or replace up to 35% of MH structures
3.	Repair leaky pipe joints and previously abandoned MH's

Section 3
Evaluation of Project Alternatives

Section 3 of this facility plan is intended to evaluate the alternatives previously identified to develop both economic and non-economic considerations.

3.1 R04 – 39th Avenue S. & E. Minnehaha Parkway

Improvements to the 39th Avenue South & East Minnehaha Parkway Regulator (R04) are proposed to include the construction of a new regulator vault and associated tunnel crossing under Minnehaha Creek, Hiawatha Avenue, and the Hiawatha Line (light rail). Closing the overflow to the storm sewer will require removal of the top of the interceptor pipe and reconfiguring the top of the weir. Construction of new control gates to the sanitary sewer will be constructed inside a new vault. An expanded regulator vault will be constructed to house gate equipment as well as an HVAC unit, MCC's for the gates and other equipment, and control and telemetry equipment. Figure 2.1-7 shows the preliminary layout of the proposed improvements at Regulator R04. The proposed underground vault for mechanical and electrical equipment is to be located adjacent to the gate chamber, but with separate entrances – one to the dry side and one to the wet side.

The 3' x 6' sandstone tunnel between the drop shaft and the confluence with 1-MN-340 is in poor condition. The tunnel was last inspected in 1998 and the concrete was found to be severely corroded.

3.1.1 Evaluation of Alternatives

An evaluation of the hydraulics of the downstream facilities was conducted for preliminary sizing of the proposed tunnel segment. If the new R04 allows all of the flow to pass without restriction, a five foot diameter pipe is adequate. However, after the confluence with 1-MN-340, the downstream pipe would be surcharged to an extent not previously experienced. The model shows a surcharge of approximately two feet under a 10-year, 6-hour event with the current configuration. With unrestricted flow from the regulator that surcharge jumps to approximately 13 feet. Therefore, the new regulator outlet gates should be configured to replicate the existing gate capacity.

3.1.2 Estimated Capital Cost

The estimated Capital Cost for the identified Regulator R04 improvements is provided in Table 3.1-1 on the following page.

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Table 3.1-1. Preliminary Capital Cost for Recommended R04 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$188,000	$188,000
2	Site Preparation	1	LS	$20,000	$20,000
3	Partial demolition of regulator structure	1	LS	$30,000	$30,000
4	Dewatering	1	LS	$80,000	$80,000
5	Temporary Wastewater Diversion Pumping	1	LS	$100,000	$100,000
6	New Regulator - structure & gates	1	LS	$100,000	$100,000
7	New 48" pipe - Vault to Drop Shaft	20	LF	$ 300	$6,000
8	6' Diameter Drop Shaft	40	VLF	$1,500	$60,000
9	Mech, Elect, Instr. and Communication Equip	1	LS	$200,000	$200,000
10	2-Pass Tunnel, 60" finished inside diameter	1260	LF	$2,000	$2,520,000
11	10' Diameter Access Shaft	50	VLF	$2,500	$125,000
12	Demo Flume; abandon / fill pipe across creek	130	LF	$200	$26,000
13	Abandon / fill tunnel	800	LF	$300	$240,000
14	Restoration and Cleanup	1	LS	$75,000	$75,000
	Subtotal A				$3,770,000
	Undeveloped Design Details (30% of Subtotal A)				$1,131,000
	Contingency (20% of Subtotal A)				$754,000
	Subtotal B				$5,655,000
	Engineering, Admin & Legal (20% of Subtotal B)				$1,131,000
	Total Preliminary Opinion of Probably Capital Cost (OPCC)				$6,786,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.2 R05 – Lake Street Siphon Tailhouse

Regulator R05 can be eliminated based on the hydraulic analysis that shows that the downstream 1-MS-100 interceptor can handle the anticipated peak flows. It is recommended that a cast-in-place concrete bulkhead be constructed in the chamber that will prevent flows from bypassing to the river. Additional work to remove the Overflow Chamber and other facilities will be included to reduce the impact to the area and improve safety concerns. These conceptual improvements are shown in Figure 3.2-1.

3.2.1 Evaluation of Alternatives

The overflow structure that is proposed for demolition remains a potential liability for MCES. The alternative to leave the structure and merely seal up the opening to the interceptor does not reduce the potential of someone falling off of the top of the structure, or the potential of someone gaining access inside the existing structure and being injured. Therefore, the recommended alternative, to remove the structure below grade, reduces risk to the public and eliminates a maintenance problem for MCES.

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3.2.2 Estimated Capital Cost

The preliminary estimated Capital Cost developed for the Site 1A (R05) recommended improvements is included in Table 3.2-1.

Table 3.2-1. Preliminary Capital Cost for Recommended R05 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$25,000	$25,000
2	Site Preparation; temporary facilities	1	LS	$50,000	$50,000
3	Demolition	1	LS	$100,000	$100,000
4	New Concrete Bulkhead	1	LS	$20,000	$20,000
5	Fill/Backfill & Grade	1	LS	$75,000	$75,000
6	Landscape Restoration	1	LS	$50,000	$50,000
7	Miscellaneous Work and Cleanup	1	LS	$20,000	$20,000
	Subtotal A				$340,000
	Undeveloped Design Details (30% of Subtotal A)				$102,000
	Contingency (20% of Subtotal A)				$68,000
	Subtotal B				$510,000
	Engineering, Administration & Legal (20% of Subtotal B)				$102,000
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$612,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.3 R06 – Minneapolis Northwest Meters

Improvements that will be made to Regulator R06 include modification of the SCADA system that will be used to operate the isolation gates under an emergency situation. Construction of a new odor control system is also recommended to replace the ineffective biofilter.

3.3.1 Evaluation of Alternatives

Improvements to the SCADA/Remote Monitoring and Control System are programming to which there are no alternatives to evaluate. Alternatives for odor control improvements were considered as listed below:

- Replace existing media
- Improve access for media replacement by modifying biofilter containment walls
- Replace the biofilter with a standard carbon filter

Replacement of the wood chip/compost media has been difficult for maintenance personnel due to the wrought-iron fence installed on top of the concrete containment wall. Both the fence and wall would need to be modified to provide easier access for removal and replacement of the media. The media has proven to degrade quickly, is subject to short-circuiting, and, especially as it degrades, demands a lot of energy.

One significant advantage of the carbon unit is the lower cost of operating the fan at a lower pressure. Another is the more reliable odor removal – especially beneficial at this location. Therefore, replacement of the biofilter with a carbon unit is recommended.

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3.3.2 Estimated Capital Cost

The estimated Capital Cost for the identified improvements at Regulator R06 is included in Table 3.3-1.

Table 3.3-1. Preliminary Capital Cost for Recommended R06 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$35,000	$35,000
2	SCADA Modifications	1	LS	$75,000	$75,000
3	Demo Biofilter/Modify Fan Vault	1	LS	$100,000	$100,000
3	New Odor Control System	1	LS	$225,000	$225,000
4	Landscape Restoration	1	LS	$20,000	$20,000
5	Miscellaneous Work and Cleanup	1	LS	$20,000	$20,000
	Subtotal A				$475,000
	Undeveloped Design Details (30% of Subtotal A)				$142,500
	Contingency (20% of Subtotal A)				$95,000
	Subtotal B				$712,00
	Engineering, Administration & Legal (20% of Subtotal B)				$142,500
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$855,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.4 R07 – Portland & Washington Avenues

Improvements that will be made to Regulator R07 include the modification to the SCADA system that will be used to operate the isolation gates under an emergency situation. Additional improvements were identified including replacing the existing aluminum handrails with fiberglass and improvements to the mist eliminator drainage system where concrete corrosion has occurred.

3.4.1 Evaluation of Alternatives

Alternatives for guardrail materials included aluminum, stainless steel and fiberglass. The highly corrosive atmosphere in the wet side of this facility has already deteriorated aluminum guardrails installed only five years ago. The only material option that can withstand that atmosphere on a long-term basis is fiberglass. The concrete repair at the Mist Eliminator in the Odor Control room is relatively minor but will require a change to prevent further corrosion. The most likely system will be an epoxy based protective system, but a final decision will be made during design.Estimated Capital Cost

The estimated Capital Cost for the identified improvements at Regulator R07 is included in Table 3.4-1.

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Table 3.4-1. Preliminary Capital Cost for Recommended R07 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Sub B)	1	LS	$6,000	$6,000
2	SCADA Modifications	1	LS	$75,000	$75,000
3	New Fiberglass Guardrails	1	LS	$10,000	$10,000
4	Concrete Rehabilitation; corrosion protection	1	LS	$25,000	$25,000
5	Miscellaneous work & cleanup	1	LS	$10,000	$10,000
	Subtotal A				$126,000
	Undeveloped Design Details (30% of Subtotal A)				$37,800
	Contingency (20% of Subtotal A)				$25,200
	Subtotal C				$189,000
	Engineering, Administration & Legal (20% of Subtotal B)				$38,000
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$227,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.5 R08 – East 26th Avenue & Seabury Avenue S

Improvements that will be made to Regulator R08 include changing the outlet to an emergency overflow facility with isolation gate. Interceptor sewer level will be measured at this location so any quantity of sewage that overflows to the storm sewer system can be calculated using the gate opening size and the level measurement for the time that the gate is open. Improvements will include removing the existing regulator structure, orifice gate and overflow weir after installation of new regulator structure and associated isolation gates. Improvements to the SCADA system that will allow for remote monitoring and operational control will be provided. Other project costs will include the removal of the cone section of a MH to the west and cutting into the interceptor pipe to insert a plug – both to facilitate diversion pumping around the regulator construction site. The existing MH will need to be reconstructed, and the new opening to the interceptor will become a new MH.

3.5.1 Evaluation of Alternatives

An evaluation of the hydraulics of the regulator and the downstream pipes was done given the current configuration and without restriction. No wastewater is diverted at R08 for either configuration. However, the unrestricted configuration causes increased overflows at R06 and R10 downstream by approximately 80%. Therefore, the outlet gates at R08 will be configured to match the current configuration. This approach will take advantage of the storage available in 1-MN-330 that is not available in the downstream sewers.

3.5.2 Estimated Capital Cost

The estimated Capital Cost for the identified improvements to the R08 Regulator is provided in Table 3.5-1.

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Table 3.5-1. Preliminary Capital Cost for Recommended R08 Improvements Plan

Bid Item	Description	Estimated Qty	Unit	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$70,000	$70,000
2	Site Preparation	1	LS	$30,000	$30,000
3	Traffic Control	1	LS	$25,000	$25,000
4	Modifications to Existing Regulator	1	LS	$20,000	$20,000
5	Temporary Wastewater Diversion Pumping	1	LS	$250,000	$250,000
6	New Regulator w/Mech & Control Rooms	1	LS	$150,000	$150,000
7	Electrical and Ventilation Equipment	1	LS	$80,000	$80,000
8	Instrumentation and SCADA	1	LS	$100,000	$100,000
9	New & Repaired MH Structures	1	LS	$180,000	$180,000
10	Asphalt Pavement Restoration	800	SY	$50	$400,000
11	Landscape Restoration	1	LS	$10,000	$10,000
12	Interceptor Sewer Cleaning	400	LF	$50	$20,000
13	Miscellaneous Work and Cleanup	1	LS	$10,000	$10,000
	Subtotal A				$985,000
	Undeveloped Design Details (30% of Subtotal A)				$295,500
	Contingency (20% of Subtotal A)				$197,000
	Subtotal B				$1,477,500
	Engineering, Administration & Legal (20% of Subtotal B)				$295,500
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$1,773,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.6 R10 – Minneapolis Southwest Meters

Improvements that will be made to Regulator R10 include modification of the SCADA programming and control system that will be used to operate the isolation gates under an emergency situation. Additional improvements include a new odor control system.

3.6.1 Evaluation of Alternatives

Improvements to the SCADA/Remote Monitoring and Control System required minimal evaluation. However, alternatives to an odor control system were considered. A biofilter was considered for odor control however experience with the biofilter for Regulator R06 has shown that the wood chip/compost media degrades quickly, is subject to short-circuiting, and, especially as it degrades, demands a lot of energy.

One significant advantage of the carbon unit is the lower cost of operating the fan at lower pressures. Another is the more reliable odor removal – especially beneficial at this location. The operational savings more than offsets the higher cost of the media. In addition, if the odor control system for R06 is replaced with a carbon unit, a similar or combined system would be less costly to operate and maintain. Therefore, a carbon unit is recommended.

3.6.2 Estimated Capital Cost

The estimated Capital Cost for the identified improvements at Regulator R10 is included in Table 3.6-1.

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Table 3.6-1. Preliminary Capital Cost for Recommended R10 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$27,500	$27,500
2	SCADA Modifications	1	LS	$75,000	$75,000
3	New Odor Control Equipment	1	LS	$225,000	$225,000
4	Landscape Restoration	1	LS	$20,000	$20,000
5	Miscellaneous Work and Cleanup	1	LS	$20,000	$20,000
	Subtotal A				$367,500
	Undeveloped Design Details (30% of Subtotal A)				$110,250
	Contingency (20% of Subtotal A)				$73,500
	Subtotal B				$551,250
	Engineering, Administration & Legal (20% of Subtotal C)				$110,250
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$661,500

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.7 R12 – Minneapolis East Meters

Improvements that will be made to Regulator R12 include modifications of the SCADA programming and control system that will be used to operate the isolation gates under an emergency situation.

3.7.1 Evaluation of Alternatives

Minimal evaluation of alternatives was considered for Regulator R12 since the only improvements identified included modifying the SCADA programming.

3.7.2 Estimated Capital Cost

The estimated Capital Cost for the identified improvements at Regulator R12 is included in Table 3.7-1 on the following page.

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Table 3.7-1. Preliminary Capital Cost for Recommended R12 Improvements Plan

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$4,000	$4,000
2	SCADA Modifications	1	LS	$75,000	$75,000
	Subtotal A				$79,000
	Undeveloped Design Details (30% of Subtotal A)				$23,700
	Contingency (20% of Subtotal A)				$15,800
	Subtotal B				$118,500
	Engineering, Administration & Legal (20% of Subtotal B)				$23,500
	Total Preliminary Opinion of Probable Capital Cost (OPCC)				$142,000

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

3.8 Rehabilitation of 1-MN-344

Rehabilitation of 1-MN-344 is recommended from the farthest upstream structure, MH 171 to the confluence with 1-MN-343 at MH 73.

From MH 73 to Regulator R04 the pipe is generally in acceptable condition; not in need of rehabilitation. There are however a number of leaky joints that will require repair. In addition, some maintenance structures that were previously abandoned and sealed are experiencing infiltration. Those structures will be rehabilitated to prevent further infiltration.

3.8.1 Evaluation of Alternatives

Two repair options were considered: replace or CIPP lining. Since the pipe is not broken or sagging CIPP lining is more cost effective than pipe replacement.

Many MH rehabilitation methods are in practice today and all will be considered during final design. The condition of the existing structure, surrounding soils, surface conditions and other factors are considered when selecting a rehab method. Most of the MH's in the pipe rehab reach are over 80 years old and are in the street. If a MH in the street fails, usually immediate repairs are undertaken. If no damage is conspicuous, damage to these MH's is usually at the street level – cracked frames, deteriorated leveling rings, I/I at the bottom of the frame, etc.

Repair of pipe joints can be accomplished by spot repair by grouting or by installation of internal seals. Either method is acceptable and similar in cost. A final determination of repair method will be made during final design.

3.8.2 Estimated Capital Cost

The estimated Capital Cost for the identified rehabilitation of 1-MN-344 is included in Table 3.8-1 on the following page.

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Table 3.8-1. Preliminary Capital Cost for Recommended 1-MN-344 Improvements

Bid Item	Description	Estimated Qty	Units	Unit Cost ($/unit)	Total Cost ($)[2,3]
1	Mobilization & Initial Activities (5% of Subtotal B)	1	LS	$620,000	$620,000
2	CIPP Lining of 9 and 12-inch pipe	1310	LF	$200	$262,000
3	CIPP Lining of 15 and 18-inch pipe	1630	LF	$250	$407,500
4	CIPP Lining of 20, 21 and 22-inch pipe	1980	LF	$300	$594,000
5	CIPP Lining of 24-inch pipe	8200	LF	$350	$2,870,000
6	CIPP Lining of 33 and 40-inch pipe	1110	LF	$400	$444,000
7	Diversion pumping (multiple sites)	1	LS	$1,000,000	$1,000,000
8	Minor MH Repairs	20	EA	$10,000	$200,000
9	Major MH Repairs	10	EA	$50,000	$500,000
10	MH Replacements	5	EA	$100,000	$500,000
11	Interceptor Joint Grouting; MH Repairs	20	EA	$2,500	$50,000
12	Interceptor Sewer Cleaning	14,000	LF	$50	$700,000
13	Miscellaneous Work & Cleanup (multiple sites)	1	LS	$100,000	$100,000
	Subtotal A				$8,322,500
	Undeveloped Design Details (30% of Subtotal A)				$2,496,750
	Contingency (20% of Subtotal A)				$1,664,500
	Subtotal B				$12,483,750
	Engineering, Admin & Legal (20% of Subtotal B)				$2,496,750
					$14,980,500

Notes:
1. *Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 9,351, August 2012.*
2. *Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +30% to -15%.*
3. *Costs were rounded up to the nearest $1,000 for convenience.*

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Section 4
Recommendations

Section 4 of this facility plan summarizes the recommendations that were made for each regulator site.

