

Study 7B - Augmentation of White Bear Lake
with Surface Water

White Bear Lake Area Comprehensive Plan

White Bear Lake Area

MCES 191435 | July 7, 2026



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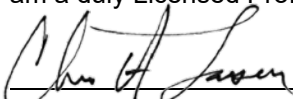
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White Bear Lake Area Comprehensive Plan
White Bear Lake Area

SEH No. MCES 191435

July 7, 2026

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Christopher Larson, PE

Date: July 7, 2026

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Study 7B - Augmentation of White Bear Lake with Surface Water

White Bear Lake Area Comprehensive Plan

Prepared for MCES

1 Introduction

The Minnesota legislature provided funding for the Metropolitan Council (Met Council) to form a work group to develop a comprehensive plan to ensure communities in the White Bear Lake area have access to sufficient drinking water to allow for municipal growth while ensuring the sustainability of surface and groundwater resources to supply the needs of future generations.

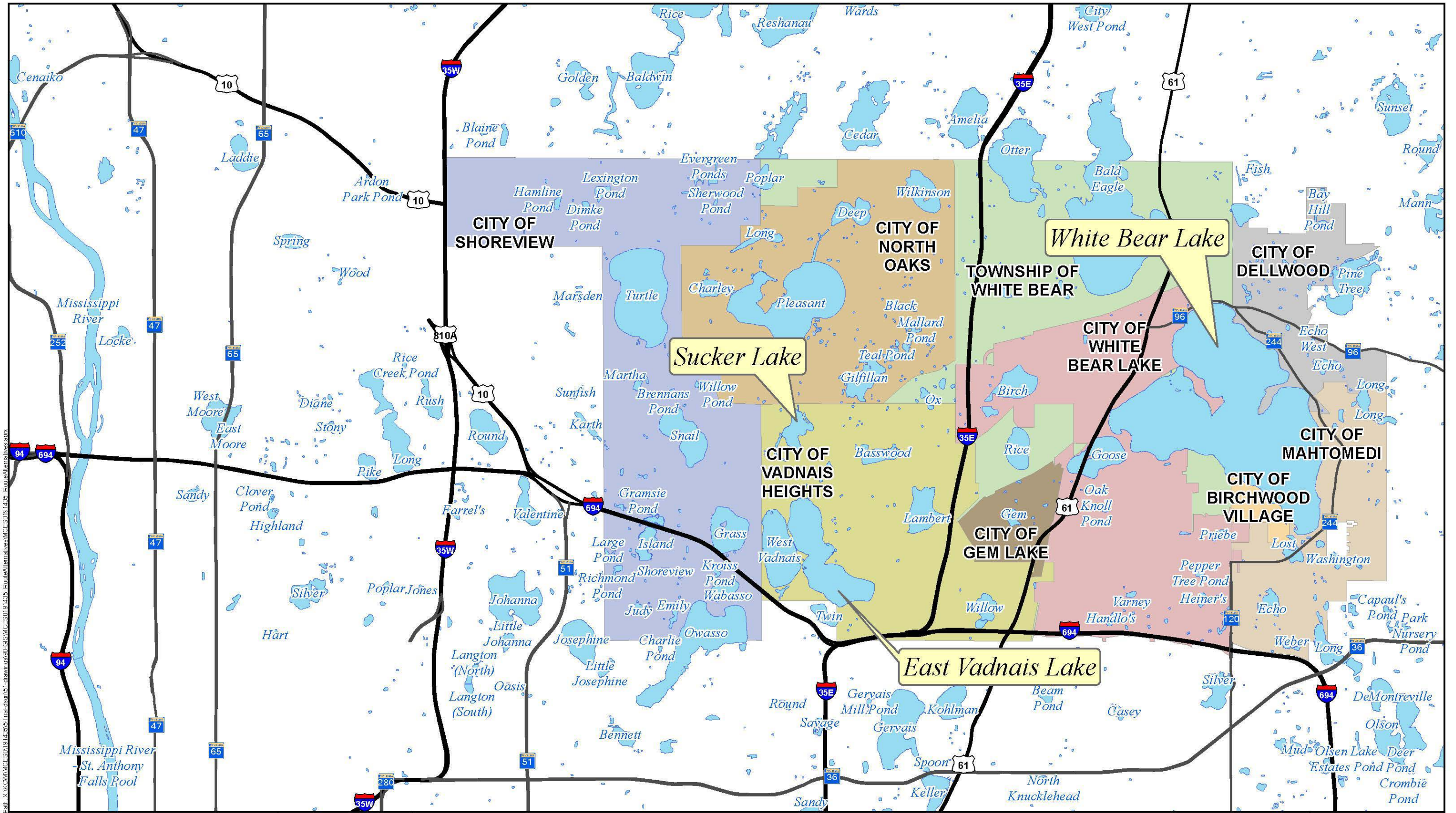
This report, Study 7B: Augmentation of White Bear Lake with Surface Water, is one component of that Comprehensive Plan. It updates and expands the 2016 Department of Natural Resources (DNR) Concept Cost Report for Augmentation of White Bear Lake with Surface Water (2016 Concept Plan), incorporating new water quality analysis from Study 7A (Barr Engineering, 2026), updated cost estimates, and expanded treatment options.

1.1 Study Objectives

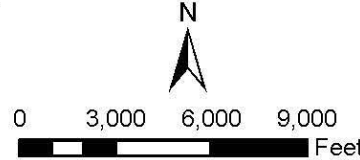
The primary objective of Study 7B is to evaluate the feasibility of augmenting White Bear Lake by pumping Mississippi River water through the St. Paul Regional Water Services (SPRWS) Chain of Lakes to help maintain White Bear Lake elevations and support long-term groundwater sustainability in the White Bear Lake area. The study will assess regulatory requirements, treatment needs, water quality considerations, infrastructure requirements, site feasibility, and capital and operating costs. Additional emphasis will be placed on determining the level of treatment necessary to protect White Bear Lake water quality and the hydraulically connected Prairie du Chien-Jordan aquifer, evaluating the reliability of augmentation as a long-term water resource management strategy, and identifying the technical, financial, regulatory, and environmental advantages and disadvantages of implementing a lake augmentation system.

1.2 Location

White Bear Lake is located in the northeastern portion of the Minneapolis/Saint Paul metropolitan area. The local jurisdictions in the vicinity of White Bear Lake and the SPRWS chain of lakes include Ramsey and Washington Counties, White Bear Township, and the cities of White Bear Lake, Shoreview, Vadnais Heights, Gem Lake, North Oaks, Birchwood Village, Mahtomedi, and Dellwood. A map of the area is shown on Figure 1.



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Project: MCES0 191435
Print Date: 6/24/2026

User Name: tschwarz
Projection: NAD 1983 UTM Zone 16N
Source: MN DNR, MNDOT, MNGEO,
& SEH Inc

Study Area
Study 7B - Augmentation of White Bear Lake with Surface Water

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1.3 Existing Surface Water Supply and Treatment System

SPRWS currently pumps surface water from the Mississippi River near Fridley, Minnesota. The water is carried through pipes east approximately eight miles and emptied into Charley Lake in the City of North Oaks. Charley Lake is the first lake in a series that also includes Pleasant Lake, Sucker Lake, and East Vadnais Lake - collectively referred to as the SPRWS chain of lakes. This chain of lakes acts as treatment, conveyance, and storage reservoirs for the system that ultimately serves as a source of raw water for the SPRWS McCarrons Water Treatment Plant in Maplewood.

The lakes act as sedimentation basins, allowing solids to settle out and improve raw water quality in advance of the treatment plant. Chemicals are added at the Fridley pump station and to East Vadnais Lake to reduce phosphorus and help solids settle. Oxygen is added to Pleasant Lake and East Vadnais Lake to further improve water quality.

SPRWS has sufficient capacity in its raw water conveyance system and lake storage to meet the demands of a two billion gallon per year augmentation system for White Bear Lake, assuming that it is not also supplying water to other alternatives in the White Bear Lake Area Comprehensive Plan (i.e. Study 2). Study 2 evaluates the SPRWS raw water pumping and conduit capacity. The current maximum raw water pumping capacity is approximately 76 million gallons per day (MGD) while the conduit capacity is approximately 100 MGD with both conduits in operation. While these capacities could not meet SPRWS maximum day demands with the addition of augmentation, lake storage can supplement the peak demands. Because the augmentation system is not essential every day during the open water months, pumping could be stopped temporarily on maximum demand days or if one of the SPRWS pumps is out of service.

1.4 Augmentation System

Two alignment alternatives were identified for conveying surface water from Sucker Lake or East Vadnais Lake to White Bear Lake. Capital costs were developed for each alternative. These alignment alternatives are described in detail in Chapter 2.

1.4.1 Intake Structure

The submerged intake structure would be located in the source lake and would provide initial screening of the lake water and allow for routine maintenance and cleaning. Water would be pumped from the source lake to the treatment facility by a pump station.

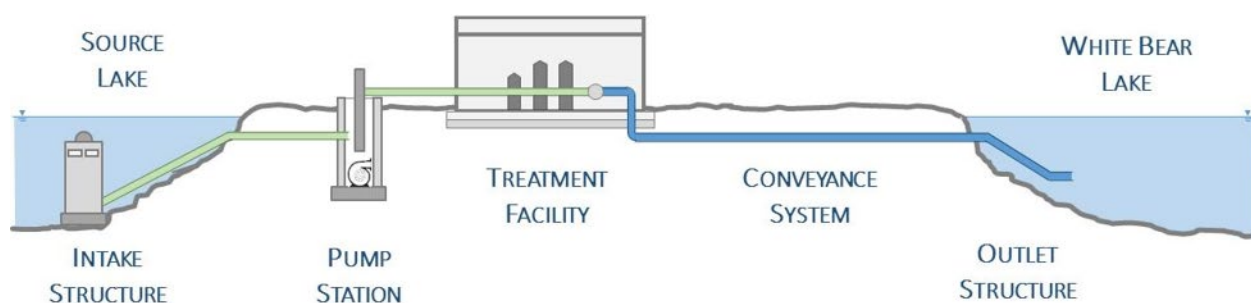
1.4.2 Raw Water Pump Station

The raw water pump station would be located near the source lake and, ideally, within or near the treatment facility. Raw water pumping equipment would consist of two high-capacity pumps, each capable of supplying the maximum required flow rates.

1.4.3 Treatment Facility

Water would be pumped into the treatment facility, where the water would have chemicals added for nutrient and total organic carbon (TOC) removal. The water would then flow through clarifiers to remove settled solids, be filtered through microfiltration membranes, and pumped to the outfall at White Bear Lake. See Section 3 for water quality and treatment details and Section 4 for associated costs.

Figure 2 – Augmentation Schematic



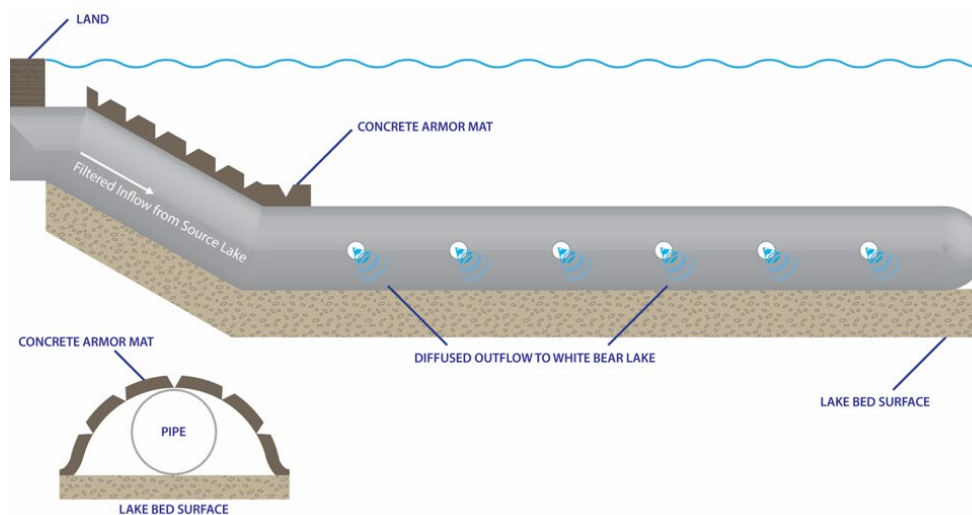
1.4.4 Conveyance System

A pipeline would convey water from the source lake to White Bear Lake along the assumed alignments described in Chapter 2. The pipeline is assumed to be installed at a depth of 8 to 10 feet, with variable depths at road and railroad crossings.

1.4.5 Outlet Structure

Water conveyed from the source lake into White Bear Lake would be discharged through a submerged concrete structure located in approximately 20 feet of water. The rate of discharge would be controlled to prevent undesirable mixing with lake bottom sediments and to minimize impacts on lake ecology.

Figure 3 – Outlet Structure



2 Chapter 2 – Description of Alignment Alternatives

2.1 Introduction

This chapter describes the two alignment alternatives for surface water augmentation and the conditions associated with each alignment that formed the basis for the capital cost estimates. The alignments were originally developed in 2016 and are reviewed and updated here based on current conditions and updated contaminated site databases.

Specific alignments and system features are assumed based on the information reviewed and best engineering practices. These are conceptual alignments; further refinement will be required during detailed planning and engineering.

2.2 System Capacity

The costs for the two augmentation alternatives assumed a pump size capable of pumping water at a rate of up to 6,000 gallons per minute. This pumping rate equates to roughly two billion gallons over an eight-month period. The volume is based on historic annual rates of augmentation and was deemed to be sufficient by DNR modeling. An analysis of the power requirements and pipe sizing is included as Appendix A.

2.3 Soil Conditions and Wetlands

Geology, soil conditions, and wetlands were reviewed for the alignment alternatives as part of the 2016 Concept Plan. Alignments were adjusted where possible to avoid wetlands or known poor soil conditions such as peat. Additional costs were included where poor soil conditions could not be avoided. Appendix B includes the Geologic and Soils Review included in the 2016 Concept Plan. Appendix C includes a wetland inventory for the alignments.

2.4 Contaminated Site Inventory

Potentially contaminated soil, groundwater, and soil vapor sites were inventoried within approximately 500 feet of the alignments. This information was used to adjust alignments where possible and to estimate additional costs for soil clean-up when sites could not be avoided. A new contaminant site inventory was prepared for Study 7B and is included in Appendix D.

2.5 Augmentation Alignment Alternatives

Augmentation alignments were selected and adjusted where possible to avoid contaminated sites, highly developed areas, private property, high-volume roadways, and newly constructed infrastructure. The following sections discuss the Sucker Lake and East Vadnais Lake alignment alternatives.

2.5.1 Sucker Lake Alternative

Sucker Lake is located in Vadnais-Snail Lake Regional Park in the City of Vadnais Heights. It is a small and shallow lake subject to changes in water quality due to wind-induced mixing of lake bottom sediments. The alignment extends from Sucker Lake to White Bear Lake along Highway 96.

The intake structure would be constructed at a water depth of approximately 10–15 feet. A pump station would be installed on the northeast bay shoreline of Sucker Lake, and water would be pumped to a treatment facility located on park property near Highway 96.

The pipe would primarily follow Highway 96 east, passing under the BNSF railroad, I-35E, and Highway 61 in tunnels, and would enter the western lobe of White Bear Lake. The tunnel under I-35E would be approximately 40 feet deep and 1,000 feet long (in 3 sections). A map showing the Sucker Lake Alignment alternative is included as Figure 4.

The environmental review identified six high-risk and approximately 50 medium and low-risk sites within the Sucker Lake alignment buffer area. The full contaminant site inventory is included in Appendix D.

2.5.1.1 Sucker Lake Alignment Costs

Table 1 includes the estimated costs for the Sucker Lake Alignment pipeline. Overall project costs that include the intake, treatment, and pipeline are presented in Section 4.

