Kimley»Horn

TECHNICAL MEMORANDUM

To:	Greg Johnson, PE, MCES
From:	Uma Vempati, PE, Kimley-Horn Ron Leaf, PE, Kimley-Horn
CC:	Mat Cox, PE, Kimley-Horn
Date:	April 21, 2025
Subject:	White Bear Lake Comprehensive Plan: Study No. 1 Redirect Stormwater to Augment White Bear Lake (Initial Evaluation)

INTRODUCTION

The purpose of this technical memorandum is to provide an initial evaluation for redirecting stormwater to augment White Bear Lake. This work is part of Metropolitan Council's (Met Council) White Bear Lake Area Comprehensive Plan Work Group efforts 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.

Study 1 is evaluating one method of a wide range of water sustainability and conservation methods to support the efforts of the Met Council work group. The study is identified as an initial evaluation to reflect that it is a screening-level analysis, intended to understand the potential benefits as well as the challenges, issues and concerns associated with the approach. Depending on the results of this initial evaluation and the extent of identified potential benefits, challenges and issues, a more detailed analysis may be completed in a second study phase if the work group decides to proceed with further evaluation.

The scope of work for the initial evaluation for Study No. 1 includes:

1. Review and estimate the number of existing stormwater ponds within two miles of White Bear Lake.

2. Identify the potential challenges, issues, and concerns with redirecting stormwater to the lake including:
    - Pumping and/or redirecting up to 780 million gallons per year (DNR estimate) from local stormwater ponds.
    - Existing stormwater pond contaminant issues (metals, nutrients, etc.)
    - System reliability during dry weather conditions
    - Distribution challenges with piping and need for utility easements and multiple pump stations
    - Potential property value changes for properties near stormwater ponds

DATA COLLECTION AND REVIEW

The following section describes the data collection and review process for existing stormwater ponds within a 2-mile radius of White Bear Lake. The Minnesota DNR Hydrography Dataset from the Minnesota Geospatial Commons was used as a starting point for determining the existing stormwater ponds within a 2-mile radius of White Bear Lake. Upon initial review, the dataset was found to have limited detail to identify specific stormwater features (including wet ponds) with any certainty.

The project team subsequently contacted two of the cities bordering the lake and the Rice Creek Watershed District (RCWD) to request available stormwater pond data. RCWD had no storm treatment system feature data. Both cities provided access to their data. These datasets consisted of a mix of lake/ponds/wetland features. The datasets were not coded to a level of detail to specifically identify only stormwater treatment ponds. For one of the cities, storm pond features consisted mostly of rain gardens.

EXISTING STORMWATER PONDS

Using the DNR Hydrography dataset as a starting point, the lakes and wetlands were first filtered out from the selected water features based on their USGS 100K DLG Class including small named ponds, lakes and public waters wetlands within the two-mile boundary. Exhibit 1 shows the full water features dataset within the 2-mile boundary of White Bear Lake.

The full set of water features were then filtered out by removing named lakes and water features and then removing any remaining unnamed public waters. Exhibit 2 shows the remaining waters that are used in the calculations for available pond volume in the next section. As can be observed in Exhibit 2, the remaining water features appear to include some non-stormwater pond features. The most apparent of these areas is in the Dellwood area where many of the small basins are more likely natural ponds and wetlands and not true stormwater treatment ponds. We recognize that this rough sorting approach results in some number more pond features than just true stormwater ponds being tallied in the volume assessment below. However, we prefer to have a consistent screening process at this early study phase instead of removing ponds on an individual basis.

As summarized in Table 1, this analysis resulted in an estimated 188 stormwater ponds/water features within the two-mile radius of the shoreline of White Bear Lake. Further review sorting was completed by watershed boundary resulting in 108 features being located within the contributing RCWD watershed boundary to the lake and 80 features being outside the contributing watershed to the lake.

