Magino Gold Project

# MAGINO GOLD PROJECT

Finan Township, Algoma District, Ontario

## ENVIRONMENTAL IMPACT STATEMENT
## CHAPTER 5: ALTERNATIVES ASSESSMENT

**Submitted to:**

Ontario Ministry of Natural Resources
Wawa - District Office
48 Mission Rd Hwy 101
PO Box 1160
Wawa ON P0S 1K0
Tel: 705-856-2396

Canadian Environmental Assessment Agency
Ontario Region
55 St. Clair Avenue East, Room 907
Toronto, Ontario M4T 1M2
Telephone: 416-952-1576

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# TABLE OF CONTENTS

# TABLES

# FIGURES

# 5.0 EVALUATION OF ALTERNATIVES

## I. Introduction

As indicated in Chapter 1, Prodigy Gold Incorporated (Prodigy) has conducted a Pre-Feasibility Study (PFS) that analysed and evaluated the technical, economic, and geological factors that helped determine whether the mining project could go forward. Prodigy evaluated the economic profitability of the Prodigy Gold Project (Project), including whether the current and/or anticipated price of gold would justify the investment. In making this determination, Prodigy took into account not only the price of gold, but also a variety of alternative methods for carrying out the Project and their technical and economic feasibility. This evaluation was necessary to determine whether or not a specific alternative could be financially supported by the Project, namely determining whether the Project justifies the large sums of money that will be needed to carry out subsequent phases of work.

In this context, the following sections discuss alternatives to the Project and identify, describe and evaluate the alternative methods for carrying out the Project.

## II. Preamble

On March 9, 2017, the Canadian Environmental Assessment Agency (the “Agency”) provided Prodigy Gold Incorporated with the results of a review of the Environmental Impact Statement (EIS) and EIS Summary prepared for the Magino Gold Project. The Agency and federal departments undertook a review of the EIS and considered it in light of the requirements of the Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012. This review resulted in a number of requests (IRC 1-12).

Prodigy Gold prepared IRC responses and amended the existing EIS. In order to aid the reviewer, please note that chapter 5 contains the responses to conform with the requirement outlined in IRCs 5 & 6.

IRC-5 stated the following requirement to conform with the EIS Guidelines “Include a section in Chapter 5 of the EIS on alternatives for mine waste based on the Agency’s OPS and the MMER assessment found in TSD 5”.

This response is located Appendix 5-2, Sections 2-5.

IRC–6 stated the following requirement to conform with the EIS Guidelines “Submit an alternatives analysis for potable water and site drainage works in accordance with the Agency’s Operational Policy Statement.

This response is located Appendix 5-2, Sections 6-7.

## 5.1 Alternatives to the Project

The purpose of the Project is to extract gold from an identified ore body and to sell the recovered gold on global markets. This can only be accomplished through the mining and processing of the identified ore body. Due to the ore body being in a fixed location, there is no feasible alternate location or other alternative to the Project except for a “No Project” Alternative. A “No Project” Alternative would leave the ore body in place. The mine would not be developed, and the beneficial effects of the Project would not occur.

## 5.2 Mine Waste Disposal Alternatives Evaluation

Under Canadian regulation, it is expected that natural water bodies frequented by fish be avoided to the extent practicable for the long-term disposal of mine waste, and that mine waste be managed to ensure the long-term protection of Canada’s terrestrial and aquatic environment.

Using a natural water body frequented by fish for mine waste disposal requires an amendment to the Metal Mining Effluent Regulations (MMER). Schedule 2 of the MMER lists water bodies designated as Tailings Impoundment Areas (TIAs) or Tailings Management Facilities (TMF). A water body is added to that Schedule 2 through a regulatory amendment.

The MMER is administered by Environment Canada (EC). EC has developed a guidance document entitled “Guidance for Proponents on the Federal Process for Designating Metal Mine Tailings Impoundment Areas” (EC Guidelines, 2011). This guidance document describes the process that must be undertaken when a proponent is considering using a natural water body frequented by fish as a TIA or TMF such that a regulatory amendment to the MMER would be required. In the context of these guidelines, the term TIA or TMF refers to a natural body of water frequented by fish into which deleterious substances such as low grade ore, tailings, mine rock, overburden and any effluent that contains any concentration of the deleterious substances specified in the MMER are disposed.

### 5.2.1 Alternatives Assessment for Mine Waste Disposal Alternatives

In accordance with the EC Guidelines, Prodigy has undertaken a comprehensive alternative assessment for mine waste disposal.

Six different tailings disposal methods were considered along with ten potential candidate sites for the location of the TMF. This assessment concluded that the optimal disposal methods for the Project is the disposal of thickened tailings. The preferred site for disposition of the tailings and the mine rock is on the Prodigy site as shown on Figure 5-1.

Details of this evaluation are presented in TSD 5.

### 5.2.2 Water Bodies Frequented by Fish Impacted by the Proposed Site Layout

Figure 5-1 presents an overlay of the proposed site layout on the site topography and identifies the water bodies that will be impacted by this layout.

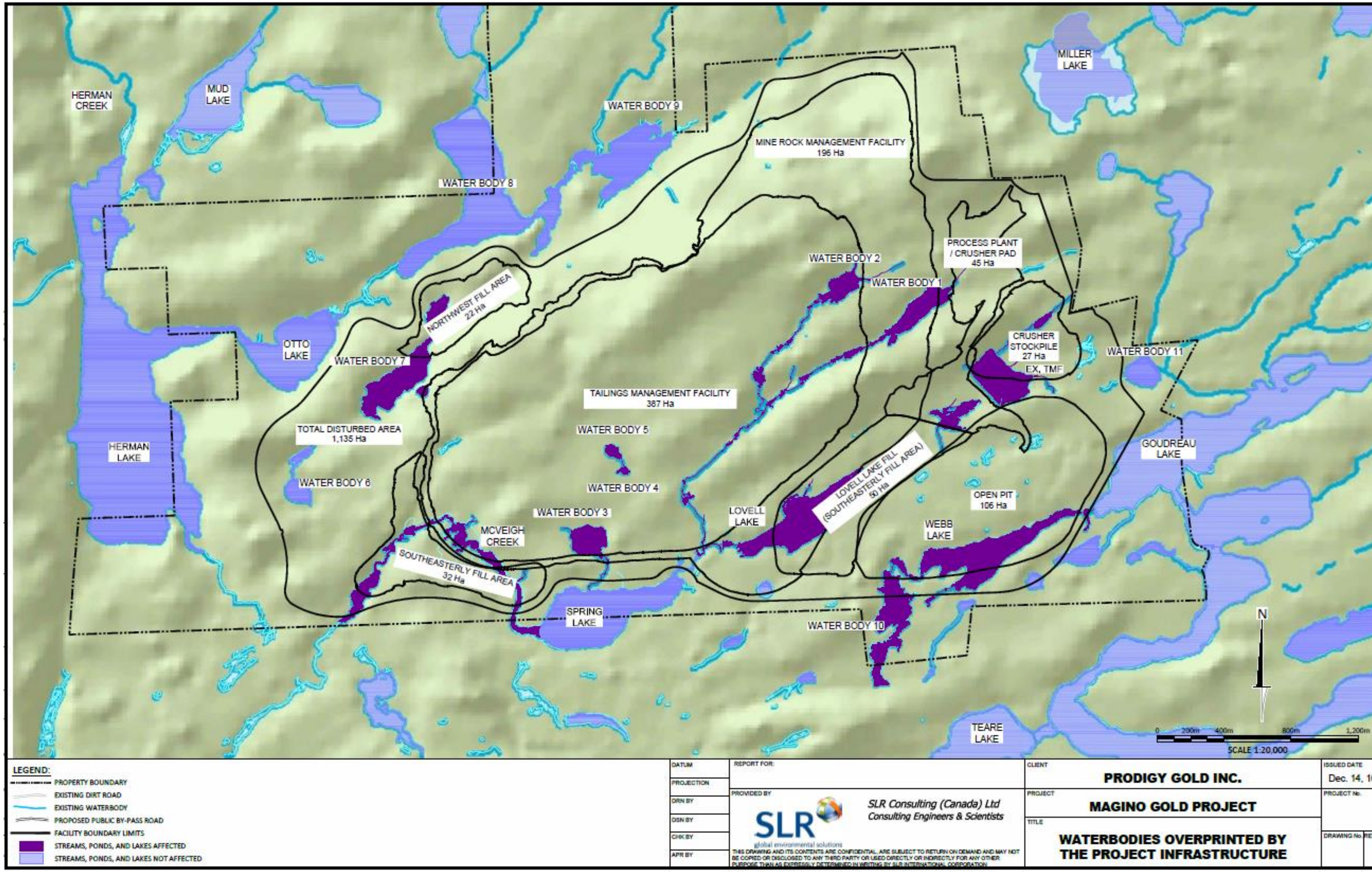
The water bodies impacted are identified in Table 5-1.

## Table 5-1: Water Bodies Impacted by the Proposed Layout

| **Summary of total habitat ($m^2$) lost to the Magino Mine** | | | |
|---|---|---|---|
| Habitat | Schedule 2 ($m^2$) | Fisheries Act Authorization ($m^2$) | Total Lost Habitat ($m^2$) |
| Stream | 22,024 | 84,705 | 106,729 |
| Waterbody | 313,835 | 202,363 | 516,198 |
| **Breakdown of habitat ($m^2$) by waterbody and watershed lost to development of Magino Mine** | | | |
| **McVeigh Creek Watershed - Streams** | | | |
| Inlet to Waterbody 2 | Schedule 2 | TMF / MRMF | 43 |
| Waterbody 2 to confluence with McVeigh Creek Tributary | Schedule 2 | TMF / MRMF | 6,572 |
| Waterbody 1 to confluence with Unnamed Tributary | Schedule 2 | TMF / MRMF | 8,270 |
| McVeigh Creek Tributary to confluence with McVeigh Creek | Schedule 2 | TMF / MRMF | 3,609 |
| Sedimentation Pond to Lovell Lake | Schedule 2 | Stockpile/Fill Area | 981 |
| Lovell Lake to Spring Lake | Schedule 2 | TMF / MRMF | 2,313 |
| Waterbody 3 to Spring Lake | Schedule 2 | TMF / MRMF | 223 |
| McVeigh Creek (downstream of Spring lake) | FAA | TMF/MRMF/ Stockpile/Fill Area and Decrease in Water Flow | 69,361 |
| McVeigh Creek (downstream of Spring Lake) to Summit Lake | FAA | Decrease in Water Flow | 5,107 |
| **Total** | | | **96,477** |
| **Webb-Goudreau Lake Watershed - Streams** | | | |
| Waterbody 10 to Webb Lake and Upstream Inlets to Webb Lake | Fisheries Act Authorization | Open Pit | 9,775 |
| Webb to Goudreau Lake | Fisheries Act Authorization | Open Pit | 462 |
| **Total** | | | **10,237** |
| **Herman Otto Lake Watershed** | | | |
| Outlet of Waterbody 7 | Schedule 2 | Stockpile / Fill Area | 19 |
| **McVeigh Creek Watershed - Waterbody** | | | |
| Waterbody 2 | Schedule 2 | TMF / MRMF | 23,236 |
| Waterbody 1 | Schedule 2 | TMF / MRMF | 36,189 |
| | Fisheries Act Authorization | TMF / MRMF (outside footprint) | 5,656 |

| Summary of total habitat ($m^2$) lost to the Magino Mine | | | |
|---|---|---|---|
| Habitat | Schedule 2 ($m^2$) | Fisheries Act Authorization ($m^2$) | Total Lost Habitat ($m^2$) |
| Lovell Lake | Schedule 2 | TMF / MRMF / Stockpile / Fill Area | 131,977 |
| Pond | Fisheries Act Authorization | Plant / Crusher Pad | 18,601 |
| Waterbody 3 | Schedule 2 | TMF / MRMF | 28,871 |
| Waterbody south of Lovell Lake | Schedule 2 | | 5,319 |
| | Fisheries Act Authorization | TMF / MRMF (outside footprint) | 1,028 |
| **Total** | | | **250,876** |
| **Webb-Goudreau Lake Watershed - Waterbody** | | | |
| Webb lake | Fisheries Act Authorization | Open Pit | 114,408 |
| Waterbody 10 | Fisheries Act Authorization | Open Pit (drawdown) | 14,176 |
| | | | 48,494 |
| **Total** | | | **177,078** |
| **Herman Otto Lake Watershed - Waterbody** | | | |
| Waterbody 7 | Schedule 2 | Water Quality Control Pond / Fill Area | 88,243 |

**Figure 5-1: Water Bodies Impacted by the Proposed Site Layout**



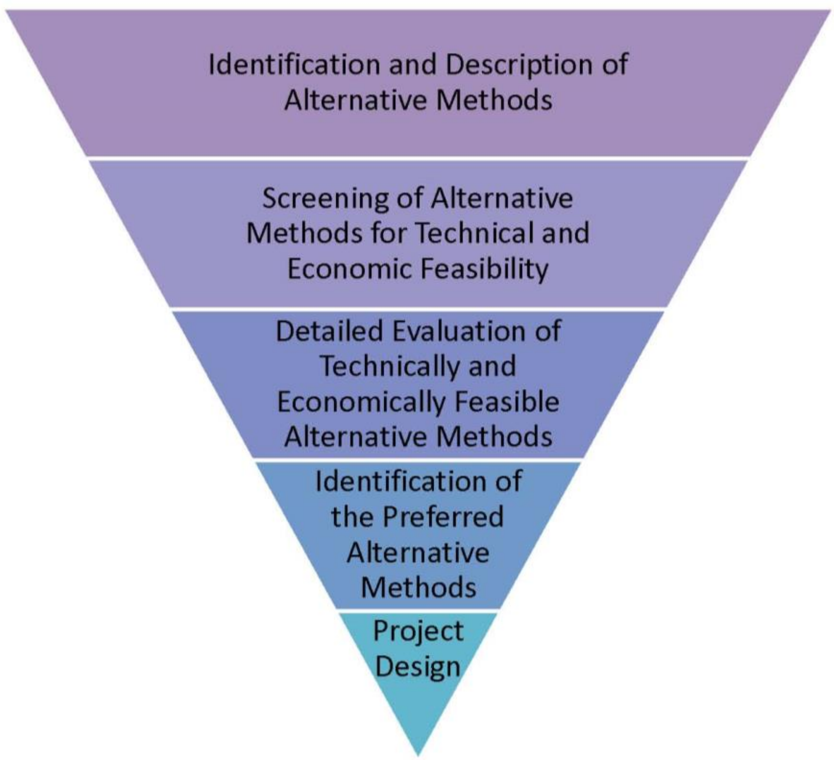
## 5.3 Alternative Methods

The Environmental Impact Statement (EIS) Guidelines requires that Prodigy complete a number of procedural steps for addressing alternative methods of carrying out various components of the Project. The key steps are:

1. Identify alternative means to carry out the project, including describing each alternative in sufficient detail, developing and applying criteria to determine their technical and economic feasibility, and identifying those alternative means that are technically and economically feasible;
2. Identify the effects of each technically and economically feasible alternative means according to a set of criteria; and
3. Identify the preferred means on the basis of consideration of relative effects and technical and economic feasibility.

On the basis of this guidance and the Agency's Operational Policy Statement (CEAA, 2013), a Project-specific approach to the evaluation of alternative methods was developed that involved four (4) key steps as illustrated in Figure 5-2. These four steps result in the identification of the preferred alternative methods that form part of the Project design. These methods are described in more detail in Chapter 6 and assessed in Chapters 7, 8 and 9 of this EIS.

**Figure 5-2: Approach to Evaluation of Alternative Methods**




### 5.3.1 Identification and Description of Alternative Methods for the Project

The EIS Guidelines require that Prodigy identify, describe, and evaluate a variety of alternative methods for the construction, operation, and closure of the Project, including those identified in the EIS Guidelines; namely:

- Location of key project components;
- Energy sources to power the Project site; and
- Water management facilities (potable and process) and general site drainage works.

Table 5-2 lists the alternatives identified for each major Project component, based on Prodigy's PFS studies, and taking into consideration input gained from local communities, Aboriginal groups, and government. This list of alternatives represents those that are considered reasonable given the Project location, the configuration of the ore body, the size of the Magino Property, the constraints imposed by legal boundaries (i.e., available tenure area), and the available infrastructure both on and off site. The following subsections describe each of the alternatives in Table 5-2 at a level of detail that is consistent with the information presented in the PFS.

**Table 5-2: Identified Alternative Methods for the Project**

| COMPONENT | ALTERNATIVE |
|---|---|
| Mine Waste Disposal Alternatives | Five disposal technologies<br>Ten candidate sites for Tailing Management Facility |
| Mine Development | Underground mining |
| | Open pit mining |
| Ore Processing | Heap leaching on a lined pad |
| | Non-cyanide processing methods |
| | Processing by milling and cyanide leaching including a cyanide destruction circuit |
| | Processing by milling and cyanide leaching using a cyanide destruction circuit and natural cyanide destruction |
| Ore Processing Location | On-site processing |
| | Off-site processing |
| Ore Processing Rate | Mill capacity of 25,000 tpd for a 14 years' operating period |
| | Mill capacity of 35,000 tpd for a 10 years' operating period |
| Power Supply | On-site power generation using renewable power sources |
| | On-site power generation using diesel power sources |
| | Off-site power generation and transmission to the mine site by Algoma Power Incorporated (API) and on-site power generation. |
| Transmission Line Re-routing through the Site | North Route |
| | Central Route |
| | South Route |
| Process Water Supply | Use of water from the mine pit and recycling of water |
| | New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water |

| COMPONENT | ALTERNATIVE |
|---|---|
| | New supply from Herman and Goudreau Lakes, including the use of water from the mine pit and recycling of water |
| | New supply from Magpie River, including the use of water from the mine pit and recycling of water |
| | New supply from groundwater wells, including the use of water from the mine pit and recycling of water |
| Non-hazardous, non-mining Solid Waste Disposal | On-site landfill |
| | Off-site landfill near Dubreuilville |
| | Export to a more remote landfill |
| Access Roads to the Magino Property | Goudreau Road for all Project traffic |
| | Goudreau Road and the Northern Bypass for heavy loads |
| | New road from Hawk Junction |
| | Service road from CN rail line to Mill site |
| On-site Relocation of Goudreau Road | Relocation of Goudreau Road to the west of the TMF & MRMF Area |
| | Relocation of Goudreau Road to the west of the open pit |
| Accommodations | All accommodations to be provided by the local communities |
| | Accommodations to be provided in the local communities and an accommodation complex on the Magino Property |
| | Accommodations to be provided in the local communities and an off-site accommodation complex located in Dubreuilville |
| Mine Pit Closure | Pit lake filling from local surface runoff and groundwater inflow |
| | Pit lake filling from local surface runoff and groundwater inflow plus in-pit disposal of mine rock and/or tailings. |
| | Pit lake filling from local surface runoff and groundwater inflow plus operations water supply |
| Closure of TMF | Closure with soil cover and revegetated surface of the TMF deck |
| | Closure by creating a wetland and/or waterbody on the TMF deck |

#### 5.3.1.1 Mine Development

There are two basic ways in which a mine can be developed for a fixed ore body: underground mining and open pit mining.

Underground Mining

Underground mining is a technique typically used to exploit large, high grade, deep ore bodies with an advantageous shape or orientation that facilitates mine construction and operations. This involves accessing the ore body by using vertical shafts, adits, and/or declines (i.e., ramps) and transporting the mined materials to the surface (e.g., via shaft lifts, trucks, or conveyors).

The past-producing mine at this location was an underground mine that exploited a high-grade ore body. At present, most of the old mine infrastructure has been removed and the underground workings have been flooded and subsequently sealed to prevent entry.

Open Pit Mining

Open-pit mining is a surface mining technique of extracting ore from the earth when a commercially viable deposit is found near the surface, or where the ore is disseminated over a large area. Open pit mining is used where the ore body is widely disseminated within the rock mass and the overburden material is relatively thin. Open-pit mines are typically expanded until either the ore body is exhausted or until further excavation and ore concentrations are uneconomic to mine.

#### 5.3.1.2 Ore Processing

Ore processing is undertaken to separate the commercially valuable gold from the ore and other mine rock such that it can be rrefining into gold bars (also referred to as doré). The process of separating the gold from the ore and mine rock involves primary crushing, grinding, cyanide leaching, gold recovery and, where relevant, the treatment of tailings to destroy cyanide.

The alternative methods for ore processing include:

1) Heap leaching;
2) Non-cyanide processing methods;
3) Processing by milling and cyanide leaching using a cyanide destruction circuit; and
4) Processing by milling and cyanide leaching using a cyanide destruction circuit, plus natural cyanide destruction.

Natural cyanide destruction on its own is not considered to be a feasible stand-alone alternative but it can be considered in combination with other cyanide leaching alternatives.

Heap Leaching on a Lined Pad

The Heap Leaching Alternative involves crushing the ore, stacking it on an area that is graded and lined with plastic, and using buried drip irrigation systems to distribute cyanide solution over the heaped material. The cyanide solution slowly dissolves gold and trickles down to the base of the heap leach pile and onto a pad. Depending on the gold concentration in the solution, the liquid is either recirculated through the heap to further dissolve the gold or it is stored in a large pond for further processing. The dissolved gold in the “pregnant solution” is extracted using carbon adsorption, desorption, and electrowinning.

Water consumption and discharges are important factors in selecting the ore processing alternatives. Heap leaching would require approximately 200 cubic metres per day ($m^3$/day) of water. Discharges of water collected in the ore pit during mining are estimated to be approximately 6,300 $m^3$/day on average during the maximum discharge year.

Closure would require “rinsing” of the heap leach pile to recover the residual cyanide solution. Rinse water would be treated and discharged in accordance with applicable permit requirements.

Non-Cyanide Processing Methods

Non-cyanide ore processing methods involve the use of alternative extraction agents for gold, such as chloride, bromide, thiourea, and thiosulfate.

Process by Milling and Cyanide Leaching including a Cyanide Destruction Circuit

This alternative consists of crushing the ore and then grinding it into fine particles in a mill where gold is extracted by leaching with cyanide solution and carbon in tanks. Processing by mill and cyanide is widely used throughout the world in the gold mining industry. Cyanide has been used for more than a century for the recovery of precious metals and is a proven technology for recovering gold from ore in an environmentally safe, efficient, and economical manner. Cyanide is the most common reagent employed by precious metals mining operations throughout the world, and is responsible for recovery of over 90 percent (%) of the world's annual gold production. Destruction of cyanide in the mill tailings will be undertaken using a separate set of mixing tanks and oxidizing agents that break down the cyanide before the tailings are placed in the Tailings Management Facility (TMF).

Ore processing by milling and cyanide leaching using a cyanide destruction circuit, would require approximately 1,680 $m^3$/day of water for the operation phase. Water discharges are estimated to be approximately 1,750 $m^3$/day on average during the summer period. Closure would require the discharge of surface water from the supernatant remaining on top of the TMF. Residual seepage through bedrock under the TMF would be managed in accordance with the Certified Closure Plan and discharged in accordance with applicable permit requirements.

Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit and Natural Cyanide Destruction

This alternative consists of the same ore processing circuit as above, with additional natural cyanide destruction in the TMF (i.e., natural cyanide destruction). Here, the cyanide solution is would be placed in exposed ponds in the TMF and aerated (via use of sprinklers) to allow natural attenuation reactions to occur, lowering the cyanide concentration. These attenuation reactions include natural volatilization of hydrogen cyanide, oxidation, hydrolysis, photolysis, and precipitation.

Closure would require the discharge of surface water from the water pond remaining on top of the TMF. Residual seepage through bedrock under the TMF would be managed in accordance with the Certified Closure Plan and discharged in accordance with applicable permit requirements

#### 5.3.1.3 Alternative Process Plant Locations

There are two basic locational alternatives for ore processing:

1) off-site processing, and
2) on-site processing.

Off-site processing would be undertaken at a fixed or pre-determined location.

On-Site Processing

On-site ore processing would involve the construction and operation of a processing plant within the legal boundaries of the Magino property. There are several locations that are considered technically feasible. Alternative process plant locations were considered during the preparation of the PFS. Emphasis was placed on identifying a location that would support efficient and cost-effective mine operations. The preferred location is north of the open pit rim. More northerly locations were eliminated from further consideration because they did not provide any technical, economic, or environmental advantages.

Off-Site Processing

Off-site ore processing would involve transporting to other off-site gold mines or existing milling facilities within a reasonable haul distance (<150 km) using trucks or a combination of truck and rail-haul.

#### 5.3.1.4 Power Supply

Electricity is needed for mine operations. The maximum power needs of the Project are estimated to be between 37 and 40 megawatts (MW) with a connected load of 50 MW. An existing single-circuit 44 kilovolt (kV) transmission line owned by Algoma Power Incorporated (API) currently services the property. This transmission line originates near Highway 101, south of Hawk Junction. The line provides power to the towns of Hawk Junction and Dubreuilville, to the settlements of Goudreau, Lochalsh and Missanabie, and to the Richmont Mine.

The alternative methods for power supply include:

1) On-site power generation using renewable power sources;
2) On-site power generation using diesel power sources; and
3) Off-site power generation and transmission to the mine site by API transmission line, combined with on-site power generation. Diesel fuel for this purpose would be trucked to the site and stored in fuel tanks.

On-site Power Generation Using Renewable Power Sources

Generation of power is possible through on-site wind and/or solar electric power generation. Assuming a typical wind turbine of 2 MW nominal capacity, a wind farm of at least 120 turbines would be required to generate approximately 50 MW of power (corresponding to connected load). Solar power would have a very large footprint.

On-site Power Generation Using Diesel-Power Sources

This alternative would consist of up to approximately 50 MW of diesel-fired electric generation on-site to meet the Project’s electric demand needs. For this alternative, the existing API transmission line would still need to be relocated around the mine pit area. However, power from the transmission line would not be used to operate the Project. Diesel fuel would be trucked to the site and stored in fuel tanks.

Off-site Power Generation and transmission by API

To use power from the existing API transmission line, a new substation would be required on-site to transfer power. An additional 3 MW of diesel-fired electric generating capacity would be installed on-site and owned and operated by Prodigy to provide power during the construction phase, and for back-up power during subsequent phases. Diesel fuel would be trucked to the site and stored in fuel tanks.

API completed a power supply study jointly with Great Lakes Power Transmission, which determined that a number of transmission options could service the Project as well as other potential demands in the region. API has also initiated a system impact assessment with regards to their plans to increase the capacity of their existing transmission infrastructure. Should API not proceed with these upgrades in time for the Project, the other alternatives are available as contingencies and would need to be reconsidered in terms of their technical and economic feasibility.

#### 5.3.1.5 Transmission Line Re-Routing

The existing API transmission line will need to be relocated around the open pit. The relocated transmission line would continue to use above-ground wood pole structures and could be constructed within a right-of-way (ROW) of approximately 30 m width. Three alternative power line re-routing alternatives have been identified. As shown on Figure 5-3, these include:

1) A North Route;
2) A Central Route; and
3) A South Route.

North Route

The preferred alternative for the on-site relocation of Goudreau Road is to the west of the TMF & MRMF area. Should it be implemented (see Section 5.2.1.12), the North Route would consist of running the realigned transmission line along the side of the re-routed Goudreau Road on the Magino property. Approximately 12 km of new transmission line construction would be required for this alternative.

Central Route

The Central Route alternative would re-route the transmission line between the mine pit and the low-grade ore stockpile. This alternative could be co-located with the re-routed Goudreau Road west of the open pit and/or other internal haul roads. This alternative would require just under 3 km of new transmission line construction.

South Route

The South Route alternative would re-route the transmission line to the south side of Webb and Goudreau lakes, with reconnections to the main transmission line. This alternative would require approximately 5 km of new transmission line construction.

#### 5.3.1.6 Process Water Supply

Water is needed for mine operations. The Project water balance has been modelled (TSD 7). The results estimate that the total fresh water supply needs for the Project could vary over the life of the Project, requiring up to approximately 4,000 $m^3$ per day.

The alternative methods for water make-up supply include:

1) Use of water from the mine pit and recycling of water on-site;
2) A new supply of make-up water from Goudreau Lake;
3) A new supply of make-up water from Herman and Goudreau lakes;
4) A new supply of make-up water from the Magpie River; and
5) A new supply of make-up from groundwater wells.

Each of the make-up water supply alternatives would incorporate maximum use, to the extent practicable, of recycled water from the pit, process plant and the TMF.

Use of Water from the Mine Pit and Recycling of Water On-site

This alternative involves using only water that can be recycled from the pit and TMF, and potentially runoff water from the process plant area. From a water balance perspective, this is possible once the pit becomes established and collects a sufficient amount of groundwater through inflow and precipitation. This could potentially occur several years after the start of mining. Accounting for mine pit water and recycling contributions to the water balance, the Project would require that up to 1.0 or 1.5 million $m^3$/year of water be added as “make up” for water required for gland seeds and reagents, lost to evaporation, permanently spread in the tailings, and any other losses.

New Supply from Goudreau Lake

This alternative would consist of using water from Goudreau Lake for Project make-up water. The associated infrastructure would include a water intake structure in the lake, with a pump station and buried pipeline to convey the water to the intended use locations. The length of pipeline to be constructed is estimated to be 2.1 km from Goudreau Lake. The volume of water to be directly withdrawn from Goudreau Lake is estimated at 4,600 $m^3$/day during operations.

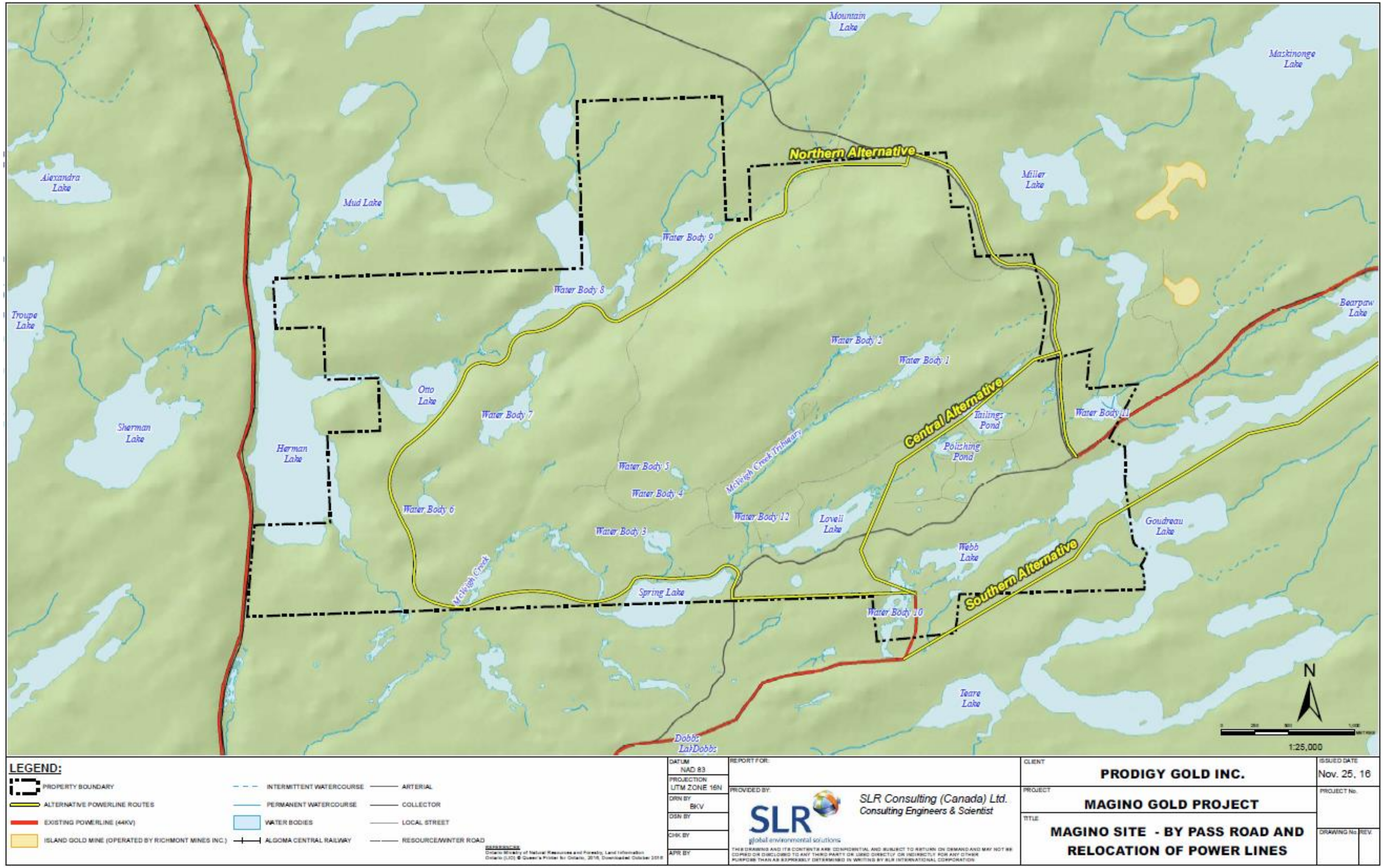
New Supply from Goudreau Lake and Herman Lake

Both Goudreau and Herman lakes have substantial catchment areas that could provide make-up water to the Project. This alternative consists of using both of these lakes instead of just one. The associated infrastructure would include a water intake structure in each of the lakes, with a pump station and buried pipelines to convey the water to the intended use locations. The lengths of pipeline that would need to be constructed from these lakes are estimated to be 2.1 km from Goudreau Lake and 6.5 km from Hermann Lake. The volume of water to be directly withdrawn during operations is estimated at 2,900 $m^3$/day from Goudreau Lake and 1,700 $m^3$/day from Herman Lake.

New Supply from Magpie River

The Magpie River is located 14 km to the west of the Project. The associated infrastructure for this option would include a (straight line) water intake structure in the river, with a pump station and potentially a buried pipeline of approximately 17 km to convey the water to the Project. Further distribution pipelines would be required to convey water to the intended use locations. Much of the 17 km of pipeline would be located outside of the Project site. The volume of water to be directly withdrawn from the Magpie River is estimated at 4,600 $m^3$/day during operations.

**Figure 5-3: Powerline Alternatives**



<u>New Supply from Groundwater Wells</u>

This alternative would involve the siting and construction of one or more well fields for groundwater make-up to provide the required 4,600 $m^3$/day of water during operations. Each well field may also require electrical equipment to power the pumps. A water main would need to be installed, as well as control wiring and power feed for the pumps.

#### 5.3.1.7 Tailings Management and Mine Rock Management

Refer to TSD 5 for discussion of the evaluation and selection of the technologies and disposal site for the tailings and the mine rock management facility.

Thickened tailings and Candidate site G (located on Prodigy's property) were retained as the optimum method and site for disposal of tailings and mine rock.

#### 5.3.1.8 Non-Hazardous, Non-Mining Solid Waste Disposal

Mine operations generate non-hazardous, non-mining solid wastes that require management. These wastes are generally inert or municipal-type non-hazardous solid waste such as food scraps, cardboard, plastics, metal tins, glass, scrap metal, wood, and paper. It is estimated that the total volume of wastes generated by the Magino Project will range from 300 to 500 kg per day.

Along with any of the alternative waste disposal approaches considered, the Project would include waste separation for recycling, with recyclable materials divided into two categories: materials that can be re-used on-site, and recyclables that can be shipped off site to appropriate recycling facilities. For all waste management alternatives, the Project would employ a hierarchy of waste management practices to minimize waste generation. This would prioritize waste prevention, minimization, reuse, and recycling over waste disposal.

Pursuant to Section 46 of the *Ontario Environmental Protection Act* (EPA), the Project would ensure that "no use shall be made of land or land covered by water which has been used for the disposal of waste within a period of twenty-five years from the year in which such land ceased to be so used unless the approval of the Minister for the proposed use has been given." (R.S.O. 1990, c. E.19, s. 46)[1].

The three alternatives for non-hazardous, non-recyclable, non-mining waste management are:

1) On-site landfill;
2) Off-site municipal landfill near Dubreuilville; and
3) Export.

<u>On-site Landfill</u>

This alternative consists of constructing a suitable landfill on the Magino property. This landfill would be designed, constructed, operated, closed, and monitored in accordance with Part V of the EPA and regulations made under the Act, most notably by Ontario Regulation 347 for landfills less than 40,000 $m^3$ in capacity.

[1] Ministry of the Environment, 1990, *Environmental Assessment Act*.

The on-site landfill would be operated by Prodigy staff. Waste materials would be hauled for a distance of approximately 5 km from the worker accommodations and processing plant to the landfill. This would be done on a daily basis (i.e., 1 truck per day).

Off-site Municipal Landfill near Dubreuilville

Prodigy has been consulting with the Town of Dubreuilville regarding its landfill infrastructure and capacity. The current landfill is reaching the end of its useful life and the town is planning for a new landfill. Once constructed, this new landfill could be used for disposal of the Project's non-hazardous, non-mining waste. A contract for the use of Dubreuilville's municipal landfill could be developed to accommodate all of these wastes likely to be generated by the Project. The Project would have to comply with contractual conditions negotiated with the landfill operator. Negotiations would determine Prodigy's contribution towards capital costs (if any).

Waste materials would be stored temporarily in large bins on-site and then hauled for a distance of approximately 15 to 20 km from the mine site to the municipal landfill on a weekly basis (i.e., 1 truck/week). Off-site waste haulage would use existing public roads.

Export

This alternative would involve using trucks to transport waste to other licensed private and/or municipal waste disposal facilities beyond Dubreuilville. Several licensed landfill facilities exist within several hundred km of the Project and would not require expansion to their capacity to accept the Project's wastes. The Project would have to comply with contractual conditions negotiated with the landfill operator.

Waste materials would be stored temporarily on-site in large bins and then hauled for a distance of approximately 350 km from the mine site to the selected landfill on a fortnightly basis (i.e., 2 trucks/month). Off-site waste haulage would use existing public roads.

Railroad transport of this waste is not feasible or cost-effective considering the limited amount of train traffic in the area and the absence of convenient loading facilities.