Table 1 – Sucker Lake Alignment Pipeline Costs

Item	Cost
Mobilization	\$1,290,000
30" Watermain (23,170 feet)	\$12,750,000
Excavation, Restoration	\$17,270,000
Tunnels	\$10,950,000
Easements	\$1,970,000
Subtotal	\$44,230,000
Contingency (20%)	\$8,850,000
Construction Total	\$53,080,000
Engineering, Legal, Admin (20%)	\$10,620,000
Total	\$63,700,000

Cost assumptions that differ from the 2016 Concept Plan include:

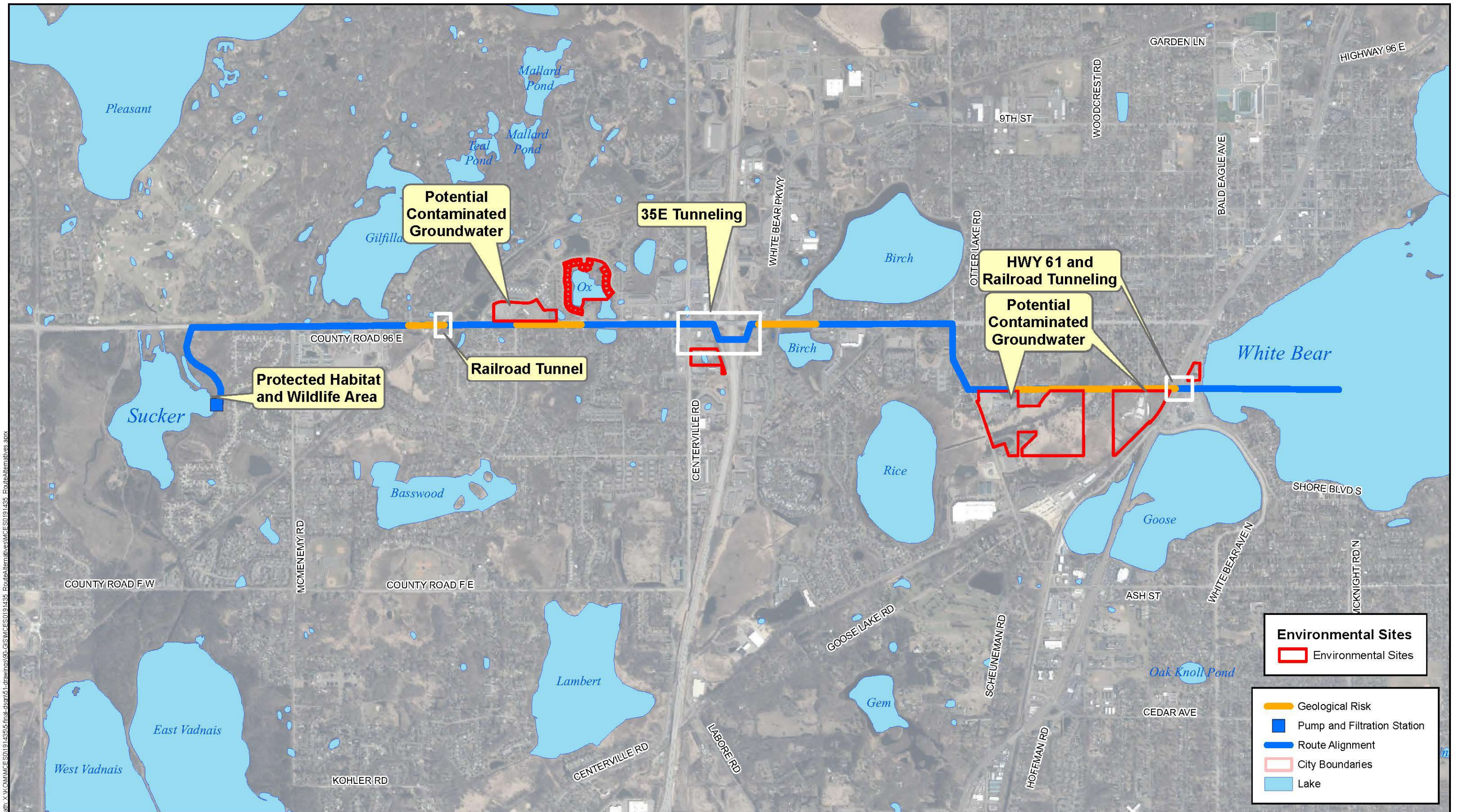
- Pipe is C-900 PVC in lieu of fused HDPE.
- A bore/casing crossing of Centerville Road at Highway 96.
- Three separate bore/casing pipes at the I-35E crossing on Highway 96: one 300-foot bore for each ramp and one 400-foot bore for the main line.

A detailed summary of the costs is included in Appendix E.

2.5.2 East Vadnais Lake Alternative

East Vadnais Lake is located in Vadnais-Snail Lake Regional Park. It is larger than Sucker Lake and less susceptible to wind-induced mixing. The East Vadnais Lake alternative would extend from the southeast corner of East Vadnais Lake near Centerville Road (County Road 59), generally aligned along Centerville Road and Goose Lake Road (County Road 14) toward Goose Lake and White Bear Lake.

The intake structure would be constructed at approximately 20 feet depth, allowing higher quality water to enter the system prior to filtration. The pipe would follow Centerville Road and Goose Lake Road, crossing under the railroad and Highway 61. Tunneling is not required under I-35E.



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Because I-35E is bridged over Goose Lake Road, the East Vadnais Lake alignment has a key cost advantage over the Sucker Lake alternative. A map showing the East Vadnais Lake alignment alternative is included as Figure 5.

The environmental review identified 8 high-risk and 32 medium and low-risk sites within the East Vadnais Lake alignment buffer area. The full contaminant site inventory is included in Appendix D.

2.5.2.1 East Vadnais Lake Alignment Costs

Table 2 includes the estimated costs for the East Vadnais Lake Alignment pipeline. Overall project costs that include the intake, treatment, and pipeline are presented in Section 4.

Table 2 – East Vadnais Lake Alignment Pipeline Costs

Item	Cost
Mobilization	\$1,070,000
30" Watermain (21,250 feet)	\$11,690,000
Excavation, Restoration	\$18,470,000
Tunnels	\$3,000,000
Easements	\$2,640,000
Subtotal	\$36,870,000
Contingency (20%)	\$7,370,000
Construction Total	\$44,240,000
Engineering, Legal, Admin (20%)	\$11,060,000
Total	\$55,300,000

Cost assumptions that differ from the 2016 Concept Plan include:

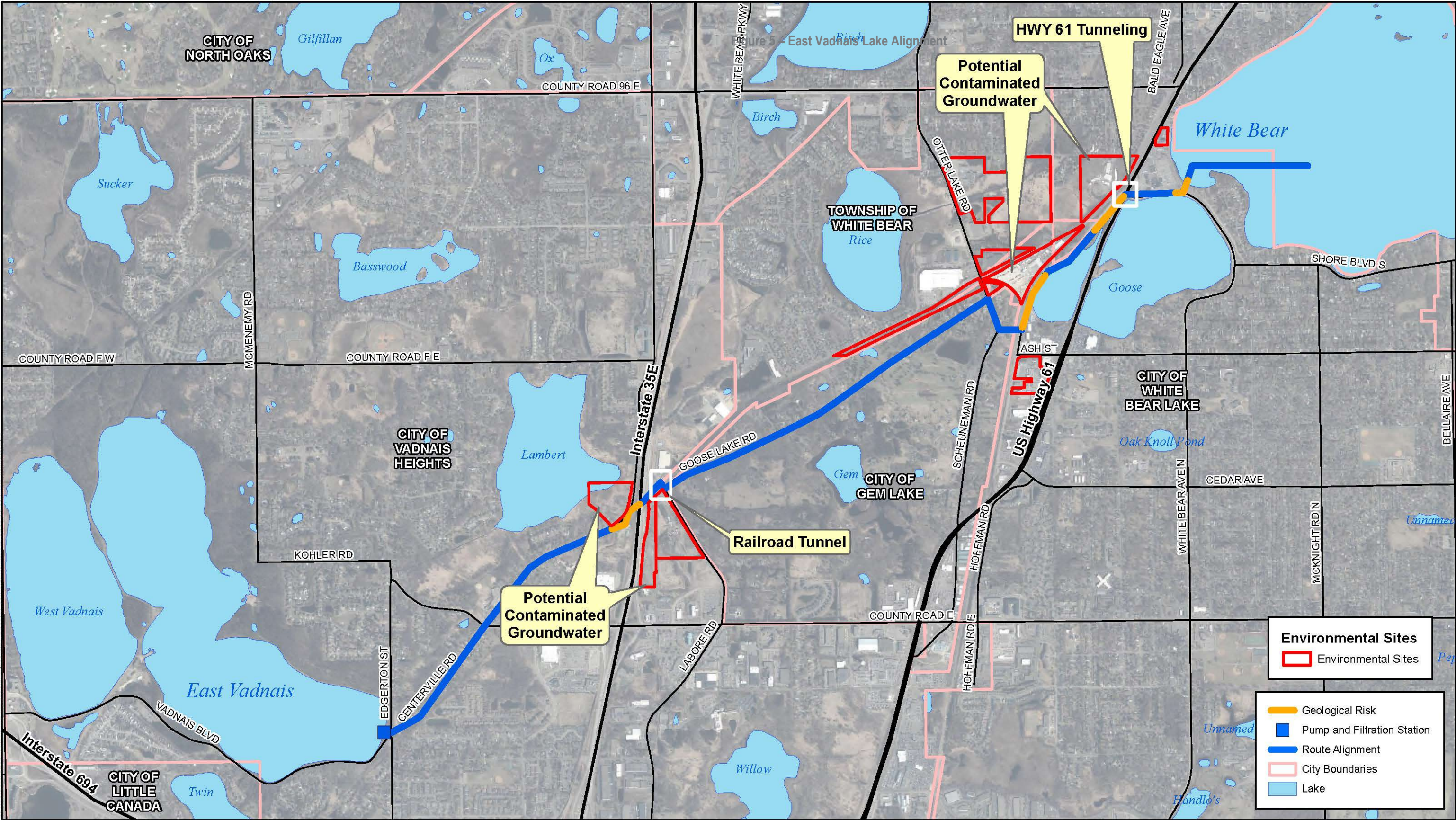
- Pipe is C-900 PVC in lieu of fused HDPE.
- A trenchless steel casing is needed under the 35E bridge on Goose Lake Road.
- The pipe would be installed in the north half of White Bear Avenue.

A detailed summary of the costs is included in Appendix E.

3 Water Quality and Treatment

Barr Engineering prepared Study 7A – Surface Water Quality Analysis in June 2026 to evaluate the potential surface water quality impacts of increasing Mississippi River water conveyed through the St. Paul Regional Water Services (SPRWS) chain of lakes to augment White Bear Lake and/or provide a sustainable regional drinking water supply for communities currently dependent on groundwater.

The Study 7A monitoring program combined historical water quality data with an expanded field sampling effort conducted during 2025 to support development and calibration of the watershed and lake water quality models. Water quality samples were collected throughout the Mississippi River, the SPRWS chain of lakes (Charley, Pleasant, Sucker, and East Vadnais Lakes), and White Bear Lake, with analyses focused on eutrophication indicators, metals, organic and inorganic constituents, radionuclides, PFAS, and other potential contaminants of concern identified through agency coordination. Monthly sampling was completed for key eutrophication





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East Vadnais Lake Alternative

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Figure

5

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parameters and metals during the growing season, while a broader suite of water quality constituents was sampled in June and September 2025 to characterize drinking water and ecological concerns, support the risk assessment, and identify potential treatment and mitigation needs for future lake augmentation scenarios.

3.1 Water Quality Results

Water quality results for the primary constituents of concern from Study 7A for Sucker Lake, East Vadnais Lake, and White Bear Lake are presented in Table 3.

Table 3 – Sucker Lake and East Vadnais Lake Water Quality Results

Parameter	Sucker Lake Concentrations	East Vadnais Lake Concentrations
Total Phosphorus	0.059 mg/L	0.023 mg/L
Total Nitrogen	0.91 mg/L	0.77 mg/L
Total Organic Carbon	9.4 mg/L	8.63 mg/L
Total Suspended Solids	2.2 mg/L	1.8 mg/L
Total Dissolved Solids	238 mg/L	223 mg/L
Manganese	0.067 mg/L	0.097 mg/L
PFOS	<1.8 ng/L	1.9 ng/L

As the table indicates, Sucker Lake has higher concentrations of nutrients and total organic carbon (TOC). Even though East Vadnais Lake had PFOS in one sample, it is below the maximum contaminant level (MCL) of 4 ng/L and was just above the detection limit of 1.8 ng/L.

3.2 Alternative Alignment Selection

The proposed Sucker Lake alignment alternative is more expensive than the East Vadnais Lake alignment alternative (\$64M versus \$55M) and has higher concentrations of most of the water quality constituents of concern. In addition, Sucker Lake is shallower and subject to water quality fluctuations. For these reasons, the East Vadnais Lake alternative is the recommended alternative and the Sucker Lake alignment alternative is not being considered further.

3.3 Water Treatment Goals

Study 7A recommended the augmentation treatment targets in Table 4 to protect White Bear Lake from degradation. It should be noted that these are the mean concentrations across sampling events and that higher concentrations of these constituents were detected at times in East Vadnais Lake.

Table 4 – Augmentation Treatment Targets

Parameter	East Vadnais Lake Mean Concentrations	Treatment Target	White Bear Lake Mean Concentrations
Total Phosphorus	0.023 mg/L (0.005-0.125 mg/L)	<0.020 mg/L	0.019 mg/L (0.006-0.173 mg/L)
Total Nitrogen	0.77 mg/L (0.52-1.28 mg/L)	<0.9 mg/L	0.72 mg/L (0.1-2.2 mg/L)
Total Organic Carbon	8.63 mg/L (7.25-10 mg/L)	<4.0 mg/L	4.6 mg/L (4.2-5.2 mg/L)
Total Suspended Solids	1.8 mg/L (<1.0-3.25 mg/L)	<1.0 mg/L	2.0 mg/L (<1.0-15 mg/L)

3.4 Water Treatment Processes and Layouts

To meet the augmentation treatment targets in Table 4, TOC and phosphorus concentrations need to be lowered. This is in addition to removing invasive species, such as zebra mussels, and reducing total suspended solids when they are elevated in comparison to White Bear Lake.

3.4.1 Enhanced Coagulation

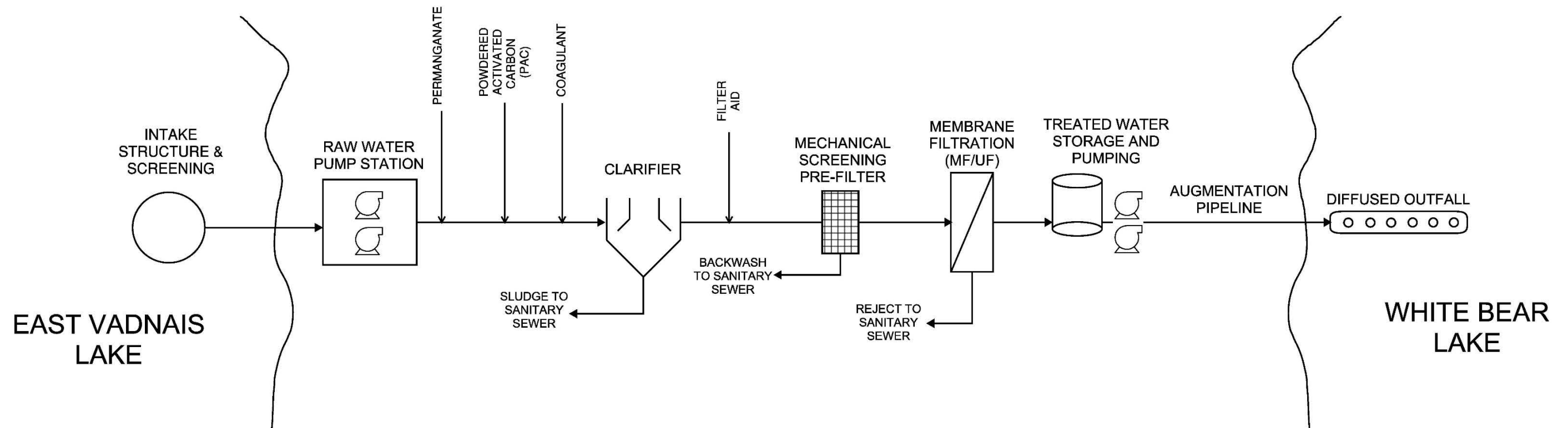
Enhanced coagulation is a well-established treatment process used to maximize the removal of TOC and can also provide substantial phosphorus removal in surface water treatment. The process involves optimizing coagulant type, dosage, pH, and mixing conditions to increase the destabilization and precipitation of dissolved and particulate organic matter beyond what is achieved for conventional turbidity removal alone. Aluminum- and iron-based coagulants, such as alum and ferric chloride, are commonly used because they effectively remove natural organic matter while simultaneously precipitating dissolved phosphorus as insoluble metal-phosphate compounds. In addition to reducing disinfection byproduct precursors and improving finished water quality, enhanced coagulation can significantly decrease nutrient loading associated with treated water discharges or lake augmentation projects. The process typically requires careful control of pH and increased coagulant dosages compared to conventional treatment.

3.4.2 Proposed Treatment Process

The following treatment process is proposed to meet the augmentation treatment targets:

1. East Vadnais Lake intake and pumping
2. Permanganate addition for chemical oxidation
3. Powdered activated carbon (PAC) addition for organics removal
4. Coagulant addition for turbidity, TOC, and phosphorus removal
5. Clarification
6. Mechanical screening to protect membranes
7. Microfiltration/Ultrafiltration (MF/UF) membrane filtration
8. Equalization
9. Pumping
10. Augmentation Pipeline
11. Outfall into White Bear Lake

A process flow diagram for the proposed treatment process is included as Figure 6. A treatment plant layout is shown on Figure 7.



