CITY OF NORTHERN



# CITY OF NORTHERN WASTEWATER PROJECT OVERVIEW

v.3 FALL

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# Introduction

## Overview of the Project

The City of Northern is embarking on a critical infrastructure project to install a sanitary sewer system along roadways on the north and northeast sides of Lake Bemidji. This project is designed to address long-standing regional planning goals and environmental concerns related to aging septic systems on small, densely packed parcels around Lake Bemidji. Unlike traditional septic systems, which typically have a lifespan of 20-30 years, the proposed municipal sewer system offers a significantly longer life expectancy of 50-100 years, providing a more sustainable and long-term solution for wastewater management in the area. The sewer line, approximately 5.8 miles in length, will run from the northwest Lake Bemidji boat access, along County State Aid Highway (CSAH) 20, through Lake Bemidji State Park, and extend to the City's southern border along the east side of the lake along Lavinia and Waville roads.

## Purpose of the Guide

This guide aims to provide Northern residents with comprehensive information about the wastewater system project. It covers the project's purpose, benefits, and what residents can expect throughout the process. Our goal is to ensure that residents are well-informed and prepared for the changes and improvements that this project will bring. Northern Township became the City of Northern on November

23, 2026, and the City now carries the project forward. This edition reflects that change and the updated design, cost, and schedule presented at the October 26, 2026 public hearing.

**Project Goals and Objectives**

The primary objectives of the City of Northern Wastewater System Project are:

- **Environmental Protection:** Safeguarding Lake Bemidji's water quality by replacing aging septic systems with a modern sanitary sewer system. This initiative will help protect the entire Mississippi River ecosystem.
- **Infrastructure Improvement:** Coordinating with Beltrami County's reconstruction plans for CSAH 20 to include storm sewers, curbs, gutters, and a multi-use trail, saving more than $1 million in project costs, versus completing the sewer project through this corridor as a standalone project where road replacement on this segment would be a City cost.
- **Economic Development:** Supporting the economic growth of the Bemidji region by maintaining the lake as a hub for recreational activities and a key natural resource.
- **Long-Term Planning:** Realizing a 50+ year regional planning goal to protect Lake Bemidji with municipal wastewater collection and treatment. This includes critical upgrades to aging septic systems at Lake Bemidji State Park, the Minnesota

Department of Natural Resources (DNR) Regional Headquarters, and Ruttger's Birchmont Lodge. The project aims to connect these facilities to a modern and reliable sanitary sewer system, ensuring the protection of Lake Bemidji's water quality and supporting the environmental health of the entire Mississippi River watershed.

**Key Highlights**

- **Protection of Lake Bemidji:** The project will provide a long-term solution by connecting key facilities to a reliable sanitary sewer system, helping to prevent future degradation of Lake Bemidji water quality.
- **Community and Economic Benefits:** By securing funding and coordinating with county construction plans, the City of Northern aims to address vital infrastructure needs, safeguard natural resources, and support the region's economic and recreational interests.
- **Strategic Coordination:** Aligning the sewer project with Beltrami County's concurrent reconstruction efforts will lead to significant cost savings and efficiency.

"Unlike traditional septic systems, which typically have a lifespan of 20-30 years, the proposed municipal sewer system offers a significantly longer life expectancy of 50-100 years, providing a more sustainable and long-term solution for wastewater management in the area."

# Project Background

**History and Need for the Project**

Since the 1960s, there have been ongoing discussions about providing municipal services around Lake Bemidji. The need for a comprehensive wastewater system has become increasingly critical due to three main factors:

1. Known system failures
2. Numerous aging septic systems
3. Small, densely packed parcels with poor soils and a high water table that limit effective nutrient filtration and hinder wastewater management
4. Lack of monitoring/knowledge of existing systems for properties where no sale or recent construction has taken place

Most of the lakefront property on Lake Bemidji was divided into lots over a century ago. As a result, many of these lots are significantly smaller than current standards, making it difficult to accommodate modern septic systems. These aging and inadequate systems pose substantial environmental and health risks, threatening not only the water quality of Lake Bemidji but also the broader Mississippi River ecosystem.

In early 2022, Northern Township and the City of Bemidji were moving towards an agreement to connect the township to the city's

wastewater treatment facility. However, the City of Bemidji rescinded their offer in May of 2023, necessitating an alternate solution. Having already secured significant funding and with the ongoing need for a comprehensive wastewater system, the township had to find a new approach. Unable to find available land to house an open-air pond system, Northern Township chose to construct a mechanical plant because it has a much smaller footprint. A site was identified on the northeast side of Lake Bemidji, and Beltrami County proved a willing partner in moving the project forward. In 2026, in response to review comments from the Minnesota Pollution Control Agency (MPCA), the Township revised both the treatment process and the plant location. The plant will now use the Sequox biological nutrient removal process by Aeromod, and the treatment site has moved roughly 1,000 feet west, to the west side of the Paul Bunyan Trail. The System Overview section describes the revised design.

**Accelerated Interest and Coordination**

The County Road 20 project accelerated the timeline for this wastewater system project, as the opportunity to coordinate with Beltrami County's concurrent reconstruction plans presented a significant cost-saving advantage. By aligning the sewer project with planned upgrades to storm sewers, curbs, gutters, and a multi-use trail along CSAH 20, the City can save more than $1 million in project costs.

**Partnerships and Support**

This project has seen overwhelming support from regional stakeholders. The Township secured written support from various entities to bolster their bonding requests, including:

- Beltrami County
- City of Bemidji
- Friends of Lake Bemidji
- Mississippi Headwaters Board
- Minnesota Association of Townships
- Greater Bemidji
- Bemidji Chamber of Commerce

**Securing Funding**

In December 2022, Northern Township secured a $5 million grant from the 2023 Congressionally Directed Spending (CDS) funds. This substantial financial support was followed by an additional $1 million grant in February 2024 from the next year's CDS funds. A third CDS grant of $750,000 from FY2026 funds covers the added planning, design, and land costs of the revised treatment plant. The engineer's estimate for Phase 1, updated for the October 26, 2026 public hearing, is approximately $14.6 million ($14,587,987.50), including collection, treatment, engineering, and contingency. The three federal grants total $6.75 million, and $1.2 million in road funds has been pledged to the project. Together they cover about 54.5 percent of Phase 1 costs. Phase 2 is estimated at about $8 million, for a total of about $22 million for both phases. The City is applying for a state Point Source

Implementation Grant (PSIG) and other funding to reduce assessments.

**Project Overview**

The proposed sewer line, approximately 5.8 miles in length, will run from the Northwoods Access on Lake Bemidji through Lake Bemidji State Park and extend to the City's southern border along the east side of the lake. This project aims to connect over 400 residential properties and several key facilities, including Lake Bemidji State Park, the Minnesota Department of Natural Resources (DNR) Regional Headquarters, and Ruttger's Birchmont Lodge, to a reliable, municipal

style mechanical wastewater treatment system.

## Primary Goals of the System

- **Protecting Lake Bemidji:** The project will protect 100% of the City of Northern's shoreline and 41% of Lake Bemidji's total shoreline, addressing environmental concerns and supporting the health of the Mississippi River watershed.
- **Community Benefits:** Upgrading major end-of-life systems will support the community's long-term health and economic vitality, ensuring the area remains a desirable location for residents and visitors. A municipal system will also allow local residents to remove septic systems from their lots freeing up usable space on properties that are already limited on buildable space.
- **Future Growth:** The new wastewater system is designed to accommodate future growth and development within the City of Northern. It has the potential to serve additional areas of the city, including the future business corridor identified in the comprehensive plan, supporting economic development and comm



Photo: Lake Bemidji State Park

# System Overview

**Description of the Wastewater System**

The City of Northern Wastewater System is being designed to provide a comprehensive and modern solution for wastewater management in the Lake Bemidji area. The system's core component is a municipal mechanical treatment plant that uses an activated sludge process, chosen for its reliability, its ability to remove nutrients, and its fit with the City's needs.

**Engineering and Design**

Freeberg & Grund, our engineering partners, have planned the system layout and components with a focus on sustainability and long-term operational efficiency. The original design used a Membrane Bioreactor (MBR) package plant. After review comments from the MPCA in 2026, the design was revised to the Sequox process by Aeromod, an extended aeration activated sludge process with biological nutrient removal. Treatment site plans were at the preliminary (80 percent) stage as of October 2026.

**Key Infrastructure and Components**

- Treatment Plant: The plant is designed to treat the domestic-strength wastewater generated in the service area, with a design flow of 130,000 gallons per day (gpd) for Phases 1 and 2. The

Sequox process tank holds the anaerobic selector, anoxic zone, multiple aeration stages, final clarifiers, and aerobic digester/biosolids storage within shared concrete walls. The preliminary tank layout is 36 feet by 54 feet. Building space is needed only for screening, blowers, electrical equipment, and controls, which will be housed in an activated sludge building and a process control building. A backup power generator is included.

- Effluent Dispersal: Treated effluent will be pumped to three rapid infiltration basins (RIBs) on the site, where it soaks into the ground. A dosing pump station distributes flow to the basins. This replaces the subsurface drain field in the original design.
- Winter Storage: When cold weather keeps the basins from operating, treated effluent will be held in an effluent storage pond with a capacity of about 8.6 million gallons and released to the basins when conditions allow. The pond includes an aeration system for use when it is more than six feet deep.
- Groundwater Monitoring: Monitoring wells around the site track groundwater levels and quality. Five wells are already in place, and two more are proposed in the current plans.
- Location: The treatment plant and dispersal area will be on the northeast side of Lake Bemidji, on the west side of the Paul Bunyan Trail, roughly 1,000 feet west of the originally proposed site. A new access road will connect the site to Whitetail Road NE. The revised location requires the City to purchase about 26 acres for the site at a cost of $225,000, roughly half the 52 acres and $500,000 the earlier plan required. Acquisition is scheduled for early 2027.




