
Canisteo and Hill Annex Legacy Mine Pits

Status Report

As required by 2020 Minn. Laws 5th Sp. Sess. Chap. 3 Art. 1 Sec. 7 Subd. 4.

02/16/2021

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As requested by 2020 Minnesota Law 5th Special Session Chap. 3 Art. 1 Sec. 7 Subd. 4: This report cost approximately \$1,000 to prepare.

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Purpose

The 2020 Minnesota State Legislature, in a 5th special session ending in October of 2020, directed the Minnesota Department of Natural Resources (DNR) as follows:

2020 Minn. Laws 5th Sp. Sess. Chap. 3 Art. 1 Sec. 7 Subd. 4.

Canisteo and Hill Annex Open-Pit Mine Groups

\$2,000,000

(a) For predesign, design, and engineering of projects to mitigate the threat to property, public safety, and water quality from rising water levels at the Canisteo and Hill Annex mine complexes. The commissioner must give priority to work that addresses the most immediate risks to public safety. If the predesign, design, and engineering for the Canisteo and Hill Annex mine complexes is complete, the commissioner may use any remaining money from this appropriation to construct mitigation measures at the Canisteo or Hill Annex mine complex.

(b) The commissioner, in cooperation with the Department of Iron Range Resources and Rehabilitation, Western Mesabi Mine Planning Board, and Itasca County, shall provide a status report on this project to the chairs and ranking minority members of the legislative committees with jurisdiction over capital investment and environment and natural resources finance by February 15, 2021, April 15, 2021, July 1, 2021, and September 1, 2021. This report must include but is not limited to recommendations on lease ownership and costs, the findings of the pit wall stability study, final engineering, and design work, including cost estimates to complete the outlet and recommendations on ownership, operations, and maintenance of the constructed outlet.

This first status report contains background information relative to the project and fulfils the requirement to report to the legislature by February 15, 2021 the status and progress made to date.

Legacy Mine Pit History

The Canisteo Mine Pit (Canisteo) and Hill Annex Mine Pit (Hill Annex) are pit lakes formed in a complex of numerous inactive iron ore mine pits in Itasca County, Minnesota. The Canisteo is located north of the cities of Coleraine, Bovey, and Taconite (Figure 1). Approximately 2 miles to the east of the Canisteo resides the Hill Annex pit, which is located north of the cities of Marble and Calumet (Figure 2).

Iron ore mining began in the Canisteo in 1907, with mining operations continuing through 1986. Between 1980 and 1986, mining operations in the Canisteo consisted exclusively of scam operations, which used previously blasted rock from the pit bottom. Open pit iron ore mining in the Hill Annex commenced in 1913 and continued into the late 1970s. After ceasing operations, the mine infrastructure was sold to the Department of Iron Range Resources and Rehabilitation (DIRRR), formerly Iron Range Resources and Rehabilitation Board (IRRRB). When mining ceased in the Canisteo and Hill Annex, the pits began to fill with water from precipitation, surface water inflow, and groundwater inflow.

Adopted in 1980, the Mineland Reclamation Rules (Minn Rules 6130) for ferrous mining require mining operations to plan for closure and reclamation, which may require water level management. For operations that ceased prior to 1980, such as the Hill Annex, reclamation was not required. At the Canisteo, reclamation was only required for disturbances connected to scam mining operations and not the entire pit. Due to the timing of the adoption of the Mineland Reclamation Rules, water level management was not required for either of the pits. For the purposes of this report, the Canisteo and Hill Annex are considered legacy mine pits because of their mine operation and closure prior to the adoption of the 1980 Mineland Reclamation Rules.

As water levels continued to rise within the Canisteo and Hill Annex, the full extent of potential hydrological impacts to surrounding communities was unknown. Recognizing the importance of a data record, from which water level predictions are made, the DNR began monitoring for pit water level and surrounding groundwater changes in 1990. The DNR continues to provide technical expertise regarding the potential hydrological impacts to surrounding communities because of rising pit water levels.

Engineered outlet structures are needed for the Canisteo and Hill Annex to prevent future flooding and potential affects to nearby communities. While these areas may still be viable options for future mining operations, which may include pumping water from the pits, an engineered outlet structure is the only guaranteed method to control water levels.

Canisteo water level management

After iron ore mining and subsequent pit dewatering ceased, the Canisteo pit complex began to fill with water from precipitation, surface water inflow, and groundwater inflow. The increasing pit water level resulted in concerns from nearby communities, including a rising water table within the city of Bovey. The DNR designed and conducted various studies to evaluate potential impacts from the rising pit water level.

In 2012, the DNR issued a water appropriation permit to Magnetation LLC, a scam mining operation, authorizing the pumping of water from the Canisteo for mining operations. This pumping resulted in a decrease

in water level (Figure 3) until Magnetation LLC filed for bankruptcy in 2015. Pumping ceased in the fall of 2016, resulting in a rise in pit water level. In 2017, ERP Iron Ore LLC acquired Magnetation LLC assets and resumed intermittent pumping (Figure 3). Pumping again ceased in 2018 when ERP Iron Ore LLC entered bankruptcy, and the water level in the pit has been rising since that time.

