ENGINEER'S CONCEPTUAL SUMMARY REPORT
Lake Shamineau High Water Outlet Investigation
Lake Shamineau Lake Improvement District
August 7, 2020

I hereby certify that this plan, specification, or 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.

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Table of Contents
Engineer's Conceptual Summary Report
Lake Shamineau High Water Outlet Investigation
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August 7, 2020

I. INTRODUCTION

A. Project Description

The purpose of this project is to lower and maintain the water level in Lake Shamineau at an elevation that protects adjacent property owners and sustains a healthy wildlife environment. The goal of the Lake Shamineau Lake Improvement District (LSLID) is to determine a solution to the high water problem that is the most feasible, cost-effective, and timely, and will minimize ongoing maintenance and future operating costs.

The proposed project concept involves the construction of an artificial outlet for Lake Shamineau, which does not have a natural outlet. Lake Shamineau is located in a closed watershed basin and during the recent wet hydrologic cycle has been subject to rising water levels. An increase in lake level has negatively affected properties around the lake with many property owners reporting damages due to high water levels. See **Exhibit A** for a breakdown of the damages from a study that was conducted for the LSLID in 2020. A project location map is shown in **Figure 1** below.

Figure 1 - Site Location Map (Morrison County)

The proposed project concept establishes an outlet for Lake Shamineau and was initiated by the LSLID. The LSLID has been studying and pursuing an outlet for the lake over the past few years, including an outlet through Lena Lake, as outlined in the Engineer's Feasibility Report prepared by HEI in January of 2018, and a potential infiltration option covered in Widseth, Smith Nolting & Associates' Preliminary Engineering Report dated June 3, 2019. The LSLID shifted its focus away from the infiltration option because flowage easements could not be acquired. The LSLID is again pursuing an outlet involving the pumping of water from the lake into the Fish Trap Creek drainage system, this time following a different route and a different approach.

Details for the proposed improvement project, including project costs and needs, will be itemized, and displayed in this report. The report will build on HEI's original feasibility report

(2018) with updates to reflect the revised route and other project details that have changed or been refined.

1. <u>Benefits</u>

   The proposed drainage system improvements to Lake Shamineau will provide the following benefits:

   1) an artificial outlet for Lake Shamineau capable of being operated year around.

   2) reduce lake bounce duration and magnitude.

   3) significantly reduce the frequency of high lake stages exceeding the Ordinary High Water (OHW) elevation of Lake Shamineau causing damages to adjacent landowners.

   4) improve lake shore land management.

   5) reduce lake shore erosion.

   6) improve the general management efforts, operation and maintenance of the system.

   The total contributing drainage area to Lake Shamineau is approximately 11.91 square miles. The concept developed for the improvement project is included herein as **Figure 7** of this report. **Figure 2** displays the total drainage area boundary for Lake Shamineau.