*Revised treatment plant and dispersal area locations (Freeberg & Grund, Lift Area 5 map, 2026)*

- Discharge Alternatives: Two primary discharge alternatives were considered:

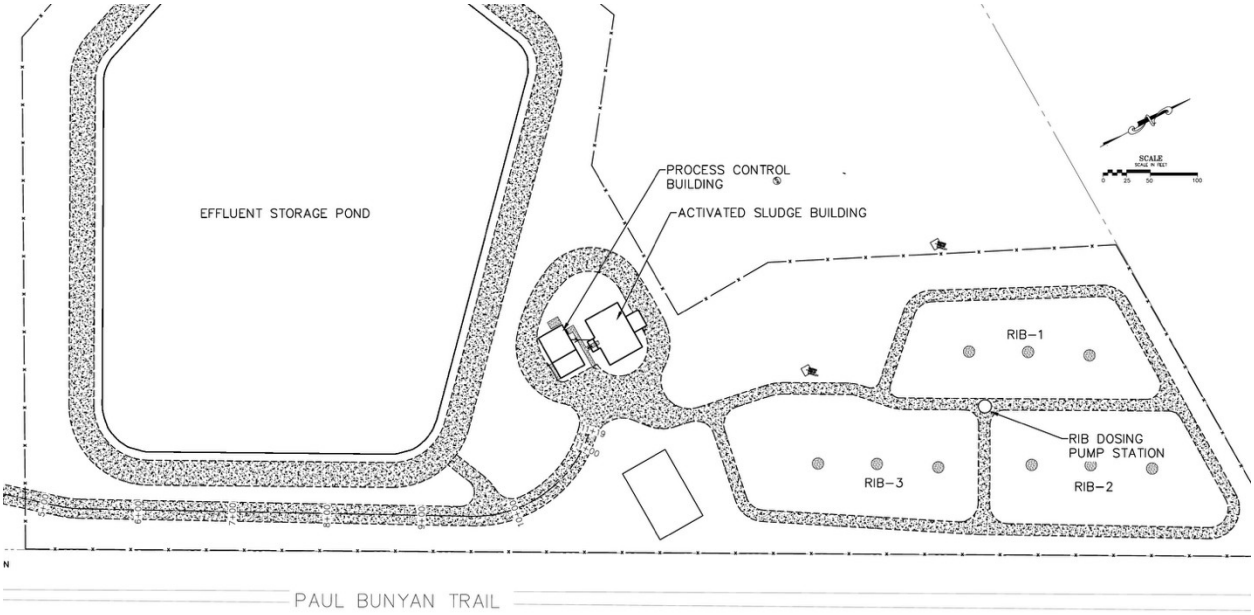
    1. Discharge to the Mississippi River downstream from the City of Bemidji's wastewater discharge. (not selected)
    2. Discharge to the ground on the treatment site, now through rapid infiltration basins. (chosen alternative)

## System Features and Benefits

- High-Efficiency Treatment: The Sequox process removes BOD and ammonia, and its anaerobic and anoxic zones and internal recycle streams provide biological phosphorus removal and denitrification. The plant is designed to keep total nitrogen in the effluent at or below 10 mg/L.
- Compact Design: Common-wall construction keeps the treatment structure small and gives the lowest capital cost of the mechanical plant options considered.
- Simplified Operation: All recycle and wasting streams are handled inside the tank and controlled by the Aeromod system, and operations and controls come as part of the Sequox package. Operating and maintenance costs are similar to other activated sludge plants.
- Scalability: The system is designed to accommodate future growth, ensuring it can handle increased wastewater volumes as the city develops.
- Cost-Effective: By coordinating with Beltrami County's reconstruction plans for CSAH 20, the City can achieve significant cost savings.

## Site Map and Layout

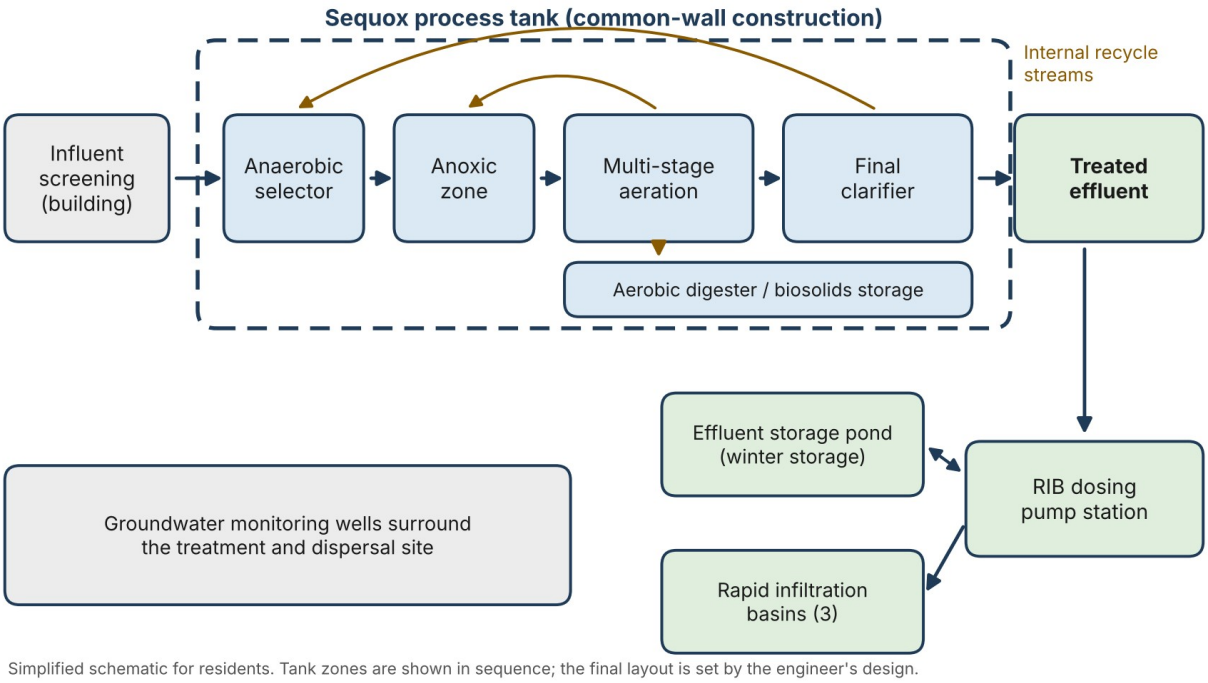
### Treatment Area Overview




*Treatment site layout from the preliminary civil plans (Freeberg & Grund, October 2026). RIB = rapid infiltration basin.*

## Process Flow Diagram

The following diagram illustrates the process flow of the Sequox treatment plant:




Simplified schematic for residents. Tank zones are shown in sequence; the final layout is set by the engineer's design.

1. Influent Screening: Wastewater from the collection system enters the plant building and is screened to remove large solids.
2. Anaerobic Selector: Screened wastewater mixes with returned activated sludge without oxygen, which prepares the bacteria for biological phosphorus removal.
3. Anoxic Zone: Nitrate-rich water recycled from the aeration zones is mixed in without added oxygen, and bacteria convert the nitrate to nitrogen gas (denitrification).
4. Aeration: Multiple aerated stages break down organic material (BOD), convert ammonia, and allow the bacteria to take up phosphorus.

5. Final Clarification: Solids settle out. The clear treated water leaves the tank, and settled sludge is recycled through the process or sent to the aerobic digester.
6. Dispersal: Treated effluent is pumped to the rapid infiltration basins, or held in the effluent storage pond during winter, and soaks into the ground on site.

**Environmental and Regulatory Compliance**

The design and operation of the wastewater system comply with all relevant environmental regulations. The EPA (Environmental Protection Agency) has provided the Federal grant funding for the project. The involvement of Federal Funds (as opposed to solely local funds) brings with it the requirements to meet all Federal environmental review elements with both State and Federal agencies. The MPCA (Minnesota Pollution Control Agency) will provide the permit and requirements for design, discharge limits/standards and ongoing monitoring of the treatment process throughout the life of the system. Regular monitoring and maintenance ensure ongoing compliance and optimal performance. Monitoring wells at the treatment site will be sampled as the MPCA permit requires.

