equipment were first removed, the buildings then demolished, and wood, steel, wire, cables, glass, concrete etc. placed in a borrow pit. A one metre thick layer of granular soil material was used to landscape and cover the borrow pit. Hazardous materials found on site were electrical equipment containing PCBs and a radar electronics tube containing toxic berrylium oxide. These were stored: the PCB's will be transported to Goose Bay in approved containers during 1987 and the radar tube will be returned to the U.S. manufacturer for disposal, as is the standard practice.

2.7.2 All existing dump sites will be covered with a one metre thick layer of granular material and contoured to blend with the surrounding terrain.

2.7.3 The Brevoort LRR installation will be complete and ready for occupancy by October of 1988. The main buildings should be in place by September 1987 from a construction start in early 1986.

2.7.4 Brevoort Island is remote from any community and all labour, communication, medical and other support systems are provided at site as part of the construction effort.

2.7.5 Transportation of personnel to site is by aircraft via Iqaluit (Frobisher Bay). All equipment and vehicles will arrive on site by sealift during the ice-free season which is from August through mid-October.

2.7.6 A construction camp from earlier site users exists at the airport. This camp was purchased by DND and upgraded to accommodate about 100 persons. It will be dismantled and removed after construction is complete. As many as 120 persons could be on site during peak construction periods each summer (June to September).

2.7.7 Nominal operating staff over the 20 year projected facility operating life is expected to be about 10 persons who will be employed by a civilian contractor on behalf of DND.

PART 3

EXISTING ENVIRONMENT

3.1 Biophysical Resources

3.1.1 Steep cliffs rising abruptly from the sea ring most of Brevoort Island. The LRR site is located at an elevation of 375 m above mean sea level on the southern end of the island.

3.1.2 Short, cool summers and long, often very cold winters typify Brevoort Island. The average yearly temperature is -9°C. Only two months, July and August, have mean temperatures greater than 0°C. Yearly maximum and minimum temperatures are 19°C for July and -37°C for March. Precipitation, largely in the form of snow, averages 48.6 mm per month. On average, frost is encountered 322 days per year. Fog is prevalent during the period of open water.

3.1.3 Waters around Brevoort Island are ice-infested for much of the year. Ice coverage varies from 10% with a loose arctic ice to 100% with land-fast ice. A small polynya commonly forms off the southeast end of the island each year.

3.1.4 Sheer sea cliffs surround most of the Brevoort Island coastline but lowlands are present in the north and northwest sections of the island. Exposed igneous or metamorphic bedrock is often overlain by stony, sandy, glacial till

intermixed with fluvial and marine deposits. Water and wind erosion move the poorly-developed, thin mineral soil into valleys and hollows, leaving slopes and hilltops bare.

3.1.5 The island is in the zone of continuous permafrost. On the main site, active permafrost layers range from 1.0 to 2.0 m and surficial sediments vary from 0 to 2.7 m in thickness.

3.1.6 Little site-specific information on the vegetation of Brevoort Island is available. The area is in the arctic desert which is dominated by lichens and mosses with willows and bilberry being the most common woody plants. Much of the ground is barren or covered by only a thin veneer of crustose or foliose lichens.

3.1.7 Waterbodies in the study area for the most part consist of scattered small ponds and intermittent streams.

3.1.8 A 43.5-ha glacial meltwater lake, southwest of the summit site is the designated water source for the development.

3.1.9 Freshwater fish populations on the island have not been reported in the literature but may occur in the water supply lake.

3.1.10 Coastal marine resources appear limited, based on the small amount of information available. Fishing efforts by Den Beste and McCart (1978) revealed no significant

concentrations of commercially exploitable fish species in the Brevoort area. They do report that small streams emptying into the fiords of southeast Baffin Island contain arctic char (Salvelinus alpinus). Ice scour and severe climate have prevented the development of an intertidal biological community. The beach is essentially devoid of microscopic marine life.