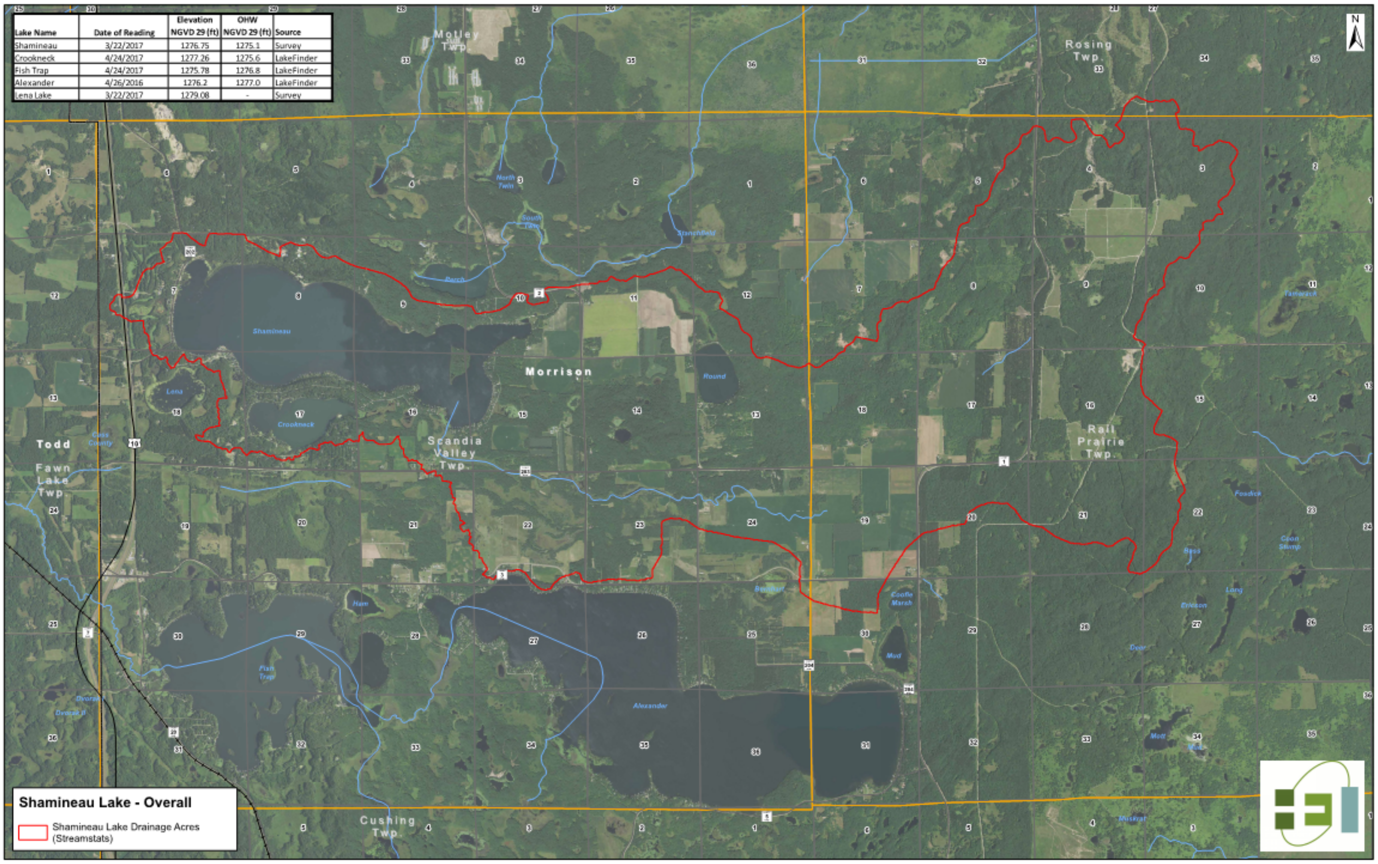


Figure 2 – Lake Shamineau Drainage Area

B. Hydrologic and Hydraulic Data

Lake Shamineau is located in a closed watershed basin, has a water surface area of 2.24 Mi², and has a contributing drainage area of 11.91 Mi². A natural outlet does not exist for Lake Shamineau, so the lake relies on groundwater movement, evaporation, and evapotranspiration to maintain or lower the water surface elevation (WSE). During the more recent wet hydrologic cycle, inflows from runoff and groundwater have exceeded the outflows and have caused Lake Shamineau's WSE to rise.

1. Hydrologic Conditions

The normal precipitation annual (1981-2010) for the Lake Shamineau drainage area is 27.24" based on **Figure 3** provided by the DNR State Climatology Office.

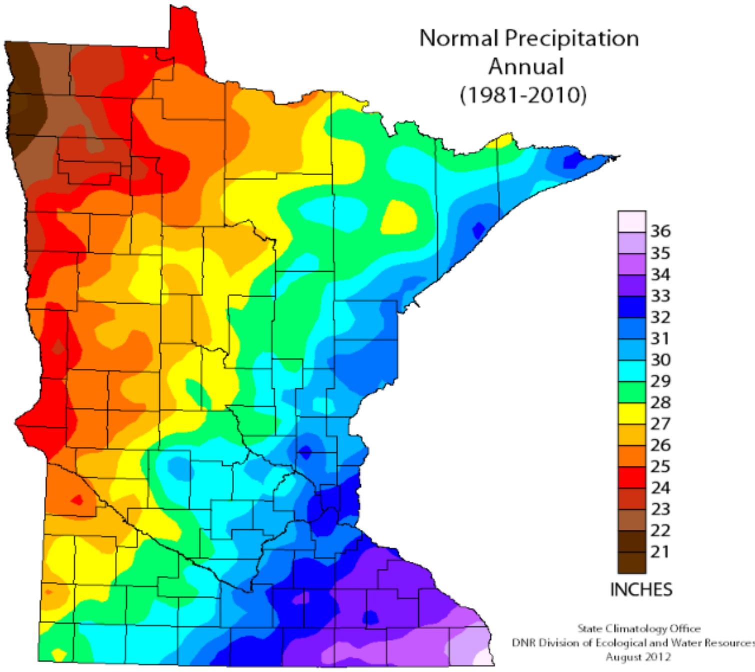
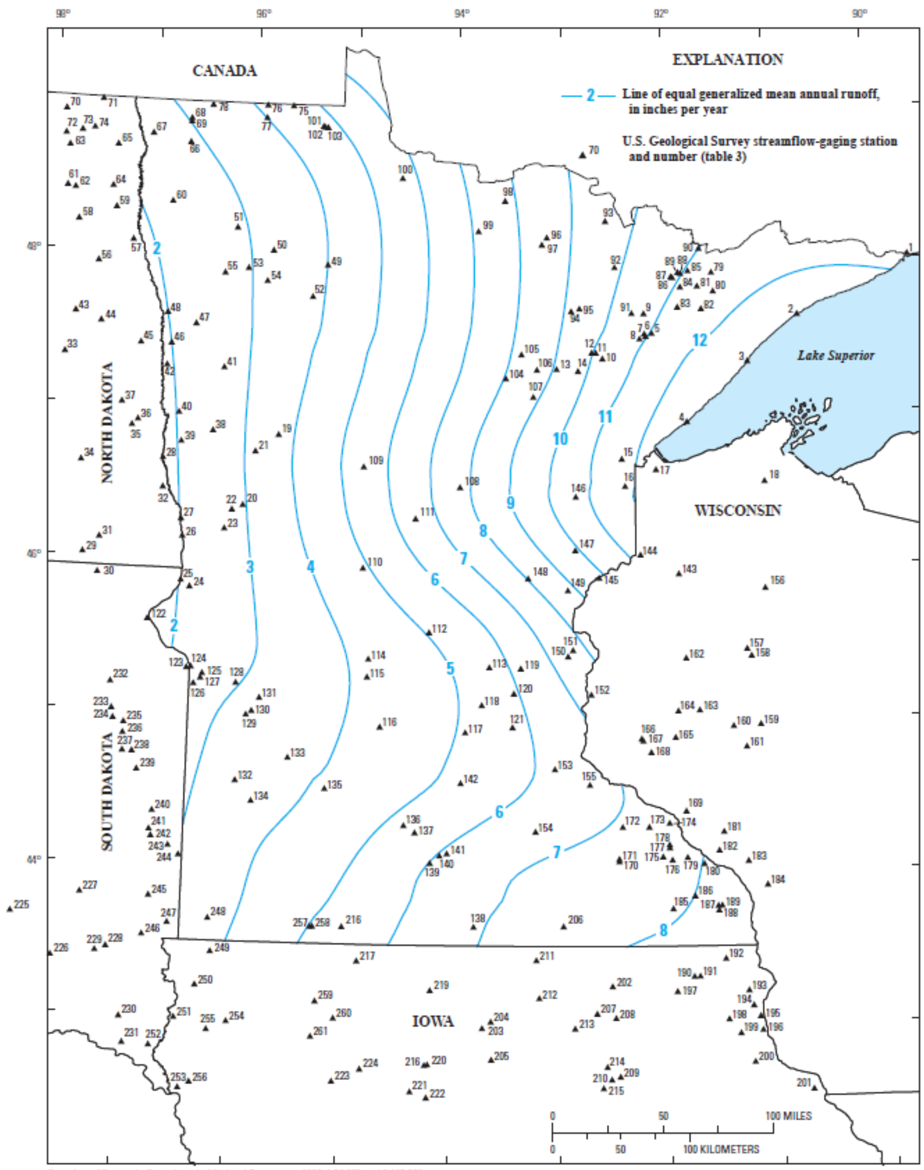