#### 5.3.1.9 Road Access

A range of alternatives have been identified for Project access (Figure 5-4):

1) Using Goudreau Road for all Project traffic;
2) Using Goudreau Road for light vehicle Project traffic and the Northern Bypass for heavy loads; and
3) Constructing a new road between Hawk Junction and the Project.

These access road alternatives, as well as other roads, may need to be used in emergency situations (e.g., during a road washout) affected the preferred alternative.

Goudreau Road for All Project Traffic

This alternative would use Goudreau Road exclusively for transport of crew, supplies, and other transport to and from the site. Vehicles are likely to be a combination of buses, personal vehicles (cars, pick-up trucks), tractor-trailers, and armoured vehicles. The Ontario Ministry of Transportation (MTO) has indicated that Goudreau Road, including the bridge over the Magpie

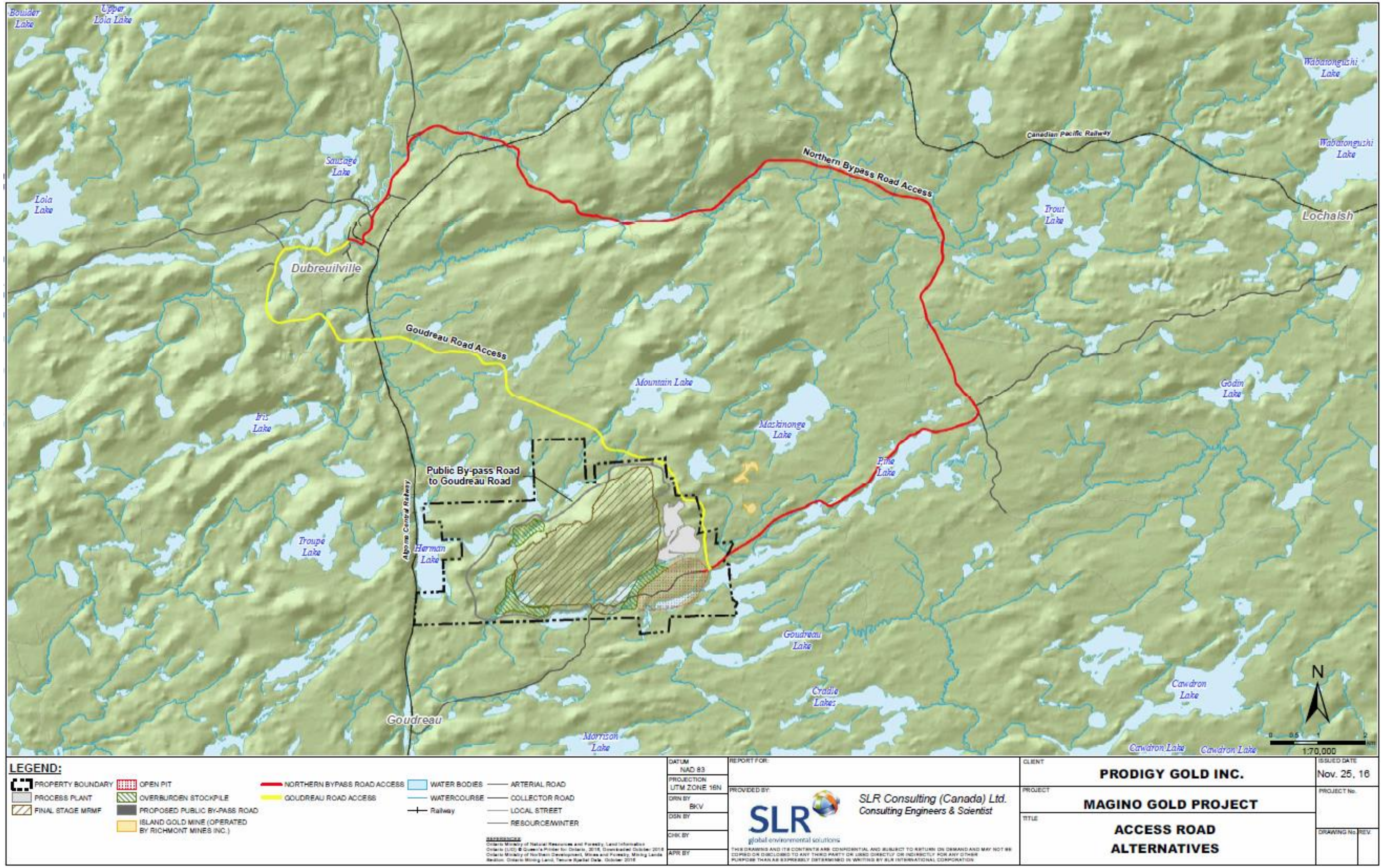
River near Dubreuilville, is adequately rated to accommodate the heaviest loads expected for the Project.

Upgrades to the Goudreau road to improve reliability for the anticipated increases in traffic and loading may include gravel re-surfacing, repairs to the cable guide rails, ditching and culvert improvements. Changes may also include re-alignment to reduce sharp corners and steep grades.

Goudreau Road and the Northern Bypass for Heavy Loads

This alternative would use Goudreau Road for transport of crew, supplies, and other transport to and from the site as describe above, but would use the Northern Bypass for heavy loads in the event that Goudreau Road did not have an adequate rating for the specific loads to be transported. Upgrades to the Northern Bypass to improve reliability for the anticipated increases in loading may include gravel re-surfacing, repairs to the cable guide rails, ditching and culvert improvements, and re-alignment to reduce sharp corners and steep grades.

**Figure 5-4: Access Road Alternatives**



New Road from Hawk Junction

This alternative consists of providing Project access from Hawk Junction, located approximately 24 km south of the Magino property. The three options that were identified within this alternative are illustrated on Figure 5-5 and described below:

- Option 1 would be a new road approximately 28 km in length. It would follow the existing forest access road north for approximately 10 km to just outside of Hawk Junction. From there, approximately 12 km of new road construction would occur along a route west of the Canadian National (CN) Main railroad track to existing road infrastructure approximately 1 km southwest of Goudreau. From there, it would follow existing road infrastructure for approximately 5 km to the Magino property;
- Option 2 would be a new road approximately 29 km in length. It would follow the existing forest access road north for approximately 15 km to just outside of Hawk Junction. From there, approximately 12 km of new road construction would occur along a route located east of the CN main railroad track to existing road infrastructure approximately 2 km east of Goudreau. From there, it would follow existing road infrastructure for approximately 2 km to the Magino property; and
- Option 3 would be a new road approximately 39 km in length. It would use the alignment of the existing forest access road for its entire length. It is the longest route because it is the most indirect. Nonetheless, it was evaluated because it would follow the existing forest access road for its entire length from just outside Hawk Junction to existing Goudreau Road east of the Magino property.

Options 1, 2 and 3 would require the replacement or new construction of five bridges, three bridges and four bridges, respectively.

#### 5.3.1.10 On-site Relocation of Goudreau Road

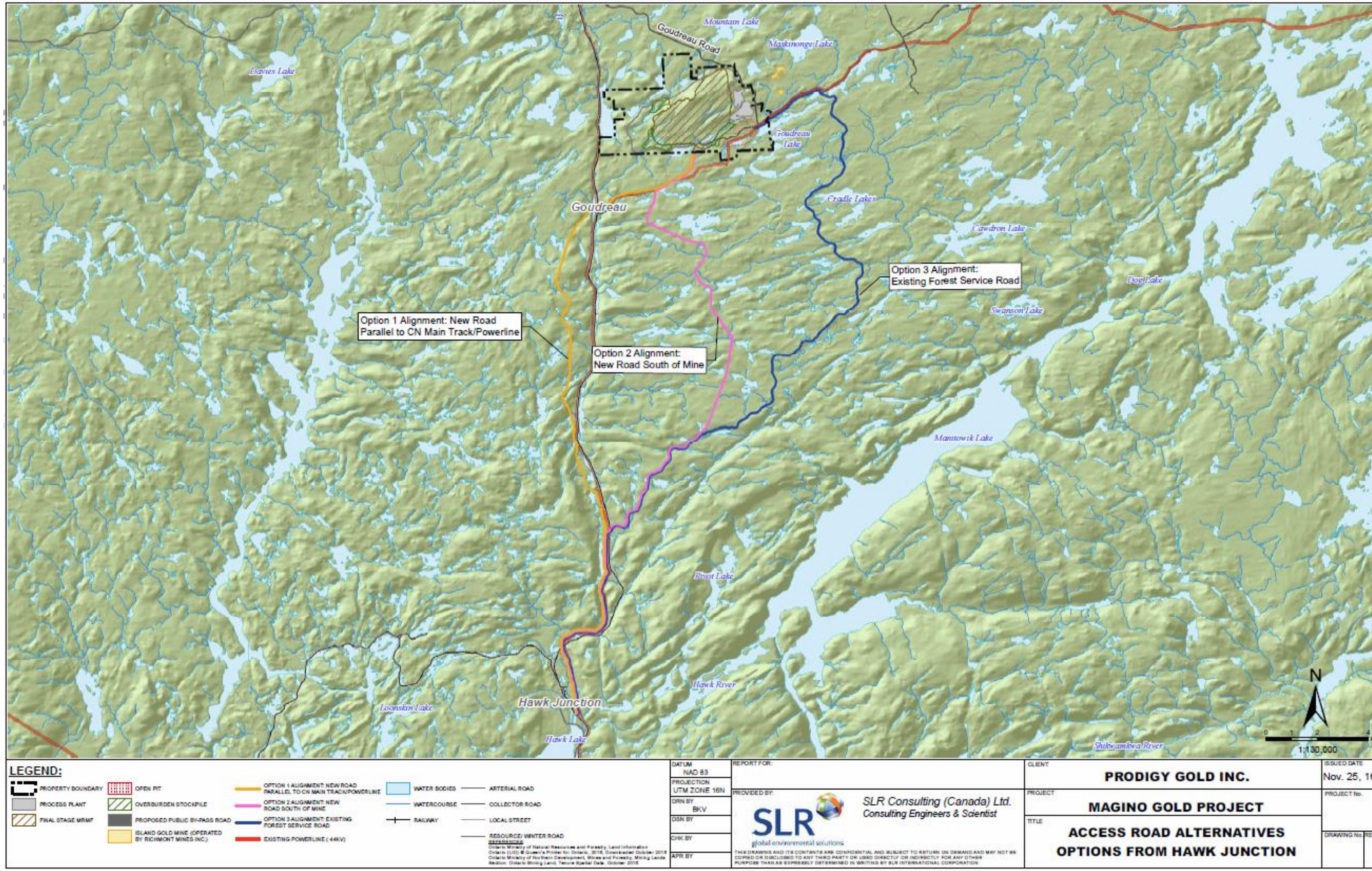
Relocation of Goudreau Road to the west of the TMF & MRMF Area

The relocation of Goudreau Road to the west of the TMF & MRMF Area would act as the “Public Bypass” or “Ring Road” around the portion of the Magino property that would contain key Project infrastructure, such as the TMF and MRMF, the process plant, the open pit, overburden stockpiles, and major surface water control features. This alternative would require approximately 8 to 8.5 km of new road.

Relocation of Goudreau Road to the west of the Open Pit

The relocation of Goudreau Road to the west of the open pit would place this portion of the road entirely within the Magino property. It could be co-located with the Central Route for the re-routed transmission line between the mine pit and the low-grade ore stockpile. This alternative would require approximately 3 km of new road.

**Figure 5-5: Access Road Alternatives - Options from Hawk Junction**



### 5.3.1.11 Housing for the Operation Phase

Local communities have expressed an interest in maximizing the accommodations provided within their communities and potentially not providing a accommodation complex on the Magino property. Considering this input and the size of the work force (i.e. peak of 400-600 positions during the construction phase, and 375 positions during operations phase), which is large compared to the nearby communities of Dubreuilville and Wawa, the following alternatives have been identified for mine workforce housing:

1) Accommodations provided in the local communities;
2) Accommodations provided in the local communities, plus a accommodation complex located on the Magino property; and
3) Accommodations provided in the local communities, plus a accommodation complex located near Dubreuilville.

<u>Accommodations Provided in Local Communities</u>

This alternative assumes that there is no dedicated accommodation complex to house the required Project workforce. Workers would either commute daily or weekly to the mine site from their place of residence in local communities. Those who do not have their own home within commuting distance would likely seek temporary accommodation in available rental units or tourist accommodation facilities (i.e., hotels, motels, cabins, campgrounds, etc.).

<u>Accommodations provided in the local communities, plus a accommodation complex located on the Magino property</u>

A proposed on-site accommodation complex would have capacity for 150 people. It would be self-contained with a kitchen and dining facility, laundry, social gathering room, potable water treatment, and sewage treatment. Prefabricated modular structures would be purchased and installed during the initial year of Project construction, and used throughout the construction period. This complex would be located adjacent to the processing plant. Travel to and from the mine site would require using a combination of private vehicles and Prodigy-supplied buses from selected pick-up points.

<u>Accommodations provided in the local communities, plus a accommodation complex located near Dubreuilville.</u>

For this alternative, it is assumed that the accommodation complex would be self-contained with a kitchen and dining facility, laundry, and a social gathering room. Utilities will be provided by the community's public works. Although it has yet to be determined whether the community accommodation complex would consist of prefabricated modular structures or permanent buildings, it has been assumed that the same prefabricated modular structures as an on-site accommodation complex will be used. Workers staying in the accommodation complex could either have limited or open access to the community. 'Lot 1' on Magpie Point has been identified by the Township of Dubreuilville as a potential location for an accommodation complex located in Dubreuilville. Travel to and from the mine site would occur on a daily basis using a combination of private vehicles and Prodigy-supplied buses from selected pick-up points.

### 5.3.1.12 Mine Pit Closure

Upon completion of mining from the pit, the mobile equipment (trucks, drill rigs, etc.) and the fixed equipment (pumps and pipelines) would be removed. The 430 m deep and 105 ha pit would be allowed to fill with water from groundwater seepage, surface water flow, and direct precipitation. While the pit is filling, berms would be installed around the perimeter to limit access to the pit rim by humans and wildlife. Ongoing monitoring of the quality of pit lake water would be conducted to ensure the upper layer of water is suitable for aquatic habitat. The rate of pit infilling at closure has been of interest during public and Aboriginal community consultations. Consequently, three alternatives for mine pit closure have been identified that would affect the rate at which the pit would fill.

<u>Pit Lake Filling from Local Surface Runoff and Groundwater Inflow</u>

This alternative does not involve any additional physical works or activities beyond those described above. Based on preliminary estimates, the alternative of using local surface runoff and ground water inflow may take several decades to fill the pit to the rim. The pit lake would be self-sustaining in terms of its ongoing water supply. Water quality in the pit, which could ultimately be discharged into Goudreau Lake, is expected to be acceptable for aquatic life.

<u>Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Backfilling of Pit with Mine Rock and/or Tailings</u>

This alternative would consider reducing the duration of pit filling due to inflow by reducing the volume of the pit. This would be done by backfilling the pit with mine tailings after mining is completed in year 10 of the operations phase. The pit lake would be self-sustaining in terms of its ongoing water supply. Given that tailings would be deposited into the pit, acceptable water quality would need to be established prior to any discharge into Goudreau Lake.

<u>Pit Lake Filling from Local Surface Runoff and Groundwater Inflow, plus Operations Water Supply Source</u>

This alternative incorporates the use of the operations water supply source to substantially fill the pit more rapidly. This alternative would involve maintaining the use of the water intake structure(s), pump station(s), and electrical supply equipment, and the construction and operation of a new pipeline to convey water to the open pit. This could reduce the pit filling time. After the pit has been filled, the pit lake would be self-sustaining in terms of its ongoing water supply. Water quality in the pit, which could ultimately be discharged into Goudreau Lake, is expected to be acceptable for aquatic life.

### 5.3.1.13 Closure of Tailings Management Facility

Three alternatives have been identified for the closure of the tailings management facility:

1) Closure with a soil cover and a revegetated surface on the TMF deck; or
2) Closure by creating a wetland and/or waterbody on the TMF deck.

Closure with a Soil Cover and Revegetated Surface on the TMF Deck

The alternative of closure with a soil cap would involve construction of a tailings, soil, and overburden surface that is then re-vegetated to create habitat that can be used by wildlife in the post-closure phase. The existing spillway would be excavated deeper to ensure the tailings surface is free-draining. The amount of soil cover needed to allow for successful revegetation and to protect groundwater from seepage would be determined during the design process.

Closure by Creating a Wetland and/or Waterbody on the TMF Deck

The TMF would be closed by creating a wetland and/or a waterbody on the TMF deck. This would be accomplished by adjusting the spillway design to ensure that a permanent pond on the surface of the tailings is created along with a fringe riparian zone. The fringe riparian zone would be covered with soil and overburden as necessary to allow wetland vegetation to grow.

### 5.3.2 Screening of Alternative Methods for Technical and Economic Feasibility

Given that the Project is in the planning stages, final decisions concerning the placement of all Project infrastructures, the technologies to be employed, and other specific design features are still being made. As part of this decision-making process, the major alternative methods described above have been screened to determine which ones Prodigy considers to be technically and economically feasible based on current conditions and information available.

To undertake this screening, Prodigy has developed criteria or considerations that help to determine the technical and economic feasibility of the alternative methods. These criteria are:

#### 5.3.2.1 Technical Feasibility

- Ability to meet Project needs (i.e., capacity and reliability);
- Likelihood of an alternative's availability to meet the Project's schedule (i.e., timing);
- Physical constraints or limitations (e.g., availability of sufficient and suitable land and locally available construction materials such as soil overburden and mine rock to implement the alternative);
- Ability of Prodigy to implement the alternative, and consistency with Prodigy's core competency as a mine owner and operator;
- Use of well-known technology that is effective and proven to protect the environment and human health;
- Supports efficient and cost-effective mine operations;
- Consistency with industry best practice; and
- Amenability to rehabilitation.

#### 5.3.2.2 Economic Feasibility

- Ability of Prodigy to finance the Project with the implementation of the alternative;
- Willingness of Prodigy to financially support the implementation of the alternative given capital investment required and/or operational costs and return on investment;
- Potential for reducing overall Project costs; and
- Potential for leaving behind an unused asset following mine closure.

It is noteworthy that not all of these criteria or considerations apply to each of the identified alternatives.

Table 5-3 describes the initial screening of the identified alternative methods based on their technical and economic feasibility. Alternatives that are considered to be both technically and economically feasible will be carried forward for further consideration in the EA. If an alternative was determined to be “Not Feasible” from either a technical or economic perspective, it was excluded from further consideration.

Where only one technically and economically feasible alternative remained after the screening, it was determined to be the “Preferred Alternative” and would form the basis for the Project. Where two or more alternatives were considered both technically and economically feasible, they were carried forward for a more detailed comparative evaluation on the basis of the relative consideration of effects, and of technical and economic feasibility.

**Table 5-3: Screening of Alternative Methods for Technical and Economic Feasibility**

<table>
<tr><th>Project Component</th><th>Alternative</th><th>Technical Feasibility</th><th>Economic Feasibility</th><th>Screening Conclusion</th><th>Rationale</th></tr>
<tr><td rowspan="2">Mine Development</td><td>Underground mining</td><td>Not Feasible</td><td>Not Feasible</td><td>Exclude from further consideration</td><td>The ore to be mined occurs as finely disseminated gold over a wide area and at a relatively low grade. While underground mining is possible and has been used in the past on the Magino property, it is not considered to be technically feasible because:<br>• High-grade ore deposits, where minerals are highly concentrated in a small fraction of the rock, do not exist at this site. Those that existed have been mined out.<br>Underground mining cannot be financially supported by the Project given that other viable alternatives exist, because it requires substantial pre-production capital expenditures for mine shafts, ramps, and surface facilities that affect Prodigy's ability to finance the Project.<br>Since most of the rock must be left in place to support the underground mine openings, there is reduced revenue potential during operations.</td></tr>
<tr><td>Open pit mining</td><td>Feasible</td><td>Feasible</td><td>Preferred Alternative</td><td>The Magino ore body is well-suited for open pit mining, because gold is close to the surface, and disseminated over an area that is estimated to be at least 300 m wide. Open pit mining is both technically and economically feasible because:<br>• It is within Prodigy's ability to implement and consistent with Prodigy's core competency as a mine owner and operator;<br>• It involves known technology with a proven ability to protect the environment and human health; and<br>• It increases Prodigy's ability to mine a greater proportion of the ore body.<br>Bulk extraction reduces the mine's lifespan and therefore its operational costs, improving Prodigy's return on investment.</td></tr>
<tr><td rowspan="3">Ore Processing</td><td>Heap leaching on a lined pad</td><td>Feasible</td><td>Feasible</td><td>Further consideration is warranted</td><td>The heap leaching process for ore processing is technically feasible.<br>• It involves well-known technologies for crushing the ore, stacking it on lined pads, and leaching out the gold using buried drip systems to apply a cyanide leaching solution.<br>Further evaluation is needed to assess what the recovery of gold might be, where the facility could be located within the relatively small Magino property, how wider leaching operations would be conducted, and importantly, how a heap leach would be closed. The latter would include rinsing to remove any chemical of concern in the heap and providing cover that reduces long-term seepage rates to a minimum.</td></tr>
<tr><td>Non-cyanide processing methods</td><td>Not Feasible</td><td>Not Feasible</td><td>Exclude from further consideration</td><td>Non-cyanide producing methods were considered not to be technically or economically feasible, because they involve technology that is not as effective as cyanide alternatives in processing low-grade ore. Moreover, the agents which could be used as alternatives to cyanide would form less stable gold complexes in solution, and thus require more aggressive conditions and oxidants to dissolve the gold. These alternative reagents are more expensive than the other available alternatives, and yield lower gold recoveries.<br><br>Lower gold recovery reduces the revenue potential and Prodigy's return on investment, rendering the Project economically infeasible.</td></tr>
<tr><td>Processing by milling and cyanide leaching including a cyanide destruction circuit</td><td>Feasible</td><td>Feasible</td><td>Further consideration is warranted</td><td>Ore processing using cyanide solution followed by cyanide destruction can be both technically and economically feasible for the type of ore body that occurs on the site. It is within Prodigy's ability to implement, is consistent with Prodigy's core competency as a mine owner and operator, and involves known technology.</td></tr>
</table>

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | Processing by milling and cyanide leaching using a cyanide destruction circuit and natural cyanide destruction | Feasible | Feasible | Further consideration is warranted | As for the above alternative, this is technically and economically feasible. The difference is that this alternative would reduce the amount of chemicals used by taking advantage of and enhancing the potential for natural attenuation that would occur in the TMF. It would also make operations of the cyanide destruction circuit more efficient. |
| Ore Processing Location | On-site processing | Feasible | Feasible | Preferred Alternative | On-site ore processing is both technically and economically feasible because:<br>• It is within Prodigy's ability to implement and consistent with Prodigy's core competency as a mine owner and operator; and<br>• It provides a reasonable rate of return to Prodigy in comparison to off-site processing alternatives. |
| | Off-site processing | Feasible | Not Feasible | Exclude from further consideration | Off-site ore processing is not considered to be economically feasible because:<br>• No off-site facilities currently exist within a reasonable distance (<150 km), other than the processing plant at the adjacent Richmont Mine. This existing plant is designed to process ore at a rate of approximately 900 tonnes per day, and would require a ten-fold expansion to its capacity to process the Project ore. This expansion would in effect require constructing and operating similar facilities to those proposed by the Project. This would not offer any cost or operational advantages over the on-site processing alternative.<br>• The costs associated with the increased handling and movement of low-grade ore over long distances would add operating costs for vehicles and fuel that that cannot be financially supported by the Project given that other viable alternatives exist; and<br>• It would be inconsistent with the preference stated by local communities and Aboriginal people for creating local jobs, and would thereby be seen as an economic loss. |
| Power Supply | On-site power generation using renewable power sources | Not Feasible | Not Feasible | Exclude from further consideration | On-site power generation from renewable sources is not technically or economically feasible because:<br>• Power cannot be consistently generated by wind or solar power facilities to allow uninterrupted operation of the mine; therefore, other power generation sources are still required;<br>• Wind and/or solar power facilities of sufficient size to generate the required power cannot be readily accommodated on the Magino property; and<br>• Construction and operation of large scale wind or solar power facilities is considered to be cost prohibitive. |
| | On-site power generation using diesel power sources | Feasible | Not Feasible | Exclude from further consideration | On-site power generation using diesel power sources is not economically feasible because:<br>• It adds capital cost for the purchase and construction of a power generation plant that cannot be financially supported by the Project given that other viable alternatives exist; and<br>• It adds operating costs for the purchase of diesel fuel and power generation plant operations that cannot be financially supported by the Project given that other viable alternatives exist. |
| | Off-site power generation and transmission to the mine site by Algoma Power Incorporated (API) and on-site power generation. | Feasible | Feasible | Preferred Alternative | Off-site power generation and transmission to the mine site by API transmission line supplemented with on-site diesel generation is both technically and economically feasible because:<br>• Off-site power generation and transmission via the existing API electric transmission line from Hawk Junction to the Project can provide the Project's power requirements;<br>• It is consistent with Prodigy's core competency as a mine owner and operator as it does |

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | | | | | not require the construction and operation of a new major power generation facility (50 MW facility); and<br>• It maximizes the use of existing off-site power generation facilities and existing transmission infrastructure, thereby reducing capital and operating costs. |
| Local Transmission Line Re-routing | North Route | Feasible | Feasible | Further consideration is warranted | The North Route is considered to be both technically and economically feasible because:<br>• It allows for the use of standard wood-pole transmission line infrastructure;<br>• The route could be co-located along the ROW for the proposed re-routed Goudreau Road, reducing capital costs and thereby improving Prodigy's return on investment;<br>• It minimizes the risk of interference with Project infrastructure and damage by Project equipment or activities;<br>• It maintains power line reliability to other users in the region and reduces economic risk to Prodigy in the event of power outage caused by mine activity; and<br>• It does not result in a potentially unused asset following mine closure that increases long-term liabilities and adds to closure costs. |
| | Central Route | Not Feasible | Feasible | Exclude from further consideration | This route is not considered to be technically feasible because:<br>• It requires a new ROW that traverses through areas with the highest levels of Project activity and significant haul truck traffic. It therefore poses an unacceptable risk of interference with Project infrastructure and of damage by Project equipment or activities. This may require the use of transmission infrastructure other than wooden poles; and<br>• The potential for damage to the transmission line reduces power line reliability to other users in the region and imposes economic risk to Prodigy in the event of power outage caused by mine activity. |
| | South Route | Feasible | Feasible | Further consideration is warranted | The South Route would re-align the existing API power line by moving it to the south side of Webb and Goudreau lakes. This route is considered to be both technically and economically feasible because:<br>• It allows for the use of wood-pole transmission line infrastructure;<br>• It minimizes the risk of interference with Project infrastructure and damage by Project equipment or activities; and<br>• It maintains power line reliability to other users in the region and reduces economic risk to Prodigy in the event of power outage caused by mine activity. |
| Process Water Supply | Use of water from the mine pit and recycling of water | Not Feasible | Feasible | Exclude from further consideration | The exclusive reliance on water from the mine pit and recycling of water during operations is not considered technically feasible because:<br>• The amount of water available is not sufficient to meet mine operational requirements. Furthermore, once mining ceases and the pit is allowed to fill, there will be insufficient recycle water to meet the process plant's requirements.<br><br>However, maximum use of mine pit water during construction and recycling of water during mine operations is considered best practice. It will be considered in combination with other viable alternatives, such as those discussed below. |
| | New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water | Feasible | Feasible | Preferred Alternative | The development of a new water supply from Goudreau Lake is both technically and economically feasible because:<br>• Sufficient water is available from the lake to support the Project needs; and<br>• It involves limited additional infrastructure, given the proximity of the source lake to the |

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | | | | | mine infrastructure.<br>The use of water from the mine pit and recycling of water to minimize the amount of water supply needed is considered best industry practice and consistent with Prodigy's core competency as a mine owner and operator. |
| | New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water | Feasible | Not Feasible | Exclude from further consideration | The development of a new water supply from Goudreau and Herman Lakes is not considered to be economically feasible because:<br>• The additional cost of developing an additional pipeline and water intake structure cannot be financially supported by the Project given that other viable alternatives exist. |
| | New supply from Magpie River, including the use of water from the mine pit and recycling of water | Feasible | Not Feasible | Exclude from further consideration | The development of a new water supply from the Magpie River is not considered to be economically feasible because:<br>• Development of water supply infrastructure at a considerable distance from the Magino property may not be within Prodigy's ability to implement; and<br>• The additional cost of developing a pipeline from a distant source cannot be financially supported by the Project given that other viable alternatives exist. |
| | New supply from groundwater wells, including the use of water from the mine pit and recycling of water | Not Feasible | Not Feasible | Exclude from further consideration | The exclusive reliance on groundwater wells is not considered to be technically or economically feasible because:<br>• There is no geologic formation in the vicinity capable of yielding adequate water to supply Project needs using a single groundwater well;<br>• Development of groundwater wells off the Magino property may not be within Prodigy's ability to implement; and<br>• The additional cost of developing a supply well off the Magino property and/or multiple well fields (either on or off the Magino property) and supporting pipelines cannot be financially supported by the Project given that other viable alternatives exist. |
| Non-hazardous, non-mining Solid Waste Disposal | On-site landfill | Feasible | Feasible | Further consideration is warranted | An on-site landfill is considered technically and economically feasible because:<br>• It can provide the Project with reliable assurance that a facility would be available to receive waste on the needed schedule.<br>The Magino property can accommodate a small landfill (<40,000 $m^3$) in a location that supports efficient and cost-effective mine operations.<br>The Magino property characteristics indicate that the minimum criteria for being considered a small landfill by the Ontario Ministry of Environment can be met (e.g., buffer distances from the property boundary and from drinking water wells, public roads, dwellings, lakes and stream and depth of water table). Also either a natural attenuation type or engineered design would be feasible. |
| | Use of municipal off-site landfill near Dubreuilville | Feasible | Feasible | Further consideration is warranted | Reliance on a municipal off-site landfill near Dubreuilville is considered technically and economically feasible because:<br>• The Town of Dubreuilville is planning to construct a new landfill that could be used in the event it is completed in sufficient time; and<br>• Utilization of an off-site landfill involves standard waste collection and transfer infrastructure and standard transport operations.<br>However, a new landfill has not yet been approved and may not be available to receive waste on the schedule needed by the Project. This alternative warrants further consideration with the town to confirm whether a new landfill would be available to receive waste on the needed |

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | | | | | schedule. |
| | Export | Feasible | Feasible | Further consideration is warranted | Export of waste to another jurisdiction (beyond the Town of Dubreuilville) is technically and economically feasible because:<br>• Utilization of an off-site landfill involves standard waste collection and transfer infrastructure and standard transport operations; and<br>• Reasonable transportation distances and tipping fees can be financially supported by the Project. |
| Access Roads | Goudreau Road for all Project traffic | Feasible | Feasible | Further consideration is warranted | The use of Goudreau Road is considered both technically and economically feasible because:<br>• The road is available for use on the needed schedule; and<br>• With some minor upgrades, it is capable of accommodating both day-to-day Project traffic and the transport of heavy equipment during construction. This includes the existing bridge across the Magpie River near Dubreuilville. |
| | Goudreau Road and the Northern Bypass for heavy loads | Feasible | Feasible | Further consideration is warranted | The use of Goudreau Road for routine (e.g., day-to-day) Project traffic along with use of the Northern Bypass for heavy loads is considered technically feasible because:<br>• The roads can be available for use on the needed schedule;<br>• This combination is capable of accommodating both day-to-day Project traffic, as well as the transport of heavy equipment during construction; and<br>• Major upgrades to the Northern Bypass would be required if it was to be used on a routine basis. That would increase Project costs unnecessarily given that another viable alternative exists. |
| | New Road from Hawk Junction | Not Feasible | Not Feasible | Exclude from further consideration | The construction of a new road is not considered economically feasible and may not be technically feasible because:<br>• The time required (two to three years or more) for obtaining landowner approval and Project permitting suggests that the road would not likely be available for use on the needed schedule; and<br>• The cost for the construction of a new road cannot be financially supported by the Project given that another viable alternative exists. The new road would be approximately 28 – 40 km in length, and require the replacement, or new construction, of between three and five bridges depending upon the alignment selected. |
| On-site Relocation of Goudreau Road | Relocation of Goudreau Road to the west of the TMF & MRMF | Feasible | Feasible | Preferred Alternative | The relocation of Goudreau Road to the west of the TMF & MRMF is both technically and economically feasible because:<br>• It is within Prodigy's ability to implement;<br>• There is sufficient land and construction materials on the Magino property to construct a 12 km road around the site;<br>• The opportunity to co-locate the transmission line along the road right-of-way reduces Project costs; and<br>• A ring road supports efficient and cost-effective mine operations by diverting public traffic away from mining infrastructure and areas of intensive mining activity. |
| | Relocation of Goudreau Road to the west of the open pit | Not Feasible | Feasible | Exclude from further consideration | The relocation of Goudreau Road to the west of the open pit is not considered to be technically feasible because:<br>• It requires a new ROW that traverses through areas with the highest levels of Project activity and significant haul truck traffic. It therefore poses an unacceptable risk of interference with Project infrastructure and vehicular accidents with members of the |

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | | | | | public using the road. |
| Accommodations | All accommodations to be within the available housing in the local communities | Not Feasible | Not Feasible | Exclude from further consideration | The provision of accommodations by the local communities in the vicinity of the Project site is not considered to be technically feasible because:<br>• Sufficient capacity does not currently exist and is not likely to be developed to provide temporary accommodation for the Project's construction workforce;<br>• Sufficient new housing is not likely to be available within the needed schedule; and<br>• The development of new housing in the communities by Prodigy is not considered to be economically feasible and is not consistent with the purpose of the Project or Prodigy's core competencies. |
| | Accommodations to be provided in the local communities and an accommodation complex on the Magino property | Feasible | Feasible | Further consideration is warranted | Accommodation in the local communities plus an accommodation complex on the Magino property is considered both technically and economically feasible because:<br>• An on-site accommodation complex can provide the Project with reliable assurance that sufficient accommodation would be available to meet the needed schedule;<br>• The Project site is sufficiently large to accommodate an on-site accommodation complex;<br>• An on-site accommodation complex would support efficient and cost-effective mine operations; and<br>• Accommodations in the local communities would serve to reduce the Project cost and provide alternative choices to Project workers. |
| | Accommodations to be provided in the local communities and an off-site accommodation complex located in Dubreuilville | Feasible | Feasible | Further consideration is warranted | Accommodation in the local communities plus an off-site accommodation complex located in Dubreuilville is considered both technically and economically feasible because:<br>• An off-site accommodation complex can provide the Project with reliable assurance that sufficient accommodation would be available to meet the needed schedule; and<br>• Sufficient land is likely available to accommodate an off-site accommodation complex in Dubreuilville.<br>Other accommodations in the local communities would serve to reduce the overall Project cost and provide alternative choices to Project workers. |
| Mine Pit Closure | Pit lake filling from local surface runoff and groundwater inflow | Feasible | Feasible | Further consideration is warranted | Filling of the mine pit from local surface runoff and groundwater inflow is both technically and economically feasible because:<br>• It relies solely on natural processes; and<br>• There are no physical constraints or limitations that would prevent the pit from filling up over time. |
| | Pit lake filling from local surface runoff and groundwater inflow plus disposal of mine rock and/or tailings. | Feasible | Not Feasible | Exclude from further consideration | Pit lake filling from local surface runoff and groundwater inflow, plus disposal of mine rock and/or tailings is not considered to be economically feasible because:<br>• The additional cost for the re-excavation, on-site transport and placement of mine rock and/or tailings back into the open pit and the re-configuration of remaining tailings and mine rock in the event that not all of the mine rock and/or tailings cannot be backfilled, cannot be financially supported by the Project at this time given that other viable alternatives exist. |
| | Pit lake filling from local surface runoff and groundwater inflow plus operations water supply | Feasible | Feasible | Further consideration is warranted | Filling of the mine pit from local surface runoff and groundwater inflow with supplementary operations water supply is both technically and economically feasible because:<br>• It relies largely on natural processes;<br>• There are no physical constraints or limitations that would prevent the pit from filling up |

| Project Component | Alternative | Technical Feasibility | Economic Feasibility | Screening Conclusion | Rationale |
|---|---|---|---|---|---|
| | | | | | by surface water and groundwater inflow. Sufficient surface water exists to provide the supplemental water supply;<br>• Project infrastructure to provide the supplemental water will be available on-site shortly after mining operations cease. It would have to be retained and operated during the pit filling period;<br>• The additional cost of operating Project infrastructure to supply the additional water can be supported by the Project; and<br>• Accelerating the pit filling allows for timelier and efficient site restoration, which may serve to reduce the overall Project cost. |
| Closure of Tailings Management Facility | Closure with a soil cover and re-vegetation of the surface of the TMF deck | Feasible | Feasible | Further consideration is warranted | Closure of the TMF with available cover materials and vegetation cap is considered both technically and economically feasible because:<br>• The soil and overburden placed on top of the tailings provide an improved base for revegetation, thereby improving the long term performance of the TMF;<br>• It minimizes residual seepage from the TMF, reducing long-term liabilities;<br>• It is durable in the long term, thereby reducing long-term liabilities; and<br>• It can be constructed using available on-site materials, thereby reducing Project costs. |
| | Closure by creating a wetlands and/or waterbody on the TMF deck | Feasible | Feasible | Further consideration is warranted | Closure of the TMF by creating a wetland and/or waterbody on the TMF deck is considered both technically and economically feasible because:<br>• It renders any chemical reaction in the tailings inert, but results in higher seepage rates than using low-permeability cover, since the tailings remain saturated;<br>• The surrounding embankment has been designed to water dam standards; and<br>• Wetland/riparian habitat can be established by the selective addition of soil and overburden. |

#### 5.3.2.3 Summary Results of the Initial Screening

Table 5-4 summarizes the results of the initial screening of alternative methods for the Project with respect to their technical and economic feasibility. The table highlights:

- Those Alternatives that were considered "Preferred" given the lack of other technically or economically feasible alternatives;
- Those alternatives that were determined to be "Not Feasible" and are excluded from further consideration in the EIS; and
- Those alternatives that warrant further consideration in the EIS. These alternative methods are the subject of further detailed evaluation presented in Section 5.2.3.