4.1 R04 – 39th Avenue S. & E. Minnehaha Parkway

4.1.1 Recommended Improvements

Table 4.1-1 – Recommended Improvements for Regulator R04

No.	Description
1.	Remove existing orifice gate, regulator structure, and weir
2.	Build new regulator structure with sluice gates for isolation
3.	Install flow monitoring upstream of new isolation gate
4.	Install HVAC to protect personnel and equipment
5.	SCADA Modifications
6.	Construct new connecting pipe and drop shaft
7.	Construct new tunnel to confluence with 1-MN-340

4.2 R05 – Lake Street Siphon Tailhouse

4.2.1 Recommended Improvements

Table 4.2-1. Recommended Regulator R05 Improvements

No.	Description
1.	Demolish overflow structure below grade
2.	Seal overflow access except for MH access for maintenance

4.3 R06 – Minneapolis Northwest Meters

4.3.1 Recommended Improvements

Table 4.3-1. Recommended Regulator R06 Improvements

No.	Description
1.	SCADA Modifications
2.	Replace Biofilter with Carbon Unit Odor Control

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4.4 R07 – Portland & Washington Avenues

4.4.1 Recommended Improvements

Table 4.4-1. Recommended Regulator R07 Improvements	
No.	Description
1.	SCADA Modifications
2.	Install Fiberglass guardrails
3.	Concrete rehab and corrosion protection in the Odor Control Room

4.5 R08 – East 26th Avenue & Seabury Avenue S.

4.5.1 Recommended Improvements

Table 4.5-1. Recommended Regulator R08 Improvements	
No.	Description
1.	Seal existing orifice gate; partial demo of regulator structure; remove weir
2.	Build new regulator structure with sluice gates for isolation
3.	Install flow monitoring
4.	Install ventilation to protect personnel and equipment
5.	SCADA Modifications to allow remote gate operation
6.	Construct new channel through old regulator to downstream pipe

4.6 R10 – Minneapolis Southwest Meters

4.6.1 Recommended Improvements

Table 4.6-1. Recommended Regulator R10 Improvements	
No.	Description
1.	SCADA Modifications
2.	New carbon unit for odor control

4.7 R12 – Minneapolis East Meters

4.7.1 Recommended Improvements

Table 4.7-1. Recommended Regulator R12 Improvements	
No.	Description
1.	SCADA Modifications

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4.8 1-MN-344 Rehabilitation

4.8.1 Recommended Improvements

Table 4.8-1. Recommended 1-MN-344 Improvements

No.	Description
1.	CIPP liner from upper end to confluence with 1-MN-345
2.	Rehabilitate or replace up to 35% of MH structures
3.	Repair leaky pipe joints and previously abandoned MH's

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Section 5
Implementation

Section 5 of this facility plan outlines the implementation plan and schedules that should be followed in order to bring the recommended improvements for each regulator into operation. A significant factor to consider is the various types of contractors needed for specific projects or tasks. For example, the SCADA upgrades would be similar at all of the sites and could be done by a single integration contractor (programmer) under a single project. The tunneling project at R04 would need a specialized mining contractor or subcontractor. The two regulator replacement projects involve a lot of demolition, excavation, concrete work, and other similar features and could be grouped together. Regulator R05 would require a contractor that can work from a barge on the Mississippi River to access the facility, located below the bluff on the east bank. Demolition debris would need to be removed the same way. The list of potential contractors capable of work from a barge in the Mississippi River would be quite short. Finally, the rehabilitation of interceptor 1-MN-344 is very different than the other projects as it will involve CIPP lining and/or sewer replacement which will not be part of any of the other projects.

5.1 Construction Projects

SCADA improvements could be included with each of the regulator projects, as is shown in each of the cost estimates. This approach would simplify R04 and R08 construction, since there is other electrical and instrumentation to be done. However, there is a more compelling argument that all of the programming for this entire group of similar facilities should be similar. In order to facilitate ease of operation and maintenance by MCES personnel, it is recommended that all of the SCADA modifications and new installations be programmed by the same entity (person or firm). Therefore, all of the SCADA programming has been removed from the projects that require it (R05 and the pipe rehabilitation do not) and placed into a separate, stand-alone project. Table 5-1 has revised cost numbers for each project with SCADA modifications removed and accumulated into a separate project.

Operation of the new R04 structure is tied integrally with the new tunnel, so it is recommended that those two items be kept together in a single project. This decision would mean that a general contractor that could address all of the regulator improvements but not the tunneling would need to hire a subcontractor to handle a major portion of that project. The opposite is also true, that the tunneling contractor could sub out the regulator work. An advantage goes to the few firms that can do both.

Therefore, construction could be done under up to six separate contracts:

1. R04 Improvements: a new Regulator and 1,260’ of tunneled interceptor pipe
2. Demolition of R05
3. R08 Improvements: replacement of the existing Regulator with a new structure
4. Rehabilitation of 1-MN-344
5. SCADA Improvements at 6 Regulator Sites
6. Improvements at the remaining regulators R06, R07, R10 and R12

Administration of six separate construction contracts may be inefficient, so consideration was given to grouping the list of six above into larger packages. The following section discusses combining improvements into larger projects with similar characteristics.

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5.2 Combinations of Construction Projects

Demolition of R05 could possibly be added to either the R04 or R08 Improvements if there are not enough bidders to make a stand-alone demolition project competitive. Also, since R04 and R08 are similar structures, it may be advantageous to package those projects together. As mentioned above, the SCADA improvements should stand alone to ensure similar control programming is done at all of the regulator locations. Table 5-1 below summarizes the projected costs of the six projects previously identified and a recommended shorter list of five projects. In all cases, pipe rehab of 1-MN-344 is separate, although it is large enough to warrant two separate pipe/MH rehabilitation projects; and SCADA programming is separate. Other combinations of projects were considered, and the Council may wish to revisit packaging of the improvements, but only the recommended packages are listed in the table below.

Table 5-1. Construction Project Packages

	Six Projects		Five Projects (Recommended)	
Project Description	No.	Cost	No.	Cost
Regulators R06, R07, R10 & R12 w/o SCADA	1	$1,406,000	1	$1,406,000
1-MN-344 Rehabilitation	2	$14,980,000	2	$14,980,000
Regulator R04 with Tunnel; w/o SCADA	3	$6,666,000	3	$6,666,000
Demolition of R05	4	$612,000		-
Regulator R08 w/o SCADA	5	$1,653,000		-
Combination R08 and Demo of R05			4	$2,265,000
SCADA at R04, R06, R07, R08, R10 & R12	6	$720,000	5	$720,000
TOTALS		$26,037,000		$26,037,000

The logic behind each of the four construction project packages is described below:

Project 1: Work at Regulators R06, R07, R10 & R12 consists mainly of odor control and miscellaneous improvements

Project 2: 1-MN-344 pipe rehabilitation is completely different work from the other projects

Project 3: Construction of R04 with the tunnel is large enough to draw competetive bids

Project 4: Demolition of R05 and construction of R08 both involve heavy construction and are therefore more similar to each other than most of the other projects; R05 is small and specialized and therefore not likely to draw many bidders as a stand alone project

Project 5: SCADA programming should be identical for all six remaining regulators. This is accomplished by having a single entity perform all of the programming for all sites

5.3 Implementation Schedule

Final Design work for the project packages could begin as soon as this Facility Plan is finalized. Table 5.3-1 on the following page illustrates an expected schedule from design through construction. It is assumed the the full Council will adopt this Facility Plan in January 2013, and the MPCA approve the plan for PFA funding after the March 1, 2013 deadline for submittal.

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Table 5.3-1. Implementation Schedule

Project	Description	Design	Construction
1	Regulators R06, R07, R10 & R12	2013	2014
2	1-MN-344 Rehabilitation	2013	2013-14
3	Regulator R04 with Tunnel	2013	2014-16
4	Regulator R08 and Demo of R05	2013	2014-15
5	SCADA Modifications	2013	2016*

* Note: SCADA could be done immediately at each of the Regulators where gates are already installed (Project 1) and as the physical improvements are completed at R04 and R08; the final completion occurring toward the end of project 3.

Other than the SCADA programming at Regulators R04 and R08, there are no aspects to the individual projects that overlap or that must be done in order. At R04 and at R08 the new regulator vault and the shafts/tunnel may be constructed prior to any work at the regulator itself. Most of the regulator vault may be constructed prior to disrupting the flow through the sewer. Programming may not be accomplished until after the regulator vault, the shafts, and the tunnel are completed. By contrast, programming as R06, R07, R10 and R12 could all progress immediately.

Demolition of R05 is not tied to any of the other projects and could progress immediately. Likewise, design for rehabilitation of interceptor 1-MN-344 could begin immediately.

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References

1. ISCO Open Channel Flow Measurement Handbook, Second Edition, 1988.
2. Brown and Caldwell, Technical Memorandum, "*MCES Regulators, Transition from Permitted CSO Status to Sanitary Sewer Status with Emergency Bypass Project*", Metropolitan Council, September 12, 2010.
3. Brown and Caldwell, "*Interceptor Master Plan*", Metropolitan Council Environmental Services, Date.
4. Metropolitan Council Environmental Services, Yearly CSO Summary, *2004 thru 2009*.
5. SSO fact Sheet, NPDES Permit Requirements for Municipal Sanitary Sewer Collection Systems and SSO's

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Appendix A: Geotechnical Investigative Report

Regulator R04

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AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
• ENVIRONMENTAL
• GEOTECHNICAL
• MATERIALS
• FORENSICS

September 28, 2012

Brown and Caldwell
30 – 7th Street East, #2500
St. Paul, MN 55101

Attn: Charles Lewis, PE

RE: Soil Boring/Rock Coring Results
Proposed 1-MN-344 Tunnel Replacement
Minneapolis, Minnesota
AET No. 01-05580

Dear Mr. Lewis:

This letter report presents the results of the standard penetration test boring and rock coring conducted on the west side of Minnehaha Creek for the referenced project. This work was performed per Task Order Authorization 14105 and our Master Subcontract.

1.0 Soil Boring/Rock Coring

The log of the standard penetration test boring and the rock coring performed is attached. Data sheets presenting the soil drilling, sampling, testing, classification, and rock description methods used are also attached. The rock coring was conducted in general accordance with ASTM:D2113, using an HQ size barrel. A double-tube sampler was used through the limestone and shale formations. A triple-tube sampler was then used in sandstone, below a depth of 46 feet. Additional information regarding the coring activities is presented on the attached Coring Data Sheets.

The boring location is graphically shown on attached Figure 1. The Hennepin County coordinates of the test location was determined by AET using GPS having "submeter" accuracy (not surveyor quality). The coordinates appear on the boring log.

The surface elevation was measured by AET using an engineer's level and rod. The reference benchmark was the top nut of the hydrant in the northeast quadrant of 38th Avenue South and Minnehaha Parkway, understood to be elevation 817.34 feet.

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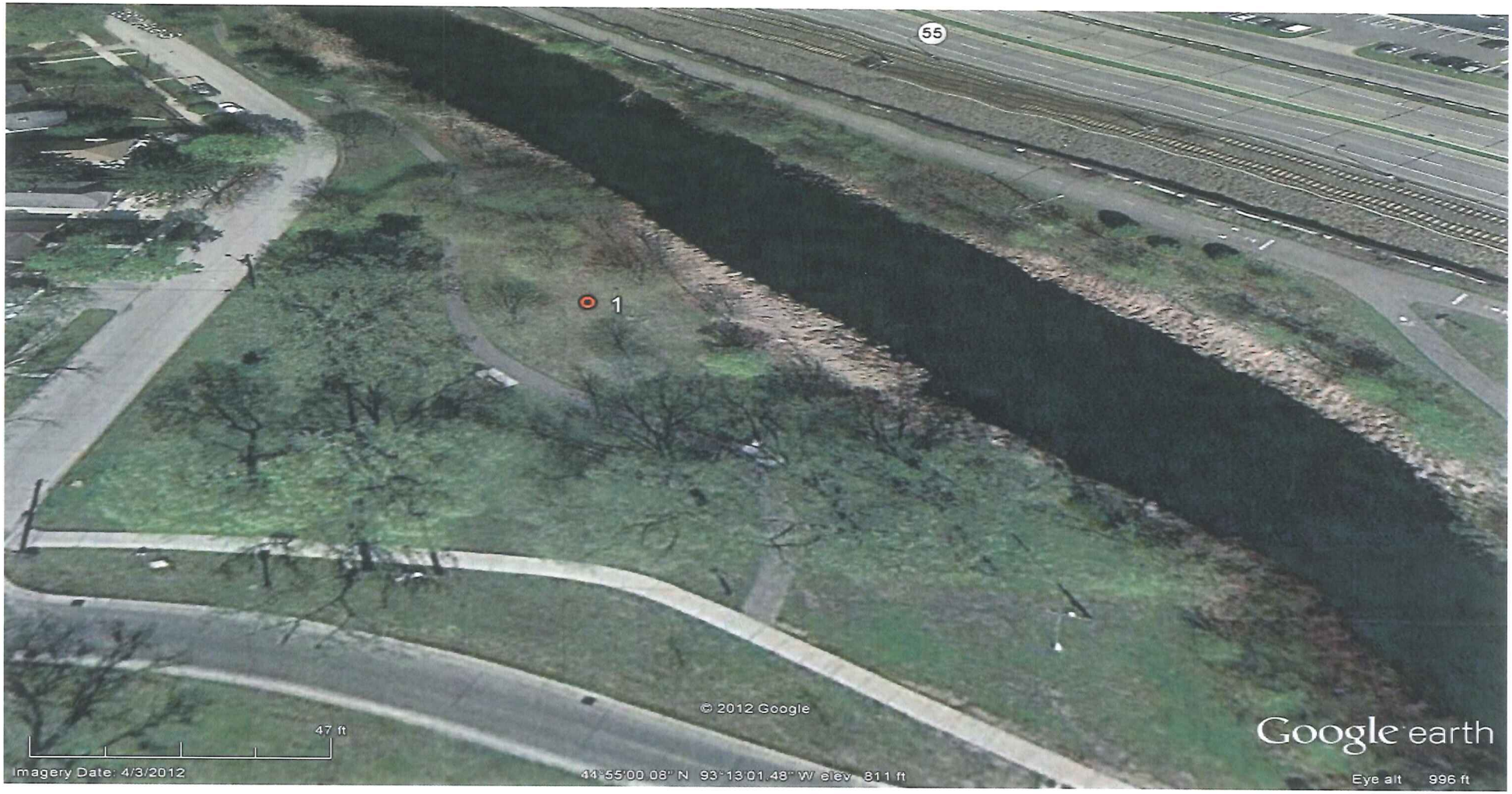
2.0 Laboratory Testing
Soil laboratory testing was limited to water content testing of cohesive soils. The results appear on the borings logs, opposite the sample upon which the test was performed.

3.0 Limitations
Within the limitations of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location.

Sincerely,
American Engineering Testing, Inc.