Figure 3 - Normal Precipitation Annual (1981-2010)

The generalized mean annual runoff for the Lake Shamineau drainage area is 6.01" based on **Figure 4** from the Techniques for Estimating the Magnitude and Frequency of Peak Flows on Small Streams in Minnesota Report.



Base from Minnesota Department of Natural Resources, 1993, 1:24,000 and 1:100,000
Universal Transverse Mercator projection, Zone 15
Horizontal coordinate information is referenced to the North American Datum 1983

Figure 4 - Generalized Mean Annual Runoff

Crookneck Lake is located just to the south of Lake Shamineau. A correlation between the WSE's of the two lakes has been observed through the comparison of lake elevation data. The data ranges from 1999 -2019 and shows that Crookneck Lake's WSE is generally 1.0 ft to 1.2 ft higher than Lake Shamineau throughout this period, as shown in **Figure 5** below. As of the DNR's readings on June 16,2020, Lake Shamineau was 2.78 feet above its OHW (OHW=1275.1, NGVD 29) and Crookneck Lake was 3.15 feet above its OHW (OHW=1275.6, NGVD 29). The Operating Plan required for the LSLID's outlet project will take into consideration water surface elevations on Crookneck Lake and the project must be operated in accordance with the approved Operating Plan to be in compliance with the DNR permit.

