HOUSTON engineering, inc.

Sturgeon Lake High Water Outlet Investigation

Windemere Township, Pine County, MN
Public Meeting
July 27, 2023

Presentation Outline

- Introduction
- Background
- Project Goals
- System Sizing
- Project Description
- Estimated Project Costs
- Funding
- Permitting
- Next Steps
- Schedule
- Comments & Questions

Introduction

- Mike Opat, PE – Project Manager—Houston Engineering, Inc. (HEI)
  - 20+ years of experience
  - Managed numerous high water outlet projects
  - Role: Assist project stakeholders with the development of a permanent outlet that will mitigate the ongoing high-water problems around the lake.
- The HEI team has successfully completed many similar high water outlet projects in the region.
- We design projects, we don't build them.

About HEI

Established in 1968

250+ employees

HEI Services

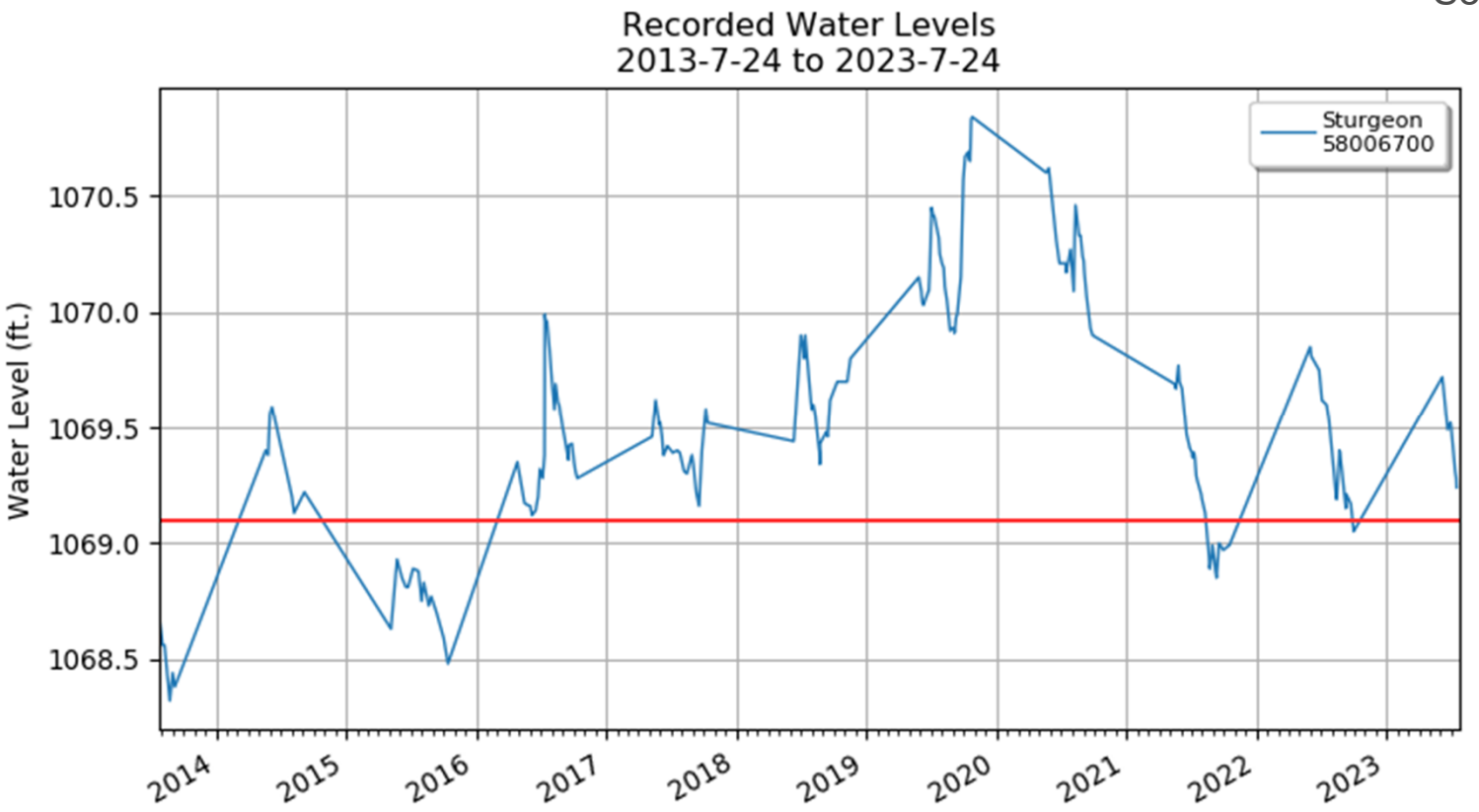
- Water resources
- Municipal
- Surveying
- Transportation
- GIS/web apps
- Land/site development
- Planning/Landscape Architecture
- Waste management