Jeffery K. Voyen, PE
Vice President/Principal Engineer
(651) 659-1305 direct
(612) 961-9186 cell
jvoyen@amengtest.com

Attachments:
- Figure 1 – Boring Location
- Subsurface Boring Log
- Coring Data Sheets (4 pages)
- Exploration/Classification Methods
- Boring Log Notes
- Unified Soil Classification System
- Rock Descriptive Terminology



AMERICAN ENGINEERING TESTING, INC.	**PROJECT** MCES 1-MN-344 Tunnel Minneapolis, Minnesota			**AET NO.** 01-05580
	SUBJECT Boring Location			**DATE** September 28, 2012
	SCALE None	**DRAWN BY** JKV	**CHECKED BY** -	**FIGURE 1**

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **01-05580** LOG OF BORING NO. **1 (p. 1 of 4)**

PROJECT: **MCES 1-MN-344 Tunnel; Minneapolis, MN**

SURFACE ELEVATION: **812.2** Hennepin Co. Coordinates: N **145880** E **543026**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	REC %	RQD IN.	RQD %	%-#200
0	FILL, mostly silty sand, trace roots, dark brown	FILL		M							
1	FILL, mostly gravel, apparent cobbles and boulders, gray			M							
2											
3			25	M	SS	10					
4											
5	FILL, mostly silty sand with gravel, trace roots, brown and light gray		12	M	SS	10					
6											
7				▼							
8	SAND, a little gravel, fine grained, gray, waterbearing, loose (SP)	COARSE ALLUVIUM	7	W	SS	12					
9											
10											
11	LEAN CLAY, gray, soft to firm (CL)	FINE ALLUVIUM	4	W/M	SS	16	37				
12											
13			8	M	SS	12	24				
14	DOLOMITIC LIMESTONE, light brownish gray, fossiliferous	PLATTEVILLE FORMATION MAGNOLIA MEMBER									
15					HQ	15		89	10	60	
16	Weathering: Slightly weathered to fresh Fracturing: Moderately to slightly fractured Stratification: Thickly bedded Hardness: Hard										
17											
18					HQ	60		100	43	72	
19											
20											
21											

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-14.6'	**4.25" HSA**							
14.6-81'	**HQ Core**	**9/17/12**	**9:30**	**9.0**	**7.0**	**7.5**		**7.3**
		9/17/12	**9:40**	**9.0**	**7.0**	**7.5**		**7.3**
BORING COMPLETED: **9/17/12**								
DR: **GH** LG: **TK** Rig: **85C**								

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-COORDINATES 01-05580.GPJ AET+CPT+WELL.GDT 9/26/12

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **01-05580** LOG OF BORING NO. **1 (p. 2 of 4)**

PROJECT: **MCES 1-MN-344 Tunnel; Minneapolis, MN**

Hennepin Co. Coordinates: N **145880** E **543026**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	REC %	RQD IN.	RQD %	%-#200
23	DOLOMITIC LIMESTONE, light gray to about 24.5' then gray *(continued)*	PLATTEVILLE FORMATION HIDDEN FALLS MEMBER *(continued)*									
24	Weathering: Fresh				HQ	56		93	50	83	
25	Fracturing: Slightly fractured, a few zones of very fractured										
26	Stratification: Thickly bedded										
27	Hardness: Hard										
28	DOLOMITIC LIMESTONE, light gray and gray, crinkley bedded	PLATTEVILLE FORMATION MIFFLIN MEMBER			HQ	58		97	53	88	
29	Weathering: Fresh										
30	Fracturing: Slightly fractured, a few zones of very fractured										
31	Stratification: Very thinly bedded										
32	Hardness: Hard										
33											
34					HQ	58		97	54	90	
35											
36											
37											
38											
39					HQ	60		100	45	75	
40	DOLOMITIC LIMESTONE, light gray	PLATTEVILLE FORMATION PECATONICA MEMBER									
41	Weathering: Fresh										
42	Fracturing: Moderately fractured										
43	Stratification: Thinly bedded										
44	Hardness: Very hard										
45	SHALE, gray to about 42.7' then sandy shale, gray	GLENWOOD FORMATION			HQ	45		75			
46											
47	SHALEY SANDSTONE, gray	ST. PETER FORMATION									

AET_CORP W-COORDINATES 01-05580.GPJ AET+CPT+WELL.GDT 9/26/12

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **01-05580** LOG OF BORING NO. **1 (p. 3 of 4)**

PROJECT: **MCES 1-MN-344 Tunnel; Minneapolis, MN**

Hennepin Co. Coordinates: N **145880** E **543026**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	REC %	RQD IN.	RQD %	%-#200
49	SHALEY SANDSTONE, gray *(continued)*	ST. PETER FORMATION *(continued)*			HQ	8		13			
50											
51	SANDSTONE, gray to light gray, uncemented to about 53.5' then well cemented, additional uncemented zones from 54.1' to 56', 57.7' to 58.2', 60.5' to 61', 63' to 63.7', 64.3' to 68', 72.1' to 72.2', 72.5' to 72.7', 74' to 74.4', 76.6' to 77.6' and 78.4' to 79.1'										
52											
53					HQ	48		80			
54											
55											
56											
57											
58											
59					HQ	59		98			
60											
61											
62											
63											
64					HQ	56		93			
65											
66											
67											
68											
69					HQ	60		100			
70											
71											
72											
73											
					HQ	59		98			

AET_CORP W-COORDINATES 01-05580.GPJ AET+CPT+WELL.GDT 9/26/12

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **01-05580** LOG OF BORING NO. **1 (p. 4 of 4)**

PROJECT: **MCES 1-MN-344 Tunnel; Minneapolis, MN**

Hennepin Co. Coordinates: N **145880** E **543026**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS				
							WC	REC %	RQD IN.	RQD %	%-#200
75	SANDSTONE, gray to light gray, uncemented to about 53.5' then well cemented, additional uncemented zones from 54.1' to 56', 57.7' to 58.2', 60.5' to 61', 63' to 63.7', 64.3' to 68', 72.1' to 72.2', 72.5' to 72.7', 74' to 74.4', 76.6' to 77.6' and 78.4' to 79.1'	ST. PETER FORMATION									
76											
77											
78					HQ	42		70			
79											
80											
81	**END OF BORING**										

AET_CORP W-COORDINATES 01-05580.GPJ AET+CPT+WELL.GDT 9/26/12

PROJECT: MCES 1-MN-344 Tunnel
Minneapolis, Minnesota

CORING DATA SHEET
BORING #1

Depth Range (ft)	Core Run Length (in.)	Core Recovery Length (in.)	% Rec.	% Fluid Ret.	Time of Run	Fluid Press. (psi)	Hyd. Press. (psi)	Estimated RPM	Barrel	Bit	Classification	Notes	RQD (%)
14.6-15.6				100%	3:12	30	225	500	HQ	HQ	Dolomitic Limestone	Magnolia Member	
15.6-16.0	17	15	89	100%	1:34	30	225	500	HQ	HQ		of Platteville Formation	60
16.0-17.0				100%	4:02	30	250	500	HQ	HQ			
17.0-18.0				100%	3:04	30	250	500	HQ	HQ			
18.0-19.0				100%	3:40	30	250	500	HQ	HQ			
19.0-20.0				100%	3:49	30	250	500	HQ	HQ			
20.0-21.0	60	60	100	100%	3:50	30	250	500	HQ	HQ			72
21.0-22.0				100%	2:30	30	250	500	HQ	HQ		Hidden Falls Member	
22.0-23.0				100%	2:58	30	250	500	HQ	HQ			
23.0-24.0				95%	2:35	30	250	500	HQ	HQ			
24.0-25.0				80%	6:19	30	250	500	HQ	HQ			
25.0-26.0	60	56	93	0%	5:30	30	250	500	HQ	HQ			83
26.0-27.0				0%	2:50	30	240	500	HQ	HQ			
27.0-28.0				0%	2:20	30	240	500	HQ	HQ			
28.0-29.0				0%	2:10	30	240	500	HQ	HQ		Mifflin Member, 28.1'	
29.0-30.0				0%	4:10	30	240	500	HQ	HQ			
30.0-31.0	60	58	97	0%	3:20	30	240	500	HQ	HQ			88

AET No.: 01-05580 **Professional:** CNA Engr. **Crew Chief:** JH, TK **Date:** 9/17/2012 **Weather:** 60° OC

PROJECT: MCES 1-MN-344 Tunnel
Minneapolis, Minnesota

CORING DATA SHEET
BORING #1

Depth Range (ft)	Core Run Length (in.)	Core Recovery Length (in.)	% Rec.	% Fluid Ret.	Time of Run	Fluid Press. (psi)	Hyd. Press. (psi)	Estimated RPM	Barrel	Bit	Classification	Notes	RQD (%)
31.0-32.0				0	2:30	30	240	500	HQ	HQ			
32.0-33.0				0	2:40	30	240	500	HQ	HQ			
33.0-34.0				0	2:10	30	240	500	HQ	HQ			
34.0-35.0				0	2:35	30	240	500	HQ	HQ			
35.0-36.0	60	58	97	0	2:45	30	240	500	HQ	HQ			90
36.0-37.0				0	4:40	30	240	500	HQ	HQ			
37.0-38.0				0	2:50	30	240	500	HQ	HQ			
38.0-39.0				0	2:10	30	240	500	HQ	HQ			
39.0-40.0				0	2:50	30	240	500	HQ	HQ		Pecatonica at 39.7'	
40.0-41.0	60	60	100	0	3:20	30	240	500	HQ	HQ	Shale	Glenwood at 40.5'	75
41.0-42.0				0	4:20	30	240	80	HQ	HQ			
42.0-43.0				0	3:54	30	240	80	HQ	HQ			
43.0-44.0				0	5:07	30	100	80	HQ	HQ			
44.0-45.0				0	2:10	30	100	80	HQ	HQ	Shaley sandstone	St. Peter at 44.8'	
45.0-46.0	60	45	75	0	1:10	30	50	80	HQ	HQ			

AET No.: 01-05580 **Professional:** CNA Engr **Crew Chief:** GH SS **Date:** 9/18/2012 **Weather:** 60° Sunny

PROJECT: MCES 1-MN-344 Tunnel
Minneapolis, Minnesota

CORING DATA SHEET
BORING #1

Depth Range (ft)	Core Run Length (in.)	Core Recovery Length (in.)	% Rec.	% Fluid Ret.	Time of Run	Fluid Press. (psi)	Hyd. Press. (psi)	Estimated RPM	Barrel	Bit	Classification	Notes	RQD
46.0-47.0				0	3:51	30	50	100	HQ	HQ3			
47.0-48.0				0	1:11	30	50	100	HQ	HQ3			
48.0-49.0				0	1:09	30	50	100	HQ	HQ3			
49.0-50.0				0	1:06	30	50	100	HQ	HQ3			
50.0-51.0	60	8	13	0	1:02	30	50	100	HQ	HQ3			
51.0-52.0				0	0.22	30	50	95	HQ	HQ3	Sandstone		
52.0-53.0				0	1:09	30	50	95	HQ	HQ3			
53.0-54.0				0	1:02	30	50	95	HQ	HQ3			
54.0-55.0				0	1:36	30	50	95	HQ	HQ3			
55.0-56.0	60	48	80	0	1:03	30	50	95	HQ	HQ3			
56.0-57.0				0	1:02	30	50	85	HQ	HQ3			
57.0-58.0				0	0:37	30	50	85	HQ	HQ3			
58.0-59.0				0	0:42	30	50	85	HQ	HQ3			
59.0-60.0				0	0:43	30	50	85	HQ	HQ3			
60.0-61.0	60	59	98	0	0:42	30	50	85	HQ	HQ3			
61.0-62.0				0	0:40	30	50	80	HQ	HQ3			
62.0-63.0				0	0:41	30	50	80	HQ	HQ3			
63.0-64.0				0	0:36	30	50	80	HQ	HQ3			
64.0-65.0				0	0:32	30	50	80	HQ	HQ3			
65.0-66.0	60	56	93	0	0:25	30	50	80	HQ	HQ3			

AET No.: 01-05580 **Professional:** CNA Engr **Crew Chief:** GH SS **Date:** 9/18/2012 **Weather:** 68° Sunny

CORING DATA SHEET
BORING #1

Depth Range (in.)	Core Run Length (in.)	Core Recovery Length (in.)	% Rec.	% Fluid Ret.	Time of Run	Fluid Press. (psi)	Hyd. Press. (psi)	Estimated RPM	Barrel	Bit	Classification	Notes	RQD
66.0-67.0				0	0:15	30	50	80	HQ	HQ3			
67.0-68.0				0	0:42	30	50	80	HQ	HQ3			
68.0-69.0				0	0:40	30	50	80	HQ	HQ3			
69.0-70.0				0	0:45	30	50	80	HQ	HQ3			
70.0-71.0	60	60	100	0	0:50	30	50	80	HQ	HQ3			
71.0-72.0				0	0:58	30	50	80	HQ	HQ3			
72.0-73.0				0	0:53	30	50	80	HQ	HQ3			
73.0-74.0				0	1:03	30	50	80	HQ	HQ3			
74.0-75.0				0	0:50	30	50	80	HQ	HQ3			
75.0-76.0	60	59	98	0	1:32	30	50	80	HQ	HQ3			
76.0-77.0				0	1:01	30	50	80	HQ	HQ3			
77.0-78.0				0	0:53	30	50	80	HQ	HQ3			
78.0-79.0				0	0:48	30	50	80	HQ	HQ3			
79.0-80.0				0	0:50	30	50	80	HQ	HQ3			
80.0-81.0	60	42	70	0	1:02	30	50	80	HQ	HQ3			

AET No.: 01-05580 **Professional:** CNA Engr **Crew Chief:** GH **Date:** 9/18/2012 **Weather:** 68° Sunny

SAMPLING METHODS

Split-Spoon Samples (SS) - Calibrated to N_{60} Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586 with one primary modification. The ASTM test method consists of driving a 2" O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30". The sampler is driven a total of 18" into the soil. After an initial set of 6", the number of hammer blows to drive the sampler the final 12" is known as the standard penetration resistance or N-value. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in this system. This converted energy then provides what is known as an N_{60} blow count.

Most of today's drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. By using the PDA energy measurement equipment, we are able to determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET's hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30". The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviations of the N-values using this method are significantly better than the standard ASTM Method.

Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

CLASSIFICATION METHODS

Soil classifications shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil classifications shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in inches
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag bit.
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES

(Calibrated Hammer Weight)

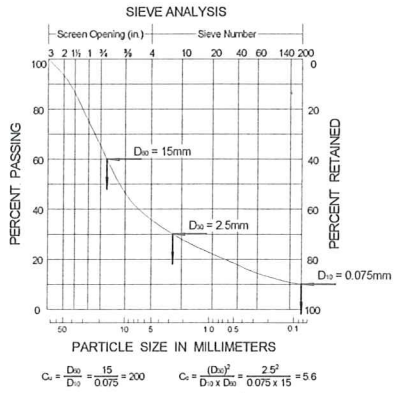
The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide N_{60} values) and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

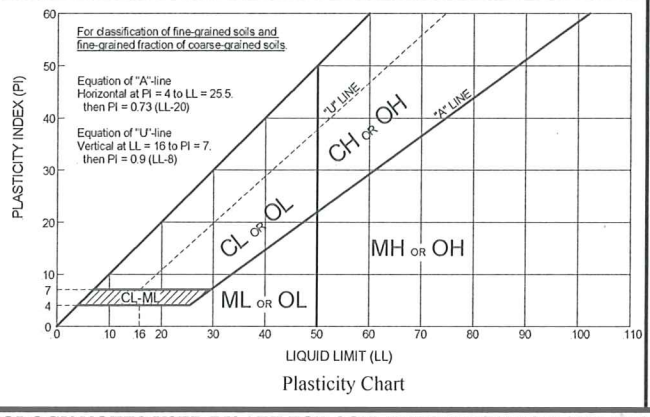
The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu≥4 and 1≤Cc≤3[E]	GW	Well graded gravel[F]
			Cu<4 and/or 1>Cc>3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu≥6 and 1≤Cc≤3[E]	SW	Well-graded sand[I]
			Cu<6 and/or 1>Cc>3[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu = D_{60} / D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition

(MC Column)

D (Dry): Absence of moisture, dusty, dry to touch.

M (Moist): Damp, although free water not visible. Soil may still have a high water content (over "optimum").

W (Wet/ Waterbearing): Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.

F (Frozen): Soil frozen

Layering Notes

Laminations: Layers less than ½" thick of differing material or color.

Lenses: Pockets or layers greater than ½" thick of differing material or color.

Peat Description

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. *Slightly organic* used for borderline cases.

Root Inclusions

With roots: Judged to have sufficient quantity of roots to influence the soil properties.

Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

ROCK DESCRIPTION TERMINOLOGY

Rock Property	Descriptive Term	Visual or Physical Properties
Weathering	Highly Weathered	Almost complete rock disintegration and decomposition. Soil-like texture with some small inclusions of hard rock.
	Very Weathered	Abundant fractures coated with oxides, carbonates, sulfates, mud, etc., thorough discoloration, rock disintegration, and mineral decomposition.
	Moderately Weathered	Some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition
	Slightly Weathered	A few stained fractures, slight discoloration, little to no effect on cementation, no mineral decomposition.
	Fresh	Unaffected by weathering agents, no appreciable change with depth.
Fracturing	Intensely Fractured	Less than 1" spacing
	Very Fractured	1" to 6" spacing
	Moderately Fractured	6" to 12" spacing
	Slightly Fractured	12" to 36" spacing
	Solid	36" spacing or greater
Stratification	Thinly Laminated	Less than 1/10"
	Laminated	1/10" to 2"
	Very Thinly Bedded	2" to 2"
	Thinly Bedded	2" to 2'
	Thickly Bedded	More than 2'
Hardness	Soft	Can be dug by hand and crushed by fingers.
	Moderately Hard	Friable can be gouged deeply with knife and will crumble readily under light hammer blows.
	Hard	Knife scratch leaves dust trace, will withstand a few hammer blows before breaking.
	Very Hard	Scratched with knife with difficulty, difficult to break with hammer blows.
RQD*	Very Poor	0 - 25 (%)
	Poor	25 - 50 (%)
	Fair	50 - 75 (%)
	Good	75 - 90 (%)
	Excellent	90 - 100 (%)

**Rock Quality Designation:* *Percent of core run consisting of the summation of hard, sound, and unfractured rock with core segments 4 inches or greater in length. Determination is conducted in general accordance with ASTM:D6032.*

Appendix B: MPCA Environmental Information Worksheet (EIW)

Regulators R04 and R08

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DRAFT for review purposes only. Use of contents on this sheet is subject to the limitations specified at the end of this document.
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Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

Environmental Information Worksheet (EIW) Form

Clean Water State Revolving Fund

Minnesota Rule Chapter 7077.0272, subp. 2.a.F.
Minnesota Rule Chapter 7077.0277, subp. 3.E.

