8. IDENTIFICATION OF CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative effects have been defined as changes to the biophysical, social, cultural or economic environments caused by a project component in combination with any on-going, past or future activities. Cumulative effects can occur as interactions between project components (either from the same or more than one site) and/or between environmental components. Effects can occur in one of four ways:

- Physical or chemical transport mechanisms;
- "Nibbling loss" (i.e., gradual disturbance);
- Spatial or temporal crowding;
- Growth induction initiated by the project.

8.1 Analysis of Cumulative Environmental Effects

Four steps in the analysis of the cumulative environmental effects of this project include scoping, analysis of effects, mitigation measures, and significance.

Scoping: Scoping includes the identification of issues of potential concern, VECs that could be affected and boundary setting. The activities considered included the operation of the CAM-3 North Warning System Long Range Radar site.

The spatial boundaries included impacts over a larger (regional) area including the crossing of jurisdictional boundaries. As the landfills will remain on site, temporal boundaries extended beyond the time frame required to complete the clean up work.

Analysis of Effects: The analysis included an evaluation of baseline data and possible effects on VECs. The combined interactions between the clean up activities and future land use and those VECs, which are similar, were identified.

Mitigation Measures: Mitigation measures were identified for project-environment interactions.

Significance: The interactions are defined as having a low (L), moderate (M) or high (H) probability of occurring. The next step is to determine the likelihood of significant adverse effects, taking into account appropriate mitigation measures.

8.2 Identification of Mitigation Measures and Residual Impacts

Mitigation measures were identified that would result in a reduction or elimination of likely environmental effects, including potential adverse effects, associated with the clean up. Mitigation measures are outlined in the Environmental Protection Plan (EPP) for CAM-3 (see Section 10). The EPP forms part of the contract documents and requires all on-site personnel to adhere to the mitigation measures outlined.

The following summarizes the mitigation measures identified for the potential adverse environmental impacts detailed above. Taking into account the mitigation measures, the significance or anticipated residual impacts were identified for all potential adverse impacts.

Potential Impact	Proposed Mitigation Measure	Significance
The extraction of granular materials and grading activities have the potential to create dust and impact air quality.	Implement dust control measures. Only water will be used for dust suppression.	Not significant.

Potential Impact	Proposed Mitigation Measure	Significance
The potential for migration of leachate from the existing and new landfills could degrade soil and water quality.	New facilities do not include hazardous materials. The Tier II facility will incorporate leachate containment, which includes synthetic liner and freezeback of permafrost. Grade landfill cover to promote surface run-off. Site facilities away from natural drainages.	Potentially significant – mitigable.
The potential exists for accidental release of hazardous materials and contaminated soil. An accidental release would impact the local environment, including soil and water quality.	Implement proper handling, storage and transportation procedures for hazardous materials. All workers to be trained in proper handling procedures for all hazardous materials on site. Do not store hazardous materials, including fuel, on beach. Follow the spill contingency plans. Ensure all materials and equipment to implement contingency plans is available on-site. Handle all fuel in accordance with Contingency Plan.	Potentially significant – mitigable.

Potential Impact	Proposed Mitigation Measure	Significance
The operation of the construction camp will include treatment and disposal of waste. The potential exists for waste to impact the environment, including soil and water quality.	Do not dispose of hazardous materials in camp waste system. Disposal of all sewage to be in accordance with applicable regulations and guidelines.	Not significant.
Erosion and sedimentation of waterbodies during grading and gravel extraction activities has the potential to impact water quality.	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water to be stabilized, if required.	Potentially significant – mitigable.
Excavation required for the development or closure of the landfills and contaminated soil excavation has the potential to degrade permafrost.	Minimize time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Slight impact (localized; not lasting)
Disturbance of the terrain and drainage may occur due to extraction of granular material, the development and closure of the landfills, movement of contractor's equipment and personnel around the site and removal of site debris.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site.	Potentially significant – mitigable.

Potential Impact	Proposed Mitigation Measure	Significance
The use of heavy equipment in various aspects of the clean up including, landfill development and closure, demolition, grading and transportation, will increase noise levels, which has the potential to disturb wildlife. Marine transportation to and from the site has the potential to disturb marine mammals.	Avoid known wildlife colonies or bird nesting areas. Employ minimum distance for transportation activities.	Potentially significant – mitigable.
Loss of habitat as a result of the development of the new landfills and the extraction of granular material in previously undisturbed areas.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	Potentially significant – mitigable.
The existing facilities may be used by wildlife as habitat (i.e. nests in structures). The demolition of these facilities has the potential to impact availability of habitat.	Inspect facilities prior to demolition for use by wildlife. Do not demolish while birds are nesting. Contact appropriate wildlife officer for additional guidance to ensure disturbance of wildlife is minimized.	Potentially significant – mitigable.
Impact on aquatic habitat due to sediment and/or hazardous materials entering an aquatic environment from activities such as the extraction of granular materials, grading and handling of contaminated soil and other hazardous materials	Implement mitigation measures to prevent deleterious substances from entering the aquatic environment.	Potentially significant – mitigable.
The transportation to/from the site has the potential to disturb aquatic animals.	Follow designated routes and times for shipping activities.	Slight impact (localized; not lasting)

Potential Impact	Proposed Mitigation Measure	Significance
The excavation of hazardous materials from the landfills, the collection and disposal of hazardous debris, the removal of hazardous materials from the facilities, and general handling of hazardous materials has the potential to impact health and safety of workers.	Transportation of any hazardous materials to be in accordance with Transportation of Dangerous Goods Regulations. Develop and implement a comprehensive health and safety plan. Workers are to wear and use appropriate personal protective equipment. Workers to be trained in use of personal protective equipment and proper handling procedure for hazardous materials. Proper procedures for working around heavy equipment to be implemented.	Potentially significant – mitigable.
The presence and movement of people around the site has the potential to disturb archaeological resources in the area.	Clearly mark archaeological resources. Avoid resources. Contact authorities in the event a new resource is discovered or a known resource is disturbed.	Not likely significant.
Clean up activities may disturb traditional land use, hunting and fishing activities that would occur during the summer months	Contact local hunters and trapper organization to coordinate clean up activities and traditional land use.	Not likely significant.