# Benefits to Residents

> "Many lots in the Bemidji area are decades old, small, and many people continue to convert cabins to year-round use. Space is limited for private systems and backup systems. A municipal system can free up space and help reduce septic failures that can negatively impact Lake Bemidji's water quality."
>
> - Nathan Kestner, Regional DNR Ecological & Water Resources Manager

**Increased Property Value and Usable Land**

Connecting to the City of Northern Wastewater System offers significant benefits, including increased property value and more usable land. Beyond reclaiming space previously occupied by septic systems, one of the most substantial advantages is the reduction in lakeside setback requirements for structures—from 100 feet to 50 feet from the ordinary high-water mark. This change allows for more flexible building options on many properties. Here are hypothetical examples of representative properties that closely mirror scenarios on Lake Bemidji to illustrate these benefits:

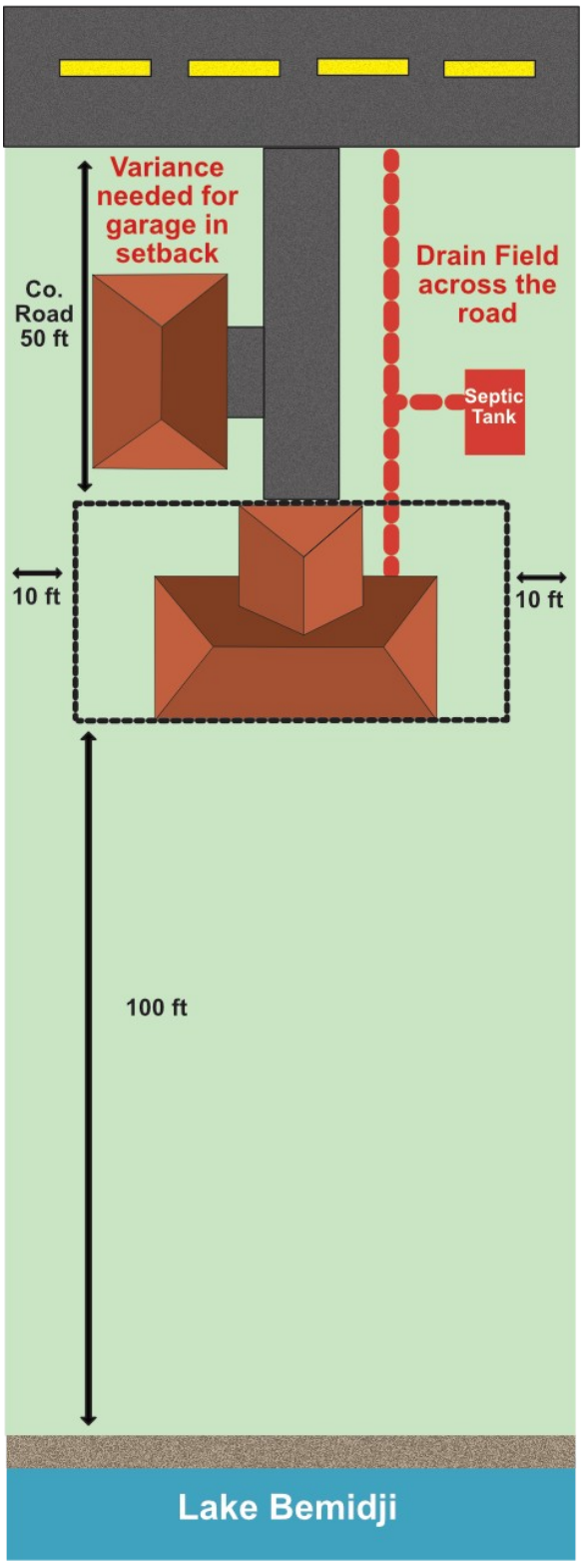
### Example Property 1: Property with Septic Drain Field Across the Road

- Current Situation:
  - Lot Size: 80 feet x 180 feet
  - Septic System: Requires a drain field across the road, which incurs additional costs and securing land usage rights.
  - Variances: Garage in the 50′ setback from County Road ROW.

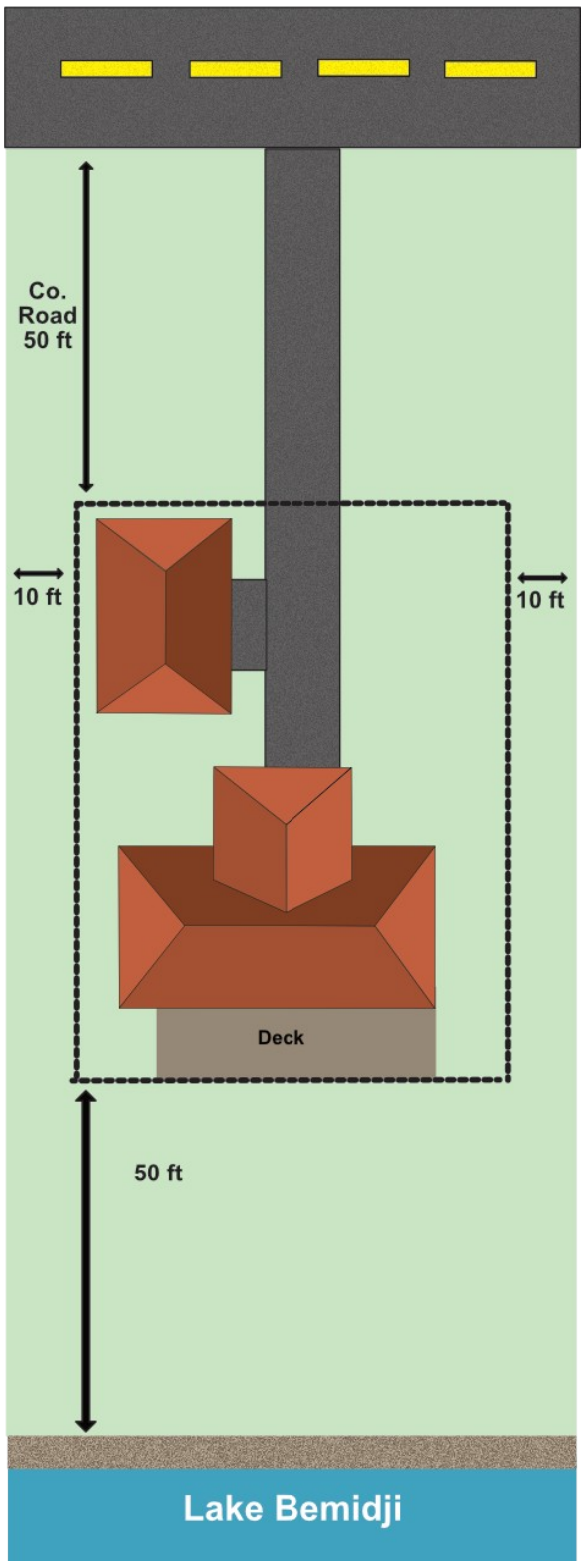
- Post-Connection Situation:
  - Elimination of Long Septic Lines: Reduced costs associated with maintaining and installing long septic lines across the road.
  - Increased Property Usability: More space on the main lot for building or landscaping.
  - No Variances: property now meets all setback requirements.
  - Improved Marketability: Properties without the need for septic systems are generally more attractive to buyers due to reduced maintenance costs and increased flexibility.
  - Potential for more bedrooms in homes due to higher septic capacity.

- Improved water quality and reduced future risk of degradation make lakeshore properties more valuable and appealing to buyers.

## 80 FT X 180 FT LOT: BEFORE SEWER



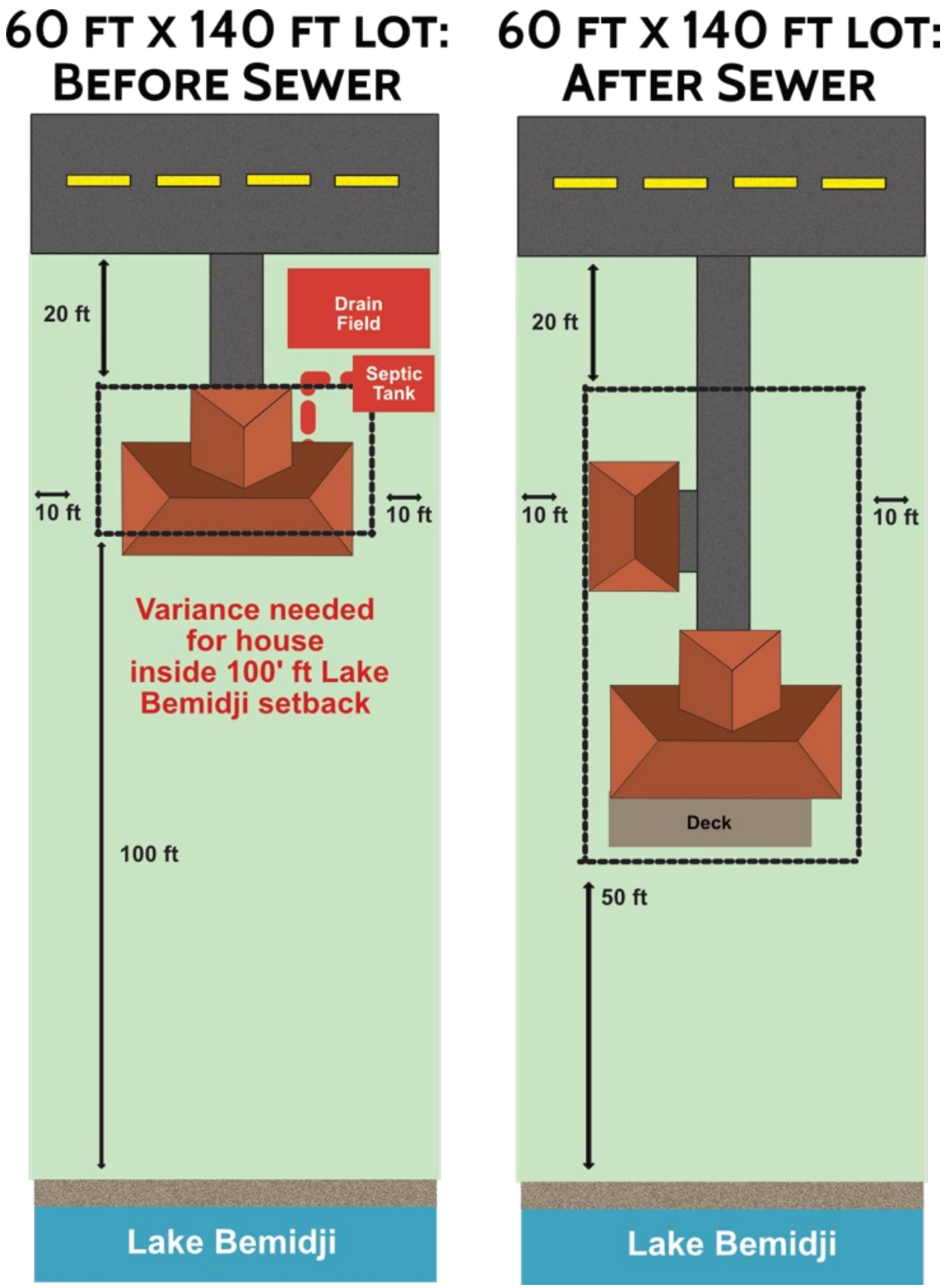

## 80 FT X 180 FT LOT: AFTER SEWER



**Example Property 2: Small Lakefront Lot**

- Current Situation:
  - Lot Size: 60 feet x 140 feet. There are many similar properties that are small, existing non-conforming lots for lot area.
  - Current Lakeside Setback: 100 feet
  - Existing Septic System: Occupies a significant portion of the small lot.

