ENVIRONMENTAL PROTECTION PLAN

REMOVAL OF FUEL DRUMS
WITHIN WATERSHED
AND
CULVERT INSTALLATION

EKALUGAD FJORD
FOX C DEWLINE SITE

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1.0 INTRODUCTION

Indian and Northern Affairs Canada (INAC) has retained Public Works and Government Services Canada (PWGSC) to complete a remediation program at the decommissioned Intermediate DEW Line site at Ekalugad Fjord, Territory of Nunavut.

The following tasks will be completed in order to achieve remediation at the site:

- Existing site infrastructure will be demolished and the demolition wastes will be segregated into hazardous and non-hazardous materials and disposed of appropriately;
- Contaminated soil areas, identified during the previous field investigations, will be remediated;
- All hazardous materials and soil will be disposed of at an off-site licensed disposal facility;
- Scattered surface debris and partially buried debris at the site is to be collected and disposed of;
- New landfills will be constructed to contain the non-hazardous contaminated soil and demolition waste generated during the clean up;
- Existing landfills, on this site, will be remediated, as required; and
- Disturbed areas will be physically restored to and shaped to match the existing terrain.

Included in the above tasks is the removal of fuel drums that have been dispersed throughout the site principally by wind action. The drums extend throughout the site and are strewn into the flood plain and within a river that connects the ocean with a freshwater lake, and a glacial stream that discharges from the adjacent mountains. The freshwater lake also contains drums and debris deposited along the beach and embankments.

Culverts will be required to permit heavy vehicle to cross the the glacial stream

Removal of the drums and placement of the culverts will be completed in a single summer, tentatively set for 2006. To proceed with the permitting and approvals for the proposed activities, a environmental protection plan is required. In order to accomplish this the following tasks will be completed:

- Review available information applicable to the project area (including correspondence, photographs, previous fisheries studies ect.).
- Consolidate details in support of appropriate techniques for instream works of the project.
- Assess any potential habitat changes to the river and glacial stream as a result of the activities noted above;
- Prepare an Environmental Protection Plan (EPP). This will follow the Fisheries and Oceans Canada (DFO) *Application Requirements for Works*

That Have the Potential to Impact Fish or Fish Habitat and include information from other applicable guidelines as necessary to meet both federal and territorial regulatory requirements. The EPP will also include contingency plans for accidental events that could potentially affect fish or fish habitat during the construction activities;

- Carry out environmental monitoring during the actual work period (part of the EPP).

This document will present the EPP, assess the potential impacts to fish and fish habitat, and provide mitigation measures.

2.0 FISHERIES

2.1 Site Description

The site is located on Ekalugad Fjord, Baffin Island, approximately 195 km south of Clyde River. The upper or main station area of Fox-C overlooks the Ekalugad Fjord at 770m above sea level, and is connected to the lower site, Qarmaralik Cove by a gravel road. The landscape is rugged and partially ice covered mountainous terrain composed of Precambrian bedrock hills with lowland plains covered with extensive glacial moraine and sand outwash. A glacier fed freshwater lake is situated north west of the main station area. This lake is connected to Qarmaralik Cove (Arctic Ocean) by a 1 km stretch of meandering river. A glacial stream also runs through the site and empties into the freshwater lake, along which the upper road parallels and frequently crosses.

2.2 Environment

A characterization of the natural environment at Fox-C was completed on August 26th and 27th 2004 by Jacques Whitford to determine the extent of fish habitat in the freshwater lake, Qarmaralik Cove and the river connecting these two water bodies. There was limited information in the report on the glacial stream.

Two other reports were completed in 2004 for geotechnical investigations as well as a Phase III Environmental Site Assessment. Sediment samples were taken during the assessment in 2004 in the area of the fuel drums at both the lake and river. Laboratory analyses were conducted on the sediments and included metals, PCBs, PHCs and PAHs. There were no exceedances noted in the chemical results received for these samples.

