2 THE UNDERTAKING

The following sections present the undertaking and define the Project's rationales.

2.1 NATURE OF THE UNDERTAKING

2.1.1 The Undertaking

HML is planning to develop the iron ore deposit at the Howse Property with the support of adjacent mining infrastructure. The deposit is located in Newfoundland and Labrador along the Labrador Trough, between Irony Mountain, Pinette Lake and Timmins 4 (the site of TSMC's current operation). The Howse Project minimizes its footprint by sharing numerous existing facilities with TSMC's current adjacent operations. In order to connect the Howse Property to the existing road network, approximately 0.95 km of existing road from past IOCC mining operations will be upgraded and 1.2 km of new road will be built on a disturbed area (Figure 3-1). At the request of local First Nation communities, HML will support First Nations in the upgrading of an existing road in order to provide full acces to the Howells River Valley via a bypass road. The Proponent is currently assessing two bypass route Alternatives, and the details are discussed in Section 2.5.3. HML proposes to use a conventional open pit drill and blast operation mining method. The extracted iron ore will be crushed and screened, hauled by truck to the TSMC's DSO project rail loop loading area (less than 5 km from the Project), and subsequently shipped by train to Sept-Îles. Therefore, little additional infrastructure will need to be built.

Pit development is expected to be completed in 2017 to allow for ore production to also begin in 2017, pending regulatory approval.

HML will ensure that all permits and authorizations from appropriate regulatory agencies are obtained prior to the start of the Construction and Operations phases in order to comply with the laws and regulations of both governments.

2.1.2 Capital Cost

The capital cost is not expected to exceed $100 million.

2.1.3 Service Agreements

Multiple service agreements exist between HML and service providers. A list of categories and some examples are provided in Table 2-1.

Table 2-1 Examples of Service Provider Agreements

SERVICE PROVIDER CATEGORY	EXAMPLE
Transportation	Air Inuit, Provincial Airlines, QNS&L, Tshiuetin
Road maintenance	Mamu
Lodging	Sodexo
Mining	Grey Rock, Naskapi Heavy Machinery, Met-Chem
Consultants	WSP, Groupe Hémisphères, Sikumiut
Others	Biogénie, Naskapi Waste Management, Pétroles Naskinnuk

2.1.4 Related Projects

HML does not have other related projects. However, since HML is a division of TSMC, TSMC DSO Project Phases I and II are considered related projects. Information on the TSMC infrastructure that will be used for the Howse Property Project is provided in Section 3.1.

2.2 PREVIOUS ENVIRONMENTAL ASSESSMENTS

Environmental assessments have been prepared for projects in the vicinity of the proposed undertaking; the most relevant are listed in Table 2-2. A portion of the Howse Property Project intersects with the TSMC DSO 3 Project Phase 1 (ELAIOM) (Figure 1-2), for which an EIS has been accepted. The following deposits, identified in Figure 1-2, are not the property of TSMC: Snow Lake 1, Snow Lake 2, Sunny 3, Barney 2, Elross 2, Fleming 9, Aurora, Ferriman 6 and Bean Lake.

Table 2-2 List of Previous Environmental Assessments

PROJECT (REF. NUMBER)	OWNER	LOCATION	ENVIRONMENTAL ASSESSMENT PROCESS	DATES
Elross Lake Area Iron Ore Mine (ELAIOM-DSO Project 1a) (80067)	New Millennium Capital Corporation, now TSMC	Western Labrador, 10 km northwest of Schefferville, Québec	Project Registration	Registered May 5, 2008
			Provincial (NL) Environmental Impact Statement required	EIS submitted January 6, 2010
			Federal Environmental Impact Statement not required	Released January 5, 2011
Joyce Lake Direct Shipping Iron Ore Project (80015)	Labec Century Iron Ore	Western Labrador, 20 km northeast of Schefferville, Québec	Project Registration	Registered on October 15, 2012
			Provincial (NL) Environmental Impact Statement required	EIS ongoing
Joan Lake Direct Shipping Ore Project (DSO 2b)	New Millennium Capital Corp., now TSMC	Western Labrador, 45 km northwest of Schefferville, Québec	Project Registration	Registered January 20, 2010
			Provincial (NL) and Federal Environmental Impact Statement not required	Released on March 24, 2011
DSO Project 2a (Goodwood, Leroy 1, Sunny 1 and Kivivic 3S Deposits)	New Millennium Capital Corp., now TSMC	Northern Québec, 50 km northwest of Schefferville, Québec	Environmental Impact Statement submitted to the Government of Québec Federal Environmental Impact Statement not required	Certificat d’autorisation (authorization certificate) delivered on January 11, 2013 by the Government of Québec
Schefferville Iron Ore Mine (James and Redmond Properties)	Labrador Iron Mines Ltd.	Western Labrador, near Schefferville, Québec	Project Registration	Registered May 5, 2008
			Provincial (Environmental Impact Statement required	EIS submitted December 21, 2008

PROJECT (REF. NUMBER)	OWNER	LOCATION	ENVIRONMENTAL ASSESSMENT PROCESS	DATES
			Federal Environmental Impact Statement not required	Revised EIS submitted August 25, 2009 Released February 12, 2010

TSMC's DSO project is divided into two phases and five assessment groups for EIS purposes (Table 2-3). EA documents for infrastructure located in Labrador are assessed under the GNL's EPA and the CEAA (2012). For infrastructure located in Québec, north of the 55th parallel, EIS are analyzed under the James Bay and Northern Québec Agreement s23, whereas for infrastructure located in Québec, south of the 55th parallel, EIS are analyzed under Québec's Environment Quality Act and the CEAA (2012).

For assessment group 1a of the ELAIOM/DSO project EIS, component studies were conducted for fish and fish habitat, archaeological and heritage sites, gender equity, Schefferville Innu and Naskapi land and resource use and traditional ecological knowledge, hydrogeology, breeding birds, terrestrial ecosystem mapping, commuter mining and Aboriginal health. A helicopter-based survey of caribou was also carried out in collaboration with LIM in May 2009. No additional studies were conducted for assessment group 2a of the ELAIOM/DSO project EIS.

Table 2-3 ELAIOM/DSO Project Division for EIS Purposes

MINING STAGE	ASSESSMENT GROUP	DEPOSITS	PROVINCE
Phase I	1a	Timmins 3N, 4 and 7; Fleming 7N	Labrador
Phase I	1b	Ferriman 4 (and haul road)	Québec
Phase II	2a	Leroy 1, Goodwood, Sunny 1, Kivivic 3S	Québec (north of 55th parallel)
Phase II	2b	Kivivic 1C, 2, 3N, 4, 5; Timmins 8	Labrador
Phase II	2c	Barney 1, 2; Sawmill 1; Fleming 6, 7X; Timmins 3S; Star Creek 2	Québec (south of 55th parallel)

2.3 GEOGRAPHICAL LOCATION

The Howse Property is located 25 km northeast of Schefferville. Figure 2-1 shows the geographical location of the Howse Property in relation to TSMC's DSO project complex and other existing infrastructure. The center of the pit is located at 67°8'19.07"W, 54°54'31.18"N. The entire Property lies in the province of Newfoundland and Labrador. The mineral rights are registered to LIM (49%) and HML (51%) in the form of two map-staked licenses, 021314M and 021315M, as listed in Table 2-4, which replace licence 0201430M.