- Post-Connection Situation:
  - New Lakeside Setback: 50 feet
  - Removal of Septic System: Frees up crucial space on the small lot.
  - Enhanced Buildable Area: Allows for potential expansions or new constructions closer to the lake. This also frees up space for additional accessory units, including garage space which was not previously possible without variances.
  - Improved Marketability: Properties without the need for septic systems are generally more attractive to buyers due to reduced maintenance costs and increased flexibility
  - Potential for more bedrooms in homes due to higher septic capacity.
  - Improved water quality and reduced future risk of degradation make lakeshore properties more valuable and appealing to buyers.

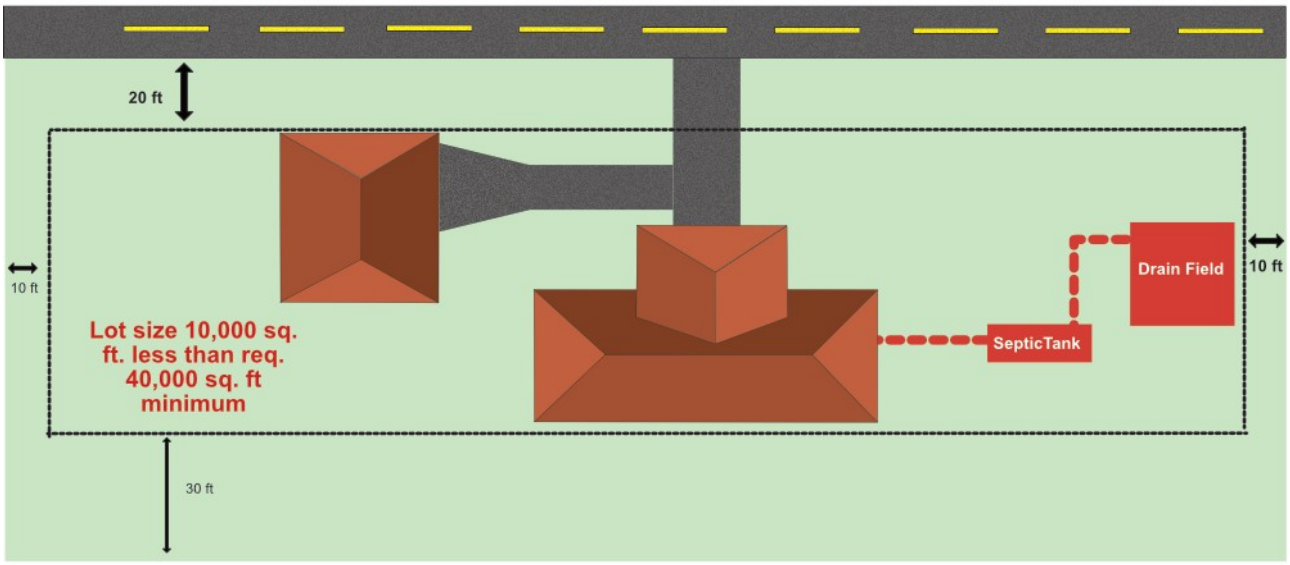

60 FT X 140 FT LOT: BEFORE SEWER
20 ft
Drain Field
Septic Tank
10 ft
10 ft
Variance needed for house inside 100' ft Lake Bemidji setback
100 ft
Lake Bemidji
60 FT X 140 FT LOT: AFTER SEWER
20 ft
10 ft
10 ft
Deck
50 ft
Lake Bemidji

**Example Property 3: Non-Lake Side Property**

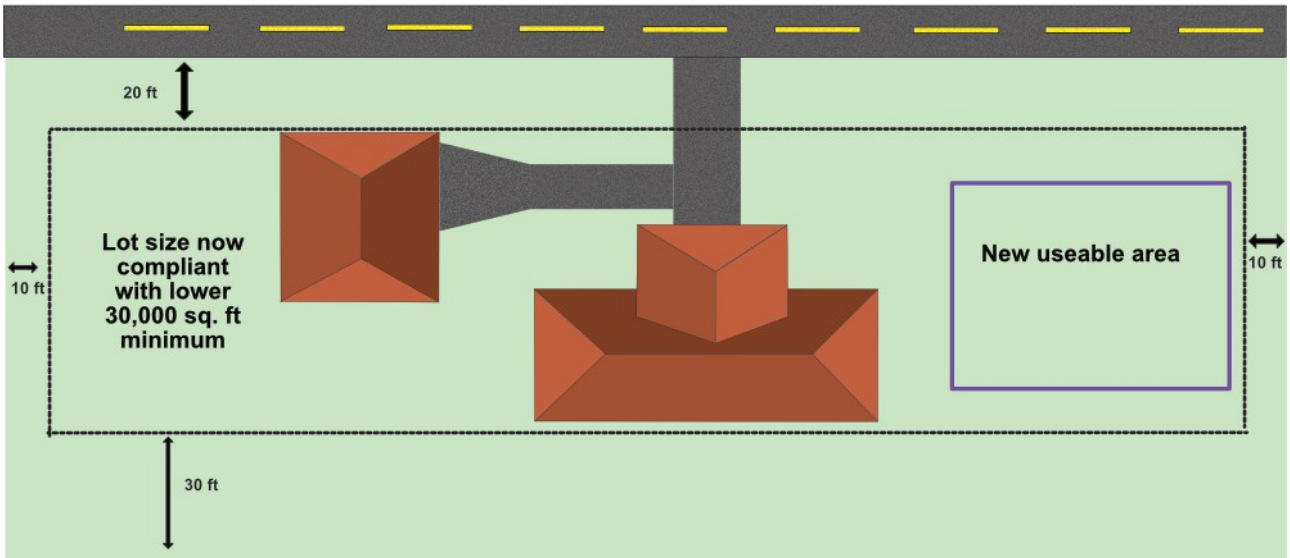
- Current Situation:
  - Lot Size: 120 feet x 300 feet
  - Minimum Lot Area Requirement: 40,000 square feet
  - Existing Septic System: Takes up significant space on the lot, limiting building options and flexibility

- Post-Connection Situation:
  - Reduced Minimum Lot Area Requirement: With the municipal sewer system, the lot area requirement drops to 30,000 square feet (MHWB minimum).
  - Increased Buildable Area: Without the need for an on-site septic system, the entire lot can be utilized for building and landscaping.
  - Improved Marketability: Properties without the need for septic systems are generally more attractive to buyers due to reduced maintenance costs and increased flexibility.
  - Potential for more bedrooms in homes due to higher septic capacity.

## 120 FT X 300 FT LOT: BEFORE SEWER




## 120 FT X 300 FT LOT: AFTER SEWER



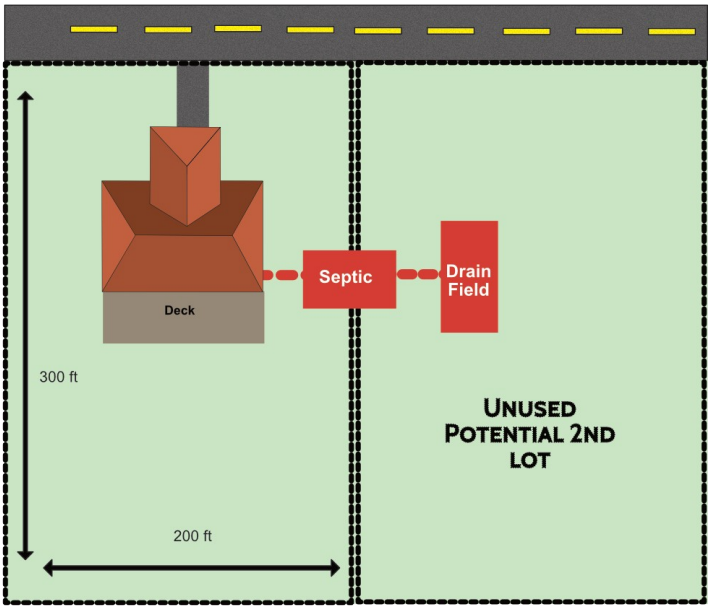
**Example Property 4: Potential Lot Divisions**

- Current Situation:
    - **Current Lot Size:** 300 feet x 400 feet (current minimum lot size required without municipal sewer at least 45,000 sq. ft)
    - **Septic System:** The existing septic system takes up significant space on the lot, limiting the flexibility for future lot divisions or development.
    - **Lot Division Limitations:** Due to the larger minimum lot size requirement and the space occupied by the septic system, the current property is constrained in its ability to be subdivided or developed further, with only 1 potential division.