Conceptual Process Flow Diagram

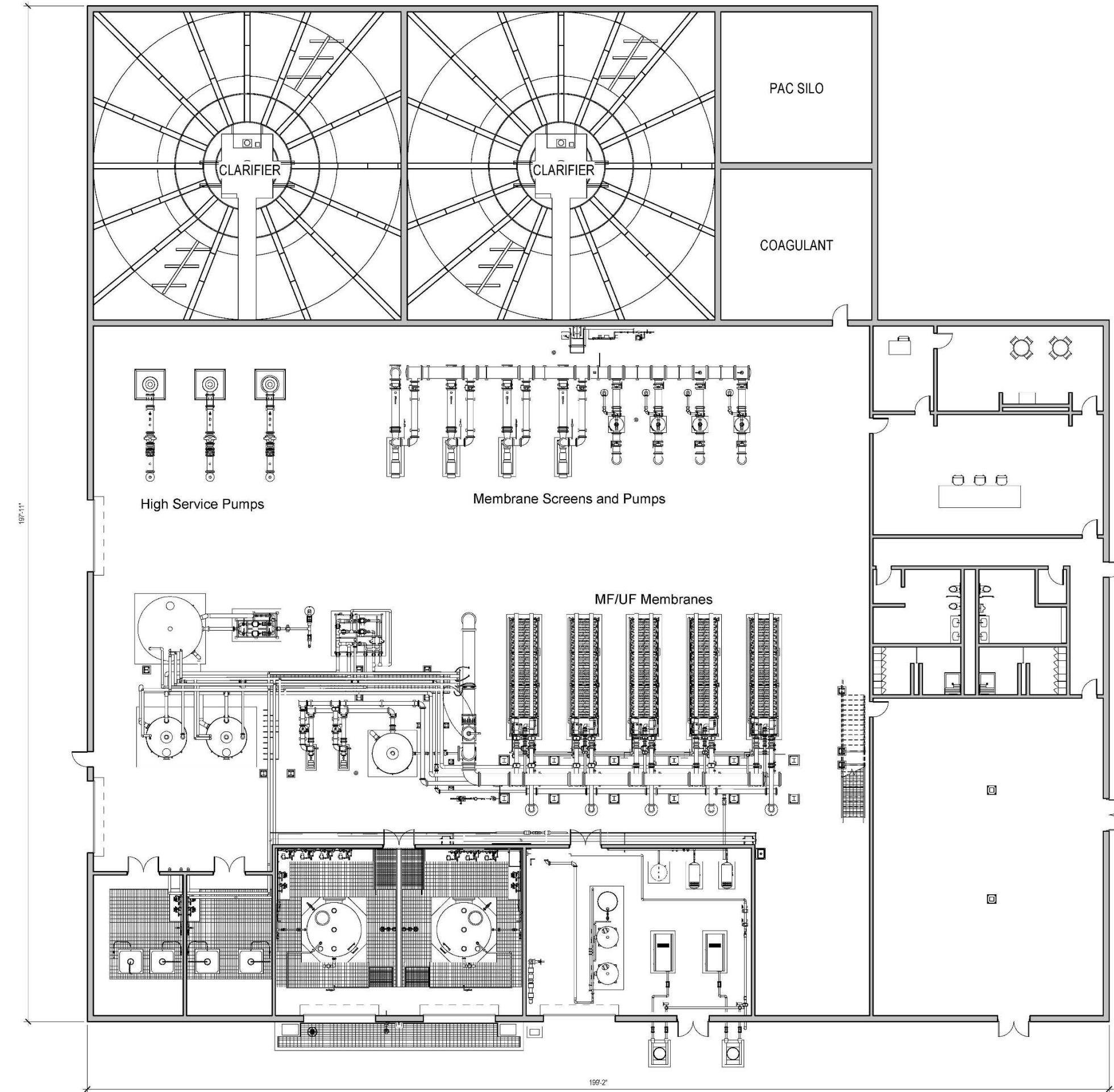
Study 7B - Augmentation of White Bear Lake with Surface Water

White Bear Lake Area

Figure
6



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www.sehinc.com



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OPTION 2 PLAN
3/32" = 1'-0"
0 5 10 24

Figure 7
Water Treatment Plant Layout

3.4.3 Proposed Augmentation Site

The proposed augmentation intake and treatment plant is located on the southeast end of East Vadnais Lake on undeveloped land owned by SPRWS. A proposed site plan with the water treatment plant is included on Figure 8.

3.4.4 Wastewater Flows

The MF/UF membranes will produce approximately 300 gallons per minute (gpm) of reject water, and the clarifiers and mechanical screens will produce approximately 50 gpm of wastewater. A 500,000-gallon wastewater equalization tank and lift station are proposed. The lift station will pump to a 42-inch sanitary sewer interceptor in Edgerton Street north of Centerville Road.

4 Costs

This chapter presents the estimated capital cost to construct the augmentation water intake, treatment, and conveyance infrastructure from East Vadnais Lake, and annual operations and maintenance (O&M) costs for an augmentation system. Appendix E provides the details of the concept level cost estimates.

4.1 Cost Estimating Methodology

The process used to develop these cost estimates follows the recommended practices of the American Association of Cost Engineering (AACE). This report documents a “concept” cost estimate, which is based on a low level of design (less than 15% complete) and is considered a “Class 4” estimate based on AACE best practices.

The capital cost estimates for the two alternatives were prepared using the following sources for unit costs of line items:

- Minnesota Department of Transportation (MnDOT) Average Bid Price for awarded projects for Specification Year 2025.
- RS Means Estimating Guidebook for civil works projects, process equipment, electrical controls and piping.
- Short Elliott Hendrickson Inc. past project bid cost summaries.
- Direct budgetary estimates for equipment from local major equipment and piping system suppliers.
- Bid tabs for similar projects.



Figure 8
Site Plan

4.2 Capital Cost Estimates

The capital cost estimates for the augmentation system elements identified in this report are summarized in Table 5. Detailed capital cost estimates are included in Appendix E.

Table 5 – Augmentation Capital Costs

Item	Cost
Lake Intake	\$9,000,000
Treatment Plant	\$70,500,000
Lift Station	\$1,000,000
Augmentation Pipeline	\$36,870,000
Outfall	\$2,000,000
Land Acquisition	\$2,500,000
Subtotal	\$121,870,000
Contingency (20%)	\$24,370,000
Construction Total	\$146,240,000
Engineering, Legal, Admin (20%)	\$29,250,000
Permitting	\$1,200,000
Total	\$176,700,000

4.3 Operation and Maintenance (O&M) Costs

In addition to capital costs, the augmentation treatment and pumping facilities would incur annual O&M costs, including labor, electricity, membrane replacement, chemicals, natural gas, equipment repair, and purchasing raw water from SPRWS. The concept-level O&M costs are presented in Table 6.

Table 6 – Augmentation O&M Costs

Item	Cost
Labor (2 FTE)	\$300,000
Electricity ¹	\$250,000
Membrane Replacement	\$175,000
Chemicals	\$250,000
Natural Gas	\$100,000
Equipment Repair	\$200,000
Purchase of Water from SPRWS ²	\$1,220,000
Total Annual O&M	\$2,495,000

Notes: 1. Pump electricity based on 250 bhp, 80% efficiency, 231 days, and \$0.17/kWh.

2. Based on \$0.61 per 1,000 gallons pumped and augmenting White Bear Lake with up to 2 billion gallons per year when augmentation is needed. Augmentation costs could be significantly lower in some years or not required when White Bear Lake water elevations are above elevation 922.0 feet.

4.4 Annual Capital and O&M Costs per 1,000 Gallons

If the capital cost of \$176,700,000 presented in Table 5 is amortized over 20 years at a 4% fixed annual interest rate, the annual payment is \$13,002,000 per year. Table 6 indicates an annual O&M cost of \$2,495,000 per year. Table 7 presents the capital and O&M costs per 1,000 gallons for a year where 2 billion gallons of augmentation water is delivered.

Table 7 – Augmentation Capital and O&M Costs per 1,000 gallons

Type	Annual Cost	Water Delivered	Cost per 1,000
Capital Cost	\$13,002,000	2,000,000	\$6.50
O&M Cost	\$2,495,000	2,000,000	\$1.25
Total			\$7.75

5 Permitting

Construction of a surface water augmentation system conveying untreated raw water from East Vadnais Lake to White Bear Lake will require coordination with numerous federal, state, regional, and local regulatory agencies. Because the project transfers approximately 2 billion gallons of water annually between two Public Waters while utilizing the SPRWS raw water supply system, regulatory review extends beyond conventional utility construction permitting and includes environmental review, water resource management, aquatic resource protection, and long-term operational approvals. The detailed permitting evaluation is provided in Appendix F – Permitting Memorandum.

The Minnesota Department of Natural Resources (DNR) is expected to serve as the lead regulatory agency. One of the primary regulatory considerations will be authorization for withdrawal of raw water from East Vadnais Lake through modification of, or authorization under, the existing SPRWS water appropriation authorization. Additional DNR approvals are anticipated for construction of intake and discharge structures below the ordinary high-water level, aquatic invasive species management, and utility crossings of Public Waters or state-owned property.

The project is also expected to require environmental review under the Minnesota Environmental Policy Act (MEPA). Depending on the final project design and agency determination, environmental review may consist of an Environmental Assessment Worksheet (EAW) or, if warranted, an Environmental Impact Statement (EIS). Environmental review is expected to evaluate potential impacts on lake hydrology, water quality, wetlands, aquatic habitat, aquatic invasive species, and operation of the SPRWS raw water supply system.

Additional permits are anticipated from the U.S. Army Corps of Engineers for work affecting Waters of the United States and wetlands, the Minnesota Pollution Control Agency (MPCA) for construction stormwater management and any required water quality certifications, and the Minnesota Department of Health (MDH) for review of facilities associated with the SPRWS raw water system. Depending on the final alignment, approvals may also be required from watershed organizations, Ramsey County, local municipalities, the Minnesota Department of Transportation (MnDOT), and BNSF Railway.

Table 8 – Permits

Agency	Permit / Approval
Minnesota Environmental Review	Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS), if required
Minnesota DNR	Water Appropriation Authorization (or amendment to the existing SPRWS authorization)
Minnesota DNR	Public Waters Work Permit
Minnesota DNR	Aquatic Invasive Species Permit
Minnesota DNR	Utility Crossing License
U.S. Army Corps of Engineers	Section 404 Permit
Minnesota Pollution Control Agency	NPDES Construction Stormwater Permit and Section 401 Water Quality Certification (if required)
Minnesota Department of Health	Plan Review
Watershed Organizations (Rice Creek, VLA WMO, Ramsey-Washington Metro WD)	Wetland, erosion control, grading, and shoreline permits
Ramsey County / Municipalities	Right-of-way, utility, and construction permits
Minnesota Department of Transportation	Highway crossing permits, if required
BNSF Railway	Utility crossing agreement

Environmental review and DNR authorization are expected to establish the project's critical permitting path and should begin during preliminary engineering. Early coordination with the DNR, SPRWS, MPCA, MDH, watershed organizations, and federal agencies is recommended to confirm permitting requirements, identify technical study needs, and reduce permitting risk. Agency permit fees are anticipated to represent only a small portion of the overall permitting effort. A detailed discussion of anticipated permitting costs, environmental review requirements, supporting technical studies, agency coordination, and implementation strategy is included in Appendix F – Permitting Memorandum.

6 Potential Regional Ownership Model

Because the proposed lake augmentation system is intended to provide regional benefits, ownership and governance through a regional entity should be considered rather than ownership by a single municipality. A regional ownership model would allow participating communities to share capital costs, operating expenses, long-term maintenance responsibilities, and decision-making while providing a governance structure that reflects the regional nature of the project. One potential approach is the formation of a Joint Water Commission under Minnesota Statutes § 116A.24. This statute authorizes two or more municipalities to establish a joint commission for the acquisition, construction, ownership, operation, and maintenance of water supply facilities and related infrastructure. Under this model, the Joint Water Commission could own and operate the augmentation system, enter into contracts with the participating communities and SPRWS, obtain financing, establish operating policies, and recover costs through user charges or annual assessments.

The commission would typically be governed by a board consisting of representatives appointed by each participating municipality, with voting rights and financial obligations established through a joint powers agreement. The agreement would define ownership interests, capital cost allocation, operation and maintenance responsibilities, budgeting procedures, emergency operations, future system expansion, and procedures for admitting additional member communities. Because the augmentation system is intended to support regional water resource management rather than serve a single municipality, a Joint Water Commission provides a governance structure that promotes equitable cost sharing, coordinated decision-making, and long-term stewardship of the facilities.

Appendix A

Hydraulics and Power Review



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TECHNICAL MEMORANDUM

TO: Greg Johnson, PE
Metropolitan Council Environmental Services

FROM: Chris Larson, PE

DATE: July 7, 2026

RE: Hydraulic and Power Analysis
SEH No. MCES 191435

Introduction

The preliminary route alignment selection for an augmentation system for WBL was performed with the goals of handling assumed maximum flow criteria, attaining maximum efficiency, and developing accurate and comprehensive cost estimates. Two alternative alignments were selected using the Mississippi River as a source water supply: augmentation of WBL with Sucker Lake water, also known as the Sucker Lake Alternative (Alternative 1), and augmentation of WBL with East Vadnais Lake water, also known as the East Vadnais Lake Alternative (Alternative 2). The alignments are shown in the Study 7B report.

Projected Flows

For the purposes of Study 7B, the pumping rate assumed for the augmentation facilities was set to match the 2 BG/year that was used in the DNRs 2016 Concept Cost Study. In addition, the historic record for the previous augmentation system typically operated around 2 BG/year.

Hydraulic Analysis

Operation of the augmentation facility was assumed to operate constantly for eight (8) months of the year and shutdown for four (4) months during the winter. This equates to approximately 6,000 gpm. A hydraulic analysis was performed for both alternative alignments, to determine the total head to overcome, brake horsepower required, and cost of power at the assumed flowrate. The Hazen-Williams equation was used to calculate friction head loss through each proposed system due to pipe length, diameter and material of pipe.

$$h_L = \frac{C_f L}{C^{1.852} D^{4.87}} Q^{1.852}$$

Minor losses are the result of velocity changes and increased turbulence through fixtures such as valves, tees, bends, reducers, and other fittings in the system. Minor losses through fittings were calculated using the following equation and then added to the friction headloss as calculated using the Hazen-Williams equation:

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$$h_L = \frac{kv^2}{2g}n, n \text{ is number of fittings}$$

Elevation head to overcome was determined by identifying the ultimate high and ultimate low points in the system. Total head was determined by adding the friction and elevation heads.

Table 1. Hydraulic Analysis					
Alternative	Pumping Rate (gpm)	Diameter (in)	Pumping Rate (ft ³ /s)	Velocity (ft/s)	Total Head (ft)
East Vadnais Lake	6000	30	13.37	3.54	133
East Vadnais Lake	6000	24	13.37	5.55	199
Sucker Lake	6000	30	13.37	3.54	134
Sucker Lake	6000	24	13.37	5.55	196

Power Analysis

Required horsepower was calculated based on an operational efficiency of 80 percent using the following equation:

$$bhp = \frac{Qh_L}{3960\eta}$$

The cost of operation was determined using the calculated head to overcome assuming a cost per kilowatt-hour (kWh) of \$0.17. Pumping duration is assumed to be eight (8) months per year to avoid operations issues to due ice and freezing temperatures.

The total energy cost presented in Table 2 shows an estimated annual energy cost for operation of the system for the two pipe diameters presented in this technical memorandum. Annual energy costs could vary from the costs presented in Table 2 due to differences in seasonal or time of day rates.

Table 2. Power Analysis					
Alternative	Pumping Rate (gpm)	Diameter (in)	Horsepower (bhp)	Energy Cost/Hour	Annual Energy Cost
East Vadnais Lake	6000	30	251.11	\$32.00	\$177,410
East Vadnais Lake	6000	24	376.31	\$47.94	\$265,780
Sucker Lake	6000	30	254.10	\$32.39	\$179,570
Sucker Lake	6000	24	370.95	\$47.30	\$262,230

Conclusion

A 30-inch pipe was selected for both alignments because the velocity was between two and five feet per second. At two feet per second or greater the water flows fast enough to scour the pipe and minimize sediment in the pipe. At velocities greater than five feet per second energy costs become unreasonable.

There is no substantial difference in total annual energy cost between the two alternative alignments.

Appendix B

Geologic and Soils Review



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MEMORANDUM

TO: Sam Paske, Assistant General Manager - Environmental Quality Assurance
Metropolitan Council Environmental Services

FROM: Brent Theroux, PE

DATE: November 24, 2015

RE: Review of Surficial Geology and Organic Soils along White Bear Lake Augmentation
Alternative Alignments
SEH No. 134593 14.00

This memorandum has been prepared to summarize the review of surficial geology and organic soils as it relates to the Concept Cost Report for Augmentation of White Bear Lake with Surface Water. The findings of this memorandum were used to establish more optimum alignments and identify areas with poor soils to better understand the related costs along the alignments.

Two (2) alternatives have been developed for augmentation of White Bear Lake (WBL): The Sucker Lake Alternative (Alternative 1) withdraws water from Sucker Lake and the East Vadnais Lake Alternative (Alternative 2) withdraws water from East Vadnais Lake. The purpose of this memorandum is provide a desktop review of the surficial geological conditions along each alternative, with a focus on areas where organic soil deposits could be encountered. Organic soils are considered to include peat, organic silt, organic clay, and other deposits of organic-based material. For the purpose of this memorandum, the nominal depth of the augmentation pipeline is assumed to be in the range of 8 to 15 feet below existing ground elevations.