POND VOLUME CALCULATIONS

The GIS boundary of each pond feature was assumed to be the top surface area of each pond. The area at a 4-foot depth of the pond was calculated by assuming a 4:1 side slope and an average depth of 4 feet. A volume calculation using these parameters and an assumed trapezoidal prism geometry provided a volume stored in each basin. Volumes were totaled by watershed and are summarized in Table 1.

This analysis shows that an estimated total volume of 100 million gallons of stored stormwater may be available within the 2-mile radius of White Bear Lake. Table 1 below shows the estimated volume of water within the five different watershed districts in the 2-mile radius. On an annual basis, the volume available within the 108 ponds located in the contributing drainage area of Rice Creek watershed would only be available a single time as the excess runoff volume from these basins is already routed to the lake. For the 80 ponds located outside of the contributing watershed, there may be potential to pump the pond

volume multiple times annually, depending on outcome of permitting discussions and public input processes.

As a point of reference for the available volume of stormwater, the Minnesota Department of Natural Resources (DNR) recently completed a groundwater modeling analysis that produced an expected volume of pumped groundwater of 780 million gallons over 8 months would be needed to maintain a water level of White Bear Lake at or above 922.0 ft., roughly six times the amount estimated as available in ponds within 2 miles of the lake.

Table 1. Estimated Available Storm Pond Volume Within 2 Miles of White Bear Lake

Watershed	Number of Ponds	Total Pond Area (Ac)	Volume (MG)
Browns Creek	10	13.2	15
Ramsey-Washington	10	4.8	5
Rice Creek	108	62.7	67
Vadnais Lake Area	22	12.1	13
Valley Branch	38	25.5	28
Total	**188**	**118**	**128**

CHALLENGES, ISSUES AND CONCERNS

The following section describes the assessment of challenges, issues, and concerns associated with redirecting stormwater to augment White Bear Lake.

PUMPING AND ROUTING

For ponds within the contributing watershed drainage area, the most like routing approach in most cases would be to pump stored stormwater into existing storm sewer conveyances that already route to the lake. This approach would consist of a pump system that would effectively pump water ponded and stored below the outlet invert into the gravity outlet pipe. The complexity arises as each subsequent pond in the downstream system, or at least those that have a meaningful volume of stored water to pump, would also need a pump system.

For ponds within two miles but located outside the contributing watershed drainage area, the engineering challenge would be to evaluate route options, applicability, and assess if that approach would meet regulatory requirements. Options may include a direct pump and force main to the lake for one or more adjacent pond systems, a single pump and force main discharged into one of the gravity systems within the watershed to route to the lake, or some combination of these options.

In both cases, there are a number of challenges and issues that would need to be further evaluated to determine the feasibility and cost-effectiveness of these options. Some of these issues include:

- Length and routing of force main, especially for ponds located outside of the watershed drainage area. A more thorough review of where gravity could remain to reduce the extent and length of force mains while maintaining some level of benefit to lake water levels. The system could easily become a complex network of interconnected ponds.
- It seems that the preferred discharge locations would be where force main routing could connect to existing storm discharge pipes into the lake. The intent would be to avoid or reduce the extent of DNR public waters permitting process for new discharge locations.
- Existing easements in some or most public storm pond locations may allow for pump systems to be added to current pond systems.
- Additional challenges and issues with new pump stations include:
    - Availability of power sources relative to where pump systems are located.
    - The need to remotely build and maintain a complex Supervisor Control and Data Acquisition (SCADA) system to monitor and control multiple pump stations or monitor them through cellular service.
    - Identifying ownership, operation and maintenance responsibilities for pump systems and force mains.
    - Evaluating the reliability of pump system intakes, which are susceptible to clogging, especially during periods of low(er) water where vegetation, debris and solids can plug screens. This has been a challenge on a number of stormwater reuse systems installed in recent years that are reusing water from stormwater wet ponds.
    - Pumping system would need to be set above the bottom of the basin to reduce the extent of sediment and organic matter that would be agitated and pumped downstream. Leaving several feet of standing water in the bottom of the basin would be the preferred approach and using floating intakes. Even with those practices employed, the shallow remaining water could tend to cause mosquito habitat to impact the area.
- For ponds located outside current RCWD boundaries, an agreement would be needed between the adjacent watershed organizations to route some portion of water across watershed boundaries. This agreement would also likely require a complete review of impacts to downstream systems as a result of reduced stormwater discharge volume. The process to move stormwater between watersheds has been completed in the past. A more thorough review of requirements and direct discussions with adjacent watershed representatives would need to be completed in subsequent phases of analysis.
- An operation and maintenance plan and agreement would likely be required to define the operational conditions of each of the pump-to-outlet systems. Some of the issues that would need to be defined further include: what times of year the pump system could and could not be operated and what water levels on White Bear Lake would trigger the activation of the systems, what high and low water levels in the ponds would trigger on and off conditions, what level of water quality sampling and/or monitoring would be needed, and on what frequency.

