



Coffee Gold Mine

YESAB Project Proposal

Appendix 31-B Access Route Operational Management Plan

VOLUME V

Prepared for:
Kaminak Gold Corp. a subsidiary of
Goldcorp Inc.
Suite 3400-666 Burrard Street
Vancouver, BC Canada V6C 2X8

Prepared by:
JDS Energy & Mining Inc.
Suite 900, 999 West Hastings St.
Vancouver, BC V6C 2W2

Hemmera Envirochem Inc.
18th Floor, 4730 Kingsway
Burnaby, BC V5H 0C6

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BMP	best management practice
Dawson	City of Dawson
DFO	Fisheries and Oceans Canada
ERT	emergency response team
Goldcorp	Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc.
MED	marine emergency duties
NAR	Northern Access Route
Project	proposed Coffee Gold Mine
Proponent	Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc.

UNITS AND MEASUREMENTS

Measurement	Definition
%	percent
km	kilometre
km ²	square kilometre
m	metre
m ³	cubic metre
t	tonne

INFORMATION REQUIREMENTS FOR QUARTZ MINE LICENSE AND WATER LICENSE

Information Requirements	Location in this Plan
Table of Concordance	<i>Will be included once YESAB process is complete.</i>
Revision Log	<i>Will be included once YESAB process is complete.</i>
Road, barge landings and ice road operational management.	Section 3.0 Traffic Management Section 4.0 Road Maintenance Section 5.0 Barge Design and Management Section 6.0 Ice Road and Winter Road Management Section 7.0 Best Management Practices Section 8.0 Wildlife Management

1.0 INTRODUCTION

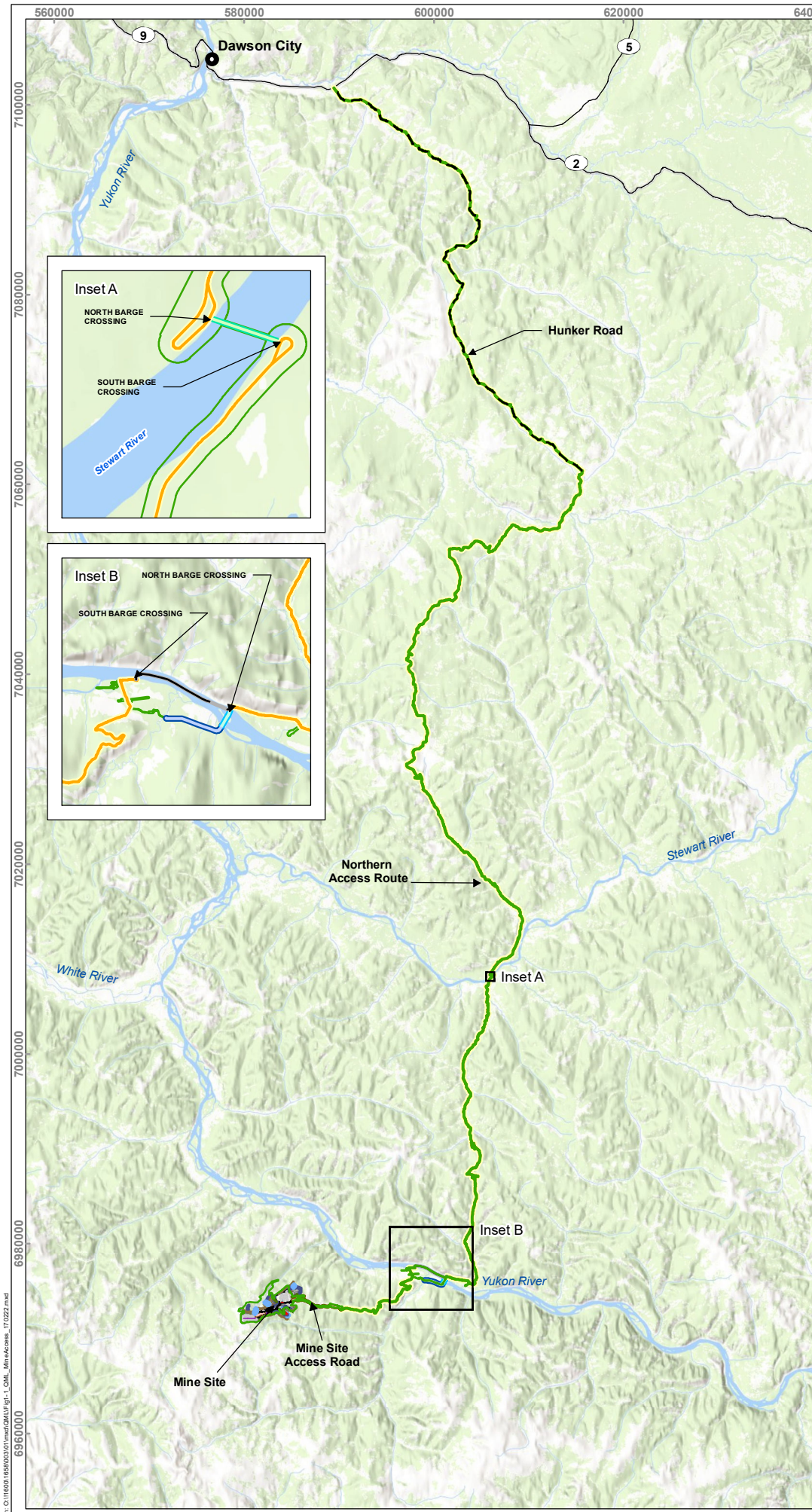
1.1 PROJECT SUMMARY

The proposed Coffee Gold Mine (Project), is an advanced exploration gold project owned by Kaminak Gold Corporation, a wholly owned subsidiary of Goldcorp Inc. (Goldcorp or Proponent) and located in the White Gold District of west-central Yukon, approximately 130 kilometres (km) south of the City of Dawson (Dawson). The Project contains several gold occurrences within an exploration concession covering an area of more than 600 square km (km²).

The Project, comprising four Open Pits called Latte, Double Double, Supremo, and Kona, is proposed to be mined at an average rate of 5 million tonnes per annum of heap leach feed by conventional shovel and truck methods. The ore will be crushed and placed onto a Heap Leach Facility by truck for nine months of the year. During the three coldest months of winter, run-of-mine ore will be stockpiled.

The Project site will be accessible by a combination of road, barge crossings, and a seasonal winter road, the Northern Access Route (NAR), which will be used to transport equipment, fuel, and other supplies. Originating 16 km outside of Dawson at the junction of Hunker Road and Highway #2 (North Klondike Highway), the NAR will initially follow existing government-maintained Hunker Road to Sulphur Creek. Past Sulphur Creek, the NAR will generally follow existing roads used by placer miners; some upgrades and realignments of existing roads will be required and will be completed by Goldcorp. **Figure 1-1** shows the intended NAR, including the existing government-maintained and user-maintained roads that will be used to access the Project site.

The NAR will cross two major rivers: Stewart River and Yukon River. During periods of open flow, barges will be utilized to move transport trucks across each river. When frozen, ice roads will be constructed to allow access to the Project site. During spring thaw and fall freeze-up periods, river access will not be possible.



COFFEE GOLD MINE

Coffee Gold Mine Access Route and Barge Crossing Locations

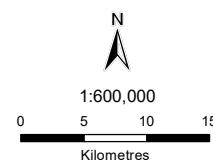


Legend

- Project Footprint
- Hunker Road
- Stewart River Ice and Barge Crossings
- Yukon River Barge Route
- Yukon River Ice Road
- Winter Road
- Mine Site Access Route
- Northern Access Route
- Highway

Notes

1. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.



NAD 1983 UTM Zone 7N

Page Size: 8 1/2" x 11"

Figure 1-1

Date:
Mar 24, 2017

Drawn by:
JS

Reviewed:
DP

GOLDCORP

1.2 SCOPE AND OBJECTIVES

This document describes the procedures and protocols for use of the NAR. The NAR will be used during both the Construction and Operation Phases to transport fuel, equipment, and other supplies. This plan describes activities for the NAR during Project operation; activities associated with the Construction Phase are detailed in the **Access Route Construction Management Plan** (see **Appendix 31-A**).

The NAR has been designed to provide safe vehicle travel to the Project site. The proposed road is designed for single lane, two-way traffic with pullouts. Measures to facilitate safe travel of the NAR by Project employees and contractors are detailed in this plan, and include road maintenance activities, driver orientation and safety training, right-of-way standards, communication and radio procedures, best management practices (BMPs) and incident response plans.