Hill Annex water level management

In 1981, the IRRRB obtained a lease for the land to operate an interpretive center and to facilitate mine site tours. In 1988, the Minnesota Legislature made the Hill Annex Mine a State Park. To facilitate mine pit site tours at the site, the State periodically pumped water from Hill Annex to reduce water levels between 1988 and 2009. During this time, water was generally pumped at the beginning of each year to lower water levels enough to facilitate these in-pit tours for the remainder of the year. After pumping stopped in 2009, the pit water level began to rise continuously again (Figure 4).

DNR water monitoring

The DNR Division of Lands and Minerals actively monitors the Canisteo and Hill Annex water levels and surrounding groundwater levels to understand the rate of pit water level increase and groundwater flow through the subsurface materials. Hydrologic information gathered near these pit locations aids in the assessment of the need for an engineered outlet structure to prevent future flooding or other impacts.

As of December 2020, the Canisteo water level is within 17 feet of the natural overflow elevation, which is at 1324 feet (Figure 3). With the pit water level rising at a rate of approximately 5 feet per year, water may begin naturally overflowing in 2 to 3 years. There are two natural overflow locations at elevation 1324 feet along the pit rim, one of which is located directly north of the city of Bovey. Our groundwater monitoring indicates that groundwater outflow from the pit moves to the south. The current hydrologic conditions in nearby communities demonstrate the need to design and construct an engineered outlet for the Canisteo.

As of October 2020, the Hill Annex water level is 53 feet below the natural overflow elevation, which is 1368 feet (Figure 4). The pit water level has risen approximately 65 feet since pumping ceased in 2009. The rate of water level rise from 2009 through 2014 was approximately 7 feet per year, but has declined to approximately 5 feet per year from 2014 to present. Water could begin naturally overflowing in 7 to 10 years. There are three natural outflow locations at elevation 1368 feet along the pit rim. As Hill Annex continues to gain water, additional work is needed to understand possible hydrologic impacts to nearby communities. The installation of additional groundwater wells is needed in the area to monitor for groundwater outflow from the pit to the surrounding communities.

2008 Allocation of Bonding dollars to DNR

In 2008, the DNR received \$3.5 million in bonding funds for a grant to the Western Mesabi Mine Planning Board (WMMPB) in response to the rising water level. The funds were allocated to construct a conveyance system and other betterments to accommodate water level and outflow control of the water level in the Canisteo. Below is an excerpt of the 2008 bonding language.

2008 Minn. Law Chap. 179, Sec. 7, Subd. 3 (j)

\$3,500,000 is for a grant to the Western Mesabi Mine Planning Board to construct a conveyance system, and other betterments to accommodate water level and outflow control of the water level in the Canisteo mine pit in Itasca County. This appropriation does not require a local match. The commissioner of natural resources shall be responsible to maintain the betterments after completion of the project.

The DNR used a portion of these funds to design an outlet and conveyance system to control the pit water level, and construct a drain tile system in the city of Bovey in 2011. The drain tile system diverts groundwater away from residential structures located within the city. As part of the outlet and conveyance system design work, the DNR generated various technical studies and reports, including the assessment of alternative outlet routes. These studies and reports are available upon request. The completed engineered outlet design, creation of specification for bid, and drain tile system construction, consumed more than half of the allocated funds for the project (Table 1). Following receipt of the bid package to complete the outlet project work, totaling \$3,100,000.00, it became evident that an additional \$1,446,165.20 would be needed.

With the need for additional funding and Magnetation LLC's proposal to dewater the Canisteo for future mining, the DNR then decided to not to move forward with construction of the outlet. Consistent with the 2008 bonding bill language, the remaining funds, totaling \$1,653,834.80, were reallocated to other Flood Hazard Mitigation Grant projects located in the cities of Austin, Granite Falls, and Inver Grove Heights. Below is an excerpt of the 2008 bonding language authorizing this reallocation.

2008 Minn. Law, Chap. 179, Sec. 7, Subd. 3

For any project listed in this subdivision that the commissioner determines is not ready to proceed or does not expend all the money allocated to it, the commissioner may allocate that project's money to a project on the commissioner's priority list .

Description	Expense
Canisteo outlet engineering and design	\$401,184.73
Bovey drain tile engineering and design	\$174,728.50
Bovey drain tile construction	\$667,993.61
Management of the construction contract for the drain tile system	\$602,258.36
TOTAL	\$1,846,165.20

Table 1 – 2008 Bonding dollar expenditures and associated work completed for the Canisteo

Canisteo and Hill Annex outlet projects

State agencies worked collaboratively to gather data at the Canisteo and Hill Annex pits between 2018 and 2020. Work has included collecting water quantity and quality information from these pits, as well as data from nearby surface waters that may serve as receiving waters for any constructed outlet (Table 2). This work was partially funded by DIRRR.

