6 EFFECTS ASSESSMENT – GENERAL CONSIDERATIONS

6.1 EFFECT AVOIDANCE STRATEGIES

The proponent has developed a comprehensive strategy to minimize the negative effects of the Project on the biophysical and socioeconomic environments and to maximize its positive effects. A significant part of this strategy consists of adapting the established mitigation measures for the DSO projects to the Howse Property Project phases. The following topics summarize the main elements of the proponent's strategy, which includes, in the opinion of HML, a meaningful accommodation of Aboriginal rights, interests and concerns through the Project design and through an on-going flow of communication and information with Aboriginal communities to mitigate effects:

- ecological constraints were studied (i.e. location of sensitive areas and species), highlighted and mapped, and the Project layout and activities were adjusted to minimize the negative effects on these constraints (i.e. reduction of footprint on wetlands, minimize effects on Pinette Lake);
- the proponent has been working in close collaboration with a team of mining engineers to develop an infrastructure layout that would minimize the Project's footprint and visual effects (Section 2.5 for details);
- the waste rock dump and other piles are located as close to the pit as possible—but outside areas of mineralization to reduce the length of haul—and are designed to minimize energy-consuming lifts;
- the footprint of the waste rock dump and overburden stockpiles will be reduced by using material from the Timmins 4 area to upgrade/build the future mining/access road. Further reduction of waste rock and overburden footprints will occur by selling sand and gravel from the glacio-fluvial deposit portion of the overburden to local communities as construction material (*potential* activity);
- the Project layout was designed to maximize the use of existing mining facilities (former IOCC infrastructure and DSO Project 1a) such as haul roads, right-of-way's, railways, waste dumps, camps, warehouses, landfills, and diesel, gas and explosives storage facilities;
- a dust control policy will be applied to reduce the release of fugitive dust and to eliminate runoff from rain and snow. All stockpiles will have a drainage system and water will be diverted to sedimentation ponds;
- instead of transporting pre-mixed explosives, these will be manufactured at the blast site, thereby eliminating the danger of an explosion during transportation;
- best-available technology will be used so as to reduce effects and pollution;
- many jobs and contracts during both the Construction and the Operation phases will be carried out by locally- and regionally-based firms and individuals, including Aboriginal and Labrador West workers and Aboriginal-owned and Labrador West businesses;
- benefits for affected Aboriginal groups and residents of Newfoundland and Labrador, with special consideration for the residents of Labrador West, will be optimized. These include major investment in local and regional infrastructure (Tshiuetin Railway, Port of Sept-Îles, Schefferville arena), which in turn create additional employment opportunities and capacity-building (literacy and essential skills training, donations of thousands of new books to school children);
- indirect economic spin-offs and future investment in the region led by government and First Nation organizations (e.g., fiber-optic communication from Emeril Junction to Schefferville; paving of local street and road network creates additional employment opportunities); and
- the workers' camp is located in the DSO3 project area so as to avoid the socioeconomic effects associated with lodging a large and predominantly male labour force in a small, primarily Aboriginal community, eliminate the cost of daily transportation, and optimize productivity.

A full list of standard mitigation measures is provided in Volume 1 Appendix VI. From this list, standard mitigation measures specific to each VC are presented in the appropriate section. The list of 153 measures fall into 12 categories:

- Tree removal and timber management;
- Erosion and sedimentation control;
- Watercourse crossing;
- Waste management;
- Hazardous materials management;
- Drilling and blasting;
- Construction equipment;
- Mining operations;
- Management of ore, rock piles, waste rock, tailings and overburden;
- Water management;
- Air quality control; and
- Rehabilitation.

To avoid repetition, the specific mitigation measures are integrated into the text where relevant and presented in Volume 1 Appendix XVI.

6.2 BEST MANAGEMENT PRACTICES

HML is directed by the environmental best practices of the Tata Group, Tata Steel and TSMC.

Throughout its long history, the Tata Group has been recognised as an organization committed to good corporate citizenship – long before the term was invented. This philosophy was encapsulated by its founder, Jamsetji Tata (1839-1904), who viewed the creation of wealth not as an end in itself, but as the means by which his company could make a positive contribution to the communities it served.

In the modern world, a good corporate citizen recognizes that it has important social and environmental, as well as financial, responsibilities. To help ensure a good quality of life for all, both now and for generations to come, we need to balance economic prosperity and social progress with care for our planet.

Tata Steel understands and recognizes that:

- responsible practices and procedures ensure that all aspects of Tata Steel's business are conducted with the utmost respect for the environment;
- every major business has an effects on the communities and societies in which it operates. In all its operations throughout the world, Tata Steel contributes to local and regional economic and social development in myriad ways;
- making sure that our employees and contractors return home from work safely each day is more important than anything else;
- ethical behaviour is intrinsic to the way we conduct our business and is part of our legacy from the founder of the Tata Group, Jamsetji Tata, who believed that business must operate in a way that respects the rights of all its stakeholders and creates an overall benefit for society; and
- regulatory compliance is part of the business.

TSMC is a member of the Canadian Institute of Mining, Metallurgy & Petroleum – Newfoundland and the Québec Mining Association, and adheres to the Equator Principles and follows the Environmental Guidelines for mining operations compiled by the United Nations Department of Economic and Social Affairs or by the Article 8j) of the United Convention on Biodiversity with respect to the protection of indigenous knowledge and lifestyle, including the CBD's Akwé: Kon voluntary guidelines for the conduct of cultural, environmental and social effects assessments regarding proposed development projects on indigenous lands and territories. Moreover, TSMC is an active player in a number of different environmental initiatives, including in wildlife protection (Ungava project).

6.2.1 HML Environmental Protection Plan

Overall, the EPP document applies to all its mining projects in the Schefferville region. However, HML is also committed to modify the EPP in order to render it specifically applicable to the Howse Project (see below). While the present version of the EPP applies to current operations only, the annual update of the document, planned to be released in spring 2016, will include provision for environmental monitoring at Howse. At the present time, it is expected that the spring 2017 version of the EPP will include Howse Operation activities.

The complete EPP is available in Volume 1 Appendix Ia.

<u>General description of TSMC's EPP</u>

The EPP serves as a tool in attaining TSMC's goals and objectives in terms of environmental management. At the corporate level, the EPP serves as a working document to ensure that compliance with environmental policies and legislation have been achieved. The EPP also serves as a reference document; a tool for documenting environmental concerns and proposed appropriate protection measures; a guidance document to provide employees and contractors with concise and clear instructions to follow for different work tasks; a tool to communicate program changes through the revision process; and as a reference to legislative, guideline and approval/permit requirements.

The EPP outlines the best protection measures to follow while performing the general activities required during the site operations (Sections 3.0 and 4.0). Detailed procedures are outlined for specific aspects of the project (Volume 1 Appendix Ia).

The EPP contains clear instructions to ensure that the personnel understands and implements environmental protection measures for both routine activities and unplanned events associated with Project activities. The style and format of the EPP is intended to be user friendly for everyone. The bulk content of the EPP is contained in the appendices.

The main body of the EPP outlines the general protection measures to be followed, activities associated with the construction, development and operation of the mining site, and the site-specific measures associated with each location during the operation phase of the DSO 3/ DSO 4 Project. The different sections of the EPP may be considered as stand-alone, separate documents outlining the general protection measures and separate contingency plans.

The **Preface** provides guidelines for making revisions to this document, as well as a source for document control records.

Section 1.0 is an introduction to the EPP, including the main purpose and its organization as well as outlining the responsible authorities and mechanisms for EPP development and implementation.

Section 2.0 provides a list of the permits and approvals required for the activities of the project. This section also outlines compliance monitoring requirements.

Section 3.0 is an introduction and overview of the general activities anticipated during the operation phase. The environmental protection measures associated with these activities are provided in Volume 1 Appendix Ia. Section 3.0 contains some general principles on environmental procedures, hazardous waste materials, petroleum product storage and transport and potential discovery of contaminated soil. These stand-alone documents outline the operational considerations and environmental concerns to justify the need for these procedures.

Section 4.0 describes the various work areas and site-specific environmental measures to apply to the operation phase of the DSO 3/DSO 4 Project, and provides a list of the applicable general standard operating procedures. This section provides a way for managers and workers to use the EPP as a guide to the most appropriate procedures applicable to each work site. This section also contains information about local environmental sensitivities and periods that may apply.

Sections 5 and 6 describe current environmental control plans and contingency plans.

EPP Update Procedure

The EPP and associated documents (environmental monitoring plan, contingency plan and Environmental emergency plan) is an evolving document. The document is updated annually based on the mining plan, the permit and legal obligation requirement as well corporate TSMC, Tata Steel Europe, Tata Steel and Tata group requirements and environmental objectives.

Since 2012, the Howse Project has evolved significantly and the EPP has been adapted to reflect these changes. A revision of this document is in process and is expected to be available in sping 2016 and will be submitted to governments of Newfoundland and Labrador and Québec as well as to all local community and First Nations for review; following the integration of all comments, the final version will be enforced and available to all employees and contractors in spring 2016.

Howse EPP

At the current exploration stage of the Howse Project, the EPP is not applicable, as the exploration stage is never included in the EPP. However, specific environmental information, environmental procedures and/or requirements are communicated to TSMC or to contractors.

As soon as all environmental measures, including government requirements and specific monitoring, will become available, these will be integrated into the EPP and communicated to all personnel. This updated EPP will be discussed with the communities during the Health, Safety, Security and environmental committee. The following Spring, the document will be submitted to authorities (governments of Newfoundland and Labrador and Québec) as agreed.

Due to the proximity of the DSO and Howse Projects, some elements of the Howse Project are already present in the DSO EPP, such as those pertaining to Pinette Lake and Goodream stream. As such, in this case, we are integrating specific Howse condition to the general EPP rather than conducting a full revision of the EPP. The major modifications will be in the following sections:

Section 1.5.3: Special training

In this section, all special training related to the Howse Project, such as archeology screening and restricted access will be listed and clearly defined.

Section 2: Project overview

The project overview is a description of each sector, including sensitive areas and restricted areas as well as a description of sensitive environmental components, such as Irony Mountain, Pinette Lake and Goodream stream, which are already listed on DSO3 project overview. Additional details will be added in the Howse Project overview, including Burnetta creek and Triangle Lake will be added in the section.

Section 3.3: Compliance monitoring

In this section, we describe all the water sampling, air quality description as well others monitoring; this will include Howse LSA water and air sampling locations as well as any other specific monitoring procedures (See Section 9 in the present document for a full description).

Section 4: Specific environmental protection measures

In this section, all specific information related to Irony Mountain, Pinette Lake, Burnetta creek, Triangle Lake and related protection measures like water discharge etc. will be described.

Section 5: Environmental control plans

6.3 CROSS-BORDER EFFECTS

The Project is adjacent to Labrador/Québec border. The closest projected Howse infrastructure is about 950 m from this border. Given the proximity of the Project, there is a potential for Air Quality (Section 7.3.2) and Noise and Vibration (Section 7.3.3) effects in Québec, as well as effects on mobile species (birds and mammals). In order to assess cross border effects, 17 sensitive receptors for air quality were located in Québec and 23 in Labrador. Most of the dust emissions will be the result of haul truck traffic and blasting. Air pollution from blasting and generators is discussed in Section 7.3.2. Noise and Vibration effects will likely be perceived in Québec, primarily due to blasting (Section 7.3.3). For noise, 14 sensitive receptors were located in Labrador and five in Québec. For a more complete review of the cross border effects related to Air and Noise, please see Volume 2, Appendices E and F, respectively.