The NAR has been designed to minimize or eliminate potential adverse environmental effects that may be associated with all season roads, ice roads and barge crossings. With the implementation of the Project design measures and BMPs in the construction and operation of the NAR, the all-season road, ice roads and barge crossings can be constructed and operated so that unintended effects or changes to the surrounding environment are minimized or eliminated.

Wildlife presence in the area of the NAR is expected to vary seasonally, or even annually; however, wildlife are expected to occasionally be observed on or adjacent to the road. Wildlife that may be found in the vicinity of the NAR include Caribou, Moose, Mule Deer, Thinhorn Sheep, Wolves, Grizzly Bear, Black Bears, and Wolverines, among others. Wildlife will have the right-of-way at all times.

Best management practices will be implemented to protect vegetation, protect water quality, minimize effects to fish and fish habitat, reduce erosion and sediment, and minimize interactions and disturbances to wildlife. General BMPs that Project employees and contractors must follow when using the NAR include the following:

- Adhere to the posted speed limits and other signage. The NAR will be limited to a speed of 50 km per hour (km/hr). Reduced speeds are a proven method of reducing the potential for wildlife/vehicle collisions (EDI 2015).
- Give wildlife the right-of-way on the road. Vehicle operators must be vigilant to watch for wildlife near roads, and take all reasonable actions to avoid collisions with wildlife. If wildlife are observed on the road, traffic must stop as far back as safely possible. If after five minutes the animals have not moved off the road, the vehicle may proceed slowly and cautiously (less than 20 km/h).
- Install and maintain erosion and sediment control. As required, erosion and sediment control methods will be implemented and maintained, thus reducing the erosion potential and subsequent potential for sediment loading into creeks, rivers, and surrounding vegetation.

- Fuel and maintain mobile equipment at least 30 m from watercourses, except for specific equipment under specific circumstances (discussed in greater detail in **Section 7.0**), and transport and secure hazardous materials in a way that reduces risk of accidental release.

The full list of BMPs that will be implemented during use of the NAR are included in **Section 7.0**.

1.3 SYNERGIES WITH OTHER PROJECT DOCUMENTS

This plan should be viewed in concert with the following management plans:

- Access Route Construction Management Plan (**Appendix 31-A**)
- Wildlife Protection Plan (**Appendix 31-F**).

2.0 DESIGN CRITERIA

The intended width of the NAR is generally greater than a single lane, but less than a standard two-lane road. **Table 2-1** provides the design criteria used for the land portion of the NAR.

Table 2-1 Northern Access Route Design Criteria – Land Portions

General	Units	Values
Design and posted Speed	km/hr	50
Finished Road Width	m	5
Surfacing Depth	mm	150 – 300
Minimum Curve Radius	m	35
Minimum Stopping Sight Distance	m	65
Maximum Favourable Road Grade (Sustained/Short Pitch)	%	8/10
Maximum Adverse Road Grade (Sustained/Short Pitch)	%	8/10
Minimum Switchback Radius	m	18
Maximum Switchback Grade	%	8
Design with Intervisible Turnouts		Yes

Notes: % - percent; m - metre; mm - millimetre

3.0 TRAFFIC MANAGEMENT

To the extent possible, competitive local suppliers will be used for the provision of fuel, equipment, materials, and supplies for the Project. It is recognized that whether or not local suppliers are used, the majority of equipment, materials, and supplies for the Project's Construction and Operation Phases will originate outside of Yukon. These goods will be hauled to site with standard highway tractor-trailer transport units. Transport trucks will utilize the existing Yukon Highway 2 (also known as the North Klondike Highway) between Whitehorse and the Hunker Road turnout outside of Dawson. From this point, off-highway trucks will be used along the Hunker Road and the site access road. A staging area close to the intersection of Highway 2 and Hunker Road, will be used to transfer loads originating south of Dawson to the trucks that will transport the supplies to the Project site. The staging and transfer to off-highway vehicles may not occur for all loads depending on factors including, but not limited to, specialized loads and road and weather conditions.

3.1 ACCESS CONTROL

Over 80 percent (%) of the NAR is existing and in use by other user groups. The Proponent will not have the authority to limit the ability for other users to access the road, except where access would otherwise not be possible without the Proponent's operations (i.e., barges and ice bridges). The following measures will be implemented to limit public access to the road:

- Access control will be put in place for the barges and ice bridges at the Stewart and Yukon rivers, and only authorised vehicles and users will be permitted to use the crossings.
- Signs will be posted on Hunker Road at Sulphur Creek and at each barge landing advising the public of the hazards of using the NAR. The signs will also provide safety and emergency contact information including radio call-out procedures and radio frequencies.
- Prior to opening the road, at least annually, the Proponent will advertise and hold at least one public meeting in Dawson to explain the hazards of using the road. Safety protocols and considerations will also be reviewed.
- The Project will develop indicators for monitoring how traffic is affected by the Project and adapt management protocols accordingly.

There will be occasions when access to the road will need to be curtailed for short periods for special reasons, such as bad weather, unsafe road conditions, maintenance activity, heavy truck traffic, movement of oversized loads, or presence of large numbers of Caribou on or adjacent to the road. The road may also be temporarily closed in the event of an incident, accident, or other event requiring mitigation or response. Typically, these short-term closures will be required to ensure safety. During these periods, access control will be maintained at river crossings and the road information sign at Sulphur Creek will indicate to the public that the NAR is temporarily closed to all traffic.

3.2 EXISTING ROAD USAGE

3.2.1 HIGHWAY 2 (NORTH KLONDIKE HIGHWAY)

Highway 2 connects Whitehorse to Dawson, and is the northern half of the highway that runs between Skagway, Alaska, and Dawson. This is a public road, in Yukon it is regulated under the Yukon *Highways Act*, RSY 2002, c. 108, and maintained on a year-round basis by the Government of Yukon's Department of Highways and Public Works. It is approximately 520 km from Whitehorse to the Hunker Road intersection. This section of Highway 2 has average annual daily traffic of 220 vehicles per day; average daily traffic ranges from a high of 480 vehicles per day in the summer to lows of 70 vehicles per day in the winter (Highways and Public Works 2011). The highway is subject to spring weight restrictions with 75% load restrictions typically encountered in early April for an approximately one-month period.

3.2.2 HUNKER ROAD

Hunker Road will be utilized to connect Highway 2 to the user-maintained portion of the NAR. Hunker Road will be utilized from the junction of Highway 2 to Sulphur Creek. This section of road is a public road, regulated under the Yukon *Highways Act* and is currently only maintained during summer by the Department of Highways and Public Works. Hunker Road has an average summer daily traffic count of approximately 120 vehicles (Yukon Highways and Public Works 2011). The road is used by placer miners as their primary route to transport equipment and supplies to and from their mining claims.

3.3 USER-MAINTAINED ROAD

Beyond Sulphur Creek, the road is considered a public unmaintained (i.e., user-maintained) road. The NAR will operate seasonally by barge during the open water season and by ice bridge during the winter. Best estimates indicate that the NAR will be useable to traffic for an average of 295 days per year, depending on annual weather variability. The barges are expected to be active starting each year in late May, and will continue until the river starts to ice over in early November. A six-week period is expected for the rivers to freeze up. Natural freezing of the Yukon and Stewart rivers will be facilitated or augmented by pumping water onto the surface ice to enhance ice thickening rates. Hauling on the winter road is anticipated to commence in mid-December of each year. The winter road is expected to be in operation until late April, when ice thickness will no longer be sufficient to support heavy equipment. Break-up is anticipated to be about four weeks from the last use of the winter road before barge services will be able to resume. Operating periods have been determined based on historical averages from barge and ice crossings over various rivers in Yukon (Dawson Ferry and the Minto Mine barge operation) as well as data obtained from ferry and ice crossings in the Northwest Territories.

Freight and fuel will be transported to the Project site by trucking contractors using standard off-highway trucks. Freight hauling will primarily utilize tridem flatdeck trailers for annual consumable transportation and a variety of trailer configurations for oversize equipment. Freight hauling is expected to average 25 tonnes (t) per load. Fuel hauling will utilize standard tridem tankers with a 46,500-litre (L) capacity.

Aside from the estimated six-week (42-day) road closure awaiting freeze-up, barges are estimated to operate an average of 158 days per year. With the estimated six-week (42-day) road closure during freeze-up, approximately 200 days or 55% of the annual loads will be transported to site during the open water season. Each barge will be operated by a Transport Canada-certified captain, and will have a deck assistant. Barges are anticipated to be self-propelled deck barges with a minimum net tonnage of 75 t. The deck length will be a minimum of 30 metres (m) with a maximum draft of 0.7 m

The ice crossings are estimated to be open for haulage an average of 137 days per year. With the estimated four-week (28-day) road closure during break-up, approximately 165 days or 45% of the annual loads will be transported to site during the winter season.