Houston Engineering Lake Outlet Experience

- **Devils Lake Outlet Project-** Ottertail County, near Perham, MN
- **Swede Grove Lake Outlet Project-** Near Hawley, MN
- **Sand Lake Outlet Project-** Ottertail County, MN
- **LaBelle & Boyer Lakes Outlet Project-** Near Lake Park, MN
- **Nelson Lake Outlet Project-** Ottertail County, MN
- **Little McDonald Lake Outlet Project-** Ottertail County, near Perham, MN
- **Lake Shamineau Outlet Project-** Morrison County, near Motley, MN
- **High Island Lake Outlet-** Sibley County, MN
- **Nammacher's Lake Outlet Repair-** Pine County, MN
- **Blackduck Lake Dam Modifications-** Beltrami County, MN
- **Ravine Lake Outlet Structure-** Cottage Grove, MN
- Many others….

Background

Source: MnDNR



OHW= 1069.1 (NGVD 29)

Last Reading: 1069.24 (NGVD 29) on 7/16/2023

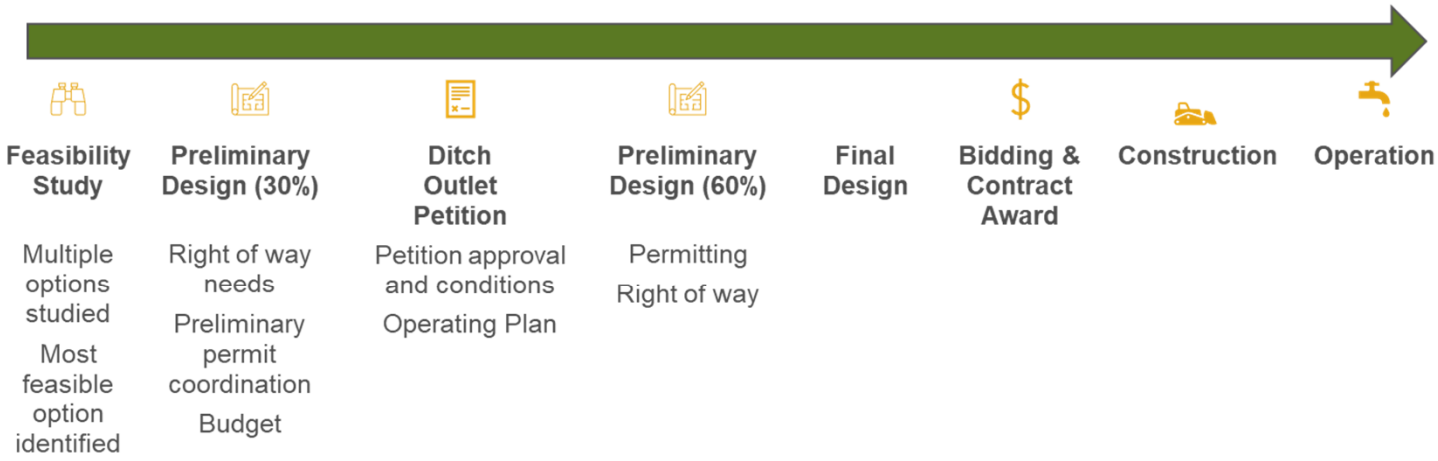
Highest Recorded: 1070.84 (NGVD 29) on 10/25/2019