Terrain

The terrain at Fox-C consists of high rugged hills with exposed rock outcrops. The three primary areas of past activity at the site include the Beach Area, the Lake Area, and the Upper Station. The Beach Area is located on Qarmaralik Cove. The Upper Station overlooks Ekalugad Fjord and is 770m above sea level approximately 3 southeast of the Cove. The Lake area is located 1 km directly south of Qarmaralik Cove.

The terrain and respective soil conditions at Fox-C are varied. Soil conditions observed in the Beach Area are clayey silt in the outwash valleys. Sand and gravel were noted in the area of Lake Road, and boulders and weathered bedrock are dominant at the Upper Station. Baffin Island is part of the northeastern Canadian Shield and is underlain with granitic rock assemblages. The bedrock geology of this site is primarily granite and quartz monsonite. Permafrost is continuous and widespread in the Quaternary deposits which mantle Baffin Island.

Surficial geology at higher elevations of the Upper Station are comprised primarily of bedrock and colluvium. At lower elevations surficial geology units include bedrock, moraines, alluvium, and beach sediments.

The Fox Charlie Glacier is situated some 1.5 km south of the upper site. One branch of the alpine glacier flows down to about 1 km south of the lower site. The whole icefield spreads from Ekalugad Fjord in the north to Kangok Fjord in the south.[1]

Hydrology

Drainage systems associated with the fjords on the north coast of Baffin Island are generally short and steep.

High elevation development at Fox-C is located on a narrow summit and drainage divide.

Most of the development in the lower elevations is located between the ocean and a fresh water lake. The lake is mainly fed by melt water from the glacier, by snow melt, and by a larger lake situated approximately 2 km to the west. The lake itself is approximately 3 km long and 1 km wide and discharges into the ocean through a river approximately 1.5 km long.[2]

[1] EBA Engineering Consultants, 2004
[2] EBA Engineering Consultants, 2004

Topography

The topography of Ekalugad Fjord is characterized by high rugged hills with numerous rock outcrops. The upper site is located on the summit of one of these hills which drops steeply on all its faces. The upper site is situated about 3 km from and 770m above the beach area. The beach area is located on the south shore of the fjord in the lower reaches of an outwash valley.[3]

Flora

A significant portion of the lower site was surveyed for plant and animal life to characterize the main ecosystem components of the site. In this region, the climate is harsh, restricting plant growth to only a few months per year. Generally, the lower site is characterized by undulating terrain formed by eroding glacial moraines composed mostly of sand and gravel with occasional floodplains. On the surfaces and in the crevices of most rocks, lichens and mosses were common at both the upper and lower sites. Many areas indicated extensive and ongoing erosion, causing significant substrate disturbance preventing the establishment of plants. In gently sloping areas, cotton grass and arctic heather were the dominant vegetation. In the exposed rocky areas, arctic willow, purple bladder campion, and mountain sorrel were found. Vegetation in the area is typical of plants found in tundra regions of the Arctic Cordillera.[4]

Fauna

There were six bird species observed and identified at the site including rock ptarmigan, snow bunting, raven, snow goose, Iceland gull, and the white-rumped sandpiper. Due to food requirements, bird species identified at the lower site would not likely occupy any potion of the upper site.

A polar bear and collared lemming were noted at the site during Jacques Whitford's investigation. Several caribou tracks were also noted along the sandy portion of the lake shore.

Many insect species live in the Arctic and show a wide range of adaptations to its extreme severity and seasonality. Four species were identified at Fox-C. The flat-backed kelp fly and an arctic wooly bear were observed. Two other species of arachnids were seen however, the species could not be identified.