An increase in rail traffic is expected between the two provinces. On average, one train per day will depart from the TSMC loading facility for a period of 10 months, when iron ore is extracted simultaneously at the Howse Property and the TSMC DSO project. During this period, traffic on the NL (WLR2013) and QC (KeRail, TSH, QNS&L and CFA) provincial railways will be higher.

No cross-border effect on ground and surface water quality and quantity is possible, since water flow direction is northwesterly (in the Howells River direction) in both cases (Section 3.1). Also, pit dewatering drawdown will not at any time reach Québec territory, since the drawdown radius will be below 1 km and the projected pit is more than 2 km from the border (Section 7.3.6).

Several species at risk designated by the SARA might be present in both Québec and Labrador. Every federally-designated species has the same designation in both provinces. As such, any of the federally-designated species in the present text have the same status in Québec. Mobile species (birds and mammals) might travel from Québec to the vicinity of the Project and consequently, could experience adverse effects from the Project. However, as presented in their respective sections (Chapters 7 and 8), these species are rather sensitive to human disturbance (notably, noise and light) and tend to avoid disturbed sites. These species will probably not frequent the Howse Project site and so the likelihood of adverse environmental effects of the Howse Project on federally-designated mobile species is unlikely.

Overall, no considerable cross-border effect is expected due to the Howse Project activities.

6.4 EFFECTS OF ACCIDENTS AND MALFUNCTIONS

This section describes the Proponent's readiness to manage unforeseen events. Accidents and malfunctions, and their associated effects on Project activities, can have adverse environmental effects on VCs. Events considered below include those caused by human error, exceptional natural events as well as the environmental effects on the project, that could cause adverse environmental effects on VCs.

The specific errors and/or events presented were identified by CEAA and communicated via the Howse Project Guidelines, and also by a roundtable of experts with knowledge of the Project and the environmental setting within which the Howse Project sits. Where possible, details of the effects are provided (e.g. estimate of contaminant leakage and extent of damage caused by the event). Estimates of the likelihood of the event and their consequence on VCs is provided. Figure 6-1 and Table 6-1 present the methodology used to assess the effect. For all potential accidents and malfunctions which have a sum total of ≤5 in the matrix table (which combines likelihood and consequence of an adverse environmental effect on a VC) the effect on VCs are qualified and quantified.

Although the Proponent makes an effort to provide the reader with phase-specific accidents, malfunctions and environmental concerns, the Proponent recognizes that most of the events described can occur at any stage of the Project's lifespan.

Figure 6-1 Effect Assessment Matrix

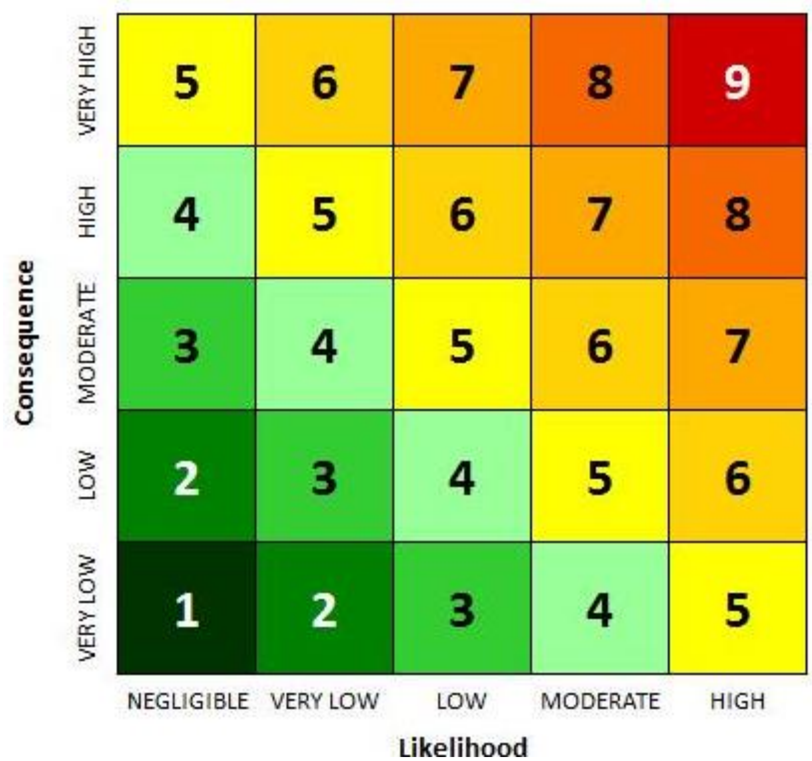

Table 6-1 Likelihood and Magnitude Definitions for the Effect Assessment Matrix

LIKELIHOOD	DEFINITION		CONSEQUENCE	DEFINITION
Negligible	Probably will never happen		Very low	Single VC temporarily affected, effect reversible
Very low	May happen once during mine life		Low	Multiple VCs temporarily affected, effect reversible
Low	May happen more than once		Moderate	Single VC temporarily affected, monitoring/restoration measures (i.e. cleanup) required
Moderate	Will probably happen during mine life		High	Multiple VCs temporarily affected, monitoring/restoration measures (i.e. cleanup) required
High	Will happen more than once during mine life		Very high	One or more VCs permanently affected

The Proponent is in the enviable position of having multiple years of experience with mining Projects in the Schefferville area and, as such, has the benefit of experience with respect to accidents and malfunctions, especially those related to the harsh local environment of the Schefferville area. Although overall details are provided below, the reader is often directed to an EPP (Volume 1 Appendix Ia) or an ERP (Volume 1 Appendix Ib), which includes details on safeguards and emergency measures that the Proponent has previously evaluated and considers effective, and is committed to follow in the event of the error/events listed below. Further, the Proponent's long-term experience with the area has allowed HML/TSMC to acquire significant amounts of information on the biophysical environment of the Howse Project area, and this knowledge will serve to inform decision-makers on how to most effectively conduct targeted responses to accidents, malfunctions, and environmental hazards (e.g. extreme weather events).

Federal and provincial standards will be used as mitigation tools in the design stage to prevent the environment from affecting the Project. For example, the National Building Code of Canada provides design criteria for dealing with wind, snow, waves, ice loading and drainage, which are important given the extreme environmental conditions the Project may face throughout its service life. The General Guidance for Practitioners prepared by the Agency (CEAA, 2003) has also been reviewed and taken into account in the design of mitigation measures for adverse effects on the public and the environment due to climate change. The design also considers the possibility of an increase in wind strength and frequency, extreme snow and ice events, extreme precipitation and sudden snow melt, and an overall increase in precipitation.

6.5 Accidents and Malfunctions Caused by Human Error

6.5.1 Spills

A spill is defined as the discharge of a hazardous product out of its containment and into the environment. Potential hazards to humans, vegetation, water resources, fish and wildlife vary in severity, depending on several factors including nature of the material, quantity spilled, location, and season (see Section 7.7 of TSMCs ERP– Wildlife protection procedures, in Volume 1 Appendix Ib). Diesel is the main product that may be spilled and therefore spill response procedures focus on this hazardous material. Other chemicals that may be spilled include sewage water, coagulant, glycol, small quantities of lubricants and oils, and releases of gaseous material. Note that spill response procedures will be different depending on the magnitude and nature of the release. A diesel spill of five liters can easily be contained and cleaned by one person, while a spill of a larger magnitude will be much more hazardous and require more personnel.

Spills are common at mining sites due to the number of liquids that are used daily. Diesel is the most common hazardous liquid that could spill, and chemical spills can include: glycol, sewage water and lubricants. These are categorized below into immiscible and miscible materials, based on their solvency with water. Lubricants and oils, because of their immiscibility with water, are treated as diesel spills.

Only very small quantities of sewage water will be present on site as sewage water treatment will take place at the Timmins Worker Camp under the ELAIOM Project. In this context, the effect of a sewage water spill is considered negligible and will not be further treated either. The Proponent's ERP has a plan for spills of miscible materials (Volume 1 Appendix Ib) on land and water, which is discussed below.

6.5.1.1 Fuel Spills

Vehicles, tanks, generators and other pieces of equipment throughout the site are to be fueled via a mobile fueling truck operated by an independent contractor. Fuel will arrive on-site by rail, and distributed to a 50,000 L vehicle fueling station where it will be then discharged to 18,000 L mobile fueling trucks for distribution to mobile equipment. As such, only 18,000 L fueling truck will be used on Howse Project study area to fuel heavy equipment. Spills could occur because of fueling carelessness during refueling of heavy machinery at the Howse site, or due to a road accident.

6.5.1.1.1 Worse-Case Scenario

A traffic accident resulting in a spill from the fueling truck (max 18,000 L spill) would be the worse-case scenario. Further, the most precarious location for a spill would be at the Two Ponds area (Figure 3-1). A large fuel spill at this location could reach a pond (small waterbody with no fish) connected to Goodream Creek and ultimately Triangle Lake. There is also a small isolated wetland on the other side of that road that could be affected. Considering the possible spill quantities and containment procedures, contamination of the Howells River is improbable.

The worse-case scenario would be that an uncontrolled large-scale spill reach a moving waterway. However, the Howse Project area was designed with no crossings and no routes are within 100 m of watercourses, therefore making a spill into a waterway unlikely.

6.5.1.1.2 Effects on VCs

Based on the definitions from Table 6-1 , the likelihood of a spill is low since it is not expected to happen, but could happen due to human error or environmental conditions. On the other hand, the **likelihood of it reaching a VC (water quality or wetlands) is negligible** since there are no crossings and all infrastructures are at least 30 m away from any water body or wetland. Therefore, due to the potential size of a spill (fuel truck), it is unlikely to reach any VC.

Assuming the unlikely event of a spill reaching a water body or a wetland, the **consequence would be high** since it could affect multiple VCs and would require monitoring and restoration measures.

When crossed in the effect assessment matrix (Figure 6-1), the result is **four (4)**, or below the effect assessment threshold and will not be further assessed here.

6.5.1.1.3 Safeguards in Place

All vehicles are equipped with spill kits for emergency response and a current Emergency Response Spill Contingency Plan, which identifies spill kit locations and response plans, will be respected. The spill kits will contain the appropriate type, size and quantity of equipment for the volume/type of product present in the storage location as well as the environment likely to be affected by a spill.

Heavy equipment will be refueled via a mobile fueling station (i.e. a fuel truck) at various locations throughout the mine site. All fuel trucks will be equipped with auto shut off valves and will be required to carry an appropriately sized spill kit. In addition, fuel trucks will follow the rules set out in the Federal 'Gasoline and Gasoline Dispensing Flow Rate Regulations' if applicable. A spill plan will be used when refueling to prevent a discharge in the event of a splashback or overfilled tank.

HML has the following safeguards in place to avoid spilling incidents:

- spill kits will be located in close proximity to areas of risk, including storage sites of hazardous materials, parking areas, and refueling locations;
- the Emergency Response Spill Contingency Plan will be given to Contractors before work begins. Contractors must make the manual available to employees and ensure they are aware of the emergency measures, their responsibility, and the importance of responding quickly when a spill occurs;
- contractors must have a sufficient number of Spill Response Kits with contents approved by the Environment Representative;
- machinery must be checked on a daily basis for leakage of lubricants or fuel, and must be in good working order with special attention given to machinery working near watercourses.
- workers awareness program, 2 drills per year;
- quarterly groundwater monitoring is required as a condition of the provincial Certificate of Approval; and
- safe driving practices.

The design of the project without any watercourse crossings is the single most important safeguard against fuel spill reaching water bodies.

