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ENVIRONMENTAL IMPACTS OF INSTALLATION OF CULVERTS, CONSTRUCTION OR MODIFICATION OF DRAINAGE DITCHES AND CREATION OF FISH HABITAT

Prepared for:

IQALUIT INTERNATIONAL AIRPORT IMPROVEMENT PROJECT "IIAIP"

BBC-SINTRA JOINT VENTURE

October 2014

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Prepared by:

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1. DRAINAGE CULVERT INSTALLATION IN NON-FISH BEARING WATERS

Culverts will be installed at all locations where access roads are required to cross a water body. The type and size of the culvert to be used will be designed to allow the runoff peak flow from a 100 year return period storm to pass through in such a way that the inlet water level does not exceed the top of the culvert. The analysis and design will consider the required flow rate, culvert size and the type of material that it is made from, the layout and structure of the entrance and outlet and erosion control.

The installation of culverts in a water body carries the risk of causing erosion and release of sediment-laden runoff into nearby watercourses. The level of Total Suspended Solids (TSS) has an effect on water clarity and aquatic life by reducing the success of feeding and fish egg and larval survival and fish habitat through nutritional alterations of the fish and aquatic plants.

1.1 Environmental Protection Procedures

The impact of erosion and the release of sediment into the water will be prevented or mitigated using the following measures:

- Watercourse crossings will be installed according to approved plans and procedures;
- Cut and fill areas will be stabilised by using low grades less prone to erosion;
- Silt fences silt (turbidity) curtains, sediment traps, or gravel berms will be installed along the banks of watercourses during construction to limit the amount of sediments escaping from the work site;
- Prior to the installation of any culverts sediment control measures will be installed before the start of any works;
- Crossing of watercourses by equipment must be limited to only that which is absolutely necessary;
- Sediment and erosion control measures must be kept in place, as required, until all disturbed areas have been stabilized;
- Work areas will be inspected regularly by the site engineer and/or environmental monitors;
- As much as possible installation of culverts should be done during the periods of minimum flow reduce the amount of erosion and sedimentation
- Works will be designed to encourage the regrowth of local plants on exposed soils. Transplanting of plants from other areas of the airport may also be attempted; and,
- Work will be conducted outside of the spawning period of the arctic char between the 1st of September and the 30th of June.

1.2 Predicted Environmental Impacts and Proposed Mitigation Measures

Predicted Environmental Impact	Proposed Mitigation
Decrease of water quality due to sediment or other contaminants both at the crossing and downstream	• Construction will follow practices outlined in section 1.1
Increased potential for erosion damage to the banks of the water body from construction equipment	• As much as possible machinery will remain above the high water mark and it will operate in a manner that minimizes disturbance to the banks of the water body. • Sediment and erosion control measures will be installed prior to

	starting work to limit the entry of sediment into the watercourse. The control measures will be inspected regularly and all required maintenance will be done as needed to maintain the efficiency of the control measures.
Removal of vegetation at culvert installation locations.	• This removal of vegetation should be kept to a minimum and should only be done in the area where the culvert will be installed. • Crossings need to be designed so that they are perpendicular to the watercourse. • Any disturbed areas will be graded in such a way as to encourage the re-growth of native plants.
Potential for spills of fuel or other fluid from construction vehicles	• Adhere to contingency plans identified in the Spill Response Plans. • Regular maintenance of machinery is required to ensure that it is free of fluid leaks. The machinery should be inspected at a minimum of twice per day for leaks, and any leaks should be addressed immediately. The machinery should arrive on the site in a clean condition. Refueling should be done at a safe distance from the water body (Minimum 30 m) and in a location where fuel flow directly towards the water body should a spill occur. • A spill kit will be maintained on the site in case of leaks or spills from machinery.

2. CONSTRUCTION AND MODIFICATION OF DRAINAGE DITCHES IN NON-FISH BEARING WATERS

The ditch will be designed to allow the runoff peak flow from a 100 year return period storm to pass through in such a way that the inlet water level does not exceed the top of the ditch. The analysis and design will consider the required flow rate, slopes of embankments and the type of material used to construct embankments, the layout of the ditch (avoiding any sharp turns) and erosion control.

The construction or modification of ditches has the risk of causing erosion and release of sediment-laden runoff into the ditch and the nearby watercourses. The level of Total Suspended Solids (TSS) has an effect on water clarity and aquatic life by reducing the success of feeding and fish egg and larval survival and fish habitat through nutritional alterations of the fish and aquatic plants.

2.1 Environmental Protection Procedures

The impact of erosion and the release of sediment into the water will be prevented or mitigated using the following measures:

- Ditches will be constructed or modified according to approved plans and procedures;
- Cut and fill areas will be stabilised by using low grades less prone to erosion;
- Silt fences silt (turbidity) curtains, sediment traps, or gravel berms will be installed along the banks of watercourses during construction to limit the amount of sediments escaping from the work site;
- Prior to the construction of or modification to ditches, sediment control measures will be installed before the start of any works;
- Crossing of watercourses by equipment can only be done one-time;
- Sediment and erosion control measures must be kept in place, as required, until all disturbed areas have been stabilized;
- Work areas will be inspected regularly by the site engineer and/or environmental monitors;
- The construction of new ditches should be started at the down gradient end (just before the breach into an existing ditch and proceed up gradient to prevent the accumulation of water the work area and allow time for sediments to fall out of suspension;
- If possible the flow of water through a ditch to be modified should be stopped during any work. The flow of water should only resume once the area has been stabilised and all work is complete;
- Rip rap or a concrete wall will be used at locations where erosion is most likely to occur in the ditch sections where the velocities will be in excess of (1.5 m/s to 4.0 m/s), also at ditch outlets, and culverts inlets and outlets. Energy dissipaters may also be used in locations where there are high velocities to control erosion;
- As much as possible the construction of and the modification to ditches should be done during the periods of minimum flow to reduce the amount of erosion and sedimentation;
- Works will be designed to encourage the regrowth of local plants on exposed soils. Transplanting of plants from other areas of the airport may also be attempted; and,
- Work will be conducted outside of the spawning period of the arctic char between the 1st of September and the 30th of June.

2.2 Predicted Environmental Impacts and Proposed Mitigation Measures

Predicted Environmental Impact	Proposed Mitigation
Decrease of water quality due to sediment or other contaminants both at the crossing and downstream	• Construction will follow practices outlined in section 2.1
Increased potential for erosion damage to the banks of the water body from construction equipment	• As much as possible machinery will remain above the high water mark and it will operate in a manner that minimizes disturbance to the banks of the water body. • Sediment and erosion control measures will be installed prior to starting work to limit the entry of sediment into the watercourse. The control measures will be inspected regularly and all required maintenance will be done as needed to maintain the efficiency of the control measures.
Removal of vegetation at culvert installation locations.	• This removal of vegetation should be kept to a minimum and should only be done in the area where the ditch will be constructed or modified. • Any disturbed areas will be graded in such a way as to encourage the re-growth of native plants.
Potential for spills of fuel or other fluid from construction vehicles	• Adhere to contingency plans identified in the Spill Response Plans. • Regular maintenance of machinery is required to ensure that it is free of fluid leaks. The machinery should be inspected at a minimum of twice per day for leaks, and any leaks should be addressed immediately. The machinery should arrive on the site in a clean condition. Refueling should be done at a safe distance from the water body (Minimum 30 m) and in a location where fuel flow directly towards the water body should a spill occur. • An spill kit will be maintained on the site in case of leaks or spills from machinery.

3. Arch Culvert and Ditch Realignment

The installation of the Arch culvert, which will be installed in the area where the new parking lot will be constructed, will be done by creating a diversion channel. The diversion channel will be dug next to the current path of the airport creek. The diversion channel will be dug by starting at the down gradient end of the channel and proceeding up gradient. The water that collects in the channel during construction will be pumped out of the channel and collected in storage basins for testing to see if treatment is required prior to discharge. A geomembrane liner will be placed in the bottom of the by-pass channel to prevent erosion and to prevent contact of the creek water with the possibly contaminated groundwater. Some minor sedimentation may occur during the transition from the existing creek bed to the diversion channel. This work will be done with the procedures and controls outlined above to limit the sedimentation as much as possible.

The arch culverts will then be installed in the dry creek bed. Any water that collects in the creek bed during construction will be pumped into storage basins for testing to see if treatment is required prior to discharge. Water will only be returned to the creek once the installation of the arch culverts and all sedimentation controls are in place.

The arch culverts will be installed in fish bearing waters. Thus, additional precautions are required in addition to those mentioned in sections 1.1, 1.2, 2.1 & 2,2, they are outlined in section 3.1 below.

3.1 Predicted Environmental Impacts and Proposed Mitigation Measures

Predicted Environmental Impact	Proposed Mitigation
Loss of fish habitat from culvert installation.	• If the installation of a culvert is determined to result in a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, appropriate measures will be presented to and approved by DFO to ensure “no net loss”
Potential for fish stranding or mortality during construction	• In water work will be limited to the placement of the culvert; no significant changes to water levels are anticipated, fish mortality is not anticipated during culvert placement.
Potential for barriers to fish passage	• Fish passage will be maintained through the culvert using mitigation measures (proper slope and flow depth, and the construction of sills and cascade pools)

4. DFO Offsetting to Compensate for the Destruction of Fish Habitat

Works will be done in another branch of the airport creek that passes farther to the northeast of the site. This work will be done to create a new fish habitat to compensate for the fish habitat that will be lost when the arch culverts will be installed. These works will include the construction of sills by installing rocks in the bottom of the creek, cascade pools and other measures to improve the habitat in the other branch.

The Environmental Protection Procedures and Predicted Environmental Impacts and Proposed Mitigation Measures that will be used for this work will be the same as those for the construction of a ditch. As much as possible water will be redirected away from the work area to reduce the amount of sediment released to the water during construction.

This work will be carried out in fish bearing waters. The precautions outlined in section 4.1 will also be put into place.

4.1 Predicted Environmental Impacts and Proposed Mitigation Measures

Predicted Environmental Impact	Proposed Mitigation
Loss of fish habitat from culvert installation.	• If the installation of a culvert is determined to result in a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, appropriate measures will be presented to and approved by DFO to ensure “no net loss”
Potential for fish stranding or mortality during construction	• In water work will be limited to the placement of the culvert; no significant changes to water levels are anticipated, fish mortality is not anticipated during culvert placement.
Potential for barriers to fish passage	• Fish passage will be maintained through the culvert using mitigation measures (proper slope and flow depth, and the construction of sills and cascade pools)