STORMWATER CONTAMINANTS

Table 2 below summarizes common stormwater pollutants, concerns and mitigation strategies. The Minnesota Stormwater Manual provides a more complete summary of concentrations of pollutants found in stormwater runoff for several different land uses and provides some basic information related to mobility, toxicity, and other properties of each contaminant. The Stormwater Manual also provides some limited information on the concentrations of a small set of pollutants in stormwater ponds. Data are fairly consistent between the two datasets.

All of the pollutants found in typical stormwater runoff and, therefore also in stormwater pond detention and treatment facilities, would likely be mobilized during pumping operations from the stored water. The

primary concern with pumping water from ponds into White Bear Lake would be the possibility of increased concentrations of these parameters and pollutants when compared to the water discharged from the same storage and treatment facilities under normal operating conditions.

Table 2. Stormwater Contaminants, Concerns and Mitigation Strategies

Pollutant	Sources	Potential Concerns	Mitigation Strategies
Nutrients (N, P)	Sediment, organic debris, fertilizer, animal feces, combined sewer overflows	Algae growth, microbial growth	Anoxic zone for denitrification
Organic Matter	Organic debris (leaves, twigs, etc.)	Decomposition causing low dissolved oxygen and odors	Infiltration
Suspended Sediment	Paved surfaces, bare soil, construction, stockpiles	Clogging intake/distribution, increased maintenance	Sedimentation, Infiltration
Chlorides	De-icing and water softening chemicals	Corrosive to pipes, toxic to plants and fish (irrigation)	No cost effective treatment
Pathogens	Animal feces, insects, sewage overflows, waste management drainage	Risk to human health	Increase temperature, low soil Ph, finer clay soils
Metals	Vehicle exhaust, roofing materials, vehicle repair drainage	Toxic to plants	Infiltration
Organic Chemicals (pesticides, industrial chemicals, petroleum chemicals)	Drainage of sources of organics	Human/animal health risk, toxic to plants	Microbial degradation

DRY WEATHER CONSIDERATIONS

The primary challenges with drawing down storm pond volumes during dry periods is a combination of aesthetics and unwanted vegetation establishment. Ponds generally have available volume to be pumped and conveyed in the spring after snowmelt and spring rain fills the basins. However, dry weather periods following the draw down would tend to allow vegetation growth in and around the basin that may need more extensive maintenance than a typical stormwater basin would require and may create aesthetic issues and odor concerns (decaying organic matter at the basin bottom) for nearby property owners.

DISTRIBUTION CONSIDERATIONS

The distribution and routing concerns were addressed previously in the pumping and routing section above. The more significant issues to overcome relate to the availability of existing easements and needs for additional easements, the regulatory ability to move stored water across the watershed organization boundaries, and defining and agreeing on the ownership, operation and maintenance requirements and responsibilities of the systems.