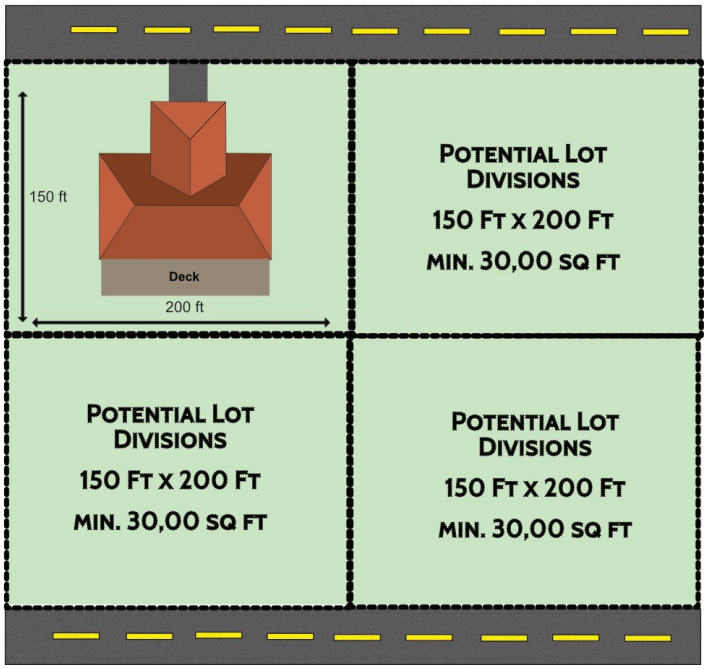
- Post-Connection Situation:
    - **Removal of Septic System:** Eliminating the septic system frees up additional space on the lot, providing more flexibility for development or subdivision.
    - **Reduced Lot Size Requirement:** With the municipal sewer system, the minimum lot size requirement drops to 100 feet x 100 feet and a minimum 30,000 sq ft, allowing for easier and more efficient lot divisions.

- **Increased Development Potential:** The property can now be divided into smaller lots (e.g., 200 × 150 at 30,000 sq. ft), making it possible to create multiple new lots for development or sale. This could be used for simple lot divisions or more significant subdivisions, depending on the property size and owner's goals.
- **Enhanced Property Value:** The ability to subdivide the lot increases its marketability and potential resale value, as it opens opportunities for additional development or investment.

### 300 FT X 400 FT LOT: BEFORE SEWER




### 300 FT X 400 FT LOT: AFTER SEWER




## Cost Savings Versus Installing and Maintaining Private Septic Systems

Implementing the City of Northern Wastewater System offers the potential for significant cost savings and superior environmental protection compared to maintaining individual private septic systems. With 63% of the known septic systems in the Phase 1 area already more than 25 years old (possibly as many as 70%, since 30 properties have no septic records) and nearing their typical 30-year life expectancy, many will soon require costly replacements. Below is a comparison of the financial and maintenance implications of private septic systems versus connecting to the new municipal wastewater system.

**Cost and Maintenance Challenges of Private Septic Systems**

- **High Installation Costs:** Replacing a septic system for a four-bedroom home with a mound design can easily exceed $20,000.
- **Ongoing Expenses:** Homeowners face regular costs for pumping, inspections, and maintenance, adding to the long-term financial burden.
- **Limited Lifespan:** Private septic systems generally last around 20-30 years before requiring replacement.
- **Multiple Points of Failure:** Each of the hundreds of private septic systems poses a risk of malfunction, nutrient leakage, and bacterial contamination, directly threatening the lake's water quality.

**Cost and Maintenance Summary of Municipal Wastewater Systems**

- **Lower Assessment Costs:** The average residential assessment (85 EBF) for connecting to the municipal wastewater system is currently projected at about $18,000. The City's goal is about $14,000, matching the 2024 estimate, through additional grants and competitive bids. Either figure compares well with replacing a private mound system, and assessments can be paid over 15 to 20 years.
- **Connection Incentives:** Early connections will waive the $2,000 connection fee, further reducing upfront costs.
- **Connection Costs:** Typical connection costs are around $30 per foot from the house to the system stub; a 50-foot run would cost approximately $1,500.
- **Managed Maintenance:** All ongoing maintenance and treatment standards are professionally managed by the City and included in the monthly service fee, currently estimated at $65 per month per Equivalent Residential Unit (ERU), providing peace of mind for residents.

### Environmental and Reliability Benefits of a Municipal System

- **Fewer Points of Failure:** Centralizing wastewater treatment reduces the risk of failures from hundreds of private septic systems to a single, well-maintained facility.
- **Superior Nutrient Management:** Municipal systems are held to more stringent treatment standards by the MPCA and are subject to active monitoring, ensuring more effective removal of phosphorus and other nutrients compared to private systems. This significantly reduces the risk of harmful algal blooms and promotes a healthier lake ecosystem**.**
- **Consistent Compliance:** Professionally operated municipal systems ensure reliable treatment standards, minimizing the environmental impacts that often accompany private septic systems.

### Summary of All Benefits From a Municipal System

1. **Flexibility in Land Use:**
    - The absence of an on-site septic system allows property owners to fully utilize their land for building, landscaping, or other uses.
    - Easier to add structures like garages, sheds, or additional living spaces without the constraints of a septic system.

2. **Cost Savings:**

- Eliminating the need for future septic system replacements and ongoing maintenance reduces long-term property costs.
- Lower minimum lot area requirements make it easier for property owners to meet zoning regulations and potentially subdivide their lots.

3. **Environmental Protection:**
    - Connecting to the municipal sewer system greatly reduces the risk of groundwater contamination. While this system will use ground discharge like individual residential septic systems, discharge from municipal systems is continuously monitored for compliance, while it is impossible to monitor hundreds of individual systems.
    - Water quality in Lake Bemidji is also protected by eliminating existing and future septic system failures.
    - Protecting Lake Bemidji ensures long-term protection of the Mississippi River watershed.

4. **Enhanced Property Value:**
    - Properties served by municipal sewer systems are generally more valuable and marketable.
    - The flexibility and reduced maintenance costs associated with municipal sewer systems make these properties more attractive to potential buyers.
    - Research shows that water clarity significantly affects lakeshore property values positively. For example, a study in the Mississippi Headwaters Region demonstrated that improved water quality leads to higher property prices.[i]

**5. Community and Economic Benefits:**

- Attraction of new residents and businesses due to improved infrastructure.
- Increased property values benefit the entire community, contributing to economic growth.
- Businesses and homeowners benefit from decreased operational costs and increased property usability. [ii]



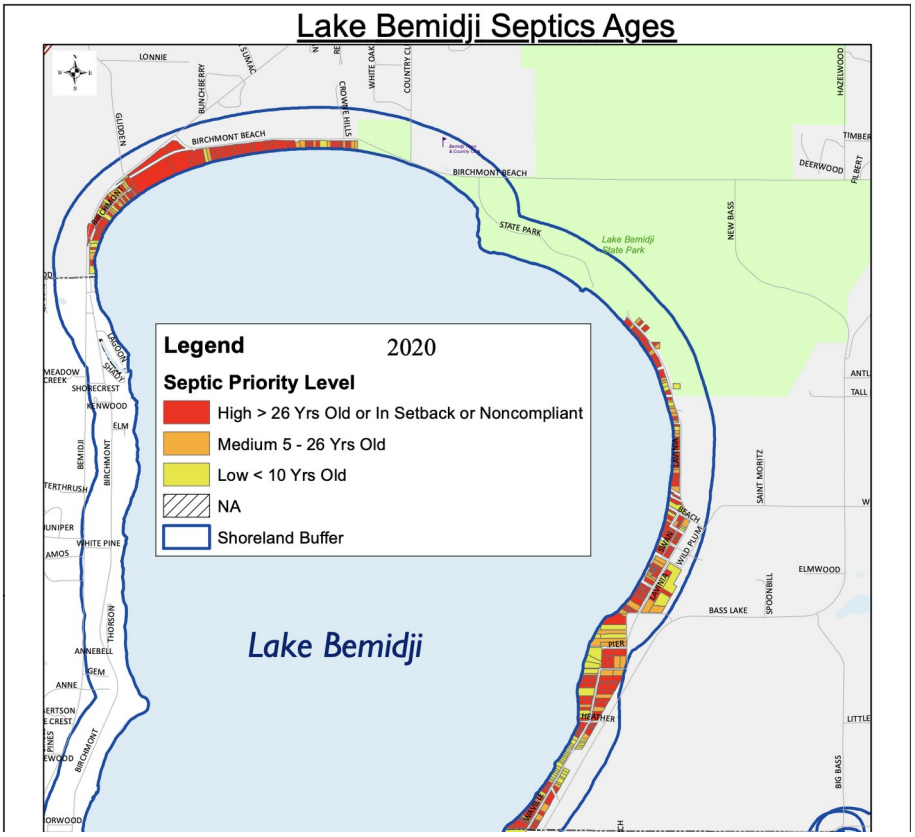
Photo: Beach Ln Boat Access

There can be increased risk of pollution from systems in sandy soils, where onsite systems are densely sited, and drain fields are close the lake. So, a centralized system reduces the risk of phosphorus enrichment to lakes compared to individual onsite systems.