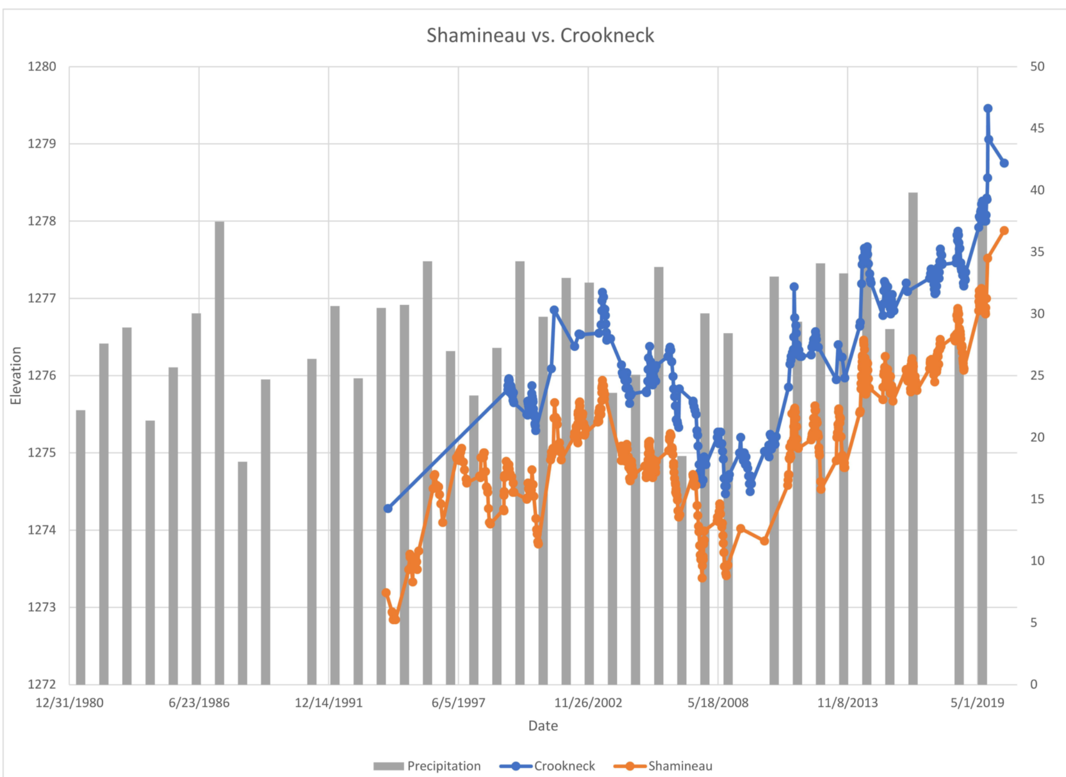


Figure 5 - Lake Elevation Comparison (Shamineau vs. Crookneck)

2. Hydraulic Performance

HEI's January 23, 2018 Engineer's Feasibility Report included a cursory analysis to develop a maximum design outflow for the proposed project to draw down and maintain Lake Shamineau. That analysis focused on reducing lake levels down to an elevation one foot below the OHW elevation over a period of 180 days. A cursory water balance was computed at that time using the generalized mean annual runoff for the contributing drainage area plus the average annual precipitation (applied to the surface area of the lake) to account for the inflows to the lake. Due to the cursory nature and conservative intent of the analysis, evaporation from the lake was not factored into the calculation. Using this approach, it was determined that an outflow of up to 12 cfs (5,400 gpm) would be required to maintain the same water surface elevation. With this outflow set as the baseline condition, the discharge rate was then increased to 20 cfs (9,000 gpm) to account for estimated groundwater inflows and a desired drawdown period of 180 days to achieve a lake elevation one foot below the OHW.

With the discharge rate being a critical component in terms of potential downstream impacts, construction, and operating costs, the LSLID requested that HEI revisit the assumptions and calculations that were part of the initial analysis. The goal with this effort was to see if there was an opportunity to refine the outflow analysis without completing an extensive effort to test, monitor and analyze the groundwater system connected to Lake Shamineau at this point in time.

Upon review of the initial water balance study, it was determined that including evaporation in the analysis would have a significant impact on the calculations. According to reference documentation prepared by the Minnesota DNR and the University of Minnesota, it can reasonably be concluded that the volume of water lost to evaporation over the surface of Lake Shamineau will usually be *greater than* the volume of water added to the lake due to precipitation falling directly onto the surface of the lake over a given year. Therefore, for the updated water balance calculations, it was assumed that evaporation and annual precipitation volumes within the lake boundary would cancel each other out, which still reflects a conservative approach as the amount of evaporation in excess of the precipitation volume is not accounted for. This refinement to the water balance study results in a baseline discharge of approximately 6 cfs being required to maintain the same water surface elevation when surface water inflows and evaporation are accounted for, but this baseline discharge rate does not reflect the potential impact of groundwater flows in and out of the lake.

Again, the 2018 study included a cursory look at potential groundwater flows, but this was done without the aid of soil testing, groundwater monitoring or modeling. The scope for the current study also did not include a detailed investigation of the groundwater component, but additional effort was put forth to review and potentially refine some of the initial assumptions and calculations that were made. Without detailed data on the sediment composition of the entire bottom of the lake, or hydraulic conductivity rates of the lake bottom or the surrounding groundwater system, it was assumed that the entire lake bottom consists of sand and gravel soil types with a relatively high rate of conductivity, allowing efficient flow of groundwater. Consistent with the overall approach, these assumptions should yield conservative results as these assumptions likely result in groundwater flowing into the lake faster than what would actually occur. Given these assumptions and simple estimates for hydraulic conductivity, it was estimated that up to 1 cfs of groundwater would flow into the lake through the bottom sediments as the pump drops the surface level of the lake. This rate would vary depending the discharge rate, the rate of the drop, and other factors, but it provides a general estimate when accounting for groundwater inflows.

The previous analysis accounted for the estimated volume of water flowing from the groundwater system into the lake as the lake was lowered. A similar assumption was made for the current analysis that an area extending about 2,600 feet beyond the shoreline of Lake Shamineau would contribute groundwater to the lake during pumping operations. It was further assumed that the amount of water available to discharge from this area would amount to 20% (the assumed effective porosity of sand and gravel sediments). Because the targeted drawdown depth of the lake surface is 2.8 feet, the volume of groundwater available for discharge to the lake during pumping from these adjacent sediments was calculated to be a volume of approximately 2,500 acre-feet.

With reference to the hydraulic conductivity assumption discussed above, a maximum groundwater inflow rate of 1 cfs would result in 724 acre-feet of water flowing into the lake from the surrounding groundwater system on an annual basis when the lake is being pumped. Eventually the volume of water in storage will be depleted as pumping continues. Selection of a faster drawdown period (i.e. 1 year) will require a larger pumping rate that will more quickly draw the lake levels down, but the lake may see some gradual bounce in water surface elevations as the groundwater surrounding the lake slowly flows into the lake. This can be controlled by periodic or sustained pumping operations if desired. Under scenarios with longer drawdown periods (i.e. 3 years), inclusion of at least 1 cfs in the total pumping rate to account for groundwater inflows over the drawdown period will account for a large portion of the volume of groundwater that will flow into the lake over that period of time and supplemental pumping beyond the initial drawdown period will be minimized.