Table 2-4 Mineral Licences

LICENCE	CLAIMS	AREA (HA)	ISSUANCE DATE	RENEWAL DATE	REPORT DUE DATE
021314M	32	797	Dec. 16, 2004	Dec. 16, 2014	Feb. 14, 2014
021315M	7	181	Dec. 16, 2004	Dec. 16, 2014	Feb. 14, 2014

2.3.1 Land Zoning and Land Use Plans

There is no zoning in the Project area, and the Project area lies outside areas for which there is a land use plan. As mentioned above, the Property is registered to LIM (49%) and HML (51%).

2.3.2 Sensitive Areas

There are no protected areas such as national, provincial or regional parks in the Project area. Wetlands cover an area of 391 ha. There are no flora or fish species at risk, but there are three terrestrial fauna species at risks and four bird species at risk in the vicinity of the Project. For a depiction of the distribution of wetlands, caribou and avifauna in relation to the Howse Project, please refer to their effects assessment sections (Chapter 7): Figure 7-33, Figure 7-34, and Figure 7-35, respectively.

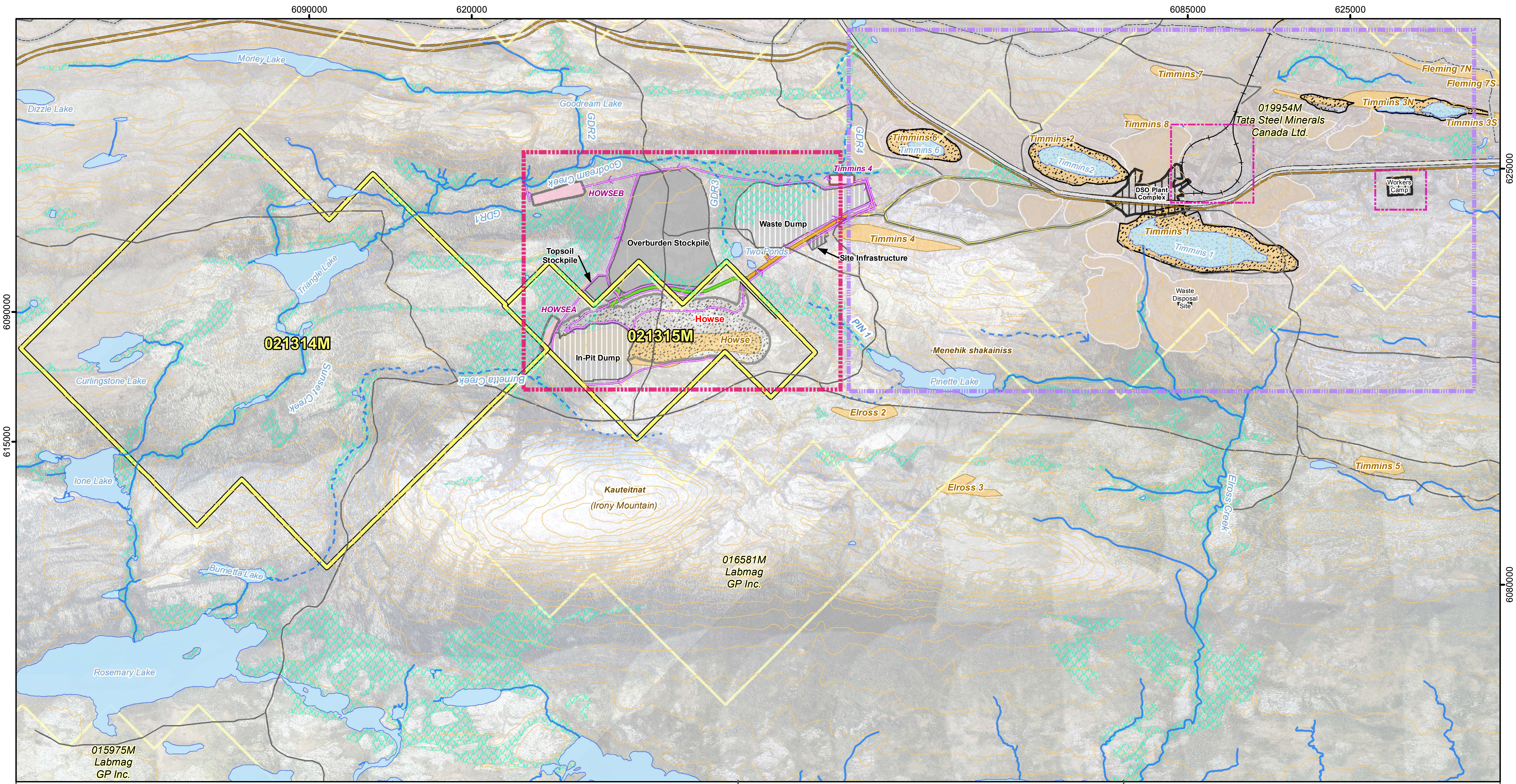
Two Aboriginal communities use the land in the vicinity of the Project: the Naskapi and the Innu. Pinette Lake has recreation value for the Aboriginal people of the area. Irony Mountain is of cultural and historical value for the local communities and Aboriginal people, especially the Innu.

2.3.3 Proximity to Federal Lands

The Howse Property is located on provincial Crown land. The distance of the Project (as the crow flies) from federal lands is shown in Table 2-5.

Table 2-5 Distance from the Nearest Federal Lands

	FEDERAL LAND	APPROXIMATE DISTANCE FROM THE HOWSE PROPERTY (km)
Québec	Schefferville Airport	24
	Matimekush (Aboriginal community)	24
	Lac John (Aboriginal community)	25
	Kawawachikamach (Aboriginal community)	25
	3 Wing Bagotville (Military base)	780
Labrador	Wabush Airport	222
	Sheshatshiu (Aboriginal community)	479
	Natuashish (Aboriginal community)	404
	5 Wing Goose Bay (Military base)	472



LEGEND

Infrastructure and Mining Components

Howse Proposed Infrastructures
- Proposed Howse Pit
- Proposed Topsoil/Overburden Stockpile
- Proposed Waste Dump/In-Pit Dump
- Proposed Site Infrastructure
- Proposed Sedimentation Pond
- Proposed Ditch and Outlet
- Haul road - Upgrade
- Haul road - New Construction
- DSO Project Truck Road
- Howse Project Area
- Howse and DSO Shared

Existing Components
- Existing Railroad
- Road to DSO Area 4
- Existing Sedimentation Pond
- DSO Howse - Claim Labrador Iron Mines Limited(49%)/ Howse Minerals Ltd.(51%)
- Other Claim
- DSO Only

Elross Lake Area Iron Ore Mine (ELAIOM)
- Plant Infrastructure Footprint
- Existing Dump
- Existing Pit
- Deposit

Basemap
- Permanent Watercourse
- Intermittent Watercourse
- Storm Runoff
- Disappearing Stream
- Artesian Spring
- Water body
- Contour Line (50 ft)
- Provincial Border
- Existing Road
- Main Access Road
- Wetland