2.3 Aquatic Habitat

The freshwater lake is approximately 40 hectares in size and is surrounded on three sides by large bedrock hills. Several glacially fed tributaries provide

[3] EBA Engineering Consultants, 2004
[4] Jacques Whitford Limited, 2004

sediment rich water to the lake, causing turbid waters. The shoreline is mainly gravel and sand with moraines near the waters edge. It was apparent that ice melt would supply significantly more water to the lake during peak flows, noted by extensive washout areas spanning approximately 14 meters wide with the existing watercourse approximately 3 meters wide. Field investigations indicate that considerable runoff into the lake would cause a high flushing rate. Outflow from the lake is located on the southeast corner and discharges along a braided river approximately 1 kilometer into Qarmaralik Cove on the Arctic coast. The river can be characterized by steep and eroding meandering banks primarily composed of sand and gravel. The river flows over relatively steep topography causing moderate to fast water velocities. Substrate on the riverbed is composed mostly of boulders, cobble and gravel indicative of a fast flowing stream with large sediment transport capacity. Ice was protruding from the river bank approximately one meter below grade at the outflow into Qarmaralik Cove at the time of the inspection indicating the approximate depth of gravel and sand are spread along the shore and into the deeper waters. Fine silt and rock flour are transported further into the ocean.[5]

There is limited information on the glacial stream that runs from the mountain and deposits into the freshwater lake. In the report on the natural environment, one of the unidentified streams that flow from the mountain to the lake indicated juvenile charr at the outlet into the freshwater lake. The glacial stream that PWGSC is concerned with has a very steep gradient that is unlikely to support fish habitat other than at the outlet. The outlet of the stream consists of flat alluvial fan formation with sand and gravel substrate. In speaking with the Jacques Whitford biologist that completed the *Natural Environment Report* for the site, he described the stream as “non-fish bearing in the upper reaches due to gradient however, fish bearing for the first 10m from the lake”. The biologist also noted that there was a large moraine located 10m in stream from the lake that provided an obstacle for fish. Therefore, PWGSC will treat the stream as fish bearing within the lower reaches of the stream. The onsite environmental monitor will also make additional assessments of the stream prior to construction activities.

To assess the presence of fish habitat at lower areas of FOX-C, sections of the lake, river and Qarmaralik Cove were visually inspected and fished using a rod and reel. In addition, Inuit were consulted to determine if these water bodies are fished for food. Overall, field investigations of the water bodies determined that Arctic Charr (*Salvenlinus alpinus*) do occupy the fresh water lake and that the river provides a channel for the migration of Arctic Charr from the ocean to the freshwater lake. In addition, gravel substrates in the lake provide good spawning habitat for Arctic Charr. During the site visit, one adult charr was observed swimming upstream approximately 50 metres downstream of the lake and a second smaller charr (15cm) individual was observed at the mouth of the river. In tributaries surrounding the lake several juvenile charr were observed,

[5] Jacques Whitford Limited, 2004

indicating that this lake is providing spawning habitat for adult Arctic Charr. Juveniles observed were in good health and measured 4-15 cm in length. Within the lake, one adult charr was caught, indicating the presence of either resident or migrating fish in the lake. This individual appeared healthy and had no skin abnormalities.

Discussions with several Inuit people confirmed the presence of fish in the freshwater lake. During winter months, Inuit are known to come to the lake to ice fish when charr are spawning in the lake.

2.3.1 Arctic Charr biology

Arctic Charr are circumpolar in distribution and have the most northern range of any North American freshwater fish. They can spend their life in land locked lakes or in salt water making them an anadromous fish species. In Canada, Arctic Charr occupy coastal drainage areas of the Atlantic, Arctic and Pacific Ocean to a distance of 300 km from shore. During summer months anadromous Arctic Charr often leave their native lake and migrate to the sea for feeding. Unlike salmon, charr do not range far from their home rivers. For example, salmon will migrate hundreds of miles from their home river where as Arctic Charr seldom venture more than 100 km. Juvenile charr feed on bottom invertebrates and larger charr feed on other fishes, such as smelts or juvenile charr (Scott and Crossman 1973).[6]

2.3.2 Breeding

Females will build spawning redds (gravel pits) during the months of October to December in shallow water (1.0 – 4.4m depth) of lakes. Males may fertilize the eggs from more than one female. Preferred spawning temperatures are approximately 4.0 °C. Depending on conditions in the lake, Arcitc Charr can remain in freshwater during winter months before returing to the ocean (Scott and Crossman 1973).[7]

2.4 Summary

Based on a field reconnaissance of the freshwater lake, it is known that juvenile Arctic Charr occupy tributaries to the freshwater lake during summer months and would live in this lake throughout much of the winter months. Adult charr spend most of their time at sea only returning to the rivers and lakes to avoid low seawater temperatures. Female adult charr are known to potentially occupy the freshwater lake year round during the year that they spawn.