**Table 5-4: Summary Results of the Initial Screening**

| Project Component | Alternative | Screening Conclusion |
|---|---|---|
| Mine Development | Underground mining | Exclude from further consideration |
| | Open pit mining | Preferred Alternative |
| Ore Processing | Heap leaching on a lined pad | Further consideration is warranted |
| | Non-cyanide processing methods | Exclude from further consideration |
| | Processing by milling and cyanide leaching including a cyanide destruction circuit | Further consideration is warranted |
| | Processing by milling and cyanide leaching using cyanide and natural cyanide destruction | Further consideration is warranted |
| Ore Processing Location | On-site processing | Preferred Alternative |
| | Off-site processing | Exclude from further consideration |
| Power Supply | On-site power generation using renewable power sources | Exclude from further consideration |
| | On-site power generation using diesel power sources | Exclude from further consideration |
| | Off-site power generation and transmission to the mine site by API and on-site power supply from 3 MW diesel power generators | Preferred Alternative |
| Local Transmission Line Re-routing | North Route | Further consideration is warranted |
| | Central Route | Exclude from further consideration |
| | South Route | Further consideration is warranted |
| Process Water Supply | Use of water from the mine pit and recycling of water | Exclude from further consideration |
| | New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water | Preferred Alternative |

| Project Component | Alternative | Screening Conclusion |
|---|---|---|
| | New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water | Exclude from further consideration |
| | New supply from Magpie River, including the use of water from the mine pit and recycling of water | Exclude from further consideration |
| | New supply from groundwater wells, including the use of water from the mine pit and recycling of water | Exclude from further consideration |
| Tailings Deposition and Placement (refer to TSD 5) | Thickened tailings | Preferred Alternative |
| | Site G | Preferred Alternative |
| Non-hazardous, non-mining Solid Waste Disposal | On-site landfill | Further consideration is warranted |
| | Use of municipal off-site landfill near Dubreuilville | Further consideration is warranted |
| | Export | Further consideration is warranted |
| Access Roads | Goudreau Road for all Project traffic | Preferred Alternative |
| | Goudreau Road and the Northern Bypass for heavy loads | Further consideration is warranted |
| | New Road from Hawk Junction | Exclude from further consideration |
| On-site Relocation of Goudreau Road | Relocation of Goudreau Road to the west of the TMF & MRMF | Preferred Alternative |
| | Relocation of Goudreau Road to the wet of the open pit | Exclude from further consideration |
| Accommodations | All accommodations to be within the available housing in the local communities | Exclude from further consideration |
| | On-site accommodation complex supplemented by off-site accommodation in the local communities | Further consideration is warranted |
| | Accommodations to be provided off-site located in Dubreuilville | Further consideration is warranted |
| Mine Pit Closure | Pit lake filling from local surface runoff and groundwater inflow | Further consideration is warranted |
| | Pit lake filling from local surface runoff and groundwater inflow plus disposal of mine rock and/or tailings | Exclude from further consideration |
| | Pit lake filling from local surface runoff and groundwater inflow plus operations water supply | Further consideration is warranted |
| Closure of Tailings | Closure with a soil cover and re | Further consideration is warranted |

| Project Component | Alternative | Screening Conclusion |
|---|---|---|
| Management Facility | vegetated surface of the TMF deck | |
| | Closure by creating a wetland and/or waterbody on the TMF | Further consideration is warranted |

### 5.3.3 Detailed Evaluation of Technically and Economically Feasible Alternative Methods

This section identifies the effects of each technically and economically feasible alternative method summarized in Table 5-3 that warranted further consideration, as evaluated by a set of criteria. The aim was to identify the preferred method on the basis of the relative consideration of their environmental effects and of technical and economic feasibility.

This evaluation has been undertaken on the basis of the description of each alternative method presented in Section 5.2 and the description of existing environmental conditions presented in Chapter 4 and related TSDs. The detailed evaluation of each alternative method is presented in tabular form in Appendix 5-1.

#### 5.3.3.1 Detailed Evaluation Criteria and Ratings

The relative consideration of effects, and of the technical and economic feasibility of each alternative method, was undertaken according to the set of criteria listed in Table 5-3. To the extent possible, the environmental effects of each alternative method were considered as residual effects, having taken into account the application of best management practices. Where possible, the evaluation considers the likely magnitude of the effects in terms of the probable quantity or quality of a VC likely to be affected.

The relative preference of one alternative over another was undertaken using the rating scheme and considerations provided in Table 5-6. The effects of each alternative method were identified and rated on a relative three-point scale:

- Most Preferred;
- Somewhat Preferred; or
- Least Preferred.

On the basis of these ratings, a preference of one alternative over another was identified for each criterion, where possible. In cases where the effects of one alternative was not notably or substantially different from another alternative, both or all were considered to be equal and rated on the three-point scale using the guidance provided in Table 5-6. A “colour code” was used to visually assist in identifying a preference of one alternative over another for each criterion. In some cases, the criterion did not apply to the set of alternative methods under consideration. This colour code was applied to the detailed evaluation presented in Appendix 5-1.

Finally, an overall preference for one alternative method over another was identified for each criteria group, where possible. In some cases, an overall preference could be clearly identified on the basis of the preferences by indicator (e.g., Alternative A was preferred for all or the majority of individual criteria). In other cases, professional judgment was applied to identify a preferred alternative for the criteria group. In these cases, the trade-offs made are explicitly described.

**Table 5-5: Detailed Evaluation Criteria**

| Criteria Group | Criteria |
|---|---|
| **Technical Performance and Opportunities** | |
| 1. Technical Performance and Opportunities | • Effectiveness in meeting the intended purpose<br>• Opportunities for increasing operational flexibility<br>• Reliability of access / supply to the site<br>• Amenability to rehabilitation |
| **Financial Costs and Risks** | |
| 2. Financial Costs and Risk | • Project costs<br>• Cost risks over the life of the Project<br>• Cost risks during post-closure |
| **Effects on the Natural Environment and Risks to Human Health** | |
| 3. Effects on the Atmospheric Environment | • Air quality<br>• Noise and vibration<br>• Light<br>• Greenhouse gases |
| 4. Effects on the Physical Environment | • Terrain and soils<br>• Groundwater<br>• Surface water<br>• Stream and lake sediments |
| 5. Effects on the Biological Environment | • Natural heritage features<br>• Fish and fish habitat<br>• Terrestrial vegetation<br>• Wetlands<br>• Significant wildlife habitat<br>• Migratory and breeding birds<br>• Mammals<br>• Species at Risk |
| **Effects on the Socio-Economic Environment and Aboriginal Interests** | |
| 6. Effects on the Social Environment | • Population and demographics<br>• Community vitality<br>• Infrastructure and Services<br>• Cultural heritage |
| 7. Effects on the Economic Environment | • Land use and tourism<br>• Employment and Business opportunities<br>• Government revenues |
| 8. Effects on Aboriginal Interests | • Aboriginal employment and business opportunities<br>• Traditional use of lands and resources<br>• Aboriginal cultural activities and special places |

**Table 5-6: Rating Scheme for the Detailed Evaluation of Alternative Methods**

| 1. TECHNICAL PERFORMANCE AND OPPORTUNITIES | 2. FINANCIAL COSTS AND RISKS | 3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH | 4. EFFECTS ON THE SOCIO-ECONOMIC ENVIRONMENT AND ABORIGINAL INTERESTS | COLOUR CODE |
|---|---|---|---|---|
| ***Most Preferred:***<br>• Proven to be effective with no substantial technical constraints posed by the proposed setting.<br>• Provides opportunities for increasing operational flexibility.<br>• Provides high level of access/supply/service to the site with low risk of service interruption.<br>• Highly amenable to rehabilitation. | ***Most Preferred:***<br>• Lowest total cost and highest internal rate of return.<br>• Low cost risk over life of the Project.<br>• Least potential for long term liabilities. | ***Most Preferred:***<br>• Adverse effects to the atmospheric, physical and/or biological environments are likely to be negligible or lowest in magnitude.<br>• Least potential for risks to human health or risks are considered to be negligible.<br>• Adverse effects are highly amenable to adaptive management. | ***Most Preferred:***<br>• Adverse effects to the social and/or economic environments are likely to be negligible or lowest in magnitude.<br>• Adverse effects Aboriginal Interests are likely to be negligible or lowest in magnitude.<br>• Adverse effects are highly amenable to adaptive management and/or agreement building with affected stakeholders or communities.<br>• Provides a substantial positive effect. | ***Most Preferred*** |
| ***Somewhat Preferred:***<br>• Appears to be effective based on theoretical modeling or application in other environmental settings. Some technical constraints may exist for the proposed setting.<br>• Provides for fewer opportunities to increase operational flexibility than other available alternatives.<br>• Provides somewhat reliable access/supply/service to the site. Service interruptions are somewhat likely over the life of the Project.<br>• Somewhat amenable to rehabilitation. | ***Somewhat Preferred:***<br>• Higher cost and lower internal rate of return than other alternatives.<br>• Moderate cost risk over life of the Project.<br>• Greater potential for long term liabilities than other available alternatives. | ***Somewhat Preferred:***<br>• Adverse effects to the atmospheric, physical and/or biological environments are likely to be minor in magnitude.<br>• Minor potential for risk to human health.<br>• Adverse effects are somewhat amenable to adaptive management. | ***Somewhat Preferred:***<br>• Adverse effects to the social and/or economic environments are likely to be minor in magnitude.<br>• Adverse effects Aboriginal Interests are likely to be minor in magnitude.<br>• Adverse effects are somewhat amenable to adaptive management and/or agreement building with affected stakeholders or communities.<br>• Provides for only a limited positive effect. | ***Somewhat Preferred*** |
| ***Least Preferred:***<br>• Barely effective based on theoretical modeling or application in other environmental settings. Substantial technical constraints may exist for the proposed setting.<br>• Limited opportunities to increase operational flexibility.<br>• Unreliable access/supply/service to the site. Service interruptions are highly likely over the life of the Project.<br>• Difficult to rehabilitate. | ***Least Preferred:***<br>• Internal rate of return is substantially lower than typical for projects of the same type.<br>• Highest cost risk over the life of the Project.<br>• Highest potential for long term liabilities. | ***Least Preferred:***<br>• Adverse effects to the atmospheric, physical and/or biological environments are likely to be major or greatest in magnitude.<br>• Highest potential for risk to human health among the alternatives or major risks to human health.<br>• Adverse effects are least amenable to adaptive management. | ***Least Preferred:***<br>• Adverse effects to the social and/or economic environmental are likely to be major or greatest in magnitude.<br>• Adverse effects Aboriginal Interests are likely to be major in magnitude.<br>• Adverse effects are somewhat amenable to adaptive management and/or agreement building with affected stakeholders or communities.<br>• Provides no positive effect. | ***Least Preferred*** |
| ***Not Applicable***<br>• This criterion does not apply to this set of alternatives. | ***Not Applicable***<br>• This criterion does not apply to this set of alternatives. | ***Not Applicable***<br>• This criterion does not apply to this set of alternatives. | ***Not Applicable***<br>• This criterion does not apply to this set of alternatives. | ***Not Applicable*** |

### 5.3.4 Identification of the Preferred Alternative Methods

Summaries of the detailed evaluations undertaken to identify the preferred alternative methods are presented in Table 5-7 to Table 5-13. The detailed evaluations of each set of alternatives by criteria and criteria group are presented in Appendix 5-1.

This evaluation was undertaken by considering the preferences identified for each criteria group. Again, in some cases, an overall preference could be clearly identified on the basis of the preferences by criteria group (e.g., Alternative A was preferred for all or the majority of individual criteria groups). In other cases, professional judgment was applied to identify a preferred alternative method by making trade-offs among criteria groups. Where trade-offs are made, they are explicitly described.

### Table 5-7: Summary of Detailed Evaluation of Ore Processing Alternatives

| CRITERIA | A<br><br>HEAP LEACHING ON A LINED PAD | B<br><br>PROCESSING BY MILLING AND CYANIDE LEACHING INCLUDING A CYANIDE DESTRUCTION CIRCUIT | C<br><br>PROCESSING BY MILLING AND CYANIDE LEACHING USING A CYANIDE DESTRUCTION CIRCUIT AND NATURAL CYANIDE DESTRUCTION | COMMENTS |
|---|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | | **Alternative C** is most preferred. Alternatives B and C are both preferred over Alternative A given their similar effectiveness and amenability to rehabilitation. Alternative C however, is more preferred from an operational flexibility perspective over Alternatives B and A. |
| **FINANCIAL COSTS AND RISKS** | | | | **Alternative C** is most preferred from a cost risk perspective over the life of the project and in the post-closure period. While Alternative A is most preferred from a capital and operating point of view, this is offset by the uncertainty associated with the amount of gold that can be recovered and the higher cost risks. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | | **Alternatives B and C** are slightly preferred to Alternative A. Effective dust control measures are available for all three alternatives. Alternative A is less preferred because the effects on air quality from a chemical spill outdoors are more difficult to control than for a spill indoors. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | | **Alternatives A, B and C** are considered equally preferred because Alternative A minimizes potential groundwater quality effects while Alternatives B and C minimize potential effects on surface water quantity. All the alternatives are considered equally preferred regarding effects on stream and lake sediments. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | | **Alternatives B and C** are preferred due to lower potential for effects due to changes in surface water flows on fish and fish habitat and on wetlands, as well as greater potential for the re-establishment of vegetation in the post-closure phase. |
| **EFFECTS ON HUMAN HEALTH** | | | | **Alternative C** is considered slightly more preferred over Alternatives A and B, since it does not use open in-ground ponds and involves the least chemical usage among all the alternatives. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | | **Alternatives A, B and C** are considered equally preferred. |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | | **Alternatives B and C** are equally preferred as they both offer greater employment and business opportunities than Alternative A. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | | **Alternatives B and C** are equally preferred as they both offer greater Aboriginal employment and business opportunities than Alternative A. |
| **OVERALL PREFERENCE** | | | | Ore processing by milling and cyanide leaching using a cyanide destruction circuit and natural cyanide destruction **(Alternative C)** is most preferred because it was identified as a preferred alternative for each evaluation criterion. It was also most preferred over Alternatives A and B for technical performance and opportunities, financial costs and risks, and effects on human health. |

**Table 5-8: Summary of the Detailed Evaluation of Local Transmission Line Re-routing Alternatives**

| CRITERIA | A<br><br>NORTH ROUTE | B<br><br>SOUTH ROUTE | COMMENTS |
|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | **Alternative A** is the most preferred alternative since the route provides for a high level of access to the mine site and to the line itself for maintenance purposes. |
| **FINANCIAL COSTS AND RISKS** | | | **Alternative A** is the most preferred. While the capital cost of Alternative A exceeds that of Alternative B, the cost risk for Alternative B could be higher than the underlying capital cost estimate. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | **Alternative B** is slightly preferred due to the shorter distance over which construction will occur. This results in lower dust, noise, vibration, and GHG emissions. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | **Alternative A** is preferred since it results in slightly lower effects on the terrain and sediment. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | **Alternative A** is preferred. Although the ROW for Alternative A is longer if co-located with a re-routed Goudreau Road to the west of the TMF and MRMF, it does not increase access to an undisturbed area. Alternative A disturbs the least amount of significant wildlife habitat, Whip-poor-will habitat, and is a location along a public road and within the area of the mine site that would be disturbed regardless by other mining activity. |
| **EFFECTS ON HUMAN HEALTH** | | | **Alternatives A and B** are considered to be equally preferred as they both pose a negligible risk to public health and workers safety. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | **Alternatives A and B** are considered equally preferred. |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | **Alternative A** is preferred as it involves a shorter distance through undisturbed land which is less disruptive to existing land use and tourism activities. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | **Alternative A** is preferred as it is likely to have less impact on the biological environment. Although the ROW for Alternative A is longer, it does not increase access to an undeveloped area. It disturbs the least amount of significant wildlife habitat, Whip-poor-will habitat, and is located along a public road and within the area of the mine site that would be disturbed regardless by other mining activity. |
| **OVERALL PREFERENCE** | | | **Alternative A** is most preferred because of the technical performance and opportunities, the lower effects on physical, biological and economic environment, as well aboriginal interests. |

***Note:*** *Assumes Alternative A is co-located with a re-routed Goudreau Road to the west of the TMF and MRMF.*

**Table 5-9: Summary of the Detailed Evaluation of Non-Hazardous Non-Mining Solid Waste Disposal Alternatives**

| CRITERIA | A<br><br>ON-SITE LANDFILL | B<br><br>USE OF MUNICIPAL OFF-SITE LANDFILL NEAR DUBREUILVILLE | C<br><br>EXPORT | COMMENTS |
|---|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | | **Alternative A** is preferred because it provides the most flexibility and reliability during operation of the mine. |
| **FINANCIAL COSTS AND RISKS** | | | | **Alternative A** is preferred since it has the lowest project costs. The operating cost savings associated with Alternative A is more certain, and therefore more significant, than the cost risks to Prodigy in the post-closure. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | | **Alternative A** is preferred as it does not require off-site transportation of wastes, thereby minimizing dust, vehicle emissions, noise, and vibration from trucking activity. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | | **Alternatives B and C** are both slightly preferred because the use of an existing or planned landfill would avoid the potential for any additional effects on the physical environment. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | | **Alternatives B and C** are both slightly preferred because the use of an existing or planned landfill would avoid the potential for any additional effects on the biological environment. |
| **EFFECTS ON HUMAN HEALTH** | | | | **Alternative A** is preferred because it avoids potential traffic accidents on public roads. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | | **Alternative A** is most preferred as it offers the lowest potential for effects on traffic and local roads and does not take up available capacity in a planned or existing landfill used by others. |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | | **Alternative B** is most preferred as it would result in revenues to the Town of Dubreuilville versus a more distant municipality or private sector operator and generates business opportunities related to haulage of waste. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | | **Alternative C** is considered preferred with respect to Aboriginal interests because it offers some opportunities for Aboriginal business operators related to waste haulage and would not result in incremental effects on Aboriginal interests. |
| **OVERALL PREFERENCE** | | | | The disposal of non-hazardous, non-mining solid waste in an on-site landfill **(Alternative A)** is preferred because it provides the most flexibility and reliability during operation of the mine and has the lowest project costs. It is also preferred as it does not require off-site transportation of wastes, thereby minimizing effects on air quality, and avoids potential traffic accidents on public roads. An on-site landfill does not take up available capacity in a planned or existing landfill used by others. Although the use of a planned or existing off-site landfill (Alternatives B and C respectively) would avoid the potential for any additional effects on the physical or biological environments that affect traditional Aboriginal activities; and Aboriginal interests, an on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects. |

### Table 5-10: Summary of the Detailed Evaluation of Access Roads Alternatives

| CRITERIA | A<br><br>GOUDREAU ROAD FOR ALL PROJECT TRAFFIC | B<br><br>GOUDREAU ROAD AND THE NORTHERN BYPASS FOR HEAVY LOADS | COMMENTS |
|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | **Alternative A** is preferred since the use of Goudreau Road on its own will meet the intended purpose in an effective and reliable manner without the need for substantial road improvements. While Alternative B provides some additional operational flexibility, this benefit is only short-term during the mine's construction phase and therefore does not offset the long-term benefits of Alternative A. |
| **FINANCIAL COSTS AND RISKS** | | | **Alternative A** is the most preferred alternative since it will result in lower financial costs and cost risks. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | **Alternative A** is slightly preferred because the short distance of the route will generate lesser effects on air quality, noise, and vibration, and smaller GHG emissions. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | **Alternative A** is slightly preferred since it poses the least potential for effects on surface water quality in the event of an accidental spill of chemicals or fuel. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | **Alternative A** is most preferred since fewer stream crossings are required along Goudreau Road than along the 30 km Northern Bypass. It poses the least potential for adverse effects on Species at Risk, mammals, migratory and breeding birds, wetlands, and terrestrial vegetation. Alternative A also poses the least potential for effects on fish and fish habitat in the event of an accidental spill of chemicals or fuel. |
| **EFFECTS ON HUMAN HEALTH** | | | **Alternatives A** is most preferred since it has a lower potential for accidents associated with its use. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | **Alternative A** is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic. |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | **Alternative A** is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic, and avoids two-way traffic at the Island Gold mine site access. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | **Alternative A** is slightly preferred as it is likely to result in lesser effects on the physical and biological environment that support traditional activities. |
| **OVERALL PREFERENCE** | | | The use of Goudreau Road for all Project traffic **(Alternative A**) is preferred because it was identified as the preferred alternative for each of the evaluation criteria. This alternative provides greater technical performance and opportunities, lower financial costs and risks, and less adverse atmospheric, physical, biological, human health, social and economic environmental effects than Alternative B. Alternative A is also slightly preferred as it is likely to result in lesser effects on the physical and biological environmental that support traditional activities. |

**Table 5-11: Summary of the Detailed Evaluation of Accommodations Alternatives for the Operation Phase**

| CRITERIA | A<br>ON-SITE ACCOMMDATION COMPLEX | B<br>ON-SITE ACCOMODATION SUPPLEMENTED BY OFF-SITE ACCOMMODATION COMPLEX LOCATED IN DUBREUILVILLE | C<br>OFF-SITE ACCOMMODATION COMPLEX LOCATED IN DUBREUILVILLE | COMMENTS |
|---|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | | **Alternative A** is most preferred since it offers opportunities for increasing operational flexibility at the mine site and is reliable. An on-site accommodation complex can be readily decommissioned and the site rehabilitated along with other mine-related infrastructure, while Alternative B may require re-purposing of the accommodation complex buildings upon closure. |
| **FINANCIAL COSTS AND RISKS** | | | | **Alternative A i**s most preferred due to lower overall Project cost and cost risks. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | | **Alternative A** is slightly preferred as there no neighbouring residences or community facilities likely affected by changes in air quality, noise, vibration, and light as compared to an accommodation complex within Dubreuilville, and because it minimizes the need for personnel vehicle traffic to the mine site and its associated GHG emissions. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | | All **Alternatives** are considered equally preferred. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | | All **Alternatives** are considered equally preferred. |
| **EFFECTS ON HUMAN HEALTH** | | | | **Alternative A** is slightly preferred because it presents fewer risks to public health and less potential for accidents related to worker travel to and from the mine site and/or within Dubreuilville. Although workers will be exposed to additional noise, other emissions, and workplace hazards that will be present at a mine site, the on-site accommodation complex can be designed and constructed to provide a safe and hospitable living environment. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | | **Alternative A** is preferred, as there are fewer adverse effects on community well-being and character in Dubreuilville (e.g., traffic, potential conflict between workers and residents; increased alcohol or substance abuse; social interaction between workers and community youth/other residents), and fewer barriers to Prodigy implementing restrictions on worker movement / activities. Alternative A will also result in relatively little incremental impact on traffic in Dubreuilville, and a smaller increase in demand on community services and infrastructure (e.g., emergency services, waste management, water supply, etc.) |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | | **Alternative B and C** are slightly preferred in terms of the economic environment criteria. Alternatives B and C provide revenues for the Township of Dubreuilville. While Alternative C could result in economic benefits for local businesses (e.g., stores, restaurant(s), the extent to which this might be realized in practice is unknown. Both Alternatives B and C do not require an amendment needed to 1989 zoning order, although municipal zoning amendment/permits would be required. Alternative A is somewhat preferred over Alternatives B and C in terms of overall land availability, provision of direct control / management of worker's activities, and because it does not diminish current or future land uses in Dubreuilville itself; however, C is slightly more preferred. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | | **All Alternatives** are equally preferred with respect to effects on the physical and biological environments that support traditional activities. |
| **OVERALL PREFERENCE** | | | | From an economic perspective, accommodation within an on-site accommodation complex **(Alternative A) would be preferable** because it provides greater technical performance and opportunities, lower financial costs and risks, and is likely to result in less adverse atmospheric, human health, social, and economic environmental effects than Alternatives B and C.<br><br>However, an off-site accommodation complex within Dubreuilville (Alternatives C) is retained as the preferred alternative to an on-site accommodation complex (Alternative A), or to partial on-site accommodation (Alternative B because it is strongly supported by local residents (refer to record of public consultation). Alternatives A, B1 and B2 are equally preferred in terms of effects on the physical and biological environments and Aboriginal interests. |

**Table 5-12: Summary of the Detailed Evaluation of Mine Pit Closure Alternatives**

| CRITERIA | A<br><br>PIT LAKE FILLING FROM LOCAL SURFACE RUNOFF AND GROUNDWATER INFLOW | B<br><br>PIT LAKE FILLING FROM LOCAL SURFACE RUNOFF AND GROUNDWATER INFLOW PLUS OPERATIONS WATER SUPPLY | COMMENTS |
|---|---|---|---|
| **TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | **Alternative B** is most preferred since it is more effective, has increased opportunities for operational flexibility, and provides greater reliability in achieving closure objectives. It creates a final pit lake in less than half the time of Alternative A. |
| **FINANCIAL COSTS AND RISKS** | | | **Alternative A** is slightly more preferred from a capital and operating cost perspective. While Alternative B has more cost risk in the post-closure, capital costs are considered to be more certain and therefore more important than the cost risks in determining a preference. |
| **EFFECTS ON THE ATMOSPHERIC ENVIRONMENT** | | | **Alternative B** is slightly more preferred since it provides for a water cover over the exposed pit walls in a shorter period of time as compared to Alternative A. |
| **EFFECTS ON THE PHYSICAL ENVIRONMENT** | | | **Alternative B** is slightly more preferred because it restores groundwater levels over a shorter period of time. Although Alternative A is more protective of surface water levels in Goudreau Lake, Alternative B provides for a water cover over the exposed pit walls in a shorter period of time and is therefore slightly more protective of surface water quality in Goudreau Lake as compared to Alternative A. |
| **EFFECTS ON THE BIOLOGICAL ENVIRONMENT** | | | **Alternative B** is most preferred since it restores aquatic habitat at the site over a shorter period of time and reduces risks of injury and/or mortality to animals. The restoration of groundwater levels is preferred to creating specialized habitat that would exist only temporarily (i.e., until pit lake is filled). |
| **EFFECTS ON HUMAN HEALTH** | | | **Alternatives A and B** are equally preferred since they both represent negligible risks to both the public and workers. There is a trade-off between the public being exposed to the risk of having an deep pit lake for a longer period of time (Alternative A) versus the risk to workers will be exposed to a deep pit lake for a shorter period of time while operating the water discharge system for Alternative B. Both alternatives are therefore considered equal. |
| **EFFECTS ON THE SOCIAL ENVIRONMENT** | | | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time and reduces risks of injury to members of the public. |
| **EFFECTS ON THE ECONOMIC ENVIRONMENT** | | | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time, making commercial use of the pit lake and its vicinity more attractive sooner than for Alternative A. |
| **EFFECTS ON ABORIGINAL INTERESTS** | | | **Alternative B** is most preferred as it re-establishes a waterbody suitable for traditional use in a shorter period of time than Alternative A. |
| **OVERALL PREFERENCE** | | | Mine pit closure by pit lake filling from local surface water runoff and groundwater, plus operations water supply **(Alternative B)** is preferred because it provides greater technical performance and opportunities, and less adverse atmospheric, physical, biological, social, and economic environmental effects. Alternative B is also most preferred from an Aboriginal interests perspective as it re-establishes a lake suitable for traditional use in a shorter period of time than Alternative A. |

**Table 5-13: Summary of the Detailed Evaluation of Closure of Tailings Management Facility Alternatives**

| CRITERIA | A<br><br>CLOSURE WITH A SOIL COVER AND REVEGETATED SURFACE OF THE TMF DECK | B<br><br>CLOSURE AS A WETLAND AND/OR WATERBODY ON THE TMF DECK | COMMENTS |
|---|---|---|---|
| TECHNICAL PERFORMANCE AND OPPORTUNITIES | | | **Alternative A** is preferred because of its effectiveness, operational flexibility in the post-closure, improved access, amenability to rehabilitation. |
| FINANCIAL COSTS AND RISKS | | | **Alternative A** is preferred since it involves lower closure costs and lower cost risks. |
| EFFECTS ON THE ATMOSPHERIC ENVIRONMENT | | | **Alternatives A and B** are considered equally preferred. While Alternative B is reduces the potential for dusting, Alternative A provides greater potential for carbon sequestration in the long term. |
| EFFECTS ON THE PHYSICAL ENVIRONMENT | | | **Alternative A** is preferred because it maximizes the potential for preventing seepage to groundwater and does not create a wetland or lake which might require ongoing management and may result in impaired surface water and sediment quality over the long term. |
| EFFECTS ON THE BIOLOGICAL ENVIRONMENT | | | **Alternative A** is preferred because it offers the greatest potential to replace habitats removed for the construction of the mine and to create niche habitats. There is also greater potential that the habitats created under Alternative A would be used by wildlife than under Alternative B. |
| EFFECTS ON HUMAN HEALTH | | | **Alternative A** is slightly preferred since it poses a slightly lower risk of accidents to workers and members of the public due to the absence of open water and/or ice during winter. |
| EFFECTS ON THE SOCIAL ENVIRONMENT | | | **Alternatives A and B** are considered equally preferred since both have the potential to make the area of the mine site and vicinity attractive to recreational users |
| EFFECTS ON THE ECONOMIC ENVIRONMENT | | | **Alternatives A and B** are considered equally preferred since both have the potential to make the area of the mine site and vicinity attractive to a variety of land users. |
| EFFECTS ON ABORIGINAL INTERESTS | | | **Alternative A** is preferred because it has better potential to establish conditions that would permit the productive use of the TMF for traditional harvesting by Aboriginal peoples than Alternative B. |
| OVERALL PREFERENCE | | | The closure of the tailings management facility with a soil cover and re-vegetation **(Alternative A)** is preferred because it provides greater technical performance and opportunities, lower costs and risks and less adverse atmospheric, physical, and biological environmental effects. Alternative A is also preferred because it has better potential to establish conditions that would permit the productive use of the TMF for traditional harvesting by Aboriginal peoples than Alternative B. |

### 5.3.4.1 Ore Processing

The Ore processing alternatives that were considered to be both technically and economically feasible and were therefore evaluated in detail were:

- Alternative A: Heap leaching on a lined pad;
- Alternative B: Processing by Milling and Cyanide leaching including a cyanide destruction circuit; and
- Alternative C: Processing by Milling and Cyanide leaching including a cyanide destruction circuit and natural cyanide destruction.

**Alternative A** was preferred or equally preferred by 2 criteria groups, **Alternative B** by 6 criteria groups and **Alternative C** by 9 (all) criteria groups.

Alternative C was preferred over Alternative B from the perspective of Technical Performance and Opportunities criteria group since it provided more operational flexibility. Alternative C was also more preferred from a cost risk perspective in the post closure period due to further treatment of cyanide through natural destruction. From the perspective of the Human Health criteria group, Alternative C is preferred since it will have between 10% and 50% less chemical use than Alternative B. Alternatives B and C were equally preferred from the perspective of adverse effects on the atmospheric environment, since both alternatives will be indoors and will have dust control measures. From the Physical and Biological Environment criteria group perspectives, both Alternatives B and C minimize potential effects on surface water quantity and have lower potential for effects on wetlands, fish and fish habitat and re-vegetation in post-closure. Alternatives B and C were equivalent for the Social and Economic Environment criteria groups. They were also considered equal from the perspective of Aboriginal Interests. Alternative B had no attribute that sufficiently dominated Alternative C; therefore, **Alternative** C was selected as the preferred alternative.

Additional information on the discipline-specific evaluations for these alternatives can be found in Appendix 5-1.

### 5.3.4.2 Local Transmission Line Re-routing

The Local Transmission Line Re-routing alternatives that were considered to be technically and economically feasible and evaluated in detailed were:

- Alternative A: North route; and
- Alternative B: South route.

**Alternative A** was preferred of equally preferred by 8 criteria groups, **Alternative B** by 3 criteria groups.

Alternative A dominated or was considered to be equal with Alternative B for all criteria groups except for Atmospheric Environment. Alternative B has a shorter route and therefore will produce less noise, dust, vibration, and GHG emissions compared to Alternative A. While Alternative A (north route) is longer, it predominantly traverses disturbed areas adjacent to an existing public road. Consequently, the alignment of Alternative A is expected to have lower adverse effects based on the Physical and Biological Environment criteria groups. The alternatives were considered equal for the Human Health criteria group: both pose a negligible risk to public health and worker safety. The Social Environment criteria group did not differentiate between the alternatives. Since Alternative A would result in a smaller effect based on the Physical and Biological Environment criteria groups, in turn, it was expected to have less effect on Aboriginal Interests. Alternative B had no attributes that sufficiently dominated Alternative A in the overall evaluation; therefore, **Alternative A** was selected as the preferred alternative.

Additional information on the discipline-specific evaluations for these alternatives can be found in Appendix 5-1.

#### 5.3.4.3 TMF and MRMF Area

Refer to TSD 5 for more detailed information.

#### 5.3.4.4 Non-Hazardous Non-Mining Solid Waste Disposal

The Non-hazardous, Non-Mining Solid Waste Disposal alternatives that were considered to be both technically and economically feasible and evaluated in detail were:

- Alternative A: On-Site Landfill
- Alternative B: Use of Municipal Off-Site Landfill near Dubreuilville; and
- Alternative C: Export.

**Alternative A** was preferred or equally preferred by 5 criteria groups, **Alternative B** by 3 criteria groups and **Alternative C** by 3 criteria groups.

The primary trade-offs between the waste management options related to the use of existing or municipal landfills which already had/or would have effects on the physical environment and biological environment vs. the creation of a new landfill on-site. Since the use of an existing/planned landfill would avoid any additional physical and biological effects associated with a new built landfill, Alternatives B and C were preferred from the Physical and Biological Environment criteria group perspectives. The on-site landfill, however, provides the most flexibility and reliability (Technical Performance and Opportunities criteria group) and would have the lowest project costs (Financial Costs and Risks criteria group). In addition, Alternative A is expected to have lower adverse effects on the atmospheric environment (Atmospheric Environment criteria group) since there are reduced transport requirements. The on-site alternatives would also avoid potential traffic accidents on public roads as well as reduction in disposal capacity for other purposes (e.g., municipal waste), and therefore was preferred from a Human Health criteria group perspective. However, export locally (Alternative B) or out of area (Alternative C) may provide some opportunities for the private sector, including Aboriginal business operators, and therefore was preferred from the Economic and Aboriginal Interests criteria group perspective. Since Alternative B had no attributes that sufficiently dominated Alternative A in the overall evaluation**, Alternative A** was selected as the preferred alternative.

Additional information on the discipline-specific evaluations for these alternatives can be found in Appendix 5-1.

#### 5.3.4.5 Access Roads

The Access Road alternatives that were considered both technically and economically feasible and evaluated in detail were:

- Alternative A: Goudreau Road for all Project Traffic; and
- Alternative B: Goudreau Road and the Northern Bypass for Heavy Loads.

**Alternative A** was preferred or equally preferred by 9 criteria groups, **Alternative B** by 0 criteria groups.

Alternative A dominated Alternative B for all criteria groups. The dominance of Alternative A is predominately related to the shorter distance that would need to be travelled. The shorter distance made it preferred from the Atmospheric Environment, Physical, Biological, Human Health, Social, and Economic Environment criteria group perspectives. In absence of TK, preference was given to Alternative A since it had fewer effects from the perspective of the Biological and Physical Environment criteria groups. Since Alternative B had no attributes that sufficiently dominated Alternative A in the overall evaluation, **Alternative A** was selected as the preferred alternative.

Additional information on the discipline-specific evaluations for these alternatives can be found in Appendix 5-1.

#### 5.3.4.6 Accommodations for the Operation Phase

The accommodations alternatives included:

- Alternative A: On-site accommodation complex;
- Alternative B: On-site accommodation complex supplemented by off-site accommodation complex in Dubreuilville; and
- Alternative C: Accommodations to be provided in the local communities and an off-site accommodation complex located in Dubreuilville.

Although **Alternative A** was preferred or equally preferred by 8 criteria groups, **Alternative B (preferred** by 3 criteria groups) and **Alternative C (preferred** by 4 criteria groups) are strongly supported by local residents.

Alternatives B and C would provide municipal revenues for Dubreuilville, and Alternative C, could also result in additional economic benefits for local businesses (although the extent to which this could be realized in practice is unknown).

Alternative A was preferred from the perspectives of the Technical Performance and Opportunities and Costs criteria groups. In addition, the siting of a accommodation complex on-site would result in fewer adverse effects on community well-being and the character in Dubreuilville (considerations for the Social Environment criteria group). A accommodation complex on-site is expected to have fewer risks to public health (Human Health criteria group) with less travel to and from the mine site and within Dubreuilville. Less travel also results in the on-site accommodation complex being preferred from the perspective of the Atmospheric Environment criteria group.

The alternatives were considered equal from the perspective of the Effects on the Physical Environment and Effects on the Biological Environment criteria groups. The alternatives were considered equal from an Aboriginal Interests perspective, since the effects on the physical and biological environment that support traditional activities were similar among the alternatives.

Since Alternatives C is strongly supported by local residents, and presents higher probability of economic benefits to local residents of Dubreuilville, Alternatives C is retained as the preferred alternative.

#### 5.3.4.7 Mine Pit Closure

The Mine Pit closure alternatives that were considered to be both technically and economically feasible and evaluated in detail were:

- Alternative A: Pit Lake Filling from Local Surface Runoff and Groundwater Inflow; and
- Alternative B: Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply.

**Alternative A** was preferred by 2 criteria groups, **Alternative B** by 8 criteria groups.

While Alternative A was slightly less expensive from a capital and operating cost perspective (Financial Cost and Risks Criteria Groups), the remaining of the criteria groups either had the alternatives considered to be equal (Effects on Human Health) or Alternative B preferred. Alternative B was slightly preferred from both air quality (Effects on Atmospheric Environment) and Effects on Physical Environment criteria. Alternative B covers the pit walls with water faster than Alternative A, thereby reducing sources of dust. From a Physical Environment criteria group perspective, Alternative B, restores groundwater levels more rapidly than Alternative A. The Biological, Social and Economic Environment criteria groups prefer Alternative B since it restores the near pre-Project conditions sooner. In absence of TK, it is assumed that **Alternative B** is preferred since it returns the site to pre-Project conditions sooner.