*Hydronyms are oriented along the direction of water flow

FILE, PROJECT, DATE, AUTHOR:
GH-0572a , PR185-19-14, 2016-03-21, edickoum

N

0 500 1 000 1 500 2 000
Meters

UTM 19N NAD 83

SCALE: 1:30 000

SOURCES:
Basemap
Government of Canada, NTDB, 1:50,000, 1979 Government of NL and government of Quebec, Boundary used for claims
SNC Lavalin, Groupe Hémisphères, Hydrology update, 2013

Infrastructure and Mining Components
New Millennium Capital Corp., Mining sites and roads
Howse Minerals Limited/ MET-CHEM Howse Deposit Design for General Layout, 2015

ENVIRONMENTAL IMPACT ASSESSMENT
HOWSE PROPERTY PROJECT

Howse Property and TSMC DSO Project Infrastructure

Howse Minerals Limited

GroupeHemispheres

5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2

1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 2-1

2.4 PURPOSE OF THE PROJECT

By developing the Howse Property, the proponent is aiming to secure a steady supply of high-quality iron ore at a fair market price for Tata Europe or India and Asia. The Tata Steel Group intends to sieze the geographical opportunity of easy access to the pre-existing rail line and the proximity of an existing camp in the development of the Howse Project. As such, the Project can be brought into production in a relatively short period of time and at a low capital cost, because it requires few new installations, and some of the required infrastructure (e.g., railway, access road, camp, mining equipment and explosives storage area) is already in place at the nearby TSMC DSO project complex, which was recently put into operation.

The proponent will take a new approach to mining based on a partnership with First Nation groups and the signing and implementation of IBAs and other agreements, which will be implemented for the Howse Property Project. The latter will create local jobs and contracts and will stimulate local businesses. To date, up to $250 million has been given to First Nations and local businesses and communities in stakeholder benefits. The Howse Project will maintain those business relations.

At the regional level, many economical spin-offs are expected from the project. Namely, 138 direct new jobs will be created and approximately 800 existing jobs will be maintained. Further, businesses throughout Newfoundland and Labrador and Québec will receive income from the Project.

Based on those economic spin-offs, the following assumptions were made:

- The QNS&L and the Chemin de fer Arnaud will benefit from the project through increased ore transportation. In addition, $21 million was invested for the Tshiuetin railway, 60 jobs were created for First Nations communities during the rehabilitation of the railway, and increased revenues are expected for Aboriginal communities throughout the mine life;
- The Sept-Îles Port Authority and companies that work in the port will benefit from the activities associated with unloading trains, storing the ore and loading the ore carriers. Between 150 to 200 jobs are expected (Port de Sept-Îles, 2014). Also, $50 million was invested for the Sept-Îles multi-user port and nearly 1,000 jobs were created during the two years of construction (Port de Sept-Îles, 2014);
- The regional air carriers will benefit from transporting the large number of workers;
- Since the only other commercial link between Schefferville and the outside world is the Port of Sept-Îles, providers of goods and services in Sept-Îles will be in a strategic position to benefit from all phases of the Project.

2.5 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

The decision to develop the Howse Property is motivated by the proximity of existing infrastructure, the high cost of maintaining the DSO4 road, ore transportation at current iron prices and the availability and quantity of high-quality iron ore at this location. Consequently, there are no viable alternatives to the Project at the macro scale.

Given that the ability to develop a mining operation is essentially determined by the location of the ore deposit, the only alternative to the Howse Project is the "no-build" scenario, which would reflect a loss of opportunity on several levels:

- given global demand, international investment might move elsewhere;
- locally and regionally, it would preclude the economic benefits associated with operating expenditures, taxation revenues to governments, infrastructure development and job creation;
- local people and First Nations would lose the opportunity to participate in the Project, with its corresponding financial and social benefits; and

- the positive effects identified would be lost if the Project is not built.

Further, the Proponent judges that there are no technically feasible alternatives to the following activities:

- pit wall slope angles (i.e. other than those proposed), because;
  - the Project design is based on the most conservative, standard methods known. As such, in an effort to produce the safest working environment possible, the Proponent has not considered any alternatives in this component of the mine design.
- bench heights through the iron deposit (i.e. other than those proposed), because;
  - the Project design is based on the most conservative, standard methods known. As such, in an effort to produce the safest working environment possible, the Proponent has not considered any alternatives in this component of the mine design.
- power supply (i.e. diesel, hydroelectric, wind-diesel, other);
  - the power supply will be generators, as used for the DSO complex. This will allow the Proponent to connect with the DSO system and reduce its overall number of generators.
- work scheduling (i.e. rotational work schedules on- and off-site);
  - The work schedule for the Howse Project is 12 hour shifts and two weeks rotations;
- use of a Dryer for the Howse Project, because;
  - high-humidity material is un-shippable and unusable during the winter months, and thus not a viable economic option for the Proponent. The dryer prevents wet ore from freezing during shipment.

The following sections present 10 Alternatives that have been considered by the Proponent. All available information is included in the analysis below, which considers economic, environmental, logistics and First Nation's concerns. In most cases, the Proponent chooses to amalgamate its activities with existing DSO3 infrastructure, a strategy which minimizes the adverse environmental effects to VCs and First Nations, and often provides financial and logistical benefits to the Proponent as well. Final decisions were made where possible, but the Proponent remains adaptable in some cases.

2.5.1 Mine Production Rates (i.e. longer or shorter operations period)

The mine production rate for the Howse Project is 3.04 Mt per year (2018-2022) and 9.13 Mt per year (2023-2031) and 5.22 in 2032. The annual production levels and mine life of the Howse deposit were primarily selected due to the fact that this project will operate in tandem with TSMC's DSO project.

The Howse Project's mine life was selected to match the mine life of the DSO project. This will allow for the efficient sharing of infrastructure and personnel which will lower costs and improve efficiency across the two projects. Furthermore, this approach reduces the environmental impact of the Howse project as the disturbances in the area are limited to the same timeframe as the DSO project.

The reason a shorter mine life at a higher production rate was not selected was due to concerns over congestion in the area using 100 tonne trucks, which would increase emissions and dust generation and lead to less efficient mining. Due to the unconsolidated nature of the ore and overburden, larger equipment was not a viable option to increase production due to stability concerns with the larger excavators required.

2.5.2 Pit Method

The nature of the Howse iron ore deposit makes open pit mining the only viable mining method. No in-depth analysis into other mining methods is required due to the geometry and nature of the deposit. Any other mining method would simply be uneconomical or would involve leaving behind significant quantities of quality ore.

It's important to note that open pit mining is always the most economical way to move material on a dollar per tonne basis, due to the nature of using large mining equipment of large blast patterns to break rock. Underground methods are selected when the quantities of waste movement to access the ore become large enough that a higher cost underground mining method becomes more economical due to the fact that it can eliminate that waste movement. This means underground mining methods are preferable typically when an ore body is deep underground.

In the case of the Howse orebody, where an average of only 2.3 tonnes of waste need to be moved to access 1 tonne of ore in order to mine the entire orebody and large mining equipment can be used, this makes any underground mining method innately less economical than open pit mining.