[6] Jacques Whitford Limited, 2004
[7] Jacques Whitford Limited, 2004

For the river, field surveys and known information on Arctic Charr biology indicate that the river outflow to Qarmaralik Cove serves only as a corridor for the migration of adult Arctic Charr into the freshwater lake for spawning. Fast flowing water over cobble does not provide good habitat for Arctic Charr spawning or year round occupancy of the river system.

Any activities requiring in water works should be undertaken so as to minimize interaction with the Arctic Charr in the freshwater lake and charr migrations in the river flowing from the freshwater lake. Since Arctic Charr are present year round in the freshwater lake and at the outlets of the surrounding tributaries, suitable mitigation measures will be required if in water works are to occur. No in water works should occur in the freshwater lake during potential spawning which would occur between October and December. Any potential in water activities in the river outflow to Qarmaralik Cove should be done prior to late August when fall migration into the freshwater lake occurs.[8]

3.0 Description of Proposed Activities

3.1 Removal of Fuel Drums

3.1.1 River Area and Flood Plain

The river area between the lake and Ekalugad Fiord has banks scattered with drums and domestic garbage. This area includes the riverbed and banks and two separate dump areas. The riverbed and banks contain approximately 200 rusted empty drums with no visible labels. Approximately 400m downstream of the lake there is an area containing tin cans, glass, wood, old newspapers and empty drums. Further down the river on the east slope there is another fuel drum dump with 175 drums scattered over the east bank above the high water mark.[9]

3.1.2 Glacial Stream

In the area leading from the mountain to the lake there is a braided glacial stream with approximately 100 barrels scattered throughout the floodplain. Approximately 15 of the drums were noted to be full to partially full at the time of the site inspection. These drums were identified and marked with orange spray paint. Fluids within these drums were identified as diesel, jet fuel and gasoline as well as mixtures containing mostly water. The majority of drums were empty.[10]

[8] Jacques Whitford Limited, 2004
[9] Earth Tech Canada Inc, 2004
[10] Earth Tech Canada Inc, 2004

The site has been abandoned for many years and although a site investigation has indicated that those drums within the water are heavily corroded and are unlikely to contain product, all drums will be assessed separately, prior to removal, to ensure that there is no product still contained within the drum.

3.1.3 Freshwater Lake

There is a fuel drum dump located near the beach at the lake. This area contains approximately 250 empty drums and some scattered wood debris. Labels on the drums indicated that they previously contained fuel, lubricating oil, and other hydrocarbon projects. Most of the drums were empty. During the inspection earlier this year, there were no fuel drums noted within the lake.

3.1.4 Summary

The fuel drums must be removed from the floodplain areas, river, and the glacial stream. According to the report written by Jacques Whitford in 2004 all of these water bodies contain, or have the potential to contain, Arctic Charr. An excavator will be used to provide additional manpower during removal of the drums from the sediments. This excavator will be on the shoreline and will not be entering any of the watercourses during mobilization, demobilization or operation. A suitable approach to removing these barrels follows below.

The following table summarized the areas requiring removal of fuel drums and the process involved.