Background

- Previous Studies:
  - 1950's
    - Hanshu (engineer) looked at an outlet through Rush, Little Rush and Passenger Lakes to the Willow River
  - 1973
    - Pine County Honshu engineer reviewed the watershed and held meetings with stakeholders
  - 1974
    - USDA study
      - Three options:
        - 1) Open drainage ditch to the Willow River
        - 2) Buried pipe to the Willow River with outlet control structure
        - 3) A combination of 1 & 2
  - 2019
    - Sturgeon Lake High-Water Committee Report
      - Background, damage assessment, and recommendation for an engineering feasibility to be completed

Background

- Typical Approach & Timeline



Background

- 2022 Feasibility Study:
  - Scope of Work was limited due to budget restrictions
  - Agreed upon Scope of Work included:
    - Cursory review of estimated flows in and out of Sturgeon Lake
    - Estimation of the magnitude of the outlet capacity needed to address the problem
      - Scenarios covering a range of drawdown periods
    - Preliminary analysis of multiple outlet routes and concepts
      - Gravity outlets
      - Pumped outlets
      - AIS filtration options
    - Overview of permitting and regulatory requirements
    - Preliminary analysis of right of way needs
    - Estimated preliminary project costs
    - Potential challenges, pros/cons

Background

- 2022 Feasibility Study:
  - Scope of Work was limited due to budget restrictions
  - Feasibility study is preliminary in nature, intended to provide stakeholders with initial information to help guide discussions and future actions.
  - Study is largely based on data and information largely available in the public domain
    - Aerial imagery, LIDAR topography, wetland maps, soil information, DNR information
    - Limited amount of on-site data (field surveys)
  - HEI utilized prior experience on similar projects, and sound engineering judgement
  - Assumed that all necessary permits, regulatory approvals, right of way can be acquired
  - DNR input was limited due to staff turnover and vacancies

Project Goals

- The goal of the preliminary Sturgeon Lake feasibility study was to identify potential solutions that address the following:
  - Provide an artificial outlet for Sturgeon Lake that will allow stakeholders to manage water levels at the OWHL
  - Improve lake shore land management
  - Reduce lake shore erosion
  - Reduce damages to public and private property around the lake
  - Protect fish, wildlife and vegetative habitats

Unique Issues

- Aquatic Invasive Species (AIS)
- Beaver dams
- Lakeland Road crossing
- DNR staff turnover and vacancies

Aquatic Invasive Species (AIS)

- Sturgeon Lake is currently included on the DNR's infested waters list due to the presence of Eurasian watermilfoil (EWM)
  - DNR requires a special permit to transport, appropriate, or divert water from infested waters
  - DNR will not allow infested water to be conveyed out of Sturgeon Lake unless it is treated for filtered to remove AIS
    - This will require some form of natural or mechanical filtration
      - Filtration has been permitted by the DNR and successfully implemented on other lakes
    - At the time of the 2022 report, EWM had not been found in Dago Lake or the Willow River
  - Brings added risk and cost to connecting to other lakes
    - May require additional filters at each lake

Aquatic Invasive Species (AIS)

- AIS Filtration:
  - Mechanical Filtration:
    - Typically involve screens (0.5mm mesh required for EWM, per DNR)
      - Has been permitted by DNR and successfully implemented on other projects in Minnesota
    - Typically require pumps to move water through screens
      - Added capital and operating costs
      - Smaller footprint than natural filtration
  - Natural Filtration:
    - Subsurface drains in lakebeds
    - Artificial sand filters
    - Can potentially be constructed without pumps
    - Require larger footprint than pump/mechanical filter systems
    - Operation can be impacted by weather conditions and debris