In addition to the economics of open pit vs underground mining, the geometry of the Howse orebody makes it virtually impossible to envision any feasible underground mining method.

The top of the orebody lies 20-30 metres below the surface, and all of the overlying material is overburden, which means that a conventional open pit ramp is by far the safest and most economical way of accessing the orebody. Any underground method would lead to the entire mine being located under loose, unconsolidated rock which would require extensive structural work to ensure stability.

Furthermore, the large size and relative homogeneity of the deposit means that once the ore is contacted, the area to mine is a large expanse stretching 1500 metres in length, up to 300 metres in width, and up to 100 metres in depth. This means that any conventional underground mining method such as Cut & Fill, Sublevel Longhole, etc. is not suitable to this orebody since these methods are designed to target specific quality ore zones within in a large mineralization. The Howse orebody simply cannot be mined anywhere close to its entirety using these methods.

While certain underground mining methods are amenable to large ore bodies, these are not applicable in this case. Room & Pillar is not feasible due to the extensive depth of the deposit and the structural weakness of the ore, which would require massive pillars to ensure stability and thus too large a portion of the orebody would be left behind to never be mined. With other methods such as Sublevel Caving or Block Caving, the ore body is simply too large, close to the surface and too deep for this to be possible or economical.

In summary, there is no doubt that open pit mining is the most efficient and economical way of mining the Howse deposit, and the only mining method that could ensure an extraction of the entire orebody. Furthermore, due to the nature of the orebody and the structural nature of the ore, it's arguable that it would not even be possible to safely mine the deposit using underground mining methods.

Here, we consider the Alternatives to the *type* of open pit mining: the Mixed Conventional and In-Pit Alternative and the Conventional Pit Methods. The Mixed Conventional and In Pit Alternative (2) provides a better economic and environmental Alternative relative the Conventional Pit Method. Further, the Mixed Conventional and In Pit Alternative will also benefit First Nations communities and assist in the Decommissioning and Reclamation phase of the Howse Project. Although a slight logistical challenge is incurred by the Proponent in coordinating the waste transport/pit readiness, the Mixed Conventional and In Pit is therefore chosen as the preferred Alternative.

2.5.2.1 Alternatives Considered

Alternative 1:

Conventional Pit: Under this scenario, all waste piles are accumulated outside the pit, as with conventional open pit mines. The resulting waste pile heights are between 720-740 m in height and combined, they represent a footprint of more than 130 ha. In particular, the waste rock is estimated at 66 ha under this Alternative.

Alternative 2:

Mixed Conventional and In-Pit: A large portion of the waste material will be accumulated inside the mined portion of the Howse pit, resulting in an out-of-pit footprint of approximately 100 ha (namely a footprint of 39 ha for the waste rock). The remainder will be accumulated in nearby waste piles. Waste pile heights vary between 60-70 m in height for this Alternative.

2.5.2.2 Effects on VCs

Alternative 1:

Conventional Pit: Under this Alternative, the waste dumps are estimated to be 27 ha larger than under the Mixed Conventional and In-Pit Alternative.

Larger waste piles are expected to deplete landscape aesthetic and increase the Project footprint. Depending on their exact location (see Alternative 2.5.4), this additional footprint may destroy wetlands and/or wildlife habitat. This Alternative also implies the necessity for a corresponding system to capture runoff, and will require more effort to accomplish complete rehabilitation of the site during the Decommissioning and Reclamation phase.

Under the Conventional Pit Alternative, the Proponent will need to travel longer distances to transport waste material away from the pit, which will increase traffic on site. Consequently, this increased traffic will be more costly, deplete air quality (and GHG emissions), increase dust and noise, and increase the possibility of accidents. These effects are shown to affect the following VCs: air quality, water quality, caribou, avifauna and fish (see Sections 7.3 and 7.4 for Effects on Biophysical VCs). Further, all of these anticipated effects will affect First Nation's use of the land and will increase their concerns over the Project (see Section 4.3 Howse Project EIS Consultations).

Alternative 2:

Mixed Conventional and In-Pit: This Alternative reduces all of the anticipated effects on VCs described under Alternative 1. Under Alternative 2, however, the pit will be 6 ha larger than under Alternative 1. However, this effect is mitigated by the fact that the Mixed Conventional and In-Pit method will result in a smaller footprint (27 ha) incurred by the smaller waste dumps. Overall, the footprint for the Mixed Conventional and In-Pit method is 21 ha smaller than the Conventional Pit method.

2.5.2.3 Rationale for best Alternative selection

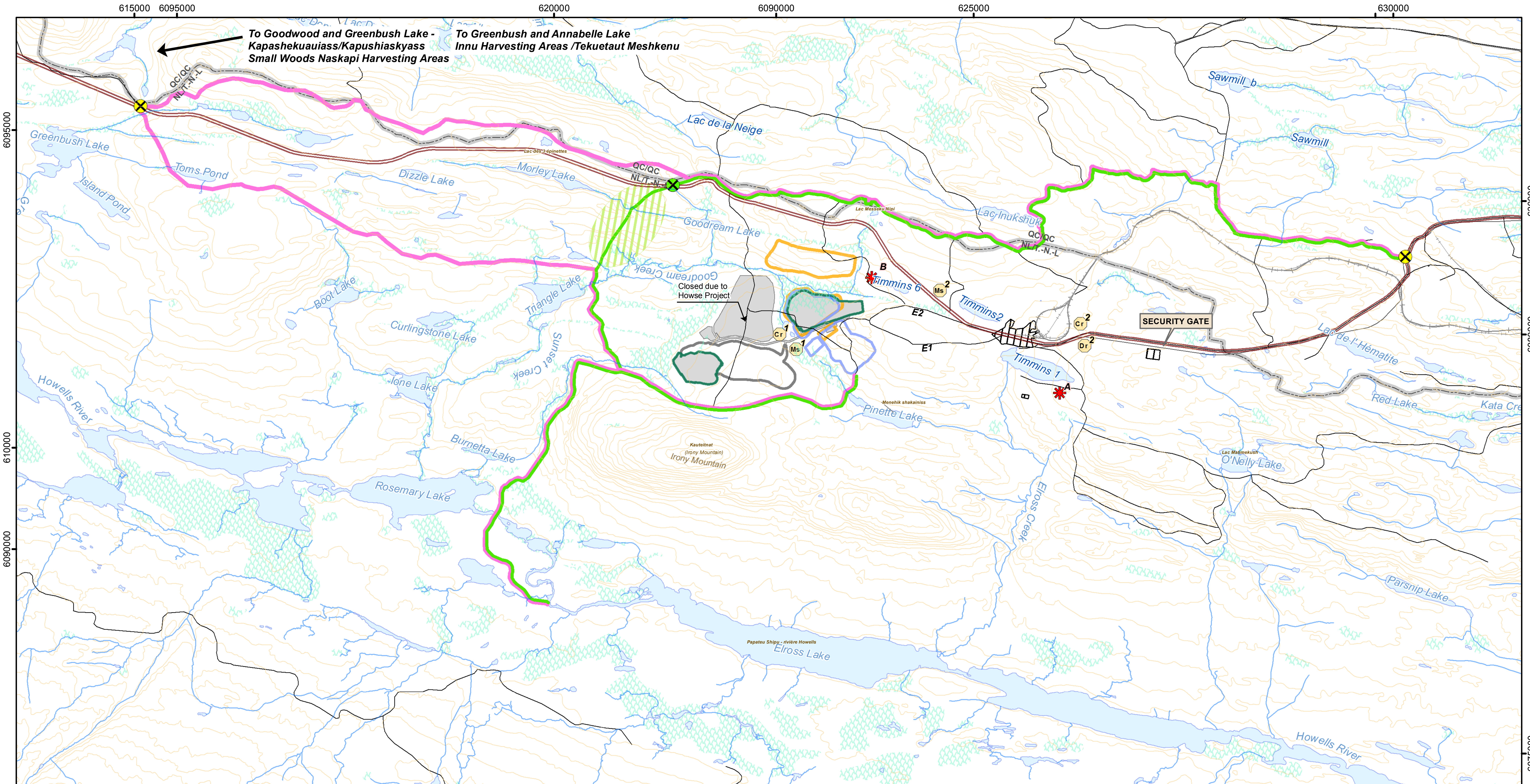
The selected alternative is 2, because it is less costly and incurs less environmental effects on VCs, and it will be preferred by First Nations.