Additional information on the discipline-specific evaluations for these alternatives can be found in Appendix 5-1.

#### 5.3.4.8 Closure of Tailings Management Facility

The Closure of the Tailings Management Facility alternatives that were considered to be both technically and economically feasible were:

- Alternative A: Closure with a Soil Cover and Re-vegetated Surface of the TMF deck; and
- Alternative B: Closure as a Wetland and/or Waterbody on the TMF Deck.

**Alternative A** was preferred or equally preferred by 9 criteria groups, **Alternative B** by 3 criteria groups.

Alternatives A and B were considered to be equal from the perspective of Atmospheric Environment criteria group. Alternative A provided greater potential for carbon sequestration in the long term; however, Alternative B was expected to produce less dust. Alternative A was preferred from a Physical Environment perspective since it maximize potential for preventing seepage to groundwater and doesn’t create a wetland or lake which requires ongoing management. From a Biological Environment perspective, Alternative A offers the best potential to replace habitats removed for the mine. From a Social and Economic criteria group perspective, Alternatives A and B offer similar potential to make the area of the mine site more attractive to recreational users and other users. Alternative A is slightly preferred from a Human

Health criteria group perspective because it poses a slightly lower accident risk to workers or the public due to the absence of water. Alternative A is most preferred from an Aboriginal Interests perspective because it has good potential to establish conditions that would permit the productive use of the TMF for traditional harvesting by Aboriginal peoples.

Since Alternative B had no attributes that sufficiently dominated Alternative A in the overall evaluation**, Alternative A** was selected as the preferred alternative.

Additional information on the discipline-specific evaluations for the alternatives can be found in Appendix 5-1.

### 5.3.5 Summary and Conclusions

Based on this evaluation, Table 5-14 summarizes the overall evaluation of alternatives and the preferred alternative method selected. These preferred alternative methods have been integrated into the Project design and are described in more detail in Chapter 6.

**Table 5-14: Summary of the Alternatives Evaluation and Identification of the Preferred Alternative Methods**

| Project Component | Alternative | Conclusions |
|---|---|---|
| Mine Development | Underground mining | Not considered technically and economically feasible |
| | Open pit mining | **Preferred Alternative** |
| Ore Processing | Heap leaching on a lined pad | Technically and economically feasible, but less preferred than processing by milling and cyanide leaching using cyanide and natural cyanide destruction. |
| | Non-cyanide processing methods | Not considered technically and economically feasible |
| | Processing by milling and cyanide leaching including a cyanide destruction circuit | Technically and economically feasible, but less preferred than processing by milling and cyanide leaching using cyanide and natural cyanide destruction. |
| | Processing by milling and cyanide leaching using cyanide and natural cyanide destruction | **Preferred Alternative** |
| Ore Processing Location | On-site processing | **Preferred Alternative** |
| | Off-site processing | Not considered technically and economically feasible |
| Power Supply | On-site power generation using renewable power sources | Not considered technically and economically feasible |
| | On-site power generation using diesel power sources | Not considered technically and economically feasible |
| | Off-site power generation and transmission to the mine site by API and on-site power supply from 3 MW diesel power generators | **Preferred Alternative** |
| Local Transmission Line | North Route | **Preferred Alternative** |

| | | |
|---|---|---|
| Re-routing | Central Route | Not considered technically and economically feasible |
| | South Route | Technically and economically feasible, but less preferred than North Route |
| Process Water Supply | Use of water from the mine pit and recycling of water | Not considered technically and economically feasible as a stand-alone alternative. |
| | New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water | **Preferred Alternative** |
| | New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water | Technically feasible, but less preferred than a new supply from Goudreau Lake due to costs |
| | New supply from Magpie River, including the use of water from the mine pit and recycling of water | Not considered technically and economically feasible |
| | New supply from groundwater wells, including the use of water from the mine pit and recycling of water | Not considered technically and economically feasible |
| Tailings Deposition and Placement (refer to TSD 5) | Thickened tailings | **Preferred Alternative** |
| | Site G | **Site G (Magino Property) Preferred Alternative** |
| Non-hazardous, non-mining Solid Waste Disposal | On-site landfill | **Preferred Alternative** |
| | Use of municipal off-site landfill near Dubreuilville | Technically and economically feasible, but less preferred than an on-site landfill. |
| | Export | Technically and economically feasible, but less preferred than an on-site landfill. |
| Access Roads | Goudreau Road for all Project traffic | **Preferred Alternative** |
| | Goudreau Road and the Northern Bypass for heavy loads | Technically and economically feasible, but less preferred than using both Goudreau Road and the Northern Bypass for heavy loads |
| | New Road from Hawk Junction | Not considered technically and economically feasible |
| On-site Relocation of Goudreau Road | Relocation of Goudreau Road to the west of the TMF & MRMF | **Preferred Alternative** |
| | Relocation of Goudreau Road to the wet of the open pit | Exclude from further consideration |
| Accommodations | All accommodations to be within the available housing in the local communities | Not considered technically and economically feasible as a stand-alone alternative |
| | On-site accommodation complex supplemented by off-site accommodation in the local communities | Technically feasible but less preferred than off-site accommodation complex located near Dubreuilville |
| | Accommodations to be provided off-site located in Dubreuilville | **Preferred Alternative** |

| | | |
|---|---|---|
| Mine Pit Closure | Pit lake filling from local surface runoff and groundwater inflow | Technically and economically feasible, but less preferred than pit lake filling from local surface runoff and groundwater inflow plus operations water supply |
| | Pit lake filling from local surface runoff and groundwater inflow plus disposal of mine rock and/or tailings | Not considered technically and economically feasible |
| | Pit lake filling from local surface runoff and groundwater inflow plus operations water supply | **Preferred Alternative** |
| Closure of Tailings Management Facility | Closure with a soil cover and re vegetated surface of the TMF deck | **Preferred Alternative** |
| | Closure by creating a wetland and/or waterbody on the TMF | Technically and economically feasible, but less preferred than closure with a soil cover and re-vegetation. |

## 5.4 References

Canadian Dam Association (CDA). (2013). Dam Safety Guidelines 2007, 2013 Edition.

Ontario Ministry of the Environment. (1990). Environmental Assessment Act.

SLR Consulting. (2013, July 8). Magino Gold Project – Project Description Report.

SLR Consulting. (2016). Schedule 2 Assessment of Alternatives for Mine Waste Management Technical Support Document 5.

SLR Consulting. (2016). Site Water Balance and Quality – Technical Support Document 7.

The International Network for Acid Prevention (INAP). (2009). The GARD Guide. Retrieved from the website: http://www.gardguide.com

**Appendix 5-1: Detailed Evaluation of Alternatives Methods**

**Table 5-15: Detailed Evaluation of Ore Processing Alternatives**

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | | |
| Effectiveness in meeting the intended purpose | • Proven to be effective and is considered to be a demonstrated technology in other settings.<br>• Effective gold extraction may be constrained during winter operations at the Magino site.<br>• Effective gold extraction relies on percolation of cyanide solution through natural material that has a variable hydraulic conductivity. | • Proven to be effective and is considered to be a demonstrated technology in other settings.<br>• Year-round operations are feasible since gold extraction and cyanide destruction processing occurs in mechanically-controlled vessels. | • Proven to be effective and is considered to be a demonstrated technology in other settings.<br>• Year-round operations are feasible since gold extraction and cyanide destruction processing occurs in mechanically-controlled vessels. Natural cyanide destruction augments that achieved by the treatment circuit.<br>• It also allows less copper, which is a catalyst in the cyanide destruction process, to be added to the tailings water. | **Alternatives B and C** are both effective in meeting the intended purpose. Alternative A may also be equally effective, subject to more evaluations however. |
| Opportunities for increasing operational flexibility | • Use of mechanical systems includes crushing and potential agglomeration of the ore and emitters to apply the cyanide and rinse solutions to extract the gold, and thereafter neutralize the ore pile. Reliance is placed on the permeability of the stacked ore pile to distribute the extraction and rinse solutions.<br>• Since reliance is placed on achieving relatively uniform permeability within natural materials such as crushed rock for both gold extraction and cyanide destruction, heap leaching offers limited opportunities for increasing operational flexibility. | • Use of mechanical systems is more extensive than for heap leaching and includes crushing, grinding and mixing of cyanide for gold extraction and the treatment chemical for cyanide destruction in large tanks.<br>• Since the function of each of these mechanical systems can be controlled and optimized, there are opportunities for increasing operational flexibility. These include increasing or reducing the size of the ground ore, changing the chemical dosages to the tanks as well as the residence time of the chemicals in the tanks in a highly controlled, and largely enclosed, environment. | • Use of mechanically-controlled vessels for gold extraction and cyanide destruction provides opportunities for increasing operational flexibility similar to those discussed for Alternative B.<br>• Having natural cyanide destruction augment the treatment circuit increases operational flexibility. | **Alternative C** offers the greatest opportunity for increasing operational flexibility. |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>Heap Leaching on a Lined Pad** | **B<br>Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C<br>Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| Reliability of access / supply to the site | • This criterion does not apply to this set of alternatives, since access/supply to the site is the same for all three alternatives. | | | This criterion does not apply to this set of alternatives. |
| Amenability to rehabilitation | • For comparative purposes rehabilitation includes the heap leach pile and associated ponds and small process plant for extracting gold from the leach solution.<br>• Adequate site remediation through cyanide destruction and dissolved metal removal by rinsing after operations are completed is somewhat achievable. Enhanced low permeability covers may have to be installed to limit infiltration on closure, and leachate collection and treatment systems may be needed after closure. | • Rehabilitation includes the low grade ore stockpile, process plant and the TMF.<br>• Highly amenable to rehabilitation through decommissioning and removal of plant, buildings and equipment and cleanup and rehabilitation of the plant area and associated roads, parking lots and water control ponds.<br>• The TMF is readily amenable to closure as has been demonstrated at other mine sites. | • As for Alternative B. Use of the Tailings Management Facility (TMF) for natural attenuation will not alter its closure and rehabilitation compared to that required for Alternative B. | **Alternatives B and C** are both highly amenable to rehabilitation. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are both preferred over Alternative A given their similar effectiveness and amenability to rehabilitation. Alternative C provides better operational flexibility than Alternative B and is therefore the preferred alternative. |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| **2. FINANCIAL COSTS AND RISKS** | | | | |
| Project costs | • Lowest capital and operating costs. | • Highest capital and operating costs. | • Similar capital and operating cost to Alternative B. | **Alternative A** offers the lowest overall cost based on total cash flow (capital, operating and closure costs). |
| Cost risks over the life of the Project | • Moderate cost risk since there is potential that gold recovery is lower than projected based on laboratory testing. | • Low cost risk since gold extraction is more controllable. | • Low cost risk, same as for Alternative B. | **Alternatives B and C** are preferred because they offer the lowest and similar cost risk. |
| Cost risks during post-closure | • There is a greater potential for post-closure risk costs due to the need to increase the amount of rinsing that is performed and potentially having to provide for treatment of leachate from the heap for a period of time. | • This has a low potential for post-closure cost risks since the level of cyanide destruction is highly controlled by the in-plant destruction circuit. | • Least potential for long-term liabilities since the level of cyanide destruction is highly controlled by the in-plant destruction circuit. However, this process is further augmented by natural destruction and copper concentration in the tailings discharge water is kept to a minimum and likely lower than for Alternatives A and B. | **Alternative C** is slightly is preferable to Alternative B as it offers slightly lower post-closure cost risks due to further treatment of cyanide through natural destruction. Alternative A has a greater potential for risk which is not desirable. |
| **OVERALL TRADEOFFS** | | | | **Alternative C** is preferred from a cost and risk perspective over the life of the project and in the post-closure period. While Alternative A offers lower capital and operating costs, this is offset by the uncertainty associated with the amount of gold that can be recovered and the higher risks. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="3">ORE PROCESSING ALTERNATIVES</th><th rowspan="2">Preference by Criterion</th></tr>
<tr><th>A<br>Heap Leaching on a Lined Pad</th><th>B<br>Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit</th><th>C<br>Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction</th></tr>
<tr><td colspan="5">3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH</td></tr>
<tr><td colspan="5">3A. Effects on the Atmospheric Environment</td></tr>
<tr><td>Air Quality</td><td>• Dust will be generated during construction of the heap leach facility / lined pad.<br>• Dust will also be generated from finely crushed rock being stacked on the heap leach pad during operations (typically the ore rock is crushed to approximately 5 to 20 mm in size and would contain a fraction of finer silt like material).<br>• To a large extent dust control is provided by the leach solution application system (typically a large number of solution emitters) that wets up a significant portion of the heap's surface. Any residual adverse effects on air quality due to dust are reasonably amenable to adaptive management through implementation of additional dust control measures such as water spray and/or the additional of cementing agents to the ore before it is placed on the heap. This is referred to as agglomeration, and is frequently also be performed to increase the permeability of the ore, making it more amenable to cyanide leaching.<br>• Emissions of cyanide from the heap are prevented by maintaining the leaching solution at a high pH, which prevents the formation of free cyanide gas. Potential adverse effects to air quality from the release of cyanide are unlikely but might occur in the event of a failure to control the pH of the leach solution or an accidental spill of cyanide.<br>• Adverse effects on air quality due to accidental chemical releases (including a cyanide spill) are less amenable to adaptive management than Alternatives B and C, as they are more likely to occur outdoors. The effects on air quality from a chemical spill</td><td>• Dust will be generated during construction of the ore processing buildings and structures.<br>• Dust generation from the finely ground rock deposited in the tailings management facility is greater than Alternative A. Typically the ore rock is ground to less than 1/10 mm in size and would contain a relatively larger fraction of finer silt-like material.<br>• Dust control is provided by the water pond that covers a portion of the tailings and the moisture in the freshly discharged tailings that settle around the pond. Any residual adverse effects on air quality due to dust are reasonably amenable to adaptive management through implementation of additional dust control measures such as water spray. However access on the soft unconsolidated tailings may make this slightly more difficult.<br>• Emissions of cyanide from the leaching tanks located in the process plant's gold leaching and cyanide destruct areas are prevented by maintain a solution pH above 9. Potential adverse effects to air quality from the release of cyanide are unlikely but may occur in the event of a failure to control the pH of the leach solution or an accidental spill of cyanide.<br>• Adverse effects on air quality due to accidental chemical releases (including a cyanide spill) are slightly more amenable to adaptive management than for Alternatives A. The effect on air quality from a chemical spill indoors is less difficult to control than for a spill outdoors.</td><td>• Dust will be generated during construction of the ore processing buildings and structures.<br>• Dust generation from the finely ground rock deposited in the tailings management facility is greater than Alternative A. Typically the ore rock is ground to less than 1/10 mm in size and would contain a relatively larger fraction of finer silt-like material.<br>• Dust control is provided by the water pond that covers a portion of the tailings and the moisture in the freshly discharged tailings that settle around the pond. Adverse effects on air quality due to dust could occur in areas where the tailings have been exposed for a period of time and are dried out during hot periods. These areas are somewhat amenable to adaptive management through the implementation of additional dust control measures such as water sprays. However access on the soft unconsolidated tailings may make this slightly more difficult.<br>• Emissions of cyanide from the leaching tanks located in the process plant's gold leaching and cyanide destruct areas are prevented by maintain a solution pH above 9. Potential adverse effects to air quality from the release of cyanide are unlikely but may occur in the event of a failure to control the pH of the leach solution or an accidental spill of cyanide.<br>• Adverse effects on air quality due to accidental chemical releases (including a cyanide spill) are slightly more amenable to adaptive management than for Alternatives A. The effects on air quality from a chemical spill indoors is less difficult to control than for a spill outdoors.<br>• Providing for additional cyanide destruction in the TMF does not result in greater cyanide releases to the air as compared to Alternatives A and B.</td><td>Effective dust control measures are available for all three alternatives. Alternative A is less attractive because the effects on air quality from a chemical spill outdoors is more difficult to control than for a spill indoors.</td></tr>
</table>

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| | outdoors is more difficult to control than a spill indoors. | | | |
| Noise and Vibration | • Noise will be generated during construction of the heap leach facility / lined pad.<br>• During operations, noise will be primarily generated by crushers, trucks and conveyors moving ore onto the heap leach pile.<br>• Vibration effects relate primarily to air and ground vibration during construction. | • Noise will be generated during construction of the ore processing buildings and structures.<br>• During operations, noise will be generated by crushers, trucks, grinding mills in the process plant and the cyanide destruction plant.<br>• Although there are additional sources of noise, grinding and cyanide destruction plant design can result in outdoor noise levels similar to that of Alternative A.<br>• Vibration effects relate primarily to air and ground vibration during construction. | • Noise will be generated during construction of the ore processing buildings and structures.<br>• During operations, noise will be generated by crushers, trucks, grinding mills in the process plant and the cyanide destruction plant.<br>• Although there are additional sources of noise, grinding and cyanide destruction plant design can result in outdoor noise levels similar to that of Alternative A.<br>• Vibration effects relate primarily to air and ground vibration during construction. | No significant differences between alternatives. |
| Light | • Adverse light trespass effects are related to require night-time lighting (integral to 24 hour per day operations). | • Adverse light trespass effects are related to require night-time lighting (integral to 24 hour per day operations). | • Adverse light trespass effects are related to require night-time lighting (integral to 24 hour per day operations). | No significant differences between alternatives. |
| Greenhouse Gases | • GHG emissions are primarily from vehicles during construction and operations. | • GHG emissions are primarily from vehicles during construction and operations. | • GHG emissions are primarily from vehicles during construction and operations. | No significant differences between alternatives. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are preferable to Alternative A. Effective dust control measures are available for all three alternatives. Alternative A is less attractive because the effects on air quality from a chemical spill outdoors is more difficult to control than for a spill indoors. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="4">ORE PROCESSING ALTERNATIVES</th></tr>
<tr><th>A<br>Heap Leaching on a Lined Pad</th><th>B<br>Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit</th><th>C<br>Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction</th><th>Preference by Criterion</th></tr>
<tr><td colspan="5">3B. Effects on the Physical Environment</td></tr>
<tr><td>Terrain and Soils</td><td>• Comparing the alternatives requires that the effect of the construction of the heap leach pad the MRMF and associated process plant be considered together.<br>• The adverse effects to the terrain and soils include permanently covering approximately 235 ha of terrain with rehabilitated and vegetated mine waste facilities with a maximum height of approximately 90 m.<br>• Risks to human health are considered to be negligible.<br>• Effects are somewhat amendable to adaptive management by further shaping the mine waste piles and altering the vegetative cover.</td><td>• For Alternative B, the effects are considered for the TMF, the MRMF and the process plant area.<br>• The adverse effects to the terrain and soils include permanently covering approximately 337 ha of terrain with rehabilitated and vegetated mine waste facilities with a maximum height of approximately 90 m.<br>• Risks to human health are considered to be negligible.<br>• Effects are somewhat amendable to adaptive management by further shaping the mine waste piles and altering the vegetative cover.</td><td>• For Alternative C, the effects are considered for the TMF, the MRMF and the process plant area.<br>• The adverse effects to the terrain and soils include permanently covering approximately 337 ha of terrain with rehabilitated and vegetated mine waste facilities with a maximum height of approximately 90 m.<br>• Risks to human health are considered to be negligible.<br>• Effects are somewhat amendable to adaptive management by further shaping the mine waste piles and altering the vegetative cover.</td><td>Alternative A is preferred over Alternatives B and C, since it has a slightly smaller footprint.</td></tr>
<tr><td>Ground water (i.e., quantity and quality)</td><td>• Effects on groundwater quality would be most evident in the post-closure phase. Residual seepage from the closed heap leach pile may require treatment and/or other management for a period of time, potentially decades. However, adverse effects are likely negligible, and likely to pose negligible risks to human health.<br>• If effects did occur due to failure of the engineered containment systems, they would be highly amendable to adaptive management.</td><td>• Solutions used in the process plant and TMF operations would contain concentrations of metals that exceed regulatory standards.<br>• Effects on groundwater quality would be most evident in the post-closure phase.<br>• As part of mitigation by design, groundwater quality would be protected by seepage collection systems located around the perimeter of the TMF.<br>• Adverse effects are likely to be minor and limited to the shallow groundwater located immediately below these tailings in the TMF and within the seepage collection systems. This would pose a negligible risk to human health since this water is not utilized for consumption. If effects did occur they would be highly amendable to adaptive management.</td><td>• Solutions used in the process plant and TMF operations would contain concentrations of metals that exceed regulatory standards.<br>• Effects on groundwater quality would be most evident in the post-closure phase.<br>• As part of mitigation by design, groundwater quality would be protected by seepage collection systems located around the perimeter of the TMF.<br>• Adverse effects are likely to be minor and limited to the shallow groundwater located immediately below the tailings in the TMF and within the seepage collection systems. This would pose a negligible risk to human health since this water is not utilized for consumption. If effects did occur they would be highly amendable to adaptive management.</td><td>Alternative A offers the lowest potential for adverse effects on groundwater quality. Alternative B and C would affect an isolated groundwater area contained within seepage collection systems, and underlying the TMF and are therefore less preferred.</td></tr>
</table>

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| Surface Water (i.e., quantity and quality) | • Surface water quality will be protected by providing adequate storage capacity in the "pregnant" solution and/or "stormwater" ponds to store excess water generated by extreme wet periods. Provision for discharging excess water, after treatment if necessary to meet applicable standards, will also be provided for.<br>• Some reduction in surface flows with Spring Lake - McVeigh Creek will occur since the presence of the heap leach and the Mine Rock Management Facility (MRMF) reduced the catchment areas.<br>• The quantity of water discharged is estimated at 6,300 m3 / day in Year 7.<br>• Adverse effects to surface water quality are likely to be negligible and to surface water quantity likely minor.<br>• Adverse effects are somewhat amendable to adaptive management. | • Surface water quality will be protected by providing adequate storage capacity in the TMF to store excess water generated by extreme wet periods. Provision for discharging excess water, after treatment to meet applicable standards, will also be provided for, if needed.<br>• A similar reduction to surface flows into Spring Lake and McVeigh Creek will occur as for Alternative A, since the TMF associated with the process plant and the heap leach facility reduce the catchment areas by similar amounts.<br>• The quantity of discharge water is substantially lower than Alternative A (i.e., average of up to 3,800 m3.day in Year 7), thereby reducing the potential for adverse effects on surface water flows.<br>• Adverse effects to surface water quality are likely to be negligible and to surface water quantity likely minor.<br>• Adverse effects are somewhat amendable to adaptive management. | • Surface water quality will be protected by providing adequate storage capacity in the TMF to store excess water generated by extreme wet periods. Provision for discharging excess water, after treatment to meet applicable standards, will also be provided for, if needed.<br>• A similar reduction to surface flows into Spring Lake and McVeigh Creek will occur as for Alternative A, since the TMF associated with the process plant and the heap leach facility reduce the catchment areas by similar amounts.<br>• The quantity of discharge water is substantially lower than Alternative A (i.e., average of up to 3,800 m3.day in Year 7), thereby reducing the potential for adverse effects on surface water flows.<br>• Adverse effects to surface water quality are likely to be negligible and to surface water quantity likely minor.<br>• Adverse effects are somewhat amendable to adaptive management. | **Alternatives B and C** are equally preferred due to similar and lower potential for adverse effects on surface water flows than Alternative A. |
| Stream and Lake Sediments (i.e., sediment quality) | • This alternative relies on sediment control facilities such as detention ponds to prevent unacceptable discharge of sediment to the environment. | • Similar to Alternative A, this alternative relies on sediment control facilities such as detention ponds to prevent unacceptable discharge of sediment to the environment. | • Similar to Alternatives A and B, this alternative relies on sediment control facilities such as detention ponds to prevent unacceptable discharge of sediment to the environment. | All alternatives are considered equal. |
| **OVERALL TRADEOFFS** | | | | **Alternative A, B and C** are considered equal. While Alternative A minimizes potential groundwater quality effects, Alternatives B and C minimize potential effects on surface water quantity. |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>Heap Leaching on a Lined Pad** | **B<br>Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C<br>Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| **3C. Effects on the Biological Environment** | | | | |
| Natural Heritage Features | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | All alternatives are considered equal. |
| Fish and Fish Habitat | • Adverse effects to fish and fish and fish are most closely tied to effects to surface water quantity and quality.<br>• Requirement for substantial discharges of water may result in minor adverse effects to surface water flows. Adverse effects to surface water quality are likely to be negligible.<br>• Effects on fish and fish habitat are highly amenable to adaptive management and/or provision of offsets. | • Adverse effects to fish and fish and fish are most closely tied to effects to surface water quantity and quality.<br>• Substantially lower requirements for discharges result in lower adverse effects to surface water flows than Alternative A. Adverse effects to surface water quality are likely to be negligible. The resultant adverse effects to fish and fish habitat are likely to be lowest in magnitude.<br>• Effects on fish and fish habitat are highly amenable to adaptive management and/or provision of offsets. | • Adverse effects to fish and fish and fish are most closely tied to effects to surface water quantity and quality.<br>• Substantially lower requirements for discharges result in lower adverse effects to surface water flows than Alternative A. Adverse effects to surface water quality are likely to be negligible. The resultant adverse effects to fish and fish habitat are likely to be lowest in magnitude.<br>• Effects on fish and fish habitat are highly amenable to adaptive management and/or provision of offsets. | **Alternatives B and C** are preferred due to lower potential for effects on fish and fish habitat resulting from changes in surface water flows. |
| Terrestrial Vegetation | • Comparing alternatives requires that the effects of the construction of the heap leach pad and associated water ponds and small process plant be considered together.<br>• The loss of terrestrial vegetation is estimated to be approximately 390 ha.<br>• Re-establishment of vegetation may be constrained by the presence of residual contaminants and seepage from mine rock used for the heap leach pile. Therefore, effects are only somewhat amenable to rehabilitation. | • Comparing alternatives requires that the effects of the construction of the process plant, MRMF and TMF be considered together.<br>• The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A.<br>• Potential for the re-establishment of vegetation on the MRMF and TMF is less constrained than for Alternative A. | • Comparing alternatives requires that the effects of the construction of the process plant, MRMF and TMF be considered together.<br>• The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A.<br>• Potential for the re-establishment of vegetation on the MRMF and TMF is less constrained than for Alternative A. | **Alternatives B and C** are preferred due to fewer constraints for the re-establishment of vegetation on the MRMF and TMF than for Alternative A reshaped heap leach pile. |
| Wetlands | • Adverse effects to wetlands are largely related to removal of wetland habitat and to effects to surface water quantity and quality.<br>• Requirement for substantial discharges of water may result in minor adverse effects to surface water flows. Adverse effects to surface water quality are likely to be negligible. | • Adverse effects to wetlands are largely related to removal of wetland habitat and to effects to surface water quantity and quality.<br>• Alternative B will result in the removal of a similar amount of wetland habitat as Alternative A.<br>• Substantially lower requirements for discharges result in lower adverse effects to surface water flows than Alternative A. Adverse effects to surface water quality | • Adverse effects to wetlands are largely related to removal of wetland habitat and to effects to surface water quantity and quality.<br>• Alternative B will result in the removal of a similar amount of wetland habitat as Alternative A.<br>• Substantially lower requirements for discharges result in lower adverse effects to surface water flows than Alternative A. Adverse effects to surface water quality are likely to be negligible. The resultant adverse | **Alternatives B and C** are equally preferred due to lower potential for effects on wetlands resulting from changes in surface water flows than for Alternative A. |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| | | are likely to be negligible. The resultant adverse effects to wetlands are likely to be lowest in magnitude. | effects to wetlands are likely to be lowest in magnitude. | |
| Significant Wildlife Habitat | • The loss of terrestrial vegetation may result in the loss of some significant wildlife habitat within the footprint for the required facilities. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | All alternatives are considered equally preferred. |
| Migratory and Breeding Birds | • The loss of terrestrial vegetation will result in the loss of migratory and breed bird habitat within the footprint for the required facilities. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | All alternatives are considered equally preferred. |
| Mammals | • The loss of terrestrial vegetation will result in the loss habitat for mammal within the footprint for the required facilities. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | All alternatives are considered equally preferred. |
| Species at Risk (Aquatic and Terrestrial) | • The loss of terrestrial vegetation may result in the loss of some habitat for Species at Risk within the footprint for the required facilities. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | • The area required by the process plant, MRMF and TMF are similar to that of the heap leach pile, ponds and smaller processing plant associated with Alternative A. | All alternatives are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are preferred due to lower potential for effects on fish and fish habitat, and effects on wetlands resulting from changes in surface water flows and greater potential for the re-establishment of vegetation in the post-closure. |
| **3D. Effects on Human Health** | | | | |
| Public Health (i.e., potential for accidents) | • This alternative involves facilities that are not accessible to the public and require fuel and chemicals to be tracked. As such the potential for adverse effects to public health is considered to be negligible. | • This alternative involves facilities that are not accessible to the public and require fuel and chemicals to be tracked. As such the potential for adverse effects to public health is considered to be negligible. | • This alternative involves facilities that are not accessible to the public and require fuel and chemicals to be tracked. As such the potential for adverse effects to public health is considered to be negligible. | All alternatives are considered equally preferred. |
| Workers Safety (i.e., workplace hazards) | • Worker safety is highly regulated and the risks to workers are considered to be negligible, with mitigation.<br>• Alternative A involves chemical use in | • As for Alternative A, worker safety is highly regulated and the risks to workers are considered to be negligible, with mitigation. | • As for Alternative A and B, worker safety is highly regulated and the risks to workers are considered to be negligible, with mitigation.<br>• Alternative C involves more chemical use | **Alternative C** is slightly more preferred than Alternatives A and B since it involves lowest chemical usage in comparison to Alternative B. The large open in-ground ponds make Alternative A less |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>Heap Leaching on a Lined Pad** | **B<br>Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C<br>Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| | the leaching process that may pose a hazard to workers.<br>• Alternative A has large open in-ground ponds that pose a minor potential risk to workers that differs from Alternatives B and C. | • Alternative B involves more chemical use (cyanide, lime, sodium metasulphate and copper sulphate) than Alternative A. | than Alternative A. However, since the amount of chemical use is reduced by between 10% and 50% in comparison to Alternative B, worker risks are reduced when compared to Alternative B and similar to Alternative A. | preferred than Alternative C. |
| **OVERALL TRADEOFFS** | | | | **Alternative C** is considered slightly more preferred over Alternatives A and B, since it does not use open in-ground ponds and involves the least chemical usage among all the alternatives. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | | |
| **4A. Effects on the Social Environment** | | | | |
| Population and Demographics | • Population and demographics are not affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • Community vitality is not affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| Infrastructure and Services | • Community infrastructure and services are not affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| Cultural Heritage | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | All alternatives are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | | All alternatives are considered equally preferred. |
| **4B. Effects on the Economic Environment** | | | | |
| Land Use and Tourism | • Land use and tourism are not affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| Employment and Business Opportunities | • Heap leaching on a lined pad is both labour and capital intensive. | • Processing by milling is more labour and capital intensive than Alternative A. | • Processing by milling is more labour and capital intensive than Alternative A and similar to Alternative B. | **Alternatives B and C** are equally preferred. |
| Government Revenues | • Government revenues are not substantially affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are equally preferred as they both offer greater employment and business opportunities than Alternative A. |

| CRITERIA | ORE PROCESSING ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**Heap Leaching on a Lined Pad** | **B**<br>**Processing by Milling and Cyanide Leaching including a Cyanide Destruction Circuit** | **C**<br>**Processing by Milling and Cyanide Leaching Using a Cyanide Destruction Circuit and Natural Cyanide Destruction** | **Preference by Criterion** |
| **4C. Effects on Aboriginal Interests** | | | | |
| Aboriginal Employment and Business Opportunities | • Heap leaching on a lined pad is not labour or capital intensive and offers limited employment and business opportunities. | • Processing by milling is more labour and capital intensive than Alternative A. As such there is more potential for Aboriginal employment and business opportunities. | • Processing by milling is more labour and capital intensive than Alternative A and similar to Alternative B. As such there is more potential for Aboriginal employment and business opportunities. | **Alternatives B and C** are equally preferred. |
| Traditional Use of Lands and Resources | • Traditional use of lands is not substantially affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| Aboriginal Cultural Activities and Special Places | • Aboriginal cultural activities and special places are not substantially affected by the various ore processing alternatives. | | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are equally preferred as they both offer greater employment and business opportunities than Alternative A. |

**Table 5-16: Detailed Evaluation of Local Transmission Line Re-routing Alternatives**

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**North Route** | **B**<br>**South Route** | **Preference by Criterion** |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | |
| Effectiveness in meeting the intended purpose | • Rerouting electric transmission lines by reasonable alignments is an effective means for continuing power transmission while allowing for construction of facilities in areas previously occupied by lines. | • Rerouting electric transmission lines by reasonable alignments is an effective means for continuing power transmission while allowing for construction of facilities in areas previously occupied by lines. | **Alternatives A and B** are considered equally preferred. |
| Opportunities for increasing operational flexibility | • The route of the power lines does not have an impact on operational flexibility. | | This criterion does not apply to this set of alternatives. |
| Reliability of access / supply to the site | • Alternative A provides a high level of access to the site and for maintenance since the route parallels a public road. The presence of a public road alongside the transmission line right-of-way provides a higher level of accessibility for ease of construction and for maintenance purposes as compared to Alternative B. | • Alternative B provides a high level of access to the site and for maintenance since there would be a trail within the new right-of-way. | **Alternative A** is slightly preferred since the presence of a public road alongside the transmission line right-of-way provides a higher level of accessibility for ease of construction and for maintenance purposes as compared to Alternative B. |
| Amenability to rehabilitation | • The transmission line will be owned by others and its use will continue after the mine closes. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred since the presence of a public road alongside the transmission line right-of-way provides a higher level of accessibility for ease of construction and for maintenance purposes as compared to Alternative B. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | A<br>North Route | B<br>South Route | Preference by Criterion |
| **2. FINANCIAL COSTS AND RISKS** | | | |
| Project costs | • Costs include a new power line which is approximately 12 km long along a public road. The Project would bear the costs of re-routing since it is needed to accommodate mine construction and operations.<br>• Capital Costs: $3.6 million<br>Annual Costs: None. The transmission line would be owned and operated/maintained by others. | • Costs include the easement, a new access road and the new power line which is approximately 5 km long.<br>• Capital Costs: $3.0 million<br>Annual Costs: None. The transmission line would be owned and operated/maintained by others. | **Alternative B** is most preferred because of lower capital costs. |
| Cost risks over the life of the Project | • Costs risks are considered to be negligible since the power line will be constructed along a public road. | • Cost risks of this alternative are considered to be moderate since it requires road construction across relatively unknown conditions and since it traverses land outside the Project area.<br>• It is possible that the cost risk associated with Alternative B could exceed the relatively small difference in capital cost between Alternative A and B. | **Alternative A** is most preferred because of the lower cost risks. |
| Cost risks during post-closure | • There are no post-closure costs or activities associated with these alternatives since the power lines will remain in place for use by others after mine closure. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is the most preferred. While the capital cost of Alternative A exceeds that of Alternative B by $600,000, the cost risk for Alternative B could be higher than this amount which only represents 20% of the underlying capital cost estimate. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | **A<br>North Route** | **B<br>South Route** | **Preference by Criterion** |
| **3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH** | | | |
| **3A. Effects on the Atmospheric Environment** | | | |
| Air Quality | • Dust will be generated during construction of the transmission line. Effects can be minimized by constructing both the bypass road and the transmission line together.<br>• There is no dust emissions associated with the operation of a transmission line. | • Dust will be generated during construction of the transmission line. Overall, a shorter route will generate less dust over a shorter construction period.<br>• There is no dust emissions associated with the operation of a transmission line. | **Alternative B** is slightly preferred due to the shorter distance over which construction will occur. |
| Noise and Vibration | • Noise and vibration will be generated during construction of the transmission line. Effects can be minimized by constructing both the bypass road and the transmission line together.<br>• There is no substantial noise or vibrations associated with the operation of a transmission line. | • Noise and vibration will be generated during construction of the transmission line. Overall, a shorter route will generate less dust over a shorter construction period.<br>• There is no substantial noise or vibrations associated with the operation of a transmission line. | **Alternative B** is slightly preferred due to the shorter distance over which construction will occur. |
| Light | • Light effects are not substantially affected by the various transmission routing alternatives. | | This criterion does not apply to this set of alternatives. |
| Greenhouse Gases | • Some GHGs will be generated during construction (due to vehicles and equipment). Effects can be minimized by constructing both the bypass road and the transmission line together.<br>• There is no GHG emissions associated with the operation of a transmission line. | • Some GHGs will be generated during construction (due to vehicles and equipment).<br>• There is no GHG emissions associated with the operation of a transmission line. | **Alternative B** is slightly preferred due to the shorter distance over which construction will occur. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is slightly preferred due to the shorter distance over which construction will occur. This results in lower dust, noise, vibration and GHG emissions. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | **A<br>North Route** | **B<br>South Route** | **Preference by Criterion** |
| **3B. Effects on the Physical Environment** | | | |
| Terrain and Soils | • Alternative A will have a negligible effect on the terrain since it follows a public road and occurs adjacent to mining facilities. These effects are not amendable to adaptive management. | • Alternative B will have a minor effect on the terrain since it is located on land that will remain undeveloped, except for the powerline. It will include a cleared area approximately 30 m wide along the line. Trees and brush within this cleared strip will be routinely removed in order to protect the line from forest fire damage. A vehicle trail will be incorporated into the cleared strip. | **Alternative A** is most preferred since it will have a negligible effect on the terrain. |
| Ground water (i.e., quantity and quality) | • Adverse effects on groundwater quantity or quality are not expected. | • Adverse effects on groundwater quantity or quality are not expected. | **Alternatives A and B** are equally preferred. |
| Surface Water (i.e., quantity and quality) | • Adverse effects on surface water quantity or quality are not expected. | • Adverse effects on surface water quantity or quality are not expected. | **Alternatives A and B** are equally preferred. |
| Stream and Lake Sediments (i.e., sediment quality) | • This alternative would have a negligible impact to sediment. | • This alternative has the potential for minor impacts due to sediment generated in local runoff during the construction activities. | **Alternative A** is most preferred since it would have a negligible impact to sediment, while there is a greater potential for sediment being generated for Alternative B. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred since it results in slightly lower effects on the terrain and sediment. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | A<br>North Route | B<br>South Route | Preference by Criterion |
| **3C. Effects on the Biological Environment** | | | |
| Natural Heritage Features | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | **Alternatives A and B** are equally preferred. |
| Fish and Fish Habitat | • Effects on fish and fish habitat are considered negligible with the implementation of standard practice mitigation such as outlined in relevant DFO Operational Statements. | • Effects on fish and fish habitat are considered negligible with the implementation of standard practice mitigation such as outlined in relevant DFO Operational Statements. | **Alternatives A and B** are equally preferred. |
| Terrestrial Vegetation | • The right-of-way for the transmission line would require the removal of terrestrial vegetation along a 12 km right-of-way located along a public road and within the area of the mine site that would be disturbed by other mining activity. In this context, the effects on terrestrial vegetation are considered to be negligible. | • The right-of-way for the transmission line would require the removal of vegetation along a 5 km right-of-way. Although this route is substantially shorter, it is located within an undeveloped area south of the northern arm of Goudreau Lake and creates a new corridor with additional indirect effects on adjacent vegetation. In this context the effects on terrestrial vegetation are considered to be greater than for Alternative A. | **Alternative A** is preferred due to its location along a public road and within the area of the mine site that would be disturbed by other mining activity. |
| Wetlands | • Effects on wetlands are considered negligible with standard design measures and the location of transmission line infrastructure (i.e., wood poles) along a public road and within the area of the mine site that would be disturbed by other mining activity. | • Although this route is substantially shorter, it is located within an undeveloped area south of the northern arm of Goudreau Lake. In this context the effects on terrestrial vegetation are considered to be greater than for Alternative A. | **Alternative A** is preferred due to its location along a public road and within the area of the mine site that would be disturbed by other mining activity. |
| Significant Wildlife Habitat | • The new right-of-way traverses approximately 3 km of moose late winter cover habitat which is considered to be significant wildlife habitat. Much of this is within the area of the mine site that would be disturbed by other mining activity. Therefore effects are considered to be negligible.<br>• Effects of a transmission line on other areas of significant wildlife habitat are considered to be negligible. | • The new right-of-way traverses approximately 3 km of moose late winter cover habitat which is considered to be significant wildlife habitat. A small portion of this right-of-way is located within an undeveloped area south of Webb Lake, however the overall adverse effect is considered to be similar to that of Alternative A.<br>• Effects of a transmission line on other areas of significant wildlife habitat are considered to be negligible. | **Alternatives A and B** are considered to be equally preferred. |
| Migratory and Breeding Birds | • Effects of a transmission line migratory and breeding birds are considered to be negligible. | • Effects of a transmission line migratory and breeding birds are considered to be negligible | **Alternatives A and B** are considered to be equally preferred. |
| Mammals | • Effects of a transmission line on mammals are considered to be negligible. | • A new right-of-way increases access to an undeveloped area which may increase hunting pressure on mammals. | **Alternatives A** is considered most preferred. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | A<br>North Route | B<br>South Route | Preference by Criterion |
| Species at Risk (Aquatic and Terrestrial) | • The new right-of-way traverses < 500 m of Whip-poor-will upland forest habitat. Much of this is within the area of the mine site that would be disturbed by other mining activity. Additional effects on Whip-poor-will are considered to be negligible. | • The new right-of-way traverses approximately 5 km of Whip-poor-will upland forest habitat and almost entirely located within an undeveloped area south of Webb Lake and Goudreau Lake. Additional effects on Whip-poor-will are considered to be minor and greater than for Alternative A. | **Alternative A** is preferred because the right-of-way disturbs the least amount of Whip-poor-will habitat and is location along a public road and within the area of the mine site that would be disturbed by other mining activity. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred. Although the right-of-way for Alternative A is longer, it does not increase access to an undisturbed area. Alternative A disturbs the least amount of significant wildlife habitat, Whip-poor-will habitat and is location along a public road and within the area of the mine site that would be disturbed by other mining activity. |
| **3D. Effects on Human Health** | | | |
| Public Health (i.e., potential for accidents) | • The presence of wood pole structures adjacent to a public road may increase the severity of accidents should a vehicle hit a pole. | • Transmission rights-of-way are commonly used by snowmobiles. The presence of wood pole structures within the right-of-way may increase the severity of accidents should a vehicle hit a pole. The potential for accidents is considered to be similar to that of Alternative A. | **Alternatives A and B** are considered to be equally preferred. |
| Workers Safety (i.e., workplace hazards) | • Alternative A does require construction and maintenance workers to work along a public road. However, worker safety is highly regulated and the risks to workers are considered to be negligible. | • Alternative B does not require construction and maintenance workers to work along a public road Despite this difference, worker safety is highly regulated and the risks to workers are considered to be negligible and similar to that of Alternative A. | **Alternatives A and B** are considered to be equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternatives A and B** are considered to be equally preferred as they both pose a negligible risk to public health and workers safety. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | |
| **4A. Effects on the Social Environment** | | | |
| Population and Demographics | • Population and demographics are not affected by the various transmission routing alternatives. | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • Community vitality is not affected by the various transmission routing alternatives. | | This criterion does not apply to this set of alternatives. |
| Infrastructure and Services | • Community infrastructure and services are not affected by the various transmission routing alternatives. | | This criterion does not apply to this set of alternatives. |