Site	Location	Identification	Removal Process
River	Floodplain dry	Determine contents	Drums will be removed by hand and consolidated with other barrels. Any contents will be drained and disposed prior to handling. Absorbant materials will be at site in the event of a discharge to soils/sediments. Any soils/sediments with product will be removed and disposed.
	Floodplain wet	Determine contents	Drums will be removed by hand with assistance from an excavator (lifting requirement only). The excavator itself will enter the floodplain only as required on a case-by-case basis and it will not enter the wetted portion of the river/stream. Area will be boomed (with attached silt fencing) off upstream of the drums as well as another boom located downstream. Absorbant materials will be at site in the event of a discharge to the water column.

Glacial Stream	Floodplain dry	Determine contents	Drums will be removed by hand and consolidated with other barrels. Any contents will be drained and disposed prior to handling. Absorbant materials will be at site in the event of a discharge to soils/sediments. Any soils/sediments with product will be removed and disposed.
	Floodplain wet	Determine contents	Drums will be removed by hand with assistance from an excavator (lifting requirement only). Area will be boomed (with attached silt fencing) off at drums as well as another boom located downstream. Absorbant materials will be at site in the event of a discharge to the water column.
Lake	Floodplain dry	Determine contents	Drums will be removed by hand and disposed. Any contents will be drained and disposed prior to handling. Absorbant materials will be at site in the event of a discharge to soils/sediments. Any soils/sediments with product will be removed and disposed.
	Floodplain wet	Determine contents	It is not anticipated that the lake has drums that require removal as they were not noted during the on site inspection however, in the event that drums are encountered in the lake the following applies. Drums will be removed by hand with assistance from an excavator (lifting requirement only). Area will be boomed (with attached silt fencing) off at drums as well as another boom located downstream. Absorbant materials will be at site in the event of a discharge to the water column.

3.2 Placement of Culverts

The culverts will be placed at various sites along the glacial stream that runs from the Fox Charlie Glacier into the freshwater lake. These crossing are required to place an access road to allow remediation of the site. Most of these crossings currently have structures that are not suitable for the stream during spring freshet. This has resulted in the erosion of the current access road and structures due to blockages and failures.

3.2.1 Beach Road

Beach Road extends approximately 2.2 km inland from the ocean. Three of the road failures were at areas that historically had culverts constructed out of 205L drums welded together. One of the failures is at an area where no culvert had been installed. The local soils at these sites are fine-grained and are therefore, extremely erodible. All of these crossings are over the glacial stream that flows

from the Fox Charlie Glacier. Areas of the road adjacent to the glacial stream will require stabilization to enable the passage of heavy equipment.

3.2.2 Station Road

This access road runs approximately 5.9 km to the Upper Station. There are two river crossings in this section of road. Both crossings were constructed in the 1960‘s using culverts. The culverts are not large enough to accommodate the flow of the glacial stream and have since eroded and washed out.

There are 5 washout areas along Station Road that require attention. These washouts are the direct cause of failed culverts and the roadway being situated in the natural path of the glacial stream. These areas will require installation of new culverts and stabilization of the stream banks.

3.2.3 Summary

Currently, areas of the site have eroded and as a result, portions of the access roads have been washed out. Some of these areas are now inaccessible and require access to complete remedial activities. The placement of culverts will be required in order to accommodate the passage of heavy equipment to the upper Station. As many as 8 culverts will be required for the glacial stream due to its meandering nature. Some areas of the access roads will require stabilization due to erosion of the stream banks during high flow periods. Stabilization will include the use of riprap and gravel sources that are available on site.

4.0 IMPACTS TO FISHERIES RESOURCES

FOC (1990) has identified a series of options in addressing the impacts of instream activity to the aquatic environment. In order of decreasing preference, they are:

- Relocation: Relocate the activity so there is not impact to the aquatic environment;
- Redesign: Redesign the activity to reduce overall impacts, particularly to critical or important habitat;
- Mitigation: Incorporate mitigative measures in the design to reduce impacts;
- Compensation: When residual impacts remain, which cannot be addressed through any of the preceding options, compensation measures are required to replace the productive capacity of the habitat altered or lost as a result of project activities.

4.1 Drum Removal

Unfortunately, the nature of the activity is such that the drums require removal, as they are a potential impact to the surrounding environment if left in-situ. Therefore, the only options are to mitigate and provide any compensation for habitat that has been altered or lost.