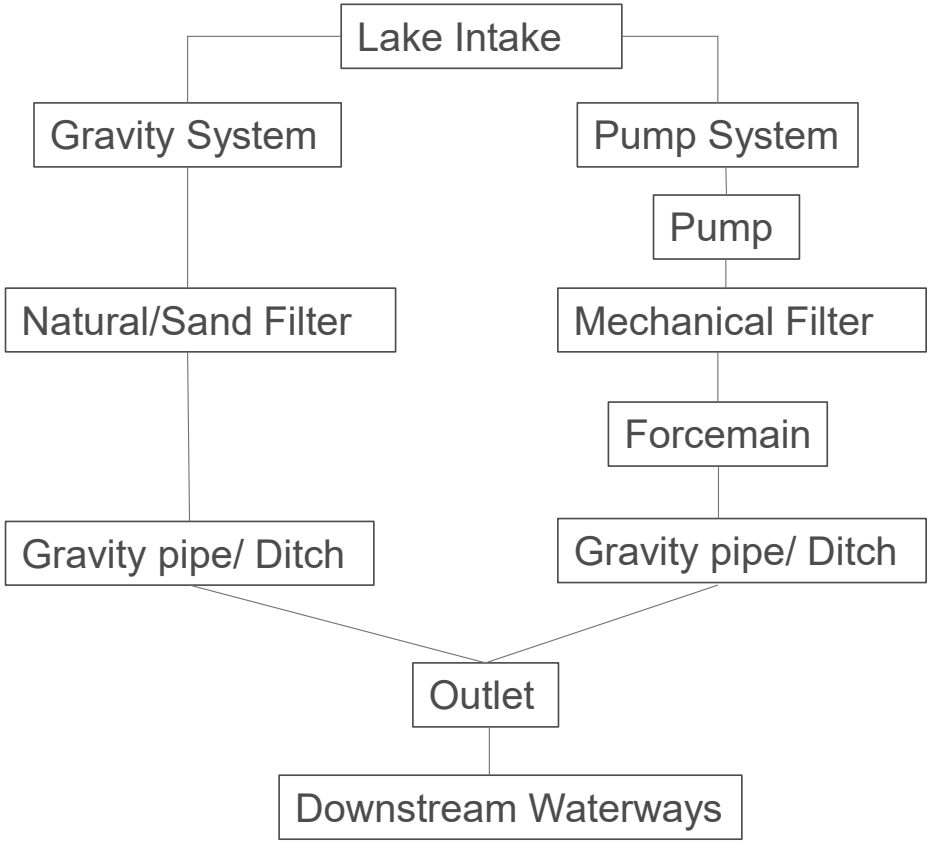
System Sizing Analysis

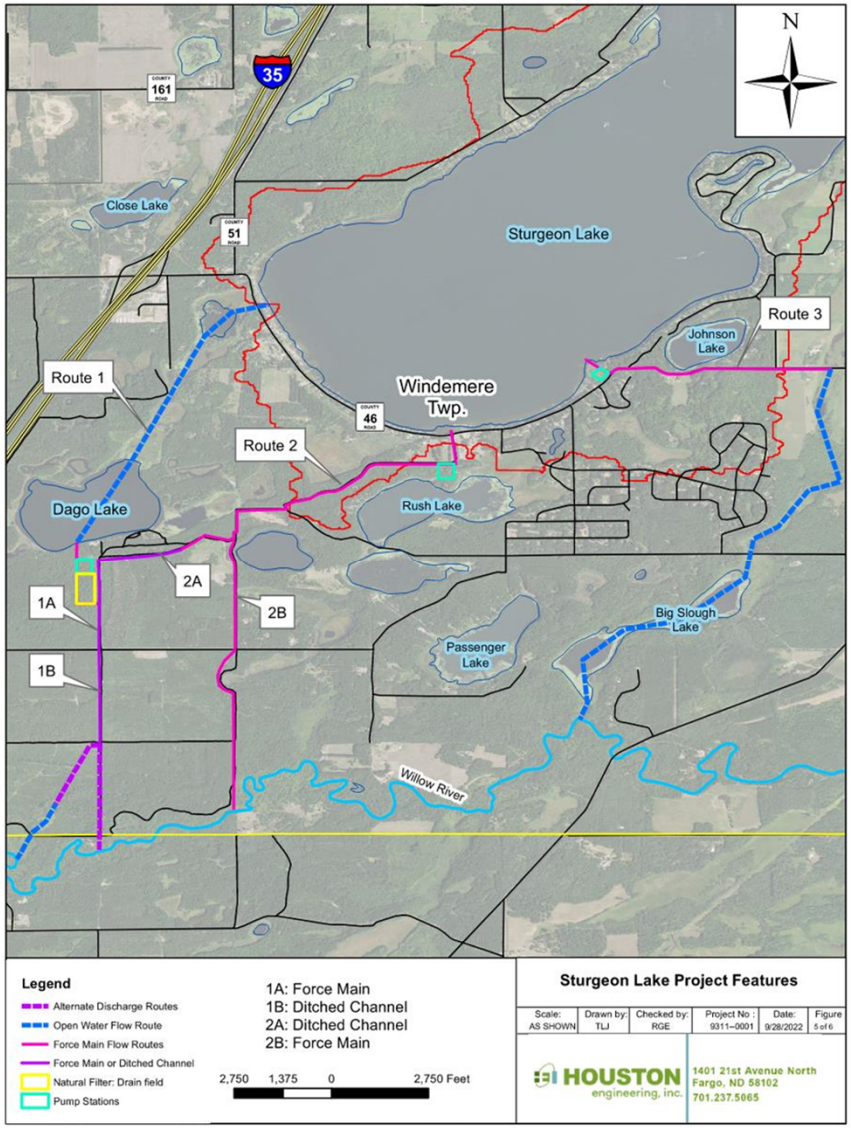
- Hydrologic Conditions
  - Precipitation→ Runoff
  - Evaporation
  - Groundwater
- Water Balance
  - Based on average conditions, a discharge rate of **4.1 cfs** (1,840 gallons per minute) over 12 month period is required to maintain water surface elevation
    - This does not account for excess water above OWH
- System Sizing
  - Assumed drawdown from 1 foot above OHW (1070.1) to OHW (1069.1)
  - Assumed that outlet will need to be shut off periodically due to downstream conditions, maintenance
    - Analyzed 6-month and 9-month operating scenarios
  - Analyzed drawdown periods of 1, 2 and 3 years

System Sizing Analysis

Lake Elevation Drawdown						
	1-Year Operation		2-Year Operation		3-Year Operation	
	6 months/yr	9 months/yr	6 months/yr	9 months/yr	6 months/yr	9 months/yr
Days of Operation	180	270	360	540	540	810
Runoff Reduction	6.3 cfs	4.2 cfs	6.3 cfs	4.2 cfs	6.3 cfs	4.2 cfs
Ground Water	1 cfs	1 cfs	0.75 cfs	0.75 cfs	0.5 cfs	0.5 cfs
1-foot level reduction	4.8 cfs	3.2 cfs	2.4 cfs	1.6 cfs	1.6 cfs	1.1 cfs
Total Pump Rate	12.1 cfs	8.4 cfs	9.5 cfs	6.6 cfs	8.4 cfs	5.8 cfs