6.5.1.1.4 Preliminary Response/Emergency Measures

TSMC's ERP includes a section on Spill Response Procedures (Volume 1 Appendix Ib). All site personnel are trained on the procedures to report a spill and initiate a spill response. In the event of a spill, the first person to notice it takes the following steps:

- contractors must contact The Environment Representative immediately in the event of an environmental incident and apply the procedures set forth in the Emergency Response Spill Contingency Plan without delay;
- immediately warn other personnel working near the spill area;
- evacuate the area if the health and safety of personnel is threatened;
- in the absence of danger, and before the spill response team arrives at the scene, take any safe and reasonable measure to stop, contain, and identify the nature of the spill; and
- remove any source of ignition in the immediate vicinity.

Fuel truck drivers will also be trained to initiate the ERP using the spill kit in the truck, in the event of a spill from a fuel truck. Large volumes of fuel should be diverted away from any waterbodies by trenching or building small dykes with the tools on hand (i.e., shovel, pick, nearby loader). If the spill kit is so equipped, placing booms on the ground or across small waterways may prevent further contamination until the Emergency Response Team can arrive. Emergency personnel may be required to boom the exit point of the river if containment is not possible at the spill site. If possible, the driver should maintain communication with the dispatcher and Emergency Response Team to update the situation.

6.5.1.1.4.1 <u>On Land</u>

Response to spills on land will include the general procedures previously detailed. If a large spill is suspected (>5 L) or there is a spill into water, immediately contact dispatch or the environment and permitting department by radio or telephone to initiate the Emergency Response Plan. For smaller spills that are contained and do not pose a threat to enter a water body, contact your supervisor and the environment and permitting department to report the spill and for instructions on cleanup. Note that depending on the magnitude of the spill, the steps outlined below may vary in order (e.g., if you knock over a 25 L fuel canister and there is no immediate danger, pick up the canister to stop the flow of fuel and place spill pads on the surface prior to contacting security). The following procedures outline response to a diesel fuel spill; however they can be applied to any low density (i.e., floating) liquid spill. Miscible liquids (mixes readily with water) will be covered separately.

Safety

Safety is of utmost importance. Immediately warn other personnel working in the area. Before approaching a spill, the immediate vicinity should be evaluated for any hazards or potential sources of fire. Sources of fire should be extinguished and/or removed from the area. When approaching a large spill, always approach from upslope or perpendicular to the slope in order to avoid contact with any free flowing material. Where possible, approach the spill from upwind to avoid any gases or the potential of a runaway fire if one were to occur. Do not approach the spill if it is not safe to do so or if proper PPE is not on hand. If possible, ensure that a fire extinguisher is nearby at all times. In case of fire, avoid being surrounded by fuel on all sides (i.e., always have an exit route).

Stop Free Flow of Product

When it is deemed safe to approach the spill, the first steps should involve reducing or stopping the flow of product whenever possible. As noted above, this could involve very simple actions such as turning off a pump, closing a valve, or sealing a puncture hole with almost anything handy (e.g., a rag, piece of wood, tape), raising a leaky or discharging hose to a level higher than the product level inside the tank, or transferring fuel from a leaking container or tank.

Reporting

After attempting to stop or reduce the flow of product, immediately contact security and/or your supervisor by radio or telephone. If possible, do not leave the location of the spill provided it is safe to do so. Have someone else call security if a radio or telephone is not available. Security will initiate the spill response team. Ensure to report your location to the dispatcher (e.g., north side of the crusher, km 10 north on the Goodwood Road.), report the nature of the spilled material (e.g., diesel fuel), the volume of spilled material (approximate), the direction of flow (e.g., towards a river, into a wetland) and whether fuel is still being discharged.

Containment

After source control and reporting, containment of the spill is the next priority. The main containment techniques involve the use of two types of barriers: dykes and trenches. Selecting the type of barrier depends on the ground surface and available materials. For example, a trench would not likely be dug when booms are available. Either type of barrier should slow the progression of the spill and serve as containment to allow recovery of the spilled product. Barriers should be placed downgradient (down-slope) from the source of the spill, and as close as possible to the source of the spill in order to minimize the affected area. If a spill cannot be rapidly or easily contained, it should initially be diverted away from any source of water.

Dykes

Depending on the volume spilled, the site of the spill, and available material at the site, a dyke may be built with soil, booms, lumber, snow, or other suitable items. A plastic liner should be placed at the foot of and over the dykes to protect the underlying soil or other material and to facilitate recovery of the spilled product. A plastic liner will also decrease the permeability of the dyke. Dykes should be constructed in a manner to accumulate a thick layer of free product in a single area (V-shaped or U- shaped with the spill on the open side of the V or U).

Trenches

Trenches are useful in the presence of permeable soil and when the spilled fuel is migrating below the ground surface. A plastic liner should be placed on the down-gradient edge of the trench to protect the underlying soil. Liners should not be placed at the bottom of the trench so water is allowed to continue flowing underneath the layer of floating oil (if applicable). Similar to dykes, trenches can be built in a V or U shape to accumulate the spilled material. Also related to trenches, a simple excavation can be made in an area of slightly lower elevation where spilled material will pool.

Recovery

Once the product has been contained, the next step is to recover and containerize the product. The use of large quantities of absorbent materials to recover higher volumes of spilled fluids should be avoided if possible. If ponding has occurred, large volumes of free-product should be recovered and containerized by using vacuums and pumps appropriate to the spilled material. Mixtures of water and fuel may be processed through an oil-water separator during or following recovery. Absorbent sheets should be used to soak up residual fuel on water, on the ground (soil and rock), and on vegetation. Dry absorbent material such as treated peat moss may also be sprinkled on vegetation to absorb films of petroleum products.

Smaller spills that have largely been absorbed into the top layer of soil can be excavated by hand using a spark resistant shovel or by using heavy equipment. Contaminated soil should be placed in a weatherproof container and disposed of properly.

Remediation

Subsequent to the initial response and recovery, Tata will remediate the affected area and confirmatory sampling will be conducted to ensure a thorough clean up. Excavated areas will be backfilled with uncontaminated soil following clean up.

6.5.1.1.4.2 On Waterbody

Response to spills near or into water include the general procedures previously detailed, including safety, stopping the free flow of product, and reporting. The containment procedures listed in above can serve to keep spilled material away from any water bodies and as a source control. Various containment, diversion, and recovery techniques for spills into water are discussed in the following sections. The following elements must be considered when conducting response operations:

- type of waterbody or water course (lake, stream, river, wetland);
- water depth and surface area;
- wind speed and direction;
- type of shoreline; and
- seasonal considerations (open-water, freeze-up, break-up, frozen).

Large Waterbody

Containment of a diesel fuel slick in a large waterbody requires the deployment of mobile floating booms to intercept, control, contain, and concentrate (i.e., increase thickness) the floating oil/fuel. One end of the boom is anchored to shore while the other is towed by a boat and used to circle the diesel fuel slick and return it close to shore for recovery using a skimmer. Reducing the surface area of the slick increases its thickness and thereby improves recovery. Mechanical recovery equipment (i.e., skimmers and oil/water separators) would be mobilized to site if required.

Small Waterbody

If diesel fuel is spilled in a small lake or pond it may not be possible to deploy booms using a boat. In this case, measures are taken to protect sensitive and accessible shorelines (spills resulting from traffic incidents). The diesel fuel slick can be monitored to determine the direction of migration. In the absence of strong winds the oil will likely flow towards the discharge of the lake. Measures are taken to block and concentrate the oil slick at the lake discharge using booms where it will subsequently be recovered using a portable skimmer, a vacuum, and/or sorbent materials.

Small Stream

In small slowly-flowing rivers, streams, channels, inlets, or ditches, inverted weirs (i.e., siphon dams) can be used to stop and concentrate moving diesel fuel for collection while allowing water to continue to flow unimpeded. In order to prevent fuel flowing over a barrier or check dam in an emergency situation (i.e., in a remote area), a rudimentary siphon dam can be made by simply inserting a pipe through the dam at its base. Care must be taken to ensure that the water level does not decrease enough to allow fuel to flow through the pipe. This can be attained by raising the exit end of the pipe to the height of the desired water level.

In the case of floating diesel fuel flowing towards a culvert (i.e., at a road crossing) a culvert block is used to stop and concentrate moving fuel for collection while allowing water to continue to flow unimpeded. In an emergency, a culvert block can be made by placing boards or a piece of plywood just above and below the surface of the water thereby stopping the uppermost level of water, or floating oil, from going through the culvert. In both cases diesel fuel will then be recovered using a portable skimmer or sorbent materials. In very slow flowing streams, fuel can be contained and recovered as noted above in the small waterbody section.

Large Stream

In the case of spills in larger rivers, with fast moving currents, diversion booming is used to direct the oil slick ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle will depend on the current velocity. Choosing a section of a river that is both wider and shallower makes boom deployment easier. Diversion booming may also be used to direct an oil slick away from a sensitive area to be protected. Once fuel has been diverted it can be recovered using a portable skimmer or sorbent materials.

6.5.1.1.4.3 Spills on Snow and Ice

Response to spills on snow or ice include the general procedures previously detailed, including safety, stopping the free flow of product, and reporting. In general, snow and ice will slow the movement of hydrocarbons. Snow and frozen ground also prevent hydrocarbons from migrating down into soil or at least slow the migration process and will often prevent seepage of fuel into water. The presence of snow may however hide the diesel fuel slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as absorbent material is to be limited as much as possible.

Following the snow melt, TSMC personnel will re-assess the spill area in order to confirm no soil penetration of spilt material for spills larger than 50 L.

Containment

When encountering a spill on snow and ice, most of the response procedures for spills on land may be used. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in ice) slow the progression of the fuel and also serve as containment to allow recovery of the fuel.

Recovery

Free-product can be recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice can be scraped up manually or by using heavy equipment, depending on volumes of spilled material and the area covered. The contaminated snow and ice is placed in containers or within lined berms on land. Once enough snow has melted, the oily water is removed from the storage and processed through an oily water treatment system. Any under ice fuel can be recovered by auguring through the ice and using a vacuum pump.

6.5.1.1.4.4 On Wetland

Wetlands vary greatly in size and composition. They may be composed of mainly peat with very little surface water (i.e., bog) or may be mainly composed of emergent plants with large amounts of flowing or standing surface water (i.e., fen or marsh). Responses to spills in these environments will therefore generally be a combination of the above noted procedures of spills on land and into water (winter procedures would default to Spills on Snow and Ice). The response would include the general procedures previously detailed above, including safety, stopping the free flow of product, and reporting.

Spills into a relatively dry wetland (i.e., no standing water) would generally be contained using the methods outlined using berms and dykes. Any free product could be contained using vacuums or pumps while remaining peat could be excavated or skimmed off using heavy equipment.

Spills into wetlands with flowing water would require the use of booms. Spills into wetlands that have standing water may or may not require booms depending on the size of the water body and the magnitude of the spill. A large magnitude spill would likely benefit from booms strung out over both the land and water portions of the wetland. A smaller scale spill may be completely contained within the wetland. In either case recovery would entail pumping/skimming the spill from the water body and excavating the land based portion of the spill area.

6.5.1.2 Spills of miscible materials

Miscible materials are substances that will readily mix with water (i.e., will not float on the surface like oil). Miscible materials on site will be used in small quantities and include glycol (less than 100 L) and sewage (reservoir of 5, 000 L, although very little sewage water will be present on site as sewage water treatment will take place at the Timmins Worker Camp under the ELAIOM Project). Both glycol and sewage, when mixed with water, will readily disperse and mix with the water and thus contaminate the water body. Ensure proper PPE is used if working near a sewage spill as it is considered a biohazard. When working near a glycol spill, workers are instructed to ensure that there is plenty of ventilation and that personnel are not breathing vapors (i.e., work up-wind from a spill and ensure proper use of vapor purifying respirators). Glycol is mildly flammable, therefore ensure sources of ignition are removed.