Economics: Alternative 2 is less costly, by an estimated $2.5 million, largely incurred by the lower restoration costs during the Decommissioning and Reclamation phase. Further, the shorter route to transport the waste material under Alternative 2 will reduce fuel costs and the possibility of traffic accidents (which could be costly due to spills etc.).

Environmental: The smaller footprint from the Mixed Conventional and In-Pit Alternative reduces all effects on VCs.

Logistics: Both options are feasible but logistics will be slightly more complex for Alternative 2, as it necessitates additional coordination and waste material location management. However, the Mixed Conventional In-Pit method will facilitate the Decommissioning and Reclamation phase, as the Proponent expects to infill the pit throughout the operations phase, and thus essentially commencing the restoration process early.

Aboriginal: With the reduction of the size of waste dumps and corresponding environmental effects, Alternative 2 should be preferred by First Nations, as it will also result in less obstructed views, due to the correspondingly smaller waste dumps.



LEGEND

Access Roads
- DSO Haul Road
- Historic Road

Alternative Roads
- Alternative 1
- Alternative 2
- Section to Build

Alternative Infrastructures
- Existing Land User Crossing
- Proposed Land User Crossing for Alternative 2
- Cr - Crusher Location
- Dr - Dryer Location
- Ms - Maintenance Site Location
- Explosive facility Location

Alternative Waste Dumps
- Option 1
- Option 2
- Option 3

Infrastructure and Mining Components
- Railroad
- Proposed Howse Pit
- Howse Infrastructure Footprint
- Existing DSO Project Infrastructure

Basemap
- Contour Line (50 ft)
- Provincial Border
- Watercourse
- Water Body
- Wetland

*Hydronyms are oriented along the direction of water flow

FILE, PROJECT, DATE, AUTHOR:
GH-0584 , PR185-19-14, 2016-03-17, edickoum

0 2 4
Kilometers

UTM 19N NAD 83 SCALE: 1:55 000

SOURCES:

Basemap and Land Use Components
Government of Canada, NTDB, 1:50,000, 1979
Government of NL and government of Quebec,

Mining Components
Howse Minerals Limited/
MET-CHEM Howse Deposit Design
for General Layout., 2015
Groupe Hémisphères, Hydrology and update, 2013

ENVIRONMENTAL IMPACT ASSESSMENT
HOWSE PROPERTY PROJECT

Project Alternatives

Howse Minerals Limited

GroupeHemispheres

5731, rue Saint-Louis, Bureau 201, Lévis (QC) Canada, G6V 4E2

1453, rue Beaubien est, Bureau 301, Montréal (QC) Canada, H2G 3C6

Figure 2-2

2.5.3 Bypass Road Locations

The location of the Howse Project requires that a section of road used by First Nations to access Pinette Lake and the Howells river valley be closed (see Figure 2-2). At the request of local First Nations Communities, the Proponent has upgraded an existing IOCC road and therefore made available the Timmins-Kivivik bypass road since August 2015, and this to accommodate First Nations' interests. The Timmins-Kivivik bypass road was an existing road that was in disrepair, built by IOCC, and was upgraded in consultation with First Nations. The Proponent does not assume ownership of this road, but is committed to its maintenance bi-annually in order to continue to accommodate First Nation's access to the land. With this mitigation measure, the Proponent is also on the same breath providing will provide additional access to the Howells River and Pinette Lake via this a bypass road.

Section 2.5.3.1 presents an analysis of the bypass road alternatives the Proponent is considering beyond the Timmins-Kivivik bypass road. Both bypass road Alternatives use the Timmins-Kivivik bypass road, which maintains access to traditional recreational and harvesting lands above the Howse and DSO activities. This bypass road starts and ends at two existing crossings (see Figure 2-2). Currently, First Nations' well-being, environmental considerations and legal options are all being considered by the Proponent in making a final decision between the bypass road alternatives.Figure 4-1 depicts the Alternatives described below.

2.5.3.1 Alternatives Considered

Alternative 1:

North Road – Greenbush: This road already exists in its entirety as it is an existing road that was built by IOCC. It connects to the Timmins-Kivivik bypass road via the Greenbush crossing to Triangle Lake, then to the Howells River and Pinette Lake, using an existing historic road between the planned Howse Pit and Irony Mountain. This Alternative is approximately 16 km longer than Alternative 2. The Proponent does not assume ownership of this road, but is committed to its maintenance bi-annually in order to continue to facilitate First Nations access to the land.

Alternative 2:

North Road – Triangle Lake: This Alternative connects to the Timmins-Kivivik bypass road between Morley Lake and Goodream Lake, via a crossing that will need to be built by the Proponent. From this crossing, the road will join Alternative 1 at Triangle Lake and follow the same course as Alternative 1. However, a section of road between the new crossing and Triangle Lake will need to be built (see Figure 2-2). The Proponent does not assume ownership of this road, but is committed to its maintenance bi-annually in order to continue to facilitate First Nations access to the land.

2.5.3.2 Effects on VCs

Alternative 1:

North Road – Greenbush: Since this road already exists (and is currently being used by light vehicles), it will have minimal negative effect on biophysical VCs. However, this Alternative requires a longer commute for local people to access the land (approximately 16 km), and so it may have a small effect on local air quality. Although this Alternative ensures that access to the land is preserved, it affects this the Access to Land VC by reducing the quality of the access. Further, the longer commute may result in more vehicle accidents and noise, which has been shown to affect wildlife (see Sections 7.4.3 and 7.4.8).

Alternative 2:

North Road – Triangle Lake: This Alternative requires the construction of approximately 1.3 km of new road to connect the Timmins-Kivivik bypass road to the existing road network. This section, depending on its exact route, which will be decided by the Proponent should this Alternative be retained, may cross wetlands, and will have to cross two streams. It is therefore expected that this Alternative will effect water quality (depletion), wetlands (destruction), and fish habitat (depletion). Further, construction activities will cause noise which will also cause wildlife disturbance (see Sections 7.4.3 and 7.4.8). This shorter route will likely be preferred by land users (as it will provide better access to the land).