Doc Type: Environmental Information Worksheet

Eligible applicants seeking funds for clean water (stormwater and wastewater) projects through the Clean Water State Revolving Fund (commonly referred to as the CWSRF Program) are required by Minn. R. ch. 7077.0272, subp. 2.a. F. and Minn. R. ch. 7077.0277, subp. 3.E., to complete an Environmental Information Worksheet (EIW). This information will be used to assess environmental impacts, if any, caused by the project.

For assistance with this worksheet, please visit the Minnesota Pollution Control Agency's website at http://www.pca.state.mn.us/publications/p-ear1-02.pdf for detailed instructions on completing this form.

1. Project title: Minneapolis Interceptor Rehab Phase 2

2. Proposer: Brown and Caldwell

Contact person: Mr. Charles J. Lewis

Title: Associate - Infrastructure Services

Address: 30 East Seventh Street, Suite 2500

St. Paul, MN 55101

Phone: 651-298-0710

Fax: 651-298-1931

3. Project location: County: Hennipen City/Twp: Minneapolis

NE	1/4		1/4	Section:	31	Township:	29N	Range:	23W
NE					18		28N		23W

Tables, Figures, and Appendices attached to the EIW:

- County map showing the general location of the project;
- United States Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable);
- Site plan showing all significant project and natural features.

4. Description:

a. Provide a project summary of 50 words or less.

The purpose of this project is to install two sanitary sewer regulator structures (approximately 10' x 10' x 10'). The structures will be installed at the intersection of 26th and Seabury, Minneapolis, MN and the intersection of 39th and Minnehaha Pkwy, Minneapolis, MN. A 6' diameter tunnel will also be intalled at the 39th and Minnehaha Pkwy site.

b. Give a complete description of the proposed project and related new construction. Attach additional sheets as necessary. Emphasize construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes. Include modifications to existing equipment or industrial processes and significant demolition, removal or remodeling of existing structures. Indicate the timing and duration of construction activities.

The MCES Facility Plan evaluates the need for improvements at seven of the ten remaining regulators in the Metropolitan Council Environmental Services (MCES) collection system, in addition to a reach of badly corroded interceptor tunnel. The regulators were originally constructed along with the first interceptor sewers in the 1930's. Improvements were made in the 1960's to most of the regulators, and in various projects since then. Included as part of the planned improvements are features to accommodate the transition from permitted combined sewer overflow (CSO) status to sanitary sewer overflow (SSO) status

with emergency bypass capabilities. Seven (7) of these facilities, located within the City of Minneapolis were selected based on the type of improvements that were identified to be needed. It should be noted that one facility, the 3rd & Commercial Regulator (R02) facility is already being addressed under a separate project. The other two facilities not included in this report present complications that will be addressed later in a subsequent analysis(s). The seven facilities selected for review under this facility plan have joint responsibility for operation and compliance as reflected in the current NPDES permit(s).

This Facility Plan proposes improvements for regulator facilities within the City of Minneapolis that will upgrade and provide pressure relief for the sanitary sewer system that will be used only for emergency relief of the system. The pressure reliefs would be necessary in order to avoid surcharging that could result in catastrophic damage to facilities, the environment, or private property.

The emergency bypass/overflow points at these regulator sites that remain in operation will be equipped with positive shut-off (locked/closed sluice gates) and remote operational control. Overflow monitoring devices (level measurement) will also be installed. Overflow gates can only be operated by manual action after consideration of the conditions at hand. Manual action in this case is defined as making a conscious decision to physically operate the gates either on-site or remotely, but shall not include automatic operation based on level.

In addition to the improvements to the seven regulators, a badly corroded segment of interceptor 1-MN-344 will be addressed. This reach of pipe is just downstream of Regulator R04 near Minnehaha Park. It is difficult to access and the most likely remedy is to replace the 1,260' segment with a new tunneled pipe. Discussion of this pipe reach as well as related costs are included in the sections on Regulator R04.

c. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

This project will install two new sanitary sewer regulators near the existing aging structures operated by Metropolitan Council Environmental Services (MCES). The installation of the new regulators will allow MCES to better manage regional sanitary sewer flows.

d. Are future stages of this development including development on any outlots planned or likely to happen? ☐ Yes ☒ No
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

e. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No
If yes, briefly describe the past development, timeline and any past environmental review.

5. Project magnitude data

Total Project Area (acres) 0.7 and 1.8 AC or Length (miles) _____
Number of Residential Units: Unattached NA Attached NA maximum units per building NA
Commercial/Industrial/Institutional Building Area (gross floor space): total square feet NA
Indicate area of specific uses (in square feet): NA

Office	0	Manufacturing	0
Retail	0	Other Industrial	0
Warehouse	0	Institutional	0
Light Industrial	0	Agricultural	0
Other Commercial (specify)	0		

Building height 0 If over 2 stories, compare to heights of nearby buildings _____

6. Permits and approvals required. List all known local, state and federal permits, approvals and financial assistance for the project. Include modifications of any existing permits, governmental review of plans, and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure.

Unit of government	Type of application	Status
MPCA	Sanitary Sewer Extension Permit	Not submitted
	NPDES/SDS Discharge of Stormwater During Construction, Construction SWPPP	Not submitted

MnDNR	Water Appropriations Permit (if needed for dewatering during construction)	Not submitted
City of Minneapolis	Obstruction Permit	Not submitted
	After Hours Work Permit	Not submitted
Minnehaha Creek WD	Water Resource Permit	Not submitted
Mn/DOT	Installation of Utilities Permit or Miscellaneous Work on Trunk Highway ROW	Not submitted
Public Facilities Authority	Grant application	Not submitted

7. Land use. Describe current and recent past land use and development on the site and on adjacent lands. Discuss project compatibility with adjacent and nearby land uses. Indicate whether any potential conflicts involve environmental matters. Identify any potential environmental hazards due to past site uses, such as soil contamination or abandoned storage tanks, or proximity to nearby hazardous liquid or gas pipelines.

The current and recent land use is primarily residential and parkland at each site. A Phase 1 Environmental Site Assessment has been completed according to ASTM Standard 1527-05 and has found the presence of a former gas station with a leaking underground storage tank (LUST) near the 39th and Minnehaha Pkwy site. The site has been closed out by the MPCA and no other issues were found. The project is compatible with nearby land uses as the excavation takes place on park land and public right of way and will affect adjacents lands only during construction.

8. Cover types. Estimate the acreage of the site with each of the following cover types before and after development:

	Before	After		Before	After
Types 1-8 wetlands	0.2	0.2	Lawn/landscaping	0.3	0.3
Wooded/forest	0	0	Impervious Surfaces	2	2
Brush/grassland	0.6	0.6	Other (describe)	0	0
Cropland	0	0			
			Total	3.1	3.1

9. Fish, wildlife, and ecologically sensitive resources.

a. Identify fish and wildlife resources and habitats on or near the site and describe how they would be affected by the project. Describe any measures to be taken to minimize or avoid impacts.

The Minnesota Biological Survey was referenced and the Fisheries Division of the DNR was contacted for sensitive resources. There is a presence of Minnesota Biological Survey Native Plant Species and Sites of Significant Biodiversity near the project locations. However, they are not located within the expected project areas. The north site (26th and Seabury) is located near the banks of the Mississippi which contains a species of Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest. The south site (38th and Minnehaha Pkwy) is located near Minnehaha Park which contains "Moderate biodiversity significance". In both cases, the areas of concern are not in close proximity to the project site and impacts on these resources will be avoided. Please see the Appendix for attached maps.

b. Are any state (endangered or threatened) species, rare plant communities or other sensitive ecological resources such as native prairie habitat, colonial waterbird nesting colonies or regionally rare plant communities on or near the site?
☒ Yes ☐ No
If yes, describe the resource and how it would be affected by the project. Indicate if a site survey of the resources has been conducted and describe the results. If the Minnesota Department of Natural Resources (DNR) Natural Heritage and Nongame Research program has been contacted give the correspondence reference number: _____
Describe measures to minimize or avoid adverse impacts.

A site survey of the resources has not been conducted. Item 9.a lists the sensitive ecological resources determined through correspondence with the Fort Snelling State Park and the West Metro Area Fisheries division of the DNR. Research was also done through the DNR's GIS database.

10. Physical impacts on water resources. Will the project involve the physical or hydrologic alteration (dredging, filling, stream diversion, outfall structure, diking, and impoundment) of any surface waters such as a lake, pond, wetland, stream or drainage ditch? ☐ Yes ☒ No
If yes, identify water resource affected. Describe alternatives considered and proposed mitigation measures to minimize impacts. Give the DNR Protected Waters Inventory (PWI) number(s) if the water resources affected are on the PWI.

11. Water use. Will the project involve installation or abandonment of any water wells, connection to or changes in any public water supply or appropriation of any ground or surface water (including dewatering)? ☐ Yes ☒ No
If yes, as applicable, give location and purpose of any new wells; public supply affected, changes to be made, and water

quantities to be used; the source, duration, quantity and purpose of any appropriations; and unique well numbers and DNR appropriation permit numbers, if known. Identify any existing and new wells on the site map. If there are no wells known on site, explain methodology used to determine.

12. Water-related land use management districts. Does any part of the project involve a shoreland zoning district, a delineated 100-year flood plain, or a state or federally designated wild or scenic river land use district? ☒ Yes ☐ No
If yes, identify the district and discuss project compatibility with district land use restrictions.

Yes, both sites are located within the Minneapolis Shoreland Zoning district. The requirements of the shoreland zoning district have been researched and are attached to this worksheet. The project is compatible with the restrictions.

13. Water surface use. Will the project change the number or type of watercraft on any water body? ☐ Yes ☒ No
If yes, indicate the current and projected watercraft usage and discuss any potential overcrowding or conflicts with other uses.

14. Erosion and sedimentation. Give the acreage to be graded or excavated and the cubic yards of soil to be moved: **7,000 CY** **<1 AC** cubic yards. Describe any steep slopes or highly erodible soils and identify them on the site map. Describe any erosion and sedimentation control measures to be used during and after project construction.

36,000 CY (Tunnel) (38th and Minnehaha Pkwy)

3,500 CY (26th and Seabury) **<1 AC**

Acres: _____

A majority of the excavation (36,000 CY) will come from the 6' diameter tunnel. Proper erosion and sedimentation BMPs will be followed near the sites of excavation. A site map has been included in the Appendix.

15. Water quality – surface-water runoff.

a. Compare the quantity and quality of site runoff before and after the project. Describe permanent controls to manage or treat runoff. Describe any storm water pollution prevention plans.

Site runoff will not be affected by this project as the structures are below grade. A SWPPP will be prepared during the final design stages of the Regulator near Minnehaha Creek and will be submitted to the Minnehaha Creek Watershed District.

b. Identify routes and receiving water bodies for runoff from the site; include major downstream water bodies as well as the immediate receiving waters. Estimate impact runoff on the quality of receiving waters.

The Mississippi River will likely serve as the receiving water body for the 26th and Seabury Site. The Mississippi River will also serve as the receiving water body for the 38th and Minnehaha Parkway Site via the Minnehaha Creek. Impact will be mitigated with proper construction controls.

16. Water quality – wastewater.

a. Describe sources, composition and quantities of all sanitary, municipal and industrial wastewater produced or treated at the site.

No wastewater will be produced at the site.

b. Describe waste treatment methods or pollution prevention efforts and give estimates of composition after treatment. Identify receiving waters, including major downstream water bodies, and estimate the discharge impact on the quality of receiving waters. If the project involves on-site sewage systems, discuss the suitability of site conditions for such systems.

N/A

c. If wastes will be discharged into a publicly owned treatment facility, identify the facility, describe any pretreatment provisions and discuss the facility's ability to handle the volume and composition of wastes, identifying any

improvements necessary.

N/A

d. If the project requires disposal of liquid animal manure, describe disposal technique and location and discuss capacity to handle the volume and composition of manure. Identify any improvements necessary. Describe any required setbacks for land disposal systems.

N/A

17. Geologic hazards and soil conditions.

a. Approximate depth (in feet) to Groundwater 1.5' (Creek), 6.6'+ minimum; *1-3'* *6.6'+* average.
Bedrock: *6.6'+* minimum; *<50', 50-100'* average.

Describe any of the following geologic site hazards to groundwater and also identify them on the site map: sinkholes, shallow limestone formations or karst conditions. Describe measures to avoid or minimize environmental problems due to any of these hazards.

No geologic site hazards are present.

b. Describe the soils on the site, giving U.S. Soil Conservation Service (SCS) classifications, if known. Discuss soil granularity and potential for groundwater contamination from wastes or chemicals spread or spilled onto the soils. Discuss any mitigation measures to prevent such contamination.

The soils present at the 26th and Seabury Site are classified as Urban land - Dorset complex. The 38th and Minnehaha Parkway Site contain the following soils: Bygland, Dorset complex, and Elkriver-Fordum complex. Bygland soils have a low potential for groundwater contamination (Soil present to the east of Hiawatha Ave at 38th and Minnehaha Pkwy Site). The Dorset and Elkriver-Fordum complex soils types have have moderately high to high potential for groundwater contamination.

18. Solid wastes, hazardous wastes, storage tanks.

a. Describe types, amounts and compositions of solid or hazardous wastes, including solid animal manure, sludge and ash, produced during construction and operation. Identify method and location of disposal. For projects generating municipal solid waste, indicate if there is a source separation plan; describe how the project will be modified for recycling. If hazardous waste is generated, indicate if there is a hazardous waste minimization plan and routine hazardous waste reduction assessments.

No solid or hazardous wastes will be produced as a result of this project.

b. Identify any toxic or hazardous materials to be used or present at the site and identify measures to be used to prevent them from contaminating groundwater. If the use of toxic or hazardous materials will lead to a regulated waste, discharge or emission, discuss any alternatives considered to minimize or eliminate the waste, discharge or emission.

No toxic or hazardous materials will be used at this site.

c. Indicate the number, location, size and use of any above or below ground tanks to store petroleum products or other materials, except water. Describe any emergency response containment plans.

A Phase I Environmental Site Assessment determined the existense of a Leaking Underground Storage Tank (LUST) from a former gas station 0.02 miles from the 38th and Minnehaha Site. Removal of the tank has occurred and the MPCA closed out the site in 2009. No further action is anticipated. No tanks will be installed for storage of hazardous/petroleum materials. The structures being installed will assist in managing the flow of wastewater.

19. Traffic. Parking spaces added: *N/A* Existing spaces (if project involves expansion): *N/A* Estimated total average daily traffic generated: *N/A* Estimated maximum peak hour traffic generated (if known) and its timing: *N/A* Provide an estimate of the impact on traffic congestion affected roads and describe any traffic improvements necessary. If the project is within the Twin Cities metropolitan area, discuss its impact on the regional transportation system.

This project will not impact the regional transportation system.

20. Vehicle-related air emissions. Estimate the effect of the project's traffic generation on air quality, including carbon monoxide levels. Discuss the effect of traffic improvements or other mitigation measures on air quality impacts. Note: If the project involves 500 or more parking spaces, consult *Environmental Assessment Worksheet (EAW) Guidelines* about whether a detailed air quality analysis is needed.

The project will have no long term effect on vehicle-related air quality.

21. **Stationary source air emissions.** Describe the type, sources, quantities and compositions of any emissions from stationary sources of air emissions such as boilers, exhaust stacks or fugitive dust sources. Include any hazardous air pollutants (consult *EAW Guidelines* for a listing), any greenhouse gases (such as carbon dioxide, methane, and nitrous oxides), and ozone-depleting chemicals (chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons or sulfur hexafluoride). Also describe any proposed pollution prevention techniques and proposed air pollution control devices. Describe the impacts on air quality.

The project will not involve any stationary source air emissions. Methane and other sewer gases will be present but contained within the sewer.

22. **Odors, noise, and dust.** Will the project generate odors, noise or dust during construction or during operation? ☒ Yes ☐ No

If yes, describe sources, characteristics, duration, quantities or intensity and any proposed measures to mitigate adverse impacts. Also identify locations of nearby sensitive receptors and estimate impacts on them. Discuss potential impacts on human health or quality of life. (Note: fugitive dust generated by operations may be discussed at item 23 instead of here.)

Odor and dust may be of concern. Odor control facilities are being considered such as carbon scrubbers. Other regulator facilities utilize carbon scrubbers and biofilters.

23. **Nearby resources.** Are any of the following resources on or in proximity to the site? Projects should search the State Historic Preservation Office's (SHPO) National Register of Historic Places database by calling 651-259-3453.

***Note:** Project proposers must contact the SHPO at Thomas.cinadr@mnhs.org or 651-259-3453 to request a database review to obtain information on any known historical or archaeological sites in the project area. Include a copy of correspondence with SHPO with the submittal of this EIW form.

a. Archaeological, historical, or architectural resources? ☒ Yes ☐ No
b. Prime or unique farmlands or land within an agricultural preserve? ☐ Yes ☒ No
c. Designated parks, recreation areas, or trails? ☒ Yes ☐ No
d. Scenic views and vistas? ☒ Yes ☐ No
e. Other unique resources? ☐ Yes ☒ No

If yes, describe the resource and identify any project-related impacts on the resources. Describe any measures to minimize or avoid adverse impacts.