3.4 ROAD SAFETY

The NAR will be a one-lane, two-way, radio-assist access road. All Proponent employees and contractors using the NAR must be equipped with a radio set to the access road frequency, which will be posted on the information sign at Sulphur Creek. Radio communication will be line-of-sight to provide communications between vehicles.

All Proponent employee and contractor drivers must possess a valid driver's licence from a Canadian province or territory for the appropriate class of vehicle. In addition, they will be required to attend a driver orientation and safety training course before they first drive the NAR. The driver orientation and safety training course will be conducted by the Proponent. The Proponent will train road users in road safety, good driving practices, and influencing behaviour on the road. Emphasis will be placed on reviewing conditions along the NAR that drivers will encounter, the mandatory use of seat belts, mandatory requirement to observe posted speed limits, and improving visibility for others by wearing reflective clothing when outside of their vehicle. To further safeguard the road users and wildlife, the Proponent will implement the following management practices for employees and contractors:

- Speed limits will be posted in accordance with permit conditions and signage requirements.
- Use of seat belts by all drivers and passengers will be mandatory.
- The Proponent will educate all employees and contractor's employees on the road safety rules during the safety induction training, which will take place before they first drive the road.
- Right-of-way standards will dictate vehicle priority (see **Section 3.6**).
- Cell phone use while driving will be prohibited.

- All Proponent-related vehicles will have radio contact capabilities and spill response kits, and will meet vehicle maintenance requirements.
- Wildlife will have the right-of-way, and harassing or approaching wildlife will be prohibited, as described in the **Wildlife Protection Plan (Appendix 31-F)**.
- Road usage by Proponent vehicles will be restricted during periods of inclement weather.
- Vehicles will not park on the travelling surface – to park, vehicles will pull off the road in a safe location such as a pullout (passing pullouts are intervisible along the NAR beginning at Sulphur Creek).
- Driving under the influence of alcohol or intoxicating drugs will be prohibited, and will result in immediate dismissal from the Project.
- All Proponent drivers will possess a valid driver's license from a Canadian province or territory for the appropriate class of vehicle.

3.5 SIGNAGE

The Proponent will post appropriate signage along the NAR. Typically, these signs will advise drivers of the posted speed limits, approaching bridges, curves, or areas of low visibility. Signs will be posted at Sulphur Creek, the Mine Site, and the two north barge landing areas to advise drivers of safety rules and road conditions.

Speed limit signs will be posted at intervals of approximately every 5 km along the road, or at points where speed limits change. Markers will be installed along one side of the road to help drivers identify the road shoulder during blizzards, white-out conditions, or dense fog. Distance markers will be posted at intervals of at most 1 km along the road.

A list of road signage is presented in **Table 3-1**.

Table 3-1 Road Signage along Northern Access Route

Indicator	Rationale for Selection
Safety precautions & user advice	At Sulphur Creek, Coffee Mine Site, and each barge landing
Blind Hill	200 m ahead of the beginning of a blind hill
Speed Limit	Nominally at 5 km intervals or at speed transition points
Curve	200 m ahead of a curve
Bridge announcement	200 m ahead of a bridge
Bridge side sign	On each side of the bridge
Kilometer markers	Nominally at 1-km intervals
Wildlife markers	200 m ahead of wildlife corridors or areas of high risk, will include both permanent and temporary / moveable signage.

3.6 RIGHT OF WAY STANDARDS

Proponent vehicles will observe the following standards, in order of highest to lowest priority, in regard to rights-of-way:

- Emergency vehicles – when lights flashing
- Wildlife
- Road maintenance equipment
- Trucks transporting dangerous goods (i.e., explosives, reagents, fuel)
- Loaded transport trucks
- All other vehicles.

When two vehicles meet on the road, the south-bound vehicle will have the right of way, as this will typically be the loaded vehicle. Pullouts will be used whenever possible. Radio contact will be in place to prevent an unexpected meeting between vehicles.

Passing will be permitted only when safe to do so. Radio contact will be established before passing any heavy equipment.

3.7 COMMUNICATION AND RADIO PROCEDURES

Radio coverage along the NAR will be by line-of-site or truck-to-truck. Radio frequencies will be provided to all Proponent employees and contractors, and frequencies will be posted on the safety precaution signs at Sulphur Creek and the barge landings.

Once past Sulphur Creek, Proponent drivers will be required to announce their vehicle type, location, and direction of travel. Unless otherwise posted, vehicles will announce their vehicle type, km marker, and direction of travel.

Proponent drivers will announce when stopping at a pull-out on the road or resuming travel. They will also announce any non-radio user or other potential hazard encountered so that other drivers may be aware of the hazard.

The Proponent's company vehicles and contractor vehicles will be required to carry a mobile satellite phone or other means of notifying mine personnel of NAR conditions, including notifying emergency response personnel, Safety and Security Department, or the Environment Department of an incident on the road (e.g., an accident, hazard, or presence of wildlife).

3.8 INCIDENT RESPONSE PLAN

The Proponent will have an emergency response team (ERT) located at the Project site that will provide prompt response in the event of an incident or accident on the NAR. Emergency Response Team personnel will be tasked with responding to any vehicle accident resulting in personal injury or spillage of harmful material, response will be performed as per the site Emergency Response Plan and Spill Contingency Plan, both of which will be developed for project licensing. In the event of an emergency along the NAR involving Proponent employees, contractors, or project vehicles, the Proponent will initiate extraction and transportation to medical assistance at the Mine Site, Dawson, or Whitehorse, depending on the location of the accident and the severity of the injury. In the event of serious injuries, the person or persons will be evacuated to the Dawson City Community Hospital or Whitehorse General Hospital. Medevac services use specially equipped planes, based in Whitehorse. The procedures in place in the Emergency Response Plan will be followed.

Although accidents or incidents may occur on the road, mitigation measures and response plans will be developed that can be applied to reduce the frequency and severity of such events. Measures to reduce the risk of incidents and accidents that would require the involvement of local emergency response and public service providers include limiting use of the NAR by Proponent drivers under poor weather or road conditions, carrying emergency roadside kits and emergency spill kits in all Proponent and contractor vehicles, and having spill kits located at all four barge landings. Contractors working for the Proponent that will be hauling dangerous goods will be required to have transportation of dangerous goods training, adhere to the Transportation of Dangerous Goods Act, SC 1992, c. 34, and Regulations, and carry appropriate spill kits in their vehicle. The types of events considered possible are as follows:

- Vehicle collisions or single vehicle accidents that may result in personal injury or spillage of potential harmful materials (e.g., fuel, lubricating fluids, reagents) onto the land or water
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury, or spillage of potentially harmful materials
- Risk of people being stranded along the route in bad weather, such as in heavy snow or whiteout conditions, or due to mechanical breakdown.

In urgent circumstances and where appropriate, the Proponent may request assistance from other departments at the Project site or in Dawson. Due to safety protocols and procedures that will be implemented, however, the NAR is not anticipated to result in an increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Dawson.

All employees using the NAR will be trained appropriately, and will be responsible for reporting, mitigating, and cleaning up small hydrocarbon spills. In the case of a larger spill, spill response will be implemented by the Proponent's ERT and Environment Department staff, who will advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan will be activated when responding to a spill.

The Proponent will report all reportable scale incidents to the appropriate government authorities (e.g., First Nations, Mines Inspector, Royal Canadian Mounted Police, Yukon Water Board, Environment Canada, Fisheries and Oceans Canada (DFO)).

4.0 ROAD MAINTENANCE

Road maintenance is essential to providing safe, efficient travel to the Project site. Day-to-day maintenance of the NAR will be performed by a site services crew employed or contracted by the Proponent. Dedicated graders will operate on the road on a routine basis. There will be supply and delivery of aggregate material for re-surfacing and sanding of passes during the winter. During periods of extended adverse weather, road maintenance activities may need to be increased. Additional equipment from the site services support and mining fleets may be utilized during these periods.

The Proponent recognizes that a good inspection program will lead to the early identification of areas of the NAR where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface and water crossings. An annual geotechnical inspection of the road will be conducted by a qualified engineer licensed to practice in Yukon, and the resulting corrective actions will be carried out, and/or collaborated on with Yukon Government.