3.1.11 Land mammals are not abundant on Brevoort Island. Lemmings (species not reported) and arctic hare (Lepus arcticus) were reported by MacLaren Marex (1979a), but no abundance estimates were made. Polar bears (Thalarctos maritimus) use coastal portions of the island extensively in winter (Stirling et al. 1980) and there is evidence of denning and the presence of young on the southwest side of the island (Stirling et al. 1980, Stemp, 1982). These reports along with sightings by MacLaren Marex (1979b) suggest that polar bears are present year round.

3.1.12 A few caribou (Rangifer tarandus), arctic wolf (Canis lupus) and arctic fox (Alopex lagopus) may come and go across the frozen Robinson Sound, but they are not thought to be resident on the island (Theriault, pers. comm.).

3.1.13 Marine mammals are more numerous than land mammals at Brevoort Island. Walrus (Obodensus rosmarus) make use of the straits between Brevoort Island and Lemieux Island east of Brevoort and 18 km north of the BAF-3 site. Walrus are

present in the area all summer and a large-scale movement into the Lemieux Island area occurs in mid-September.

3.1.14 Other marine mammals occurring in waters around Brevoort Island include harp seal (Pagophilus groenlandicus), ringed seal (Pusa hispida), and bearded seal (Erignathus barbatus) (Smith et al., 1979, Smith and Hammill 1980a, MacLaren and Davis, 1982). Scattered whale sightings, including records of bowhead (Balaena mysticetus), minke (Balaenoptera acutorostrata), and beluga (Delphinapterus leucas), have been reported by a variety of observers (MacLaren and Davis, 1982; MacLaren Marex, 1979b). The significance of Brevoort Island for these mammals appears to be relatively minor. Cumberland Sound, Hudson Strait, and Frobisher Bay are known to be important to marine mammals.

3.1.15 Bird life on and around Brevoort Island is limited. Nesting colonies of glaucous gulls (Larus hyperboreus) have been reported by Nettleship (pers. comm.) and Smith and Hammill (1980) for southern Brevoort Island. A colony of 90 pairs was reported from Brevoort Harbour by MacLaren Marex (1979c). Stemp (1982) reported 71 glaucous gulls from Brevoort Harbour of which 21 were immatures. Nesting by black guillemot (Cepphus grylle) is suspected on the southeastern end of Brevoort Island (Smith and Hammill, 1980). Only a few passerines have been observed on a casual basis by a variety of observers (MacLaren Marex, 1979a; Stemp, 1982). Shorebird

records have been similarly sparse, and no raptor records could be found in the literature.

3.1.16 In the general vicinity of Brevoort Island, many bird species have been recorded, some in large numbers. Most significant are northern fulmar (Fulmarus glacialis) and black-legged kittiwake (Rissa tridactyla) which can occur in the thousands each summer, west of the island, in Robinson Sound (Smith and Hammill, 1980b). Common eider (Somateria mollisima) also occur there in large numbers during the summer.

3.2 Socio-Economic Setting

3.2.1 Apart from its use as an occasional subsistence hunting area, Brevoort Island's only socio-economic role is as an airport and harbour used by military, scientific, and petroleum industry personnel.

3.3 Land Use

3.3.1 Apart from the existing airport and harbour facilities on Brevoort Island, there are no significant human uses of the land. Occasionally, far-ranging hunting parties from Allen Island, Pangnirtung, and Iqaluit (Frobisher Bay) visit to hunt polar bear, walrus, and seals (Theriault, pers. comm.) but no hunting statistics are available. Given the arctic desert environment and arctic climate, other uses are unlikely.

3.4 Heritage Resources

3.4.1 The heritage resources in the vicinity of BAF-3 were documented by field investigations on the island in the summer of 1986. An environmental assessment of the effect of the project on heritage resources undertaken at this time suggests that although there are potential archeological sites along the coastline of the Brevoort Island region that the NWS site will not disturb any known sites. The location of the site at an elevation above the coastline also tends to preclude there being any archaeological remains. No sites were identified within the boundaries of BAF-3.