Sewage, depending on the relative amount in comparison to the size of the water body, may create a very high biological oxygen demand (BOD) potentially removing all oxygen from the system and causing a fish kill. With prompt response, a barrier from the top to the bottom of the water column may contain and concentrate large amounts of spilled substance (mainly solids) for removal via pumps.

Glycol (ethylene glycol) dissipates rapidly in water and is a toxin. A concentration of 41,000 mg/L will kill 50% of trout within 96 hours (LC50). Glycol will generally break down in approximately 10 days.

6.5.1.2.1 Worse-Case Scenario

The worse-case will be an accident of the sewage truck on the road (e.g. a 10,000 L spill, as the maximum size of the small vacuum truck is less than 10,000 L); the associated environmental impact would be local and limited; or the incident could be related to overflow of the sewage tank.

Likewise, a glycol spill of 100 L will not have adverse effects on VCs as it is not expected reach a watercourse.

6.5.1.2.2 Effects on VCs

Based on the definitions from Table 6-1 , likelihood of a spill of glycol is low since it is not expected to happen, but could happen due to human error or environmental conditions. On the other hand, the **likelihood of it reaching a VC (water quality or wetlands) is negligible** since there are no crossings and all infrastructures are at least 30 m away from any water body or wetland. Therefore, due to the potential size of a spill, it is unlikely to reach any VC.

Assuming the unlikely event of a spill reaching a water body or a wetland, the **consequence would be high** since it could affect multiple VCs and would require monitoring and restoration measures.

When crossed in the effect assessment matrix (Figure 6-1), the result is **four (4)**, or below the effect assessment threshold and will not be further assessed here.

6.5.1.2.3 Safeguards in Place

The following safeguards are in place to prevent an accidental spill of glycol or sewage at the Howse site:

- glycol is not stored in howse project; it is used only to avoid freezing of pumps;
- transfer of sewage to the camp site every day;
- daily inspection and volume measure of the reservoir;
- A hazardous storage procedure is in place; and
- sewage management plan.

6.5.1.2.4 Preliminary Response/Emergency Measures

There is very little that can be done for cleanup of miscible materials, however, wildlife should be kept from entering the water body and any dead fish should be recovered to prevent the scent from attracting animals.

Spills of miscible materials on land can generally be contained similarly to diesel fuel, however, caution must be taken that these substances do not contaminate groundwater through seepage. Prompt removal of the top layer of soil and proper disposal would potentially avoid contamination.

6.5.2 Road Accidents

For the Howse Project, a haul road (1.95 km) will link the pit to the DSO3. This Howse haul road will be 21 m wide to accommodate large 180 tonne trucks and it will have a maximum gradient of 8% to accommodate for freezing and slippery conditions during winter. All site roads will undergo regular maintenance, including grading and ditching. Truck traffic during the construction phase is expected to be 3.2 one-way trips per hour between the pit and waste dump locations. Including other vehicles (heavy vehicles, maintenance, environment and safety), total traffic could reach 4 one-way trips per hour during the construction phase.

During the operations phase, the Howse haul road will be used to transport all equipment, fuel and personnel. An average of 70 trips will be made on a daily basis by trucks and other light vehicles. Trucks will not operate within 100 m of a watercourse or within 30 m of any water body or wetland and the likelihood of a road accident having an effect on those is therefore unlikely. Road design follows the NL standard practice and by following this procedure, the risk of accident is reduced to a minimum. All traffic on the mining road shall follow the principle develop for the Goodwood road mining Operations SOP from June 2015. Access to Howse mining area is also limited and road accidents could only involve light vehicles and/or hauling trucks. Light vehicles are expected to frequent the entire Howse site, whereas haul truck traffic will be limited to the Howse haul road.

6.5.2.1 Fuel Spill

Fuel spills resulting from a road accident are possible but such spills have been treated in the previous section and will not be discussed further here.

6.5.2.2 Wildlife Collision

A vehicle may collide with wildlife including caribou and/or avifauna which are VCs. The presence of large mammals in the area is however very rare.

6.5.2.2.1 Worse-Case Scenario

The environmental worse-case scenario with any vehicle accident would be the death of individuals of a species at risks.

6.5.2.2.2 Effects on VCs

The likelihood of collision with caribou is negligible since the presence of the species in the area is improbable. As for birds at risks, the heavy traffic on the road should be deterrent for them and collision should be infrequent (low likelihood). To be conservative, an overall **low likelihood** will be used.

The **consequence is very low** since it most probably will affect only a few individuals (if any) of species of birds at risk since no caribou are present in the area and, in any case, they avoid populated areas. Furthermore, not restoration or cleanup would be needed apart from carcasses removal.

When crossed in the effect assessment matrix (Figure 6-1), the result is **three (3)**, or below the effect assessment threshold and will not be further assessed here.

6.5.2.2.3 Safeguards in Place

Many safeguards are already in place to increase road safety:

- a water truck will spray the roads whenever necessary in order to keep dust down;
- the Howse haul road will have proper drainage and a 2% crown plus a berm on the sides;
- the speed limit will not exceed 50 km/hour;
- culverts along the roads will be inspected and maintained regularly to ensure that proper drainage is achieve;
- the Howse haul road (excluding the main access road) and the roads to the waste rock piles will not be open to the public during periods of active mining at the sites in question. To avoid any issue and prevent accident or incident a control gate is installed in the surface right boundary in each side of the main road;
- ATVs shall not be allowed on the site except where necessary to perform work. When necessary, the use of ATVs shall be restricted to designated trails and roadways, within and between work, marshaling, maintenance and storage areas, thus minimizing ground disturbance;

- ATV use shall comply with the Motorized Snow Vehicles and All-Terrain Vehicles Act, the NLDEC's Environmental Guidelines for Stream Crossings by All-Terrain Vehicles, and the DFO Fish Habitat and All-Terrain Vehicle Guidelines (DFO 2010ahttp://www.nfl.dfo-mpo.gc.ca/e0005494);
- all Project vehicles will be properly inspected and maintained in good working order, including all exhaust systems, mufflers and any other pollution control devices to meet emission standards;
- travel in areas outside designated work areas will not be permitted;
- site roads will be graded regularly and monitored for signs of erosion, and appropriate action will be taken to repair roads where necessary;
- vehicles and equipment shall follow established routes when travelling to or from the site;
- if issues arise related to noise attributed to Project or Operations related traffic, noise levels will be monitored during a typical day and, if necessary, changes will be made to reduce noise (e.g., rescheduling, modifying vehicles or adjusting speeds);
- trucks will operate only with registered allowable loads, unless oversize and overweight permits are obtained from the applicable regulatory agencies. All loads will be secured in accordance with the Load Security Regulations N.L.R 47/02 under the GNL Highway Traffic Act;
- all personal who drive in mining area should have a mining driving test; and
- Worker's awareness program, including daily and weekly safety talk.

Additionally, some measures are specifically aimed at dealing with wildlife encounter on site. As a protection measure, hunting, trapping or fishing by Project personnel is not permitted on or off site while under the direct or indirect employment of Tata Steel Minerals Canada (TSMC). The following safeguards will be followed on the Howse site with respect to wildlife:

- site and working areas shall be kept clean of food scraps and garbage;
- animal proof disposal containers shall be used and will be regularly emptied and transferred to an approved waste disposal site;
- the on-site landfill shall be regularly maintained, compacted, and covered in order to deter scavenging from wildlife (predominantly bears)
- no personal pets, domestic or wild, shall be allowed on the site
- all sightings of notable species should be immediately reported to the TSMC Environmental team in accordance with our wildlife control plan.

Sensitive Areas and Periods

Traffic including heavy equipment shall not be permitted to enter wetlands or any area that is not designated for traffic. If Site Road Access operations make encounters with migratory caribou unavoidable, the contingency plan detailed in Appendix B-2 of the EPP (Volume 1 Appendix Ia) will be followed. Appropriate measures will be taken to prevent any threat to Rusty Black Bird habitat due to Site Road Access operations.

6.5.2.2.4 Preliminary Response/Emergence Measures

In the case of any staff encountering wildlife on site, the following steps shall be followed;

- If a notable species, the Environment team shall be informed immediately and advised of best course of action;
- If not a notable species, the individual shall proceed with his/her work provided it does not interfere with their personal safety, or the animal in question;

- In the case of Bears, Wolves, Foxes, or Wolverines, should the animal present a risk to human safety contact shall be made to TSMC Security on TATA 1 to provide for escalating action if required;

If an animal is killed, contacting Environmental team for carcass disposal. Disposal of carcass will be managed by Environmental the team in cooperation with NL wildlife or others government departments including federal if required.

6.5.3 Fire

Forest fires are treated below in the *Effect of the environment on the project* section. This section covers fires on site (caused by human error) only. Fire on site can be divided in two categories:

- fire in the mining complex; or
- fire related to a spill.

6.5.3.1 Fire in the Mining Complex

Fires in the mining complex can go from small to very large and it is of the utmost importance to follow the *Dome Fire Emergency Response Plan* that is supplied to workers on site. The likelihood of a fire taking place in the mining complex is moderate as it will probably happen during the mine life. On the other hand, since the mining complex in in the middle of a large disturbed area with no surrounding vegetation or wildlife, no effect is expected from such a fire on the environment and it will not be further treated.

6.5.3.2 Spills Involving Fires

Collisions or traffic accidents resulting in fuel spills can be the source of fires. Although diesel fuel is not extremely flammable, fires are nevertheless a possibility and are included in the emergency response plan.

6.5.3.2.1 Worse-Case Scenario

A large spill from the fuel tank that would take fire would probably be the worse-case scenario as the quantity of fuel would render the site inaccessible and the proximity to the source of fuel would probably be inaccessible for the stopping of the spilling. It could event lead to an explosion, but that will be treated in the next section.

6.5.3.2.2 Effects on VCs

The likelihood of a spill from the fuel truck has already been assessed as low since it is not expected to happen, but could happen due to human error or environmental conditions. For it to catch fire would be event less probable. The **likelihood of such an event taking place is therefore assessed to be very low**.

The environmental **consequences should be moderate**. Indeed such a fire would prevent the diesel to penetrate in the soil and since such a spill is bound to happen on the road or other working areas, not wildlife habitat should be affected. Therefore, the main VC affected would be air quality and some cleanup would probably be required afterwards.

When crossed in the effect assessment matrix (Figure 6-1), the result is **four (4)**, or below the effect assessment threshold and will not be further assessed here.

6.5.3.2.3 Safeguards in Place

Firefighting equipment, including extinguishers, pumps, and hoses will be stationed at various work areas including fuel trucks, generators, and anywhere fuel or flammable material is regularly handled. Personnel will be evacuated from site if a fire cannot be immediately controlled or impacts necessities of life or personnel safety. Trained onsite personnel will respond to fires using onsite equipment. Regulatory authorities will be notified as needed. All on-site personnel will be trained in the use of fire extinguishers, and all Emergency Response Team personnel will be trained in the use of all firefighting equipment.

Should the fire be too large to handle with the portable fire extinguisher, security should be contacted and they will mobilize the fire brigade in the fire truck. The fire truck is equipped with 750 litres of water plus foam capabilities which should double the capacity of the truck. The fire truck is also equipped with 8 fire extinguishers.