The following documents were reviewed in preparing this memorandum:

- Ramsey County Geologic Atlas (Plate 3 – Surficial Geology)
- Soil boring logs prepared by American Engineering Testing for MCES (1992)
- Soil boring logs prepared by Geo Engineering Consultants for MCES (2001)
- Soil boring logs prepared by Stork Twin City Testing for MCES (2001)
- Soil boring logs prepared by GME Consultants for MCES (2004, 2005)
- Soil boring logs prepared by Braun Intertec for MCES (2005)
- Construction Plans for TH 61 between County Road E and TH 96 by MnDOT (1956)

Alignments

The Sucker Lake Alternative (Alternative 1) would connect Sucker Lake to WBL. The alignment begins on the east shore of Sucker Lake, within the Sucker Lake County Park, and runs northward to County Road 96. The alignment then follows County Road 96 eastward, crosses beneath I-35-East (I-35E), turns south along Otter Lake Road, turns east along Whitaker Street, continues east beneath Minnesota State Highway 61, turns southeast along Old White Bear Avenue, and finally terminates in Lions Park in the west bay of WBL. Figure 1 provides an overview of the proposed Sucker Lake Alternative alignment.

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The East Vadnais Lake Alternative (Alternative 2) would connect East Lake Vadnais to WBL. The alignment begins at the far east shoreline of East Lake Vadnais, near the intersection of Vadnais Boulevard and Centerville Road. The alignment follows Centerville Road northeastward toward I-35E, continues beneath I-35E along Goose Lake Road, turns south and follows Otter Lake Road, turns north along Hoffman Road and west side of Goose Lake, continues east beneath Minnesota State Highway 61 and along White Bear Avenue, and finally terminates in Lions Park on the west bay of WBL. Figure 2 provides an overview of the proposed East Vadnais Lake Alternative alignment.

Sucker Lake Alternative (Alternative 1)

The beginning of Alternative 1, on the east side of Sucker Lake, is situated within coarse glacial meltwater sediments. The meltwater sediments transition to glacial till at McMenemy Street. The glacial till encompasses the alignment from McMenemy Street to approximately White Bark Parkway, which crosses County Road 96 east of I-35E. From White Bear Parkway, and extending all the way to WBL, the surficial geology is dominated by post-glacial sandy lake sediments. In Lions Park and close to WBL, the sandy lake sediments have been found by soil boring investigations to be interbedded at variable depths with buried organic soils and soft lacustrine (clay and silt) deposits.

From	To	Surficial Geology Unit	Estimated Soil Conditions
Sucker Lake	McMenemy St.	Coarse Glacial Meltwater Sediment	coarse sand, in some areas covered by glacial till of variable thickness
McMenemy St.	White Bear Pkwy	Glacial Till	sandy loam, some clay loam and silty clay
White Bear Pkwy	Lions Park (WBL)	Post-Glacial Sandy Lake Sediment	fine to medium sand, in some areas may be underlain and interbedded with deposits of organic soils and soft clay and silt

Plate 3 of the Ramsey County Geologic Atlas identifies isolated deposits organic soils at the following locations along the Alternative 1 alignment:

- Eastern shoreline of Sucker Lake
- South side of County Road 96, approximately between East Gilfillan Road and the Burlington Northern Santa Fe (BNSF) railroad tracks
- South side of County Road 96, approximately between Bramblewood Avenue and Birch Ridge Road
- Along Whitaker Street, approximately between Margaret Street and Minnesota State Highway 61
- Lions Park on WBL

East Vadnais Lake Alternative (Alternative 2)

The beginning of Alternative 2, at the east tip of East Vadnais Lake, lies within a large lacustrine deposit of varved silt and clay. The lacustrine deposit extends from East Vadnais Lake to approximately County Road E. The Atlas indicates a long, thin band of sandy lake sediment (possibly an old beach remnant), striking southwest-northeast that cuts through the lacustrine deposit; Centerville Road approximately follows this band of sandy lake sediment. The sandy lake sediment persists along the alignment from north of County Road E to the intersection of Goose Lake Road and Labore Road. East of Labore Road and extending to roughly Otter Lake Road, the soils transition to meltwater sediments consisting of medium to coarse sand. From the Goose Lake Road/Otter Lake Road intersection, and extending all the way to WBL, the surficial geology is dominated by old sandy lake sediments. In Lions Park and close to

WBL, the sandy lake sediments have been found by soil boring investigations to be interbedded at variable depths with buried organic soils and soft lacustrine (clay and silt) deposits.

From	To	Surficial Geology Unit	Estimated Soil Conditions
Lake Vadnais	County Road E	Lacustrine with Sandy Lake Sediment	varved silt and clay, with fine sand
County Road E	Labore Road	Post-Glacial Sandy Lake Sediment	fine to medium sand, with silt and clay
Labore Road	Otter Lake Road	Glacial Meltwater Sediments	medium to coarse sand, some cobbles and boulders
Otter Lake Road	Lions Park (WBL)	Post-Glacial Sandy Lake Sediment	fine to medium sand, in some areas may be underlain and interbedded with deposits of organic soils and soft clay and silt

Plate 3 of the Ramsey County Geologic Atlas identifies isolated deposits of organic soils at the following locations along the Alternative Two alignment:

- West of the Centerville Road/Goose Lake Road intersection along the west side of I-35E
- East side of Hoffman Road, from approximately 100 feet to 1000 feet north of Scheuneman Road
- West side of Hoffman Road, from approximately White Bear Avenue to 800 feet south of White Bear Avenue
- Lions Park on WBL

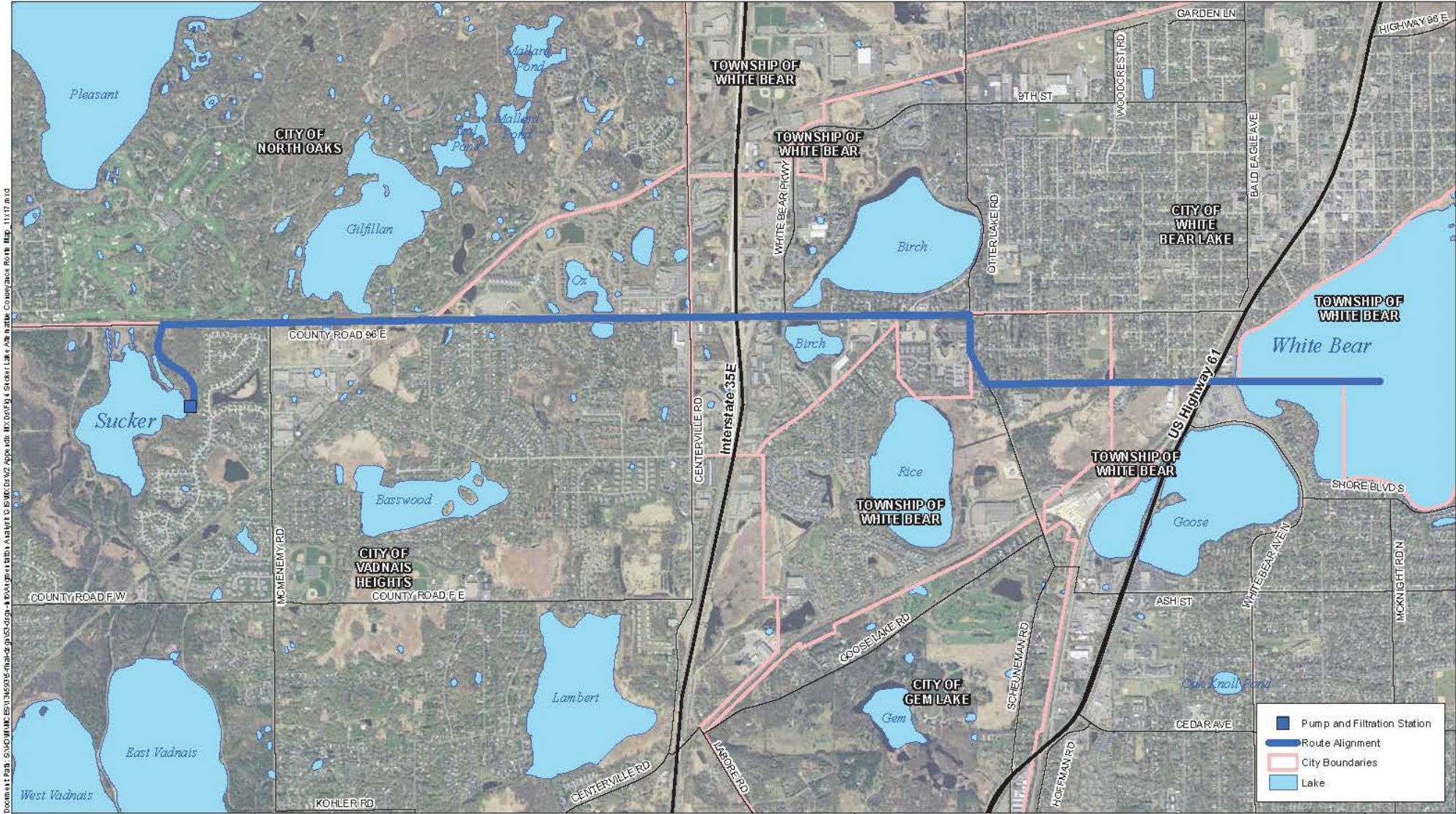
Summary

The published surficial geologic conditions along both alternatives identify a mix of soil conditions. Alternative 1 passes through areas of coarse meltwater sediment, glacial till, and generally sandy lake-deposited soils. Alternative 2 passes through lacustrine soils, coarse meltwater sediment, and generally sandy lake-deposited soils. Isolated areas of organic soils also exist along both alignments. Closer to the proposed augmentation point at Lions Park along WBL, the surficial sandy lake-deposited soils have been found by previous investigations to be interbedded with buried organic soils and soft lacustrine clay and silt. The investigations indicate these conditions to exist as far west as the intersection of Hoffman Road/White Bear Avenue and Minnesota State Highway 61, as far northwest as the intersection of Whitaker Street and Lincoln Avenue, and as far south east as the intersection of White Bear Avenue and South Shore Boulevard.

The limits of surficial geology conditions presented in this memorandum are approximate and based on our review of the referenced documents. The actual subsurface conditions encountered along either alternative alignment may vary from those described herein.

Attachments – Figures 1 and 2

c: Don Lutch
bat





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Project: MCE 134593
Print Date: 1/6/2016

Map by: LD
Projection: NAD 83, NAD 83 State Plane, Minnesota South, EPS: 2283, Feet
Datum: NAD 83, Units: Feet, Scale: 1:25000
Source: MNDNR, MNDOT, NHDOT, NHDOT, MNDNR, SEH

0 850 1,700 3,400 5,100 6,800 Feet



Sucker Lake Alternative Conveyance Route

Figure 1

This map is provided as a guide only. It is not intended to be used as a legal document. The map is a compilation of various sources and is not intended to be used as a legal document. The map is a compilation of various sources and is not intended to be used as a legal document. The map is a compilation of various sources and is not intended to be used as a legal document.

Appendix C

Wetland Inventory



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TECHNICAL MEMORANDUM

TO: Greg Johnson, PE
Metropolitan Council Environmental Services

FROM: Chris Larson, PE, SEH

DATE: July 7, 2026

RE: Preliminary Wetlands Inventory Review
SEH No. MCES 191435

This Technical Memorandum (TM) has been prepared to summarize the review of the National Wetland Inventory (NWI) as it relates to Study 7B for Augmentation of White Bear Lake with Surface Water. Its purpose is to summarize the impact to wetlands along each of the two (2) alternative alignments assumed for developing costs for augmentation of approximately two (2) billion gallons (BG) per year of water into White Bear Lake (WBL): The Sucker Lake Alternative (Alternative 1) and the East Vadnais Lake Alternative (Alternative 2). The NWI map was referenced to determine the location and type of wetlands present in the area that will be affected. Two major types of wetlands were displayed on the NWI map throughout the two options, they include Freshwater Emergent and Freshwater Forested or Shrub Wetlands.

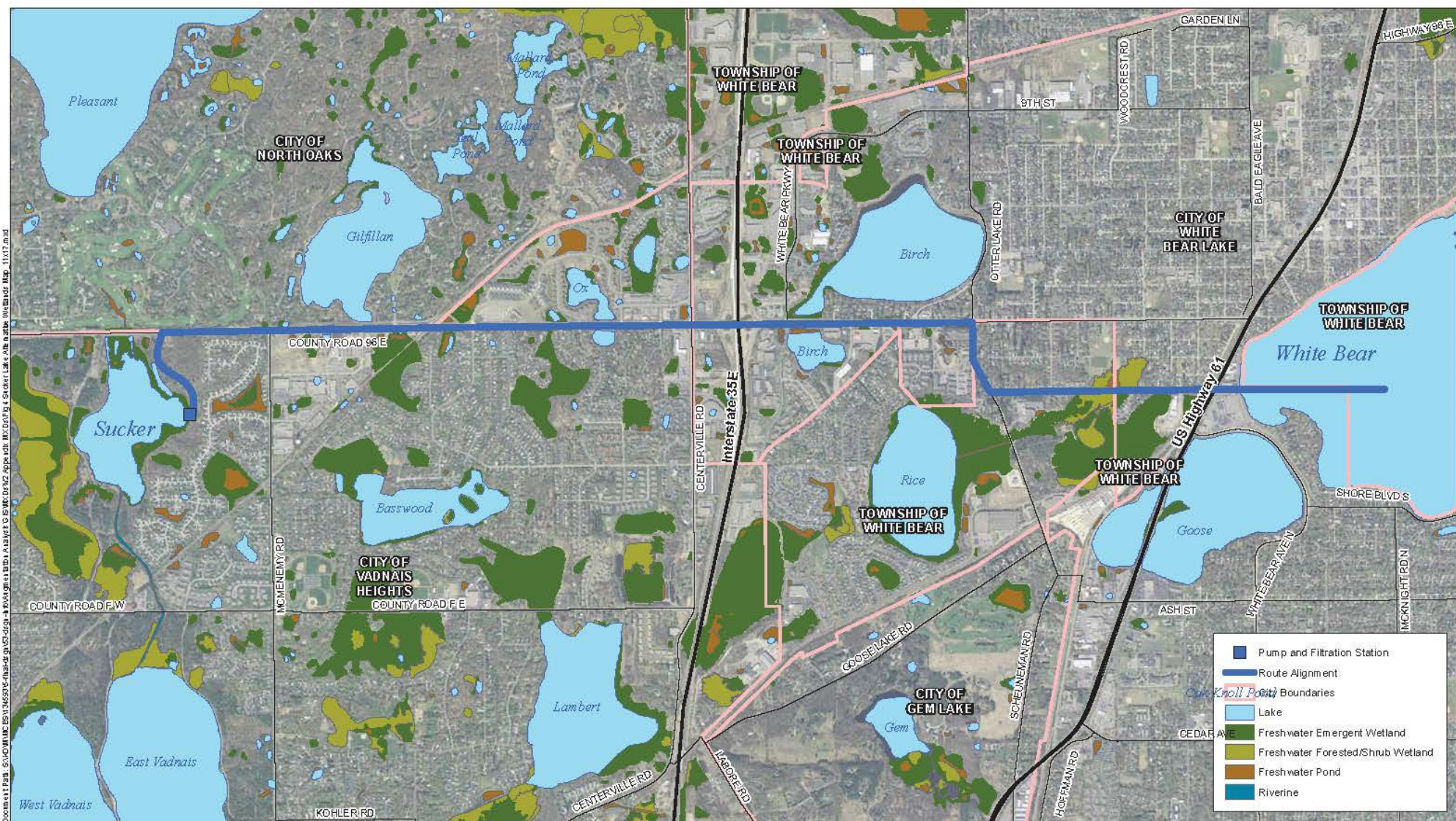
A Freshwater Emergent Wetland typically consists of marsh or wet meadow areas. These areas are often covered with six (6) or more inches of water, and contain waterlogged soils. Vegetation found in Emergent Wetlands consist of rooted, herbaceous hydrophytes, most notably cattails. Forested or Shrub Wetlands are similar, however contain more woody vegetation such as deciduous or evergreen typically less than twenty feet tall and can be seasonally flooded.

Alternative 1 would intersect a Freshwater Emergent Wetland at the Sucker Lake intake. This wetland is prevalent alongside the entire eastern shore of Sucker Lake and would be unavoidable when constructing the intake system. More sections of Emergent Wetland are found along Highway 96 in two different locations. Although the proposed watermain would not run directly through the wetland, it is possible that the wetland may be affected during construction. Figure 1 depicts the locations of the above referenced wetlands.

Alternative 2 would intersect a Freshwater Forested/ Shrub Wetland near the proposed Vadnais Lake intake located on the south eastern shore. A Freshwater Pond along Centerville Road south of Lambert Lake would need to be watched carefully during construction. Also along Centerville Road, on the north side of the road, is a Freshwater Emergent Wetland south east of Lambert Lake. Figure 2 depicts the locations of the above referenced wetlands.

Wetland areas listed above would need to be avoided as much as possible to minimize the impact and mitigation requirement wherever possible. Proper means of stormwater runoff and erosion prevention shall be taken, especially in areas where construction sites will be in the near vicinity of wetland areas as depicted on the NWI map.

Attachments – Figures 1 and 2





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Map by: LO
Projection: NAD 83, NAD 83 State Plane, Minnesota South, UTM, Zone 16N
Datum: NAD 83, North American, 1983, NAD 83
Source: MND, MNDOT, MNDOT, MNDOT, MNDOT

0 850 1,700 3,400 5,100 6,800 Feet

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Sucker Lake Alternative Wetlands

Figure 1

This map is a preliminary map and is not a survey map. It is intended to be used for informational purposes only. The map is not a legal document and should not be used for legal purposes. The map is not a legal document and should not be used for legal purposes. The map is not a legal document and should not be used for legal purposes.