SHPO was contacted on August 8th, 2012 and August 15th, 2012. There are two SHPO sites in close proximity to the south project location (38th and Minnehaha Pkwy). Due to the localized nature of the construction, these structures will not be affected. The bridge over Hiawatha Avenue and Bridgeman's Ice Cream Shoppe are the sites of concern, but they will not be affected. Attached in the Appendix is a location map identifying the SHPO sites. It should also be noted that Minnehaha Park is nearby the 38th and Minnehaha Pkwy site, but will not be impacted.

24. **Visual impacts**. Will the project create adverse visual impacts during construction or operation? Such as glare from intense lights, lights visible in wilderness areas and large visible plumes from cooling towers or exhaust stacks? ☐ Yes ☒ No

If yes, explain.

25. **Compatibility with plans and land use regulations.** Is the project subject to an adopted local comprehensive plan, land use plan or regulation, or other applicable land use, water, or resource management plan of a local, regional, state or federal agency? ☒ Yes ☐ No

If yes, describe the plan, discuss its compatibility with the project and explain how any conflicts will be resolved. If no, explain.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

26. **Impact on infrastructure and public services.** Will new or expanded utilities, roads, other infrastructure or public services be required to serve the project? ☐ Yes ☒ No

If yes, describe the new or additional infrastructure or services needed. (Note: any infrastructure that is a connected action with respect to the project must be assessed in the EAW; see *EAW Guidelines* for details.)

27. **Cumulative impacts.** Minn. R. 4410.1700, subp. 7, item B requires that the RGU consider the "cumulative potential effects of related or anticipated future projects" when determining the need for an environmental impact statement. Identify any past,

present or reasonably foreseeable future projects that may interact with the project described in this EAW in such a way as to cause cumulative impacts. Describe the nature of the cumulative impacts and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to cumulative impacts (or discuss each cumulative impact under appropriate item(s) elsewhere on this form).

No cumulative impacts are expected from the proposed work at either site.

28. Other potential environmental impacts. If the project may cause any adverse environmental impacts not addressed by items 1 to 28, identify and discuss them here, along with any proposed mitigation.

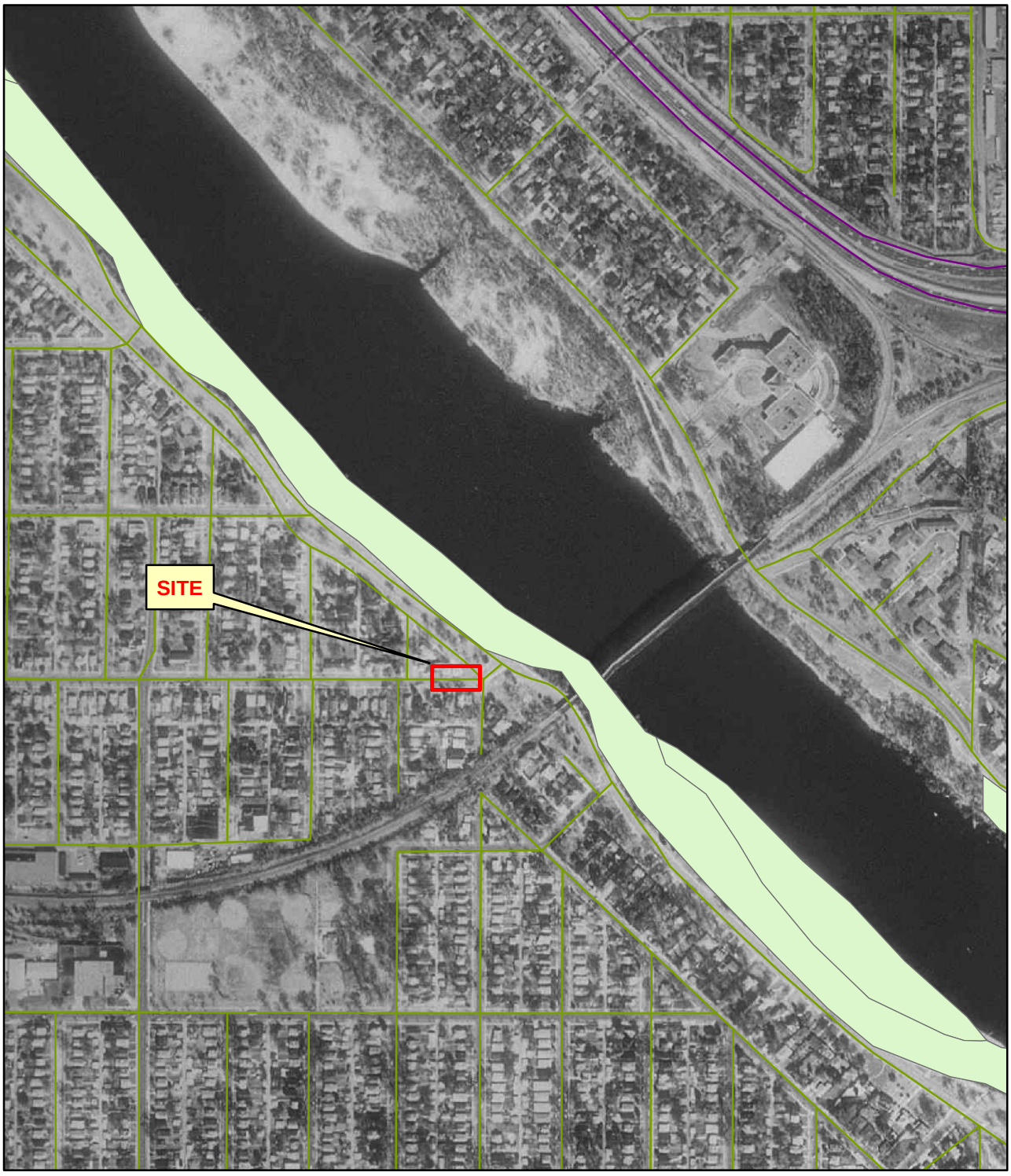
None expected

29. Summary of issues. List any impacts and issues identified above that may require further investigation before the project is begun. Discuss any alternatives or mitigative measures that have been or may be considered for these impacts and issues, including those that have been or may be ordered as permit conditions.

No evaluated impacts at either project site will require further investigation.

Appendix

ENGINEERING | SURVEYING | ENVIRONMENTAL | PLANNING



Map Created: 9/10/12

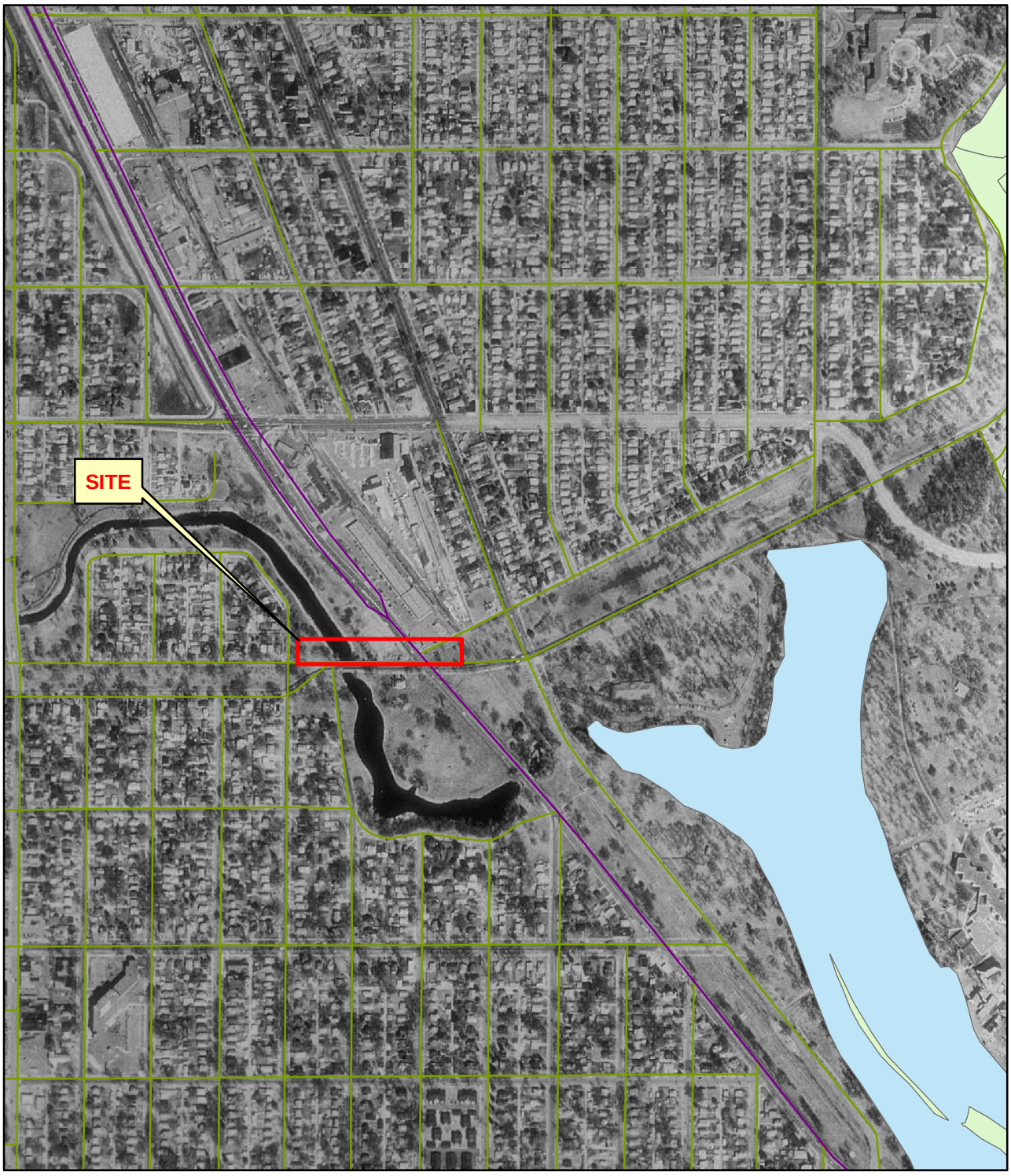
Legend

- MCBS Native Plant Communities
- MCBS Sites of Biodiversity Signifance

N

9. Fish, Wildlife, and Ecologically Sensitive Resources

ENGINEERING | SURVEYING | ENVIRONMENTAL | PLANNING



Map Created: 9/10/12

Legend

- MCBS Native Plant Communities
- MCBS Sites of Biodiversity Signifance

N

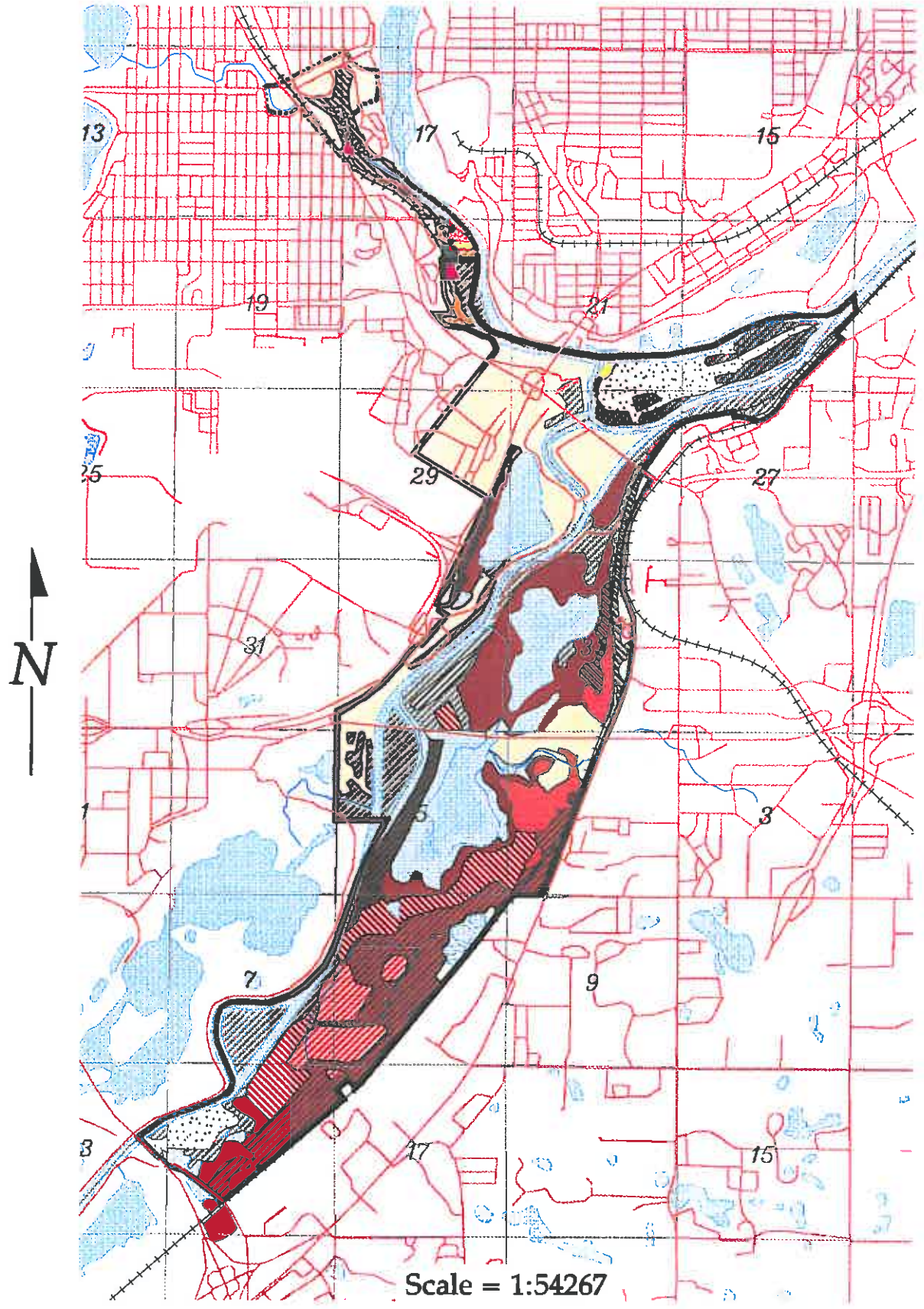
9. Fish, Wildlife, and Ecologically Sensitive Resources

Legend for Figure 1.

- Aspen Forest
- Oak Forest - mesic subtype
- Oak Forest - mesic subtype (disturbed)
- Maple-Basswood Forest
- Mesic Oak Savanna
- Mesic Oak Savanna (disturbed)
- Mesic Prairie (restored)
- Floodplain Forest
- Floodplain Forest (disturbed)
- Black Ash Swamp - seepage subtype
- Emergent Marsh
- Emergent Marsh (dominated by reed canary grass)
- Emergent Marsh (disturbed)
- Calcareous Seepage Fen - prairie subtype
- Calcareous Seepage Fen - prairie subtype (disturbed - dominated by reed canary grass)
- Calcareous Seepage Fen - prairie subtype (disturbed)
- Water bodies
- Hardwood planting
- Old field
- Developed lands

- Natural community polygon boundaries and disturbed areas
- Rivers and streams
- Fort Snelling State Park statutory boundary
- Minnehaha Regional Park boundary
- Section lines
- Roads
- Railroads

Figure 1.
Locations of natural communities and disturbed areas of Fort Snelling State Park and Minnehaha Regional Park, 1993-95 Field Surveys.