The DNR received \$2,000,000 in a 2020 legislative appropriation to be used for predesign, design, and engineering of outlets for the Canisteo and Hill Annex. A portion of these funds was used to hire a contractor (BARR) to begin work on updating the previous engineering and design for the Canisteo outlet as needed since the majority of the design is still usable. (Table 3.) Once all of the necessary data collection and modeling has been completed at the Hill Annex the DNR will move towards pre-engineering and design of an outlet. For needed work that cannot be funded by bonding dollars, the DNR secured a grant for \$442,500 from the DIRRR. These funds only partially cover necessary work. The DNR estimated it would need \$885,000 to conduct work prior to starting the engineering and design that cannot be paid for by bonding dollars. Once a final design has been completed for the Canisteo and Hill Annex and the DNR has received a cost estimate for potential outlet routes, funding would be needed to secure leases, construct outlets, and pay for operation and maintenance.

Year	Description of work completed
2018	<ul style="list-style-type: none"> • Installed continuous stream gaging equipment on the Prairie River for the Canisteo Outlet Route. • Installed continuous stream gaging equipment on the Swan River for the Hill Annex Outlet Route. • Collected and analyzed water quality samples at seven locations for the Canisteo Outlet Route. • Collected and analyzed water quality samples at ten locations for the Hill Annex Outlet Route. • Received \$30,000 from DIRRR to cover the cost of the stream gaging equipment and water quality sampling. • Worked with MPCA to review water quality sampling results.
2019	<ul style="list-style-type: none"> • Continued to collect stream flow measurements on the Prairie River for the Canisteo Outlet Route. • Continued to collect stream flow measurements on the Swan River for the Hill Annex Outlet Route. • Collected and analyzed water quality samples at seven locations for the Canisteo Outlet Route. • Collected and analyzed water quality samples at ten locations for the Hill Annex Outlet Route. • Received \$50,000 from DIRRR to continue collecting stream flow measurements and cover the cost of water quality sampling. • Worked with MPCA to review water quality sampling results. • Worked with the WMMPB, and local city leaders to support bill language for engineering and design work for the Canisteo and Hill Annex Outlet Routes.
2020	<ul style="list-style-type: none"> • Continue to collect stream flow measurement on the Prairie River for the Canisteo Outlet Route. • Continue to collect stream flow measurements on the Swan River for the Hill Annex Route. • Held meetings with the Office of School Trust Lands to draft lease language that would allow for conveyance of water across School Trust Lands along the Canisteo Outlet Route. • Held a meeting with Itasca County to discuss the Canisteo Project and leasing options. • Held a meeting with Glacier Park Iron Ore Properties to discuss Canisteo Project and leasing options. • Held a meeting with Prairie River Minerals to discuss Canisteo Project and leasing options. • Worked with the Western Mesabi Mine Planning Board, Itasca County and local city leaders to support bill language for engineering and design work for the Canisteo and Hill Annex Outlet Routes.

Table 2 - Canisteo and Hill Annex outlet project work summary

In-progress Canisteo work

The DNR continues to work with the DIRRR, WMMPB, and Itasca County to discuss and plan for the outlet project. These discussions include planning for engineering and design, construction funding, leasing, and operation and maintenance costs. The DNR is holding conversations with all landowners (Itasca County, Arbo Township, State of Minnesota, Glacier Park Iron Ore Properties, and Prairie River Minerals LLC) along the proposed outlet route to finalize lease language and determine associated fees.

BARR is continuing work with the DNR to finalize the engineering and design, and update plans and specifications for bidding the project. Figure 5 shows a draft of the engineering design plan for the proposed outlet route. A detailed list of work to be completed is as follows:

Review existing site conditions and collect additional data

- Outlet route site visit
- Conduct pit slope topographic surveys
- Survey existing infrastructure changes
- Review existing slope stability models
- Assess current slope stability concerns
- Update existing design drawings
- Update existing wetland delineation

Update outlet project cost

- Update construction cost estimate (including leases, and operation and maintenance cost)
- Update final design cost estimate (Draft received and under review)

In-progress Hill Annex work

Existing groundwater monitoring data are limited to four wells located in Calumet (Figure 6). Increasing the spatial distribution of groundwater wells along the southern pit rim will aid in assessment of water outflow through the surficial sediment and potential impacts to the local groundwater system.

The DNR intends to hire a driller to install an additional six surficial wells and four bedrock wells (Figure 6) south of the Hill Annex. Completion of groundwater well installation is expected in late spring 2021. The estimated cost to complete drilling of all 10 wells is \$368,000. The DIRRR grant will be used for these non-bondable expenses.

Additional data collection and work will assist in future modeling efforts, inform potential outlet route decisions, and help assess possible impacts from rising water levels. Potential work may include bathymetric surveys, pit wall stability analysis, wetland delineations, groundwater modeling. Following the necessary data collection the DNR will start the predesign, design, and engineering at the Hill Annex.