Appendix D

Contaminated Site Inventory



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MEMORANDUM

TO: Chris Larson

FROM: Mark Sherrill and Ben Kolter

DATE: May 4, 2026

RE: Environmental Review
Study 7B - Augmentation of White Bear Lake with Surface Water
Sucker Lake and Vadnais Lake Alternatives
SEH No. MCES0 191435

INTRODUCTION

SEH has completed an Environmental Review for the White Bear Lake Augmentation Concept Report on the Sucker Lake Alternative (Option 1) and East Vadnais Lake Alternative (Option 2) in the city of White Bear Lake, Minnesota. The purpose of this study was to determine the potential contaminated materials issues that may be encountered during construction activities along each alignment. The research targets identifying potential soil, groundwater, and soil vapor contaminated sites within the "project corridors." The project corridors include parcels partially or wholly included in a buffer area that extends 500 feet from the two alignment options. Option 1 extends east from Sucker Lake and Option 2 extends northeast from East Vadnais Lake to Goose Lake and Vadnais Lake, where the corridors overlap. The alignments are depicted on the attached **Figure 1**. Individual ranked sites and project buffer areas are depicted on **Figure 2**.

It was not within the scope of this Environmental Review to evaluate the level, extent, or confirm contamination. Additionally, the scope of this work is not considered a Phase I Environmental Assessment (ESA). Summary information and conclusions from this report may be used to develop contingency planning for environmental issues associated with proposed construction within the project corridor or to apply for liability assurances for property acquired as part of the project.

RESEARCH SUMMARY

This Environmental Review included a desktop review of the project area and a site reconnaissance. The project was limited to the following research tasks listed below:

- Environmental Database Review of MPCA What's in my Neighborhood (WIMN), Minnesota Department of Agriculture (MDA) WIMN and Petroleum Remediation Program (PRP) websites
- Limited review of the MPCA Spill sites
- Historic aerial photograph review (1947, 1957, 1966, 1980, 1991, 2003, 2004, 2008, 2009, 2011)
- Historic topographic map review (1902, 1910, 1918, 1943, 1954, 1959, 1965, 1969, 1973, 1981, 1987, 1993)
- Review of available Solid Waste, Voluntary Investigation and Cleanup (VIC), Petroleum Brownfield, and Leak Files.
- Review of located monitoring and abandoned wells available on the Minnesota Department of Health (MDH) Minnesota Well Index (MWI) website.

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- Site reconnaissance to identify suspect existing conditions and observable past uses that may impact the project.

SEH used the following categories of “low,” “medium,” and “high” risk to rank sites within the project corridor. Rankings may not adhere directly to the definitions below if information obtained during the review justified lowering or raising the rank level.

- **Low Environmental Risk** – Hazardous and/or petroleum substances are known or inferred to have been, or are being used, stored or generate on these sites; however, there appear to be “good housekeeping” practices conducted on the site. Good housekeeping practices are defined as proper handling and/or storage of hazardous or petroleum substances. There is also no record or evidence of spills, releases, surface contamination and/or subsurface contamination at the site.
- **Medium Environmental Risk** – Hazardous substances are known or inferred to have been, or are being used, stored, or generated on these sites, and there appears to be “poor housekeeping” practices conducted at the site. Poor housekeeping practices are defined as improper handling and/or storage of hazardous or petroleum substances. All properties that have underground storage tanks (USTs) or above ground storage tanks (ASTs) and leaking underground storage tank (Leak) sites that have received closure from the Minnesota Pollution Control Agency (MPCA), and vehicle repair and maintenance facilities are also considered medium environmental risks.
- **High Environmental Risk** – These are sites where hazardous and/or petroleum substances are known or inferred to have been, or are being used, stored, or generated, and there is a record or evidence that a spill, release, surface contamination and/or subsurface contamination has occurred. These sites include all active Voluntary Investigative and Cleanup (VIC), Minnesota Environmental Response & Liability Act (MERLA), active Leak sites and all active and inactive dump sites.

2026 ENVIRONMENTAL REVIEW UPDATE

SEH reviewed reasonably ascertainable records from standard sources such as publicly available federal, state, county and/or city records as appropriate to assist in identifying environmental conditions in connection with the project corridors.

SEH used the MPCA What's in My Neighborhood (WIMN) and associated files as the primary source of environmental site information. SEH reviewed additional environmental record sources, including the MPCA Incident Reports (“Spills”), MDH MWI, the MDA WIMN interactive mapping program, MPCA *Minnesota Groundwater Contamination Atlas*, and the *National Pipeline Mapping System*.

SEH also reviewed the 2025 aerial photographs for the corridor. Site reconnaissance was completed on May 6, 2026. Sites were reviewed for any site use changes or business changes since the original Environmental Review. Additionally, the March 2026 Ramsey County parcel information was reviewed for changes since the last report.

Findings of the review update are included in the discussion, **Table 1**, and **Figures**.

DISCUSSION

SEH identified the following general concerns for the project corridor. Railroad corridors intersect both alignment options. Option 2 includes significantly more railroad property than Option 1. Railroad corridors present environmental concerns from property uses directly associated with railroad activities and surrounding industry. Historically, railroad property is known for heavy metals and polycyclic aromatic hydrocarbons (PAHs) associated with transport of coal and other industrial products. Fill material is likely present below the railroad corridor in portions of both project corridors. Additionally, railroads are known

to sometimes use chemicals associated with controlling encroaching vegetation along the railroad. Railroads are depicted on the attached figures.

Sites with farm structures, such as residences and barns, formerly located within the project corridor have been demolished. For that reason alone, these sites do not qualify as low, medium or high risk sites by definition. It is unknown if all of the demolition debris or foundations associated with the buildings were removed from within the project corridor. The potential exists that buried materials are present within the project corridor that require management as solid waste or waste with hazardous materials or regulated substances. Areas with historic removed structures that are within the proposed construction limits have been identified and are included in the site ranking rationale descriptions.

SUCKER LAKE ALTERNATIVE (OPTION 1):

The Option 1 project corridor extends from Sucker Lake to Goose and Vadnais Lakes. It is located along CSAH 96 with mostly undeveloped, residential, and commercial properties. Sites 01 through 49 (6 high, 23 medium, and 20 low) were identified within the Option 1 project buffer for potential environmental risk and are summarized on the attached Figure and Table. Historically fill of unknown origin was commonly placed in low lying areas along this transect throughout the mid-century. Significant filling of low-lying marshy areas and ponds was completed during this time prior to the construction of Highway 96. Example of sites that had historic fill of unknown origin include Sites 07, 09, 10, 12, 16, 18, 24, and 27. Filling of dump material also occurred historically on this alignment. The summaries in this section are presented generally from west to east along the project corridor.

The Highway 96 Dump (White Bear Township Dump) Superfund Site, located north of Highway 96 and west of Allendale Drive in White Bear Township, was operated as a small burning dump from the 1920s to 1973. The investigations identified waste in two areas: the North Disposal Area (NDA) located in the northwest portion of the current development referred to as Weston Woods. Town house development has occurred in the South Disposal Area (SDA). During the late 1980s and into the 1990s remediation efforts began on the site. Waste material was removed from the NDA and SDA. All waste and soil contamination was removed from the SDA. The NDA was consolidated and capped. Groundwater at the site is impacted and a groundwater extraction system is in place. Site 15, located adjacent to the project alignment received an off-site source determination from the MPCA for groundwater impacts associated with the dump.

Additional areas along the Option 1 alignment include petroleum leak sites and other commercial properties with hazardous property uses. Multiple Leak sites are located at the intersection of CSAH 96 and CR 59. Sites 23, 26, and 29 have significant petroleum impacts documented for soil and groundwater associated with former and active petroleum tanks. Soil gas results for petroleum were above action levels at Site 23, which also has a dry cleaners on-site. Several properties adjacent to this intersection have historically been used for auto fueling, repair, and service.

Two additional Leak sites, former fuel station at site 36 and active fuel station at site 39, are located on CSAH 96 east of I-35E near Birch Lake Road. The Leak files associated with the fuel stations reported minor petroleum impacts to soil and groundwater that appeared to be confined to the sites. Additional releases on the corridor are also associated with Spills. For example, at the intersection of CSAH 96 and CR 50 (Otter Lake Road) where a mineral oil release occurred.

Site 43 is a Voluntary Investigation and Cleanup (VIC) site located southeast of CSAH 30 and Whitaker Street. The site had been utilized by the Water Gremlin Company (Water Gremlin) as an industrial manufacturing facility since approximately 1949. Chlorinated solvents and their related degradation products in groundwater were below drinking water standards when response actions at the site were complete. Several closed Spills are also associated with the site.

In 2023, a Domestic Water Supply Well Sampling Report was completed for portions of Gem Lake, Minnesota as part of MPCA Site Assessment SA0000918. A total of 40 groundwater supply well samples were collected from residential properties near the intersection of Goose Lake Road and Labore Road. Of the forty samples collected, fifteen had reported concentrations of 1,4-dioxane above the MDH HRL of 1.0 micrograms per liter (ug/L). The highest concentration was 2.2 ug/L at 1140 Goose Lake Road. Two of the forty wells had no detections above the laboratory reporting limit. According to the MDH MWI, static groundwater levels of the impacted wells within Option 2 range from 50 to 75 feet bgs. The wells are set in Quaternary unconfined artesian aquifers. The EPA considers 1,4-dioxane an emerging contaminant. The NPDES General Permit set to expire in 2027 does not allow discharge of emerging contaminants.

The major concern identified at the intersection of TH 61 and Whitaker Street is documented dumping. Dumping of lime sludge material and fill material, and small quantities of demolition debris, and household garbage was identified in the large wetland at Site 45. The associated State Assessment file was closed because dumping was no longer taking place. A former fuel station on site 45 (closed Leak site and closed Spills) was the source of petroleum impacted soil and groundwater that is documented to remain on-site. Site 46 was remediated of debris-laden fill that was impacted with diesel range organics (DRO), polycyclic aromatic hydrocarbons (PAHs), lead, mercury, and asbestos. Site 48 is a closed Leak site that had a gasoline release from a small gasoline tank that was removed from the site adjacent to White Bear Lake. A dry cleaners is present in the strip mall at Site 49.

EAST VADNAIS LAKE ALTERNATIVE (OPTION 2):

Option 2 is generally aligned along the MNNR Railroad and extends from East Vadnais Lake to and Goose and White Bear Lakes. The railroad has been active since at least 1902 and a former rail yard was located along White Bear Parkway. Historically, more industrial activity has occurred along this option versus Option 1. Site 45 and Sites 49 through 88 (8 high, 16 medium, and 17 low) were identified within the Option 2 project buffer for potential environmental risk and are summarized on the attached Figures and Table. The summaries in this section are presented generally from southwest northeast along the project corridor.

Near East Vadnais Lake, Sites 86 and 87 were identified for former auto repair and fueling. Closed Leaks and Spill listings document petroleum impacted soil and groundwater and rusty colored sludge on the ground surface. Petroleum impacted groundwater was identified at approximately 20 feet bgs. Petroleum impacted soil was still present; however, the tanks have all been removed.

Site 72 is a self-storage facility which has an MPCA registered Leak first reported in April 2017. According to the MPCA WIMN database, an excavation report was completed and the MPCA closed the site in 2020.

A plume of 1,4-dioxane has been identified near the intersection of Labore Avenue and Goose Lake Road. Concentrations of 1,4-dioxane have been reported above the MDH HRL of 1 ug/L within tap water samples from residential wells within the area. The assumed source is the Water Gremlin site to the northeast of the area with the detections. Contaminants from the site appear to be impacting shallow groundwater within Option 2. For additional details, see the Option 1 discussion for the Water Gremlin site.

The most notable concerns near the intersection of I-35E and CSAH 59 along the alignment are historic structures (Site 73) and a dump (Site 76). No MPCA files were available for the dump. Site 74 is a dump with additional listings; however, the activities appear to be located south of the alignment. Sites 71, 77 and 78 were noted for non-native fill and outdoor storage. A transformer released mineral oil that was cleaned up in the right-of-way adjacent to Site 75.

The MNNR Railroad wye is located near the intersection of CSAH 60 and CSAH 14 and is surrounded primarily by industrial properties. Sites identified in this area include a wood treating facility with historic bulk storage tanks (Site 53), former auto repair State Assessment Site (Site 55), a plastics company with large tanks (Site 56), a historic rail yard (Site 57), and the Lindsey Water Softener VIC site (Site 67). Site 67 was identified for shallow soil impacted with metals and buried concrete structures. A 1950s fuel station may have been located at the corner of CSAH 14 and Goose Lake Road (Site 60). The northern edge of a milk company (Site 53), identified as a dump with several other database listings, is located in the project corridor southeast of CSAH 12 and CSAH 146.

As summarized for Option 1, the major concern identified at the intersection of TH 61 and Whitaker Street is documented dumping. Dumping of lime sludge material and fill material, and small quantities of demolition debris, and household garbage was identified in the large wetland at Site 45. The associated State Assessment file was closed because dumping was no longer taking place. A former fuel station on site 45 (closed Leak site) was the source of petroleum impacted soil and groundwater that is documented to remain on-site. A dry cleaners is present in the strip mall at Site 49. What appears to be a significant amount of fill material was placed across Goose Lake (Site 51) in the 1950s for the construction of TH 61.

Site 86 has a MPCA registered Brownfield that was applied for in 2022. According to the MPCA WIMN database, a Phase I Environmental Site Assessment, Phase II Investigation, and a No Association Determination (NAD) were completed/issued in 2022. The MPCA closed Brownfield in 2024.

RECOMMENDATIONS:

SEH recommends a subsurface investigation be completed along the alignment in the areas discussed above if earthwork, dewatering and/or acquisition is planned.

Minnesota Department of Transportation (MnDOT) has right-of-way within the project area. If a Phase I ESA is not planned for the project, SEH suggests providing this document to MnDOT Office of Environmental Services (OES) and request their approval for the planned environmental due diligence for the project with respect to their property. MnDOT OES may require additional environmental work if potential construction, temporary easements, or acquisitions are planned on MnDOT property.

bck

Attachments

c: Chris Larson, SEH

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Table 1
Environmental Sites Summary
Environmental Review
White Bear Lake Augmentation Concept Report
Ramsey County
MCES0 191435

SEH ID	Rank	Ranking Rationale	Option
01	Medium	Suspicious 1940s-1980s surface disturbances - potential dumps off access road.	Option 1
02	Medium	Closed Spills.	Option 1
03	Medium	Pond filled around the 1950s.	Option 1
04	Medium	Large diesel generator and non-native fill observed, hazardous waste generator.	Option 1
05	Low	1950s-1970s historic commercial building.	Option 1
06	Low	Pond filled in the 1990s.	Option 1
07	Medium	Pond filled around the 1960s. Site developed with residence in 1972.	Option 1
08	Low	Large unknown structure present from the 1940s-1950s.	Option 1
09	Medium	Ponds filled in the 1960s or 1970s.	Option 1
10	Medium	Pond filled and a surface disturbance in the 1980s. Site developed with residence in 1987.	Option 1
11	Low	Gas main emergency shut off.	Option 1
12	Medium	Fill likely placed for road project prior to 1940s, and during improvements in 1990s.	Option 1
13	Medium	Monitoring wells on-site.	Option 1
14	Low	Unknown structure from 1940s through 1970s - appears larger than a residence and is directly adjacent to the highway.	Option 1
15	High	VIC site for off-site source determination of impacted groundwater from the Highway 96 dump site.	Option 1
16	Medium	Fill placed for road project prior to 1940s and during improvements in 1990s.	Option 1
17	High	Dry cleaners, VIC site, Superfund, Highway 96 dump site, regional groundwater impacts.	Option 1
18	Medium	1970s-1990s unknown removed structure. Fill placed for road project prior to 1940s and during improvements in 1990s.	Option 1
19	Low	Valvoline oil change.	Option 1
20	Low	Unknown 1950s surface disturbance adjacent to CSAH 96.	Option 1
21	Low	Auto parts store, hazardous waste generator.	Option 1
22	Low	Hazardous waste generator.	Option 1
23	Medium	Former fuel station, dry cleaners, paint store, closed Leaks/Spills.	Option 1
24	High	VIC, historic surface disturbances/fill, buried ash removed from site during redevelopment.	Option 1
25	Low	Hazardous waste generator.	Option 1
26	Medium	Fuel station, closed Leak, active tanks, petroleum impacted soil and groundwater remained on-site.	Option 1
27	Medium	Filled ditch/marsh around 1970s. Developed with commercial structure in 1985.	Option 1
28	Low	Potential fill of unknown origin.	Option 1
29	Medium	Former petroleum retail facility/auto repair, closed Leak, removed tanks, petroleum impacted soil and groundwater remained on-site, monitoring wells.	Option 1
30	Low	Historic (1970s-1990s) removed structure, tire shop, hazardous waste generator.	Option 1
31	Low	VIC/CERCLIS, former gun club investigated for lead in soil - no impacts identified.	Option 1
32	Low	Auto parts store, hazardous waste generator.	Option 1
33	Medium	Closed spill (25 gallons of diesel).	Option 1
34	Low	Hazardous waste generator.	Option 1
35	Low	Hazardous waste generator.	Option 1
36	Medium	Former fuel station, auto service center, closed Leak, removed tanks/hoists, petroleum impacted soil and groundwater remained on-site. Groundwater 12-15 feet bgs.	Option 1
37	Low	Abandoned industrial well.	Option 1
38	Low	Hazardous waste generator.	Option 1
39	Medium	Fuel station, closed Leak, low level petroleum impacted soil confined to dispenser island, active petroleum tanks, closed spills.	Option 1
40	Medium	Closed Spill (43 gallons mineral oil).	Option 1
41	Medium	Closed Leaks, residential fuel oil AST.	Option 1
42	Low	Hazardous waste generator.	Option 1
43	High	Industrial manufacturing, VIC, RCRA Cleanup, ASTs, hazardous waste generator, closed Spill, environmental wells, under construction, non-native fill, flammables cage with containers.	Option 1
44	Medium	Monitoring well.	Option 1
45	High	State Assessment Site, unpermitted dump of lime and sludge in wetland, former fuel station, closed Leak/Spills, outdoor storage observed.	Both
46	High	VIC, Petroleum Brownfield, Closed Leak, PAHs, lead, mercury, asbestos, and debris in soil - impacted soil excavated to native soil, groundwater not evaluated, no VOCs in soil vapor.	Option 1
47	Low	Hazardous waste generator.	Option 1