2.5.3.3 Rationale for best Alternative selection

The selected alternative is undecided and will be confirmed in consultation with First Nations.

Economics: At the onset, the least expensive is Alternative 1, since it uses an existing road. Road construction is estimated at costing $76,017/km, representing a total of $98,822 for Alternative 2 (1.3 km of new road required). In addition, the Proponent estimates that it wil cost $1,200,000 to construct the stream crossings associated with this Alternative, for a total of $1,276,017.

Since the Proponent is committed to maintaining either bypass road Alternative bi-annually throughout the Project duration, the additional 16 km (approximately) of road under the North Road-Greenbush Alternative may results in a more costly Alternative in the long term. It is estimated that it will cost $5,515/km to maintain either bypass road. This represents a total annual maintenance cost of $176,480 for Alternative 1 and $14,339 for Alternative 2 (only considering those sections that are not identical to the two alternatives).

Environmental: Alternative 1 poses the least environmental issues for biophysical components, since it uses an existing road. However, it is expected that this longer route will deplete air quality due to longer travel times. Alternative 2 requires that 1.3 km of new route be constructed, which may destroy wetlands and deplete water quality. Under this Alternative, two streams will need to be crossed, thereby affecting water quality/fish habitat.

Logistics: The logistics of either bypass route involve the bi-annual maintenance to which the Proponent is commited. For this, the logistics of Alternative 2 (1.3 km) is smaller than Alternative 1 (16 km). However, the new road construction required under Alternative 2 poses large logisitcal constraints. Further, Alternative 2 requires that the Proponent arrange for the safe crossing of the DSO haul road by land users.

Aboriginal: The longer route presented in Alternative 1 may reduce the quality of land users access to the land. Further, longer travel times may increase the frequency of accidents.

2.5.4 Dump Locations

The Proponent analyses three alternative locations for waste dumps in this section. Figure 2-2 shows the locations of the three dump location alternatives considered. **The final Alternative is Alternative 2, because it has fewer adverse effects on the environment.**

2.5.4.1 Alternatives Considered

Alternative 1:

Alternative 1 has 3 waste dumps, located above and below the Howse haul road. The largest waste dump (furthest above the Howse pit) occupies a naturally sloped area. The waste piles under this Alternative have a footprint of 82 ha.

Alternative 2:

Alternative 2 has two waste dump locations, one above the Howse haul road and the other at the Howse In-Pit site (e.g. *within* the Howse Pit). Consequently, the out-of-pit footprint for this Alternative is 39 ha. This option is entirely removed from the Pinette Lake watershed.

Alternative 3:

This Alternative has dump components above and below the Howse haul road. Two of the three proposed sites are on the Pinette Lake watershed, with one dump site being within 300 m of Pinette Lake. The footprint for this Alternative is 71 ha.

2.5.4.2 Effects on VCs

Alternative 1:

This Alternative has the largest footprint. Therefore, this Alternative has the potential to destroy the most habitat, in particular because the largest dump location is surrounded by wetlands. Further, the 2nd-largest dump location is, for the most part, on wetlands.

This Alternative requires the longest travel routes for trucks to reach its topmost location (more than 2 km of road to travel from the Howse pit). Consequently, this Alternative implies a depletion of air quality and a potential for more road accidents. This location, however, is strategic in that it does not create a pile per se, but rather uses the natural landscape to depose of the waste. The aesthetic effect, therefore, is not as impactful as the other two Alternatives.

The location of parts of the waste dump below the Howse haul road is within the Pinette Lake watershed, and therefore could affect its water quality and associated fish habitat and ultimately, affect First Nation's land use at Pinette Lake.

Alternative 2:

This Alternative has a much smaller footprint than the others because the Proponent would use the mined part of the pit as a dump site. This Alternative also encroaches on wetlands, but to a slightly lesser extent as compared to the other two Alternatives.

Alternative 2 is completely removed from the Pinette Lake watershed.

Alternative 3:

Alternative 3 has a footprint of 71 ha, divided into three piles. Of these, two piles are on the Pinette Lake watershed, the closest being approximately 300 m from Pinette Lake.

2.5.4.3 Rationale for best Alternative selection

The selected Alternative is 2.

<u>Economics:</u> Aside for the longer travel routes incurred by Alternative 1 due to the location of the largest dump location, the costs of implementing all three Alternatives are comparable. The longer commute for Alternative 1 may be slightly more costly to the Proponent.

<u>Environmental:</u> The Alternatives with the largest footprint (habitat destruction, including wetlands) also have effects on Pinette Lake (adverse effects on water quality and fish habitat). The longer commute for Alternative 1 may result in more vehicle accidents and noise, which has been shown to affect wildlife (see Sections 7.4.3 and 7.4.8). As such, the logical Alternative from an environmental perspective is Alternative 2.

Logistics: The logistics incurred by Alternatives 1, 2 and 3 are similar.

Aboriginal: The fewer adverse environmental effects associated with Alternative 2 should be preferred by First Nations. Further, since Pinette Lake is frequently used by locals for recreational activities, the other Alternatives would be a cause for concerns for First Nations. The bypass road Alternatives considered by the Proponent also reach very close to Dump Location Alternative 3, which would not be appropriate.

2.5.5 Crushing and Screening Facility Location

The crushing and screening facility has a footprint of 1.5 ha. The Alternative to place the Howse crushing and screening facility at the DSO site (Alternative 2) poses no negative effects on economics, the environment (minimal, see below), logistics and/or First Nations, whereas Alternative 1 is more costly, it also creates additional environmental stress and requires additional loading/unloading and transportation of material.

Alternative 2 is therefore a logical way to proceed and clearly the preferred Alternative for the Howse Project.

2.5.5.1 Alternatives Considered

Figure 2-2 shows the proposed locations of the two Alternatives for the crushing and screening facility location.

Alternative 1:

The crushing pad will be placed near the Howse Pit (exact location to be determined).

Alternative 2:

Crushing pad will be placed near the rail loop.

2.5.5.2 Effects on VCs

Alternative 1:

If the Proponent were to place the crushing and screening facility near the Howse Project site, it would destroy an additional 1.5 ha of habitat, likely wetland, at the Howse site. Wetland destruction would necessarily correspondingly affect wildlife, through habitat destruction.

Alternative 2:

This Alternative places the crushing and screening facility in an area that is already heavily disturbed (no natural environment and air, noise and light emissions already created as a result of the activities at the DSO complex). As such, the placement of the facility near the rail loop is not expected to cause additional effects on VCs.

2.5.5.3 Rationale for best Alternative selection

The selected Alternative is 2 – the crushing and screening facility will be placed at the DSO site, near the rail loop.

Economics: Alternative 2 reduces the number of generators needed as it will use the DSO plant generator, which reduces costs.

Environmental: Although Alternative 2 requires that ore be shipped from the pit to the facility, it also places the facility in an already-disturbed area, thereby concentrating the disturbance in a single location, and avoiding the destruction/alteration of any additional habitat. Modelling confirms that noise will be reduced this way (Volume 2 Supporting Study E).