Future funding needs

Additional funds will be needed for the Canisteo outlet project to secure leases, construct the outlet, and pay for operation and maintenance. DNR is in the process of determining these costs and will include them in the next update. If the Canisteo water level continues to rise at a rate similar to those in recent years, water will begin to naturally overflow by 2023-2024. Thus, prioritizing funding and resources to complete this project is crucial, as construction of the outlet is estimated to take one year to complete. The remainder of the bonding dollars will be spent on the predesign, design and engineering at the Hill Annex.

If the Hill Annex water level continues to rise at a rate similar to those in recent years, water will begin to naturally overflow by 2028-2031. Considerable work and data collection, as stated above, are needed to evaluate potential outlet routes and inform decisions. Though the expected timeline for the Hill Annex to naturally overflow is 7-10 years, it is important to continue momentum on this project.

The next status report is due on April 15, 2021.

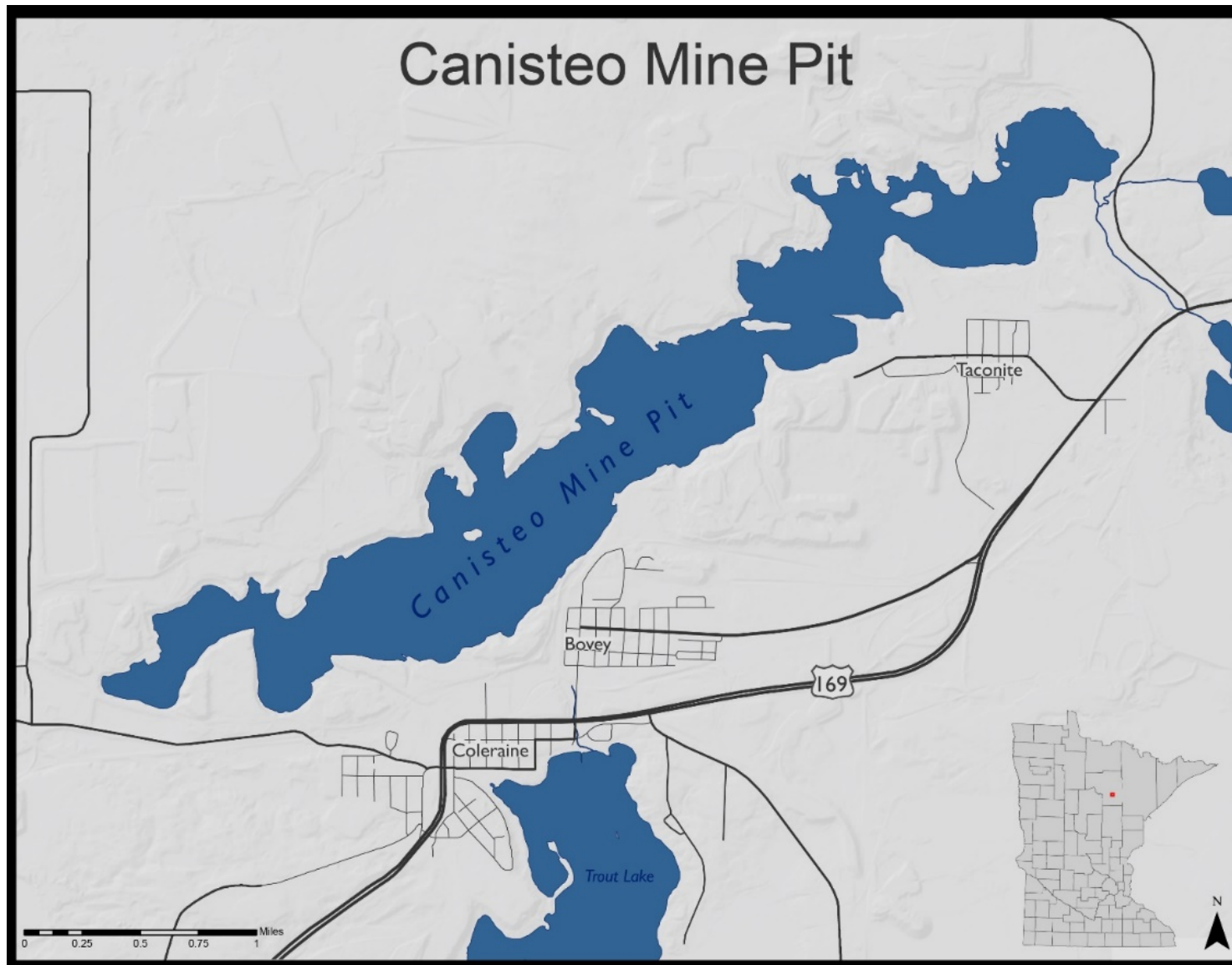


Figure 1 - Map of Canisteo, located north of the cities of Coleraine, Bovey, and Taconite