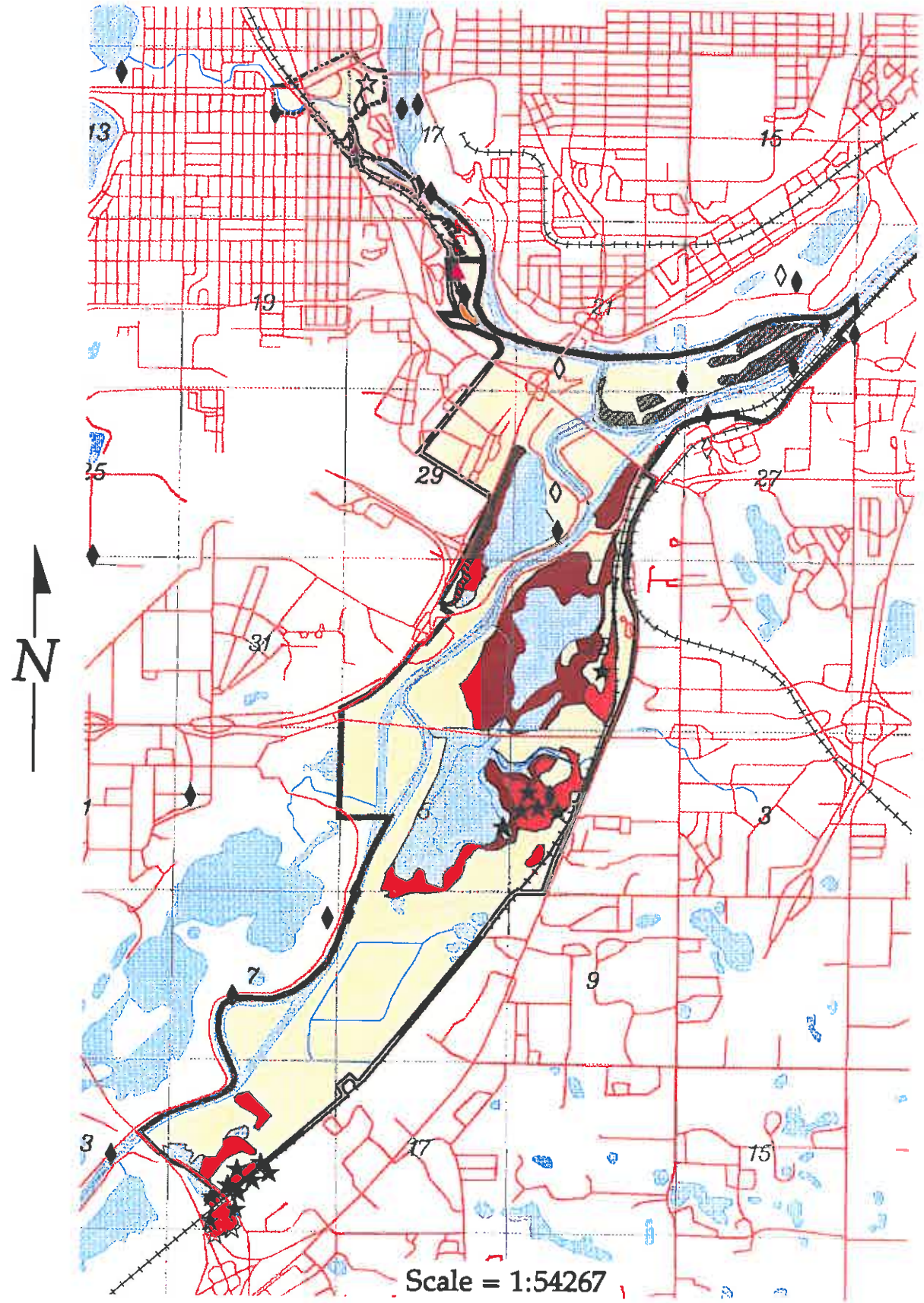
Source: MN County Biological Survey, October 19

Legend for Figure 2.

- Oak Forest - mesic subtype
- Maple-Basswood Forest
- Mesic Oak Savanna
- Floodplain Forest
- Black Ash Swamp - seepage subtype
- Emergent Marsh
- Calcareous Seepage Fen - prairie subtype
- Water bodies
- Disturbed lands

- Rare Plant Record (1970 and later)
- Historic Rare Plant Record (prior to 1970)
- Rare Animal Record (1970 and later)
- Historic Rare Animal Record (prior to 1970)
- Natural community polygon boundaries and disturbed areas
- Rivers and streams
- Fort Snelling State Park statutory boundary
- Minnehaha Regional Park boundary
- Section lines
- Roads
- Railroads

Figure 2.
Locations of natural communities and rare species of Fort Snelling State Park and Minnehaha Regional Park, 1993-95 Field Surveys.



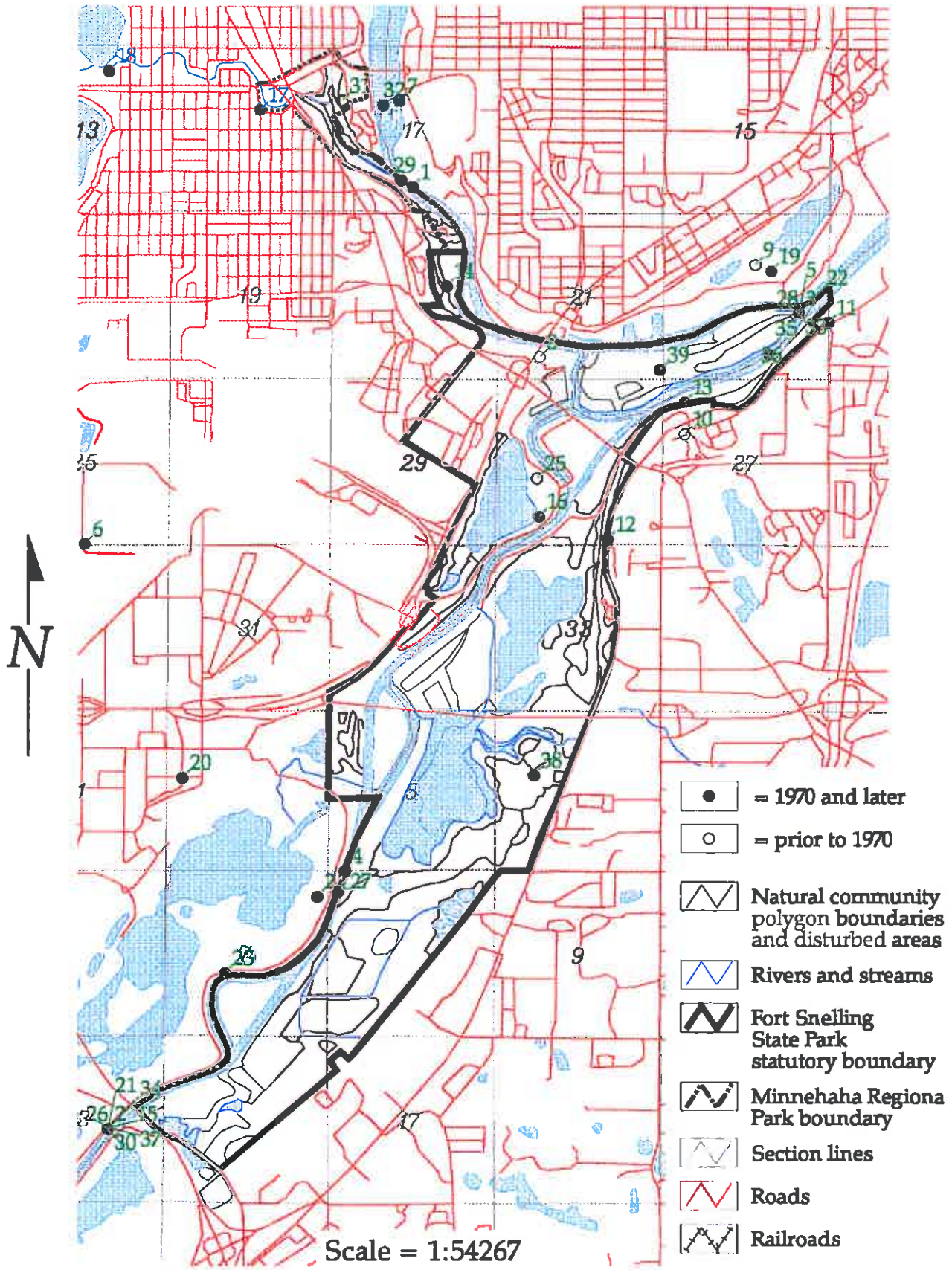
Source: MN County Biological Survey, October 19

Legend for Figure 5.

Map #	MN Stat	Occur #	Element name	Common name
1	NON	6	*Actinonaias ligamentina*	Mucket **mussel**
2	NON	95	***Actinonaias** ligamentina*	Mucket **mussel**
3	NON	96	***Actinonaias** ligamentina*	Mucket **mussel**
4	NON	11	***Arcidens** confragosus*	Rock-pocketbook **mussel**
5	NON	12	***Arcidens** confragosus*	Rock-pocketbook **mussel**
6	SPC	53	***Bartramia** longicauda*	Upland **sandpiper**
7	SPC	49	*Cycleptus **elongatus***	Blue **sucker**
8	SPC	4	*Elaphe **vulpina***	**Fox snake**
9	SPC	8	*Elaphe **vulpina***	**Fox snake**
10	SPC	27	*Elaphe **vulpina***	**Fox snake**
11	SPC	93	*Elaphe **vulpina***	**Fox snake**
12	SPC	94	*Elaphe **vulpina***	**Fox snake**
13	SPC	95	*Elaphe **vulpina***	**Fox snake**
14	SPC	108	*Elaphe **vulpina***	**Fox snake**
15	SPC	2	*Elliptio **crassidens***	Elephant-ear **mussel**
16	THR	7	*Emydoidea **blandingii***	Blanding's **turtle**
17	THR	423	*Emydoidea blandingii*	Blanding's **turtle**
18	THR	481	*Emydoidea blandingii*	Blanding's **turtle**
19	THR	699	*Emydoidea **blandingii***	Blanding's **turtle**
20	END	46	*Falco **peregrinus***	**Peregrine falcon**
21	SPC	8	***Fusconaia ebena***	Ebonyshell **mussel**
22	SPC	9	***Fusconaia ebena***	Ebonyshell **mussel**
23	THR	311	***Haliaeetus leucocephalus***	**Bald eagle**
24	THR	1439	***Haliaeetus leucocephalus***	**Bald eagle**
25	SPC	22	*Lampropeltis **triangulum***	**Milk snake**
26	NON	11	*Lampsilis **teres***	**Yellow sandshell mussel**
27	NON	12	*Lampsilis **teres***	**Yellow sandshell mussel**
28	NON	13	***Lampsilis** teres*	**Yellow sandshell mussel**
29	NON	19	*Ligumia **recta***	**Black sandshell mussel**
30	NON	94	*Ligumia **recta***	**Black sandshell mussel**
31	SPC	14	*Microtus **ochrogaster***	**Prairie vole**
32	SPC	7	***Polyodon spathula***	**Paddlefish**
33	NON	26	*Quadrula **metanevra***	Monkeyface **mussel**
34	NON	12	*Quadrula **nodulata***	Wartyback **mussel**
35	NON	13	*Quadrula **nodulata***	Wartyback **mussel**
36	SPC	4	*Scaphirhynchus **platorynchus***	**Shovelnose** sturgeon
37	NON	29	*Tritogonia **verrucosa***	Pistolgrip mussel
38	NON	0	***Vireo bellii***	**Bell's vireo**
39	NON	3	***Vireo bellii***	**Bell's vireo**

Minnesota Legal Status
END = Endangered
THR = Threatened
SPC = Special Concern
NON = No legal status

Figure 5.
Rare animal species occurrences in Fort Snelling State Park and Minnehaha Regional Park



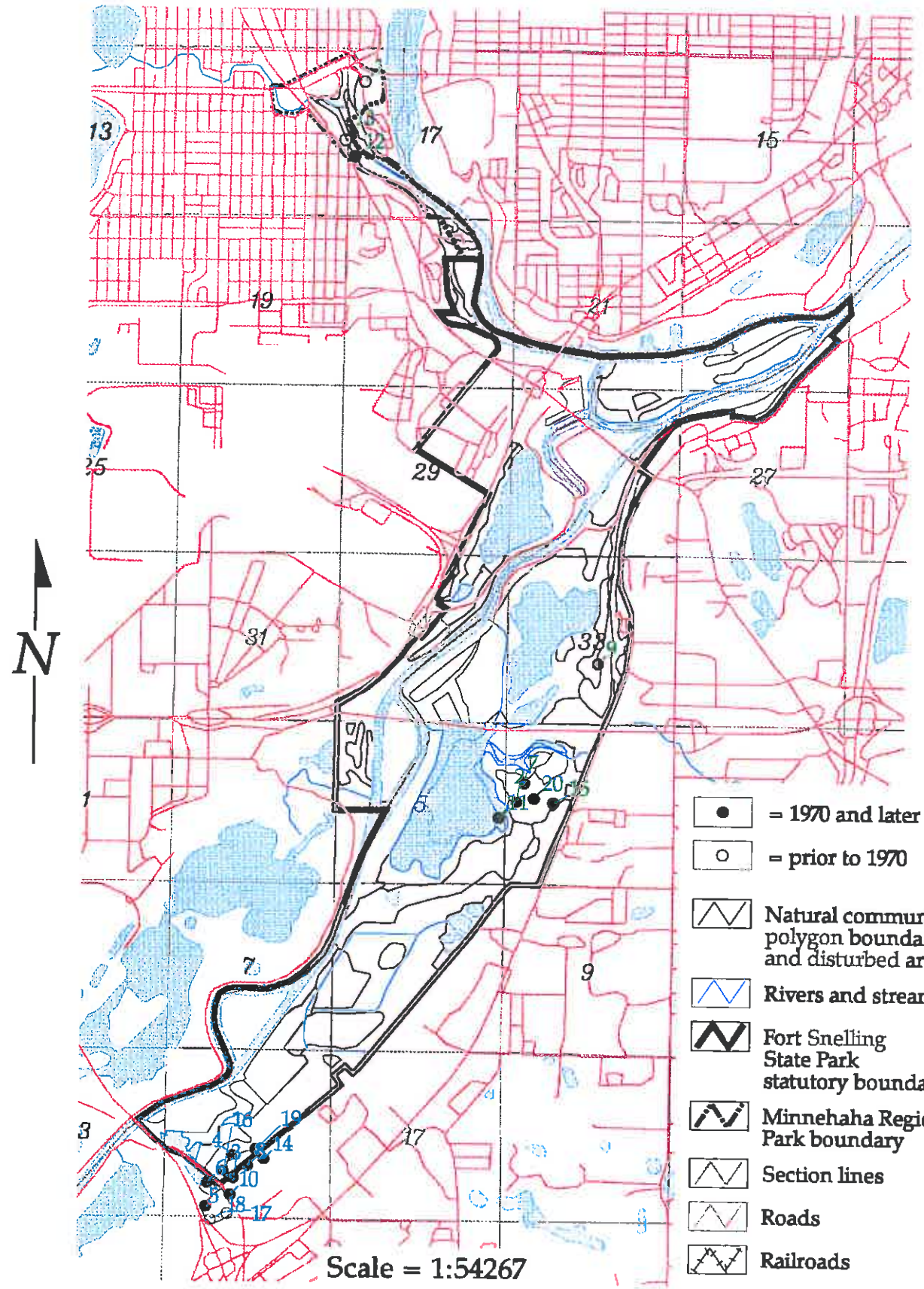
Source: MN County Biological Survey, October 19

Legend for Figure 4.

Map #	MN Stat	Occur #	Element name	Common name
1	PTH	1	*Carex plantaginea*	Plantain-leaved sedge
2	THR	3	*Carex sterilis*	Sterile sedge
3	THR	7	*Carex sterilis*	Sterile sedge
4	THR	58	*Carex sterilis*	Sterile sedge
5	THR	102	*Carex sterilis*	Sterile sedge
6	THR	103	*Carex sterilis*	Sterile sedge
7	SPC	22	*Cypripedium candidum*	Small white lady's slipper
8	SPC	24	*Cypripedium candidum*	Small white lady's slipper
9	SPC	217	*Cypripedium candidum*	Small white lady's slipper
10	SPC	260	*Cypripedium candidum*	Small white lady's slipper
11	SPC	21	*Echinochloa walteri*	Walter's barnyard grass
12	PSC	1	*Gaura biennis*	Biennial gaura
13	THR	3	*Lycopodium porophilum*	Rock clubmoss
14	NON	1	*Oxypolis rigidior*	Cowbane
15	NON	21	*Oxypolis rigidior*	Cowbane
16	NON	40	*Oxypolis rigidior*	Cowbane
17	THR	1	*Rhynchospora capillacea*	Hair-like beak-rush
18	THR	1	*Scleria verticillata*	Whorled nut-rush
19	THR	9	*Valeriana edulis* ssp. *ciliata*	Valerian
20	THR	13	*Valeriana edulis* ssp. *ciliata*	Valerian

Minnesota Legal Status
THR = Threatened
SPC = Special Concern
PTH = Proposed Threatened
PSC = Proposed Special Concern
NON = No legal status

Figure 4.
Rare plant species occurrences in Fort Snelling State Park and Minnehaha Regional Park



Source: MN County Biological Survey, October 19

12. Shoreland Zoning District Code

ARTICLE VI. - SH SHORELAND OVERLAY DISTRICT

551.440. - Purpose.

The SH Shoreland Overlay District is established to preserve and enhance the environmental qualities of surface waters and the natural and economic values of shoreland areas within the city, to provide for the efficient and beneficial utilization of those waters and shoreland areas, to comply with the requirements of state law regarding the management of shoreland areas, and to protect the public health, safety and welfare.

551.450. - Established boundaries.

The boundaries of the SH Overlay District shall be all land located within the following distances from protected waters: (1) One thousand (1,000) feet from the ordinary highwater mark of a lake, pond, wetland or flowage; or (2) Three hundred (300) feet from a river or stream or the landward extent of the floodplain of such river or stream, whichever is greater.

(2000-Or-048, § 2, 5-19-2000)

551.460. - Definitions.

As used in this article, the following words and phrases shall mean:

Best management practices. Erosion and sediment control and water quality practices that are the most effective and practicable means of controlling, preventing and minimizing degradation of surface water.

Bluff. A steep outcropping, hill, cliff or embankment along a river or stream, with an average slope of eighteen (18) percent or greater measured over a horizontal distance of fifty (50) feet or more, and that rises at least twenty-five (25) feet above the ordinary high water mark of the protected water.