The Proponent or Proponent's contactor will be responsible for road inspections and maintenance, and will conduct periodic inspections (on a weekly basis at minimum when the road is in operation by the Proponent) of the NAR to verify that the road is maintained for safe travel of personnel, equipment, and supplies. These inspections will be logged and any deficiency recorded and followed up by a corrective plan. The periodic inspections will include an inspection of the bridge abutments and a visual observation of the road surfaces to assess the status of the road's foundation. The inspection will also include visual observation of erosion and sediment control measures that may be implemented along the road. Other qualified professionals will be utilized for specialized inspections, as required.

Road maintenance during the summer season will focus on the following tasks:

- Repair potholes, ruts and re-blade washboard areas.
- Ensure proper drainage and crowning is maintained on the road surface.
- Clear ditches and remove deadfall, where required.
- Ensure culvert locations are well marked and culverts are draining properly prior to snowfall.

Road maintenance during the winter season will focus on the following tasks:

- Remove snow from driving surface and pullouts.
- Sand and scarify the road surface, where required.
- Ensure drainage off the road structure is maintained, including steaming of culverts as necessary to maintain drainage.

The entire NAR will be inspected for signs of accumulation of ponded water either on the road surface or along the sides of the road. The Proponent will evaluate and monitor the accumulation to determine why water is accumulating in these areas. Based on these evaluations and to avoid erosion or washing out of the road, required remedial action will be carried out to correct the cause of such ponding. This may include grading of the road surface to remove areas of ponding, or installation of additional culverts if excessive water ponding occurs adjacent to the road.

4.1 WATERCOURSE CROSSING INSPECTIONS AND MAINTENANCE

The watercourse crossing inspection and maintenance program has two main components:

- A regular inspection program to identify issues relating to watercourse crossings, such as structural integrity, hydraulic function, and erosion and sediment control measures
- An event inspection program to track the effects of large storm events on watercourse crossings such as structural integrity, hydraulic function, and erosion and sedimentation.

4.1.1 REGULAR CROSSING INSPECTION AND MAINTENANCE

Prior to spring freshet, all culverts and stream crossings will be inspected to confirm that they are in good state to accommodate the rapid spring thaw. During the freshet period (mid-May through June), crossing inspections will be performed daily during high flows and weekly during the remainder of the ice-free period through fall freeze-up (July through October). An annual geotechnical inspection of the road will be conducted by a qualified engineer licensed to practice in Yukon.

These inspection activities for each watercourse crossing will consist of the following:

- Visual inspection of its infrastructure to identify defects, cracks, or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required.
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible.
- Visual inspection of the upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to abutments and their foundations as they will be vulnerable to scour and erosion during flood events. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded by the Proponent to help track changes in conditions over time. Maintenance operations will be coordinated with the Environment Department, and will consist of undertaking remediation of any detected problems, repairing damage as soon as possible, and implementing erosion and sediment control measures. An environmental monitor will be on site for any work in or near a fish-bearing stream.

4.1.2 EVENT CROSSING INSPECTIONS, MONITORING AND MAINTENANCE

Inspection frequency will increase after heavy or prolonged rainfall storm events. Visual inspection of each watercourse crossing will be completed to identify potential risks to the crossing's structural integrity, debris accumulation, and whether erosion and scour have occurred. Water accumulation along the road will also be monitored. Results will be recorded by the Proponent to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible under the direction of the site services supervisor and the Environment Department. Unless required to correct an urgent instability of a crossing that could pose a safety hazard to road users or the environment, instream work on fish-bearing streams will take place in the work timing window between July 1 and April 15. Instream work on all streams is to be minimized and completed at times of low flow. The environmental monitor will be on site for any work in or near a fish-bearing stream.

4.2 INSPECTIONS AND MAINTENANCE OF EMBANKMENTS IN PERMAFROST TERRAIN

The NAR crosses upwards of 36 km of terrain that has been identified as being ice-rich permafrost, with an additional 36 km identified as crossing ice-poor permafrost. Specific embankment designs including a minimum “fill only” embankment section of at least 1.5-m thickness have been developed for the ice-rich terrain. Somewhat different inspections, monitoring, and maintenance are required for the sections of road in permafrost terrain compared to the sections in non-permafrost terrain. The following additional inspections will be carried out during road operations:

- Regular weekly visual inspection will be performed for the road. Specific items to note on or near the embankments constructed in ice-rich permafrost terrain include:
 - Ponding of water along the toe of the embankment fill
 - Settlement and cracking on the road travelling surface
 - Settlement, instability, and cracking on the embankment side slope. Some cracking and settlement are to be expected because the thermal cover in the side slopes is not sufficient to limit the depth of thaw to the depth of the natural active layer; however, excessive cracking and settlement that progresses to near the edge of the road shoulder points to the need for corrective action.
 - Excessive settlement or bowing of culverts
 - Spreading or downslope movement of the embankment that may be due to instability of the frozen subgrade caused by slope failure or creep
 - Probing of the active layer depth outside of the embankment footprint but close to the toe of the fill to evaluate if it is increasing beyond that in similar undisturbed terrain further from the road
 - Amount of snow piled or drifted on the embankment side slope
 - Formation of icings (aufeis).
- Annual inspection by a registered engineer licensed to practice in Yukon.

Observation of any of the above-noted conditions will consider whether they are occurring due to the degradation (thaw) of the supporting frozen subgrade. Maintenance undertakings specific to the fill embankments in permafrost terrain will be required if any of the above-noted observations are made, and will include the following:

- Timely correction of drainage issues to remove the cause of water ponding along the toe of the embankment. This may include the installation of additional culverts in locations that are not obvious cross-drainage locations. Construction of surface water deflection berms, rather than ditches, to divert water away from the road embankment may also be considered. The largest effect on the stability and serviceability of the road in the areas of ice-rich permafrost will come from inadequate handling of surface water and ground water in the active layer, leading to ponding at the toe.
- Addition of more embankment fill to correct grade and surface irregularities where settlement or instability is occurring. Additional fill may also be required in some locations to provide additional thermal cover to the underlying permafrost soils.
- Removal of plowed or drifted snow from the side slopes of the embankment. Snow accumulation on the embankment slopes insulates the ground below the slopes, yielding much warmer temperatures in the subgrade, which can exacerbate thaw in the following summer season thereby leading to embankment instability.
- If icings (aufeis) occur, accumulating ice will be removed along with an attempt to create a channel in the ice to increase water velocity. If aufeis is occurring at culvert locations and culverts are filling with ice, it must be removed. This may require regular steaming of some culverts throughout the winter.
- Opening of all culverts prior to freshet, which may require digging out the ends of the culvert and steaming to remove accumulated snow and ice, such that they can pass the freshet flows.
- Embankment movement or spreading, thought to be the result of creep of the ice-rich soils may require flattening of the side slopes to reduce shear stresses. In the case of higher fills, toe berms may be considered to reduce creep.

4.3 SNOW REMOVAL AND SNOW MANAGEMENT

Management of snow accumulation will consider the following objectives; human safety, drainage of snow melt, permafrost preservation, wildlife movement and road conditions. Snow management will vary during different periods of the year to achieve as many of these objectives as possible.

The manner in which the snow is cleared will include consideration of the road configuration to verify that snow accumulation will not compromise drainage during the freshet. Snow clearing will also be performed to help with the preservation of permafrost in the road apron. When safe to do so, snow will be cleared beyond the road shoulders to eliminate a snow blanket on the shoulders, which acts to insulate the road apron and may cause problems with permafrost.

To allow wildlife movement during the winter months, snow banks will be managed and maintained to less than 1-m high and will include periodic breaks to allow wildlife to move across the road.

Sections of the road are expected to experience snow drifts because of strong winds over the winter period. As much as possible, this snow will be cleared to the downwind side of the road to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely. Prior to the annual freshet and where deemed necessary, snow will be removed from drainage ditches using an excavator or rubber-tired backhoe.

4.4 DUST MANAGEMENT

Dust suppression is typically not utilized on remote northern roads. The amount of dust generated along a road is dependent on the dryness of the road surface; the number, weight, and speed of vehicles; and maintenance of the driving surface. Regular grading of the road combined with the addition of granular material to the driving surface will be needed; this will improve road safety and also reduce the amount of dust. Dust will also be mitigated by maintaining posted speed limits.

In areas or times identified by the Proponent road monitor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition is affecting vegetation (including browse for ungulates) wildlife habitat, fish habitat, or water quality, the Proponent will arrange mitigation measures as appropriate. Dust suppression may involve actions such as grading of the road surface, placement of new coarser topping, or watering of the road surface. If watering of the road surface is required, then water would be pumped from local rivers and creeks into water truck. The maximum estimated amount will be 100 cubic metres (m³) per day, and pump intakes will be screened to prevent the entrainment of fish. The use of chemical dust suppressants is not expected for the NAR; however, chemical dust suppressants will be considered if other mitigations efforts are unsuccessful and there is a possible safety concern arising from dust.