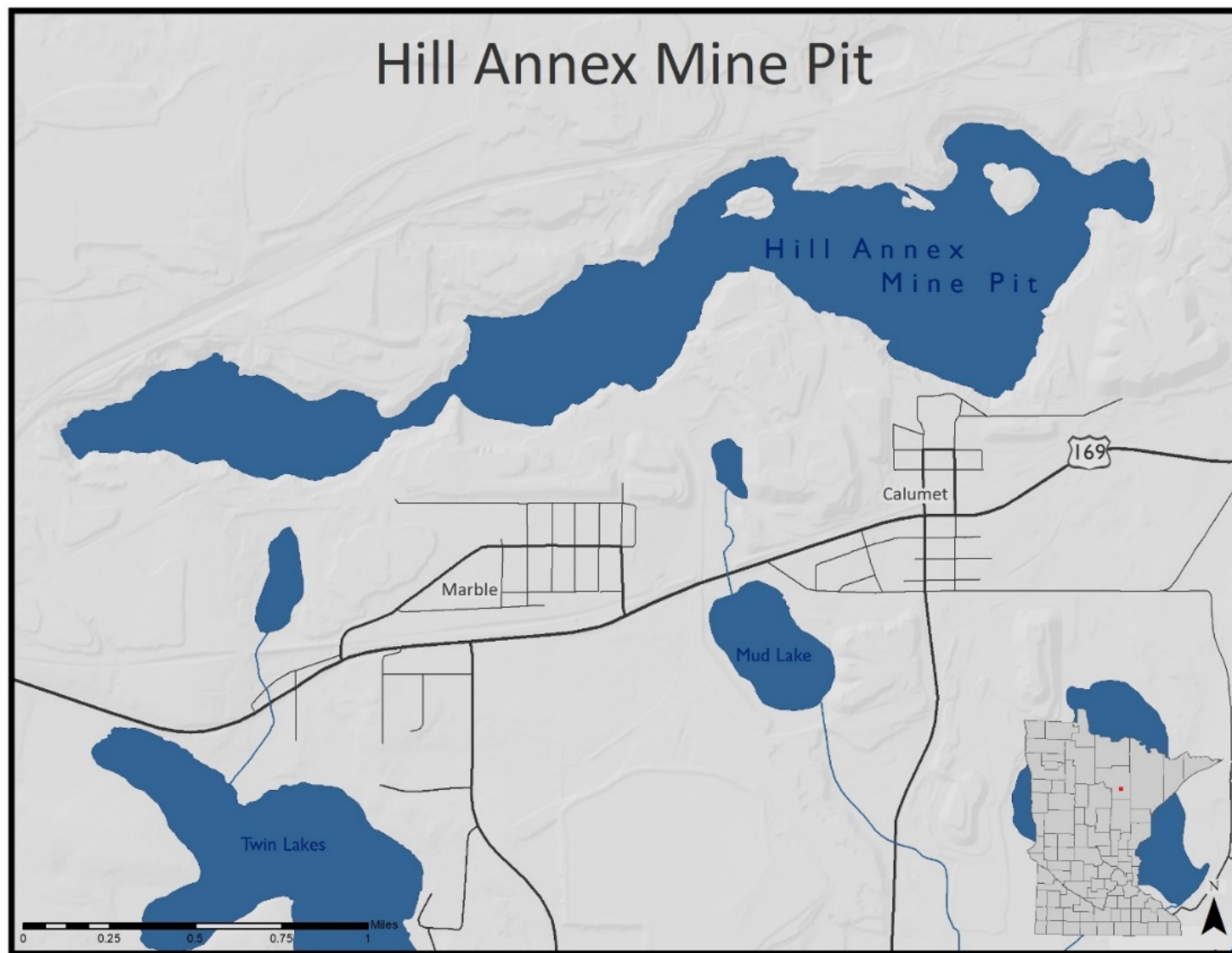


Figure 2 - Map of Hill Annex, located north of the cities of Marble and Calumet

Canisteo Mine Pit Water Levels

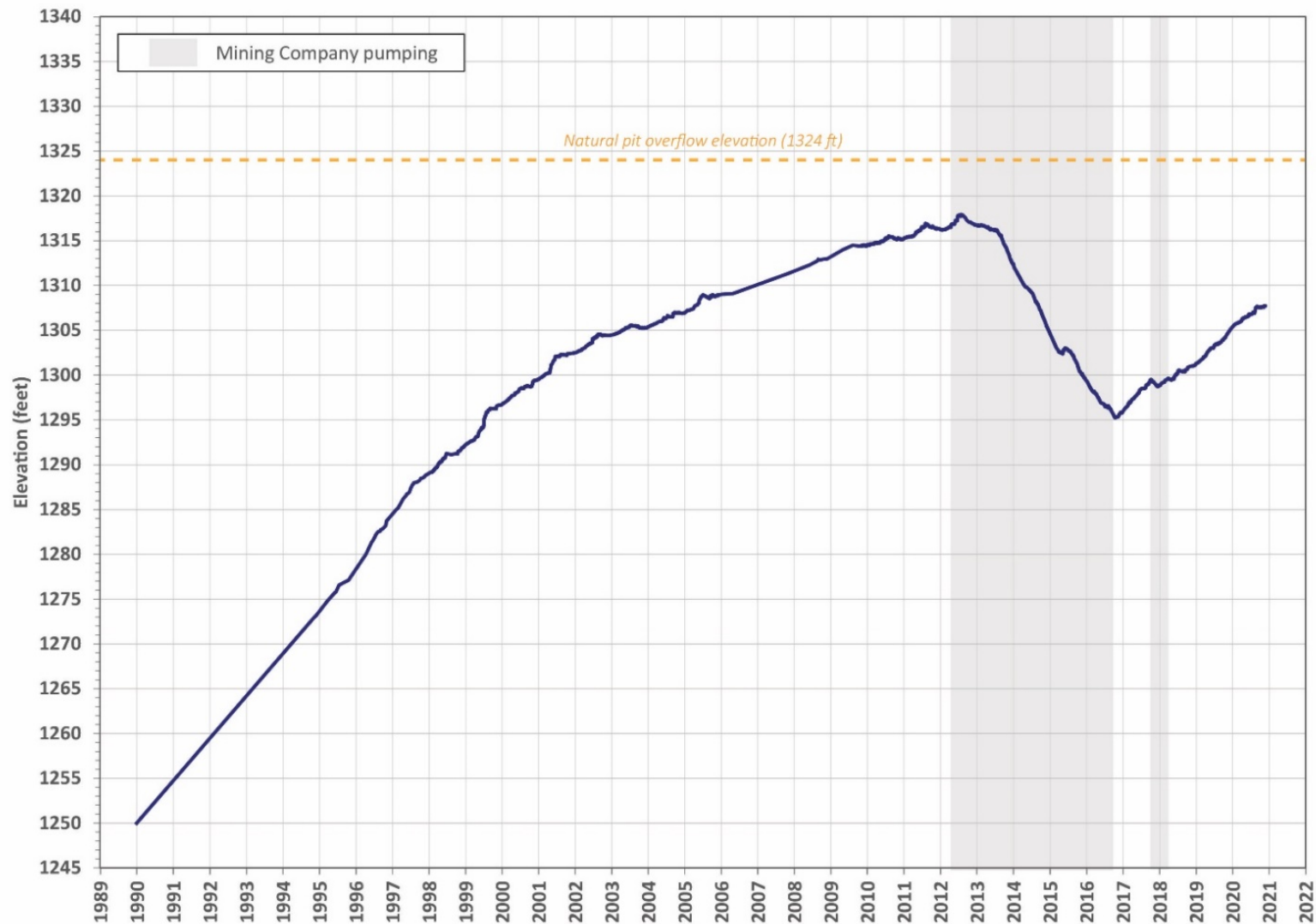


Figure 3 - Canisteo water level relative to the natural pit overflow elevation of 1324 feet. Grey shading represents mining company dewatering, including pumping from 2012 to 2016 by Magnetation LLC and from late 2017 to early 2018 by ERP Iron Ore LLC