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MCES0 191435

SEH ID	Rank	Ranking Rationale	Option
48	Medium	Closed Leak from a small gasoline tank adjacent to White Bear Lake, petroleum impacted soil and groundwater remained on-site.	Option 1
49	Medium	Dry cleaners, closed Spills, hazardous waste generator.	Both
50	Low	Historic commercial/industrial structures in 1940s and 1950s.	Option 2
51	Medium	Fill material placed for construction of TH 61 across Goose Lake in 1950s.	Option 2
52	Low	Petroleum Brownfield site investigated for nearby Leak site - no contamination found during construction of cell tower, soil stockpiles observed.	Option 2
53	High	Wood treating facility, closed Leak (no impacts identified for soil or groundwater), RCRA Cleanup site, hazardous waste generator, historic bulk storage tanks, outdoor storage observed.	Option 2
54	Low	Outdoor storage at lumber yard.	Option 2
55	High	State Assessment Site (no MPCA file), former auto repair, hazardous waste generator.	Option 2
56	Medium	Plastics company, outdoor storage, large holding tanks observed.	Option 2
57	High	Historic railyard.	Option 2
58	NOT A SIT	Leak site not on this site. Residence. No issues	Option 2
59	Low	Outdoor storage, poor housekeeping observed.	Option 2
60	Medium	Small structure at intersection in 1950s. Potentially a corner store or fuel station.	Option 2
61	Low	Hazardous waste generator, outdoor boat storage lot.	Option 2
62	Low	Outdoor storage of implements and water heaters.	Option 2
63	Low	Hazardous waste generator, outdoor storage observed.	Option 2
64	Low	Hazardous waste generator, printing shop.	Option 2
65	High	Milk company, Unpermitted Dump, State Assessment Site, petroleum/other tanks, closed Spills, hazardous waste generator.	Option 2
66	Medium	Railroad spur owned by wood treating company.	Option 2
67	High	VIC, releases identified with the Lindsey Water Softener Site. Shallow soil impacted with metals and buried concrete structures. Groundwater impacted with metals and petroleum.	Option 2
68	Medium	Historic removed structures, potentially outdoor storage, surface disturbances 1940s-1970s, pit filled in 1970s.	Option 2
69	Low	Stockpile with asphalt/rocks observed.	Option 2
70	Low	Monitoring well and lake level augmentation well.	Option 2
71	Medium	Historic gravel pit filled in 1980s, small junk yard.	Option 2
72	Low	Closed Leak.	Option 2
73	Medium	Historic removed structures below roadway. Probably only residences/farms.	Option 2
74	High	VIC, Solid Waste Permit-by-rule, dump.	Option 2
75	Medium	Closed Spill (mineral oil from transformer) in right-of-way, hazardous waste generator, outdoor storage observed.	Option 2
76	High	Unpermitted dump, State Assessment Site (no MPCA files).	Option 2
77	Medium	Debris and stockpiles, wood pallets, drum, snowmobiles/auto, acetylene tanks, generators observed.	Option 2
78	Medium	Excavating company, removed/active petroleum tanks, historic surface disturbance, stockpile observed.	Option 2
79	Low	Historic removed structures in the 1950s, structures removed in the 1970s.	Option 2
80	Medium	Closed Spill (waste oil).	Option 2
81	Low	Stockpile observed.	Option 2
82	Low	Former farmstead razed in the 1960s.	Option 2
83	Low	Hazardous waste generator.	Option 2
84	Medium	Non-native fill in railroad embankment. Farmland until City Hall built in 2000.	Option 2
85	Low	Outdoor storage of vehicles, equipment or other objects, and surface disturbances from 2008-2011.	Option 2
86	Medium	Inactive Brownfield, closed Spill, former tanks, staining inside structure, hazardous waste generator.	Option 2
87	Medium	Former fuel station, close Leak, closed Spill, removed tanks, auto repair, petroleum impacted soil on-site, groundwater impacted on and off-site, groundwater 20 feet bgs, hazardous waste generator.	Option 2
88	Low	Potentially a commercial structure present in the 1940s. Residential from the 1950s-2015.	Option 2
89	Medium	Active railroad corridor.	Option 1
90	Medium	Closed Spill.	Option 1
91	Medium	Closed Spill.	Option 1
92	Medium	Closed Spill.	Option 1
93	Medium	Closed Leak/Spill, current lumberyard, RCRA generator.	Option 2
94	Medium	Closed Spill.	Option 2

Table 1
Environmental Sites Summary
Environmental Review
White Bear Lake Augmentation Concept Report
Ramsey County
MCES0 191435

SEH ID	Rank	Ranking Rationale	Option
95	Low	Hazardous waste generators.	Option 2
96	Medium	Closed Spill.	Option 2
97	Medium	Closed Spill.	Option 2
98	Medium	Current auto dealership.	Option 2
99	Medium	Closed Spill.	Option 1

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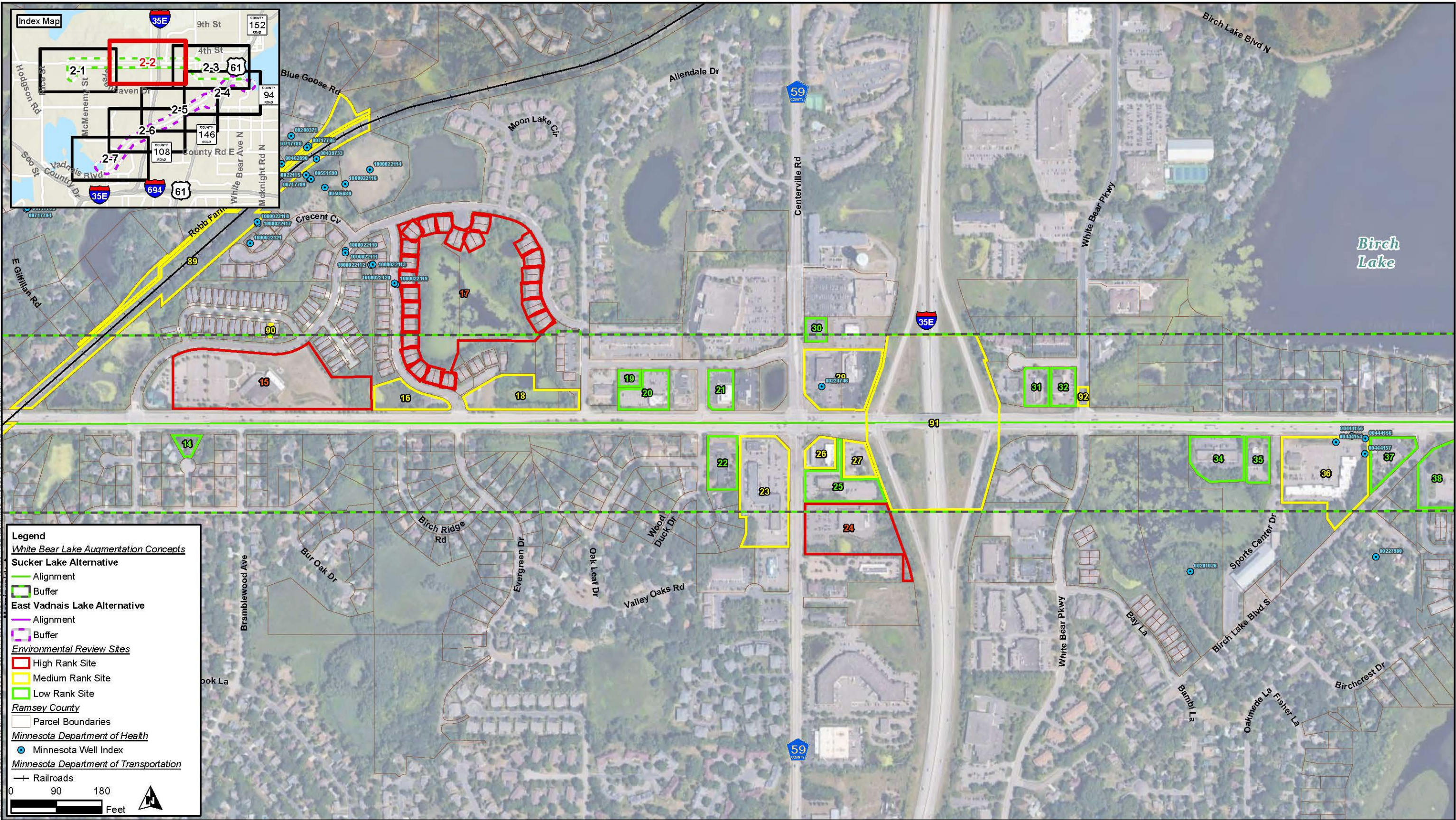


Legend
White Bear Lake Augmentation Concepts
Sucker Lake Alternative
— Alignment
— Buffer
East Vadnaia Lake Alternative
— Alignment
— Buffer
Environmental Review Sites
■ High Rank Site
■ Medium Rank Site
■ Low Rank Site
Ramsey County
□ Parcel Boundaries
Minnesota Department of Health
● Minnesota Well Index
Minnesota Department of Transportation
— Railroads

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Feet

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Project: RAMSE 189930
Print Date: 5/8/2026

User Name: bkolter
Projection: NAD 1983 UTM Zone 15
Source: SEH, MnDOT, ESRI, MCEs

Project Corridor Features

Environmental Review

White Bear Lake Augmentation Concept Report

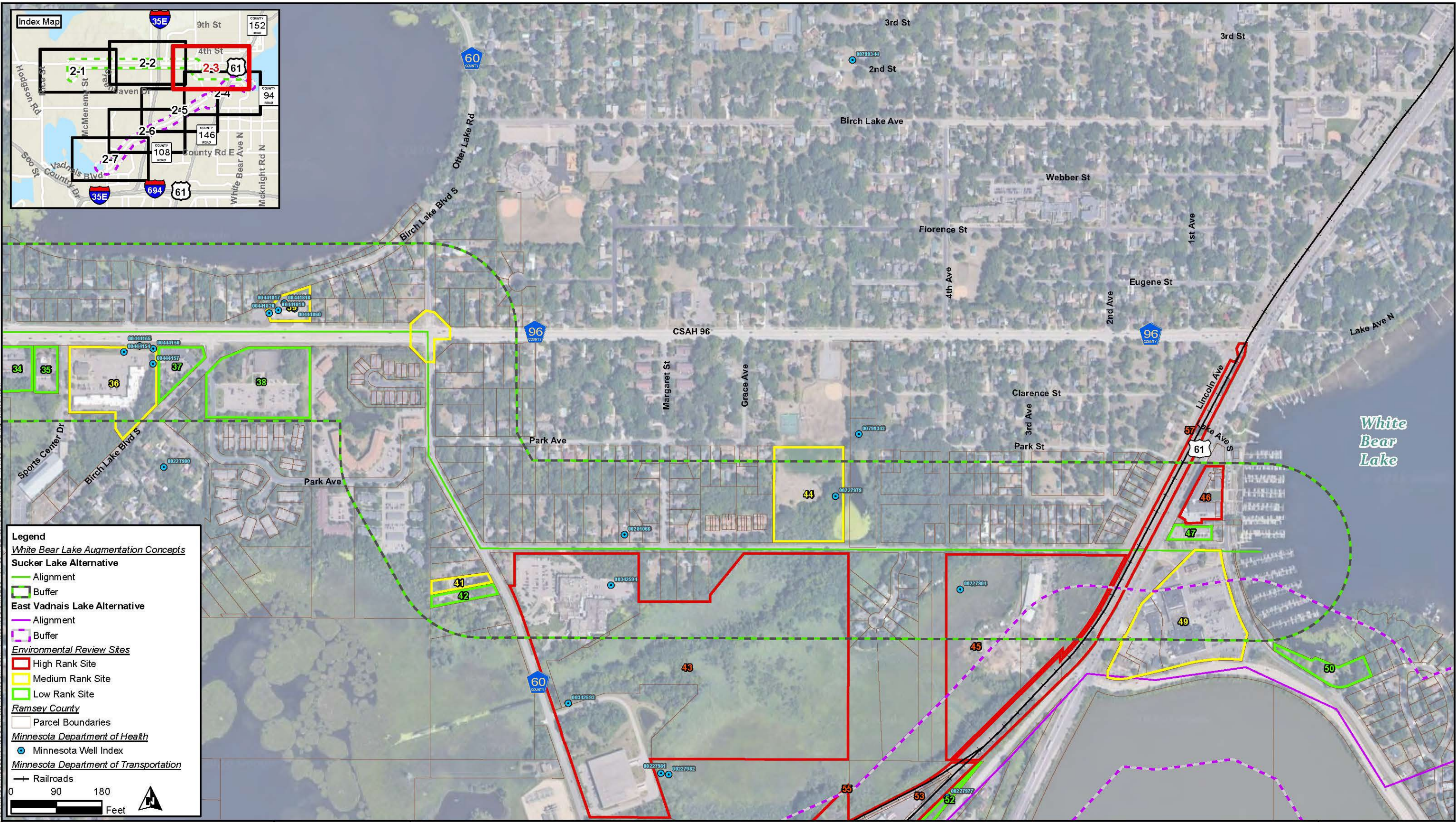
Sucker Lake and Vadnais Lake Alternatives

Ramsey County, Minnesota

Figure
2-2

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Legend

White Bear Lake Augmentation Concepts

Sucker Lake Alternative

Alignment

Buffer

East Vadnaia Lake Alternative

Alignment

Buffer

Environmental Review Sites

High Rank Site

Medium Rank Site

Low Rank Site

Ramsey County

Parcel Boundaries

Minnesota Department of Health

Minnesota Well Index

Minnesota Department of Transportation

Railroads

0 90 180

Feet



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Project Corridor Features

Environmental Review

White Bear Lake Augmentation Concept Report

Sucker Lake and Vadnaia Lake Alternatives

Ramsey County, Minnesota

Figure 2-3

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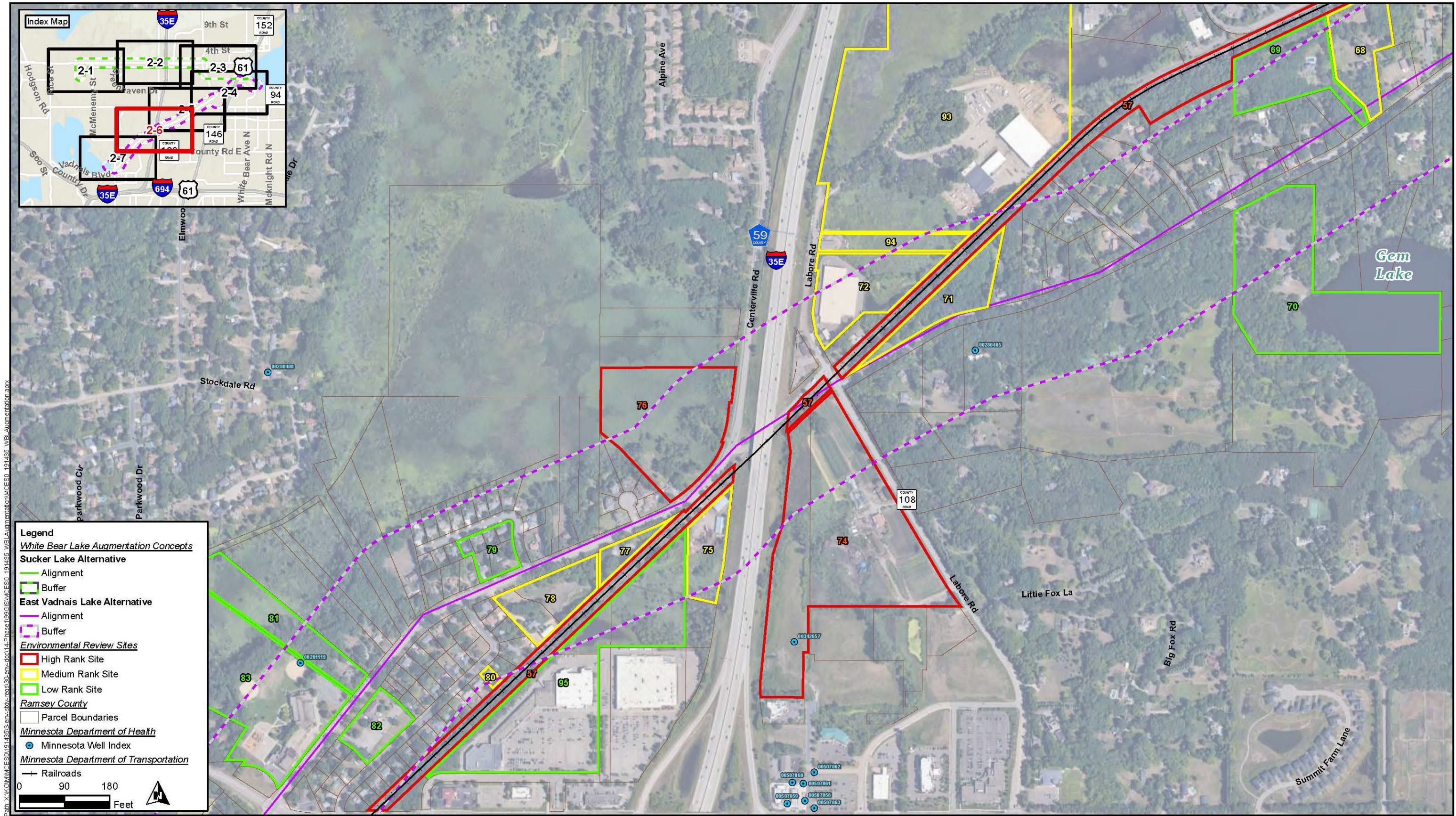
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Projection: NAD 1983 UTM Zone 15
Source: SEH, MnDOT, ESRI, MCES