With the above assumptions and variables accounted for, a series of calculations were conducted to provide the LSLID with a range of options for potential drawdown periods. These drawdown periods (presented in yearly increments) include potential periods of pumping operations for the given year and periods during which maintenance and operating restrictions preclude pumping. Assuming the pumps operate for nine months each year, the options analyzed resulted in minimum recommended flow rate of approximately 10 cfs for a longer drawdown period (i.e. around 3 years) and a flow rate of around 16 cfs for shorter drawdown period (i.e. approximately 1 year). The LSLID can reference this range of options and weigh the cost of various pumping options against the associated drawdown benefits and potential downstream concerns. It should be noted that these design and operating values are based on average annual rainfall, runoff, and evaporation within the drainage basin, and variations from these averages will result in decreased or increased pumping time to drawdown and maintain the lake to the target elevations. **Figure 6** below summarizes the drawdown of the Lake by pumping rate and the estimated time to reach the desired lake elevation.

Period	1 Year Drawdown	
Operation Time	6 months	9 months
Pump Rate, cfs	21	14
Pump Rate, gpm	9,500	6,500
Pump Rate, mgd	13.7	9.4
Period	2 year Drawdown	
Operation Time	6 months	9 months
Pump Rate, cfs	15	11
Pump Rate, gpm	6,900	4,800
Pump Rate, mgd	9.9	6.9
Period	3 Year Drawdown	
Operation Time	6 months	9 months
Pump Rate, cfs	13	9.3
Pump Rate, gpm	6,000	4,200
Pump Rate, mgd	8.6	6.0
Period	4 Year Drawdown	
Operation Time	6 months	9 months
Pump Rate, cfs	12	8.7
Pump Rate, gpm	5,600	3,900
Pump Rate, mgd	8.1	5.6

Figure 6 - Lake Elevation Drawdown vs. Pumping Rates.

II. RECOMMENDED SOLUTIONS TO ALLEVIATE EXISTING FLOODING AND DRAINAGE PROBLEMS

A review of the historic and recent problems being experienced with Lake Shamineau indicate that a majority of the reported and documented problems appear due to the wet hydrologic cycle and the lake not having an outlet. The problems appear to be related to an increase in WSE above those desired by the property owners around Lake Shamineau. A new outlet structure and pumping station is proposed to drawdown and maintain the lake at a lower WSE. The proposed project will provide improved economic value to the lake.

The preliminary alignment is included in **Figure 7** below shows the recommended alignment and project features.

Figure 7 - Project Features

One recommended solution is currently being considered for this project. The below description is intended to provide the information related to the proposed recommended solution.

A. West Bound Outlet

This preferred alternative proposes the construction of an outlet to the west of Lake Shamineau. The proposed project limits extend from a point near the shoreline of the SW part of Lake Shamineau and within the S 1/2 Section 7, T132N, R31W (Scandia Valley Township) and proceeds westerly along Aztec Road (340th Street/County Road 202). From there it continues south along the east side of US 10 to the south side of County Road 203 in the NE ¼ of Section 19, T132N, R31W (Scandia Valley Township) in Morrison County. From there the water exits the forcemain pipe and continues to gravity flow through an existing drainage ditch that passes through US Highway 10 before flowing west into Todd County and eventually reaching Fish Trap Creek south of Pulaski Road in Section 24, T132N, R32W (Fawn Lake Township). Fish Trap Creek becomes part of Todd County Ditch No. 41 (TCD 41) at the railroad bridge located in Section 23 and eventually reaches the Long Prairie River about six miles downstream.

The proposed project includes the installation of a new lake outlet structure and pumping station near Lake Shamineau immediately adjacent to the shoreline at the west part of the lake. From the pumping station, pressurized forcemain pipe will take water west and then south along US Highway 10 to the location of a forcemain pipe outlet structure located on the south side of County Road 203. The proposed project alignment is shown in **Figure 7** and the drainage area is shown in **Exhibit B.**

This alternative currently has the most support from the public and agencies involved in the outlet investigation. Considering the items presented, this alternative provides the best known alternative serving the needs expressed.

Upon review of the known practical alternatives and consideration of the problems expressed by the LSLID due to the high water levels on Lake Shamineau it was determined by the Engineer that the proposed alternative best serves the overall interests expressed by the Lake Shamineau LID and best serves the natural resource interests within the drainage area.

B. Filter System at Pump Station

The system will include a MNDNR approved filter to prevent the transfer of aquatic invasive species (AIS) to downstream water bodies. Lake Shamineau is currently included in the MNDNR's Infested Waters List due to the presence of Eurasian watermilfoil. At the present time Eurasian watermilfoil has not been found in Fish Trap Creek or Fish Trap Lake, which feeds the creek. The MNDNR has advised the LSLID that AIS filtration will not be required if AIS species in Lake Shamineau are also present in the receiving waters downstream, so it is possible that the filtration system currently included in the concept plan may not be required.