Logistics: Sharing of the facilities with other DSO projects renders the construction logistics of Alternative 2 simpler. Alternative 2 simplifies product manipulation by condensing all mineral processing facilities in two locations. Alternative 1 requires that the mineral be crushed at the Howse site, then manipulated once again at DSO3 facilities, thus necessitating repeated loading and unloading of product.

Aboriginal: No known effects.

2.5.6 Water Treatment

In this section, water treatment options with/without coagulant, are analyzed. Section 3.2.5 of the present document states that if any runoff water from the site exhibits water quality issues (other than suspended solids), treatment chemicals, such as a coagulant, could be added as a contingency measure to help destabilize the fine particles and help them co-precipitate out with the floc formed by the addition of a coagulant. Currently, since Howse operations are not ongoing on an annual basis, and the use of coagulant is not required under the GNL guidelines, and local information on water quality at adjacent project sites indicates that it is not inferior when it is untreated (i.e. no coagulant is applied), the use of coagulant is not expected for the Howse Project. Should it be required, the type of coagulant will be decided by the Proponent at a later date. Further, the Proponent is committed to conducting an economic and environmental feasibility study for each option.

The Proponent choses Alternative 1 (no water treatment) for the time being, but is committed to conduct ongoing water monitoring and implementing a coagulant if needed.

2.5.6.1 Alternatives Considered

Alternative 1:

No water treatment: Use of sedimentation ponds alone to allow sediment to settle for a known period of time prior to discharge.

Alternative 2:

Water treatment: Use of coagulant as water treatment could be added as a contingency measure at the entrance of sedimentation ponds with manual dosing pumps, and mixed naturally by the turbulence action of the incoming flow. The inorganic coagulant could be aluminum sulfate, iron salts or lime. The treatment chemicals will help destabilize the fine particles and help them co-precipitate out with the floc formed by the addition of a coagulant. Alternatively, an organic polyamide cationic flocculant could also be used to destabilize the fine iron oxide particles. An anionic flocculant could be added to enhance the settling rate of the coagulated particles if required.

2.5.6.2 Effects on VCs

Alternative 1:

This Alternative requires larger sedimentation ponds, and so increases the Howse footprint, thus potentially destroying sensitive habitat. However, the Howse Project will only build two new sedimentation ponds (HOWSEA, 1.9 ha and HOWSEB, 4.4 ha) and the third sedimentation pond is existing (Timmins 4 sedimentation pond 3, 3.4 ha). As such, Alternative 1 uses 3.1 ha of new footprint only, due to the larger sedimentation ponds. These values are based on the new sedimentation ponds being twice as large as those proposed under the present WMP (Volume 1 Appendix IV), as suggested in Section 3.2.5.

The new footprint could imprint on sensitive environmental areas. However, the current WMP plan, which includes two new sedimentation ponds that are planned without the use of coagulant, have been designed so that their imprint on wetlands is limited/minimized.

Alternative 2:

The Howse WMP (Section 3.2.5) estimates that ponds will be half the size presented under the current WMP. As such, under Alternative 2, the Howse footprint is smaller. However, depending on the Proponent's choice of coagulant, this treatment may need further management by the Proponent.

2.5.6.3 Rationale for best Alternative selection

The selected Alternative is 1

Economics: The cost of adding coagulant renders Alternative 2 more costly than Alternative 1.

Environmental: The addition of coagulant will decrease the Howse footprint: estimates indicate that sedimentation ponds will be half their size under Alternative 2. Local information on water quality at adjacent project sites indicates that it is not inferior when it is untreated (i.e. no coagulant is applied).

Logistics: Given that the addition of coagulant may not be necessary, the logistics of Alternative 1 are easier. Section 3.2.5 states that, based on the surface runoff water quality from the Timmins 4 site, a chemical treatment dosing system is not required.

Aboriginal: Other than the smaller footprint of the Project, this activity poses no known effects to local communities.

2.5.7 Explosives Transportation Route

The Proponent sees no Alternative but to use the existing DSO facilities for explosives storage. Trucks from explosives facility A will need to meet trucks with the detonators from explosives facility B, at which point the products will be mixed and trucked to the Howse Pit (see Figure 2-2 Depiction of project Alternatives). This is logically the safest, and preferred at all levels, for this activity. Rather, the Proponent assesses the different routes that trucks may take to transport explosives to the mine site. The safest and shortest route (Alternative 1) is chosen.

2.5.7.1 Alternatives Considered

Alternative 1:

Start at explosives location A and follow route E1 to meet a truck from explosives location B, and go to the Howse pit (see Figure 2-2).

Alternative 2:

Start at explosives location A and follow route E2, track back on E1 to meet a truck from explosives location B, and go to the Howse pit (see Figure 2-2).

2.5.7.2 Effects on VCs

Both Alternatives are very similar and will have very similar effects on VCs. However, Alternative 2 is slight longer (just under 1 km) and so may have more adverse effects on air quality.

2.5.7.3 Rationale for best Alternative selection

The selected Alternative is 1 because it is slightly less expensive, simpler, and safer.

Economics: Both Alternatives have the same economic costs. It can be assumed that the slightly longer route under Alternative 2 will render it slightly more expensive to the Proponent.

Environmental: It can be assumed that the slightly longer route under Alternative 2 may incur more adverse effects on air quality.

Logistics: Alternative 2 is more logistically complex at it will require that the truck containing the explosives track back onto route E1 to meet the detonator truck.

Aboriginal: Improved social acceptability resulting from the implementation of Alternative 1, as risk of accidents is reduced.

2.5.8 Winter (November-March) blasting

Based on the analysis below, the Proponent has chosen Alternative 1 (no winter blasting). However, the Proponent will blast infrequently in winter, and only if frozen ground or hard rock are encountered during winter overburden removal. HML is committed to implementing a seismograph for one year to assess vibration speed (peak particle velocity) during blasting. However, the blasting activity/schedule will be upgraded as needed, depending on the results. See Section 9.1.2 for more details.

2.5.8.1 Alternatives Considered

Alternative 1:

No winter blasting: Blasting will only occur between April and October if exceedances are detected.

Alternative 2:

Winter blasting: Blasting will occur all year.

2.5.8.2 Effects on VCs

Alternative 1:

This Alternative poses no negative effects on biophysical VCs.

Alternative 2:

This Alternative will create additional short-term noise between November and March, which may cause disturbances to wildlife (See Sections 7.4.3, 7.4.8, 8.6 and 8.7), as blasting creates avoidance behavior in caribou and avifauna. Further, this Alternative will deplete air quality between November and March (see Section 7.3.2). It is estimated that air quality will exceed allowable standards due to winter blasting 13 times in 5 years (Lalonde, personal communication).

2.5.8.3 Rationale for best Alternative selection

The selected Alternative is 1

Economics: Alternative 1 is more costly to the Proponent as it will slow down mining operations.