PROPERTY VALUE CONSIDERATIONS

According to an EPA study on the Economic Benefits of Runoff Controls, urban runoff systems with standing water (i.e., wet ponds) often appear to be natural systems and can be a great benefit to adjacent property owners (and add value). Poorly maintained wet ponds or constructed wetlands are often unsightly due to excessive algal growth or garbage build-up. These conditions are considered detriments by area residents and people passing through the areas. Wet ponds and constructed wetlands can also become mosquito breeding grounds. Mosquito problems usually can be reduced or eliminated by designing the wet pond so that all portions of the basin are connected to open water to allow natural predators to control the mosquito larvae (Tourbier and Westmacott, 1992). Source: Economic Benefits Of Runoff Controls | Polluted Runoff | US EPA

A study completed in Columbia, Maryland, and a similar study in Boulder, Colorado, both indicated that properties located adjacent to stormwater ponds regularly sell at a premium in relation to neighboring properties. The Boulder study found that properties located adjacent to constructed wetlands sold with up to a 30 percent premium. Inherent in both studies was that these ponds were designed and operated with aesthetic appeal as an important feature.

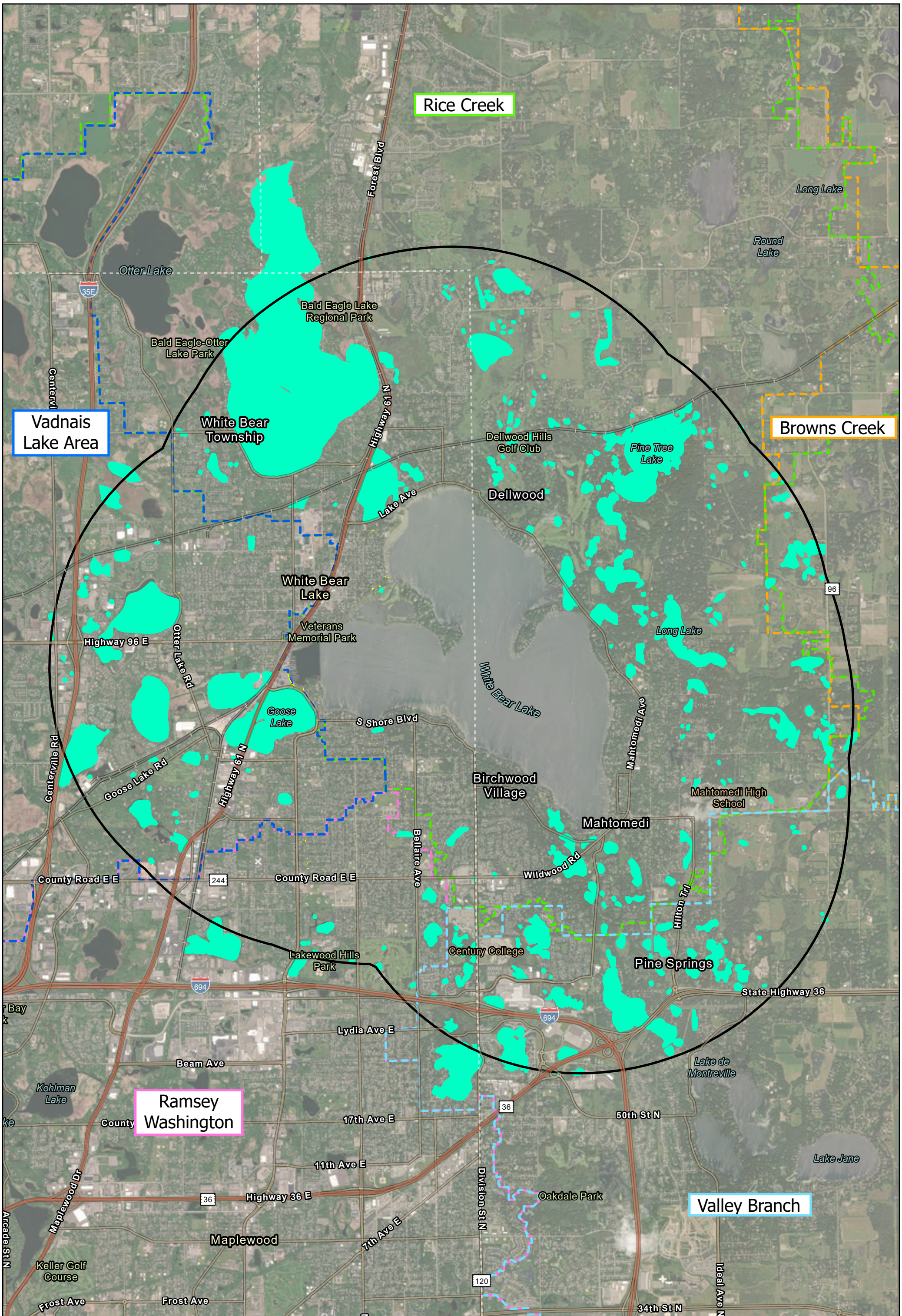
Pumping or directing stormwater away from existing ponds to White Bear Lake may have potential to decrease property values for existing developments that are located next to stormwater ponds. This would need to be further evaluated if this alternative is further studied by the White Bear Lake Area work group.