The concept plan for the outlet currently includes a mechanical filtration system identical to others that have recently been approved by the MNDNR for similar lake outlet projects (e.g. Little McDonald Lake and Devils Lake). Natural filtration utilizing native soils and lake bottom substrates were considered and can be further vetted during future design phases, but the mechanical filters provide a known solution for budgeting and system sizing considerations needed at the conceptual stage. The mechanical filtration options also offer some advantages in term of the required construction footprint, constructability, and long-term viability. An additional advantage with the mechanical filters is that they can potentially be repurposed if filtration is no longer required in the future. This will likely not be possible with natural filtration options (i.e. angle wells, Ranney wells, etc.).

C. Dewatering

Construction of the project will involve challenges associated with working in the lake and handling the high groundwater conditions in the area. Installation of the inlet pipe and associated inlet screen will involve construction out into the lake with construction activities taking place as far as 100 feet from the shoreline. Further investigation as to the limits of the inlet will need to be conducted as the design progresses. The means and methods for constructing these features will generally be left to the contractor hired to build the project, but a significant effort to confine and dewater the construction area will likely be required, particularly if the construction timeframe precludes them from working through ice in the winter months. The intake system and associated estimated costs for this concept plan were developed with reference to recently completed outlet projects in the area. While these projects provide a good example of a system that functions and is constructible, potential cost saving measures will be further investigated during the design phase. Further considerations may be made by the LSLID in terms of the construction time period and whether potential cost savings realized by allowing contractors to work through the ice may be worth the associated delays that could result by accommodating this schedule.

D. Bypass

A preliminary analysis of the surface water system downstream of the proposed outlet has shown that the impacts to the existing ditches and natural waterways will be minimal and the project can be operated in a fashion that will not exceed the maximum water levels and flow rates that have been specified by the landowners and agencies that the LSLID is in the process of coordinating with. Further coordination with these stakeholders, and others along the route, will continue as the project is developed and downstream concerns can be addressed through design modifications and conditions included in the operating plan that will be required as a condition to the permit issued by the MNDNR. One key consideration for downstream impacts involves a water control structure on private property between the outlet and Fish Trap Creek. This structure was enhanced with public funding and is currently subject to an agreement that limits modification of the structure. Given the potential timeline associated with the development, approval and construction of the outlet project, it is likely that this agreement will expire before construction begins and modifications can be made with fewer obstacles to overcome. The landowner still must consent to any modification of the structure and the LSLID has discussed this with the current landowners. The concept plan and the associated preliminary cost estimates include considerations for a bypass system that will address the landowner's concerns.

III. COMPATIBILITY WITH EXISTING PLANS AND ENVIRONMENTAL INTERESTS

A. <u>Permit Issues</u>

1. <u>Local</u>

Scandia Valley Township, Morrison County, and Todd County will be given an opportunity to review the plans of the proposed improvements. They may also require permits. The LSLID is aware of other requirements of state law applicable to the proposed project; including, but not limited to, Minnesota Statutes 103E.015 - Considerations before Drainage Work is Done; 103E.501 to 103E.555

- Construction of Drainage Project; and 103E.601 to 103E.661 - Funding, Collection and Payment of Drainage System Costs. The LSLID is working with Todd County, the ditch authority responsible for TCD (Todd County Ditch) 41, and these requirements will be satisfied by the LSLID prior to construction.

2. State

A Stormwater Pollution Prevention Plan (SWPPP) will need to be developed and a permit will be required from the Minnesota Pollution Control Agency (MPCA), since construction activities will disturb more than one acre of land. The Lake Shamineau LID will coordinate the development of the SWPPP. The Department of Natural Resources and Minnesota Board of Water and Soil Resources will review the Preliminary Engineer's Report and provide an Advisory Report to the Drainage Authority. A MNDNR Waters Permit will be required. Local TEP involvement will likely be required regarding the MN WCA interests. Approval from these noted agencies will likely be required for the Drainage Improvement Project.

3. Federal

The Corps of Engineers (USACE) Section 404 permit may be required for this improvement project, particularly if fill will be placed in wetland areas. There are no known federally listed endangered or threatened species that will be impacted by the project. However, the USACE permit will likely identify any unknown endangered or threatened species requirements. No other federal permits are anticipated.

No documented archaeological or historical sites eligible for the national register exist within the project area. However, if necessary, further studies may be conducted to verify that there are no unreported sites that will be affected by the project. The formal permit process will be initiated during the design phase of the project.

B. Conformance with Existing Water Management Plans

The proposed project is consistent with the goals and objectives of the Morrison County Comprehensive Local Water Management Plan.

IV. EVALUATION OF SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACT OF THE PROJECT

A. Economic Analysis of Private and Public Benefits and Costs of the Project

1. Lake Shamineau

The private benefits to be expected from the proposed improvement project accrue to the landowners contributing surface water runoff to Lake Shamineau. Lakeshore owners will be provided with flood damage reduction, improved shoreline management benefits, and increased property values. The public and recreational users will be provided with benefits tied to improved access and water quality. Two preliminary cost estimates were developed to provide the LSLID with possible costs associated with two different outflows from the pump station.