6.5.3.2.4 Preliminary Response/Emergence Measures

Small fires that are away from the source of fuel can be extinguished relatively easily using an appropriately sized fire extinguisher, however larger fires or fires that are near the source of the spill (i.e., leaking tank) have a much greater potential danger associated with them. Unless personnel are trained in the use of fire extinguishing equipment and the fire is small and away from the source of fuel, the onsite fire crew should be notified immediately via radio and/or telephone (contact dispatch) and informed of the situation. Personnel should evacuate to a safe distance. Large fires may require the evacuation of all personnel from a large radius surrounding the immediate area.

In the case of a small fire, personnel may attempt to extinguish the fire with a fire extinguisher provided it is safe to do so and the employee is adequately trained and knowledgeable in the types of fire extinguishers for different types of fire. When approaching a fire, always approach from upwind or at a slight angle and away from the fuel source. Pull the pin on the fire extinguisher, aim the nozzle at the base of the flame, squeeze the handle/trigger, and sweep from side to side until the fire is extinguished. Once the fire is extinguished and it is deemed safe to do so, proceed to the spill response procedures outlined above.

6.5.4 Explosives

Explosives of the type proposed for use at the Project are very common and are used every day by mining and construction companies throughout Canada. If proper procedures are followed, the risks of accidents and malfunctions are extremely low. As per Federal regulations, two explosive magazines are required, one containing detonators and one containing primers. TSMC as part of DSO project already have 2 magazines which separate detonators from other explosives. This area has already been approved and permits in place. Furthermore, this area is secured with signage and locked access as well as locked magazines. Also, Site Mixed Explosives Technology (SME) SME is a technology that allows the components of an emulsion explosive to be mixed and sensitized just prior to entering the hose into the blast hole. This allows the elimination of an emulsion manufacturing facility and requires only proper storage facilities for each component. The two main components being fuel oil and ammonium nitrate liquor would be stored in tanks along with the other components of emulsion at the DSO project. As such, there are no explosion risks outside to the pit, since the emulation is not mixed beforehand.

During the Operations phase, blasting at the Howse Property will occur approximately once per week during summer and irregularly during winter. This infrequent schedule is due to the softness of the ore found at the Howse Property, where it is estimated that only 50% of the material will require blasting.

At this point in the blasting process, measures such as notification of the community would have been made up to 48 hours prior, and so safeguards would already be in place for this event. The frequency therefore, of an unplanned blasting event could not be more than once per week/month during the operations phase.

An uncontrolled explosion is defined as an unmanaged or uncontrolled detonation of explosives, or inadvertently combined emulsion constituents, or detonators associated with blasting of the open pit or quarry, or the detonation of explosives resulting in property damage from fly rock or higher-than standard-practice vibration levels. This scenario was not considered to be credible in consideration of normal industry practice and the design basis for the Project. Their analysis follows. While blasting will be a regular part of Project activities during Operation (and to a lesser extent during Construction), the risk of an uncontrolled explosion is greatly reduced by current technology and the legal requirement to follow strict operating procedures. Drilling will be conducted using track-mounted drill rigs. Explosives will be pumped into the boreholes using industry certified explosive delivery trucks, the holes stemmed, and the charges will be detonated in a sequential manner. All of this will be done by qualified and certified blasting personnel. Blasting during Operation will occur a few times a week according to strict clearance procedures. Explosives will be supplied by a distributer who is certified under Canadian regulations, and the method of supply is to not mix the constituent chemicals until they are pumped into the blast hole in the pit. The licensed explosives supplier will be responsible for the final mixing of the emulsion explosives prior upon delivery directly to the blast holes. An on-site explosives magazine will provide for storage of blasting accessories and explosives. This magazine will be in compliance with the Explosives Act and Regulations. Transporting explosives will be regulated by Explosives Regulations under the Explosives Act, Transportation of Dangerous Goods Regulations and the Canada Motor Vehicle Safety Standards.

A Blasting Plan will also be developed and followed and will specifically address health and safety. The new Explosives Regulations require a fire safety plan and key control plan to be in place before an application for a magazine licence is submitted and the applicant must include in the application a declaration that these plans have been prepared. Additionally, a security plan must be prepared for every magazine storing type E (blasting) explosives.

Therefore, the potential for an uncontrolled explosion would be limited to a malfunction or accident in relation to a planned blasting activity (i.e., an early detonation or unplanned detonation in the pit). As a licensed blasting contractor will handle all explosives who will be highly trained in the safe handling, storage, and use of explosives, this accident scenario is not likely.

Any leakage of the emulsion that might occur within a facility will be physically contained. The material will be recovered and if need be, transported to a blast site within a pit and detonated for disposal as described above. Leakage that might occur to ground outside a facility but not at a blast site will be contained. Any free product will be transported to a blast site and detonated if necessary for disposal. Any impacted soil at the spill site will be collected and moved to the secure area for disposal.

6.5.4.1 Worse-Case Scenario

The worse-case scenario for explosives is considered to be the detonation of a full Operation phase explosives magazine. It will be located in an isolated area, at distances from other facilities prescribed by federal regulations to ensure the safety of personnel and facilities in the extremely unlikely event of an accident or malfunction. In a worse-case scenario, the principal effects will be health and safety related.

6.5.4.2 Effects on VCs

We consider the adverse environmental effects of an unplanned explosion at the pit on VCs. An unplanned explosion is not expected to emit more elements into the air than a planned explosion. As such, it is expected to have the same adverse environmental effects as for a planned explosion, and those effects have already been treated in their respective section of the effect assessment chapter.

Section 7.4.9 also analyzes the possible adverse effects of vibrations on fish and fish egg mortality and concludes that the maximum charges predicted by the Howse activities will not affect either VC. As such, even an unplanned explosion is not expected to cause adverse effects on fish since it is not expected to occur outside of the pit.

The **likelihood of an unplanned explosion is negligible** since this activity is well supervised and a lot of safeguards are in place to prevent such events. Also, all personals affected to this activity are highly trained.

Since an eventual unplanned explosion is only expected to happen in the pit, the **magnitude is also very low** as it is not expected to affect the environment any more than a planned explosion.

When crossed in the effect assessment matrix (Figure 6-1), the result is **one (1)**, or below the effect assessment threshold and will not be further assessed here.

6.5.4.3 Safeguards in Place

Rigorous safeguards have been put in place to control risk associated to explosives on site, and they are categorised as follows:

6.5.4.3.1 Guidelines for Explosives

The loading, transportation, storage, preparing, fixing and firing of explosives shall be governed by regulations of the Explosives Act (Canada) and by applicable provincial regulations.

<u>Transportation of Explosives</u>

- all vehicles used to transport explosives shall conform to the Transportation of Dangerous Goods regulations and the Federal Explosives Act, and Transport Canada Regulations; and
- all drivers transporting explosives shall be trained and certified in the transportation of explosives.

<u>Explosive Magazines</u>

- explosives and detonators shall not be stored together in a magazine.
- magazines are to be properly identified, federally licensed, locked and located in a secure area;
- regulations regarding inventory of explosives and maintenance of magazines shall be strictly adhered to;
- any amount of stolen explosive product must be reported as required by the Explosive Regulation;
- disposal of damaged explosives shall be done as recommended by the manufacturers MSDS.

<u>Drilling Near Explosives</u>

- an extreme hazard may exist in any area where blasting has taken place during previous construction or where grade blasting precedes ditch blasting. This hazard may be in the form of lost or abandoned explosives or undetonated explosives located in rock rubble or lodged in bootlegs;
- all drillers shall be experienced and familiar with the work to be performed prior to commencing activities;
- all provincial regulations regarding drilling shall be strictly adhered to;
- no Driller shall drill a hole within the prohibited radius beside any loaded hole. These distances may change from Province to Province. The driller shall ensure he is aware of the required distance;
- drillers shall ensure that the work surface is bare and clean of debris before drilling.
- no attempt shall be made to remove or destroy any explosives or detonators that may be encountered. Work in the area shall cease immediately and supervision notified;

- dust control devices shall be kept in good working order;
- required PPE shall be worn by all drillers.

6.5.4.3.2 Guidelines for Blasting

General

A qualified contractor will comply with all Federal and Provincial legal requirements in connection with the use, storage and transportation of explosives, including the Canada Explosives Act and Transportation of Dangerous Goods Act.

Only employees thoroughly experienced in handling explosives shall be permitted to supervise, handle, haul or detonate explosives. The qualified contractor shall ensure that no person shall be allowed to conduct or direct a blasting operation unless that person is the holder of a valid Blasters Certificate where required by the authority having jurisdiction. In those jurisdictions, where the licensing of blasters is mandatory, the qualified contractor will provide the proof of the required certification for every person so required.

Any vehicle used to transport explosives from the magazine to the blast shall conform to the Transportation of Dangerous Goods regulations.

Qualification for Blasters

- blasting will be managed by a qualified contractor in compliance with all regulations; and
- a list of competent and/or certified blasters must be posted at the work location.

Blasting Restrictions

- controlled blasting (i.e., use of mats, blast design and adequate collar) shall be required when blasting is performed in the vicinity of overhead or underground facilities or structures, to preclude the possibility of damage due to fly-rock, air blast or vibrations;
- when the project is within the vicinity of an electrical transmission corridor a potential hazard exists whereby premature initiation of blasting could be triggered by stray current from the electrical field which may exist at these locations;
- all blasting operations shall be suspended and all men and equipment withdrawn immediately at the first indication of an approaching electrical storm;
- mobile radio transmitters shall be kept well away from areas of electrical blasting operations and signs shall be posted to have all transmitters near the site turned off;
- drilling and blasting operations shall be planned so that the last blast of the day shall normally occur one full hour prior to sunset;
- blast holes shall not be left loaded for extended periods during working hours or overnight, unless provisions have been made for guarding of the blast site. Where such a variance is approved the following restrictions shall apply as a minimum:
    - Tying in of blast holes shall be delayed until immediately prior to the resumption of the day's blasting activity or the start of the following day's activities;
    - The area loaded shall be marked with pink "Restricted Area" tape and shall be continuously patrolled to prevent unauthorized entry to the area.
- the following procedure shall be followed by a qualified contractor prior to the start of each drilling operation in any area where blasting has previously been conducted:
    - the bedrock surface area around the proposed holes shall be thoroughly cleaned of all debris down to bare rock;
    - a thorough examination shall be made of the bedrock to locate previous blast holes or remnants of holes that no missed holes or cut-offs are encountered;

- should any pre-drilled holes or remnants of holes be found these shall be circled with red/orange fluorescent paint and marked with a like-paint stake and shall be examined by a qualified blaster to determine that they are free from undetonated explosives;
- drilling shall not start until all hoes or hole remnants have been located, circled with paint, marked by a stake and determined to be free of undetonated explosives by a qualified blaster;
- should explosives or suspected explosives be encountered the area shall be clearly marked as being hazardous and entry restricted to authorized work personnel only;
- in any event, holes shall not be drilled within the prohibited radius adjacent to any loaded holes. These distances are specified in provincial regulations for the Province where the work is located.

Blasting Signals and Sirens

Warning signs detailing the Blasting Procedure shall be erected on all accesses to the blast area. All workers shall familiarize themselves with blast warning signs and obey them. Prior to initiating the blast warning system:

- the blaster shall complete his blast inspection;
- the blaster shall clear all personnel from the blast area;
- the blaster shall ensure all road and access road traffic is halted, if applicable;
- the blaster shall retreat to a safe firing distance while checking the controlled area and confirming that the guards are posted and the controlled area is secure.