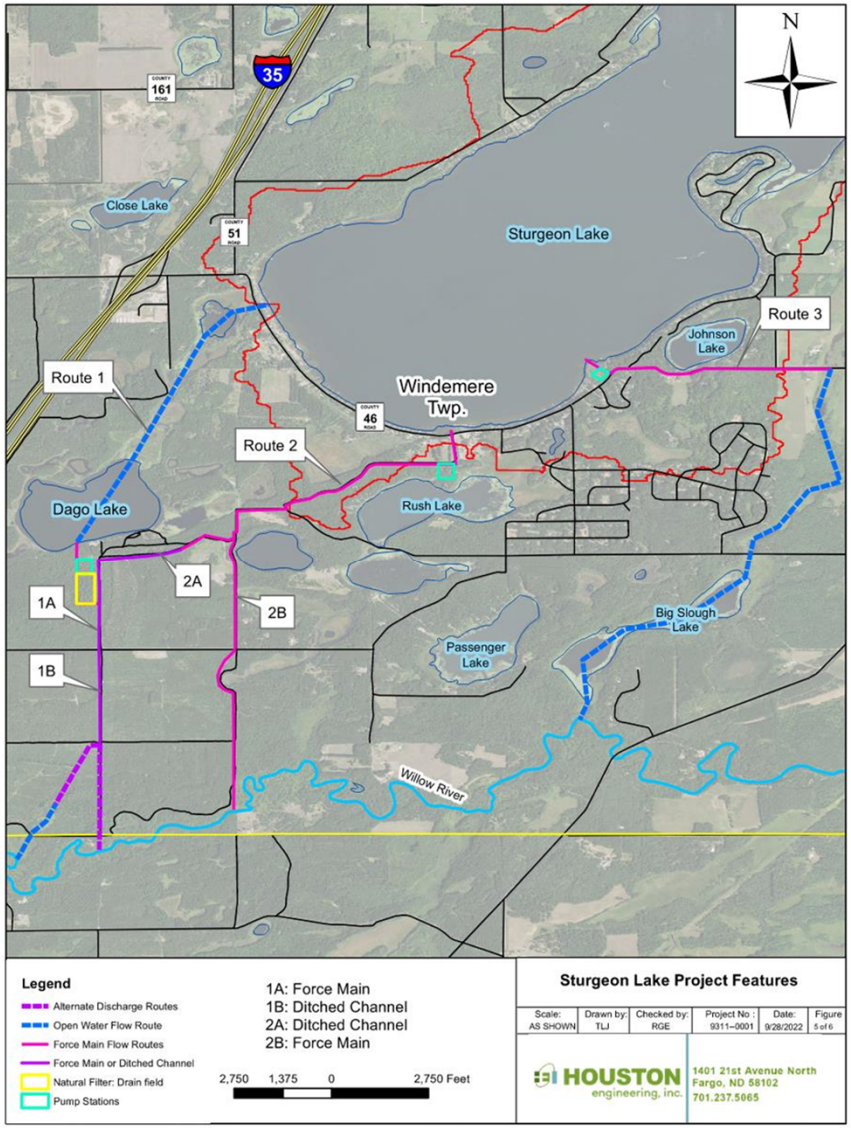
Project Features & Potential Routes





Project Features & Potential Routes

- Route 1A: Dago Lake to Willow River
  - Pump, filter, forcemain pipe to river
- Route 1B: Dago Lake to Willow River
  - Pump, mechanical filter, open ditch to river
- Route 2A: Sturgeon Lake to Willow River
  - Pump, mechanical filter, forcemain pipe & open ditch to river
- Route 2B: Sturgeon Lake to Willow River
  - Pump, mechanical filter, forcemain pipe to river
- Route 3: Sturgeon Lake to Willow River tributary
  - Pump, mechanical filter, forcemain pipe to tributary