More information on dust controls and BMPs related to pumping of water from local rivers and creeks will be in the Dust Management Plan that is currently in development for project licensing.

4.5 INTERACTION WITH WILDLIFE

Wildlife presence in the area of the NAR is expected to vary seasonally, or even annually; however, wildlife are expected to occasionally be observed on or adjacent to the NAR. Wildlife that may be found in the vicinity of the NAR include, but are not limited to, Caribou, Moose, Mule Deer, Thinhorn Sheep, Wolves, Bears and a variety of furbearers, small mammals and birds. An operational decision tree matrix for drivers dealing with wildlife along Project roads is provided in **Figure 4-1**.

Wildlife will have the right-of-way at all times. In the event that wildlife presence creates a barrier to movement (e.g., aggregations of Caribou), the Proponent's Environment Department will be in charge of managing the situation and, with the collaboration of other relevant departments such as Safety and Security, will advise road users of the hazards. Proponent's road users will report by radio if any wildlife is observed on the road or within 100m of the road, or if extra vigilance is needed along a specific area of the road. The following protocols will be implemented for the protection of wildlife on the road:

- The NAR is designed for speeds of 50 km/hr. Reduced speeds are a proven method of reducing the potential for collisions between wildlife and vehicles (EDI 2015). Additional speed restrictions along specific sections of road may be implemented for the protection of wildlife on an as-needed basis.
- Wildlife will be given right-of-way on the road. Vehicles must stop until the animal(s) moves off the road. Proponent drivers will be vigilant for wildlife, and will take all reasonable actions to avoid collisions with wildlife. If wildlife are observed on or near the road, Proponent traffic will stop as far back as safely possible; if after 5 minutes the animals have not moved off the road, the vehicle may proceed slowly and cautiously (less than 20 km/hr).
- Road signage, including both permanent and temporary/movable signage, will be erected to inform users regarding seasonal wildlife issues and high-risk areas for wildlife collisions.
- Wildlife observations along the road will be communicated to nearby drivers via radio communications to alert drivers of potential hazards; communication of wildlife locations may be suspended when the communication presents a larger risk to wildlife (e.g., moose locations during hunting season).
- All Proponent vehicles will be equipped with a wildlife sighting log to record wildlife observations. Drivers will be required to document all wildlife observations and wildlife logs will be submitted to the Environment Department on a weekly basis.
- The location of an aggregation of Caribou must be immediately reported to the Safety, Environment or Site Services departments, who will inform all potentially affected employees.
- All incidents between vehicles and wildlife must be reported to the Proponent's Safety and Environment Department whether they are:
 - Near-miss
 - Collision with injury
 - Collision causing accidental death.
 - Each incident will be investigated by the appropriate Supervisor and the Environment Department, and measures to avoid recurrence will be implemented. Disciplinary measures will be taken against any employee or contractor if the investigation concludes that the accident is the result of negligence.

Upon approval of Yukon Conservation Officer Services, animal and bird fatalities resulting from collision will have carcasses collected; salvageable meat will be offered to local First Nations, damaged meat/body parts will be made available to local trappers or disposed of.

Temporary road closures and/or traffic restrictions (e.g., convoying traffic, decreased speed limits, traffic restrictions during certain hours) may be implemented as determined to be required to mitigate effects on wildlife during sensitive periods. Temporary road closures or traffic restrictions will be determined by the Proponent in consultation with Environment Yukon, Tr'ondëk Hwëch'in Fish and Wildlife staff and other road users as needed. Refer to the **Wildlife Protection Plan (Appendix 31-F)** for details on possible temporary traffic restrictions for the seasonal protection of wildlife.

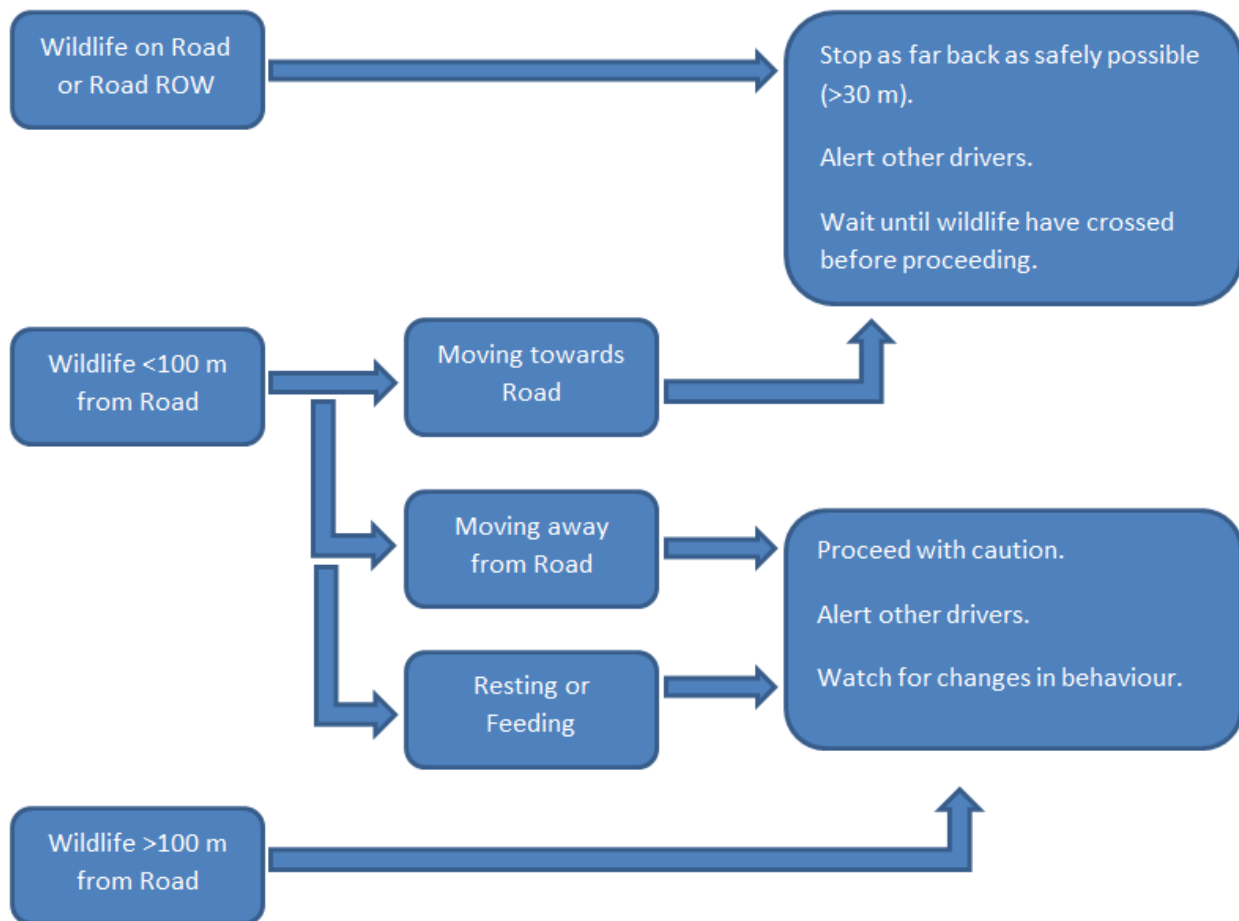


Figure 4-1 Project Wildlife and Road Operations Decision Matrix

The NAR requires barge crossings on both the Stewart and Yukon rivers. Barge landing sites have been individually designed to best accommodate the characteristics unique to each site.

Barges will be self-propelled deck barges with a minimum net tonnage of 75 t. The deck length will be a minimum of 30 m with a maximum draft of 0.7 m. **Figure 5-1** through **Figure 5-4** provide typical plan, profile, and section drawings for the barge landing design.