# Impact on Lake Bemidji

**Water Quality Protection**

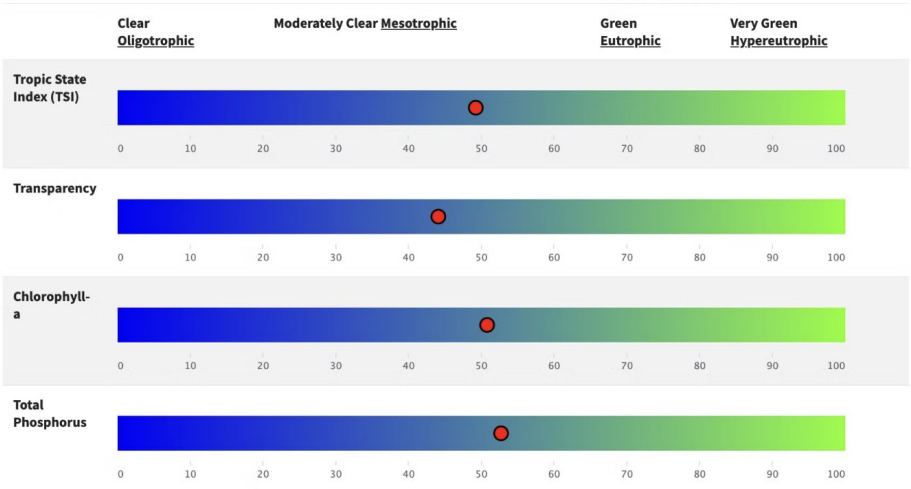
Lake Bemidji is a highly valuable and sensitive resource, increasingly vulnerable to nutrient pollution due to densely populated areas with small, substandard lots, aging septic systems, and sensitive soil and groundwater conditions. As the population around the lake grows, small cabins are being replaced by large lake homes, exacerbating the strain on existing septic systems. Continued reliance on these individual systems significantly elevates the risk of phosphorus and bacterial contamination, jeopardizing the lake's water quality and overall ecological health.




The implementation of the City of Northern Wastewater System is a critical measure to ensure the long-term protection and enhancement of Lake Bemidji's water quality. Below are key points and data demonstrating how this project will positively impact the lake and its surrounding environment:

Objective: The primary objective of the City of Northern Wastewater System is to protect and preserve the existing water quality conditions of Lake Bemidji now and long into the future. This is not, and should not be considered, water quality restoration.

Eutrophication: Lake Bemidji has been identified as mildly eutrophic, which means it is nutrient-rich, -causing -algae blooms that occur in late summer. These blooms are driven by an abundance of phosphorus, a nutrient that promotes algae growth. Reports from RMB Environmental Laboratories indicate that Lake Bemidji has elevated levels of phosphorus, -somewhat higher than expected for lakes in this ecoregion, and at levels that would exceed the impaired waters status threshold set by the MPCA.[iii] The mildly eutrophic status of Lake Bemidji indicates that it is vulnerable to degradation from further eutrophication. However, it is important to understand that some level of nutrient availability is necessary to sustain a healthy aquatic ecosystem and a quality sport fishery. The real concern about the eutrophication process is that it is ongoing, cumulative and extremely difficult to reverse once eutrophic or hypereutrophic thresholds are reached.




Overall Trophic State Index for this lake: **49**

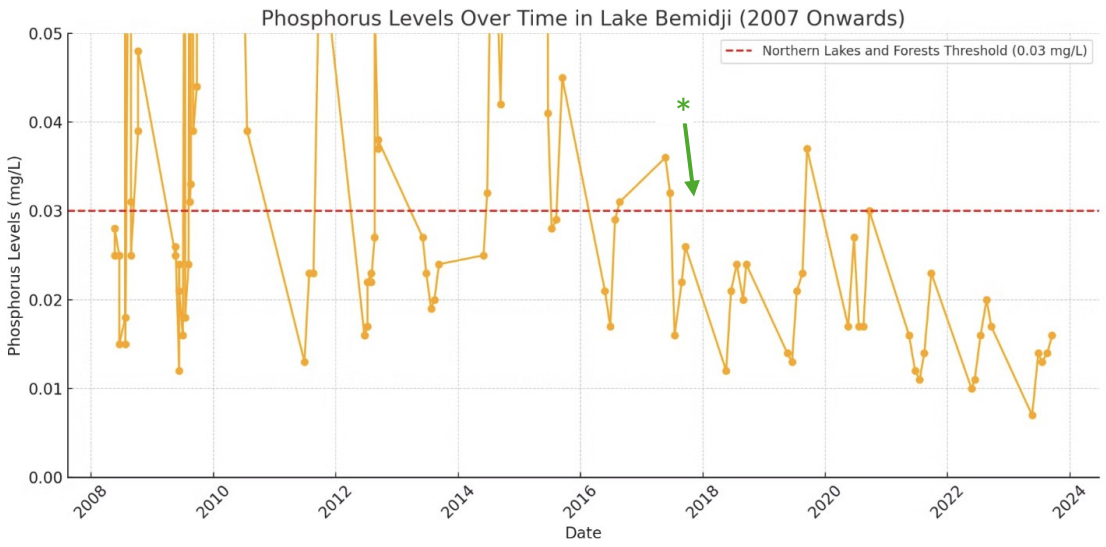
| Parameters | 10-Year average of all summer samples | Parameter TSI | Expected TSI range of lakes in same ecoregion | Number of samples |
|---|---|---|---|---|
| Transparency (meters) | 3 | 44 | 38 - 47 | 68 |
| Chlorophyll-a (parts per billion) | 8 | 51 | 44 - 53 | 49 |
| Total Phosphorus (parts per billion) | 29 | 53 | 42 - 52 | 49 |

Source: MPCA June and September 2014 to

Phosphorus inputs: There are numerous ways phosphorus can enter a lake, some natural and some human induced, but relatively few ways for any significant removal. Thus, lakes act as nutrient sinks capturing and retaining most of the nutrient input.

Internal Loading: A unique characteristic of water, where it reaches maximum density at 39 degrees F, results in a complete turnover of the entire water column every spring and fall. This natural process is called internal loading, where nutrients are cycled from the lower depths and sediment layers of the lake and mixed throughout the water column. This process can be influenced by groundwater flows and land use activities.

Data from the Minnesota Pollution Control Agency (MPCA) show that Lake Bemidji frequently approaches or exceeds the Northern Lakes and Forests Ecoregion phosphorus impairment threshold of 0.03 mg/L (30 µg/L), placing it at risk of long-term impairment.[iv] Phosphorus concentrations in the lake have often led to algae growth, degrading water quality, impacting aquatic life, and reducing the lake's suitability for swimming, fishing, and boating.




~~* Zebra Mussels, an aquatic invasive species, were first documented in lake Bemidji in 2018, and were likely present for some time before documented. An observed improvement in transparency and an apparent decline in phosphorous levels since that time is likely due to filter feeding by Zebra Mussels and sequestering large amounts of available nutrients (phosphorous) into Zebra Mussel biomass. However, it is important to note that those nutrients are still present in the ecosystem and once Zebra Mussels reach carrying capacity future die offs will eventually release and cycle those nutrients back into the~~

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One pound of phosphorus can support up to five hundred pounds of algae, illustrating the profound impact even small amounts of nutrient runoff can have on a water body.[vi] The ongoing presence of aging and failing septic systems—63% of which are more than 25 years old in the Phase 1 area—contributes significantly to phosphorus and bacteria loading, including E. coli, into Lake Bemidji. These issues can present serious health risks and degrade the lake's overall ecological health.



Photo: Example of algae blooms

**Septic Pollution's Lasting Impact**

Recent research highlights the importance of re-evaluating assumptions about traditional onsite septic systems and their environmental impact. A 2019 study by Frank L. Schellenger and Ferdi L. Hellweger, published in *Lake and Reservoir Management*, reveals that these septic systems are a significant, often-overlooked source of nutrient pollution in lakes.[vii] Contrary to common belief, the nutrients from onsite septic systems do not stay contained due to natural soil filtration and mineral binding. Instead, they continue to leach into the surrounding water, fueling the growth of nuisance algae and invasive plant species.

This pollution has serious implications for our lakes' ecological health. Algae blooms and invasive plants can diminish water quality, harm local fish populations, and reduce recreational enjoyment. Without addressing nutrient runoff from septic systems, lake management strategies aimed at reducing algae blooms and invasive plants are unlikely to succeed in the long term.

The study also explored the potential effects of replacing septic systems with a centralized wastewater treatment system, concluding that such a system would significantly reduce nutrient pollution. This shift to centralized treatment would support long-term lake health and environmental quality, offering a more sustainable solution for preserving our local water resources and enhancing community quality of life.