| CRITERIA | LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES | | |
|---|---|---|---|
| | **A<br>North Route** | **B<br>South Route** | **Preference by Criterion** |
| Cultural Heritage | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | **Alternatives A and B** are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternatives A and B** are considered equally preferred. |
| **4B. Effects on the Economic Environment** | | | |
| Land Use and Tourism | • The North Route alternative involves approximately 12 km of new right-of-way along the proposed public bypass road. Because only 1 km traverses undisturbed land, this alternative is considered to be less disruptive to commercial trapping/bear management and outfitting activities than Alternative B. | • The South Route alternative involves approximately 5 km of new right-of-way that traverses undisturbed land. This is considered to be more disruptive to commercial trapping/bear management and outfitting activities than Alternative A.<br>• The South Route is located in proximity to a cabin on the south shore of Goudreau Lake, currently accessed by Bearpaw Trail. | **Alternative A** is preferred as it involves a shorter distance through undisturbed land which is less disruptive to existing land use and tourism activities. |
| Employment and Business Opportunities | • Employment and business opportunities are not substantially affected by the routing alternatives. Both alternatives would likely be constructed by existing Algoma Power staff and suppliers. | | This criterion does not apply to this set of alternatives. |
| Government Revenues | • Government revenues are not affected by routing alternatives. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred. While it requires a longer route, there is a shorter distance through undisturbed land which is less disruptive to existing land use and tourism activities. The effects of Alternative A can be minimized by constructing both the bypass road and the transmission line together. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="3">LOCAL TRANSMISSION LINE RE-ROUTING ALTERNATIVES</th></tr>
<tr><th>A<br>North Route</th><th>B<br>South Route</th><th>Preference by Criterion</th></tr>
<tr><td colspan="3">4C. Effects on Aboriginal Interests</td><td></td></tr>
<tr><td>Aboriginal Employment and Business Opportunities</td><td colspan="2">• Employment and business opportunities are not substantially affected by the routing alternatives. Both alternatives would likely be constructed by existing Algoma Power staff and suppliers.</td><td>This criterion does not apply to this set of alternatives.</td></tr>
<tr><td>Traditional Use of Lands and Resources</td><td>• In the absence of specific Traditional Knowledge from any Aboriginal group, effects on Aboriginal use of lands and resources are considered closely related to effects on the biological environment.<br>• The new right-of-way traverses < 500 m of Whip-poor-will upland forest habitat.<br>• Much of the new right-of-way is within an area of the mine site that would be disturbed by other mining activity.</td><td>• In the absence of specific Traditional Knowledge from any Aboriginal group, effects on Aboriginal use of lands and resources are considered closely related to effects on the biological environment.<br>• The new right-of-way traverses approximately 5 km of Whip-poor-will upland forest habitat.<br>• The new right-of-way is almost entirely located within an undeveloped area south of Webb Lake and Goudreau Lake.</td><td>In the absence of specific Traditional Knowledge from any Aboriginal group, Alternative A is most preferred. Although the right-of-way for Alternative A is longer, it disturbs the least amount of significant wildlife habitat, Whip-poor-will habitat and is located along a public road and within the area of the mine site that would be disturbed by other mining activity.</td></tr>
<tr><td>Aboriginal Cultural Activities and Special Places</td><td>• No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places.</td><td>• No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places.</td><td>In the absence of Traditional Knowledge, Alternatives A and B are considered equally preferred.</td></tr>
<tr><td colspan="3">OVERALL TRADEOFFS</td><td>In the absence of specific Traditional Knowledge from any Aboriginal group, Alternative A is preferred as it is likely to have less impact on the biological environment. Although the right-of-way for Alternative A is longer, it does not increase access to an undeveloped area. It disturbs the least amount of significant wildlife habitat, Whip-poor-will habitat and is located along a public road and within the area of the mine site that would be disturbed by other mining activity.</td></tr>
</table>

**Table 5-17: Detailed Evaluation of Water Supply Alternatives**

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | |
| Effectiveness in meeting the intended purpose | • Effective in supplying good quality fresh water for processing activities and potable water. | • Effective in supplying good quality fresh water for processing activities and potable water. | **Alternatives A and B** are considered to be equally preferred and are both effective in meeting the intended purpose. |
| Opportunities for increasing operational flexibility | • Since reliance is placed on one lake pump station and pipeline, opportunities for increased operational flexibility are limited. | • Since there are two pump stations and two pipelines, there are increased opportunities for operational flexibility since over the short term (likely few hours or days) the extraction from one of the lakes can be increased to accommodate curtailed extraction possibly due to mechanical problems, from the other.<br>• Over the long term, i.e. weeks to months or years, there would be limited opportunities for operational flexibility since specified relative amounts of water would have to be achieved in accordance with a Permit to Take Water. | **Alternative B** is preferred since it has greater opportunities for operational flexibility. |
| Reliability of access / supply to the site | • Goudreau Lake is large and provides a reliable source of good quality water.<br>• Supply reliability to the mine could be enhanced by providing redundant pumps in the supply line. | • Goudreau and Herman Lakes are large lakes and together provide a higher level of reliability of supply than the single source Alternative A.<br>• Supply reliability to the mine could be further enhanced by providing redundant pumps in the two supply lines. | Both alternatives will be reliable, however **Alternative B** offers a somewhat higher level of reliability as multiple water sources and conveyances are provided in the event of an unplanned service interruption. |
| Amenability to rehabilitation | • Highly amenable to rehabilitation through decommissioning and removal of pipelines and habitat rehabilitation. | • Highly amenable to rehabilitation through decommissioning and removal of pipelines and habitat restoration. However, since two pipelines are involved, the amenability of this alternative is considered to lower than for Alternative A, the overall mechanical reliability of this alternative is considered the same as that for Alternative A. | **Alternative A** is preferred since it is more amenable to rehabilitation through decommissioning and removal of pipelines and habitat rehabilitation. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is most preferred since it offers an increased operational flexibility over the short term and is more reliable. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **2. FINANCIAL COSTS AND RISKS** | | | |
| Project costs | • Lowest capital cost<br>Capital:$940,000<br>Annual Operating: $140,000 | • Highest capital costs<br>Capital: $2,920,000<br>Annual Operating: $240,000 | **Alternative A** is most preferred since it has lower costs. |
| Cost risks over the life of the Project | • Low cost risk due to short length of pipeline that would need to be constructed, operated and decommissioned.<br>• The cost risk associated with the mine being unoperational due to disruption of a single supply is readily mitigated by providing redundant pumps in the supply line. | • Moderate cost risk. It is higher than for Alternative A because of the longer pipeline lengths involved with that alternative.<br>• The cost risk associated with the mine being unoperational due to disruption of supply is minimized by having two water sources. Cost risk can be further mitigated by providing redundant pumps in the supply lines. | **Alternative A** is most preferred since it has lower cost risks. |
| Cost risks during post-closure | • Low cost risks since closure involve rehabilitation a narrow strip along which the pipeline was located. | • Moderate cost risk. It is higher than for Alternative A, because of the longer pipeline, lengths involved with that Alternative. | **Alternative A** is preferred since it has lower cost risks for the post closure period. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred because of lower costs and cost risks. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH** | | | |
| **3A. Effects on the Atmospheric Environment** | | | |
| Air Quality | • Dust will be generated during construction of the transmission line.<br>• There is no air emissions associated with the operation of the water supply line. | • Dust will be generated during construction of the transmission line. Overall, a shorter route will generate less dust over a shorter construction period.<br>• There is no air emissions associated with the operation of the water supply line. | **Alternative A** is slightly preferred due to the shorter distance over which construction will occur. |
| Noise and Vibration | • Noise and vibration will be generated during construction of the transmission line.<br>• There is no noise or vibration associated with the operation of the water supply line. | • Noise and vibration will be generated during construction of the transmission line. Overall, a shorter route will generate less dust over a shorter construction period.<br>• There is no noise or vibration associated with the operation of the water supply line. | **Alternative A** is slightly preferred due to the shorter distance over which construction will occur. |
| Light | • Light effects are not substantially affected by the various transmission routing alternatives. | | This criterion does not apply to this set of alternatives. |
| Greenhouse Gases | • Some GHGs will be generated during construction (due to vehicles and equipment).<br>• There are no GHG emissions associated with the operation of the water supply line. | • Some GHGs will be generated during construction (due to vehicles and equipment).<br>• There are no GHG emissions associated with the operation of the water supply line. | **Alternative A** is slightly preferred due to the shorter distance over which construction will occur. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is most preferred due to the shorter distance over which construction will occur. This results in lower dust, noise, vibration and GHG emissions. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **3B. Effects on the Physical Environment** | | | |
| Terrain and Soils | • Adverse effects are considered to be negligible. Since the pipeline and associated power cables will buried, effects will be limited to a pump house on the banks of Goudreau Lake. | • As for Alternative A, effects are considered to be negligible.<br>• Since this alternative will include an additional pump house on the shore of Herman Lake its effects would be slightly larger than for Alternative A. | **Alternative A** is most preferred since it will have a slightly lower effect on the terrain and soils. |
| Ground water (i.e., quantity and quality) | • Adverse effects on groundwater quantity and movement may occur with the burial of the pipeline below the water table in shallow overburden deposits. These effects are considered negligible, with mitigation. | • Adverse effects on groundwater quantity and movement may occur with the burial of the pipeline below the water table in shallow overburden deposits. These effects are considered to be negligible, with mitigation. | **Alternatives A and B** are equally preferred. |
| Surface Water (i.e., quantity and quality) | • The effects on surface water quality are considered to be negligible with mitigation.<br>• Construction of the pipelines may have a short term disruption to surface water flow.<br>• The average effect on Goudreau Lake level would be a reduction of approximately 2 cm during years 8 to 14 of mine operations. Effects would be less than that during years 1 through 2 since the pit would be providing additional makeup water. | • The effects are considered to be negligible with mitigation.<br>• Construction of the pipelines may have a short term disruption to surface water flow.<br>• The average effect on Goudreau Lake level would be a reduction of slightly less than 2 cm and of Herman Lake level approximately 1 cm. (Note that the lake level effects projects are considered only to be meaningful to within a1 cm accuracy.) | **Alternative A** is the preferred alternative only effect one, instead of two water bodies. |
| Stream and Lake Sediments (i.e., sediment quality) | • Goudreau Lake sediments may be adversely affected in the area of the supply end of the pipeline. Some streams will be temporally disturbed as the pipelines are installed. | • Goudreau Lake and Herman Lake sediments may be adversely in the area of the supply and of the pipelines. More streams than for Alternative A will be temporarily disturbed as pipelines are installed. | **Alternative A** is preferred since it will have less effect on the streams and lake sediments, affecting only one, instead of two water bodies. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is most preferred since it will have a slightly lower effect on the terrain and soils. It will have less effect on the surface water streams and lake sediments, affecting only one, instead of two water bodies. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **3C. Effects on the Biological Environment** | | | |
| Natural Heritage Features | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | **Alternatives A and B** are equally preferred. |
| Fish and Fish Habitat | • Adverse effects to fish and fish and fish are most closely tied to effects to surface water quantity and quality and stream and sediment quality.<br>• Effects on surface water and sediments in Goudreau Lake and along the pipeline right-of-way are considered to be minor. | • Adverse effects to fish and fish and fish are most closely tied to effects to surface water quantity and quality and stream and sediment quality.<br>• Effects on surface water and sediments in Goudreau Lake and along the pipeline right-of-way are considered to be minor, but there is a greater potential for adverse effects on stream sediments along a longer pipeline route. Alternative B requires construction within two lakes rather than one for Alternative A. | **Alternative A** is preferred because there is less potential for adverse effects on stream sediments along a shorter pipeline route. Alternative A also avoids construction within one additional lake (i.e., Herman Lake). |
| Terrestrial Vegetation | • The right-of-way for the Goudreau water supply pipeline would be approximately 2 to 2.5 km long and located along a public road and/or within the area of the mine site that would be disturbed by other mining activity. This effect is considered to be negligible. | • The Goudreau plus Herman Lakes water supply pipelines involve rights-of-way approximately 9.0 km in length. Although this distance is greater than for Alternative A, the right-of-way would be located largely along a public road and/or within the area of the mine site that would be disturbed by other mining activity. Because less than 1 km of the pipeline to Herman Lake would be located outside of the disturbed area, its effect on terrestrial vegetation is considered to be similar to that of Alternative A. This effect is considered to be negligible. | **Alternatives A and B** are considered to be equally preferred. |
| Wetlands | • The right-of-way for the Goudreau water supply pipeline would be approximately 2 to 2.5 km long and located along a public road and/or within the area of the mine site that would be disturbed by other mining activity. No wetlands are likely to be traversed by a right-of-way to Goudreau Lake. | • The Goudreau plus Herman Lakes water supply pipelines involve rights-of-way approximately 9.0 km in length and located along a public road and/or within the area of the mine site that would be disturbed by other mining activity.<br>• Regardless of its location along a public road, a buried pipeline is likely to disturb wetland functions due to alteration of groundwater and surface water flow regimes.<br>• This alternative involves the crossing of several wetland areas located along the public road. These effects are considered to be minor. | **Alternatives A** is preferred because it does not affect any wetland habitat as compared to Alternative B. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| Significant Wildlife Habitat | • A buried pipeline is most likely to affect amphibian breeding habitat that is considered to be significant wildlife habitat. The right-of-way to Goudreau Lake does not traverse any significant wildlife habitat for amphibians. | • A buried pipeline is most likely to affect amphibian breeding habitat that is considered to be significant wildlife habitat. The right-of-way to Goudreau Lake does not traverse any significant wildlife habitat for amphibians. | **Alternatives A and B** are considered to be equally preferred. |
| Migratory and Breeding Birds | • Effects of a buried pipeline and related water intakes on migratory and breeding birds are considered to be negligible. | • Effects of a buried pipeline and related water intakes on migratory and breeding birds are considered to be negligible. | **Alternatives A and B** are considered to be equally preferred. |
| Mammals | • Effects of a buried pipeline and related water intakes on mammals are limited to the effects of increased access to Goudreau Lake and disturbance during construction. These are considered to be negligible, with mitigation. | • Effects of a buried pipeline and related water intakes on mammals are limited to the effects of increased access to Goudreau and Herman Lakes and disturbance during construction. Although these effects are considered to be negligible, with mitigation, this Alternative would increase human access for hunting to a greater extent than Alternative A. | **Alternative A** is considered to be slightly preferred since it minimizes human access for hunting to a greater extent than Alternative B. |
| Species at Risk (Aquatic and Terrestrial) | • The right-of-way for the Goudreau water supply pipeline is not likely to traverse Species at Risk habitat and is to be located within the area of the mine site that would be disturbed by other mining activity. | • The Goudreau plus Herman Lakes water supply pipelines are not likely to traverse Species at Risk habitat and are to be located largely within the area of the mine site that would be disturbed by other mining activity. | **Alternatives A and B** are considered to be equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred because there is a less potential for adverse effects on stream sediments, wetland habitat. Also, it avoids construction in one additional lake (i.e., Herman Lake). and minimizes human access for hunting to a greater extent than Alternative B. |
| **3D. Effects on Human Health** | | | |
| Public Health (i.e., potential for accidents) | • The potential for accidents by the members is considered negligible. | • The potential for accidents by the members is considered negligible. | **Alternatives A and B** are considered to be equally preferred. |
| Workers Safety (i.e., workplace hazards) | • Workplace hazards associated with excavation and construction activities are considered to be avoidable and/or manageable. | • A longer pipeline route offers greater potential for workplace accidents. However, these hazards are considered to be avoidable and/or manageable. | **Alternatives A and B** are considered to be equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternatives A and B** are considered to be equally preferred. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | |
| **4A. Effects on the Social Environment** | | | |
| Population and Demographics | • Water supply alternatives do not have an impact on population and demographics. | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • This alternative has the potential to affect three (3) cabins on Goudreau Lake; at least two occupied by Island Gold employees and all are owned by other mining companies. Goudreau Lake is not widely used for recreational purposes, including fishing and therefore effects of water takings on community vitality (specifically on recreational uses such as fishing) are likely to be negligible, with mitigation. | • This alternative has the potential to affect between 10-15 recreational seasonal camps in Goudreau in the vicinity of Herman Lake, plus two (2) cabins on Herman lake and three (3) cabins on Goudreau Lake.<br>• At least two (2) of these cabins are occupied by Island Gold employees and all are owned by other mining companies. Although Herman Lake is used more for recreational purposes, effects of water takings on community vitality (specifically on recreational uses such as fishing) are likely to be negligible, with mitigation. | **Alternative A** is most preferred. Alternative B results in a greater number of owners/users of recreational cabins potentially affected by water takings. |
| Infrastructure and Services | • The water supply alternatives under consideration do not have an impact on community infrastructure and services. | | This criterion does not apply to this set of alternatives. |
| Cultural Heritage | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | Alternatives A and B are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred since it potentially affects fewer owners/users of recreational cabins. |
| **4B. Effects on the Economic Environment** | | | |
| Land Use and Tourism | • There are no commercial uses of cabins on Goudreau Lake nor is the lake used for fishing by outfitters. | • Herman Lake and vicinity is used by outfitters for fishing/bear hunting/ATVing. This alternative has the potential to affect the commercial use of three (3) cabins in area of Goudreau and the one outfitter cabin on Herman Lake which is considered ‘commercial’ by MNRF. | **Alternative A** is most preferred, as fewer owners/users of cabins used for commercial purposes might be affected by water taking. |
| Employment and Business Opportunities | • The water supply alternatives under consideration do not have a substantial impact on employment or business opportunities. | | This criterion does not apply to this set of alternatives. |
| Government Revenues | • The water supply alternatives under consideration do not have a substantial impact on government revenues. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is most preferred, as fewer owners/users of cabins used for commercial purposes might be affected by water taking. |

| CRITERIA | WATER SUPPLY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**New supply from Goudreau Lake, including the use of water from the mine pit and recycling of water** | **B**<br>**New supply from Herman and Goudreau lakes, including the use of water from the mine pit and recycling of water** | **Preference by Criterion** |
| **4C. Effects on Aboriginal Interests** | | | |
| Aboriginal Employment and Business Opportunities | • The water supply alternatives under consideration do not have a substantial impact on Aboriginal employment or business opportunities. | | This criterion does not apply to this set of alternatives. |
| Traditional Use of Lands and Resources | • In the absence of specific Traditional Knowledge from any Aboriginal group, effects on Aboriginal use of lands and resources are considered closely related to effects on the physical and biological environments. | • In the absence of specific Traditional Knowledge from any Aboriginal group, effects on Aboriginal use of lands and resources are considered closely related to effects on the physical and biological environments and potentially greater than Alternative A. | In the absence of specific Traditional Knowledge from any Aboriginal group, **Alternative A** is preferred since it will have less effect on the physical and biological environment. |
| Aboriginal Cultural Activities and Special Places | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | In the absence of specific Traditional Knowledge from any Aboriginal group**, Alternatives A and B** are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | In the absence of specific Traditional Knowledge from any Aboriginal group**, Alternative A** is preferred since it will have less effect on the physical and biological environment. |

**Table 5-18: Detailed Evaluation of Non-Hazardous Non-Mining Solid Waste Disposal Alternatives**

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | A<br>On-Site Landfill | B<br>Use of Municipal Off-Site Landfill near Dubreuilville | C<br>Export | Preference by Criterion |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | | |
| Effectiveness in meeting the intended purpose | • The intended purpose of a landfill is to accommodate all of the non-hazardous, non-mining wastes likely to be generated by the Project. An on-site landfill can be constructed to accommodate all such. | • A contract for the use of Dubreuilville's municipal landfill could be developed to accommodate all of the non-hazardous, non-mining wastes likely to be generated by the Project.<br>• The jurisdiction over the approval and construction of a municipal landfill is outside of Prodigy's control and therefore may not be available in time to meet Prodigy's needs. | • A contract for the use of another landfill off-site could be developed to accommodate all of the non-hazardous, non-mining wastes likely to be generated by the Project. There are several other available landfills in the region, increasing the reliability of this Alternative. These landfills are permitted and have demonstrated successful performance. | **Alternatives A and C** are considered to be equally preferred and more effective that Alternative B given that a site owned by the municipality may not be available in time to meet Prodigy's needs. |
| Opportunities for increasing operational flexibility | • An on-site landfill, owned and operated by Prodigy provides for complete operational flexibility. | • The Town of Dubreuilville's existing landfill is reaching its capacity. A new landfill is planned that would have to serve Dubreuilville and potentially other waste generators in the area. The project would have to comply with contractual conditions negotiated with the landfill operator, limiting flexibility somewhat. Since it is not dedicated to the project and operated by an external party, it would have less operational flexibility than Alternative A. | • There are several other available landfills in the region. These landfills are permitted and have demonstrated successful performance. The availability of more than one landfill increases operational flexibility over Alternative B.<br>• The project would have to comply with contractual conditions negotiated with the landfill operator, limiting flexibility somewhat. | **Alternative A** is preferred since mine has complete control and therefore full flexibility. |
| Reliability of access / supply to the site | • This is the most reliable option because the landfill is on site and within a short distance from the areas where the waste will be generated. Mine operators will be able to dispose of waste at any time and under most weather conditions. | • Alternative B provides relatively reliable access, assuming the planned new landfill is located between 15 and 20 km outside of the mine site. Weather may affect access in winter.<br>• Reliability of landfill operations somewhat uncertain since the Dubreuilville landfill has not been constructed. | • Access will be controlled by weather and may pose some problem in winter because of long haul. Reliability may be increased by providing large enough storage bins at the mine to handle delays in collection.<br>• Supply in terms of disposal rate may be increased by providing large enough storage bins at the mine to handle delays in collection. | **Alternative A** is preferred because landfill is on mine property and is therefore under Prodigy's control. |
| Amenability to rehabilitation | • An on-site landfill is highly amenable to rehabilitation. | • A new landfill operated by the municipality is highly amendable to rehabilitation by the municipality. | • A landfill is highly amendable to rehabilitation by its owner/operator. | All of the alternatives are equally preferred. |
| **OVERALL TRADEOFFS** | | | | **Alternative A** is preferred because it provides the most flexibility and reliability during operation of the mine. |

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>On-Site Landfill** | **B<br>Use of Municipal Off-Site Landfill near Dubreuilville** | **C<br>Export** | **Preference by Criterion** |
| **2. FINANCIAL COSTS AND RISKS** | | | | |
| Project costs | • Costs are estimated at approximately $44/tonne. | • Tipping fees and transport costs are estimated at approximately $90/tonne. Negotiations would determine Prodigy's contribution towards capital costs (if any). | • Tipping fees and transport costs are estimated at approximately $90/tonne. | **Alternative A** is preferred since costs are likely to be the lowest. |
| Cost risks over the life of the Project | • Low cost risk. Costs are extremely predicable, since costs of construction and operation are under the control of Prodigy. | • Moderate cost risk. This alternative depends on the Town of Dubreuilville permitting, constructing and operating a new landfill. These costs are not yet known and have therefore not yet been incorporated into a tipping fee. These costs are not under the control of Prodigy and the tipping fee that Prodigy would be charged has not been established. | • Low cost risk. The permitting, construction and operating costs of an established landfill would be incorporated into the tipping fee. Although these costs are not under the control of Prodigy, tipping fees would be governed by contract and are considered to be predictable over the timeframe of the contract. | **Alternatives A and C** are preferred because of low cost risk. |
| Cost risks during post-closure | • Low cost risk. Any unanticipated costs in the post-closure that might arise would be borne by Prodigy alone. | • Any unanticipated costs that might arise in the post-closure would be borne by the Town of Dubreuilville. | • Any unanticipated costs that might arise in the post-closure would be borne by the facility owner/operator. | **Alternatives B and C** are preferred since post-closure costs and cost risks not borne by Prodigy. |
| **OVERALL TRADEOFFS** | | | | **Alternative A** is preferred since it has the lowest project costs. The operating cost savings in the order of $46/tonne associated with Alternative A is more certain than the cost risks to Prodigy in the post-closure. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="4">NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES</th></tr>
<tr><th>A<br>On-Site Landfill</th><th>B<br>Use of Municipal Off-Site Landfill near Dubreuilville</th><th>C<br>Export</th><th>Preference by Criterion</th></tr>
<tr><td colspan="5">3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH</td></tr>
<tr><td colspan="5">3A. Effects on the Atmospheric Environment</td></tr>
<tr><td>Air Quality</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on air quality.<br>• This alternative does not require off-site transportation of wastes, thereby minimizing the effects of dust and vehicle emissions along local public roads.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on air quality.<br>• The predicted 52 truck trips / year over 15 to 20 km will result in greater air quality effects along local public roads than Alternative A.</td><td>• An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that is protective of air quality.<br>• The predicted 26 truck trips / year over approximately 350 km will result in greater air quality effects along local public roads than Alternative A.</td><td>Alternative A is preferred since it does not require off-site transportation of wastes, thereby minimizing the effects of dust and vehicle emissions along local public roads.</td></tr>
<tr><td>Noise and Vibration</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse noise and vibration effects.<br>• This alternative does not require off-site transportation of wastes, thereby minimizing noise and vibration effects along local public roads.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse noise and vibration effects.<br>• The predicted 52 truck trips / year over 15 to 20 km will result in greater noise and vibration effects along local public roads than Alternative A.</td><td>• An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that is protective of air quality.<br>• The predicted 26 truck trips / year over approximately 350 km will result in greater noise and vibration effects along local public roads than Alternative A.</td><td>Alternative A is preferred since it does not require off-site transportation of wastes, thereby minimizing noise and vibration effects along local public roads.</td></tr>
<tr><td>Light</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects of light trespass.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects of light trespass.</td><td>• An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that minimizes the effects of light trespass.</td><td>All of the alternatives are equally preferred.</td></tr>
<tr><td>Greenhouse Gases</td><td>• This alternative does not require off-site transportation of wastes, thereby minimizing GHG emissions from trucking activity.</td><td>• The predicted 52 truck trips / year over a haul distance of approximately 15 to 20 km will result in greater GHG emissions than Alternative A.</td><td>• The predicted 26 truck trips / year over a haul distance of approximately 350 km will result in greater GHG emissions than Alternative A.</td><td>Alternative A is preferred as it does not require off-site transportation of wastes, thereby minimizing GHG emissions from trucking activity.</td></tr>
<tr><td colspan="4">OVERALL TRADEOFFS</td><td>Alternative A is preferred as it does not require off-site transportation of wastes, thereby minimizing dust, vehicle emissions, noise and vibration from trucking activity.</td></tr>
</table>

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**On-Site Landfill** | **B**<br>**Use of Municipal Off-Site Landfill near Dubreuilville** | **C**<br>**Export** | **Preference by Criterion** |
| **3B. Effects on the Physical Environment** | | | | |
| Terrain and Soils | • Effects on terrain and soils are largely unavoidable. The local terrain and soils will be affected where the landfill is constructed. | • Effects on terrain and soils are largely unavoidable but inevitable given the Town's intent to construct its own landfill. The local terrain and soils will be affected where the landfill is constructed. | • The local terrain and soils have already been affected where the landfill was constructed.<br>• No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in an additional, avoidable effect on terrain and soils. |
| Ground water (i.e., quantity and quality) | • An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on groundwater. The groundwater will be affected where the landfill is constructed. | • The groundwater will be affected where the landfill is constructed. A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on groundwater. | • An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that is protective of groundwater. | **Alternatives B and C** are equally preferred because they do not result in an additional, avoidable effect on groundwater. |
| Surface Water (i.e., quantity and quality) | • The surface water will be affected where the landfill is constructed. An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on surface water. | • The surface water will be affected where the landfill is constructed. A new municipal land can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on surface water. | • An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that is protective of surface water. | **Alternatives B and C** are equally preferred because they do not result in an additional, avoidable effect on surface water |
| Stream and Lake Sediments (i.e., sediment quality) | • Depending on location, steam and sediments would be affected where the landfill is constructed. An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on stream and lake sediments. | • Depending on location, steam and sediments would be affected where the landfill is constructed. A new municipal land can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on stream and lake sediments. | • An existing licensed landfill will have been constructed and would continue to be operated and closed in a manner that is protective of stream and lake sediments. | **Alternatives B and C** are equally preferred because they do not result in an additional, avoidable effect on stream and lake sediments. |
| **OVERALL TRADEOFFS** | | | | **Alternatives B and C** are both slightly preferred because the use of an existing or planned landfill would avoid the potential for any additional effects on the physical environment, |

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>On-Site Landfill** | **B<br>Use of Municipal Off-Site Landfill near Dubreuilville** | **C<br>Export** | **Preference by Criterion** |
| **3C. Effects on the Biological Environment** | | | | |
| Natural Heritage Features | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site. | • No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site or Dubreuilville. | • Effects on natural heritage features (if any) will have been addressed at the time the landfill was approved. | All of the alternatives are equally preferred. |
| Fish and Fish Habitat | • An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on fish and fish habitat. | • A new municipal land can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on fish and fish habitat. The use of a planned landfill avoids the potential for any additional effects on fish and fish habitat. | • Effects on fish and fish habitat (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on fish and fish habitat.<br>• No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in an additional effects on fish and fish habitat. |
| Terrestrial Vegetation | • Effects on terrestrial vegetation are largely unavoidable. An on-site landfill will require the removal of upland forest habitat. | • Effects on terrestrial vegetation are largely unavoidable but inevitable given the Town's intent to construct its own landfill. Terrestrial vegetation will be affected where the landfill is constructed. | • Terrestrial vegetation has already been affected where the landfill was constructed.<br>• No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in an additional effects on terrestrial vegetation. |
| Wetlands | • An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on wetlands. | • A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on wetlands. The use of a planned landfill avoids the potential for any additional effects on wetlands. | • Effects on wetlands (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on wetlands.<br>• No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in an additional effects on wetlands. |
| Significant Wildlife Habitat | • An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on significant wildlife habitat. | • A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on significant wildlife habitat. The use of a planned landfill avoids the potential for any additional effects on significant wildlife habitat. | • Effects on significant wildlife habitat (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on significant wildlife habitat.<br>• No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in an additional effects on significant wildlife habitat. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="4">NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES</th></tr>
<tr><th>A<br>On-Site Landfill</th><th>B<br>Use of Municipal Off-Site Landfill near Dubreuilville</th><th>C<br>Export</th><th>Preference by Criterion</th></tr>
<tr><td>Migratory and Breeding Birds</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on migratory and breeding birds or attracting them to the site.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on migratory and breeding birds or attracting them to the site. The use of a planned landfill avoids the potential for any additional effects on birds.</td><td>• Effects on migratory and breeding birds (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on birds.<br>• No incremental effects are generated at an existing facility.</td><td>Alternatives B and C are equally preferred because they do not result in an additional effects on migratory and breeding birds.</td></tr>
<tr><td>Mammals</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on mammals or attracting them to the site.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on mammals or attracting them to the site. The use of a planned landfill avoids the potential for any additional effects on mammals.</td><td>• Effects on mammals (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on mammals.<br>• No incremental effects are generated at an existing facility.</td><td>Alternatives B and C are equally preferred because they do not result in an additional effects on mammals.</td></tr>
<tr><td>Species at Risk (Aquatic and Terrestrial)</td><td>• An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on Species at Risk.</td><td>• A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on Species at Risk. The use of a planned landfill avoids the potential for any additional effects on Species at Risk.</td><td>• Effects on Species at Risk (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on Species at Risk.<br>• No incremental effects are generated at an existing facility.</td><td>Alternatives B and C are equally preferred because they do not result in an additional effects on Species at Risk.</td></tr>
<tr><td colspan="4">OVERALL TRADEOFFS</td><td>Alternatives B and C are both slightly preferred because the use of an existing or planned landfill would avoid the potential for any additional effects on the biological environment.</td></tr>
<tr><td colspan="5">3C. Effects on Human Health</td></tr>
<tr><td>Public Health (i.e., potential for accidents)</td><td>• An on-site landfill avoids the use of public roads for transport of wastes.</td><td>• Off-site transport of waste increases the potential of traffic accidents on public roads over Alternative A.</td><td>• Off-site transport of waste increases the potential of traffic accidents on public roads over Alternative A. The potential for accidents increases with distance travelled.</td><td>Alternative A is preferred because it avoids potential traffic accidents on public roads. Alternatives B and C require the use of public roads for the transport of wastes.</td></tr>
<tr><td>Workers Safety (i.e., workplace hazards)</td><td>• Workplace hazards are similar at all landfills. Effects to worker safety are considered negligible.</td><td>• Workplace hazards are similar at all landfills. Effects to worker safety are considered negligible.</td><td>• Workplace hazards are similar at all landfills. Effects to worker safety are considered negligible.</td><td>All alternatives are equally preferred.</td></tr>
<tr><td colspan="4">OVERALL TRADEOFFS</td><td>Alternative A is preferred because it avoids</td></tr>
</table>