Blast Siren Procedure

- once all guards are in place, the blast zone has been cleared and all workers are accounted for the blast warning siren procedure will commence;
- after a final check with all guards, the Blaster In Charge gives the O.K. to sound three short sirens indicating that blasting will commence in one minute;
- once these three sirens have gone, there is radio silence until a minute has passed and the Blaster In Charge does a final check with the guards;
- once the final check has been cleared with all guards the Blaster In Charge requests the "Blast Imminent" siren. This is a longer continuous siren which will be immediately be followed by the blast when finished;
- once the blast has been detonated all guards hold their position;
- the Blaster In Charge waits until all flyrock has landed and the dust has settled before checking the blast to make sure all explosives have detonated;
- once the Blaster has determined that all explosives have detonated and it is safe to return to work he requests the guards to sound the "All Clear", which is a continuous siren similar to the "Blast Imminent". Once this siren has sounded all guards are free to let traffic pass.

Loading Explosives

- When loading holes, only wooden or plastic tamping poles shall be used;
- Non-sparking tools are to be used when priming explosives;
- Artificial lighting shall be in place and used when required;
- Once holes are loaded, they must be guarded until initiated (fired);
- No loose or boxed explosives or detonators shall be left unattended;
- Loaded holes must not be driven over by mobile equipment;

- An appropriate blasting machine shall be used for the number of circuits/detonators to be fired;
- Precautions shall be taken to minimize fly rock;
- Secure the Blast Site:
  - Danger area clear of workers/equipment (minimum of 500m);
  - Guards have been assigned and instructed as to duties;
  - Warning signals have been posted.

Blast Detonation

- Only one person shall be in charge of initiating a blast sequence and blasting. This person shall be a duly qualified and, where required, a certified blaster. This person shall personally supervise and be responsible for all connections and detonating the blast. No change of responsibility shall take place;
- Prior to any blast a controlled area shall be established. All personnel not involved with the actual detonation must stand back at least the safe required distance as set by the Blaster In Charge;
- Workers involved with the detonation must stand back as required by the Blaster In Charge, from the time the "Blast Imminent" signal is given until the "All Clear" has been sounded;
- The blaster shall position himself at the maximum distance practical from the blast;
- Personnel shall vacate vehicles and take a position of safety that provides full body cover to protect against possible fly rock strike when a blast is about to take place. Each person shall take their individual cover when the "Blast" signal sounds (i.e. cover should not be shared). The Blaster shall, where practical, direct all personnel to take a position of safety at the back of a blast rather than in front of the face;
- Prior to any electrical blast and after mats have been placed, a continuity check shall be performed to ensure that the circuit is intact;
- Proper warning signals are sounded before firing the charge;
- After every blasting sequence the blasting foreman or blaster shall conduct a thorough post-blast inspection of the blast area for cut-offs or misfires and shall ensure that any undetonated explosives are properly destroyed by blasting prior to any other working proceeding.

After the Blast

- If a misfire occurs, the Blaster must wait 30 minutes for safety fuse and 10 minutes for electrical detonation, before inspecting the blast;
- Lead wires are to be shorted out immediately after firing;
- No other person enters the blast site until the blaster has examined for hazards (unstable slopes, loose rocks, trees, etc.);
- The Blaster must make a thorough check for misfired charges;
- No person is to enter the blast site until the blaster has given permission;
- All clear signal is sounded;
- Any hazards are corrected before workers are employed in that area (loose rocks, trees, misfires, etc.).

Misfire Procedures

- Only qualified workers involved with the blast are to be allowed in the blast area;
- Metallic equipment can only be used under controlled conditions with a spotter;

- Misfires must be detonated before any other work is to be done;
- Any drilling to re-fire the undetonated explosives is carried out under the direction of the blaster;
- No dynamite is to be removed from any misfired hole;
- Only ammonium nitrate products can be washed out with water;
- No person shall remove, relight, or disturb any fuse or any part of a misfired charge.

6.5.4.4 Preliminary Response/Emergence Measures

Very small amounts of 'prepared' explosives will be onsite at any given time. Explosive materials and their individual components (i.e., ammonium nitrate) will be housed offsite through an independent contracting company. In the event of any explosives related issues, an immediate evacuation of the surrounding area would occur and the Emergency Coordinator would deploy the Emergency Response Team.

In the event of a vehicular accident occurring while transporting explosives, the explosives contracting company and the Emergency Response Team would be notified immediately in order to evacuate the surrounding area and put in place the emergency response plan. On-site emergency medical services would be contacted to respond or put on standby, depending on the severity of the explosion. It is highly likely that in the case of an explosion, firefighting services would be required from the Emergency Response Team. After the risk to human life and property has passed, a qualified professional would be required to 'clear the area' (i.e., indicate that there is no longer a risk of explosion) prior to clean up. With fire crew on standby, the Emergency Response Team would commence with cleanup as appropriate for ammonium nitrate and/or fuel spilled on site.

6.5.5 Water Management Plan failure

The water management plan (WMP) includes a network of ditches and sedimentation ponds that are designed to control mine drainage. There are three types of mine drainage that are managed by the WMP at the Howse property:

- natural site runoff (main parameters of concern being suspended solids consisting of silt, sand and grit);
- runoff from overburden and waste rock dump (main parameters of concern being suspended solids consisting of silt, sand and grit); and
- pit dewatering (clean groundwater mixed with sump water charged with suspended solids and possibly nitrogen compounds).

Any diesel or oil that could be present in the sump water will be captured by an oil/water separator system before it reaches the surface runoff network of sedimentation pond.

Throughout the mine life, the three sedimentation ponds (sedimentation pond HOWSEA, sedimentation pond HOWSEB and existing Timmins 4 Sedimentation pond 3) will be increasingly filled with these contaminants.

Possible failures of the WMP include:

- Sedimentation pond leakage;
- Ditch failure; and
- Pump failure.

6.5.5.1 Worse-case scenario

Since the main water treatment of the Project is achieved through deposition in the sedimentation ponds, a sedimentation pond leakage would be the worse-case scenario. It would be even worse if it happened at the end of the mine life since the sedimentation ponds will be filled with contaminated sediments. The resulting increased flow could also increase erosion downstream. Ultimately that would equate to a contamination of receiving watercourses by suspended solids and possibly nitrogen compounds, potentially leading to effects on aquatic life.

6.5.5.2 Effects on VCs

Since some of the ditches are within a 100 m of watercourses but always at least at 30 m away, a ditch failure could result in an effect on water quality or fish and fish habitat. The **likelihood of such a failure is considered to be low** as it has chances of happening if fallen materials or ice block a ditch, but the distance from water bodies greatly reduces that risk as does the planned proper maintenance and inspection. In the event of a ditch failure causing a spill in a waterway, the **consequence would be low** since it would affect many VCs such as water quality and fish and fish habitat, but since only runoff travels through those ditches, only suspended solids would be discharged, limiting damages to the environment that will clean itself once the discharge ceases.

A pump failure on the other hand would simply imply less water flow through the WMP network and hence no effect is expected from such an event.

As stated in the worse-case scenario, a sedimentation pond failure could result in a more important effect. The **likelihood of a sedimentation pond failure is negligible** since the ponds will be constructed to withstand extreme environmental conditions and will be inspected regularly. On the other hand, if such an event was to happen, the **consequence of the effect could be high** since many VC could be affected (water quality, fish and fish habitat) and some restoration measures could be necessary to limit contamination of affected areas.

Overall, when crossed in the effect assessment matrix (Figure 6-1), the result for either ditch failure or sedimentation pond failure is **four (4)**, or below the effect assessment threshold and will not be further assessed here.

6.5.5.3 Safeguards in place

During the operation phase, it is important that particular attention is given to storm water management to ensure sediments and related contamination does not enter any nearby water bodies, and to limit erosion. The main safeguard against WMP failure is its design that is detailed in section (3.2.5.4. Water Management Infrastructure).

Apart from that, the Proponent has the following additional safeguards in place:

- at minimum, WMP ditch infrastructure will be inspected two times per year (Spring and Fall);
- environmental monitoring (previously-acquired data on surrounding water bodies will assist with monitoring);
- EPP Section 4.7.3 (Storm WMP): runoff captured in perimeter ditches, discharge monitored weekly, environmental long term effect program.
- EPP Section 5.1 (Groundwater Control Plan): dewatering water will be used for dust suppression or will infiltrate in the soil, installation of petroleum product reservoirs, designed containers for hazardous materials, use of berms, no dewatering into natural drainage system without treatment;

- EPP Section 5.2 (Surface water control plan): petroleum product reservoirs, no discharge of potentially contaminated water into the natural drainage system, use of designed containers for hazardous materials, use of berm for process, fuel-storage, re-fueling and wash-down areas, appropriate storage of fuels and chemicals.

6.5.5.4 Preliminary Response/Emergence Measures

Emergency measures to be applied here are the same as for spills (see section 6.5.1).

6.5.6 Slope Failures

Slope failure can happen anywhere a slope exists, but is more likely on manmade slopes such as the ones found on piles and in the pit. Slope failure can be of little impact if occurs in an already disturbed area, but could be more problematic if it occurred in a previously unaffected area.

6.5.6.1 Worse-Case Scenario

Although a failure of the pit wall would be highly dramatic for the workers present, it would not translate in an adverse environmental effect.

On the other hand, a slope failure of a pile into a peripheral ditch would divert the mine drainage into the environment before being treated in a sedimentation pond. In that case surface water contamination could occur. Effect would be similar to that expected from a WMP ditch failure. The only waterbody close enough to peripheral ditch subject to such an event is Goodream Creek and the ditch in question is only redirecting surface runoff from natural area and from waste dump and overburden stockpile. As such, the only contaminant expected to be transported is suspended solids.

6.5.6.2 Effects on VCs

Likelihood

Although unlikely (negligible), the **consequences of such an event could be high**, as multiple VCs like water quality and fish habitat could be temporarily affected but the discharged suspended solids. Prompt excavation of the ditch should greatly limit the adverse effects, but if high quantities of suspended solids are discharged into Goodream Creek, some fish habitat could be compromised and some cleanup measures might be required.

When crossed in the effect assessment matrix (Figure 6-1), the result is **4**, or below the effect assessment threshold and will not be further assessed here.

6.5.6.3 Safeguards in Place

TSMC's approach to managing potential wall failures, either as a result of general instability or as a direct result of freeze-thaw cycle, is based on the following steps:

- Ground monitoring plan;
- Regular waste rock, and ditch inspection (2 times per year is the minimum);
- Identification; and
- Mitigation.

Prevention and identification are safeguards and will be detailed in this section, whereas mitigation will be treated in the next section.

<u>Prevention</u>

In 2014, geotechnical study "Howse Pit Conceptual Slope Design" was conducted by Golder Associates (Volume 2 Supporting Study A). This study, based on core samples, laboratory tests, and numerical modeling, provides slope recommendations throughout the depth of the pit. The Howse pit was designed to conform to these slope parameters

During operations, excavations will be closely monitored to ensure their adherence to the design of the pit. Daily surveys will ensure the excavation of the benches match the design of the pit, which ensures a degree of stability based on the initial geotechnical study.

Further geotechnical work will be conducted throughout the life of the operation as the slope study concludes that with further drilling there is potential for the slopes to be steepened and for waste rock movement to be reduced. While a timeframe for this work cannot be determined at this time and the nature of this work will be to seek additional geological data to confirm that the pit walls can be steepened, it will present opportunities to identify geological anomalies which may compromise the stability of the pit.

Strictly adhering to slope parameters recommended by external geotechnical experts is a key component to preventing wall failures.