Project Corridor Features
Environmental Review
White Bear Lake Augmentation Concept Report
Sucker Lake and Vadnais Lake Alternatives
Ramsey County, Minnesota

Figure
2-5

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Source: SEH, MnDOT, ESRI, MCES

Project Corridor Features

Environmental Review

White Bear Lake Augmentation Concept Report

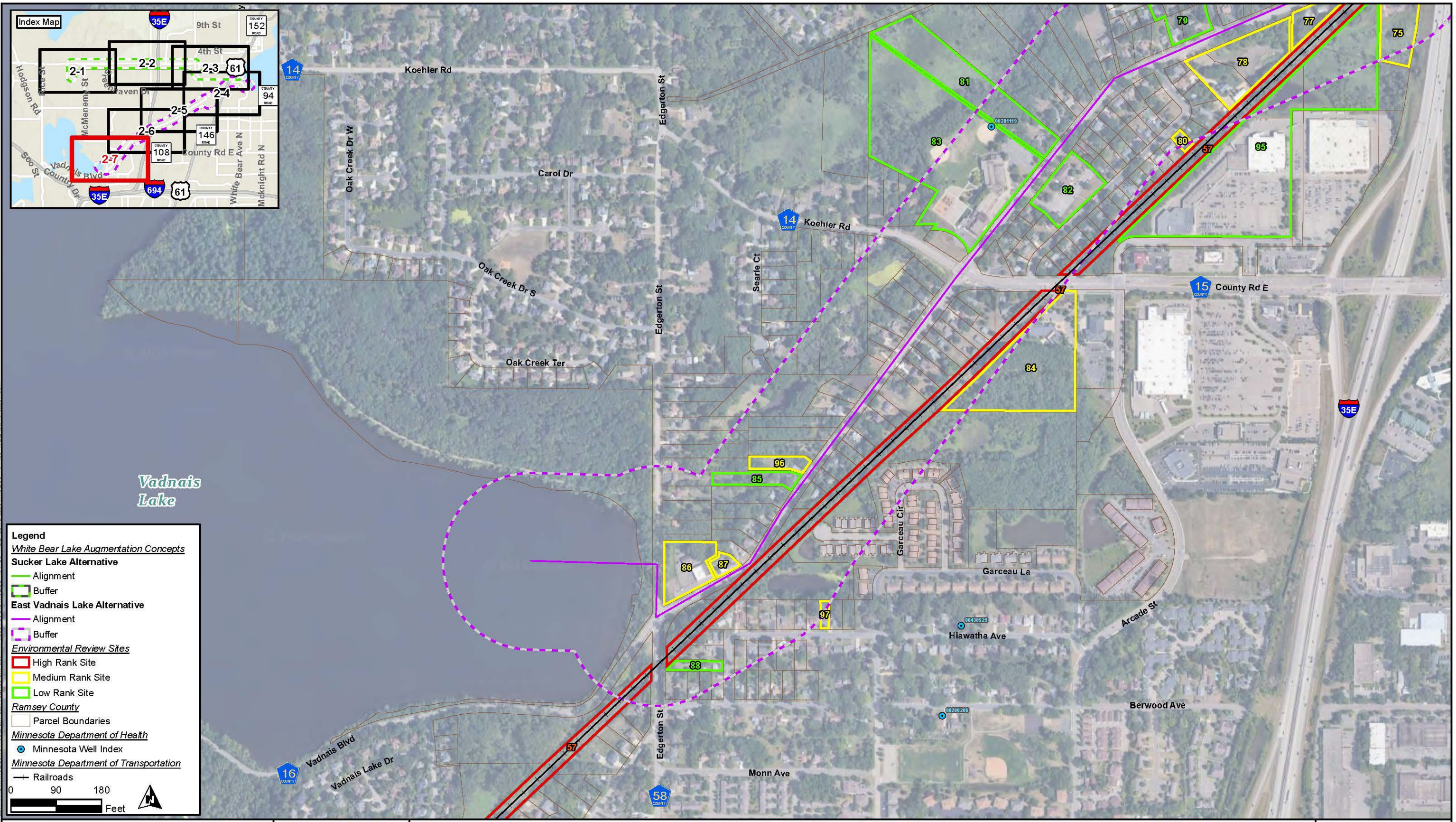
Sucker Lake and Vadnais Lake Alternatives

Ramsey County, Minnesota

Figure
2-6

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Project Corridor Features
Environmental Review
White Bear Lake Augmentation Concept Report
Sucker Lake and Vadnaish Lake Alternatives
Ramsey County, Minnesota

Figure
2-7

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Appendix E

Detailed Cost Summary

East Vadnais Lake Alignment

Capital Costs for Concept Level Surface Water Augmentation

6/26/2026

Code	Item	Unit	QTY	Unit Price	Total Price	Uncertainty	Basis of Cost
Sitework							
S1	Mobilization	LS	1	1,073,000	1,073,000		3% construction \$
S2	Traffic Control: Barricades and Lights	LS	1	500,000	500,000	low	\$250k/yr
S3	Erosion Control	LF	21,300	5	107,000	low	Plugged in footage for downstream (low) side of trench or edge of easement/ROW.
S4	Tree Removal and Replacement	Tree	50	1,600	80,000	low	Estimated from Google Street view of potential trees encountered along route.
S5	Comon Excavation Removal of unsuitable/excess material (includes trucking)	CY	89,900	35	3,147,000	high	Removal of unsuitable/excess material. 3.3 CY/LF - 10'D x 15'W trench width. assumed 40% useable material for backfill based on Ramsey County Geological Atlas and no soil borings. Assumes trench excavation for forcemain is included in forcemain items. Includes removal of: 4" reclaimed material (bit roads), 8" class 5 (conc roads), 3" class 5 (bit trail), 4" class 5 (conc walk)
S6	Bituminous Trail Replacement	SY	1,000	33	33,000	low	Bituminous walk section assumed based on visual site drive through - no pavement cores \$110/Ton*113lb/sy/in*3in= \$19/SY Bit+ \$1.6/SY Reclaim + \$35/CuYd*4in=\$4/SY Class 5.
S7	Concrete Sidewalk and Median	SY	500	94	47,000	low	4" Walk at intersections for sidewalk ADA Access. Includes 4" Class 5 \$10/sf walk = \$90/SY + \$4/SY Class 5
S8	Bituminous Pavement 2 -2" Lifts (4" total bit)+ 4" Reused Reclaim+4" CL5 Residential Roads	SY	1,000	32	32,000	high	Road section assumed based on visual site drive through - no pavement cores \$110/Ton*113lb/sy/in*4in= \$25/SY Bit+ \$3/SY Reclaim + \$35/CuYd*4in=\$4/SY Class 5. Includes Driveway Tie Ins
S9	Bituminous Pavement 4 -2" Lifts (8" total bit)+ 4" Reused Reclaim+8" CL5 County/Arterial Roads	SY	83,400	61	5,088,000	high	County/Arterial Road section assumed based on visual - no pavement cores - 40' wide - Centerville Rd, 34' Wide - Goose Lake Rd, 38' Wide Otter Lake Rd and Hoffman Rd \$110/Ton*113lb/sy/in*8in= \$50/SY Bit+ \$3/SY Reclaim + \$35/CuYd*8in=\$8/SY Class 5. Includes Driveway Tie Ins
S10	Concrete Pavement	SY	3,500	133	466,000	low	White Bear Avenue Assumed 8" with 8" Class 5 - Includes Removal \$110/SY 8" Concrete + \$35/CuYd*8in=\$8/SY Class 5 + \$15/SY Removal
S11	Concrete Curb and Gutter B424	LF	2,200	35	77,000		White Bear Ave Curb (North side) + Centerville Rd Medians Primarily rural road with limited curb and no storm sewer.
S12	Dewatering (Wells/Well Points)	LS	1	600,000	600,000	high	Install local segment system w/Frac tank settling treatment prior to discharge to surface waters or sanitary system. If contaminated. Geotechnical investigations including well pump testing to establish potential drawdown rates necessary.
S14	Trucking to Waste (contaminated)	CY	15,810	120	1,898,000	high	Assumed quantity based on Contaminated Site Inventory. Phase 1 investigations and potential for Phase 2 needed. Geotechnical investigations including well pump testing to establish potential drawdown rates necessary.
S15	Site Grading	SY	36,000	4	144,000	low	Assumed limited disturbance (15') beyond rural road shoulder for segments along pipe installed in roadway. Include site demolition.
S16	CLSM Backfill	CY	1,200	150	180,000	low	Casing backfill and potential utility crossing backfill.

S17	Select Fill	CY	71,000	30	2,130,000	medium	Assumed quantity based on Ramsey Sub-geological Atlas - no borings. Used in areas where existing pipe trench will be backfilled with existing materials encountered. See Geotechnical TM for general locations and descriptions of potential for sands, gravels and glacial deposits. Assumes 60% of material is hauled away. 3.3 CY/LF - 60% x 10'D x 15'W trench
S18	Granular Pipe Foundation Material	CY	16,000	35	560,000	medium	0.75 CY/LF - 10'W x 2'D Pipe Foundation
S19	3" Crushed Rock & Fabric	CY	10,623	70	744,000	High	Assume 5% of pipe length - 1' deep x 10' wide
S20	Ground Support System	LS	1	800,000	800,000	medium	Assumed tandem trench box for open cut installation of pipes such that the profile depth when installed with the tandem trench box (6' WIDE WIDTH) and the planned 10' trench excavation will not impact adjacent utilities except for crossings.
S21	CIP Vault (Walls, Base Slab, Footings) - Access	EA	2	65,000	130,000	medium	For two maintenance access structures for potential pipeline cleaning.
S22	Precast Utility Vault - Air Release	LS	2	75,000	150,000	medium	For two air release structures.
S23	72" Manhole (10' Deep)	EA	8	16,000	128,000	low	For segment isolation valves.
S24	Top Soil	CY	7,900	75	593,000	low	Assumed 6" topsoil x 20' wide along entire pipeline length. Represents site grading area covered with six inches of topsoil.
S25	Landscape and Turf Restoration	SY	48,000	6	288,000	low	Assumed seeding for rural road way shoulders with the right-of-way. 20' wide along entire pipeline length
S26	Signal and Push Button Modifications	LS	1	50,000	50,000	low	Replace Loops at Centerville Rd/County E Intersection, loops at White Bear Ave/HWY 61 intersection
Subtotal					\$19,045,000		
Pump & Forcemain							
C5	30" Forcemain and DI Fittings	LF	21,246	550	11,686,000	high	Pipe installed under roadway along alignment. C900 DR18. \$500/LF. Includes excavation
C15	Utility Relocation	LS	1	450,000	450,000		Assume relocation along 1/3 of alignment.
Subtotal					\$12,136,000		
Permits							
P1	DNR Public Waters Work Permit	LS	1	1,500	1,500		SEH Project Comparisons.
P2	DNR Water Appropriation Permit	LS	1	1,350	1,350		SEH Project Comparisons.
P3	DNR Invasive Species Permit	LS	1	1,400	1,400		SEH Project Comparisons.
P4	DNR Utility Permit	LS		-	-		SEH Project Comparisons.
P5	Wetland Conservation Act Permit	LS	1	3,400	3,400		SEH Project Comparisons.
P6	U.S. Army Corps of Engineer Structures Permit	LS	1	3,400	3,400		SEH Project Comparisons.
P7	MnDOT Utility Accommodation on Highway ROW	LS	1	2,500	2,500		SEH Project Comparisons.
P8	Ramsey-Washington Metro WD Erosion Control	LS	1	2,700	2,700		SEH Project Comparisons.
P9	Ramsey County Right of Way Permit	LS	1	1,000	1,000		SEH Project Comparisons.
P10	Rice Creek Watershed District Permits	LS	1	4,500	4,500		SEH Project Comparisons.
P11	VLAWMO Wetland Replacement Plan	LS	1	1,800	1,800		SEH Project Comparisons.
P12	Construction SWPPP & NPDES Permit	LS	1	3,200	3,200		SEH Project Comparisons.
P13	BNSF Pipeline Permit	LS	2	10,000	20,000		SEH Project Comparisons.
Subtotal					\$47,000		
Tunneling							
T1	35-E (42' steel casing & Trench Support)	LS	1	950,000	950,000	medium	Trench support at each end. Casing installed by pipe ramming (200 LF at \$4000/LF + trench support at end \$150,000) Note: Carrier pipe and installation under FM line items.
T2	HWY 61 (42' steel casing & Trench Support)	LS	1	950,000	950,000	medium	Trench support at each end. Casing installed by pipe ramming (200 LF at \$4000/LF + trench support at end \$150,000) Note: Carrier pipe and installation under FM line items.
T3	Railroad Crossings (42' steel casing & Trench Support) Goose Lake Rd, Scheuneman Road	LS	1	1,100,000	1,100,000	medium	Trench support at each end. Casing installed by pipe ramming 2x(100 LF at \$4000/LF + trench support at end \$150,000) Note: Carrier pipe and installation under FM line items.
Subtotal					\$3,000,000		

Easements						
M1	Edgerton and Centerville Rd. Screenhouse	LS	1	2,500,000	2,500,000	high Temporary disruption and permanent easements.
M2	WBL Outlet Easement	LS	1	40,000	40,000	medium Temporary disruption and permanent easements.
M3	Temporary Easements	SF	10,000	10	100,000	medium Temporary disruption and permanent easements.
	Subtotal				\$2,640,000	

Total Construction Costs	\$36,868,000
Contingency @ 20%	\$7,374,000
Total Construction Costs with Contingency @ 20%	\$44,242,000