One of the greatest impacts that this type of project can have on the aquatic environment is the introduction of sediment during drum removal and the potential for product release that may be trapped within the surrounding sediments, or residual product within the drum. Most of the drums are severely corroded and it is unlikely that there would be a large amount of product left within the drums however, each drum will be assessed individually to determine its integrity. Removal of the drums will be conducted at low water, in order to ensure as many drums as possible, are located outside of the wetted area.

4.1.1 Control of Hydrocarbons

With the use of heavy equipment near a watercourse, there is the potential for introduction of hydrocarbons to the aquatic environment. To minimize the risk of an accidental release of hydrocarbons, the following procedures will be undertaken:

- All equipment will be maintained and in good working order;
- Appropriate spill containment kits must be on site and ready to use before work commences;
- Refueling operations must not occur within 100m of a watercourse; and
- Maintenance and parking areas must not be within 100m of a watercourse.

4.2 Culvert Placement

The culverts are to be redesigned to improve the current situation. Currently, the culverts that were historically placed (1960's) are beyond their lifespan or were not of sufficient capacity for the glacial stream during spring freshet. Placing new culverts will ensure that the stream does not undermine or erode its current pathway. Properly installed culverts will also ensure that sedimentation from erosion is not released into the stream. These culverts are scheduled to be installed during low flow and, removed prior to spring freshet.

The glacial stream is on a steep gradient and it is unlikely that it would support fish in the upper reaches however, the habitat report written for the site indicates “in tributaries surrounding the lake, several juvenile charr were observed….”. Due to a glacial moraine located 10m in from the freshwater lake, fish cannot migrate into the upper reaches of the stream and are restricted to the lower 10m reach of the stream.

4.3 Timing of Instream Works

Arctic Charr spawn during the months of October to December in the shallow water of the lake. Construction activities will have to be completed prior to mid-September to allow for the removal of culverts prior to spawning activities. At this point it is still unknown if the glacial stream can support fisheries as there is a very steep gradient along most of the stream length. The current assumption is that at least the lower reaches do sustain juvenile charr on a seasonal basis.

Drum removal along the river will have to occur prior to August when the charr start to migrate from the fjord into the lake. Given the potential for sediment introduction associated with this activity, it is recommended that the removal be completed during low flow season. Low water occurs at this site from approximately July 15th to August 21st.

4.4 Residual Impacts

4.4.1 Fuel Drums

It is not anticipated that the residual impacts will be sufficient enough to require a fisheries compensation plan. The removal of the drums will ensure that no further product is released to the environment. There is the potential that the drums would have become fish habitat in another vicinity however, it is unlikely in this location due to the velocity of flow. This river is currently utilized by the charr as a corridor to move between the lake and the ocean. It is unlikely that the river is used as a spawning or habitat area with the exception of the inlet and outlet. As well, any structures placed to compensate the loss of fish habitat would be washed out during spring freshet.

During removal of the fuel drums, it will be necessary to place booms across the river for containment in the event that a spill occurs. These booms will have attached silt fencing and will be placed around the drums as well as downstream, in the event of failure to capture product within the first boom. Absorbent materials will be stationed at the work area to absorb product should a ruptured drum be encountered. All drums will be inspected prior to any removal process

and at this time it will be determined if there are contents within the drum. Most of the drums that are within the river itself have likely corroded and ruptured due to continued submergence in the water.

4.4.2 Culverts

There may be some residual impacts from the placement of the culverts. When first installed, there will be a release of sediments to the water column. Due to the size of the stream, it is recommended that they be placed without a diversion channel being established during installation, as this is likely to cause more disruption to the streambed. A release of sediments will also occur when the culverts are decommissioned at the end of the construction period. The installation method for the culverts will ensure that the plume will be limited in duration. Silt fencing will be placed downstream of the culvert to minimize the release of sediments to the lower reaches.