2. Cost Estimate Development

An Engineer's Preliminary Opinion of Probable Cost was developed for a pumping rate of 10 cfs. The total estimated cost is $3,785,000, with an estimated $435,000 in preconstruction costs and $3,350,000 in construction phase costs. The construction phase costs include a contingency amount of $394,500, which is approximately15% of the estimated construction cost. The contingency is included to account for uncertainties involved with conceptual nature of the estimate and to account for unknowns that may arise. A cost estimate was also developed for a 16 cfs system and it was approximately $400,000 higher than the 10 cfs system. A detailed breakdown of the project costs is included as **Exhibit C** to this report.

In addition to project costs and financial interests, there are other non-quantifiable factors to be considered. These include impacts to the environment, social costs, and cultural costs. These adverse impacts will also include inconveniences caused by the construction operations. Permanent and temporary right-of-way will be obtained along the improvement section of US 10. Permanent right-of-way will be required for the installation of the new Lake Shamineau outlet structures and drainage pipe. Temporary right-of-way is required for the placement of topsoil and required construction activities. The land required for temporary right-of-way will likely be lost for one or two growing seasons. After completion of the project construction, the permanent right-of-way can generally be used for agricultural uses or other purposes as was prior to the project, with noted conditions. Temporary right-of-way will revert to original pre-project land uses with no conditions.

Construction activities will likely cause minor traffic inconveniences due to traffic rerouting caused by construction activities.

There are no known or reported cultural or archaeological sites along the alignment of the proposed improvement project. Therefore, there are no anticipated negative impacts to known cultural or archaeological resources.

There is no known State or Federal Threatened or Endangered Species (wildlife) reported within the project area, therefore, no anticipated impacts exist. There does not appear to be permanent impacts to wetlands or protected waters as part of the project that would require mitigation.

B. Environmental Review

The land use within the US 10 drainage area is in the form of farmsteads, roads, lakes, wetlands, natural coulees, drainage ditches, and woodlands. It is anticipated that the primary use of the impacted land will continue with little change due to development or growth.

C. Effects of the Project on Water Quality

The occurrence of an extreme runoff condition during project construction should not cause an increased sediment load into downstream channels or Lake Shamineau. Minimal changes to land use and cover type will result from the project. When the project is completed, the sediment load to receiving waterbodies from the project will not increase significantly from pre-project conditions. Erosion reduction techniques will also be incorporated into the project design, including a riprap outfall structure. Erosion problems caused by high lake levels and overland flows will be reduced.

Lake Shamineau is on the 2020 Impaired Waters List for Hgf (mercury in the fish tissue) Impairments. There is a current TMDL for Lake Shamineau related to this impairment. However, the construction and operation of the improvement project is not expected to have a positive or negative effect on the identified water quality impairment.

In addition, there does not appear to be a practical project feature that could be added as part of the project to address the mercury impairment.

V. POTENTIAL PROJECT SCHEDULE

Figure 8 below illustrates a potential project schedule going forward.

Task	Description	Timeline *(Estimated*[1])*
Outreach and System Capacity Analysis	• Determine most feasible, cost-effective and timely alternative. • Field survey and data review • Outreach with agencies, landowners, and public • Submit report to DNR for grant funding • LSLID Annual Meeting presentation	September 2020 In-Process
Planning, Design, and Project Development	• Detailed topographic and legal surveys • Geotechnical evaluation • Final alignment determination • Develop plan and detail sheets • Operation and maintenance plans • Wetland delineation	*December 2020*
Permitting	• EAW and Phase 1 Archeological • Permits	*January 2021*
Final Plans and Specifications (90% and 100% Stages)	• Design and develop final construction details • Prepare • Intake, outfall structure, forcemain, and lift station design • Prepare final specifications and contract documents • Right of Way	*May 2021*
Bidding Process	• Coordination of bid process • Bidder questions • Prebid meeting, preconstruction meeting • Award contract	*May 2021*
Construction Management, Staking, and Observation	• Construction staking • Geotechnical testing services • Construction observation • Process contractor pay applications • Walk throughs/inspections • System start up and initial operation	*June 2021 to November 2021*
Final Completion and Closeout	• Punchlist Items • Turf Establishment	*Spring 2022*

***The estimated timeline indicates tasks completion timeframes that will depend on the timing of receipt of funds, permitting, right of way easements, weather, and other unforeseeable conditions.**

Figure 8 - Project Schedule

VI. EXHIBITS

EXHIBIT A

Lake Shamineau Damages Breakdown from 2020 Lake Shamineau High-Water Impact Survey

How much would you estimate that you have spent on any of the following expenses due to high water level?
(Number of responses out of 134 submitted surveys)

		Shoreline repair	Landscaping	Aeration	Dock repair	House or Cabin repair	Septic repair	Well repair
$0-$99		11	22	24	31	31	37	38
$100-$499		18	17	4	17	2	2	1
$500-$1,999		23	21	12	15	7	2	4
$2,000-$4,999		31	18	25	5	6	4	1
$5,000-$9,999		21	8	7	3	3	2	1
$10,000-$14,999		6	0	0	0	8	1	2
$15,000+		7	2	0	1	5	1	1
$100,000+		0	0	0	0	2	0	0
		117	88	72	72	64	49	48