CONCLUSIONS

Based on this preliminary assessment, there may be on the order of 100 million gallons of water available annually in existing stormwater ponds and features within 2 miles of White Bear Lake that could be pumped or directed into the lake. This approach would involve a complex network of pumps systems and conveyances to route the stored water to the lake, especially from the areas currently outside the contributing watershed drainage areas. While physically possible, there are likely significant public acceptance concerns from property owners near the ponds and from lake users on the quality of water to be augmented as well as significant regulatory challenges with moving water between watersheds. There are also a number of details related to operation and maintenance that would need further analysis and definition to develop an acceptable overall operations and maintenance plan for the systems. It is recommended that the White Bear Lake Area work group consider these potential challenges and issues before deciding to further evaluate this alternative in detail.

Exhibits:

1	Divert Stormwater to Augment White Bear Lake
2	Remaining Stormwater Features


Rice Creek
Vadnais Lake Area
Browns Creek
Ramsey Washington
Valley Branch
Forest Blvd
Long Lake
Round Lake
Otter Lake
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Bald Eagle Lake Regional Park
Bald Eagle-Otter Lake Park
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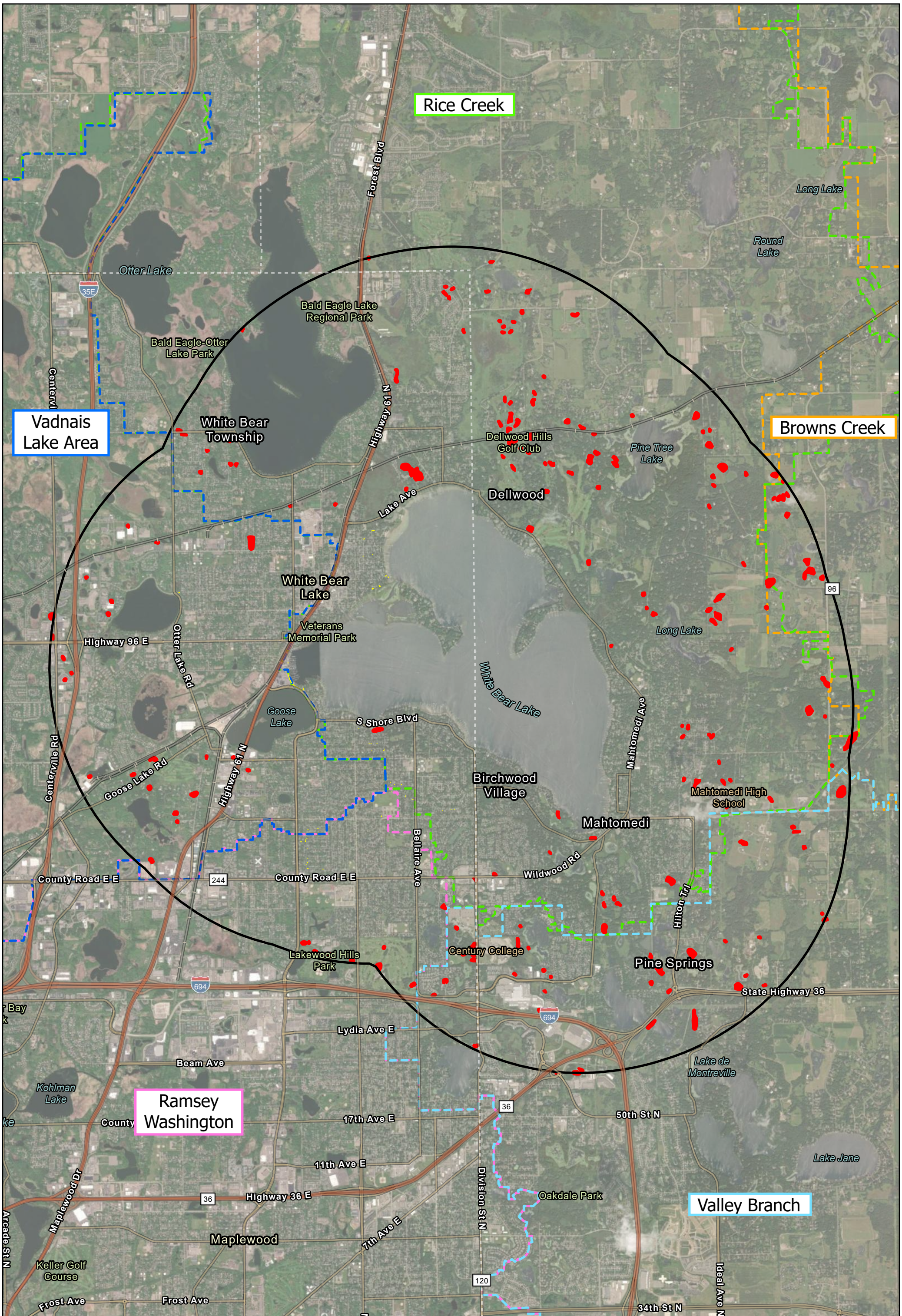