Work will be completed at low water and prior to the spawning period. Placement of the culverts is expected to commence around July 15th with removal of the structures prior to any fish spawning activities at the end of September.

5.0 ENVIRONMENTAL MONITORING

An environmental monitor will be at site during all in-stream construction and activities. The monitor will liaise directly with the contractor and will have the authority to temporarily suspend activities if it is anticipated that adverse environmental effects may result from construction activities. The monitor will also consult with the contractor in order to modify (to the extent feasible) the construction activity. The monitor will also be in direct contact with contractor personnel, and, in the event of an unforeseen impact or potential for impact, will notify the appropriate representative. The chain of command for providing feedback and incident reporting will be clearly defined as directed by DFO.

The environmental monitor will:

- Assist in the removal of drums within the water bodies and within the flood plain;
- Assist in the placement of culverts silt fencing the lower reaches of the stream area when installing the culverts and making the necessary fish salvages if required;
- Install silt fencing;
- Monitor water bodies during culvert and drum removal for excess sedimentation;
- Assess requirements for erosion and sediment control;

- ❖ Make a final assessment of erosion and sediment control and site stabilization before equipment leaves the site.

6.0 SUMMARY OF IMPACTS

Table 1 presents a summary of impacts to the aquatic environment as well as proposed mitigation and compensation. Impact areas are also identified. Many of the impacts can be mitigated with current methods and technology.

6.1 Fuel Drums

The proposed activities will be the removal and disposal of fuel drums that are scattered within the flood plain and in the stream and river. The removal of these drums will enhance the surrounding environment and will eliminate the threat of further product release within the system.

Removal of these drums will also cause some sedimentation and there is the potential for residuals and product to be dispersed into the water column. These impacts can be mitigated by providing booms with attached silt fencing and spill containing absorbent materials at the site. A drum by drum inspection will be conducted to ensure that those drums with the potential to contain product will be assessed prior to removal. Over pack barrels may be required if there are drums located at depth.

If the environmental monitor determines that sediment sampling or floodplain sampling is required of the sediments surrounding the fuel drums, and this area is found to be impacted, the removal of soils within the wetted area will be performed in the dry. This will be completed by constructing a coffer dam around the impacted area and pumping seepage into a barrel. Water contained in barrel will then be tested for contaminants and will either be returned to the environment or removed from site and disposed in a registered landfill, depending on chemical results. All impacted sediments will be disposed of in a registered landfill.

6.2 Culvert Installation

Other site activities will result in the placement and subsequent removal of culverts in order to complete remediation of the site. Impacts will be balanced by the removal of non-conforming or unsuitable structures currently utilized at the site to place conforming structures that will be removed prior to spring freshet. There will no longer be any obstructions for the glacial stream to circumnavigate and will therefore, not erode into the new access road running alongside the

stream. This will result in less erosion and consequently sediment within the stream.

During installation of the culverts the on site monitor will establish if a pump and dam system will be required to complete the installation in the dry. This will be dependent on the velocity and quantity of flow at the time of installation. A pump and generator will be made available at site as a contingency measure.

Release of sediment is likely to occur during removal of the obstructions and installation/decommissioning of the culverts. These releases will be temporary and will be completed prior to spawning season. Silt fencing will be placed down stream of the culverts during installation to ensure limited sedimentation is encountered in the lower reaches of the stream.

Table 1. Summary of Potential Impacts to the Aquatic Environment

Potential Impacts	Area Affected	Redesign	Mitigation	Compensation	Net Impact
Fuel Drums					
Loss of instream habitat	Localized		Replace loss of habitat with boulders at outlet of river.		0
Introduction of sediment			Can be mitigated.		0
Introduction of a deleterious substance			Can be mitigated.		0
Culvert Installation					
Introduction of sediment			Can be mitigated.		0

Photo 1: Barrels along the river and floodplain.

Photo 2: Barrels along the riverbank.

Photo 3: Barrels in the river between the Lake and Ekalugad Fjord.