**Phosphorus Impairment in Lake Irving and Its Impact on Lake Bemidji**

Lake Irving, located in Beltrami County, has been classified as impaired for phosphorus (P) by the Minnesota Pollution Control Agency (MPCA). To meet state water quality standards, Lake Irving needs a 57% reduction in phosphorus.[viii]

This impairment affects not only Lake Irving but also Lake Bemidji downstream, as the two are part of the interconnected Mississippi River system. The MPCA report states:

"Continued enrichment of the two impaired lakes [Irving and Little Turtle] will have negative consequences on immediately downstream lakes of the Turtle River system and Lake Bemidji of the Mississippi River system." *(MPCA 2018, p.xii)*

Further, the report's modeling highlights the direct impact Lake Irving has on Lake Bemidji:

"Water quality of downstream Lake Bemidji is largely dependent upon that of Lake Irving. BATHTUB modeling of Lake Bemidji reinforces that increases in P loading from Lake Irving may be expected to increase TP concentrations in Lake Bemidji." *(MPCA 2018, p.47)*

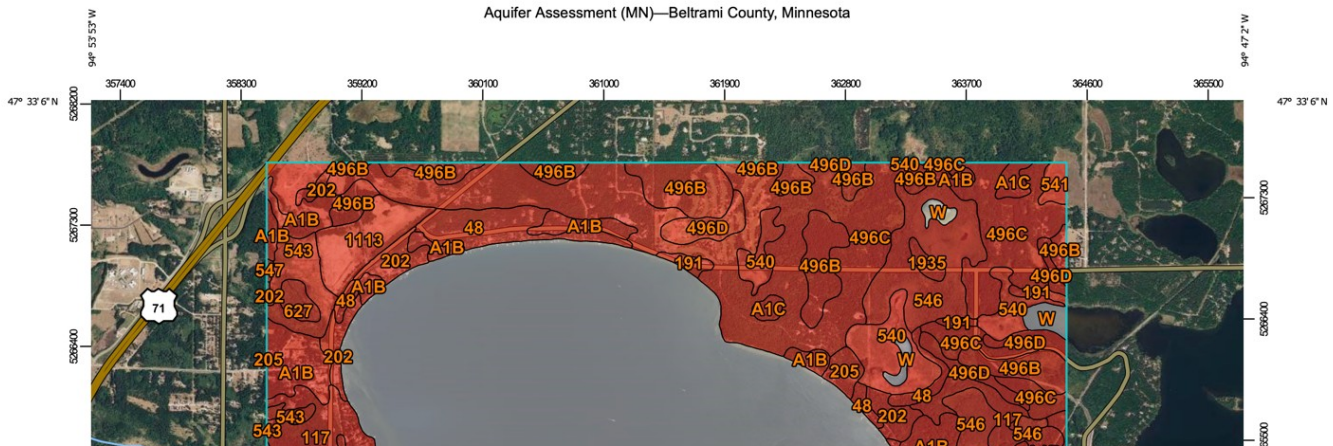
Addressing nutrient inputs wherever we can benefit the entire region. Nathan Kestner, NW Regional Manager at the Minnesota DNR, emphasizes this connection:

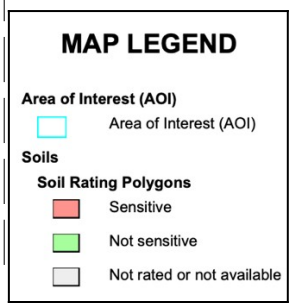
"Any reductions in nutrient inputs into lakes can positively benefit water quality and habitats. Improvements to water quality and habitats typically translate to a more positive recreational experience, whether fishing, boating, or other reasons people choose to live and recreate in the area."

The City's wastewater project, by helping to reduce phosphorus contributions to Lake Bemidji, plays a crucial role in protecting the lake's health and recreational quality, which is already at heightened risk due to the impaired condition of its upstream neighbor, Lake Irving.

**Groundwater and Soil Sensitivity**

Sensitive Soils: The soils around Lake Bemidji, especially in the northern areas, have high hydraulic conductivity due to glacial outwash and sediments. This means water and contaminants can quickly move through the soil, influencing groundwater and surface water quality.






Shallow Groundwater: Groundwater levels in these areas are typically within three feet of the ground surface, which limits the effectiveness of traditional septic systems in removing phosphorus and other contaminants.

**Expected Improvements with the Wastewater System**

- Reduction in Phosphorus Loading: By replacing aging septic systems with a centralized wastewater treatment plant, the project will significantly reduce the amount of phosphorus entering Lake Bemidji. The treatment plant will have much lower phosphorus effluent levels compared to even the most compliant septic systems. Furthermore, the treatment plant

will be discharging into the ground and not directly into Lake Bemidji or the Mississippi river.

- Protection of Sensitive Areas: The new wastewater system will protect sensitive groundwater zones by eliminating the need for individual septic systems that can fail and release contaminants.
- Enhanced Water Quality Management: The centralized system allows for more effective and efficient management of wastewater, reducing the regulatory burden on individual property owners and ensuring consistent treatment standards.

**Protecting Fish Populations and Aquatic Habitats**

Fish populations and aquatic habitats in Lake Bemidji are also vulnerable to the impacts of nutrient enrichment, particularly from phosphorus, which often comes from septic system drain fields.

According to Edie Evarts, local DNR Area Fisheries Supervisor, “The main concern for fish and aquatic habitat is increased nutrients that reach the lake... A septic system that does not provide adequate treatment allows nutrients (phosphorus) to reach nearby lakes and streams, contributing to greater algae and plant growth. Algal blooms and abundant weeds can change water quality for fish and wildlife habitats... More phosphorus also can increase the likelihood of toxic blue-green algae blooms...there can be increased risk of pollution from systems in sandy soils, where onsite systems are densely sited, and drain fields are close to the lake. So, a centralized system reduces

the risk of phosphorus enrichment to lakes compared to individual onsite systems."

Switching to a centralized wastewater system is a critical step in safeguarding Lake Bemidji's aquatic environment. By effectively reducing phosphorus inputs, the system helps maintain healthier water conditions, supporting fish populations and preserving the lake's biodiversity for future generations.

**Summary of Benefits**

- Environmental Protection: The wastewater system will help maintain and improve water quality in Lake Bemidji, protecting it from nutrient loading and other pollutants.
- Community Health: Improved water quality reduces health risks associated with contaminated water, benefiting the entire community.
- Economic Advantages: Cleaner water can enhance property values, attract tourism, and support recreational activities, contributing to the local economy.

Many folks may be surprised to learn that 1 pound of phosphorus introduced into a freshwater system can translate into approximately 500 pounds of algae growth. Any reductions in nutrient inputs into lakes can positively benefit water quality and habitats. Improvements to water quality and habitats typically translate to a more positive recreational experience, whether fishing, boating, or other reasons people choose to live and recreate in the area.

- Nathan Kestner, Regional DNR Ecological &

Alternative Analysis for the City of Northern Wastewater Project

As Northern Township worked to address the urgent need for a comprehensive wastewater management solution, several alternatives were evaluated, each with its own set of implications for the Township's future, its residents, and the environment. Below is an in-depth analysis of the six primary options considered, along with a brief history of our interactions with the City of Bemidji and the DNR. This analysis was written while Northern was still a township, and its references to the Township describe that period.

1. **Hook Up to City System as Paying Customers:**

In early discussions with the City of Bemidji, Northern Township was offered the option to connect to the City's existing wastewater system as paying customers. This was seen as a straightforward solution that would have allowed the Township to utilize the City's infrastructure without annexation. In May 2021, Ruttger's Birchmont Lodge, located on the northern shores of Lake Bemidji, requested to connect to the City's sewer system due to its failing septic system. Discussions between the City, County, and Township progressed through the summer and fall, and by January 2022, the City indicated a willingness to allow the Township to connect as a paying customer, particularly as the County planned roadwork along Co. Rd. 20 in the same area.

However, after Northern Township secured significant federal funding for the project, including a $5 million grant in December 2022, the City rescinded its offer. In May of 2023, the City reversed its stance, officially giving notice it would no longer allow Northern Township to connect as customers without annexation. This sudden change in position left the Township without the option to connect to the City's system, forcing us to seek other alternatives despite having obtained funding with the City's initial support.

2. **Orderly Annexation – Let the City Install the System:**

Another alternative discussed during talks with the City of Bemidji was orderly annexation, in which the City would annex the affected areas of Northern Township and install the wastewater system. While this option would have allowed for the installation of the necessary infrastructure, it carried significant drawbacks for Township residents and the Township itself. Annexed residents would still face assessments, SAC/WAC charges, user fees, and much higher City taxes. Furthermore, the remaining parts of Northern Township would lose a substantial portion of their tax revenue, likely resulting in higher taxes for non-annexed residents to compensate for the loss.

In October 2021, Northern Township held an informational meeting with residents to gauge their opinions on further annexation by the City. The response was overwhelmingly negative, with the several

hundred residents in attendance strongly opposing any additional annexation. While they supported the need for wastewater services to protect Lake Bemidji, the idea of becoming City residents, paying City taxes and losing the rural character of Northern Township was nearly unanimously rejected.

3. **City's Merger Proposal:**

A third option proposed by the City was a full merger of Northern Township into the City of Bemidji, making all Township residents part of the City. This option would not only affect the areas directly impacted by the wastewater project but would also convert the entire Township into City limits. This proposal, like the annexation option, was met with strong opposition from residents and thus rejected.

4. **Township Installs Collection System with Pond Treatment:**

One of the early alternatives the Township pursued instead of connecting to the City of Bemidji's system was the construction of its own wastewater collection system, with treatment being handled through an open-air pond treatment facility. This option seemed initially feasible, provided suitable land could be secured for the pond. The Township identified several potential sites for the pond system, but only one was viable due to its proximity to Lake Bemidji. The land, located on School Trust Land (section 36), required cooperation from

the Minnesota Department of Natural Resources (DNR) to either lease or purchase the property.

Unfortunately, the DNR was slow to respond to the Township's requests. Northern Township first contacted the DNR in mid-2023, but it wasn't until April 2024 that the DNR provided a definitive answer. They informed the Township that there was no divestment strategy in place for School Trust Land and that it would take a considerable amount of time to establish a process for selling or leasing the land. Ultimately, the DNR declined the Township's request, stating that they had no interest in selling or leasing the land for a wastewater treatment pond.

5. **Do Nothing Option:**

Another option considered was to take no action. This option, however, presents significant risks to the Township and its residents. Without a centralized wastewater system, there would be no protections in place to prevent nutrient pollution from septic systems reaching Lake Bemidji. This would not only jeopardize the water quality of the lake but most likely result in the Township losing $6.75 million in federal funding already allocated for the project.