Environmental: Alternative 1 reduces the Howse environmental (noise and air quality) footprint during winter which will temporarily benefit wildlife and nearby people which may suffer from the estimated 13 times in 5 years that the air quality will exceed allowable standards due to winter blasting (Lalonde, personal communication). However, in delaying the Howse Project operations, Alternative 1 also delays the restoration process and thus delays the time for wildlife to return to the Howse site. As such, the relatively short-term and rare air quality exceedances may be acceptable to the Proponent. Winter blasting would avoid avifauna disturbance in summer, as there are very few birds in the Howse area in winter, and notably no species at risk. Further, winter blasting would not conflict with the migratory bird convention nor with breeding periods.

Logistics: The logistics incurred from either Alternative are equal.

Aboriginal: Aboriginal considerations will likely mirror the environmental ones, as air quality standards and wildlife health are both deemed important issues to Aboriginal communities.

2.5.9 Maintenance Site Location

The possible locations for the maintenance site are shown in Figure 2-2. The Proponent has chosen to use existing DSO3 Maintenance Site facilities. This will minimize environmental effects by reducing the project footprint and the need to build new structures at the Howse site.

2.5.9.1 Alternatives Considered

Alternative 1:

Build a new maintenance facility on the Howse Project Site.

Alternative 2:

Use existing DSO3 maintenance Site facilities.

2.5.9.2 Effects on VCs

Alternative 1:

Additional footprint will, depending on the exact location, create negative effects on sensitive landscapes (environmental or cultural sensitivity).

Alternative 2:

This Alternative poses no negative effect on biophysical VCs

2.5.9.3 Rationale for best Alternative selection

The selected Alternative is 2

Economics: Alternative 1 is more costly as it requires building new infrastructure.

Environmental: Alternative 2 is preferred as no extra footprint is needed. However, trucks will need to travel between 2-3 km to reach the existing DSO3 Maintenance Site (Alternative 2), thereby increasing the possibility of accidents (e.g. fuel spills) and emitting more GHGs.

Logistics: With Alternative 2, construction logistics would be facilitated, whereas Alternative 1 necessitates the construction of a new facility with installation of new water and power sources. Distance between existing DSO3 maintenance and Howse site is however minimal and should not pose any logistical problem.

Aboriginal: Reduced footprint will improve social acceptability from local communities.

2.5.10 Water Management Plan (WMP)

The selected WMP for the Howse Project is largely based on DFO and Aboriginal concerns over the integrity of Pinette Lake. Complete WMP for Alternatives 2 and 3 are provided in Volume 1, as Appendices V and VI.

2.5.10.1 Alternatives Considered

Alternative 1:

Part of the WMP infrastructures are within the Pinette Lake Watershed. Runoff from these infrastructures are pumped to Timmins 4 Pond 3. Runoff from all the other infrastructures will be discharged to Goodream Creek, including runoff from dewatering and runoff. No detailed plan is available for this alternative.

Alternative 2:

Part of the WMP infrastructures are within the Pinette Lake Watershed. Runoff on these infrastructure pumped to Timmins 4 Pond 3. Runoff on remaining infrastructures discharged to Goodream Creek, dewatering to Goodream Creek and pit runoff discharged in Burnetta Creek. (a copy of this plan is available in Volume 1 Appendix V).

Alternative 3:

Almost no infrastructures in Pinette Lake Watershed. Runoff of topsoil stockpile and in-pit dump to Burnetta Creek, Runoff on remaining infrastructures in Goodream Creek. Dewatering in Goodream Creek, Pit runoff in Goodream creek (2/3 in Timmins 4 Pond 3, 1/3 in HOWSEB). A copy of this plan is available in Volume 1 Appendix IV).

Table 2-6 Watershed Area variations

	GOODREAM CREEK	BURNETTA CREEK	PINETTE LAKE
Alternative 1	+100ha	-40ha	-61ha
Alternative 2	+22ha	+39ha	-61ha
Alternative 3	+46ha	-38ha	-9ha

2.5.10.2 Effects on VCs

Alternative 1:

This Alternative required significant watershed area changes, increasing the negative effects on aquatic fauna and water balance. Both DFO and Aboriginal groups expressed concerns over this plan.

Alternative 2:

This Alternative required large watershed area changes, but dewatering water flow allocation was better split between the Burnetta and Goodream watersheds.

Alternative 3:

This Alternative requires the smallest watershed area changes, particularly for Pinette Lake. The dewatering water flow allocation is better split between the Burnetta and Goodream watersheds, thereby minimizing effects on VCs.

2.5.10.3 Rationale for best Alternative selection

The selected Alternative is 3

Economics: There are no major cost differences between Alternatives.

Environmental: The footprint of the three Alternatives is similar; Alternative 3 minimizes the watershed area variation; Alternative 3 better divide dewatering and drainage water flows between Burnetta and Goodream creeks watersheds.

Logistics: All three Alternatives require comparable logistical efforts.

Aboriginal: Alternative 3 minimizes the biophysical effects on Pinette Lake, therefore increasing social acceptability to the project.

2.5.11 Summary of Project Alternatives

Table 2-7 presents a summary of the project alternatives considered for the Howse Project.

Table 2-7 Summary of Project Alternatives Considered

ACTIVITY CONSIDERED	ALTERNATIVE SELECTED	EFFECTS ON VC
1. Mine production schedule	The mine production rate for the Howse Project is 3.04 Mt per year (2018-2022) and 9.13 Mt per year (2023-2031) and 5.22 in 2032.	This design reduces effects on VCs by coordinating activities with adjacent mining operations.
2. Pit method	Mixed Conventional and In-Pit: A large portion of the waste material will be accumulated inside the mined portion of the Howse pit. The remainder will be accumulated in nearby waste piles.	Overall footprint of the Howse Project, traffic and overall disturbance effects will be mitigated.
3. Bypass road location	This Alternative is undecided	
4. Dump size and location	The Proponent has chosen the Alternative with the least adverse environmental effects	Habitat destruction.
5. Crushing and screening facility location	Use existing DSO3 infrastructure.	This Alternative poses no negative effect on biophysical VCs as compared to other Alternatives
6. Water treatment	The Alternative to not treat water is selected (use of sedimentation ponds alone)	This Alternative will result in larger sedimentation ponds under the WMP (habitat destruction)

ACTIVITY CONSIDERED	ALTERNATIVE SELECTED	EFFECTS ON VC
7. Explosives transportation route	The Proponent will use the shortest and safest route proposed.	This Alternative poses no negative effect on biophysical VCs as compared to other Alternatives
8. Winter blasting	No winter blasting: Blasting will only occur between April and October	This Alternative poses no negative effect on biophysical VCs as compared to other Alternatives
9. Maintenance site location	Use existing DSO3 infrastructure.	This Alternative creates a slight increase in traffic and a correspondingly slight depletion of air quality as compared to other Alternatives
10. Water management plan	Almost no infrastructures in Pinette Lake Watershed. Runoff of topsoil stockpile and in-pit dump to Burnetta Creek, Runoff on remaining infrastructures in Goodream Creek. Dewatering in Goodream Creek, Pit runoff in Goodream creek (2/3 in Timmins 4 Pond 3, 1/3 in H2)	This Alternative requires the smallest watershed area changes, particularly for Pinette Lake. The dewatering water flow allocation is better split between the Burnetta and Goodream watersheds, thereby minimizing effects on VCs.