Estimated Project Costs

- The estimated construction costs are based on recent bids submitted by contractors on similar projects, and information from contractors and suppliers
- Actual costs could vary from estimates as market conditions, weather conditions, construction schedules, and other factors all impact the bids submitted by contractors
- Preliminary level design → Preliminary level cost estimate
  - Order of magnitude/relative cost
  - Focus on higher cost items (pumps, filters, etc)
  - Estimates will be refined as level of design increases

- A more accurate estimate of the actual cost of the LSLID project will not be known until bids are opened

Estimated Project Costs

- Estimated project cost includes:
  - Construction
  - Engineering
  - Permitting
  - Utilities
  - Legal
  - Administration
  - Financing
  - Contingency

- Right-of-way & financing costs have not been included

Estimated Project Costs

- Contingencies:
  - Estimates include a contingency in the budget to account for unanticipated costs that might come up, and other considerations
    - Particularly important at feasibility stage given conceptual level involved
  - Any funds not spent would translate to a lower final project cost
  - Including a contingency is good practice and mitigates delays and financial challenges
  - Estimates in this feasibility include contingency amount of **+/- 15%** of estimated construction cost

Estimated Project Costs

- Costs were not estimated for every drawdown scenario
  - Estimates are based on 2-year drawdown with 9 months annual operation (6.6 cfs)
- Selection of a different discharge rate could result in higher or lower costs
  - Costs associated with the drawdown scenarios presented are estimated to range from +/-10% lower to +/- 30-40% higher
- Costs reflect 2022 dollars
- Estimates are most appropriate for comparing the alternatives to each other

Estimated Project Costs

	Route 1A	Route 1B	Route 2A	Route 2B	Route 3
Cost Estimate	$3,800,000	$3,050,000	$5,550,000	$4,850,000	$3,7504,000

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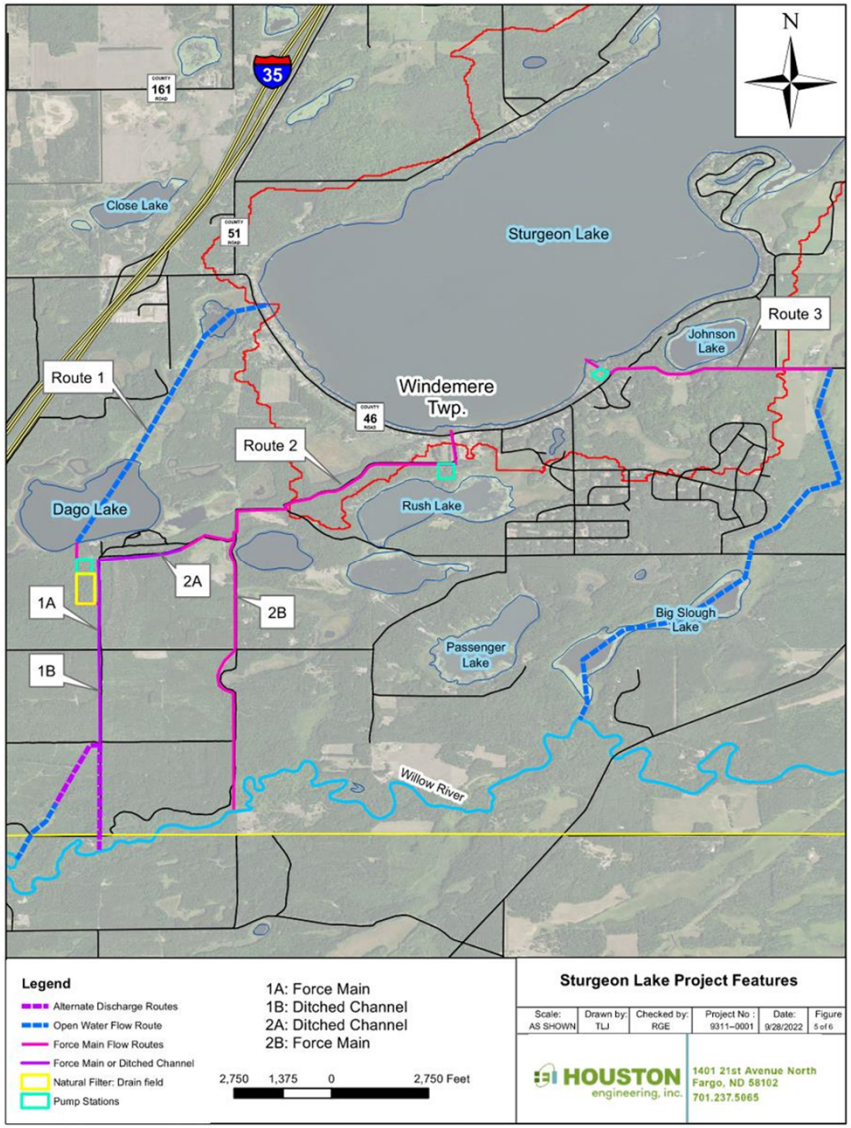