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES<br>A<br>On-Site Landfill | B<br>Use of Municipal Off-Site Landfill near Dubreuilville | C<br>Export | Preference by Criterion |
|---|---|---|---|---|
| | | | | potential traffic accidents on public roads. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | | |
| **4A. Effects on the Social Environment** | | | | |
| Population and Demographics | • The solid waste disposal alternatives under consideration do not have an impact on population and demographics. | | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • The solid waste disposal alternatives under consideration do not have an impact on population and demographics. | | | This criterion does not apply to this set of alternatives. |
| Infrastructure and Services | • This alternative does not result in any impact to community infrastructure or services (e.g., waste management facilities and services and roads). | • The addition of non-hazardous, non-mining solid waste generated by the Project to a municipal landfill near Dubreuilville (existing or new) will reduce the available capacity / lifespan of the landfill.<br>• The predicted 52 truck trips / year will have negligible effects on local roads for a haul distance of approximately 15 to 20 km. | • The addition of non-hazardous, non-mining solid waste generated by the Project to another private or municipal landfill will reduce the available capacity / lifespan of the landfill.<br>• The predicted 26 truck trips / year will have negligible effects on local roads for a haul distance of approximately 350 km. | **Alternative A** is most preferred as it offers the lowest potential for effects on local roads and does not take up available capacity in a planned or existing landfill used by others. |
| Cultural Heritage | • No effects on cultural heritage features are anticipated because there are no cultural heritage features on or in the vicinity of the Magino site. | • A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on cultural heritage features. Any adverse effects are considered to be negligible, with mitigation. | • Effects on cultural heritage features (if any) will have been deemed acceptable at the time the landfill was approved. | All of the alternatives are equally preferred. |
| **OVERALL TRADEOFFS** | | | | **Alternative A** is most preferred as it offers the lowest potential for effects on traffic and local roads and does not take up available capacity in a planned or existing landfill used by others. |

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A**<br>**On-Site Landfill** | **B**<br>**Use of Municipal Off-Site Landfill near Dubreuilville** | **C**<br>**Export** | **Preference by Criterion** |
| **4B. Effects on the Economic Environment** | | | | |
| Land Use and Tourism | • An on-site landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on off-site land uses and tourism related activities. The adverse effects of a licensed landfill within the context of a mine site are considered to be negligible, with mitigation. | • A new municipal landfill can be sited, constructed, operated and closed to avoid and/or minimize adverse effects on wetlands. The use of a planned landfill avoids the potential for any additional effects on off-site land uses and tourism related activities. | • Effects on off-site land uses and tourism related activities (if any) may already have occurred where the landfill was constructed. The use of an existing landfill avoids the potential for any additional effects on off-site land uses and tourism related activities. No incremental effects are generated at an existing facility. | **Alternatives B and C** are equally preferred because they do not result in additional effects on off-site land uses and tourism related activities. |
| Employment and Business Opportunities | • An on-site landfill would be constructed, operated and decommissioned by existing Project staff. | • A municipal owned and operated landfill would be constructed, operated and decommissioned by municipal staff. The additional waste generated by the Project offers limited business opportunities related to waste haulage. | • Export of waste to an off-site landfill offers limited business opportunities related to waste haulage. | **Alternatives B and C** are slightly preferred as they offer the potential business opportunities related to waste haulage. |
| Government Revenues | • An on-site landfill would not generate revenues to government. | • The addition of non-hazardous, non-mining solid waste generated by the Project to a municipal landfill near Dubreuilville (existing or new) will likely require the payment of tipping fees to the municipal government. | • The addition of non-hazardous, non-mining solid waste generated by the Project to another off-site landfill will likely require the payment of tipping fees to the site owner / operator.<br>• The use of a landfill operated by the private sector would not typically generate additional revenues to government, unless they are afforded a portion of the tipping fees charged. | **Alternative B** is slightly preferred to Alternative C as it would result in revenues to the Town of Dubreuilville versus a more distant municipality or private sector operator. Both Alternatives B and C are preferred to Alternative A, which would not generate any revenues to government. |
| **OVERALL TRADEOFFS** | | | | **Alternative B** is most preferred as it would result in revenues to the Town of Dubreuilville versus a more distant municipality or private sector operator and generates business opportunities related to haulage of waste. |

| CRITERIA | NON-HAZARDOUS NON-MINING SOLID WASTE DISPOSAL ALTERNATIVES | | | |
|---|---|---|---|---|
| | **A<br>On-Site Landfill** | **B<br>Use of Municipal Off-Site Landfill near Dubreuilville** | **C<br>Export** | **Preference by Criterion** |
| **4C. Effects on Aboriginal Interests** | | | | |
| Aboriginal Employment and Business Opportunities | • An on-site landfill would be constructed, operated and decommissioned by existing Project staff. | • A municipal owned and operated landfill would be constructed, operated and decommissioned by municipal staff. The additional waste generated by the Project offers limited business opportunities related to waste haulage. These opportunities may be available to Aboriginal business operators. | • Export of waste to an off-site landfill offers limited business opportunities related to waste haulage. These opportunities may be available to Aboriginal business operators. | **Alternatives B and C** are slightly preferred as they offer the potential business opportunities related to waste haulage. These opportunities may be available to Aboriginal business operators. |
| Traditional Use of Lands and Resources | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding the use of the Magino site for traditional purposes. | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding effects of a planned municipal landfill on traditional use and resources. | • In the absence of Traditional Knowledge from any Aboriginal group regarding effects of an existing off-site landfill on traditional use and resources, this Alternative would not result in an incremental effect. | In the absence of Traditional Knowledge from any Aboriginal group. **Alternative C** is preferred since it would not result in an incremental effect on traditional use of lands and resources. |
| Aboriginal Cultural Activities and Special Places | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | • No comment can be offered with respect to a planned municipal landfill at an unspecified location in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | • In the absence of Traditional Knowledge from any Aboriginal group regarding effects of an existing off-site landfill on Aboriginal cultural activities and special places, this Alternative would not result in an incremental effect. | In the absence of Traditional Knowledge from any Aboriginal group. **Alternative C** is preferred since it would not result in an incremental effect on Aboriginal cultural activities and special places. |
| **OVERALL TRADEOFFS** | | | | In the absence of Traditional Knowledge from any Aboriginal group, **Alternative C** is preferred because it offers some opportunities for Aboriginal business operators related to waste haulage and would not result in an incremental effects Aboriginal interests. |

**Table 5-19: Detailed Evaluation of Routine Access Road Alternatives**

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="2">ROUTINE ACCESS ROAD ALTERNATIVES</th><th rowspan="2">Preference by Criterion</th></tr>
<tr><th>A<br>Goudreau Road for all Project Traffic</th><th>B<br>Goudreau Road and the Northern Bypass for Heavy Loads</th></tr>
<tr><td colspan="3">1. TECHNICAL PERFORMANCE AND OPPORTUNITIES</td><td></td></tr>
<tr><td>Effectiveness in meeting the intended purpose</td><td>• The Goudreau access road is a highly effective means for the transport of workers, supplies, fuels and chemicals for operations, as well as the materials and equipment needed to construct the mine. The bridge over the Magpie River at Dubreuilville is reported to be adequately rated. Some road improvements may be necessary.<br>• This road is also used by Richmond Mine located adjacent to, and east of Magino. Therefore, there will be two mining companies to share the work needed to maintain access.<br>• The road length from the west side of Dubreuilville to the Goudreau Lake shore is approximately 15 km.</td><td>• As for Alternative A, Goudreau Road is highly effective means to gain access to the site.<br>• Consideration of the additional use of the Northern bypass road was prompted since this route incorporates a larger bridge across the Magpie River with a higher load rating than the Goudreau Road bridge. However, the physical condition of the 30 km long road (originating at the same location to the west of Dubreuilville as for Alternative A) is poor and therefore would not be as an effective option for servicing the mine.</td><td>Alternative A is slightly more preferred than Alternative B since it can provide all the necessary access and requires the least amount of road improvements.</td></tr>
<tr><td>Opportunities for increasing operational flexibility</td><td>• Operational flexibility is desirable to manage the transport of large, heavy equipment to the site during construction. Alternative A offers less flexibility since it involves only one route. The transport of heavy loads during operations is not expected, therefore additional flexibility in access is not required.</td><td>• Alternative B offers greater operational flexibility during construction since large, heavy loads could be diverted onto the Northern Bypass.</td><td>Alternative B is preferred since it offers greater operational flexibility during construction over Alternative A with respect to transport of heavy loads.</td></tr>
<tr><td>Reliability of access / supply to the site</td><td>• Goudreau Road provides reliable access to the site with low risk of service interruption. The exclusive use of Goudreau Road for daily operations does not preclude the use of the Northern Bypass should Goudreau Road not be available due to service interruptions (i.e., heavy snowfall) or in an emergency.</td><td>• Because the exclusive use of Goudreau Road for daily operations does not preclude the use of the Northern Bypass on occasion, Alternative B provides a similar level of reliability as Alternative A.</td><td>Alternatives A and B are considered equally preferred.</td></tr>
<tr><td>Amenability to rehabilitation</td><td colspan="2">• There are no plans to remove existing roads from the road network.</td><td>This criterion does not apply to the set of alternatives.</td></tr>
<tr><td colspan="3">OVERALL TRADEOFFS</td><td>Alternative A is preferred since the use of Goudreau Road on its own more effectively meets the project needs by providing effective access without the need for substantial improvements. While Alternative B provides some additional operational flexibility, this benefit is only short term during the mine's construction phase and therefore does not offset the long term benefits of Alternative A.</td></tr>
</table>

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| **2. FINANCIAL COSTS AND RISKS** | | | |
| Project costs | • Costs have not been evaluated for the potential road improvements as of the time this analysis was completed. It is anticipated that these will not be significant; i.e. of the order of $50,000. | • Cost associated with Alternative B are anticipated to be higher than for Alternative A since improvements would have to be done on the Northern Bypass as well. | **Alternative A** is preferred due to lower overall Project costs. |
| Cost risks over the life of the Project | • Cost risks are likely to be low over the life of the Project and would include repairs of any damages that may occur due to use or weather conditions (e.g. flooding). | • Cost risks will be higher than for Alternative A since maintenance of two roads are involved. | **Alternative A** is the most preferred since it will result in lower cost risks. |
| Cost risks during post-closure | • There are no plans to remove existing roads from the road network. This criterion therefore does not apply. | | This criterion does not apply to the set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is the most preferred alternative since it will result in lower costs and cost risks. |

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| **3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH** | | | |
| **3A. Effects on the Atmospheric Environment** | | | |
| Air Quality | • Effects during construction are primarily related to truck and personnel vehicle traffic along approximately 15 km of road. Dust will also be generated from road improvements (if required) and ongoing maintenance activities. Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.<br>• Effects during operations are primarily related to truck and personnel vehicle traffic along approximately 15 km of road. | • Effects during construction are primarily related to truck and personnel vehicle traffic along approximately 30 km of road. Dust will also be generated from road improvements (if required) and ongoing maintenance activities. Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.<br>• Effects during operations are primarily related to truck and personnel vehicle traffic along approximately 30 km of road. | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| Noise and Vibration | • Noise and vibration will be generated from road improvements (if required) and ongoing maintenance activities. Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.<br>• Effects during operations are primarily related to truck and personnel vehicle traffic along approximately 15 km of road. | • Noise and vibration will be generated from road improvements (if required) and ongoing maintenance activities. Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. Effects during operations are primarily related to truck and personnel vehicle traffic along approximately 30 km of road | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| Light | • Light effects are not substantially affected by the routine access road alternatives. | | This criterion does not apply to this set of alternatives. |
| Greenhouse Gases | • GHG emissions from trucking activity will occur along approximately 15 km of road. | • GHG emissions from trucking activity will occur along approximately 30 km of road. | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred because to the shorter distance of the route will generate lesser effects on air quality, noise, vibration and smaller GHG emissions. |

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| **3B. Effects on the Physical Environment** | | | |
| Terrain and Soils | • Terrain and soils are not likely to be affected by the use of an existing road.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.<br>• Soil quality may be adversely affected in the unlikely event of a chemical or fuel spill. Chemical and fuel spills contained and contaminated soil removed/disposed. Effects are considered to be negligible, with mitigation. | • Terrain and soils are not likely to be affected by the use of an existing road.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.<br>• Adverse effects on soil quality in the event of a chemical or fuel spill can contain and contaminated soil removed/disposed. Adverse effects are considered similar to that of Alternative A. | **Alternatives A and B** are considered equally preferred. |
| Ground water (i.e., quantity and quality) | • Groundwater is not likely to be affected by the use of an existing road other than in the unlikely event of a chemical or fuel spill. Chemical and fuel spills can be readily remediated. Effects are considered to be negligible, with mitigation. | • Groundwater is not likely to be affected by the use of an existing road. Adverse effects on groundwater In the event of a chemical or fuel spill are considered similar to that of Alternative A. | **Alternatives A and B** are considered equally preferred. |
| Surface Water (i.e., quantity and quality) | • Surface water is not likely to be affected by the use of an existing road other than in the unlikely event of a chemical or fuel spill.<br>• Goudreau Road has two stream crossings discharging from Herman and Dreany Lakes, respectively. The effects on surface water quality due to accidental spills of chemicals or fuels at these crossings are expected to be negligible, with mitigation.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | • Surface water is not likely to be affected by the use of existing roads other than in the unlikely event of a chemical or fuel spill.<br>• Goudreau Road has seven stream crossings. The effects on surface water quality due to accidental spills of chemicals or fuels at these crossings are expected to be negligible.<br>• The potential for effects from an accidental spill to occur is slightly greater for Alternative B due to the presence of 5 additional stream crossings and proximity of the route to two small lakes and Goudreau Lake.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | **Alternative A** is most preferred because of a lower potential for surface water quality impacts and lower risk of an accidental spill. |
| Stream and Lake Sediments (i.e., sediment quality) | • Stream lakes and sediments are not likely to be affected by the use of an existing road other than in the unlikely event of a chemical or fuel spill. Chemical and fuel spills can be readily remediated. Effects are considered to be negligible.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | • Stream lakes and sediments are not likely to be affected by the use of an existing road other than in the unlikely event of a chemical or fuel spill. Chemical and fuel spills can be readily remediated. Effects are considered to be negligible.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | **Alternatives A and B** are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred since it poses the least potential for effects on surface water quality and human health in the event of an accidental spill of chemicals or fuel. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="2">ROUTINE ACCESS ROAD ALTERNATIVES</th><th rowspan="2">Preference by Criterion</th></tr>
<tr><th>A<br>Goudreau Road for all Project Traffic</th><th>B<br>Goudreau Road and the Northern Bypass for Heavy Loads</th></tr>
<tr><td colspan="3">3C. Effects on the Biological Environment</td><td></td></tr>
<tr><td>Natural Heritage Features</td><td>• No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site.</td><td>• No effects on natural heritage features are anticipated because there are no natural heritage features on or in the vicinity of the Magino site.</td><td>Alternatives A and B are considered equally preferred.</td></tr>
<tr><td>Fish and Fish Habitat</td><td>• No new effects on fish and fish habitat are anticipated due to the increased use of an existing road other than in the unlikely event of a chemical or fuel spill. The effects on fish and fish habitat are considered to be negligible.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.</td><td>• No new effects on fish and fish habitat are anticipated due to the increased use of an existing road other than in the unlikely event of a chemical or fuel spill. The effects on fish and fish habitat are considered to be negligible.<br>• The potential for effects from an accidental spill to occur is slightly greater for Alternative B due to the presence of 5 additional stream crossings and proximity of the route to two small lakes and Goudreau Lake.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.</td><td>Alternative A is slightly preferred due to the shorter distance of the route. There are fewer stream crossings and therefore a lower potential for adverse effects from an accidental spill of chemicals or fuels.</td></tr>
<tr><td>Terrestrial Vegetation</td><td>• No new effects on terrestrial vegetation are anticipated due to the increased use of an existing road.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.</td><td>• New traffic along the route will result in new indirect effects on terrestrial vegetation (e.g., dust deposition).<br>• Although, the temporary effects of road improvements on terrestrial vegetation can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A.</td><td>Alternative A is slightly preferred due to the shorter distance of the route.</td></tr>
<tr><td>Wetlands</td><td>• No new effects on wetlands are anticipated due to the increased use of an existing road.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.</td><td>• New traffic along the route will result in new indirect effects on wetlands (e.g., dust deposition).<br>• Although, the temporary effects of road improvements on wetlands can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A.</td><td>Alternative A is slightly preferred due to the shorter distance of the route.</td></tr>
<tr><td>Significant Wildlife Habitat</td><td>• Increased use of Goudreau Road may increase disruption to wildlife using significant habitat.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated.</td><td>• New traffic along the route will result in new indirect effects on any significant wildlife habitat present along the route (i.e., noise, dust, road-kill).<br>• Although, the temporary effects of road improvements on significant wildlife habitat can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A.</td><td>Alternative A is slightly preferred due to the shorter distance of the route.</td></tr>
</table>

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| Migratory and Breeding Birds | • Increased use of Goudreau Road may increase disruption to migratory and breeding birds using the habitat available along the route.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | • New traffic along the route will result in new indirect effects on migratory and breeding bird habitat present along the route (i.e., noise, dust).<br>• Although, the temporary effects of road improvements on migratory and breeding birds and their habitat can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A. | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| Mammals | • Increased use of Goudreau Road may increase disruption to mammals using the habitat available along the route.<br>• Temporary effects of road improvements and ongoing maintenance activities can be effectively mitigated. | • New traffic along the route will result in new indirect effects on mammals along the route (i.e., noise, dust).<br>• Although, the temporary effects of road improvements on mammals and their habitat can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A. | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| Species at Risk (Aquatic and Terrestrial) | • Increased use of Goudreau Road may increase disruption to Species at Risk using the habitat available along the route. | • New traffic along the route will result in new indirect effects on Species at Risk and their habitat (if present along the route).<br>• Although, the temporary effects of road improvements on Species at Risk and their habitat can be effectively mitigated, there remains a greater potential for adverse effects along 30 km of the Northern Bypass road than for Alternative A. | **Alternative A** is slightly preferred due to the shorter distance of the route. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is most preferred since fewer stream crossings are likely required along Goudreau Road than along the 30 km Northern Bypass. It has the least potential for adverse effects on Species at Risk, mammals, migratory and breeding birds, wetlands and terrestrial vegetation. Alternative A also has the least potential for effects on fish and fish habitat in the event of an accidental spill of chemicals or fuel. |

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| **3D. Effects on Human Health** | | | |
| Public Health (i.e., potential for accidents) | • The potential for accidents to members of the public using Goudreau Road is considered to be minor. While the amount of traffic on Goudreau Road will increase, it is generally wider than the Northern Bypass and will be regularly maintained. | • The potential for accidents to members of the public using Goudreau Road and/or the Northern Bypass road is considered to be minor. However, the Northern Bypass road is narrower than Goudreau Road and in poor quality resulting in a slight increase the risk of accidents. | **Alternative A** is the most preferred due to the lower risk of accidents. |
| Workers Safety (i.e., workplace hazards) | • The potential for accidents to workers using Goudreau Road is considered to be minor. While the amount of traffic on Goudreau Road will increase, it is generally wider than the Northern Bypass and will be regularly maintained. | • The potential for accidents to workers using Goudreau Road and/or the Northern Bypass road is considered to be minor. However, the Northern Bypass road is narrower than Goudreau Road and in poor quality resulting in a slight increase the risk of accidents. | **Alternative A** is the most preferred due to the lower risk of accidents. |
| **OVERALL TRADEOFFS** | | | **Alternatives A** is most preferred since it avoids the routine use of the Northern Bypass and the potential risks of accidents associated with its use. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | |
| **4A. Effects on the Social Environment** | | | |
| Population and Demographics | • The routine access road alternatives under consideration do not have an impact on population and demographics. | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • The routine access road alternatives under consideration do not have an impact on community vitality. | | This criterion does not apply to this set of alternatives. |
| Infrastructure and Services | • Using Goudreau Road for all Project traffic will increase the volume of trucks and other vehicle along approximately 15 km of road that is currently shared with the public and other industrial users (e.g., Island Gold Inc., Strike Minerals). | • Using Goudreau Road and the Northern Bypass for heavy loads will increase the volume of trucks and other vehicle along approximately 30 km of road that is currently shared with the public.<br>• Non-mine users of the Northern Bypass do no currently experience substantial industrial traffic. | **Alternative A** is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic. |
| Cultural Heritage | • The use of existing roads for Project traffic would not substantially affect cultural heritage features. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="3">ROUTINE ACCESS ROAD ALTERNATIVES</th></tr>
<tr><th>A<br>Goudreau Road for all Project Traffic</th><th>B<br>Goudreau Road and the Northern Bypass for Heavy Loads</th><th>Preference by Criterion</th></tr>
<tr><td colspan="3">4B. Effects on the Economic Environment</td><td></td></tr>
<tr><td>Land Use and Tourism</td><td>• Using Goudreau Road for all Project traffic will increase the volume of trucks and other vehicle along approximately 15 km of road that is currently shared with the public, commercial and industrial users (e.g., Island Gold Inc., tourism outfitters, trappers and potentially forestry operators).<br>• The portion of Goudreau Road past the turnoff for the public bypass will not be changed.</td><td>• Using Goudreau Road and the Northern Bypass for heavy loads will increase the volume of trucks and other vehicle along approximately 30 km of road that is currently shared with the public.<br>• There would be an increase in two-way industrial traffic on the portion of the Goudreau Road in the vicinity of the Island Gold mine entrance.<br>• Non-mine users of the Northern Bypass do no currently experience substantial industrial traffic.</td><td>Alternative A is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic. There is also less potential for two-way industrial traffic at the Island Gold access.</td></tr>
<tr><td>Employment and Business Opportunities</td><td colspan="2">• The use of existing roads for Project traffic would not affect employment and business opportunities.</td><td>This criterion does not apply to this set of alternatives.</td></tr>
<tr><td>Government Revenues</td><td colspan="2">• The use of existing roads for Project traffic would not affect government revenues. Prodigy would likely share in maintenance costs with other users.</td><td>This criterion does not apply to this set of alternatives.</td></tr>
<tr><td colspan="3">OVERALL TRADEOFFS</td><td>Alternative A is slightly preferred due to the shorter distance traveled on a shared use roadway that already experiences industrial traffic and avoids two-way traffic at the Island Gold access.</td></tr>
</table>

| CRITERIA | ROUTINE ACCESS ROAD ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Goudreau Road for all Project Traffic** | **B**<br>**Goudreau Road and the Northern Bypass for Heavy Loads** | **Preference by Criterion** |
| **4C. Effects on Aboriginal Interests** | | | |
| Aboriginal Employment and Business Opportunities | • The use of existing roads for Project traffic would not substantially affect Aboriginal employment and business opportunities. | | This criterion does not apply to this set of alternatives. |
| Traditional Use of Lands and Resources | • No specific comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding the use of Goudreau Road as access to areas used for traditional purposes.<br>• Alternative A was identified as being slightly preferred to Alternative B in regards to effects on the physical and biological environments. | • The Missanabie/Dog Lake area is an area important to local Aboriginal communities. Access to this area is primarily via Highway 101/651. However, there is indirect access to Lochalsh and other remote roads and trails via Goudreau Road and Northern Bypass.<br>• No specific comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding the use of Goudreau Road and the Northern Bypass road as access to areas used for traditional purposes. | In the absence of Traditional Knowledge from any Aboriginal group, **Alternative A** is slightly preferred to Alternative B as it is likely to result in lesser effects on physical and biological environments that support traditional activities. |
| Aboriginal Cultural Activities and Special Places | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | • No comment can be offered in the absence of Traditional Knowledge from any Aboriginal group regarding Aboriginal cultural activities and special places. | In the absence of Traditional Knowledge**, Alternatives A and B** are considered equally preferred. |
| **OVERALL TRADEOFFS** | | | In the absence of specific Traditional Knowledge from any Aboriginal Group, **Alternative A** is slightly preferred to Alternative B as it is likely to result in lesser effects on physical and biological environments that support traditional activities. |

**Table 5-20: Detailed Evaluation of Mine Pit Closure Alternatives**

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | |
| Effectiveness in meeting the intended purpose | • Proven to be an effective and demonstrated approach for closing open pits at other mine sites.<br>• Suitable water quality is predicted to occur in the pit lake once it has filled. | • As for Alternative A, however Alternative B achieves pit lake filling and hence closure, in a much shorter time frame than Alternative B. This scenario assumes the rate of water transferred from Goudreau Lake to hasten pit filling, is similar to the amount of project makeup water extracted just prior to mine closure. | **Alternative B** is more effective as it creates a final pit lake in less than half the time of Alternative A. |
| Opportunities for increasing operational flexibility | • Since reliance is paced on natural groundwater and surface water inflows there are limited opportunities for any flexibility during pit filling. | • Since reliance is placed on both natural groundwater and surface water inflows, as well as fresh water obtained from Goudreau Lake, Alternative B provides opportunities for increased operational flexibility. | **Alternative B** offers the greatest opportunity for increasing operation facility. |
| Reliability of access / supply to the site | • Access needs to be maintained to the pit lake rim to facilitate water sampling and any routine inspections that may be required.<br>• Since pit filling takes longer, maintaining access will involve moderate risks to reliability of access. | • Access needs to be maintained to the pit lake for shorter duration<br>• Maintaining this access will involve lower risks to reliability of access than for Alternative A. | **Alternative B** is most preferred since it involves a lower risks of failure to maintain access to the lake during the filling period. |
| Amenability to rehabilitation | • This alternative is considered to be somewhat amendable to rehabilitation due to the long time it takes to fill the pit and form the pit lake. | • This alternative is considered to be more amendable to rehabilitation than Alternative A since it takes less time to form the pit lake. | **Alternative B** is most preferred since it is more amenable to rehabilitation. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is most preferred since it is more effective, has increased opportunities for operational flexibility and a provides greater reliability in achieving closure objectives. It creates a final pit lake faster than Alternative A. |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **2. FINANCIAL COSTS AND RISKS** | | | |
| Project cost | • Lowest closure costs.<br>• Closure costs include cleanup of the pit after mining, construction of a safety berm around the future pit lake perimeter and ongoing monitoring of pit lake quality and maintenance of pit access. On completion of pit lake filling, a new channel to connect the pit lake to Goudreau Lake will be provided.<br>• Capital Cost (on mine closure) $0.8 million.<br>• Annual Cost $63,000 (for up to 55 years). | • Higher closure cost.<br>• Additional costs include an automate discharge system for transferring water from Goudreau Lake into the pit.<br>• Capital Cost (on mine closure) $1.1 million.<br>• Annual Cost $167,000 (for 44 years). | **Alternative A** is the most preferred alternative from a cost perspective. |
| Cost risks over the life of the Project | • This criterion does not apply to this set of alternatives, since there are no costs or cost risks associated with the pit during the operating period, as these are pit closure alternatives. | | This criterion does not apply to this set of alternatives. |
| Cost risks during post-closure | • Cost risks associated with the post-closure period, which is assumed to encompass the pit filling period, are somewhat preferred.<br>• Potential cost risks would be attributed to potential water quality issues that may arise as the pit fills. If water quality is worse than projected and does not meet quality objectives, some form of treatment may be required. | • Cost risks associated with this alternative are considered to be of the same nature as those for Alternative A, but since they are less likely to occur, they are most preferred.<br>• A substantial portion of the pit lake (approximately 60%) would be filled with water from Goudreau Lake, which provides for sufficient dilution of any constituents in the pit lake water derived from groundwater inflow and runoff from the pit walls to achieve water quality objectives. As such, the cost risk associated with pit water treatment is considered to be lower than from Alternative A. | **Alternative B** is the most preferred since cost risks associated with the provision of pit water treatment are considered to be low. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly more preferred from a capital and operating cost perspective. While Alternative B has more cost risk in the post-closure, capital costs are considered to be more certain and therefore more important than the cost risks in determining a preference. |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH** | | | |
| **3A. Effects on the Atmospheric Environment** | | | |
| Air Quality | • This alternative will result in the steep excavated pit walls being exposed for a longer period before being covered by water. Exposed pit walls may be an ongoing source of dust. | • This alternative will result in the steep excavated pit walls being exposed for a shorter period of time before being covered by water, thereby reducing the duration that the exposed pit walls would be an ongoing source of dust. | **Alternative B** is slightly more preferred since it provides for a water cover over the exposed pit walls in a shorter period of time as compared to Alternative A. |
| Noise and Vibration | • Noise and vibration is not affected by the pit lake filling alternatives under consideration. | | This criterion does not apply to this set of alternatives. |
| Light | • Light is not affected by the pit lake filling alternatives under consideration. | | This criterion does not apply to this set of alternatives. |
| Greenhouse Gases | • GHG emissions are not affected by the pit lake filling alternatives under consideration. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is slightly more preferred since it provides for a water cover over the exposed pit walls in a shorter period of time as compared to Alternative A. |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **3B. Effects on the Physical Environment** | | | |
| Terrain and Soils | • The pit lake will represent a permanent change to the terrain and will lead to the establishment of a new 105 ha lake. In the context of the overall environmental setting of this lake, such an effect is considered to be minor.<br>• During pit filling access to the pit will be restricted by an earthen berm placed around its perimeter.<br>• This alternative will result in the steep excavated pit walls being exposed for longer period before being covered by water. | • Generally as for Alternative A, it is expected that the pit lake develops in roughly half the amount of time, reducing the time that the pit walls are exposed. | **Alternative B** is slightly more preferred since it provides for a water cover over the exposed pit walls in a shorter period of time as compared to Alternative A. |
| Ground water (i.e., quantity and quality) | • Filling the pit lake will gradually restore the pre-project groundwater levels at the site.<br>• Since groundwater flows into the pit, adverse groundwater quality effects from groundwater are unlikely. Pit water will need to meet applicable criteria prior to discharge. | • Filling the pit lake will gradually restore pre-project groundwater levels at the site but at a faster rate than Alternative A.<br>• As for Alternative A, adverse groundwater quality effects are not likely. Pit water will need to meet applicable criteria prior to discharge. | **Alternative B** is most preferred since it restores pre-mining groundwater levels over a shorter period of time |
| Surface Water (i.e., quantity and quality) | • Filling of the pit lake will have a minor permanent effect on surface water quantity in the Spring Lake and McVeigh Creek system as surface water is diverted into the pit. The inflow to this system will be decreased by approximately 4% on the average. | • The effects on flows to the Spring Lake and McVeigh creek system and Goudreau Lake are the same as the Alternative A. | **Alternative A** is the most preferred since it restores the pre-mining natural water inflows to Goudreau Lake over a shorter period of time because dewatering of the open pit has stopped. |
| Stream and Lake Sediments (i.e., sediment quality) | • The manner of lake filling does not substantially affect stream and lake sediments in the surrounding waterbodies. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is slightly more preferred because it restores groundwater levels over a shorter period of time. Although Alternative A is more protective of surface water levels in Goudreau Lake, Alternative B provides for a water cover over the exposed pit walls in a shorter period of time and is therefore slightly more protective of surface water quality in Goudreau Lake as compared to Alternative A. |
| **3C. Effects on the Biological Environment** | | | |
| Natural Heritage Features | • Pit lake filling alternatives under consideration do not affect designated natural heritage features. | | This criterion does not apply to this set of alternatives. |
| Fish and Fish Habitat | • Filling the pit lake will eventually create fish habitat at the site, potentially offsetting some of the loss in fish habitat initially caused by the Project. | • Filling the pit lake will create fish habitat at the site but at a faster rate than Alternative A. This will also reduce the duration of adverse effects on surface water quantity in Spring Lake, Goudreau Lake and the McVeigh Creek system caused by pit dewatering. | **Alternative B** is most preferred since it creates fish habitat in the pit lake over a shorter period of time and reduces the duration of adverse effects on surface water quantity in the vicinity. |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| Terrestrial Vegetation | • Filling the pit lake will gradually restore the pre-project groundwater levels that help sustain terrestrial vegetation at the site.<br>• This alternative will result in the steep excavated pit walls being exposed for longer period before being covered by water. Steep pit walls may provide specialized habitats and a greater variety of niches for rare vegetation communities. | • Filling the pit lake will gradually restore pre-project groundwater levels that help sustain terrestrial vegetation at the site but at a faster rate than Alternative A.<br>• This alternative will result in the steep excavated pit walls being exposed for a shorter period of time than Alternative A before being covered by water. Steep pit walls may provide specialized habitats for rare vegetation communities. | **Alternative B** is most preferred since it restores groundwater levels that help sustain terrestrial vegetation at the site over a shorter period of time. The restoration of pre-project groundwater levels is preferred to creating specialized habitat that would exist only temporarily (i.e., until pit lake is filled). The creation of specialized habitat or niches that are temporary is less preferred over the re-establishment of pre-project groundwater conditions at the mine site. |
| Wetlands | • Filling the pit lake will gradually restore the pre-project groundwater levels and surface water flows that help sustain wetlands at the site. | • Filling the pit lake will gradually restore pre-project groundwater levels and surface water flows that help sustain wetlands at the site but at a faster rate than Alternative A. | **Alternative B** is most preferred since it restores groundwater levels and surface water flows that help sustain wetlands at the site over a shorter period of time. |
| Significant Wildlife Habitat | • Filling the pit lake will gradually restore the pre-project groundwater levels and surface water flows that help sustain wetlands and amphibian breeding habitat at the site. The exposed pit walls may provide suitable nesting habitat for Peregrine falcons. | • Filling the pit lake will gradually restore pre-project groundwater levels and surface water flows that help sustain wetlands and amphibian breeding habitat at the site but at a faster rate than Alternative A. | **Alternative B** is most preferred since it restores groundwater levels and surface water flows that help sustain wetlands and amphibian breeding habitat at the site over a shorter period of time. |
| Migratory and Breeding Birds | • This alternative will result in the steep excavated pit walls being exposed longer period before being covered by water. Steep pit walls may provide specialized habitats and refugia for some migratory and breeding bird species.<br>• A filled pit would result in the establishment of new (and perhaps specialized) habitat for some species. | • This alternative will result in the steep excavated pit walls being exposed for a shorter period of time before being covered by water. Steep pit walls may provide specialized habitats and refugia for some migratory and breeding bird species.<br>• A filled pit would result in the establishment of new (and perhaps specialized) habitat for some species. | **Alternative A** is slightly preferred because has a greater potential to result in the establishment of new (and perhaps specialized) habitat that would be sustained over the long term. |
| Mammals | • Filling the pit lake will gradually restore the pre-project groundwater levels and surface water flows that help sustain habitats utilized by mammals at the site.<br>• There is a risk that some animals could be exposed to the steep slopes of the pit, resulting in injury and/or mortality. | • Filling the pit lake will gradually restore pre-project groundwater levels and surface water flows that help sustain habitats used by mammals at the site but at a faster rate than Alternative A.<br>• There is a risk that some animals could be exposed to the steep slopes of the pit, resulting in injury and/or mortality similar to Alternative A, except for a shorter period of time. | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time and reduces risks of injury and/or mortality of animals due to length of time of the risk exposure. |
| Species at Risk (Aquatic and Terrestrial) | • Filling the pit lake is not expected to result in positive or adverse effects to those Species at Risk currently using the site.<br>• This alternative will result in the steep excavated pit walls being exposed for longer period before being covered by water. Steep pit walls may provide specialized habitats for some Species at Risk that are not currently using the site. Steep pit walls may be good foraging habitat for bats. | • Filling the pit lake is not expected to result in positive or adverse effects to those Species at Risk currently using the site.<br>• This alternative will result in the steep excavated pit walls being exposed for a shorter period of time before being covered by water. Steep pit walls may provide specialized habitats for some Species at Risk that are not currently using the site. Steep pit walls may be good foraging habitat for bats. | **Alternatives A and B** are considered to be equally preferred because filling the pit lake is not expected to result in substantially different effects to those Species at Risk currently using the site. In both cases, the specialized habitat that might be created would exist only temporarily (i.e., until pit lake is filled). |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **OVERALL TRADEOFFS** | | | **Alternative B** is most preferred since it restores near pre-project biological conditions at the site over a shorter period of time and reduces risks of injury and/or mortality to animals. The restoration of pre-project groundwater levels and surface water flows is preferred to creating specialized habitat that would exist only temporarily (i.e., until pit lake is filled). |
| **3D. Effects on Human Health** | | | |
| Public Health (i.e., potential for accidents) | • There is minor risk that members of the public could have an accident by trespassing into the safety berm area and being exposed to the steep it slopes. | • The public would be exposed to similar minor risks to Alternative A, except for a shorter period of time. | **Alternative B** is slightly preferred since it reduces risks to public health due to length of time of the risk exposure. |
| Workers Safety (i.e., workplace hazards) | • Risks to workers engaged in maintaining the pit area and collecting water samples is considered to represent a negligible risk to worker safety. | • Risks to the workers, while still negligible, are considered to be slightly higher than for Alterative A since the works need to operate and maintain a discharge system for conveying water from Goudreau Lake into the pit by a piping system that enters the pit. | **Alternative A** is slightly preferred since it requires less worker activity on the pit slopes while maintaining the Goudreau Lake discharge system. |
| **OVERALL TRADEOFFS** | | | **Alternatives A and B** are equally preferred since they both represent negligible risks to both the public and workers. There is a trade-off between the public being exposed to the risk of having an deep pit lake for a longer period of time (Alternative A) versus the risk to workers will be exposed to a deep pit lake for a shorter period of time while operating the water discharge system for Alternative B. Both alternatives are therefore considered equal. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | |
| **4A. Effects on the Social Environment** | | | |
| Population and Demographics | • The pit filling alternatives under consideration do not have an impact on population and demographics. | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • Recreational use of the pit lake would be possible once it has been filled and suitable water quality has been established. | • Recreational use of the pit lake would be possible once it has been filled and suitable water quality has been established. Alternative B re-establishes a lake suitable for recreational use in a shorter period of time than Alternative A. | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time and reduces risks of injury to members of the public. |
| Infrastructure and Services | • The pit filling alternatives under consideration do not have an impact on community infrastructure and services. | | This criterion does not apply to this set of alternatives. |
| Cultural Heritage | • The pit filling alternatives under consideration do not have an impact on cultural heritage. | | This criterion does not apply to this set of alternatives. |

| CRITERIA | MINE PIT CLOSURE ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow** | **B**<br>**Pit Lake Filling from Local Surface Runoff and Groundwater Inflow plus Operations Water Supply** | **Preference by Criterion** |
| **OVERALL TRADEOFFS** | | | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time and reduces risks of injury to members of the public. |
| **4B. Effects on the Economic Environment** | | | |
| Land Use and Tourism | • Commercial use of the pit lake would be possible once it has been filled, suitable water quality and a healthy fish population has been established. | • Commercial use of the pit lake would be possible once it has been filled, suitable water quality and a healthy fish population has been established. This is projected to occur over a shorter period. Alternative B re-establishes a lake suitable for l use in short period of time than Alternative A. Water quality discharged into Goudreau will be of better quality sooner, than for Alternative A, thereby promoting the establishment of a healthy fish population. | **Alternative B** is most preferred since it restores the area to near pre-project conditions over a shorter period of time, making commercial use of the pit lake and its vicinity possible sooner than for Alternative A. |
| Employment and Business Opportunities | • The pit filling alternatives under consideration do not have an impact on employment and business opportunities. | | This criterion does not apply to this set of alternatives. |
| Government Revenues | • The pit filling alternatives under consideration do not have an impact on government revenues. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative B** is most preferred since it restores near pre-project conditions at the site over a shorter period of time, making commercial use of the pit lake and its vicinity more attractive sooner than for Alternative A. |
| **4C. Effects on Aboriginal Interests** | | | |
| Aboriginal Employment and Business Opportunities | • The pit filling alternatives under consideration do not have an impact on Aboriginal employment and business opportunities. | | This criterion does not apply to this set of alternatives. |
| Traditional Use of Lands and Resources | • Use of the pit lake for traditional purposes would be possible once it has been filled and suitable water quality has been established. | • Use of the pit lake for traditional purposes would be possible once it has been filled and suitable water quality has been established. This is projected to occur over a shorter period. Alternative B re-establishes a lake suitable for traditional use in short period of time than Alternative A. | In the absence of specific Traditional Knowledge, **Alternative B** is most preferred as it re-establishes a lake suitable for traditional use in short period of time than Alternative A. |
| Aboriginal Cultural Activities and Special Places | • The pit filling alternatives under consideration do not have an impact on cultural activities and special places. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | In the absence of specific Traditional Knowledge, **Alternative B** is most preferred as it re-establishes a lake suitable for traditional use in short period of time than Alternative A. |