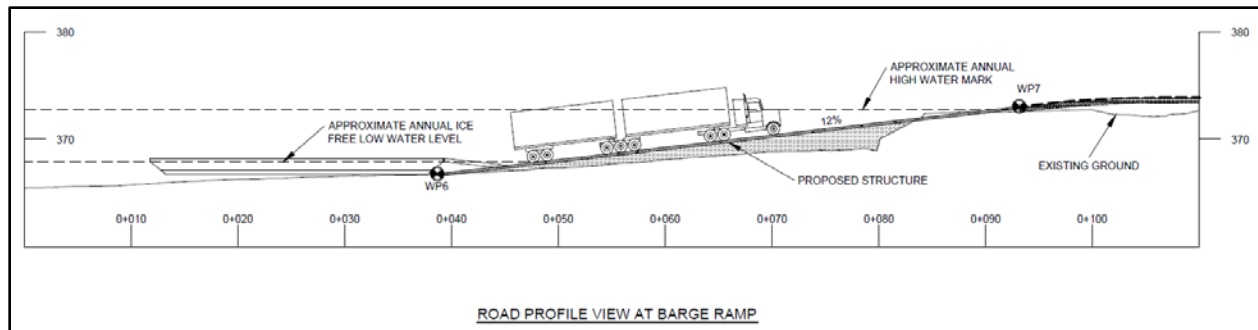


Figure 5-2 Profile View at Barge Ramp

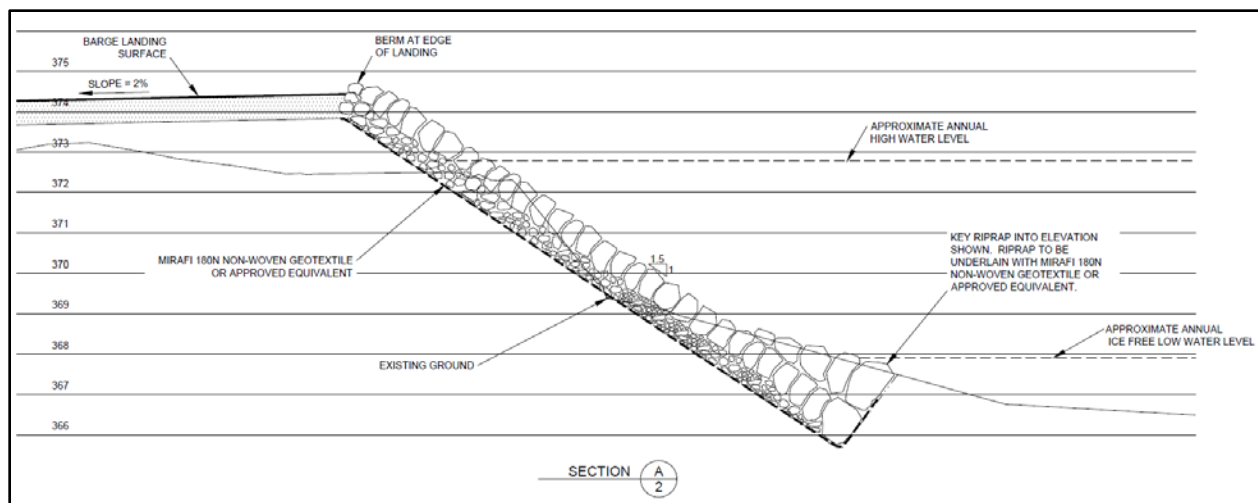


Figure 5-3 Typical Section through Barge Landing

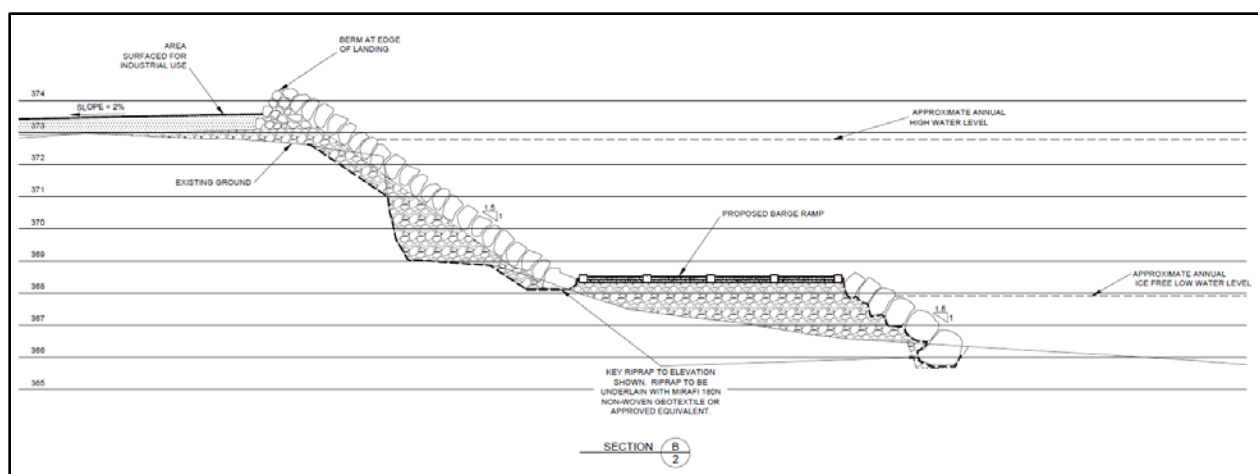


Figure 5-4 Typical Section through Barge Ramp

5.2 OPERATING PLAN

The barges at both the Stewart River and Yukon River are assumed to be operated in similar fashion. Barges are estimated to operate an average of 158 days per year from late May to late October each year. Each barge will be operated by a Transport Canada-certified captain and have a deck assistant.

Access control will be put in place for the barges at the Stewart and Yukon rivers. Only authorized vehicles will be permitted to be transported on Proponent's barges (see **Section 3.1**).

5.2.1 FUELLING REQUIREMENTS

Fuel for the barging operations will be stored in 20,000-L double-walled tanks that will be placed a minimum of 30 m from the water line inside of high-density polyethylene-lined berms. One fuel tank will be located on each of the south side barge landing at the Stewart and Yukon Rivers. Lined containment berms will be sized to provide 22,000 litres of storage, or 110% capacity of the tank. The fuel tank will be periodically filled by fuel trucks hauling fuel to the Project site. A spill containment tray will be placed underneath the fuelling nozzles.

5.2.2 MONITORING AND MAINTENANCE

Prior to launching the barges back into the river at the beginning of the open water season, all major repairs will be performed on the barges to minimize mechanical down time during the season. Routine preventative maintenance will be performed throughout the open water season.

At the end of each barging season, the barges will be removed out of the rivers and stored on the southern barging landing areas. Site services equipment such as a dozer and loader will be used to remove the barges out of the water. The barge on the Stewart River will be removed first, then the Yukon barge, so no equipment will be stranded between the two rivers. The barges will be winterized prior to storage. Winterization will consist of draining all fuel, lubricants and coolants to prevent spills over the winter. The same site services equipment will be used to push the barges back into the rivers when the barge season resumes in the spring.

Annual geotechnical inspections of the river banks, barge ramp and lined sumps will be conducted by qualified geotechnical engineers licensed to practice in Yukon. Weekly inspections during operating months of the fuel tank, fuel containment and fuelling equipment will be conducted by the Proponent.

5.3 GENERAL BARGE SAFETY

The Proponent's barge crew will be trained and certified in Marine Emergency Duties (MED) A1 and A2. The MED course meets the standards of training, certification and watch keeping and is run by Transport Canada. The A1 MED course covers basic safety with a focus on hazards and emergencies awareness, firefighting, emergency response, lifesaving appliances and abandonment, survival and rescue. The A2

MED course covers small passenger-carrying vessel safety with the same focus as A1 with the addition of maintenance and inspection of emergency equipment and passenger control. The barge crew will also be trained in Marine First Aid.

The Proponent's ERT and environment staff will be trained in National Fire Protection Association 472 Hazardous Materials Response Certification, awareness and operations for responders.