	Average Cost	Shoreline repair	Landscaping	Aeration	Dock repair	House or Cabin repair	Septic repair	Well repair	Total
$0-$99	$ 50	$ 550	$ 1,100	$ 1,200	$ 1,550	$ 1,550	$ 1,850	$ 1,900	$ 9,700
$100-$499	$ 250	$ 4,500	$ 4,250	$ 1,000	$ 4,250	$ 500	$ 500	$ 250	$ 15,250
$500-$1,999	$ 1,250	$ 28,750	$ 26,250	$ 15,000	$ 18,750	$ 8,750	$ 2,500	$ 5,000	$ 105,000
$2,000-$4,999	$ 3,500	$ 108,500	$ 63,000	$ 87,500	$ 17,500	$ 21,000	$ 14,000	$ 3,500	$ 315,000
$5,000-$9,999	$ 7,500	$ 157,500	$ 60,000	$ 52,500	$ 22,500	$ 22,500	$ 15,000	$ 7,500	$ 337,500
$10,000-$14,999	$ 12,500	$ 75,000	$ -	$ -	$ -	$ 100,000	$ 12,500	$ 25,000	$ 212,500
$15,000+	$ 15,000	$ 105,000	$ 30,000	$ -	$ 15,000	$ 75,000	$ 15,000	$ 15,000	$ 255,000
$100,000+	$ 100,000	$ -	$ -	$ -	$ -	$ 200,000	$ -	$ -	$ 200,000
		$ 479,800	**$ 184,600**	**$ 157,200**	**$ 79,550**	**$ 429,300**	**$ 61,350**	**$ 58,150**	**$ 1,449,950**

EXHIBIT B

Shamineau Lake - Overall
Shamineau and Croockneck Lake Drainage Area
Non Contributing Areas
Lake Drainage Divide
N
Sylvan Twp.
Cass
May Twp.
Motley Twp.
Villard Twp.
Rosing Twp.
Todd
Morrison
Fawn Lake Twp.
Scandia Valley Twp.
Rail Prairie Twp.
Turtle Creek Twp.
Cushing Twp.
Placid
East Nelson
North Twin
South Twin
Stanchfield
Perch
Shamineau
Round
Lena
Crookneck
Cass County
Tamarack
Fosdick
Ham
Fish Trap
Alexander
Bernhart
Mud
Rogers
Bass
Long
Lina
Little Cranberry
Cranberry

EXHIBIT C

ENGINEER'S PRELIMINARY OPINION OF PROBABLE COST LAKE SHAMINEAU OUTLET PROJECT - PUMP TO COUNTY ROAD 203 DITCH (PUMPING RATE: 10 CFS)					
Item No.	Item Name	Unit	Quantity	Unit Price	Amount
1	Mobilization	LS	1	$ 150,000.00	$ 150,000
2	Traffic Control	LS	1	$ 20,000.00	$ 20,000
3	Erosion Control	LS	1	$ 30,000.00	$ 30,000
4	Site Restoration	LS	1	$ 20,000.00	$ 20,000
5	Road Repairs (One lane of Aztec Road)	SY	3,400	$ 60.00	$ 204,000
6	CR 203 Repairs at Forcemain Crossing	SY	180	$ 60.00	$ 10,800
7	24" - PVC Pipe (Gravity Intake)	LF	500	$ 100.00	$ 50,000
8	16" - C900 PVC Pipe (Forcemain)	LF	7,000	$ 75.00	$ 525,000
9	Mechanical Aquatic Invasive Species Filter	EA	1	$ 375,000.00	$ 375,000
10	12" PVC Backflow Pipe	LF	500	$ 70.00	$ 35,000
11	Inlet Structure with Fish Screen	LS	1	$ 45,000.00	$ 45,000
12	Dewatering	LS	1	$ 500,000.00	$ 500,000
13	Pump Station	LS	1	$ 500,000.00	$ 500,000
14	Air/Vacuum Valve and Manhole	EA	1	$ 15,000.00	$ 15,000
15	Outlet Structure w/ Flap Gate	LS	1	$ 60,000.00	$ 60,000
16	Downstream Property Mitigation (erosion prevention, fill, etc)	LS	1	$ 10,000.00	$ 10,000
17	Bypass at Existing Dam (Zetah property)	LS	1	$ 60,000.00	$ 60,000
18	Downstream Crossings Improvements	LS	1	$ 25,000.00	$ 25,000
				Construction Subtotal	**$ 2,630,000**
Pre-Construction Costs:					
	Project Development				$ 35,000
	Preliminary Engineering (including EAW, permitting, ROW assistance)				$ 200,000
	Final Design & Bidding				$ 90,000
	Soils Investigation				$ 15,000
	Administrative, Legal, Misc. (permit fees, county ditch petition process)				$ 70,000
	Contingencies				$ 25,000
				Pre-Construction Subtotal	**$ 435,000**
Construction Phase Costs:					
	Construction				$ 2,630,000
	Contingencies				$ 394,500
	Land Rights (easements, outlet fee)				$ 150,000
	Construction Engineering, Survey, Material Testing				$ 110,000
	Utility Relocations				$ 30,000
	Electrical Service				$ 20,000
	Administrative, Legal & Misc.				$ 15,500
				Construction Phase Subtotal	**$ 3,350,000**
	OPINION OF TOTAL PROBABLE PROJECT COSTS				**$ 3,785,000**