**Table 5-21: Detailed Closure of Tailings Management Facility Alternatives**

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| **1. TECHNICAL PERFORMANCE AND OPPORTUNITIES** | | | |
| Effectiveness in meeting the intended purpose | • This alternative deals with covering the tailings surface in the TMF. Closure of the side slopes of the TMF will be the same for both alternatives.<br>• Very effective since the soil cover will minimize infiltration into tailings and allow revegetation. | • This alternative deals with covering the tailings surface in the TMF. Closure of the side slopes of the TMF will be the same for both alternatives.<br>• Moderately effective in minimizing water infiltration to the groundwater and reducing seepage. | **Alternative A** is most preferred because it offers the best protection against leachate generation from the tailings. |
| Opportunities for increasing operational flexibility | • A final grading plan will be needed to close the site. Closure with a soil cover and re-vegetation will impose certain requirements on the grading plan in terms of slopes and soil placement to promote vegetation growth.<br>• Closure with a soil cover and re-vegetation would not substantially constrain post-closure maintenance activities or access. | • A final grading plan will be needed to close the site. Closure as a wetland and/or lake will impose certain requirements on the grading plan in terms of slopes to capture runoff and soil placement needed to create a suitable wetland or lake substrate. More constraints on the final grading plan are anticipated when constructing a wetland and/or lake than for Alternative A.<br>• Closure as a wetland and/or lake may constrain post-closure maintenance activities or access.<br>• This alternative will require some ongoing management of water quality and water quantity. | **Alternative A** is most preferred because it would have fewer constraints for final site grading, and post-closure maintenance and access. |
| Reliability of access / supply to the site | • This alternative will provide a high level of access.<br>• Access roads can be included in soil cover and designed to provide year round access including winter months. | • Access to portions of the deck will be limited due to the presences of wetlands. | **Alternative A** offers the best access to both slope and deck areas of the TMF. |
| Amenability to rehabilitation | • Very amenable to rehabilitation.<br>• Water pond will be removed are tailings surface will be allowed to dry out as appropriate cover soils are placed.<br>• Winter construction in any “soft” areas will also be possible. | • Somewhat amendable to rehabilitation since wetlands construction may involve construction such as cover placement and re-vegetation in softer, saturated tailings. | **Alternative A** is more amendable to rehabilitation. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred because of its effectiveness, operational flexibility in the post-closure, improved access, and since it is more amendable to rehabilitation. |

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | A<br>Closure with a Soil Cover and Re-vegetate | B<br>Closure as a Wetland and/or a Lake | Preference by Criterion |
| **2. FINANCIAL COSTS AND RISKS** | | | |
| Project costs | • Most preferred since it involves slightly lower closure costs.<br>• Closure Capital: $9.0 million | • Somewhat preferred since closure costs are slightly higher than for Alternative A.<br>• Closure Capital: $10.2 million | **Alternative A** is most preferred since it has slightly lower costs. |
| Cost risks over the life of the Project | • This criterion is not applicable since closure alternatives are being considered. | | This criterion does not apply. |
| Cost risks during post-closure | • Low cost risk. Creating a viable terrestrial ecosystem after closure is standard industry practice. | • Moderate cost risk. This alternative has a slightly higher cost risk than Alternative A because the construction of wetlands and/or lakes on soft tailings is considered more complex with less potential for the establishment of a viable ecosystem. The complexity and need for adaptive management introduces greater cost risk. | **Alternative A** is most preferred because of lower cost risks. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred since it involves lower closure costs and lower cost risks. |
| **3. EFFECTS ON THE NATURAL ENVIRONMENT AND RISKS TO HUMAN HEALTH** | | | |
| **3A. Effects on the Atmospheric Environment** | | | |
| Air Quality | • Dust and vehicle emissions would be generated during final grading and placement of soil cover.<br>• Once established, a vegetated cover will serve to reduce dust generation from exposed surfaces. | • Dust and vehicle emissions would be generated during final grading and placement of soil cover.<br>• Once established, a wetland or lake cover will serve to reduce dust generation from exposed surfaces.<br>• Closure as a wetland and/or lake will minimize the potential for dusting in the long term. | **Alternative B** is most preferred since it reduces the potential for dusting due to wind erosion of soils from the top of the TMF as compared to Alternative A. |
| Noise and Vibration | • Noise and vibration is not affected by the closure alternatives under consideration. | | This criterion does not apply to this set of alternatives. |
| Light | • Light is not affected by the closure alternatives under consideration. | | This criterion does not apply to this set of alternatives. |
| Greenhouse Gases | • Once established and depending on the area of the TMP covered, a vegetated cover can provide some carbon sequestration benefits over the long-term. Woody vegetation such as deciduous or coniferous trees provide greater potential for carbon sequestration than wetland vegetation under | • Once established and depending on the area of the TMF covered, a wetland cover can provide some carbon sequestration benefits over the long-term. Wetland vegetation does not provide as much potential for carbon sequestration as a vegetated cover would under Alternative A. | **Alternative A** is most preferred as woody vegetation such as deciduous or coniferous trees provide greater potential for carbon sequestration than wetland vegetation under |

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| | Alternative B. | | Alternative B. |
| **OVERALL TRADEOFFS** | | | **Alternatives A and B** are considered equally preferred. While Alternative B is reduces the potential for dusting, Alternative A provides greater potential for carbon sequestration in the long term. |
| **3B. Effects on the Physical Environment** | | | |
| Terrain and Soils | • Effects on terrain occurred due to the creation of the TMF. The manner in which the TMF is closed does not affect the terrain at the site.<br>• Exposed soils on the TMF will be subject to erosion by surface water runoff and wind. | • Effects on terrain occurred due to the creation of the TMF. The manner in which the TMF is closed does not affect the terrain at the site.<br>• Closure as a wetland and/or lake will minimize the potential for erosion of soils from the top of the TMF by surface water runoff and wind. | **Alternative B** is most preferred since it reduces the potential for erosion of soils from the top of the TMF as compared to Alternative A. |
| Ground water (i.e., quantity and quality) | • Most of the seepage from the tailings will be collected by the toe drain system in the TMF embankment and appropriately managed.<br>• The small amount of residual seepage to groundwater is not expected affect water quality outside the footprint of the TMF. | • Most of the seepage from the tailings will be collected by the toe drain system in the TMF embankment and appropriately managed.<br>• While there will be a slight increase in the small amount of seepage to groundwater due to the saturated tailings under the wetlands, it is not expected to affect water quality outside the footprint of the TMF. | **Alternative A** is most preferred since it provides the most opportunity for preventing seepage to groundwater. |
| Surface Water (i.e., quantity and quality) | • The manner in which the TMF is closed is not likely to substantially affect surface water quantity or quality in existing waterbodies in the vicinity of the TMF. Surface water controls at the base of the TMF will effectively manage discharge volumes and quality. | • The manner in which the TMF is closed is not likely to substantially affect surface water quantity or quality in existing waterbodies in the vicinity of the TMF. Surface water controls at the base of the TMF will effectively manage discharge volumes and quality.<br>• Surface water quantity and quality in the wetland and/or lake on top of the TMF will be governed by the runoff volumes and quality. Poor surface water quality may result from runoff over exposed tailings and/or mine rock.<br>• This alternative will require some ongoing management of water quality and quantity. | **Alternative A** is most preferred since there are no wetlands or lakes created that depend on suitable quantities of water and water quality to be sustained over the long term. |
| Stream and Lake Sediments (i.e., sediment quality) | • The manner in which the TMF is closed is not likely to substantially affect the sediments in existing waterbodies in the vicinity of the TMF. Surface water controls at the base of the TMF will effectively manage discharge of sediment laden waters and sediment quality. | • The manner in which the TMF is closed is not likely to substantially affect the sediments in existing waterbodies in the vicinity of the TMF. Surface water controls at the base of the TMF will effectively manage discharge of sediment laden waters and sediment quality.<br>• Sediment quality in the wetland and/or lake on top of the TMF will be governed the quality of the runoff into the wetland or lake. Runoff over exposed tailings and/or mine rock may impair | **Alternative A** is most preferred since there are no wetlands or lakes created that depend on suitable sediment quality to be sustained over the long term. |

<table>
<tr><th rowspan="2">CRITERIA</th><th colspan="3">CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES</th></tr>
<tr><th>A<br>Closure with a Soil Cover and Re-vegetate</th><th>B<br>Closure as a Wetland and/or a Lake</th><th>Preference by Criterion</th></tr>
<tr><td></td><td></td><td>sediment quality in the created wetland and/or lake over the long term.</td><td></td></tr>
<tr><td colspan="3">OVERALL TRADEOFFS</td><td>Alternative A is preferred because it maximizes the potential for preventing seepage to groundwater and does not create a wetland or lake which might require ongoing management and may result in impaired surface water and sediment quality over the long term.</td></tr>
<tr><td colspan="3">3C. Effects on the Biological Environment</td><td></td></tr>
<tr><td>Natural Heritage Features</td><td colspan="2"><ul><li>The closure alternatives under consideration do not have an impact on natural heritage features.</li></ul></td><td>This criterion does not apply to these alternatives</td></tr>
<tr><td>Fish and Fish Habitat</td><td><ul><li>The manner in which the TMF is closed is not likely to substantially affect fish and fish habitat in existing waterbodies in the vicinity of the TMF.</li><li>This alternative offers no potential for the creation of new fish and fish habitat on top of the TMF.</li></ul></td><td><ul><li>The manner in which the TMF is closed is not likely to substantially affect fish and fish habitat in existing waterbodies in the vicinity of the TMF.</li><li>This alternative offers some potential for the creation of new fish and fish habitat on top of the TMF. However, the quality of this habitat is likely to be very poor because:<ul><li>the wetland or lake created would remain isolated (i.e., not connected to any natural waterbody);</li><li>only seasonal habitat would be possible (i.e. a shallow lake would likely freeze to bottom each year and kill any fish present); and</li><li>there would remain the potential for impaired surface water quality and variable water quantities over the long term.</li></ul></li><li>Any fish habitat created would not support a commercial or recreational fishery.</li><li>It is noteworthy that the existing tailings facility on the Magino site does not support a fish community.</li></ul></td><td>Alternative A is most preferred given that the fish habitat created on top of the TMF would likely be very poor in quality and potentially unsustainable over the long term.</td></tr>
<tr><td>Terrestrial Vegetation</td><td><ul><li>This alternative offers the potential to replace some of the upland forest habitat removed by the construction of the mine.</li><li>Exposed rock barrens may provide niche habitat for unique vegetation communities.</li></ul></td><td><ul><li>This alternative offers less potential to replace the upland forest habitat removed by the construction of the mine than Alternative A.</li></ul></td><td>Alternative A is most preferred since it offers the potential to replace some of the upland forest habitat removed by the construction of the mine and may provide niche habitat for some unique vegetation communities.</td></tr>
<tr><td>Wetlands</td><td><ul><li>This alternative offers no potential for the creation of new wetlands on top of the TMF to replace some of the wetlands removed by the construction of the mine.</li></ul></td><td><ul><li>This alternative offers the potential for the creation of new wetlands on top of the TMF to replace some of the wetlands removed by the construction of the mine.</li></ul></td><td>Alternative B is most preferred because it offers the potential to replace some of the</td></tr>
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| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| | | • A functioning wetland would likely reduce soil erosion the potential for impaired water quality runoff from the top of the TMF. It may serve to provide some niche habitat for wildlife. | wetlands removed by the construction of the mine. A wetland would provide some ecosystem services and niche habitats for wildlife. |
| Significant Wildlife Habitat | • This alternative offers some potential to replace the moose calving habitat removed by the construction of the mine.<br>• The final grading of the TMF would need to consider the need for moose to access to the top of the mine.<br>• Exposed rock barrens may provide niche habitat for some mammals (e.g., denning sites). | • This alternative offers only limited potential to replace some of the moose calving habitat removed by the construction of the mine and only limited opportunities to create other forms of significant wildlife habitat.<br>• The final grading of the TMF would need to consider the need for moose to access to the top of the TMF. | **Alternative A** is most preferred since it offers the potential to replace some of the moose calving habitat removed by the construction of the mine |
| Migratory and Breeding Birds | • Closure with a soil cover and some re-vegetation may provide habitat that is attractive to passerines and other upland bird species. It would not likely be a preferred habitat for most birds given the abundance of upland forest habitat in the vicinity.<br>• Exposed rock barrens may provide niche habitat for some bird species. | • Closure as a wetland and/or lake may provide habitat that is attractive to waterfowl.<br>• It is not likely that a wetland or lake on top of the TMF would provide any niche habitat for bird species<br>• The quality of this habitat is likely to be very poor because the wetland or lake created would be small and remain isolated (i.e., not connected to any natural waterbody). It would not likely be a preferred habitat for waterfowl given the abundance and quality of other wetlands and lakes in the vicinity.<br>• There would remain the potential for impaired surface water quality that might affect the health of birds utilizing the wetland and/or lake. | **Alternative A** is most preferred since it may provide habitat that is attractive to passerines and other upland bird species and potentially some niche habitat. The upland habitat created for Alternative A is more likely to be of similar quality to that in the site vicinity and would utilized by birds more than the wetland and/ or lake habitats created under Alternative B. |
| Mammals | • Closure with a soil cover and some re-vegetation may provide habitat that is attractive to a wide range of mammal species and may provide niche habitat for some mammals (e.g., denning sites, bear foraging habitat). | • Closure as a wetland and/or lake provides less opportunity to create habitat that is attractive to a wide range of mammal species than Alternative A. | **Alternative A** is most preferred because it offers the greatest potential to provide habitat that is attractive to a wide range of mammal species and may provide niche habitat for some mammals. |
| Species at Risk (Aquatic and Terrestrial) | • This alternative offers the potential to replace some of the Whip-poor-will habitat removed by the construction of the mine. | • This alternative offers very limited potential to replace the Whip-poor-will habitat removed by the construction of the mine as compared to than Alternative A. | **Alternative A** is most preferred since it offers the potential to replace some of the Whip-poor-will habitat removed by the construction of the mine. The ability to replace Species at Risk habitat on the Magino property itself is considered to be highly advantageous. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred because it offers the greatest potential to replace habitats removed for the construction of the mine, create niche habitats. There is also greater potential that the habitats created under Alternative A would be used by wildlife than under Alternative B. |

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| **3D. Effects on Human Health** | | | |
| Public Health (i.e., potential for accidents) | • Risks to members of the public accessing the covered TMF are considered to be negligible. | • Risks to members of the public accessing the TMF are considered to be negligible but slightly higher than Alternative A due to the presence of open water and/or ice during winter. | **Alternative A** is slightly preferred since it poses a slightly lower risk of accidents due to the absence of open water and/or ice during winter. |
| Workers Safety (i.e., workplace hazards) | • Risks to workers engaged in maintaining the covered TMF are considered to be negligible. | • Risks to workers engaged in maintaining the covered TMF are considered to be negligible, but slightly higher than Alternative A due to the presence of open water and/or ice during winter. | **Alternative A** is slightly preferred since it poses a slightly lower risk of accidents due to the absence of open water and/or ice during winter. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is slightly preferred since it poses a slightly lower risk of accidents to workers and members of the public due to the absence of open water and/or ice during winter. |
| **4. EFFECTS ON THE SOCIAL ENVIRONMENT AND ABORIGINAL INTERESTS** | | | |
| **4A. Effects on the Social Environment** | | | |
| Population and Demographics | • The closure alternatives under consideration do not have an impact on population and demographics | | This criterion does not apply to this set of alternatives. |
| Community Vitality | • Effects on community vitality (e.g., recreational activities) are linked to effects on the physical and biological environments. Alternative A is more likely to make the area of the mine site attractive to recreational users than Alternative B. | • Effects on community vitality (e.g., recreational activities) are linked to effects on the physical and biological environments. Alternative B is less likely to make the area of the mine site attractive to recreational users. | **Alternative A** is most preferred since it is more likely to make the area of the mine site attractive to recreational users. |
| Infrastructure and Services | • The closure alternatives under consideration do not have an impact on community infrastructure and services. | | This criterion does not apply to this set of alternatives. |
| Cultural Heritage | • The closure alternatives under consideration do not have an impact on cultural heritage. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred since it is more likely to make the area of the mine site and vicinity attractive to recreational users. |

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| **4B. Effects on the Economic Environment** | | | |
| Land Use and Tourism | • Effects on land use and tourism are linked to effects on the physical and biological environments. Alternative A is more likely to make the area of the mine site attractive to a variety of land users than Alternative B. | • Effect on land use and tourism are linked to effects on the physical and biological environments. Alternative B is less likely to make the area of the mine site attractive to a variety of land users than Alternative A. | **Alternative A** is most preferred since it is more likely to make the area of the mine site attractive to a variety of land users. |
| Employment and Business Opportunities | • The closure alternatives under consideration do not have an impact on employment and business activity. | | This criterion does not apply to this set of alternatives. |
| Government Revenues | • The closure alternatives under consideration do not have an impact on government revenues. | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | **Alternative A** is preferred since it is more likely to make the area of the mine site and vicinity attractive to a variety of land users. |
| **4C. Effects on Aboriginal Interests** | | | |
| Aboriginal Employment and Business Opportunities | • The closure alternatives under consideration do not have an impact on Aboriginal employment and business activity. | | This criterion does not apply to this set of alternatives. |
| Traditional Use of Lands and Resources | • This alternative would replace some of the upland forest and rock barren habitats removed for the construction of the mine, create niche habitats and may provide habitat that is attractive to a wide range of wildlife.<br>• Closure with a soil cover and re-vegetation would not substantially constrain post-closure access by Aboriginal people.<br>• There is good potential to establish conditions that would permit the productive use of the TMF including potential traditional harvesting by Aboriginal peoples. | • This alternative would replace some of the wetland and lake habitat removed by the construction of the mine. However, the fish habitat created on top of the TMF would likely be very poor in quality and potentially unsustainable over the long term.<br>• Closure as a wetland and/or lake may constrain post-closure access by Aboriginal people. It will require some ongoing management of water quality and water quantity. This reduces the potential for the productive use of the TMF including potential traditional harvesting by Aboriginal peoples. | In the absence of specific Traditional Knowledge from any Aboriginal group, **Alternative A** is most preferred because it has good potential to establish conditions that would permit the productive use of the TMF for traditional harvesting by Aboriginal peoples. |
| Aboriginal Cultural Activities and Special Places | • The closure alternatives under consideration do not have an impact on Aboriginal cultural activities and special places | | This criterion does not apply to this set of alternatives. |
| **OVERALL TRADEOFFS** | | | In the absence of specific Traditional Knowledge from any Aboriginal group, **Alternative A** is preferred because it has better potential to establish conditions that would permit the |

| CRITERIA | CLOSURE OF TAILINGS MANAGEMENT FACILITY ALTERNATIVES | | |
|---|---|---|---|
| | **A**<br>**Closure with a Soil Cover and Re-vegetate** | **B**<br>**Closure as a Wetland and/or a Lake** | **Preference by Criterion** |
| | | | productive use of the TMF for traditional harvesting by Aboriginal peoples than Alternative B. |

## Appendix 5-2: IRC-5 and IRC-6 Response – Evaluation of Alternatives

### 1. Introduction

This addition to Chapter 5 of the Magino EIS is submitted in response to CEAA's IRC #5 and IRC #6 in which Prodigy is requested to:

1) Replace Chapter 5, Section 5.2 "Mine Waste Disposal Alternatives Evaluation" (IRC 5);
2) Submit an alternative analysis for potable water and site drainage works in accordance with the Agency's Operational Statement Policy

This Appendix presents:

- An alternatives assessment for Mine Waste Disposal, which include tailings, mine rock and overburden (Sections 3 to 6 below)
- An Errata to be corrected for Section 5.3 of Chapter 5 which presents the assessment of alternatives for Freshwater Make-up for the Project (Section 7 below)
- An explanation why no assessment of alternatives is presented for the proposed site drainage (Section 8 below)

### 2. Mine Waste Alternatives Assessment

### 2.1 Context

Under Canadian regulation, it is expected that natural water bodies frequented by fish be avoided to the extent practicable for the long-term disposal of mine waste, and that mine waste be managed to ensure the long-term protection of Canada's terrestrial and aquatic environment.

Using a natural water body frequented by fish for mine waste disposal requires an amendment to the Metal Mining Effluent Regulations (MMER). Schedule 2 of the MMER lists water bodies designated as Tailings Impoundment Areas (TIAs) or Tailings Management Facilities (TMF). A water body is added to that Schedule 2 through a regulatory amendment.

The MMER is administered by Environment Canada (EC). EC has developed a guidance document entitled "Guidance for Proponents on the Federal Process for Designating Metal Mine Tailings Impoundment Areas" (EC Guidelines, 2011). This guidance document describes the process that must be undertaken when a proponent is considering using a natural water body frequented by fish as a TIA or TMF such that a regulatory amendment to the MMER would be required. In the context of these guidelines, the term TIA or TMF refers to a natural body of water frequented by fish into which deleterious substances such as low grade ore, tailings, mine rock, overburden and any effluent that contains any concentration of the deleterious substances specified in the MMER are disposed.

In accordance with the EC Guidelines, Prodigy has undertaken a comprehensive alternative assessment for mine waste disposal which is attached to the Magino EIS as TSD 5.

For the purpose of the Alternatives Assessment of the EIS (Chapter 5), CEAA requires that the Proponent follow the CEAA's **Operational Policy Statement Addressing "Purpose of" and "Alternative Means" under the *Canadian Environmental Assessment Act, 2012,*** for this mine waste alternatives assessment.

The evaluation of alternatives under this Operational Policy involves three steps:

1) Step 1 Identify technically and economically feasible alternative means
2) Step 2: List their potential effects on valued components
3) Step 3: Select the approach for the analysis of alternative means

## 2.2 Criteria for Determining the Technical and Economic Feasibility of the Mine Waste Disposal Alternatives

There are two basic criteria for this evaluation:

1. Technical feasibility

The disposal method retained for tailings disposal must be a proven technology for the scale of the operation. Six methods of tailing disposal are known to be technically feasible. They are: ATD-#1 – In-pit tailings disposal;

- ATD-#2 – Dry stack tailings disposal;
- ATD #3 – Surface paste tailings disposal;
- ATD #4 – Thickened tailings disposal;
- ATD #5 – Conventional tailings disposal; and
- ATD #6 – Co-disposal of tailings and mine rock.

These disposal methods were described in TSD 5 and a brief overview is presented in Section 5.2.

2. Economic feasibility

As stated in the key facts table presented in Chapter 6 (Table 6-1), the expected recovery of gold over the life of the mine is approximately 3000 koz of gold which will require the movement of up to 550 million tonnes of material (up to 120 million tonnes of ore and up to 430 million tonnes of mine rock). Given these tonnages, the economic feasibility of the Magino Project is highly sensitive to the capital invested (initial and sustaining capital) and the ongoing operating cost of the operation.

For tailings management (up to 130 million tonnes), capital and operating costs are driven by the disposal method retained and the disposal location of the tailings.

For the mine rock (up to 430 million tonnes), the capital and operating costs are driven by the distance that waste rock must be transported for disposal. For many mining operations in similar locations and climate, with current fuel prices, the haulage cost of waste rocks is of the order of \$0.45 to \$0.50/tonne/km (this varies with specific conditions at each site).

# 3. Alternative Tailings Deposition Methods

Six (6) preliminary alternative tailings disposal (ATD) methods were identified, which include:

- ATD-#1 – In-pit tailings disposal;
- ATD-#2 – Dry stack tailings disposal;
- ATD #3 – Surface paste tailings disposal;
- ATD #4 – Thickened tailings disposal;

- ATD #5 – Conventional tailings disposal; and
- ATD #6 – Co-disposal of tailings and mine rock.

The first of the alternative disposal methods include deposition of tailings within an existing mined-out open pit, while the remainder of the disposal methods include surface deposition of tailings within an engineered facility. However, the last of the alternative disposal methods considered includes placement of tailings and mine rock together in a single facility (i.e., co-disposal). The difference between dry stack, paste, thickened, and conventional tailings deposition relates to the amount of water contained in the tailings when sent to the disposal facility (i.e., slurry density). Co-disposal of tailings may consider tailings of effectively any slurry density. Each of these alternatives is summarized in the following sections.

## 3.1 Description of ATDs

### 3.1.1 In-Pit Tailings Disposal – ATD #1

Open pit disposal involves pumping tailings to an existing open pit capable of storing the tailings generated by the mill. Tailings can be transported (pumped transport of slurry, thickened or paste tailings, or truck or conveyor transport of filtered tailings) to a mined out open pit. Surface water management is relatively straightforward compared to on-land disposal alternatives, as water is contained within the boundaries of the mined-out pit. If the pit has already flooded as part of a planned closure scenario prior to use, tailings can be pumped (slurry) and discharged at depth in the open pit to reduce the effect on surface water in the open pit, as well as to limit destabilizing effects on the pit walls, which could occur by rapidly drawing down pit water levels.

### 3.1.2 Dry Stack Tailings Disposal – ATD #2

Filtered or dry stack tailings are achieved by dewatering tailings materials to an unsaturated state, corresponding to approximately 80 to 85% solids by weight (defined as weight of solids divided by weight of solids plus weight of water). Tailings are dewatered using vacuum or pressure filters, though screening methods may be considered where the fines content (fraction of material by weight finer than 75 microns) is relatively low (i.e., best for sandy material).

After dewatering, the tailings materials are transported by conveyor or truck to the disposal area where they are handled by earthmoving equipment. The need for containment structures (i.e., embankments) may be significantly reduced for dry stack tailings storage facilities compared to other tailings disposal methods.

### 3.1.3 Surface Paste Tailings Disposal – ATD #3

Paste tailings are generally defined as being comprised of 65 to 70% solids by weight material. Paste tailings are produced in specialized paste thickeners, or ultra-high-density thickeners, and have been dewatered to a point where they theoretically do not segregate when deposited and produce minimal bleed water. In spite of perceived pumping capabilities of paste tailings, a major challenge with paste tailings is flow velocity in the pipe. Positive displacement pumps are typically required over centrifugal pumps for transporting of paste tailings. Paste is best-suited for backfill in underground workings, where transport and placement is aided by gravity.

### 3.1.4 Thickened Tailings Disposal – ATD #4

Thickened tailings materials have been dewatered, or ‘thickened’, through the use of high-density or deep-cone thickeners, cyclones, or chemical modifications to a range of about 45 to 65% solids by weight. With many of the tailings thickening technologies, it takes what happens inefficiently in the tailings impoundment, and does it in the process circuit (i.e., water is released from the tailings and returned to process while the tailings are still in the process circuit). In these cases, and in order to obtain benefits of the technology in general terms, the tailings must remain non-segregating, meaning that the gradation of the material near the spigot is the same as that in the center of the pool. Thickened tailings produce smaller amounts of reclaim water than conventional tailings, and can form nominally steeper beach angles than conventional tailings, so slightly less space may be required for tailings disposal.

Alternatively, tailings thickening can be performed to classify the material, as is the case with the use of cyclones for sand dam construction. The cyclones use pressure to separate coarse tailings, termed underflow, from the fine tailings, termed overflow. Cycloning can be performed in a single cyclone (or single-stage), or in a series to achieve enhanced segregation of the coarse and fine materials.

With regard to containment of thickened tailings, modest retention structures are typically required (i.e., embankments or impoundments), and tailings are typically deposited using spigots from the perimeter or from a central thickened discharge. However, in some cases, the tailings can be self-supporting on low angle slopes, as is the case with cyclone sand dam construction.

### 3.1.5 Conventional Tailings Disposal – ATD #5

Conventional tailings are unthickened tailings slurry with a typical slurry density in the range of 30 to 40% solids by weight. Conventional tailings are pumped and piped to a tailings storage facility that employs containment dams, embankments or surface impoundments to retain the tailings, which are typically spigotted. Conventional tailings are characterized by low strength, high water content and exhibit relatively complex water management. Also, conventional tailings slurry typically segregates during deposition, with the tailings releasing significant amounts of water for recovery in reclaim water ponds.

### 3.1.6 Co-Disposal of Tailings and Mine Rock– ATD #6

Co-disposal is the mixing of fine-grained mine waste material (i.e., tailings) with coarse-grained mine waste material (i.e., mine rock) into a single waste storage facility. Mixing of the tailings with mine rock promotes filling of voids to maximize density of the material. Several different terminologies for co-disposal are considered based on the point at where mixing occurs, or how the independent waste streams are placed, as follows:

- ***Co-mingling:*** Co-mingling involves mixing and subsequent placement of tailings and mine rock together in a single waste storage facility. Tailings and coarse mine rock material are transported independently and mixed together, usually by mechanical means, within a waste storage facility, or combined into a single discharge stream when pumped or conveyed;
- ***Co-placement:*** Tailings and coarse mine rock materials are transported independently, but not mixed to form a single discharge stream. Examples of co-placement may include

mine rock end-dumped into a tailings storage facility, or mine rock used to construct perimeter embankments for tailings storage; and

- ***Co-deposition:*** Similar to co-placement, but the waste streams are generally placed in independent layers allowing the deposited tailings to naturally enter the voids in the underlying mine rock layers.

For the purposes of the pre-screening assessment, co-mingling of the tailings and mine rock is considered. However, co-placement of tailings and mine rock (e.g., use of mine rock for embankment construction) may be considered as a component to tailings disposal alternatives ATD #2 through ATD #5.

### 3.2 Screening of Tailings Disposal Methods (ATD)

The standard approach for tailings disposal for the majority of mining operations in Northern Ontario and elsewhere in the world is a permanent surface impoundment, or Tailings Management Facility (TMF), confined as necessary with embankments to ensure containment. Tailings materials are often dewatered in conventional thickeners to a slurry density of up to about 55% solids by weight, or comprise conventional unthickened tailings with a slurry density of about 30 to 40% solids by weight, and are transported as a slurry to the TMF. Depending on the water content of the tailings delivered to the TMF, the typical approach in Northern Ontario involves either conventional tailings management or thickened tailings management. A summary of the advantages and disadvantages of each tailings disposal method is presented in Table 5-22.

**Table 5-22: Considered Tailings Disposal Methods – Advantages and Disadvantages**

| Disposal Method | Advantages | Disadvantages |
|---|---|---|
| **ATD #1 - In-Pit Tailings Disposal** | • Containment costs are substantially reduced<br>• Limited possibility of structural failure of the facility<br>• Attractive in the sense of putting material back from where it came<br>• Reduced disturbance footprint<br>• Likely close to process plant<br>• Reduced visual intrusion | • Requires availability of a mined-out pit<br>• Ore body sterilization<br>• High tailings rate of rise resulting in large and long-term tailings consolidation<br>• Increased risk of groundwater contamination |
| **ATD #2 – Dry Stack Tailings Disposal** | • Most efficient water conservation<br>• Low seepage losses from tailings stack<br>• Reduced disturbance footprint<br>• Minimal containment requirements (i.e., limited construction)<br>• Produces a stable tailings mass<br>• Increased potential for progressive reclamation | • Higher capital costs than other technologies due in part to cost of filters<br>• Tailings must be conveyed or trucked to the TMF, potentially resulting in increased air quality impacts<br>• Increased power requirements<br>• Requires use of equipment for tailings placement/compaction |

| Disposal Method | Advantages | Disadvantages |
|---|---|---|
| | • More simple water management than other technologies | • Not a proven technology for sites with wet climates combined with high production rates<br>• Increased potential for dust management issues at the TMF<br>• Need to manage out-of-specification material |
| **ATD #3 – Surface Paste Tailings Disposal** | • Less interstitial tailings water as compared to thickened and conventional tailings technologies<br>• Reduced seepage losses from the tailings<br>• Produces minimal seepage water (if any) when discharged<br>• Produces effectively a non-segregating tailings mass | • Higher capital costs than other technologies due in part to cost of thickeners and pumps<br>• Higher operating costs than other technologies due to increased power requirements<br>• Need to manage out-of-specification material<br>• Not a proven technology at high production rates<br>• Limited use for surface disposal, with most successful applications involving paste backfill<br>• Berms and containment structures are typically still required |
| **ATD #4 – Thickened Tailings Disposal** | • Relatively low operating costs<br>• Less interstitial tailings water when compared to conventional tailings technology<br>• Tailings are less segregating than conventional tailings<br>• Proven technology at moderate to high production rates | • Containment dams required<br>• Seepage issues depending on dam/impoundment type<br>• Considerable water to manage<br>• Increased cost over conventional tailings due to thickeners and pumping requirements<br>• Long term control and management is required, particularly if a water closure cover is employed |
| **ATD #5 – Conventional Tailings Disposal** | • Lowest operating costs when compared with other technologies<br>• Proven technology at all ranges of tailings production | • Least efficient water conservation<br>• Containment dams required<br>• Long term control and management is required, particularly if a water closure cover employed<br>• Seepage issues depending on dam/impoundment type<br>• Complex water management |
| **ATD #6 – Co-Disposal of Tailings and Mine Rock** | • Strength and stability of co-mingled waste reduces consequences of static and dynamic loading of tailings alone<br>• Minimal containment requirements for co-mingled waste (i.e., limited construction) | • Difficult to control the deposition strategy to optimize blending of the coarse and fine waste feeds<br>• Most economic where the two feeds can be pumped together or blended for in-pit storage (i.e., more challenging for |

| Disposal Method | Advantages | Disadvantages |
| --- | --- | --- |
| | • Combining the two waste streams increases the chemical stability reducing oxidation and the potential for acid mine drainage<br>• Potentially less complex water management than other considered tailings disposal technologies | surface disposal)<br>• A larger footprint area may be required to accommodate both waste streams |

### 3.2.1 Pre-Screening Criteria for Alternative Tailings Disposal Methods

Section 2.3 of the MAA Guidelines (Environment Canada, 2011) identifies several legitimate pre-screening criteria, as follows:

- ***Would the TIA preclude future exploration or mining of a potential resource?*** A TIA located over an area where proven indicators of mineralization exist, or a reasonable indication of possible mineralization based on regional trends, may be one possible reason to exclude it from further consideration. Under this scenario, it may not be reasonable to conduct a lengthy exploration program to determine whether an economically viable resource exists in the area.
- ***Is any part of the mine waste disposal system unproven technology?*** If a specific disposal method relies on technology that has not been demonstrated to be effective in the context of the site under consideration, then it could justifiably be argued that the alternative should be excluded from further consideration. It would not be reasonable to conduct lengthy fundamental or applied research to prove whether the technology may be successful.
- ***Will the TMF capacity be too small to store the proposed upper limit of tailings?*** Unless good rationale exists to have more than one TMF for any given project site (e.g., due to separation of tailings streams), it can justifiably be argued that a site that does not have sufficient capacity using reasonable, technically-viable containment strategies can be excluded from consideration.
- ***Will the TIA result in negative life of project economics?*** It is justifiable to exclude a TIA from further consideration if it would result in negative life-of-project total (overall) economics. When using project economics as pre-screening criteria, the mine waste disposal economics must be evaluated in consideration of the total project economics. It is conceivable that a more expensive mine waste disposal alternative could result in improved total project economics.

The criteria retained for pre-screening assessment of alternative mine waste disposal methods for the Magino Project builds on those suggested by the MAA Guidelines (Environment Canada, 2011) and CEAA's Operation Policy on Alternatives Assessment, and include:

- Does the mine waste disposal system rely on proven technology? (Yes/No);
- Does the alternative have the capacity for a significant percentage of total tailings? (Yes/No);
- Is the alternative feasible with respect to project scheduling? (Yes/No); and

- Does the adoption/implementation of the disposal method result in negative life of the project economics? (Yes/No).