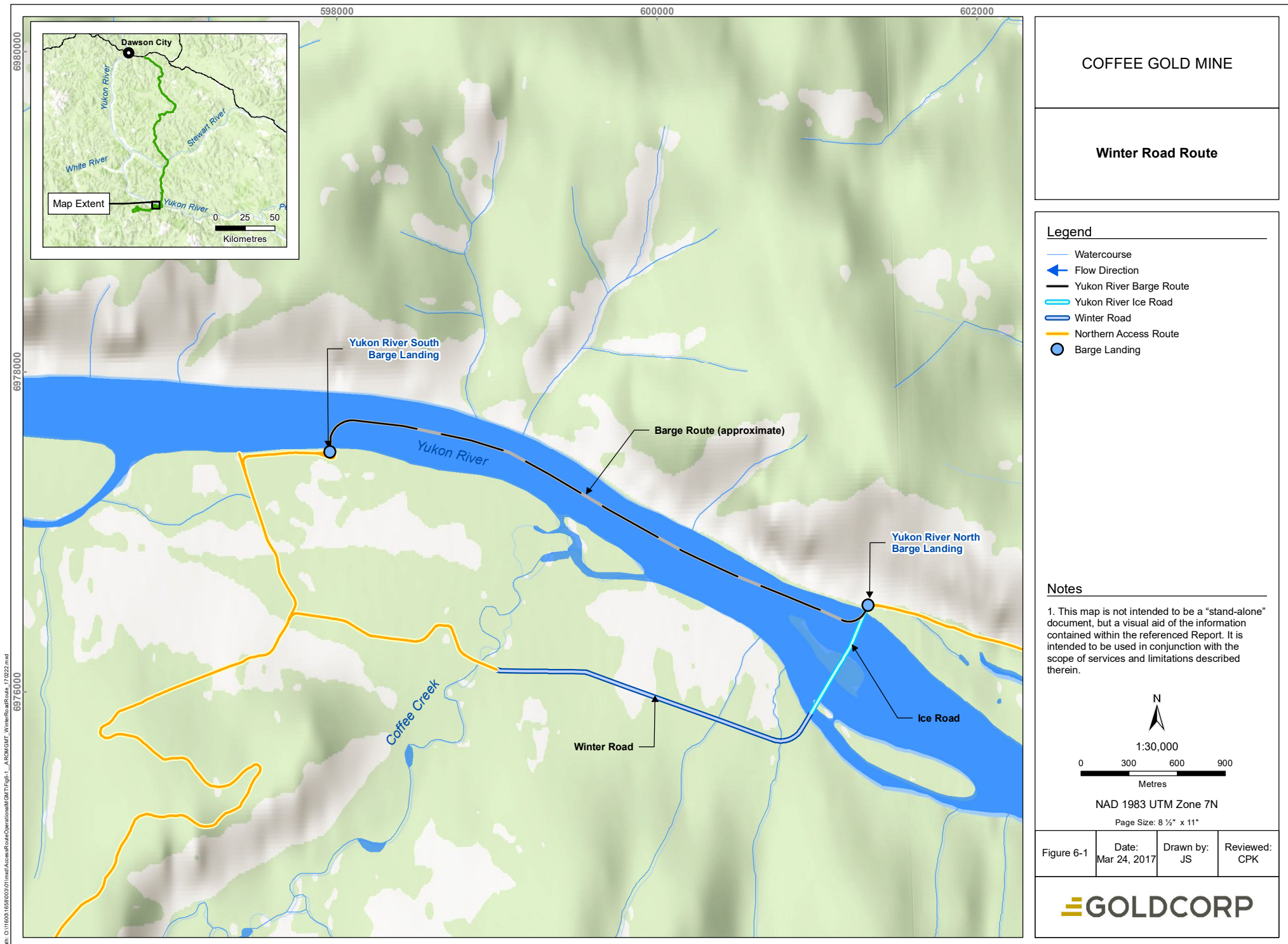
Below is a list of the procedures for dealing with various emergencies in regards to the barging operations on each river:

- Emergency Response to Capsizing or Sinking
- Emergency Response to Loss of Power or Control
- Emergency Response to Fire Onboard
- Emergency Response to Man Overboard
- Emergency Response to Freight or Vehicle Overboard
- Emergency Response to Spills.

Additional details on each procedure will be in the Emergency Response Plan.

6.0 ICE ROAD AND WINTER ROAD MANAGEMENT

Three components of ice road and bridge development are critical for the operation of the NAR during the winter months, and will be constructed annually. The winter ice components consist of: an ice bridge across the Stewart, an ice bridge across the Yukon, and an overland ice road on the south side of the Yukon which will connect the Yukon ice bridge to the all-season road and bridge at Coffee Creek. The winter road adjacent to the Yukon River is shown in **Figure 6-1** and **Figure 6-2**.



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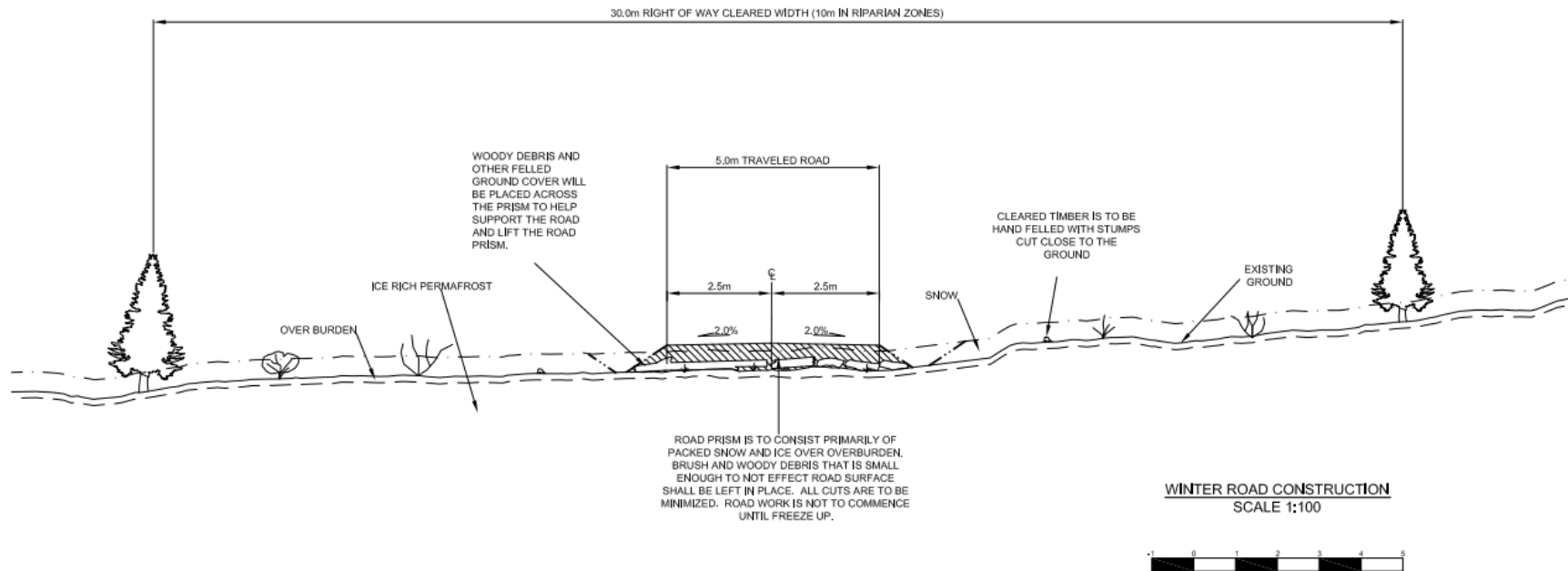


Figure 6-2 Typical Cross Section: Winter Road Construction

6.1 DESIGN CRITERIA

Table 6-1 provides the design criteria used for the ice roads on the Stewart and Yukon rivers.

Table 6-1 Ice Crossing Design Criteria

Operating Speeds	Unit	Value
Loaded trucks on ice	km/hr	25
Loaded trucks on land	km/hr	30
Loaded trucks on/off portages	km/hr	10
Empty trucks on ice	km/hr	35
Empty trucks on land	km/hr	55
Road Width on ice	m	10

Table 6-2 provides minimum ice thickness and total allowable weight for various vehicle configurations.

Table 6-2 Load Limits at 100 Percent of Highway Legal Gross Vehicle Weight

Vehicle Configuration	Minimum Ice Thickness (m)	Total Allowable Weight (kg)
2-Axle Hotshot	0.66	14,600
3-Axle Hotshot	0.73	22,500
6-Axle Tractor Trailer	0.89	46,500
7-Axle B-Train	0.96	56,500

Note: kg - kilogram

6.2 WINTER ROAD CONSTRUCTION

The winter road and ice roads will be constructed by an experienced contractors or Proponent personnel. Construction of the winter road is planned to begin in late November each year. At this time, it is expected that the ground subgrade and rivers are frozen and able to support light tracked equipment. The start of construction will be dependent on seasonal conditions in any given year.

Construction of the winter road and ice roads consists of first determining if there is adequate ice thickness on the rivers to support construction equipment. Prior to construction, the ice profiles will be reviewed and permissible equipment weights will be approved and minimum ice thicknesses to support equipment will be determined. Snowcats, with a low bearing pressure, will work behind the profiling crew, clearing the snow along the ice alignments. Once the snow is cleared from the ice, flooding will commence in order to increase ice thickness. Once ice thicknesses are sufficient, heavier track and rubber-tired equipment will begin portage construction and road widening on ice, to promote maximum ice growth.

Winter road construction typically consists of layers of compacted snow and water placed on the frozen ground to create a level driving surface suitable for highway-legal loads. The winter road section will be roughed in on the initial pass and a final grooming of the winter road will take place once the crews have the entire winter road route opened to design widths.