Funding

- Grants:
  - Some similar projects have received grants from the Minnesota Legislature/MnDNR
    - Typically requires 50% local match & not all costs are eligible for reimbursement
- Financing:
  - Interim financing to cover expenses during construction
  - Long-term financing (i.e., 5-20 years) secured through public bond sales
    - Bonds require at least 20% of the project to be funded through special assessments, per Minnesota Statutes.
- Special Assessments:
  - The project could be funded through MN Statute Chapter 429 special assessments
    - Project sponsor must have statutory authority
- General Funds
- Other sources?

Permitting

- **Federal:**
  - US Army Corps of Engineers- CWA Section 404
- **State:**
  - MnDOT: Req'd if project footprint impacts MnDOT right of way
  - DNR: Public Waters Permit required for work below OHW
    - Operating Plan
    - AIS
  - BWSR: Wetlands
- **Local**
  - County:
    - Zoning- New buildings, shoreline modifications
    - Highway Department- use of road right of way, including road crossings
    - SWCD- Wetlands
  - EAW: Usually discretionary
  - Townships: use of road right of way, including road crossings; local zoning
  - County Drainage Authority: If public drainage is involved

Operating Plan

- The Operating Plan is a formal document that governs the operation of the project
  - Addresses downstream concerns and/or impacts
  - Addresses when project will be operated
    - Mandatory open/closed
    - Discretionary open/closed
- The Operating Plan will likely be a condition attached to the DNR permit for the project

Right-of-Way/Land Rights

- Permanent Right-of Way
  - Fee title and/or easements
  - Public road right-of-way→ Permits issued by road authority
    - Some areas may still require easements from underlying landowners
- Temporary Right-of-Way
  - Temporary easements (1-2 years) to provide for additional space for construction

- Acquiring land rights can often be the most challenging part of developing a project
- Landowners were not contacted as part of the feasibility study

Next Steps

Potential next steps….

- Request formal DNR review and comment
- Develop stakeholder coordination plan
- Conduct public and agency outreach
- Identify preferred alternative
- Proceed with preliminary design

Potential Schedule

Task Order	Task	Description	Number of Months Required *(Estimated*[1])*
1	Feasibility Study and Outreach	• Determine most feasible, cost-effective and timely alternative. • Outreach with agencies, landowners, and public • Submit report to DNR for grant funding • Township meeting presentation	Feasibility study complete, Outreach 1-3 months
2	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	*4-6 Months after Task 1*
3	Permitting	• EAW and Phase 1 Archeological • Permits	*3-6 Months concurrent/ after Task 2*
4	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	*2 Months after Task 3*
5	Bidding Process	• Coordination of bid process • Bidder questions • Prebid meeting, preconstruction meeting • Award contract	*1 Month after Task 4*
6	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	*8-16 Months after Task 5*
7	Final Completion and closeout	• Punchlist Items • Turf Establishment	*1 Month after Task 6*

Questions & Comments