The results of the pre-screening assessment for the tailings disposal alternatives are presented in Table 5-23. Some of the factors that differentiate the use of the alternative tailings disposal (ATD) technologies include:

- ***Energy supply:*** Certain tailings disposal methods use more energy than other disposal methods, and thus require an expensive energy supply and greater overall carbon footprint. Specifically, dewatering and transport of filtered, thickened and paste tailings materials requires more energy than conventional tailings that uses only gravity. Similarly, certain types of co-disposal require more energy than conventional tailings, such as co-mingling that typically relies on dewatering of the tailings to a point (e.g., to a paste or filtered tailings) to facilitate mixing with the mine rock.
- ***Climate:*** Although certain tailings disposal methods have been implemented in wet or cold climates, their successful implementation may be aided by a dry climate.
- ***Production rates:*** Though they have been proposed for sites with moderate to high production rates, filtered and paste tailings disposal technologies remain unproven at certain production rates. However, thickened and conventional tailings disposal methodologies comprise proven technologies at mines with high production rates.
- ***Project economics:*** Prodigy must weigh carefully the trade-offs that come with using certain tailings disposal methods. For instance, reduced disposal area footprint and reduced water consumption, as is the case with filtered tailings, often come at the expense of higher up-front capital costs and operational costs, which is an expense that many mines cannot support.
- ***Operational predictability:*** Maintaining uniform deposition slopes on paste and certain types of thickened (e.g., cyclone sand dam) tailings disposal facilities has proven to be a challenge because of changes in ore characteristics, tailings gradations, and percent solids contained in the slurry. For filtered technology, coordination of the material handling, spreading and compaction with a high production rate are not simple tasks, combined with seasonally wet and/or cold weather. Also, filtered tailings and paste tailings technologies are more affected by upset conditions than other technologies, requiring contingencies for placement of "off-specification" material. Similar operational complexities to that of filtered and paste tailings can be expected for certain methods of co-disposal, particularly co-mingling.
- ***Topography:*** Some tailings disposal technologies are better-suited for flat topographies than others, though most tailings disposal technologies benefit from some natural topographic containment, which limits the need for paddock-style embankment construction. However, filtered tailings disposal or properly co-mingled tailings/mine rock disposal is possible in a variety of terrains, accounting for stability, operational and closure requirements.
- ***Seismicity:*** Concerns about dynamic stability of slopes constructed using tailings (e.g., filtered tailings or cyclone sand dams) may negate many of the perceived benefits, while engineered earthen or rock embankments designed to retain tailings slurry may be more robust in seismic situations (particularly when downstream construction is employed).

- ***Water:*** Filtered tailings technology significantly enhances water conservation, while paste tailings technology benefits similarly, albeit to a reduced degree. Water conserved by thickened tailings technologies are only marginally improved over conventional tailings disposal.

Of the various tailings disposal methods, thickened and conventional tailings deposition through the use of constructed surface impoundments remains the most common and typically least expensive of the ATDs. Other ATDs bring potential opportunities to conserve water, minimize space requirements, reduce environmental impacts, and improve closure conditions, but these opportunities must be analyzed in detail before deciding on a specific method. While the industry has seen some success, the use of certain ATDs such as filtered tailings technology at high production rates remains unproven.

**Table 5-23: Pre-Screening Summary for Alternative Tailings Disposal Methods for the Magino Project**

| Pre-Screening Criteria | Rationale | | ATD #1 In-Pit | ATD #2 Dry Stack | ATD #3 Paste | ATD #4 Thickened | ATD #5 Conventional | ATD #6 CO-DISPOSAL[2] |
|---|---|---|---|---|---|---|---|---|
| Does mine waste disposal system rely on proven technology? | If the ATD method relies on unproven technology at the Project site, then it can justifiably be argued that the alternative should be excluded from further consideration. | Is the technology proven in net-wet climates (i.e., precipitation exceeds evaporation) with moderately high tailings production rates (35,000 tpd)? | Yes | No | No | Yes | Yes | No |
| Does the alternative have the capacity for a significant percentage of total tailings? | If the ATD method cannot contain a significant portion of the tailings, it would not be the primary tailings impoundment method and another method would be required. | Is a single tailings disposal site feasible? | No | Yes | Yes | Yes | Yes | Yes |
| Is the alternative feasible with respect to Project scheduling? | If the ATD cannot accept tailings as required by the mine and milling production schedule, another tailings impoundment method will be required and the alternative should be removed from further consideration. | Can the disposal method be utilized from the onset of operation? | No | Yes | Yes | Yes | Yes | Yes |
| Does the adoption/implementation of the disposal method result in negative life of the Project economics? | It is justifiable to exclude a tailings disposal method from further consideration if its use would result in negative life of project total (overall) economics. | Is the disposal method anticipated to result in a significant increase in project cost (CAPEX & OPEX only)? | Yes | Yes | Yes | No | No | Yes |
| **Should the ATD be carried forward to the alternative assessment?** | | | **No** | **No** | **No** | **Yes** | **Yes** | **No** |

Notes:
1. Blue shading denotes positive attributes for the considered alternative.
2. Responses to pre-screening criteria for ATD #6 assume co-mingling of the tailings and mine rock, while co-placement of tailings and mine rock (e.g., use of mine rock for embankment construction) may be considered as a component to alternatives ATD #2 through ATD #5.

### 3.2.2 In-Pit Tailings Disposal – ATD #1

Advantages of in-pit tailings storage include low tailings containment costs and low risk of tailings dam failure, as well as the tailings material is in effect returned to its original location. Disadvantages, however, include ore body sterilization, high tailings rate of rise, significant and lengthy rates of tailings consolidation, higher risks for groundwater contamination, as well as potentially increased difficulty in reclamation.

- ***Considerations for the Magino Project***

Current development plans for the Magino Project considers mining of the deposit within a 10-year time-frame and processing of the ore within a 10 to 12-year period. Unless additional resources are found, the pit will be depleted by Year 10 of operations. During mining, any tailings that are produced would have to be disposed of on the surface since the open pit will be actively mined. Also, as with any mine project, the pit has the potential to be expanded in the future based on project economics (e.g., reduced cut-off grade), whereby in-pit disposal could condemn future resources.

Up to approximately 30 Mt of ore is planned to be processed after the pit becomes available for use, which could conceivably be placed in the mined-out pit. Using this approach, up to 20% of the tailings generated during the life of mine could be disposed in-pit. The placement of tailings in the open pit after mining operations has ceased, and milling continues would have a limited effect on the selected on-land TMF footprint area as it would still be required to contain approximately 80% of the total tailings stream. However, a future in-pit tailings storage facility could enable the proponent to undertake early closure of the on-land facility while still operating the mill during the latter portions of the life of the project.

- ***Pre-Screening Decision***

The Magino Project site is a net-wet climate (i.e., precipitation exceeds evaporation) with an anticipated tailings production rate of 35,000 tpd. Based on these criteria, in-pit tailings disposal is considered a viable approach to tailings management, pending that an existing pit is available for use. However, an existing pit is not available for use at the forefront, and an out-of-pit disposal site is still required for the initial 10 years of operations, while it is more desirable to generate a single site for tailings disposal than rely on multiple storage locations. A reliance on more than one site for tailings storage would also have a significant negative effect on the life of project economics, requiring construction, operation and closure of two sites instead of one. Further, committing to in-pit disposal would limit the proponent’s options to establish new mine plans toward the end of planned operations should economic conditions change, warranting additional mining or expansion of the resource. Therefore, this alternative is not considered feasible for the Magino Project and is eliminated from further consideration.

### 3.2.3 DryStack Tailings Disposal – ATD #2

Since the Mount Polley tailings dam breach, which occurred in British Columbia in August 2014, a heightened interest in tailings dam safety has been realized, from the standpoint of the regulatory community, as well as the mine operators, design engineers, and the general public.

Shortly after the breach, British Columbia's Ministry of Energy and Mines (BCMEM) commissioned an expert engineering review panel to study the Mount Polley tailings dam breach (Morgenstern et al., 2015). The concluding remarks in this report state that the future of tailings management requires not only an improved adoption of best applicable practices (BAP), but also a migration to best available technology (BAT). They go on to say that *"using filtered (or dry-stack) tailings technology is a prime candidate for Best Available Technology (BAT)"* and recommended that *"BAT should be actively encouraged for new tailings facilities and proposed mines."* However, it is generally understood within the consulting and mining communities that dry stack tailings represent BAT only in specific locations, for specific mine plans, and under specific climatic conditions.

Projects that benefit most by the use of dry stack tailings technologies are typically characterized by one or more of the following attributes: (i) regions where water conservation is crucial; (ii) areas where high seismicity contraindicates some forms of cost-effective conventional tailings management (e.g., upstream-constructed embankments); (iii) topographic considerations that exclude conventional dam construction and/or viable tailings storage to dam material volume ratios; and (iv) the operating and/or closure liability of a conventional tailings impoundment is in excess of the incremental increase to develop a dry stack.

Although generally more expensive per tonne of tailings stored than conventional tailings disposal, filtering (or screening) costs can potentially be offset by improved storage efficiency and a smaller environmental footprint. The costs of moving tailings materials to the impoundment are higher than conventional slurry transport as trucks or conveyors are employed. Furthermore, an equipment fleet is typically required to spread and compact the material that is placed to form the structural shell zone.

As tailings are placed unsaturated, dry stack disposal facilities may be susceptible to oxidation. Although overall water losses are minor, provisions must still be made for the collection and management of seepage and surface water runoff.

Although dust generation is an issue for many dry stack tailings facilities, it can be managed by compaction of the materials, incorporating erosion protection on slopes, applying a tackifier, or covering the tailings surface by other means (e.g., progressive reclamation). Though more stable in seismically-active regions than certain other tailings disposal methods, site-specific testing and analyses are still required to characterize the dynamic performance and specific requirements for the dry stack facility.

Sites that exhibit seasonal or prolonged freezing weather conditions may be further challenged by dry stack technology, as frozen tailings cannot feasibly be placed and compacted. Along these lines, one thing that needs to be considered when designing a filtered tailings dry stack is where to place tailings that do not meet the project specifications with regard to water content (and or presence of ice). The general placement area may be designed to contain off-specification tailings for brief periods without need for a dedicated separate conventional tailings storage facility for upset conditions.

- ***Considerations for the Magino Project***

While dry stack tailings disposal technology at Magino may be considered technically feasible, it would be without precedence, as discussed above. Also, it would involve the following:

- High energy consumption for filtration equipment (additional greenhouse gas emissions);
- Operation of an additional equipment fleet (trucks and dozers) to transport, spread and compact tailings; to provide for access roads across the tailings; and for snow clearing (additional greenhouse gas emissions). Thus, a relatively large haulage and material handling fleet would be required to transport and compact the filtered tailings at the disposal site;
- A separate storage area would likely need to be provided for filtered tailings that cannot be placed during inclement weather or freezing conditions. This would be difficult to locate in the limited space available at the mine site;
- Dry stack tailings are more prone to wind and water erosion/dispersion;
- A water holding pond would be required for storage of impacted surface water runoff and management thereof, such as during spring runoff and other wet periods;
- A large filtration system would be required, or series of filters, considerably increasing the mechanical complexity of the tailings disposal option. Preliminary estimates indicate that over 22 large operating pressure filters would be required (in addition to another five units for stand-by to ensure system reliability). The capital and operating costs associated with such an extensive filtration plant are not considered feasible for the economic viability of the project; and
- The dry stack facility would involve compaction of tailings forming the outer shell to ensure structural stability. Since compaction issues could arise during freezing conditions, or during inclement weather (e.g., high snowfall or rainfall conditions), the failure risk, while low, would still be higher than slurry tailings deposition behind a rockfill embankment constructed during non-freezing conditions.

- ***Pre-Screening Decision***

The same general geographic locations would be considered for dry stack tailings disposal as for the other tailings disposal alternatives. As such, a single tailings disposal site is feasible, which could be utilized from the onset of operations. However, use of this disposal method is considered to offer limited environmental benefits over the other tailings disposal methods, while the in-plant water management methodology is considered more complex, as well as the concern with placement of off-specification material and/or material during inclement weather conditions. Furthermore, the added filtration and mobile equipment adds considerable capital and operating costs, which affects the economic viability of the project and increases overall greenhouse gas emissions resulting from the project. Finally, and most importantly for the Magino Project, implementation of this technology is well beyond any precedent with regard to climatic conditions and tailings production rates. Therefore, this alternative is not considered feasible for the Magino Project and is eliminated from further consideration.

### 3.2.4 Surface Paste Tailings Disposal – ATD #3

Paste disposal has been successfully used as underground backfill for many years. Surface paste disposal, however, is relatively new and its application is limited, and expected to remain limited, to special circumstances. Surface paste tailings may be used at mines with low production rates with water and space constraints, as well as inexpensive energy. Due to the high percent solids of the paste and high viscosity, the paste flows follow the ‘plug flow’ concept (Watson, 2010). This requires the materials to have a minimum of 15% particles smaller than two micron (2 μm) (Watson, 2010).

Producing and transporting paste is considered expensive due to the high capital and operating cost of paste thickeners and the need for positive displacement pumps. Typically, paste tailings are distributed in a surface facility in a similar manner to conventional tailings, using perimeter spigots. However, given the low water content, paste tailings form higher beach angles, requiring more careful consideration of embankment design (i.e., to accommodate the steeper beach angles). In some cases, paste tailings are spread using mechanical equipment, though challenged due to the low bearing capacity of the recently-placed paste tailings. Spreading of paste in a surface tailings disposal facility is a difficult operation since it requires mechanical equipment but cannot support any significant traffic loads.

Surface paste tailings are used at mines with low production rates with water and space constraints as well as inexpensive energy. Paste is best used to backfill underground workings. It is not recommended for moderate to high production mines or with coarse tailing materials.

- ***Considerations for the Magino Project***

The proposed processing rate for the Magino mill is 35,000 tpd. Paste technologies are used primarily for backfill of underground mines, and remain relatively unproven at mines with moderate to high production rates such as that proposed for the Magino Project. Further, as no underground mining is proposed to be associated with the Magino Project, the use of paste tailings technology is not considered desirable for the project.

- ***Pre-Screening Decision***

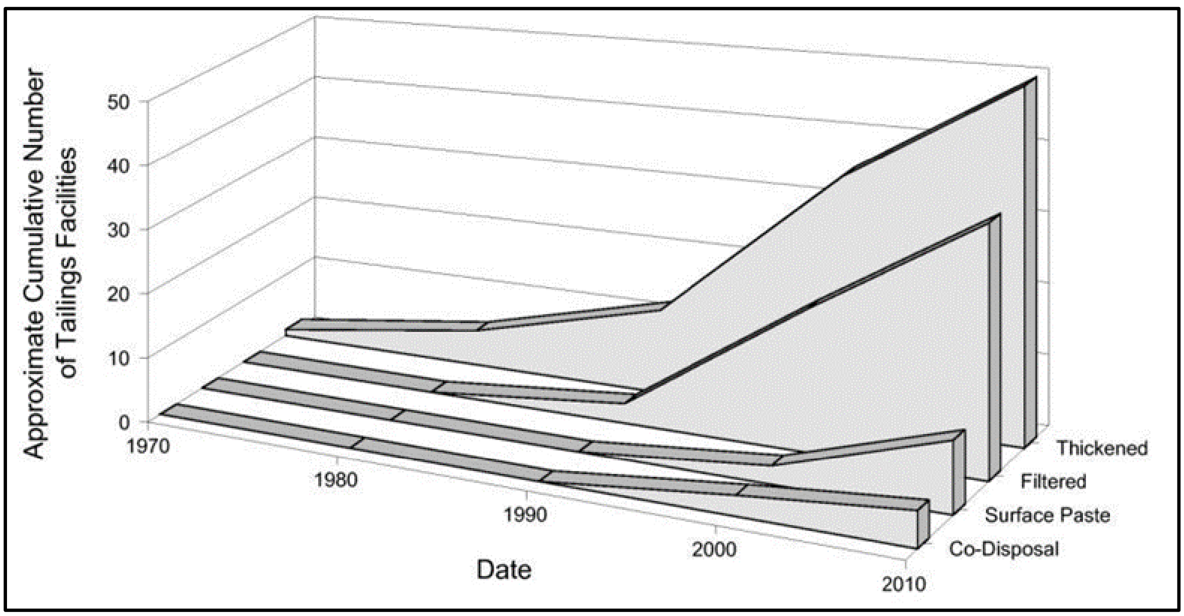
The same general geographic locations and footprint areas would be considered for a surface paste tailings disposal site as for the other tailings disposal alternatives, and the use of embankments for tailings containment are considered required. Paste is best used to backfill underground workings. The use of this disposal method is considered to offer limited environmental benefits over the other tailings disposal methods (i.e., the disturbance area remains the same), while the in-plant water management methodology is considered more complex. Furthermore, the added paste thickening and pumping equipment adds considerable capital and operating costs, which adversely impact the economic viability of the project. This technology is not recommended for moderate to high production mines or with coarse tailings materials. Finally, implementation of this technology is not considered viable at the proposed tailings production rates, and provides limited advantage over thickened or conventional tailings disposal. Therefore, this alternative is not considered feasible for the Magino Project as it presents no environmental or economic advantages, and is eliminated from further consideration.

### 3.2.5 Thickened Tailings Disposal – ATD #4

Thickened tailings technologies comprise several different approaches, with the use of thickeners to nominally decrease the water content of the tailings slurry considered more viable than the other approaches to thickened tailings (e.g., cyclones for sand dam construction) for the Magino Project. With thickened tailings, thickeners are used in the process circuit to nominally decrease the water content of the tailings prior to pumping the thickened slurry to the TMF. The tailings are pumped to the TMF and spiggoted in a similar manner to a conventional system.

Tailings thickeners are used to increase the slurry density at mines with various production rates, and have become a proven technology for most applications, including sites with moderate to high production rates. Figure 5-1 provides a summary of the relative number of dewatered tailings facilities on a global scale through 2010, showing that thickened tailings technology is more commonly employed than the other methods. With regard to co-disposal, Figure 5-6 refers to co-mingling where the fine tailings are dewatered (e.g., to a paste), and then mixed with the coarse mine rock materials.

**Figure 5-6: Trends in Dewatering Tailings Technology (Davies et al., 2010)**




- ***Considerations for the Magino Project***

The proposed processing rate for the Magino Project is 35,000 tpd, which is well within the range of use for thickened tailings using thickeners in the mill. Given the wet environment, a nominal reduction in the amount of water contained in the tailings slurry is seen as a benefit for the project.

- ***Pre-Screening Decision***

Surface disposal of thickened tailings is anticipated to require effectively the same infrastructure as conventional tailings disposal for the Magino Project. The main benefit of using thickened tailings slurry over conventional tailings is the reduction in the amount of water contained in the tailings slurry being sent to the TMF. However, disadvantages to the approach include nominally increased costs and operating requirements for thickened tailings versus conventional tailings. Thickened tailings disposal for the Magino Project meets each of the pre-screening criteria, and is therefore carried forward in the MAA. During an August 23rd presentation to the Batchewana First Nation (BFN), some members expressed their preference for the thickened tailings disposal method.

### 3.2.6 Conventional Tailings Disposal – ATD #5

Conventional tailings disposal is widely used and remains one of the least expensive methods of disposal, recommended for use at any production rate. Selection of the embankment type, such as downstream, centerline, or upstream constructed embankments, must be based on the specific characteristics at each mine, including the tailings grind, climate, site seismicity, topographic constraints, and other factors. Where downstream embankment construction is employed, in particular, these facilities are relatively simple to operate under varying weather conditions.

- ***Considerations for the Magino Project***

The proposed processing rate for the Magino Project is 35,000 tpd, which is well within the range of use for conventional tailings. Given the availability of suitable mine rock material for embankment construction at the site, development of the more significant embankments that would be required for storage of conventional tailings (and potentially thickened tailings) is not only achievable, but significantly reduces the amount of mine rock that would need to be managed in a separate mine rock management facility. The decreased costs and operating requirements for conventional tailings as compared to thickened tailings are seen as potential benefits.

- ***Pre-Screening Decision***

As discussed in the preceding sections, conventional tailings disposal has many of the same disadvantages as thickened tailings disposal. The main benefit to the use of thickened tailings over the use of conventional tailings is the removal of nominal amounts of water in the process circuit prior to delivery to the TMF. However, conventional tailings disposal remains a dependable and cost effective method for disposal of mine tailings. As such, conventional tailings disposal for the Magino Project meets each of the pre-screening criteria, and is therefore carried forward in the MAA.

### 3.2.7 Co-Disposal of Tailings and Mine Rock – ATD #6

The approach to co-disposal of tailings and mine rock that involves co-mingling was assessed through the pre-screening process, while co-placement of tailings and mine rock (e.g., use of mine rock for embankment construction, or dumping of mine rock into a mined-out pit alongside tailings) could be considered with any of the other tailings disposal alternatives.

- ***Considerations for the Magino Project***

When tailings are co-mingled, the tailings are typically dewatered to the point of a paste or filtered tailings prior to mixing with the mine rock. As such, the majority of the operational complexities discussed in the preceding sections for paste or filtered tailings would also apply for co-mingling as it relates to the Magino Project, particularly with respect to the proposed production rates and wet climatic conditions. An additional operational complexity is then introduced through the process of mixing the two waste streams together.

### 3.3 Technically Feasible Tailing Disposal Method for the Magino Project

The conclusion of this analysis indicates that both thickened tailings disposal (ATD #4) and conventional tailings disposal (ATD #5) are considered viable options for the Magino Project.

Either alternative requires the construction of a tailing management facility (TMF) to contain up to 150 million tonnes of tailings. The TMF requires the construction of an embankment (tailings dam) of significant proportion.

Having selected a disposal method, there are three other major economic drivers for the capital and operating costs of the TMF:

1) The distance of the TMF from the processing facility which impacts the capital requirement for both the construction of the facility and the ongoing operation of the facility, and,
2) The sourcing of material for the construction and ongoing maintenance of the TMF.

As the topography of the Project area is relatively flat, it is expected that the TMF dam could reach up to 80 m in height and several kilometers in length. A preliminary design of the TMF is provided in TSD 6. An estimated 200 million tonnes of rock fill will be required to construct the embankment.

Since the mining operation involves an open pit, and that mining will require the disposal of up to 430 million tonnes of mine rock, Prodigy will utilize the mine rock for the construction of the TMF embankment.

## 4. Mine Rock Disposal

The Magino Project will require the mining and movement of up to 550 million tonnes of mine rock, 130 million tonnes of which is ore that will be processed at the mill and disposed of as tailings.

### 4.1 Economic Considerations for Disposal of Mine Rock

Based on similar mining operations, in similar climate, haulage costs for mine rock are estimated at $0.25 per tonne per km travelled (this varies with fuel costs and topography). For the Magino Project, mining will occur over a 10 year period for an average haulage of 43 million tonnes per year of mine rock). Each km travelled will add up to $11 million dollars per year in operating cost for haulage. It is thus imperative to maintain haulage distances at a minimum in order to achieve economic feasibility of the Project.

There are two major constraints on the site selection for the mine rock management facility (MRMF):

1. The MRMF must be as close to the ore body as physically possible; and,
2. The MRMF must avoid sterilizing potential mineral resources.

Given these constraints, and that up to 200 million tonnes of mine rock will be used for the construction of the TMF embankment, Prodigy undertook a reconnaissance of potential disposal sites located within a 10 km radius of the ore body (mine pit) that could satisfy the disposal requirement for both the TMF and the mine rock. Preferably, the disposal site retained should not overprint a waterbody as this requires an amendment to the Schedule of the MMER regulation. As presented in TSD 5, ten candidate sites were identified as possible locations for mine waste disposal.

Important considerations for the identification of candidate sites is driven by the requirements of the TMF as the construction of the TMF will utilize up to half of the mine rock extracted, thus eliminating the need for quarries. Considerations for the potential sites include the following:

- **Distance from the open pit:** The open pit is located at the south-east corner of the Magino property.
- **Topographic containment:** Good topographic confinement reduces the requirements for dams and minimizes the length and height of containment structures. Natural containment is preferred for long-term stability. The embankment fill to tailings storage capacity ratio is an important consideration where containment structures are required, with lower values indicating improved storage efficiency. Containment dams are typically the most significant proportion of total costs related to tailings storage when surface impoundments for conventional or thickened tailings slurry are used.
- **Expandability:** The volume of tailings and storage requirement for which this assessment is being completed is based on the anticipated mineral reserves. As a general preference, the TIA should have the potential for expansion should additional mineral reserves be proven and exploited.
- **Existing land use:** Considerations related to property ownership and rights, population and housing, recreation, transportation and service corridors, transmission line, easements and rights-of-way should be taken into consideration.
- **Aboriginal traditional land use:** Information about how recent and current traditional practices are carried out on the land potentially affected should be considered as part of the assessment process.
- **Proximity to process plant:** From an operational, maintenance and reliability perspective, shorter pipeline lengths are preferable thus reducing the potential adverse effects of accidents and malfunctions. The site should be easily accessible.
- **Watersheds and drainage:** Restraining activities to as few watersheds as possible is preferred. Locating a TIA in the upper reaches of a watershed(s) minimizes water management requirements, including the need for diversion works.

- **Facility footprint:** A smaller physical footprint is generally preferred as it has less direct environmental impacts, and also often translates to less runoff to manage and therefore lower operational costs and environmental risks.
- **Provide downstream buffering capacity:** Availability of additional surface area downstream of the disposal facility allows for easier collection of effluent, catchment of seepage, and the establishment of a collection/polishing pond and/or treatment facilities.

A total of ten (10) candidate sites have been identified for the pre-screening assessment that would satisfy the Schedule amendment application (TSD 5). The locations of these alternative sites are presented on Map 3. Table 5-24 provides a brief characterization of each candidate sites with additional detailed descriptions presented in TSD 5.

The TMF embankment quantities and available tailings storage capacity for each of the candidate sites was evaluated based on the following assumptions:

- Embankment geometry assumes 2.5H:1V (horizontal: vertical) upstream and downstream slopes, with 15 m crest width;
- A maximum embankment height of 100 m was assumed, though many of the sites were too confined to allow development of a 100 m high embankment without significant loss of tailings storage capacity;
- Embankment construction is assumed to comprise the downstream construction method, which provides for the most robust embankment volumes and enhanced safety requirements;
- Tailings storage capacity developed assuming 0% percent surface slopes on the tailings with 2 m freeboard, which is considered appropriate for this level of assessment (i.e., only used for preliminary facility sizing);
- Tailings capacities assume an in-place dry density of 1.4 tonnes per cubic meter ($t/m^3$); and
- Rockfill assumed for embankment construction with a dry density of 2.0 $t/m^3$.

Preliminary embankment grading was developed for each of the candidate sites.

### 4.2 Preferred Disposal Location for Mine Rock

An item of note regarding the candidate sites is that Site G is the only site contained within the property boundaries for the Magino Project, and, Site G is the nearest to the open pit and is owned by Prodigy. Table 5-24 indicates the distance from the mine pit to the candidate site and the expected incremental annual haulage costs associated with each candidate site. Other significant characteristics of the canditiate sites are presented in Table 5-25. Figure 5-7 presents the configuration of the TMF and MRMF on the Magino site.

**Table 5-24: Distance from the Mine Pit and Mine Rock Haulage Costs for Candidate Sites**

| Candidte Site | Incremental Length of Haulage Road (kilometer) | Incremental Annual Haulage Costs for Mine Rock (430 Mtonnes) | Incremental Capital Costs for Selected Project Components | | Delays and Costs associated with Site Acquisition |
|---|---|---|---|---|---|
| | | | Additional Construction cost of TMF (Site G as Base Case TSD 5, Table 4.1) | Haulage Road and Tailing Pipeline Construction Costs (TSD 5, Table 4.1) | |
| Site A | 12.4 | $ 133,300,000 | over $125,000,000 | $ 8,700,000 | Yes |
| Site B | 7 | $ 72,250,000 | over $125,000,000 | $ 3,800,000 | Yes |
| Site C | 8.7 | $ 93,525,000 | $ 123,000,000.00 | $ 4,100,000 | Yes |
| Site D | 7.1 | $ 76,325,000 | over $125,000,000 | $ 4,000,000 | Yes |
| Site E | 3.8 | $ 40,850,000 | $ 108,000,000 | $ 1,600,000 | Yes |
| Site F | 9 | $ 96,750,000 | over $125,000,000 | $ 7,000,000 | Yes |
| Site G | 0.6 | $ 6,450,000 | Base Case | $ - | No |
| Site H | 11.9 | $ 127,925,000 | over $125,000,000 | $ 3,500,000 | Yes |
| Site I | 3.9 | $ 41,925,000 | $ 78,000,000 | $ 500,000 | Yes |
| Site J | 9.3 | $ 99,975,000 | > $123,000,000 | $ 6,800,000 | Yes |

In addition to the incremental cost of haulage, additional capital would be required to purchase the candidate site, should an alternative to Site G be feasible. The acquisition process for an alternative site would add further delays due to negotiations involved in acquiring the site and the condemnation drilling to ensure that ore reserves are not sterilized.

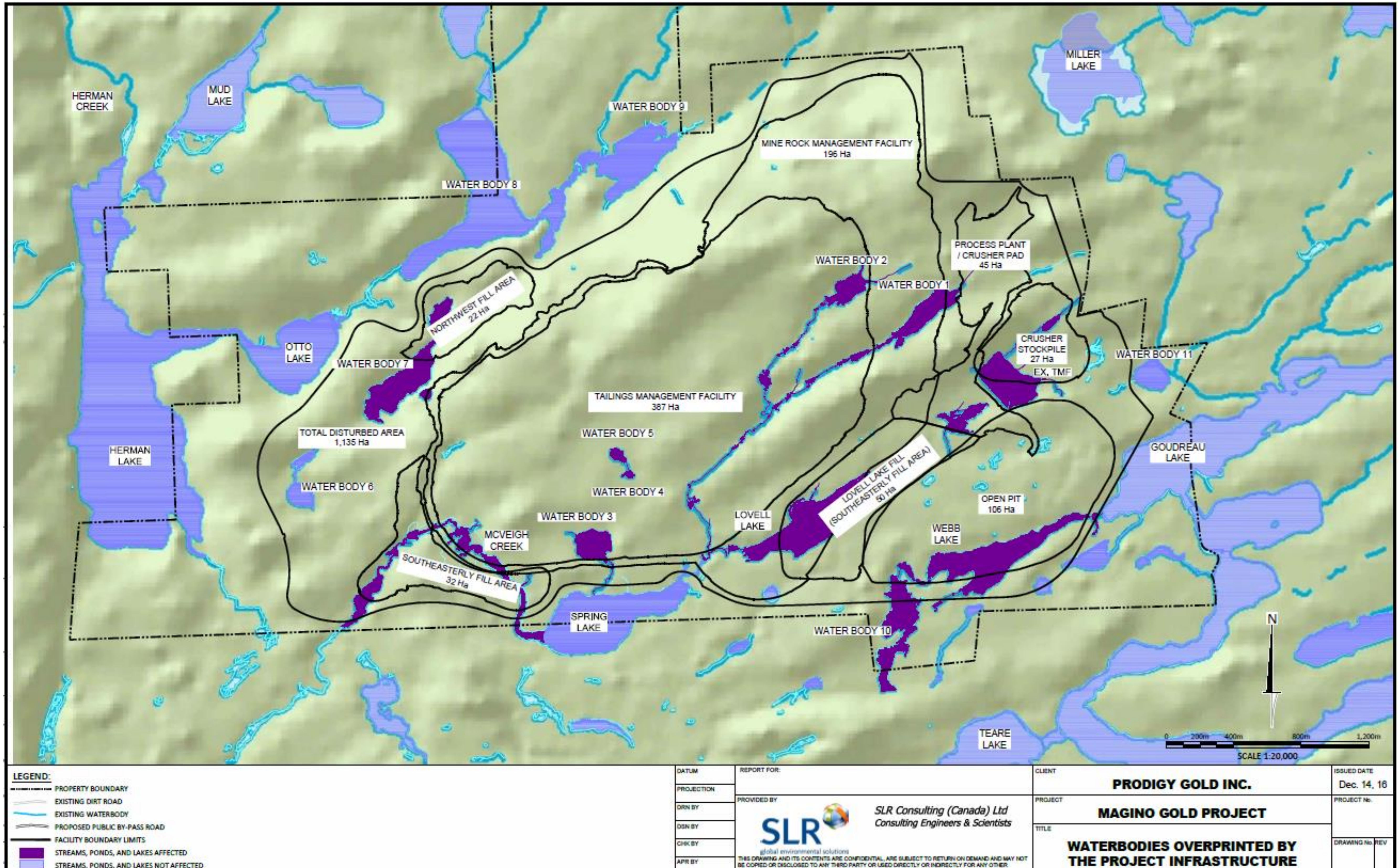
**Table 5-25: Characteristics of Candidate Tailings Disposal Sites**

| Account | Sub-Account | Indicator | Unit | Site A | Site B | Site C | Site D | Site E | Site F | Site G | Site H | Site I | Site J |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Environmental | Aquatic Habitat | Stream Length Affected | m | 1,700 | 500 | 0 | 1,500 | 1,840 | 3,800 | 4,000 | 700 | 2,170 | 3,100 |
| | | Waterbody (lakes, ponds or wetlands) Impacted | no. | 0 | 0 | 0 | 2 | 5 | 2 | 2 | 1 | 0 | 0 |
| | | Area of Waterbodies Impacted | ha | 0 | 0 | 0 | 0.5 | 25 | 4 | 8 | 9 | 0 | 0 |
| | Hydrology / Hydrogeology | Number of Additional Watersheds Affected | no. | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 3 |
| | | Number of Stream Crossings by Tailings Pipeline and Road | no. | 2 | 1 | 3 | 3 | 3 | 2 | 0 | 1 | 1 | 2 |
| | Terrestrial Resources - General | Area Available for Tailings Storage | ha | 336 | 285 | 267 | 232 | 270 | 403 | 385 | 323 | 322 | 433 |
| | Terrestrial Resources - Air Quality / Noise | Straight-Line Distance from Project Boundary | km | 3.8 | 3.7 | 4.6 | 1.1 | 0.0 | 0.5 | Within | 3.8 | 0.3 | 5.0 |
| Technical | Conventional or Thickened Tailings Impoundment | Tailings Storage Capacity *(Note 2)* | $Mm^3$ | 100 | 90 | 89 | 57 | 102 | 135 | 110 | 70 | 113 | 184 |
| | | | Mt | 140 | 126 | 125 | 80 | 143 | 189 | 154 | 98 | 158 | 258 |
| | | Ability to Store LOM Tailings | Yes/No | No | No | No | No | No | Yes | Yes | No | Yes | Yes |
| | | Volume of Embankment Fill *(Note 3)* | $Mm^3$ | 132 | 108 | 90 | 94 | 88 | 83 | 75 | 72 | 84 | 114 |
| | | | Mt | 264 | 216 | 180 | 188 | 176 | 166 | 150 | 144 | 168 | 228 |
| | | Embankment Fill to Tailings Storage Volume | ratio | 1.3 | 1.2 | 1.0 | 1.6 | 0.9 | 0.6 | 0.7 | 1.0 | 0.7 | 0.6 |
| | Embankment Safety Factors | Height of Embankment | m | 90 | 90 | 80 | 80 | 80 | 80 | 80 | 100 | 80 | 90 (Note 1) |
| | Operational Complexity | Access Pipeline and Road Length | km | 12.4 | 7.0 | 8.7 | 7.1 | 3.8 | 9.0 | 0.6 | 11.9 | 3.9 | 9.3 |

Notes:

1. The embankment height for Site J can be reduced from 90 m as the current layout more than exceeds the required tailings storage capacity for the project; and
2. Tailings storage capacity calculated assuming an in-place tailings dry density of 1.4 $t/m^3$; and
3. Embankment fill tonnage calculated assuming use of rockfill with an in-place dry density of 2.0 $t/m^3$.

**Figure 5-7: Water Bodies Impacted by the Proposed Site Layout**



## 5. Conclusion of the Technical and Economic Feasibility Analysis for the TMF and MRMF

The conclusion of this analysis indicates that both thickened tailings disposal (ATD #4) and conventional tailings disposal (ATD #5) are economically viable options for the Magino Project. Based on environmental concerns over water management, Prodigy has retained the thickened tailing method for the Magino Project.

The brief economic considerations presented in Section 5.3 related to construction cost of the TMF embankment, and haulage cost of waste rock, indicate that the only economically feasible disposal site (for the current commodity price for gold) is site G located on the Magino property. Any of the alternative sites technically suitable for the construction of a TMF would add from $80 to over $125 million to the capital cost of the Project and over $40 million per year in haulage costs for the waste rock. For the Magino Project to be economically feasible at this time there is NO alternative to Site G for the disposal of tailings and mine rock.

As there is NO viable alternative to Site G for the disposal of tailings and mine rock, no further consideration are given to Step 2 and Step 3 of CEAA's Operational Policy on Alternative Assessment.

1) Step 2: List their potential effects on valued components
2) Step 3: Select the approach for the analysis of alternative means

## 6. Freshwater Make-up Alternatives Assessment

Water is needed for mine operations. The Project water balance has been modelled (TSD 7). The results estimate that the total fresh water supply needs for the Project could vary over the life of the Project, requiring up to approximately 4,000 $m^3$ per day. This freshwater makeup is made of the following requirements:

- Make-up process water used for the preparation of reagents, and seal water for pumps, and, additional mill process water as required.
- Potable water.

Section 5.3, Chapter 5 of the EIS, presents a detailed assessment of alternative for freshwater make-up and supply needs of the Magino Project. Section 5.3 was erroneously entitled: "Process Water Supply". This title should read: "Freshwater Make-up".

For the purpose of review and applicability to the EIS Guidelines, Section 5.3 should have been properly entitled Freshwater Makeup.

## 7. Site Drainage

Part 2, Section 2.2. Of the EIS Guidelines states that an alternatives assessment for site drainage works must be presented.

There is no alternatives assessment for the site drainage works, as all project components are constructed within the perimeter of the Goudreau bypass road (refer to figure 6-9). The drainage strategy, clearly described in Chapter 6, utilises the natural topography of the site to collect and contain all runoff that is in contact with mine workings.

For any mining project, under the Mine Metal Effluent Regulation (MMER), the proponent has an obligation to contain, collect and monitor the water quality of all surface runoff that is in contact with the mine's works. The approach developed by prodigy implements best management practices for the management for site drainage as described in "Environmental Code of Practice for Metal Mines" published by Environment Canada.

Prodigy considers that there is no alternative to the approach presented in Chapter 6 and hence, no alternative assessment is presented on site drainage.