Clear cutting. The removal of an entire stand of trees, shrubs, bushes or similar vegetation.

Development. The erection, construction, reconstruction, relocation or enlargement of any structure except walkways, stairways, retaining walls, light poles, piers, docks and similar structures where accessory to a public park, unenclosed structures up to four hundred (400) square feet and not more than twenty (20) feet wide used for the storage of watercraft where accessory to a public park and if located at least ten (10) feet from the ordinary high water mark of any protected water, and stairways and seasonal

docks not exceeding four (4) feet in width where accessory to any other use.

Ordinary highwater mark. A mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The ordinary highwater mark commonly is that point where natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Protected waters. The following lakes, ponds, wetlands, streams and rivers are protected waters: Brownie Lake, Cedar Lake, Lake of the Isles, Lake Calhoun, Lake Harriet, Lake Nokomis, Lake Hiawatha, Mother Lake, Legion Lake, Cemetery Lake, Diamond Lake, Grass Lake, Powderhorn Lake, Ryan Lake, Spring Lake, Taft Lake, Birch Pond, Bridal Veil Pond, Loring Pond, Webber Pond, wetlands mapped by the city engineer or classified by the United States Fish and Wildlife Service, Bassett Creek, Minnehaha Creek and Shingle Creek and the Mississippi River.

Steep slope. Land having an average slope of eighteen (18) percent or greater measured over a horizontal distance of fifty (50) feet or more. Steep slopes that are less than ten (10) feet in height shall not be considered a steep slope.

Surface water oriented uses. Land uses in which access to or use of a surface water feature is an integral component, such as boathouses, docks, marinas, observation platforms and water control structures including locks and dams.

Top of steep slope. The contour at which the slope ceases to be eighteen (18) percent or more.

(2000-Or-048, § 3, 5-19-2000)

551.470. - Location of development.

(a) *Location prohibited except as authorized by variance.* Except as allowed in section (b) below or where approved by a variance as provided in this article and Chapter 525, Administration and Enforcement, development in the SH Overlay District shall be prohibited on steep slopes or within forty (40) feet of the top of a steep slope or bluff, and shall not be located within fifty (50) feet of the ordinary high water mark of any protected water. Development authorized by variance shall be subject to the following:

(1) Development must currently exist on the steep slope or within forty (40) feet of the top of a steep slope within five hundred (500) feet of the proposed development.

(2) The foundation and underlying material shall be adequate for the slope condition and soil type.

(3) The development shall present no danger of falling rock, mud, uprooted trees or other materials.

(4) The view of the developed slope from the protected water shall be consistent with the natural appearance of the slope, with any historic areas, and with the surrounding physical context.

(b) *Location restricted except as authorized by conditional use permit.* Conditional uses authorized in the primary zoning district are also authorized in the SH Overlay District and are subject to section (a) above. Notwithstanding section (a) above, the following uses may be allowed in all areas of the SH Overlay District by conditional use permit rather than variance as provided in this article and Chapter 525, Administration and Enforcement.

(1) Public parks and surface water-oriented development on steep slopes or within forty (40) feet of the top of a steep slope, other than bluffs, or within fifty (50) feet of the ordinary high water mark of any protected water, where allowed by the primary zoning district, provided the development does not cause a hazard to water navigation.

(2) Electrical transmission services of under two hundred twenty (220) kilovolts, subject to the following conditions:

a. When routing transmission services, all of the following shall be avoided where practicable:

1. Steep slopes, streams, rivers, valleys and open exposures of water, wetlands, wooded areas, ridge crests and open space recreation areas.
2. Soils susceptible to erosion, which would create sedimentation and pollution problems, and areas of unstable soils which would be subject to extensive slippage.
3. Areas with high water tables, especially if construction requires excavation.

b. The structural design of transmission services shall consider the following:

1. Underground placement shall be preferred in order to minimize visual impact. If above ground placement is proposed, the applicant shall describe the economic, technological or land characteristics which make underground placement infeasible.
2. If above ground placement is necessary, the appearance of any structures shall be made as compatible as practicable with the natural area with regard to height, width, materials used and color.
3. The cleared portion of the right-of-way shall be kept to a minimum.
4. Crossing points over protected waters shall be consolidated with other public facilities and rights-of-way so that the smallest area possible is devoted to crossing.

c. In the construction of transmission service, effective erosion and sedimentation control programs shall be conducted during all clearing, construction or reconstruction operations in order to prevent the degradation of surface waters and adjacent lands.

d. Right-of-way maintenance shall comply with the following:

1. Natural vegetation of value to fish or wildlife, which does not pose a hazard to or restrict reasonable use of the utility, shall be allowed to grow in the right-of-way.
2. Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs and low- growing trees shall be planted and maintained on the right-of-way.
3. Chemical control of vegetation shall be avoided. Where such methods are necessary, chemicals used and the manner of their use shall be in accordance with rules, regulations and other requirements of all state and federal agencies with authority over the use, and best management practices shall be followed.

(2000-Or-048, § 4, 5-19-2000; 2008-Or-010, § 1, 2-1-08)

551.480. - Height of structures.

Except for structures subject to a more restrictive maximum height limitation in the primary zoning district, the maximum height of all structures within the SH Overlay District, except for single and two-family dwellings, shall be two and one-half (2.5) stories or thirty-five (35) feet, whichever is less. The maximum height of single and two-family dwellings shall be two and one-half stories or thirty (30) feet, whichever is less. The height limitation of accessory structures and single and two-family dwellings may be increased by variance, as provided in Chapter 525, Administration and Enforcement. The height limitation of all other principal structures may be increased by conditional use permit, as provided in Chapter 525, Administration and Enforcement. In addition to the conditional use standards contained in Chapter 525, the city planning commission shall consider, but not be limited to, the following factors when determining maximum height:

(1) Access to light and air of surrounding properties.
(2) Shadowing of residential properties or significant public spaces.
(3) The scale and character of surrounding uses.
(4) Preservation of views of landmark buildings, significant open spaces or water bodies.

(2008-Or-010, § 2, 2-1-08)

551.490. - Conditional uses and variances.

(a) *Evaluation criteria.* In addition to the conditional use and variance standards contained in Chapter 525, Administration and Enforcement, the city planning commission and board of adjustment shall consider the following:

(1) The prevention of soil erosion or other possible pollution of public waters, both during and after construction.

(2) Limiting the visibility of structures and other development from protected waters.

(3) The suitability of the protected water to safely accommodate the types, uses and numbers of watercraft that the development may generate.

(2000-Or-048, § 5, 5-19-2000; 2007-Or-089, § 1, 10-19-07; 2008-Or-010, § 3, 2-1-08)

551.500. - Development on slopes between twelve (12) and eighteen (18) percent.

Development on slopes between twelve (12) and eighteen (18) percent, other than bluffs, where allowed by the primary zoning district, provided the development is not located within fifty (50) feet of the ordinary high water mark of any protected water, may be allowed in the SH Overlay District subject to the regulations of this article, Chapter 535, Regulations of General Applicability, and the following conditions:

(1) The foundation and underlying material shall be adequate for the slope condition and soil type.

(2) The development shall present no danger of falling rock, mud, uprooted trees or other materials.

(3) The view of the developed slope from the protected water shall be consistent with the natural appearance of the slope, with any historic areas, and with surrounding architectural features.

(2000-Or-048, § 6, 5-19-2000)

551.510. - Grading and filling.

Grading or filling involving more than ten (10) cubic yards where the slope of the land is toward a protected water shall be prohibited within the SH Overlay District except where authorized by an erosion control plan approved by the city engineer and the zoning administrator, subject to the following conditions:

(1) The smallest amount of bare ground shall be exposed for as short a time as feasible.

(2) Temporary ground cover, such as mulch, shall be used and permanent ground cover, such as turf grass, native grasses or other perennial flowering plants, vines, shrubs or trees shall be established.

(3) Best management practices to prevent erosion and trap sediment shall be employed to ensure that soil loss levels do not degrade the protected water.

(4) Fill shall be stabilized to accepted engineering standards.

(5) Any work which will change or diminish the course, current or cross-section of a protected water shall be prohibited except where approved by the commissioner of natural resources.

(6) The top of a riverbank or lake bank shall not be moved closer to the protected water.

(7) Such grading or filling shall comply with the provisions of Chapter 52, Erosion and Sediment Control for Land Disturbance Activities, of the Minneapolis Code of Ordinances.

551.520. - Removal of vegetation.

Removal of vegetation on steep slopes or bluffs or within forty (40) feet of the top of steep slopes or bluffs, or within fifty (50) feet of the ordinary high water mark of any protected water, shall be prohibited within the SH Overlay District except as authorized by the zoning administrator subject to the following conditions:

(1) Clear cutting of vegetation shall be prohibited, except as necessary for an approved development and subject to the requirements of this article and Chapter 535, Regulations of

General Applicability. This provision shall not prevent the removal of noxious weeds or dead or diseased vegetation.

(2) Selective removal of vegetation shall be allowed, subject to the requirements of this article and Chapter 535, Regulations of General Applicability, provided sufficient vegetative cover remains to screen parking areas, dwellings and other structures when viewed from the protected water and provided a continuous natural cover is maintained.

(3) Vegetation shall be restored to the extent feasible after any construction project is completed to retard surface runoff and soil erosion and to provide screening. Restoration shall be completed as soon as feasible, but in no case later than the beginning of the next growing season following the completion of a project.

(4) Best management practices to prevent erosion and trap sediment shall be employed to ensure that soil loss levels do not degrade the protected water.

(2000-Or-048, § 7, 5-19-2000)

551.530. - Stormwater management.

All development shall comply with all applicable regulations governing stormwater management, and shall employ best management practices to minimize off-site stormwater runoff, maximize overland flow and flow distances over surfaces covered with vegetation, increase on-site filtration, replicate predevelopment hydrologic conditions as nearly as possible, minimize off-site discharge of pollutants to ground and surface water, and encourage natural filtration function.

ENGINEERING | SURVEYING | ENVIRONMENTAL | PLANNING

Map Created: 9/10/12

Legend

- Affected Site Locations
- Historic/Architecture Property Listings

0 100 200 400 Feet

N

23. Nearby Resources (SHPO)

From: Thomas Cinadr [thomas.cinadr@mnhs.org]
Sent: Wednesday, August 08, 2012 2:41 PM
To: Dan Sjoblom
Subject: Re: SHPO Review for two properties - Minneapolis, MN
Attachments: Historic.rtf; Archaeology.rtf

THIS EMAIL IS NOT A PROJECT CLEARANCE.

This message simply reports the results of the cultural resources database search you requested. The database search produced results for only previously known archaeological sites and historic properties. Please read the note below carefully.

Archaeological sites and historic properties were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory for the search area requested. **Reports containing the results of the search are attached.**

The result of this database search provides a listing of recorded archaeological sites and historic architectural properties that are included in the current SHPO databases. Because the majority of archaeological sites in the state and many historic architectural properties have not been recorded, important sites or structures may exist within the search area and may be affected by development projects within that area. Additional research, including field survey, may be necessary to adequately assess the area's potential to contain historic properties.

If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson in Review and Compliance @ 651-259-3455 or by email at kelly.graggjohnson@mnhs.org.

The Minnesota SHPO Survey Manuals and Database Metadata and Contractor Lists can be found at
http://www.mnhs.org/shpo/survey/inventories.htm

SHPO research hours are 8:00 AM – 4:00 PM Tuesday-Friday.
The Office is closed on Mondays.

Tom Cinadr
Survey and Information Management Coordinator
Minnesota State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. West
St. Paul, MN 55102

651-259-3453

On Wed, Aug 8, 2012 at 9:29 AM, Dan Sjoblom <dsjoblom@evs-eng.com> wrote:
Tom,

Here are the requested coordinates for each location:

T29N R23W Section 31

26th and Seabury

T28N R23W Section 18
38th and Minnehaha Pkwy

Thanks,

Daniel M. Sjoblom, EIT
EVS, Inc. | Staff Engineer
10250 Valley View Rd. Ste 123, Eden Prairie, MN 55344
dsjoblom@evs-eng.com | www.evs-eng.com

From: Thomas Cinadr [mailto:thomas.cinadr@mnhs.org]
Sent: Wednesday, August 08, 2012 8:47 AM
To: Dan Sjoblom
Subject: Re: SHPO Review for two properties - Minneapolis, MN

Dan,

I need the Township/Range/Section coordinates for your search request.

Tom

Tom Cinadr
Survey and Information Management Coordinator
Minnesota State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. West
St. Paul, MN 55102

651-259-3453

On Tue, Aug 7, 2012 at 11:08 AM, Dan Sjoblom <dsjoblom@evs-eng.com> wrote:
Dear Mr. Cinadr,

EVS Inc. is performing an Environmental Assessment of two sites located in Minneapolis, MN. We are required to notify SHPO of this action and request any comments you might have as to whether this property is:

- Listed or eligible to be listed on the National register of Historic Places
- The property is located within or adjacent to a Historic District
- Does the property's area of potential effects include an historic district.

I've attached two location maps of our assessment areas and the two intersections are listed below:

E. 26th Street & Seabury Avenue S.
Minneapolis, Hennepin County, Minnesota 55406
(Residential Properties of interest may include: 2556 Seabury, 3905-3927 26th St. E., and 2605 40th Ave S.)

38th Avenue S. & Minnehaha Parkway
Minneapolis, Hennepin County, Minnesota 55406
(Extends to the East across the Hiawatha Ave to Nawadaha Blvd)

Thank you very much,

Daniel M. Sjoblom, EIT
EVS, Inc. | Staff Engineer
10250 Valley View Rd. Ste 123, Eden Prairie, MN 55344
dsjoblom@evs-eng.com | www.evs-eng.com

From: Thomas Cinadr [thomas.cinadr@mnhs.org]
Sent: Wednesday, August 15, 2012 7:27 AM
To: Dan Sjoblom
Subject: Re: SHPO Review Request
Attachments: Archaeology.rtf; Historic.rtf

THIS EMAIL IS NOT A PROJECT CLEARANCE.

This message simply reports the results of the cultural resources database search you requested. The database search produced results for only previously known archaeological sites and historic properties. Please read the note below carefully.

Archaeological sites and historic properties were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory for the search area requested. **Reports containing the results of the search are attached.**

The result of this database search provides a listing of recorded archaeological sites and historic architectural properties that are included in the current SHPO databases. Because the majority of archaeological sites in the state and many historic architectural properties have not been recorded, important sites or structures may exist within the search area and may be affected by development projects within that area. Additional research, including field survey, may be necessary to adequately assess the area's potential to contain historic properties.

If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson in Review and Compliance @ 651-259-3455 or by email at kelly.graggjohnson@mnhs.org.

The Minnesota SHPO Survey Manuals and Database Metadata and Contractor Lists can be found at
http://www.mnhs.org/shpo/survey/inventories.htm

SHPO research hours are 8:00 AM – 4:00 PM Tuesday-Friday.
The Office is closed on Mondays.

Tom Cinadr
Survey and Information Management Coordinator
Minnesota State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. West
St. Paul, MN 55102

651-259-3453

On Tue, Aug 14, 2012 at 7:30 AM, Dan Sjoblom <dsjoblom@evs-eng.com> wrote:
Mr. Cinadr,

EVS Inc. is performing an Environmental Assessment of a site located in Minneapolis, MN. We are required to notify SHPO of this action and request any comments you might have as to whether this property is:

- Listed or eligible to be listed on the National register of Historic Places
- The property is located within or adjacent to a Historic District

- Does the property's area of potential effects include an historic district.