Hill Annex Pit Water Levels

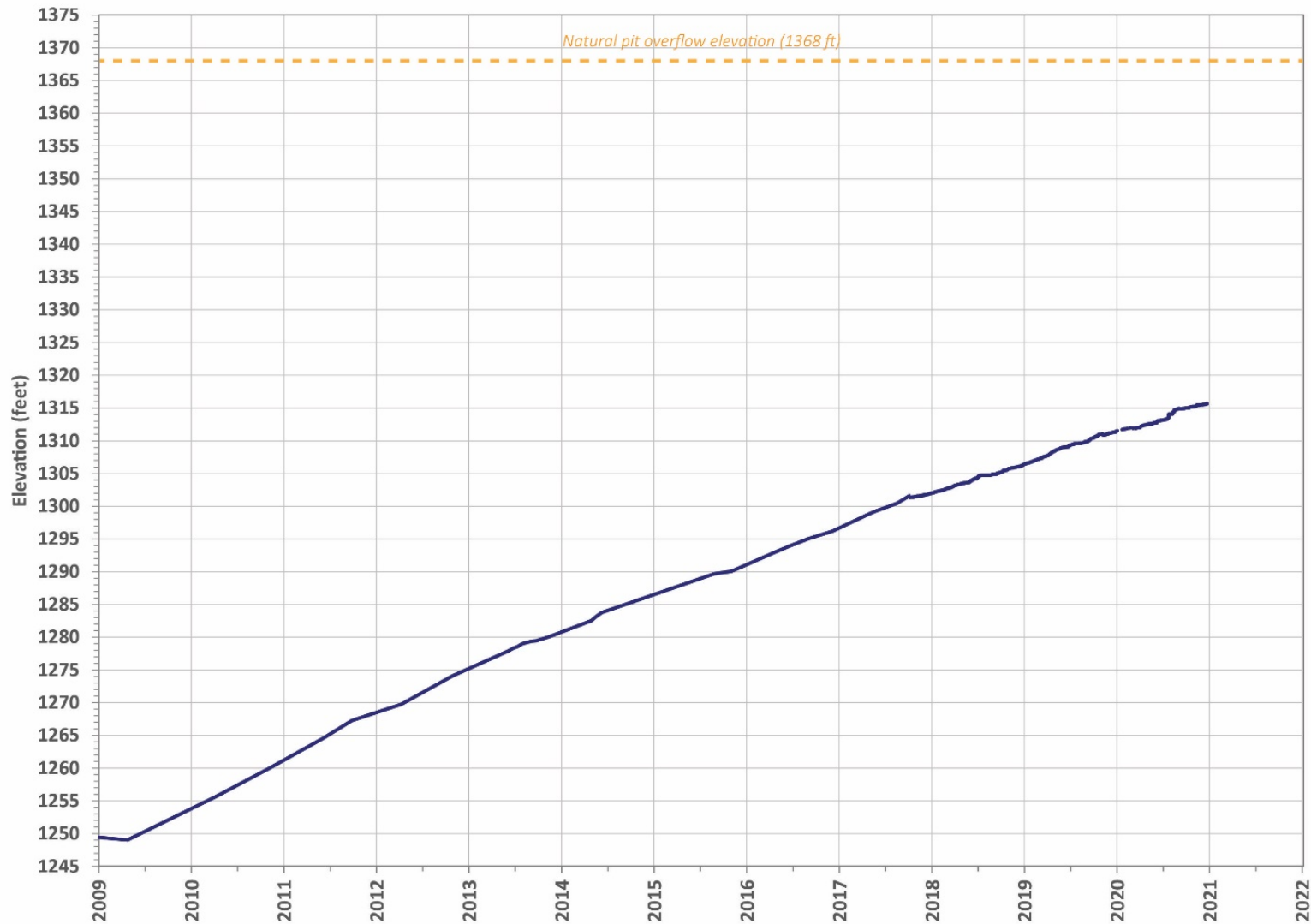


Figure 4 - Hill Annex water level relative to the natural pit overflow elevation of 1368 feet