Sucker Lake Alignment

Capital Costs for Concept Level Surface Water Augmentation

6/26/2026

Code	Item	Unit	QTY	Unit Price	Total Price	Uncertainty	Basis of Cost
Sitework							
S1	Mobilization	LS	1	1,289,000	1,289,000		3% construction \$
S2	Traffic Control: Barricades and Lights	LS	1	600,000	600,000	low	
S3	Erosion Control	LF	23,200	5	116,000	low	Plugged in footage for downstream (low) side of trench or edge of easement/ROW.
S4	Tree Removal and Replacement	Tree	300	1,600	480,000	low	Estimated from Google Street view of potential trees encountered along route.
S5	Common Excavation Removal of unsuitable/excess material (includes trucking)	CY	90,600	35	3,171,000	high	Removal of unsuitable/excess material. 3.3 CY/LF - 10'D x 15'W trench width. assumed 40% useable material for backfill based on Ramsey County Geological Atlas and no soil borings. Assumes trench excavation for forcemain is included in forcemain items. Includes removal of: 4" reclaimed material (bit roads), 8" class 5 (conc roads), 3" class 5 (bit trail), 4" class 5 (conc walk)
S6	Bituminous Trail Replacement	SY	14,500	33	479,000	low	Bituminous walk section assumed based on visual site drive through - no pavement cores \$150/Ton*113lb/sy/in*3in= \$26/SY Bit+ \$3/SY Reclaim + \$35/CuYd*4in=\$4/SY Class 5.
S7	Concrete Sidewalk and Median	SY	1,100	94	104,000	low	4" Walk at intersections for sidewalk ADA Access. Includes 4" Class 5 \$10/sf walk = \$90/SY + \$4/SY Class 5
S8	Bituminous Pavement 2 -2" Lifts (4" total bit)+ 4" Reused Reclaim+4" CL5 Residential Roads	SY	11,800	32	378,000	high	Road section assumed based on visual site drive through - no pavement cores \$110/Ton*113lb/sy/in*4in= \$25/SY Bit+ \$3/SY Reclaim + \$35/CuYd*4in=\$4/SY Class 5. Includes Driveway Tie Ins
S9	Bituminous Pavement 4 -2" Lifts (8" total bit)+ 4" Reused Reclaim+8" CL5 County/Arterial Roads	SY	5,800	61	354,000	high	County/Arterial Road section assumed based on visual - no pavement cores - \$110/Ton*113lb/sy/in*8in= \$50/SY Bit+ \$3/SY Reclaim + \$35/CuYd*8in=\$8/SY Class 5. Includes Driveway Tie Ins
S10	Concrete Pavement	SY	5,800	133	772,000	low	Crossing at Hwy 96 Assumed 8" with 8" Class 5 - Includes Removal \$110/SY 8" Concrete + \$35/CuYd*8in=\$8/SY Class 5 + \$15/SY Removal
S11	Concrete Curb and Gutter B424	LF	16,900	35	592,000		Watermain behind curb. Assume all curb replaced along project length
S12	Dewatering (Wells/Well Points)	LS	1	600,000	600,000	high	Install local segment system w/Frac tank settling treatment prior to discharge to surface waters or sanitary system. If contaminated. Geotechnical investigations including well pump testing to establish potential drawdown rates necessary.
S14	Trucking to Waste (contaminated)	CY	16,800	120	2,016,000	high	Assumed quantity based on Contaminated Site Inventory. Phase 1 investigations and potential for Phase 2 needed. Geotechnical investigations including well pump testing to establish potential drawdown rates necessary.
S15	Site Grading	SY	65,000	4	260,000	low	Assumed disturbance of 25'along length of pipe. Include site demolition.
S16	CLSM Backfill	CY	2,400	150	360,000	low	Casing backfill and potential utility crossing backfill.
S17	Select Fill	CY	78,000	30	2,340,000	medium	Assumed quantity based on Ramsey Sub-geological Atlas - no borings. Used in areas where existing pipe trench will be backfilled with existing materials encountered. See Geotechnical TM for general locations and descriptions of potential for sands, gravels and glacial deposits. Assumes 60% of material is hauled away. 3.3 CY/LF - 60% x 10'D x 15'W trench
S18	Granular Pipe Foundation Material	CY	18,000	35	630,000	medium	0.75 CY/LF - 10'W x 2'D Pipe Foundation
S19	3" Crushed Rock & Fabric	CY	11,585	70	811,000	High	Assume 5% of pipe length - 1' deep x 10' wide

S20	Ground Support System	LS	1	900,000	900,000	medium	Assumed tandem trench box for open cut installation of pipes such that the profile depth when installed with the tandem trench box (6' WIDE WIDTH) and the planned 10' trench excavation will not impact adjacent utilities except for crossings.
S21	CIP Vault (Walls, Base Slab, Footings) - Access	EA	2	65,000	130,000	medium	For two maintenance access structures for potential pipeline cleaning.
S22	Precast Utility Vault - Air Release	LS	2	75,000	150,000	medium	For two air release structures.
S23	72" Manhole (10' Deep)	EA	8	16,000	128,000	low	For segment isolation valves.
S24	Top Soil	CY	8,600	75	645,000	low	Assumed 6" topsoil x 20' wide along entire pipeline length. Represents site grading area covered with six inches of topsoil.
S25	Landscape and Turf Restoration	SY	52,000	6	312,000	low	20' wide along entire pipeline length
S26	Signal and Push Button Modifications	LS	1	200,000	200,000	low	Replace: Loops and push buttons at McMenemy, Loops and Pushbuttons at Greenhaven, Loops and Push Buttons at Otter Lake Rd
Subtotal					\$17,817,000		
Pump & Forcemain							
C5	30" Forcemain and DI Fittings	LF	23,170	550	12,744,000	high	Pipe installed: south of curbline on Hwy 96, under roadway in Otter Lake Rd and Whitaker St. C900 DR18. \$500/LF. Includes excavation
C15	Utility Relocation	LS	1	750,000	750,000		Assume relocation along 1/3 of alignment.
Subtotal					\$13,494,000		
Tunneling							
T1	35-E (42' steel casing & Trench Support)	LS	1	8,100,000	8,100,000	medium	3 separate bores: 1 across southbound entrance ramp, 1 across interstate, and 1 across northbound entrance Trench support at each end. Casing installed by pipe ramming 2x(300 LF at \$4000/LF + \$150,000 trench support) + (1x400LF at \$6000/LF + \$300,000 trench support) Note: Carrier pipe and installation under FM line items.
T2	HWY 61 & RR Crossing (42' steel casing & Trench Support)	LS	1	1,350,000	1,350,000	medium	Trench support at each end. Casing installed by pipe ramming (300 LF at \$4000/LF + trench support at end \$150,000) Note: Carrier pipe and installation under FM line items.
T3	Railroad Crossing (42' steel casing & Trench Support) Centerville Rd Crossing (42' steel casing & Trench Support)	LS	1	1,500,000	1,500,000	medium	Trench support at each end. Casing installed by pipe ramming 2x(150 LF at \$4000/LF + trench support at end \$150,000) Note: Carrier pipe and installation under FM line items.
Subtotal					\$10,950,000		
Easements							
M1	Ramsey County Parks	LS	1	20,000	20,000		Temporary disruption and permanent easements.
M2	HWY 96 and Centerville Rd	SF	76,000	25	1,900,000	high	Temporary disruption and permanent easements (parking lot and green space with in roadway setback space).
M3	WBL Outlet Easement	LS	1	50,000	50,000		Temporary disruption and permanent easements.
Subtotal					\$1,970,000		

Total Construction Costs	\$44,231,000
Contingency @ 20%	\$8,847,000
Total Construction Costs with Contingency @ 20%	\$53,078,000



Project Name:	White Bear Lake Augmentation
SEH Project No:	MCES 191435
Date:	June 26, 2026
Estimator:	SEH
Description:	6000 gpm MF/UF Augmentation Treatment

DIVISION 1 - GENERAL REQUIREMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CONTRACTOR MOBILIZATION, OVERHEAD, PROFIT (15%)	LUMP SUM	1	\$ 9,151,500	\$ 9,151,500
SUBTOTAL DIVISION 0 AND 01				\$ 9,151,500
DIVISION 2 - EXISTING CONDITIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CLEARING AND GRUBBING	LUMP SUM	1	\$ 300,000	\$ 300,000
SUBTOTAL DIVISION 2				\$ 300,000
DIVISION 3 - CONCRETE	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CAST IN PLACE CONCRETE	CY	3500	\$ 1,700	\$ 5,950,000
SUBTOTAL DIVISION 3				\$ 5,950,000
DIVISION 4 - MASONRY	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PRECAST STRUCTURAL CONCRETE	LUMP SUM	1	\$ 3,600,000	\$ 3,600,000
MASONRY	LUMP SUM	1	\$ 195,000	\$ 195,000
SUBTOTAL DIVISION 4				\$ 195,000
DIVISION 5 - METALS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
METAL FABRICATIONS	LUMP SUM	1	\$ 750,000	\$ 750,000
SUBTOTAL DIVISION 5				\$ 750,000
DIVISION 7 - THERMAL & MOISTURE PROTECTION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
THERMAL & MOISTURE PROTECTION (ROOFING, ETC.)	LUMP SUM	1	\$ 1,400,000	\$ 1,400,000
SUBTOTAL DIVISION 7				\$ 1,400,000
DIVISION 8 - OPENINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
DOORS AND WINDOWS	LUMP SUM	1	\$ 350,000	\$ 350,000
SUBTOTAL DIVISION 8				\$ 350,000
DIVISION 9 - FINISHES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
EQUIPMENT/PROCESS PIPING PAINTING	LUMP SUM	1	\$ 350,000	\$ 350,000
SUBTOTAL DIVISION 9				\$ 350,000
DIVISION 10 - SPECIALTIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
SPECIALTIES	LUMP SUM	1	\$ 75,000	\$ 75,000
SUBTOTAL DIVISION 10				\$ 75,000
DIVISION 12 - FURNISHINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
LAB CASEWORK	LUMP SUM	1	\$ 60,000	\$ 60,000
SUBTOTAL DIVISION 12				\$ 60,000
DIVISION 21 - FIRE SUPPRESSION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FIRE PROTECTION SYSTEM	LUMP SUM	1	\$ 90,000	\$ 90,000
SUBTOTAL DIVISION 21				\$ 90,000
DIVISION 22 - PLUMBING	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PLUMBING	LUMP SUM	1	\$ 2,000,000	\$ 2,000,000
SUBTOTAL DIVISION 22				\$ 2,000,000
DIVISION 22 - HVAC	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
HVAC	LUMP SUM	1	\$ 1,500,000	\$ 1,500,000
SUBTOTAL DIVISION 23				\$ 1,500,000
DIVISION 26 - ELECTRICAL	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
ELECTRICAL	LUMP SUM	1	\$ 9,500,000	\$ 9,500,000
SUBTOTAL DIVISION 26				\$ 9,500,000
DIVISION 31 - EARTHWORK	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
EARTHWORK	LUMP SUM	1	\$ 950,000	\$ 950,000
SUBTOTAL DIVISION 31				\$ 950,000
DIVISION 32 - EXTERIOR IMPROVEMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
EXTERIOR IMPROVEMENTS (PAVEMENT, FENCING, LANDSCAPING, ETC)	LUMP SUM	1	\$ 380,000	\$ 380,000
SUBTOTAL DIVISION 32				\$ 380,000
DIVISION 33 - UTILITIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
UTILITIES		1	\$ 1,500,000	\$ 1,500,000
SUBTOTAL DIVISION 33				\$ 1,500,000
DIVISION 40 - PROCESS INTERCONNECTIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PROCESS PIPING AND VALVES	LUMP SUM	1	\$ 10,900,000	\$ 10,900,000
SUBTOTAL DIVISION 40				\$ 10,900,000

DIVISION 41 - MATERIALS PROCESSING & HANDLING EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
BRIDGE CRANE	UNIT	1	\$ 250,000	\$ 250,000
<i>SUBTOTAL DIVISION 41</i>				<i>\$ 250,000</i>
DIVISION 43 - PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
HIGH SERVICE PUMPS	UNIT	3	\$ 150,000	\$ 450,000
<i>SUBTOTAL DIVISION 43</i>				<i>\$ 450,000</i>
DIVISION 44 - POLLUTION & CONTROL EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
MF-UF SYSTEM SKID - 1500 GPM	EACH	5	\$ 1,500,000	\$ 7,500,000
MEMBRANE EQUIPMENT INSTALLATION	LUMP SUM	1	\$ 3,000,000	\$ 3,000,000
MEMBRANE FEED PUMPS	EACH	4	\$ 100,000	\$ 400,000
CLARIFIERS	EACH	2	\$ 6,000,000	\$ 12,000,000
CHEMICAL FEED SYSTEMS	LUMP SUM	1	\$ 1,500,000	\$ 1,500,000
<i>SUBTOTAL DIVISION 44</i>				<i>\$ 24,400,000</i>
SUB TOTAL				\$ 70,500,000

Appendix F

Permitting Memorandum



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MEMORANDUM

TO: Greg Johnson, PE

FROM: Christopher Larson, PE (Lic. MN, MI)

DATE: July 7, 2026

RE: Permitting - WBL Augmentation
SEH No. MCES 191435

1.0 Purpose and Project Description

The purpose of this memorandum is to summarize the regulatory approvals, environmental review requirements, and permits anticipated for construction and operation of a lake augmentation system that would transfer approximately **2 billion gallons of untreated raw water annually** (approximately **5.5 MGD average**) from East Vadnais Lake to White Bear Lake.

East Vadnais Lake is part of the Saint Paul Regional Water Services (SPRWS) raw water supply system and stores untreated Mississippi River water prior to treatment at the McCarrons Water Treatment Plant. The proposed project would withdraw raw water from East Vadnais Lake and discharge it into White Bear Lake during periods when augmentation is required to supplement lake levels.

Because the project transfers raw water between two Public Waters while utilizing a regional drinking water supply source, permitting extends beyond conventional construction approvals and includes environmental review, water resource management, and long-term operational authorizations.

2.0 Regulatory Overview

The project will require approvals from numerous federal, state, regional, and local agencies. The Minnesota Department of Natural Resources (DNR) is expected to serve as the lead regulatory agency because the project involves withdrawal and transfer of water between Public Waters.

The principal regulatory issues include:

- Authorization for withdrawal of raw water from the SPRWS system
- Environmental review under the Minnesota Environmental Policy Act (MEPA)
- Construction within Public Waters and wetlands
- Protection of aquatic resources
- Prevention of aquatic invasive species transfer
- Protection of the SPRWS raw water supply

The anticipated critical-path approvals are:

- Environmental review
- DNR authorization for water withdrawal

Engineers | Architects | Planners | Scientists

Short Elliott Hendrickson Inc., 3535 Vadnais Center Drive, St. Paul, MN 55110-3507

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- SPRWS operating agreement
- Public Waters permits

3.0 Required Permits and Estimated Costs

Table 1 summarizes the principal permits anticipated for the project and typical agency permit fees.

Table 1. Anticipated Permits

Agency	Permit / Approval	Typical Agency Fee*
Minnesota DNR	Water Appropriation Authorization (or amendment to existing SPRWS authorization)	\$1,500–\$3,000
Minnesota DNR	Public Waters Work Permit	\$1,000–\$2,000
Minnesota DNR	Aquatic Invasive Species Permit	\$250–\$1,000
Minnesota DNR	Utility Crossing License	Nominal
MEPA	Environmental Assessment Worksheet (EAW)	No filing fee
U.S. Army Corps of Engineers	Section 404 Permit	Typically no fee for public agencies
MPCA	NPDES Construction Stormwater Permit	\$400–\$1,000
MPCA	Section 401 Water Quality Certification (if required)	Included with federal review
Minnesota Department of Health	Plan Review	Typically no fee
Watershed Organizations	Wetland, grading, and erosion control permits	\$2,000–\$10,000
Ramsey County	Right-of-Way Permit	\$500–\$2,000
Municipalities	Utility and right-of-way permits	\$500–\$3,000
BNSF Railway	Utility Crossing Agreement	\$10,000–\$25,000

Estimated Agency Permit Fees: Approximately \$16,000 to \$47,000

Cost to Obtain Permits

Although direct agency permit fees are relatively modest, they represent only a small portion of the overall cost required to secure project approvals. The majority of permitting costs are associated with engineering and environmental services necessary to support permit applications and agency review.

For a regional inter-lake augmentation project of this scale, anticipated activities include:

- Environmental review documentation (EAW or, if required, EIS)
- Hydrologic and hydraulic modeling
- Water quality characterization and limnological analyses
- Wetland delineations and mitigation planning
- Aquatic habitat and aquatic invasive species evaluations

- Geotechnical investigations
- Preparation of permit applications and supporting technical memoranda
- Agency coordination meetings and responses to review comments
- Public meetings and stakeholder engagement
- Preparation of easement exhibits and permit drawings

Accordingly, a **planning-level permitting budget of approximately \$1.0 to \$1.2 million** is recommended for project development. This budget is expected to provide sufficient funding for environmental review, technical studies, permit application preparation, and regulatory coordination while recognizing that actual costs will depend on agency requirements and the level of environmental review.

4.0 Environmental Review and Supporting Technical Studies

The project is expected to require environmental review under MEPA. Depending upon the final project design and agency determination, review may consist of an Environmental Assessment Worksheet (EAW) or, if significant environmental effects are identified, an Environmental Impact Statement (EIS).

The principal technical issues expected to be evaluated include:

- Hydrologic impacts to East Vadnais Lake and White Bear Lake
- Water quality and nutrient loading
- Operation of the SPRWS raw water system
- Wetlands and aquatic habitat
- Aquatic invasive species
- Lake level management
- Cumulative environmental impacts

Supporting technical studies should include:

- Hydrologic and water balance modeling
- Lake response modeling
- Water quality characterization
- Limnological evaluation
- Wetland delineation
- Aquatic habitat assessment
- Hydraulic analyses
- Geotechnical investigations
- Utility investigations
- Cultural resources review

These studies will support environmental review, DNR permitting, and engineering design.

5.0 Permitting Strategy and Recommendations

Permitting activities should proceed concurrently with preliminary engineering. Early coordination with the DNR, MPCA, MDH, USACE, watershed organizations, Ramsey County, municipalities, and SPRWS is recommended to establish permit requirements and confirm the level of environmental review.

The recommended permitting sequence is:

1. Conduct agency coordination and pre-application meetings.
2. Complete preliminary engineering and supporting technical studies.
3. Initiate environmental review.
4. Submit major permit applications.
5. Acquire easements and execute the SPRWS operating agreement.
6. Complete final design incorporating permit conditions.

The anticipated critical path consists of:

- Environmental review
- DNR authorization for withdrawal of raw water
- SPRWS operating agreement
- Public Waters permits

Conclusions

The proposed East Vadnais Lake–White Bear Lake augmentation project is feasible from a permitting perspective but will require extensive coordination among multiple regulatory agencies. The most significant regulatory issues involve environmental review, authorization to withdraw raw water from the SPRWS system, and demonstrating that the project will protect regional water supply reliability and aquatic resources.

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