Additionally, doing nothing leaves the Township vulnerable to forced annexation by the City of Bemidji. In such a scenario, affected

residents would still face the same assessments, SAC/WAC charges, and use fees, but would also be subject to much higher City taxes and more restrictive City ordinances. Meanwhile, the rest of Northern Township would lose a large portion of its tax base, likely resulting in increased taxes for non-annexed residents. The risks of inaction are too great, both financially and environmentally.

6. **Current Path – Township Installs System with Package Plant:**

The current path pursued by Northern Township involves the installation of a municipal wastewater system with a mechanical treatment plant and ground discharge. This option emerged as the most viable solution after the pond system alternative fell through. By March 2024, the Township had begun exploring mechanical plant options, and these systems proved to be more affordable than initially expected.

This option allows the Township to maintain control of its own wastewater system without the need for annexation now, and greatly reduces the risk of future forced annexation. Federal funding already secured covers a significant portion of the project costs, reducing assessments for residents to approximately 60% of the project's total cost. There is also the potential for additional state funding which we will continue to aggressively pursue. Most importantly, this path provides the necessary protections for Lake Bemidji's water quality

while keeping Northern Township intact and independent from the City of Bemidji.

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**Conclusion: A Path Forward**

Northern Township's current course of action—installing a mechanical treatment plant and collection system—remains the best solution for protecting both the Township's autonomy and the environment. While several alternatives were considered, including connecting to the City system and exploring pond treatment, the combination of federal funding, community support, and the ability to protect Lake Bemidji's water quality makes the Township's chosen path the most sustainable option. This plan not only safeguards the Township from annexation risks but also provides long-term environmental and economic benefits for generations to come. Northern's incorporation was granted in February 2026, and the City of Northern now carries the project forward.



Photo: Lake Bemidji

# Supporting Research and Studies

### Water Quality Reports

- **RMB Environmental Laboratories Report (2017):** Indicates that nutrient levels are above the ecoregion average range and the state level for impairment for phosphorus. Highlights the need for a protective and preemptive management strategy for Lake Bemidji, focusing on avoiding further degradation and reducing pollution intensity from land use.[ix]

### Soil and Aquifer Assessments

- **USDA Natural Resources Conservation Service:** The northern areas of Lake Bemidji have soils with high hydraulic conductivity, meaning water and contaminants move quickly through the soil, reaching groundwater and the lake. Groundwater levels are typically within three feet of the surface, limiting the effectiveness of septic systems in filtering phosphorus and other contaminants.[x]

### Economic Impact of Wastewater Systems

The economic benefits of wastewater treatment systems are substantial and multi-faceted. Research highlights the significant advantages of municipal wastewater systems over individual septic systems, particularly in terms of cost savings, property value

increases, and broader economic growth. Key findings from various studies include:

1. **Cost Efficiency:** Municipal systems alleviate the financial burden on property owners, who otherwise face high costs for upgrading, repairing, and maintaining septic systems.
2. **Enhanced Property Values:** Studies show a positive relationship between water quality and lakeshore property values, with cleaner water resulting in higher property prices.
3. **Economic Growth:** Municipal wastewater projects stimulate local economies by creating jobs, attracting private investment, and increasing property values.

For example, the Town of Dennis Wastewater Development Study found that every dollar spent on construction resulted in nearly $15 of private investment, generated $2 in public investment, and increased the property values, with every $10,000 in construction costs saving or creating 5.75 jobs.[xi]

**Property Value Impact**

The relationship between lake water quality and lakeshore property values is well-documented. A notable study, “Lakeshore Property Values and Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region,” submitted to the Legislative Commission on Minnesota Resources by the Mississippi Headwaters Board and Bemidji State University, found that water clarity significantly affects property prices in the region.[xii]

- **Water Clarity Impact:** The major finding of this research shows that water clarity positively affects the prices paid for lakeshore properties. This relationship supports similar results found in studies of Maine lakes.
- **Economic Implications:** Changes in lake water clarity will result in millions of dollars in property values—lost or gained—in this lake region of Minnesota. Protecting water quality is crucial not only for ecological health and social benefits but also for economic reasons.

**Conclusion**

Rural and urban water/sewer projects generate much greater economic benefits than their total construction cost. A study on the economic impact of 87 water/sewer projects concluded that these facilities save and create permanent jobs, generate private investment, leverage additional government funds, and increase the property values. Urban projects typically generate more significant economic impacts due to the better general infrastructure in urban areas compared to rural ones but both areas generally see positive environmental and economic outcomes for their communities.[xiii]



Photo: Bemidji Town & Country Golf Course

# Looking Forward: The City of Northern in 20 Years

As we look to the future, it is essential to consider how the City of Northern Wastewater System project will shape our community over the next two decades and beyond. This project is not merely an infrastructure upgrade; it is a foundational step towards ensuring that the City of Northern grows in an environmentally responsible and sustainable manner.

**Positioning the City of Northern for Sustainable Growth**

The implementation of the wastewater system aligns with a 50-year regional planning goal that has long been a vision for our community. The ability to achieve this milestone speaks volumes about our commitment to environmental stewardship and sustainable development.

- **Environmental Responsibility:** By replacing aging septic systems with a modern, centralized wastewater treatment plant, we are significantly reducing nutrient loading into Lake Bemidji. This will preserve water quality and protect the broader Mississippi River watershed, ensuring that our natural resources remain healthy and vibrant for future generations.

- **Sustainable Development:** The wastewater system will support more compact and efficient land use, enabling the reuse of vacant or underutilized properties and promoting higher-density development where appropriate. This aligns with best practices in urban planning and contributes to a more sustainable community structure.
- **Economic Growth:** Enhanced infrastructure will make the City of Northern more attractive to businesses and investors, fostering economic development. Improved property values, increased tourism, and new business opportunities will create a dynamic and thriving local economy.

**A Milestone Achievement**

Reaching this point in our wastewater system project is a significant achievement for the City of Northern. It represents decades of planning, community effort, and strategic coordination. This milestone underscores our ability to tackle complex challenges and implement solutions that benefit the entire community.

- **Community Health and Well-being:** Improved water quality and reliable wastewater management will directly enhance the health and well-being of our residents. Safe and clean water is fundamental to public health, and this project ensures that we meet that critical need.

- **Long-term Vision:** By focusing on sustainable growth, we are laying the groundwork for a resilient and adaptable community. The decisions we make today will have lasting impacts, and this project ensures that we are moving forward with a clear and responsible vision for the future.

**Final Conclusions**

As the City of Northern embarks on this transformative journey, it is essential to recognize the broader implications of our actions. The wastewater system project is more than a technical solution; it is a testament to our community's values and priorities.

- **Environmental Stewardship:** We are committed to protecting our natural environment and ensuring that Lake Bemidji and its surrounding ecosystems remain pristine.
- **Economic Vitality:** By investing in critical infrastructure, we are paving the way for sustained economic growth and prosperity.
- **Community Strength:** This project reflects the strength and resilience of the City of Northern, showcasing our ability to come together and achieve common goals.

Looking ahead, we can be proud of the steps we are taking to create a sustainable, healthy, and prosperous future for the City of Northern.

This wastewater system project is a cornerstone of that vision, ensuring that we grow in a way that honors our past, meets the needs of the present, and safeguards the future.

# [i]Endnotes


Lakeshore Property Values And Water Quality: Evidence From Property Sales In The Mississippi Headwaters Region," by Krysel et al. (2003).

[ii] Town of Dennis Wastewater Development Study, April 2018, UMASS Donahue Institute

[iii] RMB Environmental Laboratories, Inc. (2017). Lake Bemidji 2017 Water Quality Report. Bemidji, MN: RMB Environmental Laboratories.

[iv] Minnesota Pollution Control Agency. (n.d.). Impairment assessment for Lake Bemidji (ID 04-0130-02). Retrieved from https://webapp.pca.state.mn.us/surface-water/impairment/04-0130-02

[v] Boissoneault, L. (2021, January 27). *Mussel-phosphorus puzzle: Invasive mussels are reshaping the chemistry of the Great Lakes.* Great Lakes Now. https://www.greatlakesnow.org/2021/01/invasive-mussels-phosphorus-chemistry-great-lakes/

[vi] Clean Lakes Alliance. (n.d.). Understanding phosphorus and its impact on water quality. Retrieved from https://www.cleanlakesalliance.org/phosphorus/

[vii] Frank L. Schellenger & Ferdi L. Hellweger (2019) Phosphorus loading from onsite wastewater systems to a lake (at long time scales), Lake and Reservoir Management, 35:1, 90-101, DOI: 10.1080/10402381.2018.1541031

[viii] Minnesota Pollution Control Agency. (2018). *Mississippi Headwaters Total Maximum Daily Loads for Little Turtle Lake and Lake Irving: Addressing excess phosphorus concentrations by quantifying phosphorus sources, identifying treatment alternatives, and developing a future monitoring plan.* Minnesota Pollution Control Agency.

[ix] RMB Environmental Laboratories, Inc. (2017). Lake Bemidji 2017 Water Quality Report. Bemidji, MN: RMB Environmental Laboratories.

[x] U.S. Department of Agriculture, Natural Resources Conservation Service. (n.d.). Web soil survey. Retrieved from https://www.nrcs.usda.gov/resources/data-and-reports/web-soil-survey

[xi] Town of Dennis Wastewater Development Study, April 2018, UMASS Donahue Institute

[xii] Lakeshore Property Values And Water Quality: Evidence From Property Sales In The Mississippi Headwaters Region," by Krysel et al. (2003).

[xiii] Economic Impact of Water/Sewer Facilities on Rural and Urban Communities," Faqir S. Bagi, Rural America, Volume 17, Issue 4/Winter 2002