Identification

Preventing wall failures involves identifying potential failure zones before they occur. TSMC will have a detailed field reporting system in order to allow operations and technical personnel to report any anomalies or changes to the pit walls as part of their regular duties in and around the pit. These may include bench degradations, water infiltration through the walls as a result of thawing, cracks propagating through the wall, or localized slope failures which may compromise the integrity of a bench or the pit wall. These reports will then be followed up with a field investigation by qualified personnel to identify the nature of the anomaly and evaluate whether it poses a risk to the wall stability of the excavation.

These field observations, while conducted daily, will be intensified during thaw periods as this is the timeframe where potential failure zones are most likely to appear.

TSMC will also conduct regular comprehensive surveys of the pit walls. Through the use of modelling software, pit walls can be regularly measured to ensure their slopes and benches are stable, and any movement can be identified to its specific area to be evaluated by qualified personnel.

Lastly, TSMC will evaluate the possibility of implementing a radar based slope stability system. These systems monitor pit walls on a real time basis and can report any movement within a pit wall in order to identify failure zones before they occur.

6.5.6.4 Preliminary Response/Emergence Measures

Once a potential failure zone is identified, an action plan is formed in order to address the situation. The action plan will depend on the severity and size of the potential failure zone.

For personnel safety, the first step will be to close off access to areas immediately above and below the potential failure zone, through signage and berms if necessary. If the potential failure zone is deemed large and severe enough that the integrity of the pit will be compromised, geotechnical directed drilling may be conducted in order to collect core samples and conduct a proper detailed analysis of the area in question, though this remains a very unlikely scenario.

In a scenario involving bench degradation or small localized slope failures, which typically occur at higher elevations where the rock may not be entirely consolidated, a pushback of the slope will typically be enough to ensure the stability of the area.

As the excavation deepens and the rock gets harder and more consolidated, action plans become increasingly dependent on the specific nature of the potential failure zone, thus it is difficult to generalize a response plan. Depending on the nature of the zone in question, responses to potential failure zones can include installing a dewatering well behind the wall, rock bolting, grouting, or scaling of the wall, and other options.

In extreme cases where the potential failure zone is deemed to be impossible to mitigate, a small localized blast may be initiated in an attempt to make the failure occur so re-sloping and clean-up work can proceed and operations can resume

The pit wall slope angles and bench heights are based on the most conservative, standard methods known.

6.5.7 Accidents and malfunctions caused by exceptional natural events and Effects of the environment on the Project

This section assesses how natural events could impact on the project activities (and possibly cause accidents and malfunctions) and in turn, how these altered activities can adversely affect VCs. Some exceptional natural events effects on the environment could be exacerbated by the presence of the project. This section focuses on assessment of those complications due to the presence of the mine.

Extreme weather conditions may occur in various seasons over the course of the Project duration. The Proponent's EPP document considers, and classifies extreme weather as follows: extreme wind events and white-out events, and extreme precipitation events, each with its respective procedures.

Section 6.4.4 presents climate change scenarios for the Howse Project area. Extreme precipitation events are predicted to increase in frequency for the summer months in the Howse Project area. The effects of the predicted temperature changes in the Howse area are not expected to alter site activities or operations.

6.5.7.1 High Winds and blizzard

High winds are frequent at the mine site, especially in winter, because it is in an alpine tundra area with a lot of fetch to the West, where the dominant winds come. However, high winds may increase the possibility of road accidents (especially in the event of a blizzard), due to poor visibility. Effects of road accidents are considered in Section 6-14. TSMC's EPP document considers an extreme wind event as gusts occur in excess of 110 km/h, or sustained wind speed of 90 km/h. A white-out event can be considered as any event in visibility descends to a point in which outside travel becomes difficult.

Other than the possibility of road accidents, no other effects on VCs are expected from high winds since, in the event of a high wind/blizzard event, TSMC will either limit/stop all outdoor work, limiting/stop the use of heavy equipment. The final decision on these procedures will be made by the mine superintendent.

6.5.7.1.1 Worst Case Scenario

Since only small infrastructures are planned for the Howse Project (most infrastructures belonging to the ELAIOM Project), they do not provide large areas on which wind can act. The worst situation would probably by associated with a blizzard that would reduce visibility such that further work or transport is impossible.

6.5.7.1.2 Effects on VCs

The effects of road accidents on VCs are discussed in Section 6-14 above.

6.5.7.1.3 Safeguards in Place

Data should be relayed from the TSMC Environmental staff regarding present and expected wind conditions utilizing Environment Canada forecasts and on-site weather equipment to the Mine superintendent.

The mine superintendent shall decide a course of action which will provide for worker safety, including but not limited to:

- limiting outdoor work;
- stopping all outdoor work;
- limiting heavy equipment;
- stopping all heavy equipment;
- issuing a no-travel notice, temporarily stopping travel between DSO3, DSO4, and Schefferville; and
- mandating maximum work periods.

6.5.7.2 Effects of climate change on water balance (flood/drought)

The effects of 100-year flood and drought events on the water balance at the Howse site are discussed in Section 6.4.4. In all cases (drought or flood), the implementation of the Howse Project has the effect of increasing flow into three watersheds (Goodream Creek, Burnetta Creek and Pinette Lake). As a result, the effect of a 100-year drought event on the Howse Project under natural conditions (no Project) would incur more drought (adverse effects) than under the Howse Project itself. As such, we consider the adverse effects of a 100-year flood on the water balance/Howse VCs.

Due to the sloped nature of the area, flooding is highly unlikely. Increase rain fall has already been taken into account for sedimentation pond design and not impact is expected there. The only area where flooding could occur would be in the pit itself in the event that precipitations surpasses sump pump capacities. In that event, operation would have to be halted until the pumps can clear the pit again. Pit flooding would therefore imply a cessation of operations until sump pumps are able to empty the pit again. Since this in unlikely to happen and would only last a few days, not significant impact on the Project, or VCs, is expected.

6.5.7.2.1 Effects on VCs

A 100-year flood event implies an 8% increase in flow, which is not expected to adversely affect fish or fish habitats more than the natural conditions would by itself in a wet year. As such, fish and fish habitat will not be adversely affected.

6.5.7.2.2 Safeguards in place

The WMP is designed to withstand high water flow events.

6.5.7.2.3 Preliminary response/emergence measures

Cease operations until pit is emptied again.

6.5.7.3 Forest Fire

Climate predictions for the Howse Project area include warmer summer nights, longer summers and more summer precipitation. When considering that precipitation is sometime accompanied by lightning events, the combined predicted changes to these variables imply more forest fire activity in the area.

TSMC's EPP document considers forest fires that threaten operations as well as those that do not threaten operations. Given the tundra-like vegetation surrounding the Howse Project, as well as the wetlands in the vicinity, a forest fire event is unlikely to occur at the Howse site. The possibility of a forest fire on site is limited to a small area near Greenbush (outside of the Howse Project site) and from the limit of the propriety of the Howse Project and the Howells River valley.

6.5.7.3.1 Worse-case scenario

The worse case scenario would be that a forest fire reaches the Howse site, which could cause total destruction of the Howse infrastructures, and effectively destroy most of the VCs associated with the Project. This scenario, however, is very unlikely (negligible) given the landscape in which the Howse Project lies: the disturbed land from past IOCC activities coupled with the wetlands surrounding the site and the low-fuel vegetation beyond this makes the possibility of a forest fire resulting in effects on VCs at the Howse site negligible.

Rather, smoke from a fire in the Greenbush area or in the Howells River Valley could affect operations at the Howse Project site by affecting visibility. In the event that a forest fire occurs that does not threaten the Howse Project area, the Proponent will first consider precautionary measures owing to the potential for logistics disruption, and secondly, TSMC should assume the role of assisting agency given the resources at its disposal.

Consequently, low visibility can increase the possibility of traffic accidents.

6.5.7.3.2 Effects on VCs

The effects of road accidents on VCs are discussed in Section 6-14 above.

6.5.7.3.3 Preliminary Response/Emergence Measures

In any event, should a forest fire be initiated, the water bombers in Wabush or Goose Bay will be contacted to put out the fire. TSMC Safety personnel regularly attend the Standing Joint Committee for Emergency Measures, (SJCEM) compose of Schefferville, Matemikush-Lac John or Kawawa.

The following text is derived from TSMC's EPP (Volume 1 Appendix Ia), Appendix B-4 and pertains to TSMC's DSO operations. This document is updated annually and includes consideration of the upcoming operations. As such, it will be updated to reflect the Howse Project in spring 2016.

The Goodwood Haul road linking DSO4 deposits with the DSO Process plant, should be considered an area at high risk for forest fires due to the dense, continuous spruce (C-2 Fuel Type). In case of fire, the incident shall be reported to the appropriate authorities, SOPFEU if the fire is located in Quebec, and Department of Natural Resources if the fire is located in Newfoundland and Labrador. Further, the TSMC representative reporting the incident shall pass onto the appropriate government agency the following details;

- Fire location (GPS Coordinates);
- Fire description including; Approximate size, wind direction, wind speed, relative humidity, temperature, weather conditions over fire (clear, cloudy, lightening), flame length, smoke color, geographical features (hills, lakes, etc);
- Resources at risk. Clearly communicate which infrastructure (if any) is being imminently threatened by the fire (Roads, transmission lines, etc.) and which may be threatened as the fire develops;
- Resources available. Clearly state assets at TSMC's disposal which may be utilized in the direct or indirect suppression of wildfires including heavy equipment, water trucks, etc;
- Appoint an incident commander on behalf of TSMC, and mobilize the TSMC fire brigade as a precautionary measure to perform structural protection should it be necessary;
- In the event that the site may be threatened by forest fires, evacuation of the camp may not be necessary due to the lack of combustible material in the vicinity of the camp. Should the roads north or south of the camp be threatened, a no-travel order shall be placed, and the road closed with the assistance of the Surete de Quebec until such time that the fire shall no longer impede travel; and

- Should personnel be in the DSO4 area and a fire threaten the Goodwood road, a no-travel order should be issued for the Goodwood road, including stopping haulage operations, until the fire passes, the threat diminishes, or both.

6.5.7.4 Unlikely events

6.5.7.4.1 Ice jams

There are no large rivers are present in the vicinity of the Project and hence no ice jams are expected to occur or to affect the Howse Project activities, or their associated VCs. Also, the absence of crossings largely eliminates any risks of impacts from that source.

6.5.7.4.2 Landslides and avalanches

Landslides or snow slides could potentially block paths and delay operations slightly, although not enough to modify project global schedule. Rock slides from waste piles are discussed in the Slope Failures Section above.

6.5.7.4.3 Seismic events

There are no avalanches of earthquake risks in the vicinity of the project (see Section 7.3.5).

6.5.7.4.4 Erosion

Possible erosion effects are expected only downstream of the Project, and therefore, no effect on the Project itself are expected.

6.5.7.4.5 Subsidence

Since the mine does not include underground tunnels, this is not considered as an issue.

6.6 Climate Change

This section discusses the effects of climate change on the project. Predicted temperature and precipitation changes, including extreme events, are discussed, as well as their potential effects on the Howse Project.

Finnis (2013) describes the climate change projections (2038-2070) for 19 climate indices, based on seven regional climate models (RCMs). It is noted that the climate change predictions reported in this document are for years commencing approximately 5 years after the projected closure of the Howse Project (Operations are expected to cease in 2032), but, given that climate change predictions are not absolute, the environmental effects of climate change on the Howse Project are assessed below based on the values reported in Finnis (2013).

The results for the northern Labrador interior are discussed below, with reference to how these predicted climatic changes may affect the Howse Project. The current climate trends of the Schefferville region are described in Section 7.3.1.