Once the winter road is constructed to design width, crews will focus on grooming and building up the portage section, pushing back snowbanks, and flooding along the ice roads to advance ice development.

Water to construct the ice bridges and winter road will come from the Stewart and Yukon Rivers. During early construction activities when flooding is required, it is estimated that a maximum of 300 m³/day of water from each river will be required. River crossings constructed on ice will adhere to DFO *Ice Bridges and Snow Fills* (DFO 2007) as well as DFO *Protocols for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (DFO 2010).

Once the ice roads and winter road are deemed suitable for hauling, they will be monitored and maintained to ensure safe and continuous operation until the end of April (see **Section 6.4**).

6.3 WINTER ROAD OPERATIONS

Once the winter road and ice road have been approved for hauling, the NAR will re-open and operate according to the traffic management rules and procedures outlined in **Section 3.0 Traffic Management**.

Additional signage will be provided at the access points of the ice roads to notify drivers of the reduced speeds on the ice.

Emergency shelters will be temporarily placed at each barge landing, and equipped with survival and communications equipment.

6.4 WINTER ROAD AND ICE ROAD MONITORING AND MAINTENANCE

Once the winter road and ice roads are full operation, the Proponent will use road maintenance crews for the following tasks:

- Maintaining road widths and repairing damage to the ice sheets as required
- Focused flooding.

Monitoring activities will include:

- Ice profiling every second day until the ice roads reach 100% capacity, then weekly
- Identifying ice structural conditions, such as excessive cracking and pressure ridges
- Measuring ice thickness and density.

Once hauling on the winter NAR is complete, maintenance crews will perform the following tasks to decommission the road:

- Remove all gravel on the ice surfaces that may accumulated.
- Gather all road signs and properly store them for future use.
- Remove any garbage that is found along the route.
- Remove any hydrocarbon spills that are found along the route.
- Conduct final maintenance of all winter road construction equipment.
- Demobilize from site.

7.0 BEST MANAGEMENT PRACTICES

Applicable BMPs, as described in *Best Management Practices for Works Affecting Water in Yukon* (Government of Yukon 2011), will be implemented. In addition, the Proponent will implement DFO advice and direction that apply to the protection of water quality, including *Project Planning, Erosion and Sediment Control, Shoreline Re-vegetation and Stabilization, Fish Protection, and Operation of Machinery* (DFO 2013). The Proponent will implement BMPs to protect vegetation and water quality, minimize effects to fish and fish habitat, reduce erosion and sediment, and minimize interactions and disturbances to wildlife.

7.1 VEGETATION MANAGEMENT

Operational activities along the NAR are not expected to involve the clearing of vegetation, with the possible exception of periodic clearing along the road right-of-way to meet operational and/or safety needs. During clearing activities:

- Known locations of rare plants and sensitive habitats (e.g., wetlands) will be marked prior to the commencement of works. To the extent possible, vegetation clearing will be minimized within an appropriate buffer of these sites.

To limit the spread of invasive species along the NAR:

- To the extent possible, clearing activities within the road right-of-way will minimize the disturbance of native vegetation and limit soil exposure
- Whenever practical, clearing activities within the road right-of-way will avoid disturbing areas that are within or adjacent to existing invasive plants populations; if work must occur in these areas, activities will be conducted in advance of seed development to minimize the potential for spreading seeds, and movement of equipment between infested and non-infested areas will be restricted to the extent possible.
- Whenever practical, quarry and borrow sites will be inspected to verify they are free of invasive species prior to the transport of gravel or other materials for road maintenance to new areas.

Dust management along the NAR (**Section 4.4**) will help limit effects to adjacent vegetation. More information on vegetation along the NAR, as well as mitigation and monitoring programs relevant to vegetation, will be included in the Vegetation Management Plan.

7.2 REFUELLING AND SPILL PREVENTION

Petroleum hydrocarbons will not be stored within 30 m of the top of a bank.

- Petroleum hydrocarbons stored in drums must have secondary containment, and will be covered to prevent rainfall and snow from filling the containment area.
- Fueling and maintenance of mobile equipment must be done at least 30 m from watercourses (with the exception of barges, see Section 5.2).

- Spill kits are to be present in all of the Proponent's mobile equipment, and large kits will be located at fuel and lubricant storage areas, and at river crossings.
- Appropriate spill kits will be onboard any vehicle that transports on behalf of the Proponent dangerous goods and at the barge landings.
- Spills are to be contained, cleaned up, and reported according to the Spill Contingency Plan.

It may be necessary to operate small gas engine power equipment near water, principally water pumps used for site isolation during culvert repair, installation, and dust control practices. The following BMPs are to be used to minimize risk of petroleum hydrocarbons from entering watercourses:

- Place water pumps on a fuel containment tray and position above the high-water mark, and remove them at the end of each work day.
- Refuel water pumps by hand (2- or 5-gallon fuel containers) and ensure a spill kit is present at the time of refueling.
- Store pumps at minimum of 30 m away from a watercourse when not in use.
- Store fuel containers a minimum of 30 m away from a watercourse (i.e., do not leave jerrycans next to the pumps).
- Inspect in-use pumps daily.
- Fish screens will also be installed over the intakes of suction hoses placed in fish-bearing waters in accordance with *Freshwater Intake End-of-Pipe Fish Screen Guide* prepared by DFO (1995).

7.3 EROSION AND SEDIMENT CONTROL

Erosion and sediment control will be required for repair and maintenance activities that have the potential to affect watercourses by introducing sediment into the water. Effective erosion and sediment control measures should be installed before starting work to minimize the potential for effects to fish habitat and water quality.

- Erosion and sediment control measures will be maintained until all disturbed ground has been stabilized, suspended sediment has resettled to the bed of the waterbody or settling basin, and runoff water is clear.
- Erosion and sediment control measures will have regular inspection and maintenance, and will be repaired if damage occurs.
- Any surfaces that are disturbed will be stabilized (e.g., with topsoil and seeding, straw) to prevent sediment from entering the watercourse.
- Filtration techniques, such as silt fencing and/or straw bales, will be used where required to minimize the introduction of silt or sediment into a watercourse.
- Surface roughening or cat-tracking on slopes will be used where required to help trap runoff and encourage infiltration into the ground.
- Check dams will be installed if site conditions warrant.

- Non-biodegradable erosion and sediment control materials will be removed once the site is stabilized.
- Straw matting, or similar tools, will only be obtained for erosion control purposes if no other methods are available.

7.4 SPILL PREVENTION AND SPILL KITS

The Spill Contingency Plan will be kept on-site. Employees and contractors will be trained in fuel handling and storage BMPs, and how to implement the Spill Contingency Plan.

7.5 INSTREAM WORK

Instream repair and maintenance work may have the potential to affect water quality, fish, and fish habitat if equipment is required to be placed instream. To reduce the risk of fish mortality as much as possible during repair and maintenance of instream structures (e.g., culverts), site isolation and fish salvage measures will be employed. Site isolation and fish salvage comprise an effective method to prevent direct and indirect fish mortality as a result of repair and maintenance activities, by carefully removing fish from a work area as well as preventing water from contacting construction works, thus maintaining water quality. Fish screens will also be installed over the intakes of suction hoses placed in fish-bearing waters in accordance with *Freshwater Intake End-of-Pipe Fish Screen Guide* prepared by DFO (1995).

Annual instream maintenance is expected at the barge landings to remove barriers to safe transport that may have been deposited by the annual movement of ice. Dredging or removal of boulders will be carried out in accordance with DFO protocols and guidance during appropriate fisheries timing windows.

8.0 WILDLIFE MANAGEMENT

Operation of the NAR has the potential to affect wildlife in several ways, including indirect loss of habitat due to sensory disturbance adjacent to the road; increased mortality due to collisions with vehicles; increased mortality due to increased hunter access to the area; and increased mortality or effects to health resulting from contamination of the surrounding environments (through dust deposition or other contamination within the terrestrial environment). The Proponent has introduced procedures to minimize the potential effects to wildlife (**Section 4.5**), and will strictly enforce policies regarding human-wildlife interactions.

Monitoring of wildlife along the road corridor will begin during construction. Wildlife monitoring along the road will be conducted in conjunction with wildlife monitoring programs established for the broader Project and will include tracking wildlife observations along the road, as well as broader regional surveys for Caribou, Moose, Wolves, and Raptors. Adaptive management measures will be employed to manage for any unanticipated effects from the Project. The wildlife monitoring and adaptive management programs are detailed in the **Wildlife Protection Plan (Appendix 31-F)**.

9.0 REFERENCES

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