White Bear Township
Highway 61 N
Dellwood Hills Golf Club
Pine Tree Lake
Dellwood
Lake Ave
White Bear Lake
Veterans Memorial Park
Highway 96 E
Otter Lake Rd
Goose Lake
S Shore Blvd
Centerville Rd
Goose Lake Rd
Birchwood Village
Mahtomedi Ave
Mahtomedi High School
Mahtomedi
Bellaire Ave
Wildwood Rd
Hilton Trl
96
County Road E E
244
Lakewood Hills Park
Century College
Pine Springs
State Highway 36
694
Lydia Ave E
Beam Ave
Lake de Montreville
Kohlman Lake
County
17th Ave E
50th St N
11th Ave E
Division St N
Oakdale Park
36
Maplewood Dr
Maplewood
7th Ave E
Arcade St N
Keller Golf Course
Frost Ave
120
34th St N
Ideal Ave N
Lake Jane
0
0.38
0.75
1.5 Miles
N
Earthstar Geographics, Metropolitan Council, MetroGIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS
EXHIBIT 1
Study 1 - Divert Stormwater to Augment White Bear Lake
4/17/2025
Legend
2-mile Boundary
DNR Water Bodies
Raingarden
Watershed Districts
Browns Creek
Ramsey-Washington
Rice Creek
Vadnais Lake Area
Valley Branch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S Shore Blvd
Centerville Rd
Goose Lake Rd
Birchwood Village
Mahtomedi Ave
Mahtomedi
Mahtomedi High School
Wildwood Rd
Bellaire Ave
Hilton Trl
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EXHIBIT 2
Study 1 - Remaining Stormwater Features to Augment White Bear Lake
4/17/2025
Legend
2-mile Boundary
Reduced DNR Water Bodies
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Watershed Districts
Browns Creek
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