The Township/Range/Section coordinates are as follows:

T28N R23W Section 18
(38th and Minnehaha Pkwy)

Thank you,

Daniel M. Sjoblom, EIT
EVS, Inc. | Staff Engineer
10250 Valley View Rd. Ste 123, Eden Prairie, MN 55344
dsjoblom@evs-eng.com | www.evs-eng.com

Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Tradition	Context	Reports	NR	CEF	DOE
County:	**Hennepin**													
21HE0291	Longfellow Gardens	28	23	18	NE-NW-SW-NE	2.2	1	AS,SR		TR-1	HE-99-02			

Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Tradition	Context	Reports	NR	CEF	DOE
County:	**Hennepin**													
21HE0348	Meeker Island Lock and Dam	29	23	31	SE-SE-NE	17	1	SR		UC-1				
	Meeker Island Lock and Dam	29	23	31	NE-NE-SE	17	1	SR		UC-1				
County:	**Ramsey**													
21RA0051	Meeker Island Lock and Dam	29	23	31	SE-NE-SE	17	1	SR		UC-1				

History/Architecture Inventory

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
Parkway Motor Hotel	4757 Hiawatha Ave. S.	28	23	18	SE-NW-NE	St. Paul West					HE-MPC-4110
Minnehaha Falls	Hiawatha Ave. & Mississippi River	28	23	18	NW-SE-NE	St. Paul West		Y			HE-MPC-4111
house	3021 Minnehaha Pkwy.	28	23	18	NE-SE-NE	St. Paul West					HE-MPC-4190
St. James Episcopal Church	3225 Minnehaha Pkwy. E.	28	23	18	NW-SW-NW	St. Paul West					HE-MPC-4191
Lake Nokomis Lutheran Church	5011 31st Ave. S.	28	23	18	NW-NW-SW	St. Paul West					HE-MPC-4553
service station	5032 34th Ave. S.	28	23	18	NE-NW-SW	St. Paul West					HE-MPC-4567
Nokomis Branch Library	5100 34th Ave. S.	28	23	18	SE-NW-SW	St. Paul West					HE-MPC-4568
house	4900 36th Ave. S.	28	23	18	SW-SE-NW	St. Paul West					HE-MPC-4577
house	4818 37th Ave. S.	28	23	18	NW-SE-NW	St. Paul West					HE-MPC-4582
house	4820 38th Ave. S.	28	23	18	NE-SE-NW	St. Paul West					HE-MPC-4586
Resurrection Lutheran Church	5350 38th Ave. S.	28	23	18	SE-SE-SW	St. Paul West					HE-MPC-4587
farmhouses	49xx 39th Ave. S.	28	23	18	S-S-N	St. Paul West					HE-MPC-4589
house	4912 41st Ave. S.	28	23	18	SW-SW-NE	St. Paul West					HE-MPC-4605
Trinity Lutheran Congregational Church	5212 41st Ave. S.	28	23	18	NW-SW-SE	St. Paul West					HE-MPC-4606
house	5033 43rd Ave. S.	28	23	18	NW-NE-SE	St. Paul West					HE-MPC-4618
gas station	3319 50th St. E.	28	23	18	SW-SE-NW	St. Paul West					HE-MPC-4719
Minnehaha United Methodist Church	3701 50th St. E.	28	23	18	NE-NE-SW	St. Paul West					HE-MPC-4720
house	3901 50th St. E.	28	23	18	NW-NW-SE	St. Paul West					HE-MPC-4721
duplex	3201-3203 51st St. S.	28	23	18	SW-NW-SW	St. Paul West					HE-MPC-4722
Faith Evangelical Lutheran Church	3430 51st. St. E.	28	23	18	NE-NW-SW	St. Paul West					HE-MPC-4723
Bridge No. 4559	Minnehaha Pkwy. over Minnehaha Creek	28	23	18	NE-SW-NE	St. Paul West					HE-MPC-4811
Bridge No. 3953	MUN 1121 / M'haha Pkwy / M'haha Creek	28	23	18							HE-MPC-5353

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
Minnehaha Parkway	Minnehaha Parkway between Hiawatha Ave. and Lake Harriet Parkway	28	23	18		Saint Paul West	HE-99-4H		Y		HE-MPC-5359
Bridge No. 5492	TH 55 over Minnehaha Creek	28	23	18	NE-SW-NE	St. Paul West					HE-MPC-8356

History/Architecture Inventory

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
Canada Dry Bottling Works	3530-3536 E. 28th St.	29	23	31	SW-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0626
North Star Foundry	32xx E. 27th St.	29	23	31	SW-NW-SW	St. Paul West	HE-2004-2H				HE-MPC-0632
Stockland Roacd machinery Company	3415 27th St. E	29	23	31	SE-NW-SW	St. Paul West	HE-2004-2H				HE-MPC-0633
Chicago, Milwaukee & St. Paul Viaduct	Chicago, Milwaukee & St. Paul Railroad over 36th Ave. S	29	23	31	SW-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0634
house	2652 38th Ave. S	29	23	31	NE-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0635
house	2647 38th Ave. S	29	23	31	NE-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0636
pedestrian underpass	38th Ave. under Chicago, Milwaukee & St. Paul Railroad	29	23	31	SE-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0637
house	2636 39th Ave. S	29	23	31	NE-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0638
house	2629 39th Ave. S	29	23	31	NW-NW-SE	St. Paul West	HE-2004-2H				HE-MPC-0639
George A. Brackett Field	3601 E. 28th St.	29	23	31	S-NE-SW	St. Paul West	HE-2004-2H				HE-MPC-0642
duplex	2629-2631 Dorman Ave.	29	23	31	NW-NW-SE	St. Paul West	HE-2004-2H				HE-MPC-0643
house	2616 River Parkway W	29	23	31	NE-NW-SE	St. Paul West	HE-2004-2H				HE-MPC-0644
Chicago, Milwaukee & St. Paul Short Line Railroad	parallel to 27th Ave.	29	23	31	S	St. Paul West	HE-2004-2H				HE-MPC-0645
house	252 Bedford St. SE	29	23	31	NW-NE-NE	St. Paul West	HE-2001-3H				HE-MPC-3011
Malcolm Willey House	255 Bedford St. SE	29	23	31	NE-NE-NE	St. Paul West	HE-2001-3H	Y			HE-MPC-3012
house	1901 East River Terrace	29	23	31	NE-NW-NE	St. Paul West					HE-MPC-3066
house	1933 East River Terrace	29	23	31	SE-NW-NE	St. Paul West					HE-MPC-3067
Willem and Willemina Luyten Residence	1940 East River Terrace	29	23	31	SE-NW-NE	St. Paul West					HE-MPC-3068
house	1956 East River Terrace	29	23	31	SE-NW-NE	St. Paul West					HE-MPC-3069
apartment	2214-2216 Sharon Ave. SE	29	23	31	NE-NE-NE	St. Paul West	HE-2001-3H				HE-MPC-3079

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
Linstrom/Julian House	2100 Minneapolis Ave.	29	23	31	NW-SW-NW	St. Paul West					HE-MPC-3624
house	2815 31st Avenue South	29	23	31	SW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3911
St. Albert the Great	2836 33rd Avenue South	29	23	31	SW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3915
J. G. Herr House	2836 35th Avenue South	29	23	31	SW-SE	Minneapolis South	HE-2009-10H				HE-MPC-3920
Marion Cooper House	2800 36th Avenue South	29	23	31	SW-SE	Minneapolis South	HE-2009-10H				HE-MPC-3922
house	2933 36th Avenue South	29	23	31	SW-SE	Minneapolis South					HE-MPC-3923
Robert Sorenson House	3121 22nd Street East	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3946
Vandenburgh Memorial Tabernacal	3101 24th Street East	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3947
duplex	3128-3130 24th Street East	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3948
four-plex	3223 25th Street East	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3951
four-plex	3227 25th Street East	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3952
American Wicker Works	3105 26th Street East	29	23	31	SW-NW	Minneapolis South	HE-2009-10H				HE-MPC-3954
Stampings Inc.	3119 26th Street East	29	23	31	SW-NW	Minneapolis South	HE-2009-10H				HE-MPC-3955
four-plex	2508 33rd Avenue South	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3959
four-plex	2512 33rd Avenue South	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3960
Silas Anderson House	2420 33rd Avenue South	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3961
Donald B. Lawrence House	2420 34th Avenue South	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3962
Close Associates Office	3101 East Franklin Avenue	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3967
Dr. Andrew Sonderlund House	2016 Seabury Avenue	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3969
N. A. Johnson House	2036 Seabury Avenue	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3970
house	2216 Seabury Avenue	29	23	31	NW-SW	Minneapolis South	HE-2009-10H				HE-MPC-3971
Elmer Freeman House	2428 Seabury Avenue	29	23	31	NW-SE	Minneapolis South	HE-2009-10H				HE-MPC-3972
Gustav Freeman Apartment/Garage	2432 Seabury Avenue	29	23	31	NW-SE	Minneapolis South	HE-2009-10H				HE-MPC-3973
house	2929 38th Avenue South	29	23	31	SE-SW	Minneapolis South	HE-2009-10H				HE-MPC-3974

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY	**Hennepin**										
CITY/TOWNSHIP:	**Minneapolis**										
house	2721 39th Avenue South	29	23	31	SE-NW	Minneapolis South	HE-2009-10H				HE-MPC-3975
house	2916 39th Avenue South	29	23	31	SE-SW	Minneapolis South	HE-2009-10H				HE-MPC-3976
house	2944 42nd Avenue South	29	23	31	SE-SW	Minneapolis South	HE-2009-10H				HE-MPC-3979
house	2853 44th Avenue South	29	23	31	SE-SE	Minneapolis South	HE-2009-10				HE-MPC-3987
house	2901 45th Avenue South	29	23	31	SE-SE	Minneapolis South	HE-2009-10H				HE-MPC-3989
house	2904 45th Avenue South	29	23	31	SE-SE	Minneapolis South	HE-2009-10H				HE-MPC-3990
Dr. Emil Sebastian Geist House	2904 46th Avenue South	29	23	31	SE-SE	Minneapolis South	HE-2009-10H				HE-MPC-3991
house	2911 Dorman Ave.	29	23	31	SE-SE	Minneapolis South	HE-2009-10H				HE-MPC-3993
Mrs. E. A. Lawrence House	2772 West River Parkway	29	23	31	SE-SE	Minneapolis South	HE-2009-10H				HE-MPC-3998
Gopher Post No. 440 America Legion	3418 Lake St. E.	29	23	31	SE-SW-SW	St. Paul West					HE-MPC-4126
El Lago Theater	3500-3506 Lake St. E.	29	23	31	SW-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-4127
El Lago Theater		29	23	31	SW-SE-SW	St. Paul West	HE-90-10H				HE-MPC-4127
house	2221 Minneapolis Ave. S.	29	23	31	SW-NW-NW	St. Paul West					HE-MPC-4176
house	2305 Minneapolis Ave. S.	29	23	31	SE-NW-NW	St. Paul West					HE-MPC-4177
house	2320 Minneapolis Ave. S.	29	23	31	SE-NW-NW	St. Paul West					HE-MPC-4178
house	2760 River Rd. W.	29	23	31	SW-NE-SE	St. Paul West	HE-2009-10H				HE-MPC-4248
Orville Freeman House	2316 Seabury Ave. S.	29	23	31	SE-NW-NW	St. Paul West	HE-2009-10H				HE-MPC-4253
CMSP&P Mississippi River Bridge (Bridge No. L5733)	near 27th St. E. over Mississippi River	29	23	31	SE-SW-NE	St. Paul West	HE-2004-2H				HE-MPC-4388
house	2412 32rd Ave. S.	29	23	31	NW-SW-NW	St. Paul West					HE-MPC-4554
Werner Transportation Company Building	26xx 32nd Ave. S.	29	23	31	NW-NW-SW	St. Paul West					HE-MPC-4555
house	2804 32nd Ave. S.	29	23	31	NW-SW-SW	St. Paul West	HE-2009-10H				HE-MPC-4556
Priory for St. Albert the Great	2836 32nd Ave. S.	29	23	31	NW-SW-SW	St. Paul West					HE-MPC-4557
house	2929 32nd Ave. S.	29	23	31	SW-SW-SW	St. Paul West					HE-MPC-4558

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
farmhouse	2636 35th Ave. S.	29	23	31	NE-NW-SW	St. Paul West					HE-MPC-4572
Burgwald Machine, Inc.	2648 37th Ave. S.	29	23	31	NW-NE-SW	St. Paul West					HE-MPC-4578
Bethany Church for the Deaf	2901 38th Ave. S.	29	23	31	SE-SE-SW	St. Paul West	HE-2009-10H				HE-MPC-4583
First Free Methodist Church	3909 39th Ave. S.	29	23	31	SW-SW-SE	St. Paul West					HE-MPC-4588
house	2732 41st Ave. S.	29	23	31	SW-NW-SE	St. Paul West					HE-MPC-4597
house	2801 42nd ave. S.	29	23	31	NE-SW-SE	St. Paul West	HE-2009-10H				HE-MPC-4607
house	2920 44th Ave. S.	29	23	31	SW-SE-SE	St. Paul West	HE-2009-10H				HE-MPC-4619
house	2924 44th Ave. S.	29	23	31	SW-SE-SE	St. Paul West					HE-MPC-4620
Seek Ye the Lord Immanuel Baptist Church	3620 26th St. E.	29	23	31	SW-SE-NW	St. Paul West	HE-2009-10H				HE-MPC-4676
Heinrich Manufacturing Company	1901 E. Hennepin Ave.	29	23	18	SW-SW-SW	St. Paul West					HE-MPC-5100
Bridge No. 92330	MSAS 243 / 31st Ave S under Soo Line RR	29	23	31							HE-MPC-5343
Bridge No. 92331	MSAS 250 / 36th Ave S under Soo Line RR	29	23	31							HE-MPC-5345
commercial building	3712 E. Lake St.	29	23	31	SE-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7566
commercial building	3318 E. Lake St.	29	23	31	SE-SW-SW	St. Paul West	HE-2004-8H				HE-MPC-7724
house	3328 E. Lake St.	29	23	31	SE-SW-SW	St. Paul West	HE-2004-8H				HE-MPC-7725
commercial building	3400 E. Lake St.	29	23	31	SE-SW-SW	St. Paul West	HE-2004-8H				HE-MPC-7726
garage	3508 E. Lake St.	29	23	31	SW-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7727
commercial building	3540 E. Lake St.	29	23	31	SW-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7730
commercial building	3616-2618 E. Lake St.	29	23	31	SE-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7734
commercial building	3624 E. Lake St.	29	23	31	SW-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7737
commercial building	3722 E. Lake St.	29	23	31	SE-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7738
commercial building	3800 E. Lake St.	29	23	31	SE-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7739
commercial building	3822 Lake St. E	29	23	31	SE-SE-SW	St. Paul West	HE-2004-8H				HE-MPC-7744

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY Hennepin											
CITY/TOWNSHIP: Minneapolis											
commercial building	4004 Lake St. E	29	23	31	SW-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7746
commercial building	4008 Lake St. E	29	23	31	SW-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7747
commercial building	4010 Lake St. E.	29	23	31	SW-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7749
commercial building	4200 Lake St. E.	29	23	31	SE-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7752
American Rug Laundry	4222 Lake St. E.	29	23	31	SE-SW-SE	St. Paul West	HE-2004-8H				HE-MPC-7755
commercial building	4300 Lake St. E.	29	23	31	SW-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7756
commercial building	4306 Lake St. E.	29	23	31	SW-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7758
commercial building	4400 Lake St. E.	29	23	31	SW-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7760
commercial building	4500 Lake St. E.	29	23	31	SE-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7762
commercial building	4508 Lake St. E.	29	23	31	SE-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7763
commmercial building	2945 44th Ave. S	29	23	31	SW-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7769
house	2952 45th Ave. S	29	23	31	SW-SE-SE	St. Paul West	HE-2004-8H				HE-MPC-7770
duplex	2624-2626 West River Parkway	29	23	31		St. Paul West					HE-MPC-7861
house	2630 West River Parkway	29	23	31		St. Paul West					HE-MPC-7862
house	2634 West River Parkway	29	23	31		St. Paul West					HE-MPC-7863
house	2638 West River Parkway	29	23	31		St. Paul West					HE-MPC-7864
Chicago, Milwaukee & St. Paul Grade Separation Project	off 29th St	29	23	31	S	St. Paul West	HE-2004-6H		Y		HE-MPC-9960
Chicago, Milwaukee & St. Paul Grade Separation Project		29	23	31	S	St. Paul West	HE-2002-7H		Y		HE-MPC-9960

Legend	**Project:** 26th and Seabury, 38th and Minnehaha Parkway	**Date:** 21 Aug 2012
N W E S	**Notes:** Site 2 Map	

10250 Valley View Rd., Suite 123 | Eden Prairie, MN 55344-3531 | Phone: 952.646.0236 | Fax: 952.646.0290 | www.evs-eng.com

Legend	**Project:** 26th and Seabury, 38th and Minnehaha Parkway	**Date:** 21 Aug 2012
N W E S	**Notes:** Site 2 Map	

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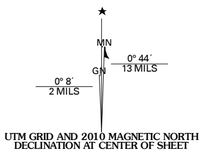
U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map US Topo

SAINT PAUL WEST QUADRANGLE
MINNESOTA
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 15T
10 000-foot ticks: Minnesota Coordinate System of 1983
(south zone)

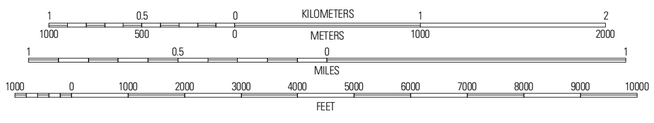
Imagery.....NAIP, June 2009
Roads.....©2006-2010 Tele Atlas
Names.....GNIS, 2008
Hydrography.....National Hydrography Dataset, 2009
Contours.....National Elevation Dataset, 2001



UTM GRID AND 2010 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
VK
Grid Zone Designation
15T

SCALE 1:24 000



CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with version 0.5.10 of the draft USGS Standards for 7.5-Minute Quadrangle Maps.
A metadata file associated with this product is draft version 0.5.11

QUADRANGLE LOCATION

Minneapolis North	New Brighton	White Bear Lake West
Minneapolis South	Saint Paul West	Saint Paul East
Bloomington	Saint Paul SW	Inver Grove Heights

ADJOINING 7.5' QUADRANGLES

ROAD CLASSIFICATION

Interstate Route	State Route
US Route	Local Road
Ramp	4WD

Interstate Route · US Route · State Route

SAINT PAUL WEST, MN
2010