Temperature

For the northern Labrador interior, winter temperature increases (3-4°C) are expected to be more pronounced than summer temperature increases (~1°C). In both cases (winter and summer) temperature increases will be more pronounced for minimum temperatures, indicating that nighttime conditions in winter will be warmer by the mid-century. Given the current severe winter temperatures in Labrador, these changes are not expected to pose any constraints on the Howse Project, nor require any mitigation. Currently, the freezing temperatures in winter cause the need to dry the ore before transportation and it is expected that the same drying process will be required as a result of continued freezing conditions in winter, despite the predicted warming, until the end of the Project.

However, the RCM's predicted warming during the spring and fall seasons may result in winters being on average 1-2 weeks shorter, which could result in some changes to the Howse Project region. In addition, to reducing the time period for when ore drying is necessary, the earlier onset of spring/later onset of winter may:

- cause vegetation to grow earlier in the region and provide suitable forage for wildlife, notably caribou;
    - Given that predictions are for more pronounced effects inland as compared to the coast due to the moderating effects of the ocean, and given that the George River Caribou Herd has its calving areas closer to the coast, it is speculated here that caribou may gradually show a preference for calving in inland habitats. This effect, should it occur, will be verified under the Ungava Program (Section 9.2.2).
- similarly, uncouple wildlife-forage relationships for other wildlife in the area;
- if coupled with lower precipitation, cause increase drought conditions which could be problematic for fish and plants;

- delay trout spawning in fall.

The effects of the predicted temperature changes in the Howse area are not expected to alter site activities or operations. Notably, the predicted nighttime temperature increases will not cause any changes to freezing/thawing, since the temperatures are expected to remain below freezing values, even with the changes expected. The changes to wildlife may be more pronounced as an earlier spring thaw could result in uncoupling between forage availability and wildlife.

Precipitation

Finnis (2013) predicts increases in the intensity of precipitation in the area, in particular during the summer months. This includes the 3/5/10 day precipitation events as well as the number of days with substantial precipitation (more than 10 mm). Similarly, Finnis (2013) predicts increases in extreme precipitation events. Increases in summer precipitation events such as those described above for the mid-century may result in a rise in flood events in the Howse area. The effects of floods and HML's preparedness for these events are discussed in 6.5.7.2.

The predicted increased precipitation will necessitate a corresponding need for pit dewatering. However, towards the end of the Howse project (when increased precipitation is predicted), this will occur in tandem with the predicted increased pit dewatering, when the pit depth reaches the water table. At this stage, HML expects to conduct pit dewatering activities continuously, and so the measures for the increased pit dewatering will already be in place to accommodate the predicted increased precipitation events predicted by Finnis (2013).

Water balance modelling was conducted for ground water and surface water for the Howse Project (ful reports available in Volume 1 Appendix XVII and XVIII, respectively). The hydrological year 1978-1979 was selected as typical wet year because it resulted in an annual runoff of 794 mm, which is more than the runoff corresponding to a 100 years wet year return period (776 mm). The hydrological year 1996-1997 was selected as typical dry year because it resulted in an annual runoff of 343 mm, which is less than the runoff corresponding to a 100 years dry year return period (350 mm).

Table 6.1. Monthly precipitation values used in water balance modelling

MONTH	RAINFALL (MM) WET/DRY	SNOWFALL (MM) WET/DRY	RUNOFF (MM) WET/DRY	LAKE EVAPORATION (MM) WET/DRY	EVAPOTRANSPIRATION (MM) WET/DRY
January	0.0	62.4/17.6	0.0	0.0	0.0
February	0.0	61.6/1.8	0.0	0.0	0.0
March	0.2/0.0	101.9/9.7	0.2/0.0	0.0	0.0
April	60.2/2.9	42.2/21.0	60.2/2.9	0.0	0.0
May	73.1/43.2	26.0/23.8	547.2/195.0	0.0	0.0

MONTH	RAINFALL (MM) WET/DRY	SNOWFALL (MM) WET/DRY	RUNOFF (MM) WET/DRY	LAKE EVAPORATION (MM) WET/DRY	EVAPOTRANSPIRATION (MM) WET/DRY
June	82.3/35.1	0.0	32.9/14.1	109.6/99.4	38.4/34.8
July	149.5/170.8	0.0	59.8/68.3	103.3/93.6	36.2/32.8
August	76.9/42.6	0.0	30.7/17.0	73.8/66.9	25.8/23.4
September	100.5/67.4	2.4/0.0	41.2/27.0	48.5/43.9	17.0/15.4
October	21.3/7.8	64.8/14.3	21.3/7.8	0.0	0.0
November	0.0/10.4	63.3/27.2	0.0/10.4	0.0	0.0
December	0.0	51.9/36.4	0.0	0.0	0.0
Year	**564.0/380.3**	**476.5/151.8**	**793.5/342.5**	**335.2/303.8**	**117.3/106.3**

Groundwater modelling conducted for the Howse Project indicates that for a dry year scenario with a recharge of 60 mm, the estimated dewatering rate is about 8, 500 m^3/day. By comparison, for a wet year scenario with a recharge of 250 mm and conductivity hydraulic multiplied by 2 for overburden and Sokoman units, the estimated dewatering rate is about 23, 200 m^3/day.

The following Tables (1.1, 1.2, 1.3 and 1.4) summarizes the monthly maximum flow differences with and without Howse deployment for all locations and for wet, average and dry years. Note that monthly maximum flow differences are the same for each scenario for Burnetta Creek and Pinette Lake (except in the case of a Q = 0) because only drainage areas differences are applied. Since all scenarios are have similar effects at those two outflow locations, they will not be further discussed here as the effect on VCs is already assessed in Section (Chapter 7). For Goodream Creek these differences are not constant because pit dewatering values change and pit dewatering is treated in priority in HOWSEB sedimentation pond. Also note that the variation observed when the Project is added to the model is based on wet, average and dry monthly maximums respectively (e.g. the variation compares two wet-year conditions: one with and one without Howse).

For example, Table 6.2 indicates that, with Howse, a 23% increase in flow is expected in May at the Timmins 4 sedimentation pond 3 outflow in a dry year scenario relatively to a dry year scenario without Howse (ΔQ/Q Without Howse - Dry). However, if we look at the actual water flow (Q with Howse = 283 L/s), the flow is still far below the Q without Howse for an average year in May (453 L/s). Therefore the increase in water flow with Howse, even though it is considerable, will have no additional adverse environmental effects due to erosion since the flow is still way below the stream bed containment capacity. In fact, the presence of the project will slightly increase water flow in low flow periods (June to September), thereby potentially increasing fish habitat availability.

The same rationales apply for the dry year scenario of HOWSEB sedimentation pond as shown in Table 6.3. Indeed, the large proportional increases as shown by the high percentages (ΔQ/Q Without Howse) are due to very low Q without Howse (sometimes Q = 0) rather than very large Q with Howse as is again shown by the Q with Howse from June to September as compared with the Q without Howse for May. Note that if Q without Howse equals zero, any increase in flow will result in an infinite (∞) ΔQ/Q since the water flow difference is divided by zero. Once again no erosion is expected to occur due to the project in dry years, and in this case, the substantial increase in flow should prevent it from drying up as it often does in summer, thereby increasing fish habitat availability.

For the wet scenario, the situation is different. Indeed, the effect of the Project in a wet year is proportionally smaller for the month of May (ΔQ/Q with Howse = 8% and 21% for Timmins 4 sedimentation pond 3 and HOWSEB respectively) since the natural flow of the receiving stream is already very high. Therefore the adverse effect of a wet year on water quality through erosion would be mainly due to the higher natural water levels in the stream (Q without Howse – May) rather than the Project itself. As for other months, the situation is similar at Timmins 4 sedimentation pond 3, with proportionally smaller increases in water flow with Howse in a wet year scenario. On the other hand, for HOWSEB, were most the dewatering is sent ΔQ/Q with Howse reaches very high values, but the situation is similar as with the dry year scenario; that is the Q with Howse for June to September, although proportionally a lot higher that the corresponding Q without Howse, are still all far below the Q without Howse for an average year in May, and hence, no adverse effect are expected on the environment in the form of erosion. Once again, increases in water flow will probably eliminate dry up events that the model still suggests happens in a wet years in June, thereby increasing fish habitat availability.

Table 6.2. Monthly Maximum Flow Variation for Wet, Average and Dry Scenario at Timmins 4 Sedimentation Pond 3 Outflow – With and Without Howse Project

Month	Q Without Howse (L/s)			Q With Howse (L/s)			ΔQ/Q With Howse (%)			ΔQ/Q Without Howse (%)		
	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry
May	645	453	230	699	515	283	8%	12%	19%	8%	14%	23%
June	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
July	28	7	42	30	8	50	6%	11%	17%	7%	12%	20%
August	6	16	0	6	18	0	6%	11%	0%	7%	12%	0%
September	29	25	14	31	27	17	6%	11%	17%	7%	12%	20%

Q: Water flow

ΔQ : Difference in the water flow with and without Howse project

Table 6.3. Monthly Maximum Flow Variation for Wet, Average and Dry Scenario at HOWSEB Sedimentation Pond Outflow – With and Without Howse Project

Month	Q Without Howse (L/s)			Q With Howse (L/s)			ΔQ/Q With Howse (%)			ΔQ/Q Without Howse (%)		
	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry
May	2182	1533	777	2641	1923	944	17%	20%	18%	21%	25%	21%
June	0	0	0	266	255	97	100%	100%	100%	∞	∞	∞
July	94	25	142	369	282	252	74%	91%	44%	291%	1037%	77%
August	20	56	0	288	315	97	93%	82%	100%	1366%	467%	∞
September	100	83	48	375	345	149	73%	76%	68%	276%	316%	213%

Q: Water flow

ΔQ : Difference in the water flow with and without Howse project

Table 6.4. Monthly Maximum Flow Variation for Wet, Average and Dry Scenario at HOWSEA Sedimentation Pond Outflow – With and Without Howse Project

Month	Q Without Howse (L/s)			Q With Howse (L/s)			ΔQ/Q With Howse (%)			ΔQ/Q Without Howse (%)		
	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry

May	170	119	61	291	205	104	42%	42%	42%	72%	72%	72%
June	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
July	7	2	11	13	3	19	42%	42%	42%	72%	72%	72%
August	2	4	0	3	7	0	42%	42%	0%	72%	72%	0%
September	8	6	4	13	11	6	42%	42%	42%	72%	72%	72%

Q: Water flow

ΔQ : Difference in the water flow with and without Howse project

Table 6.5. Monthly Maximum Flow Variation for Wet, Average and Dry Scenario at Pinette Lake Outlet – With and Without Howse Project

Month	Q Without Howse (L/s)			Q With Howse (L/s)			ΔQ/Q With Howse (%)			ΔQ/Q Without Howse (%)		
	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry	Wet	Average	Dry
May	484	340	173	466	328	166	-4%	-4%	-4%	-4%	-4%	-4%
June	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
July	21	5	31	20	5	30	-4%	-4%	-4%	-4%	-4%	-4%
August	4	12	3	4	12	0	-4%	-4%	0%	-4%	-4%	0%
September	22	18	11	21	18	10	-4%	-4%	-4%	-4%	-4%	-4%

Q: Water flow

ΔQ : Difference in the water flow with and without Howse project

As such, the adverse effects of the Project during a wet or dry year on the water balance at the Howse site are not expected to differ significantly from an average scenario, at least not in a negative way. What is show with tables above is that the effect of the Project on the VCs will not be amplified by the occurrence of a dry or wet year. It is therefore not deemed necessary to complexity effect assessment of the VC with dry and wet year scenarios, since the effects will be basically the same. In any case, the average scenario still is the most probable to occur, and therefore the best premise on which to assess the effect of the project on the environment.