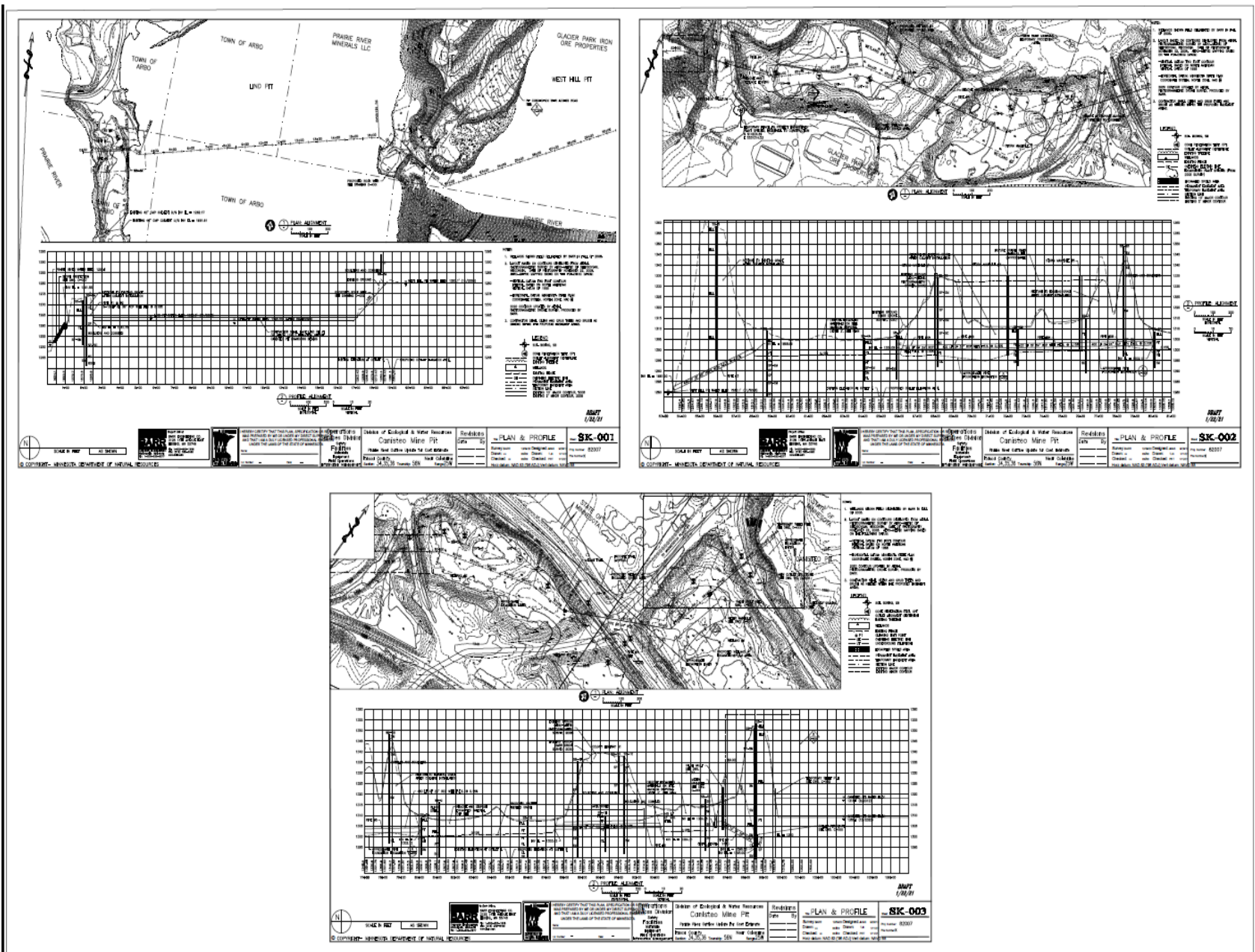


Figure 5. Canisteo Proposed Outlet Route Engineering Design Plan and Profile

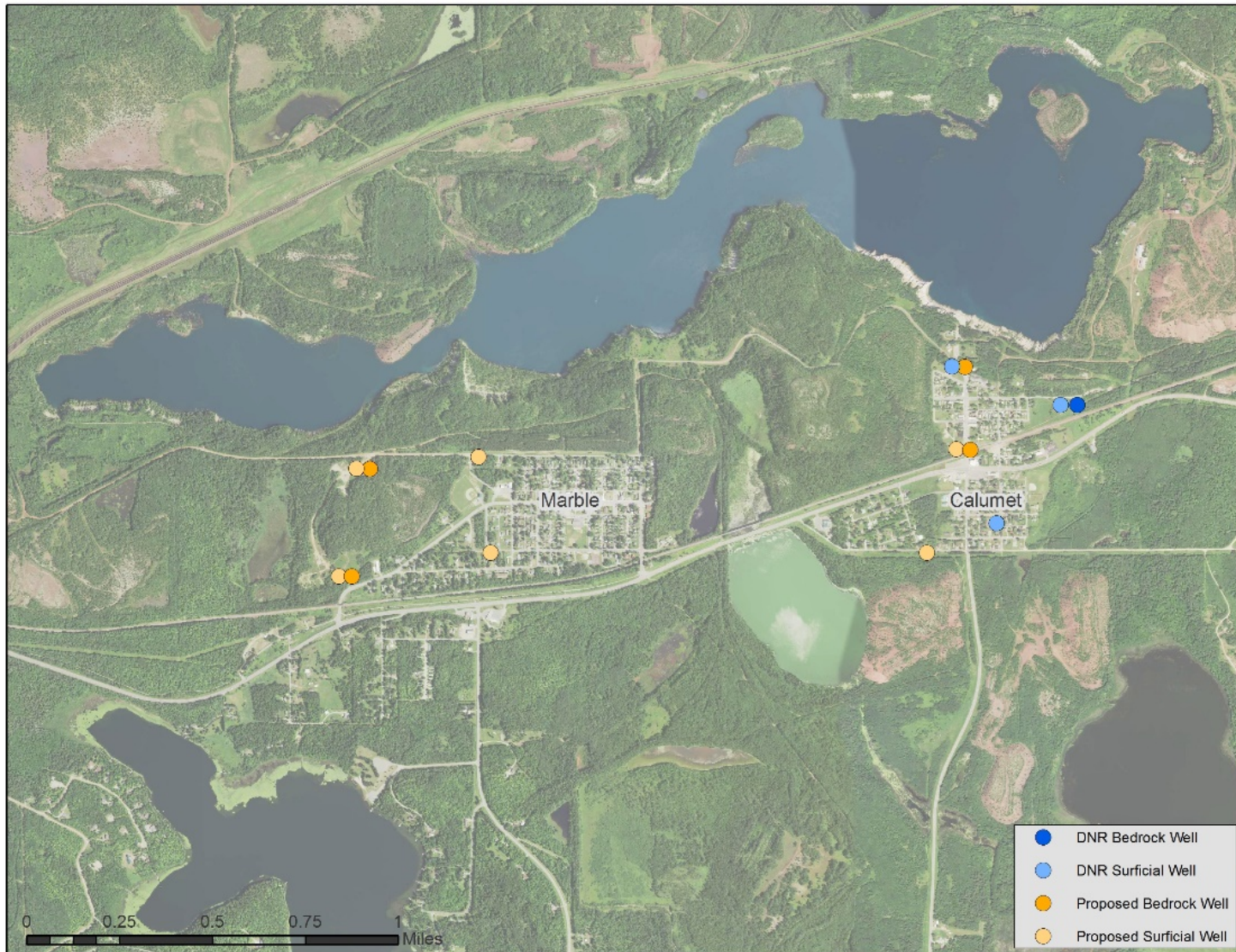


Figure 5 - Proposed locations for additional groundwater wells south of the Hill Annex pit