PART 4

PROJECT IMPACTS AND MITIGATIVE MEASURES

4.1 Potential Impacts

4.1.1 The identification of potential environmental or social impacts as a result of constructing and operating BAF-3 as a LRR are itemized in the following table. These potential concerns were identified by federal and Newfoundland environmental personnel who reviewed the environmental screening document prepared for this project (New North Consultants 1986).

TABLE 4.1 BREVOORT ISLAND

Valued Components		Related Issues
Mammals	Caribou Arctic hares Arctic fox Wolves	- death of nuisance animals particularly bears. - harassment near camps
Birds	Gulls Black Guillemot Fulmar Kittiwake Common Eider Other	- nesting disturbance - impact on colonies
Marine Species	Whales Walrus Seal	- disturbance during sea-lift - pollution from fuel spills
Water	Water source Groundwater Ocean Disposal/sewage	- contamination by fuel spills into surface waters - surface water contamination

Land	Slope stability Erosion protection	- erosion - permafrost degradation
Vegetation	Tundra	- impact on plant communities
Heritage Resources	Archaeological sites	- disturbance or loss. - impact on unidentified archaeological sites
Social & Economic	Employment Opportunity	- impact on native hunting activities

4.1.2 The environmental concerns identified and the extent of the mitigative measures presented must be placed in the context of the project. The Brevoort site is already disturbed and virtually all of the development for the new facilities will be restricted to already-disturbed areas.

4.1.3 However, restrictions and operating conditions have also been placed on the construction contractor and his activities in order to ensure environmental protection. All permits were obtained prior to the start of construction.

4.1.4 These constraints on activities include:

a. terms and conditions with respect to environmental protection attached to permits and licenses required by the contractor;

b. guidelines requiring specific conduct by the contractor on matters of environmental significance;

c. the preparation of an environmental protection plan and implementation by all on-site personnel; and

d. contingency plans in the event of an environmental emergency were prepared.

4.1.1 Biophysical Resources

4.1.1.1 Marine mammals including walrus and a variety of whales and seals are present at Brevoort Island nearshore waters at various times of the year. These animals are hunted by people from Baffin Island on occasion. Interaction by ships or aircraft with these marine mammals will be infrequent as will the opportunity for disturbance by site personnel, therefore, the potential opportunities for disturbance will be minimal.

4.1.1.2 Walrus use parts of Brevoort Island for hauling-out areas. Walrus are extremely sensitive to human contact and aircraft overflight, and at the same time are very site - tenacious (Smith et al. 1979; Brown, pers comm.). Human presence, either on foot or in vehicles, or aircraft have the potential to disturb these endangered sea mammals. In addition to the potential implications of disturbing walrus, a socio-economic impact is also possible, since hunters from Iqaluit exploit the Brevoort Island walrus herds from time to time.

4.1.1.3 Aircraft movements will avoid all areas known to be frequented by wildlife (polar bear den sites, walrus haul-out sites). Aircraft which must pass over wildlife-frequented sites will do so at a minimum altitude of 500 m (approx. 1500 ft). Vehicles cannot leave the site, nor will persons on foot under normal circumstances so the potential for any disturbance to wildlife off the BAF-3 site is extremely remote.

4.1.1.4 No attempts to chase, catch, divert, follow, or otherwise harass wildlife by aircraft, vehicle, or on foot shall be made by personnel directly or indirectly associated with BAF-3.

4.1.1.5 Interaction with polar bears is usually due to their curiosity and indifference to humans. Polar bears will scavenge the garbage dump and occasions will arise where they may become a nuisance. Proper incineration and burial of garbage will minimize this type of problem during both construction and O&M.

4.1.1.6 No specific concerns relating to other mammals have been identified.

4.1.1.7 In the event of unanticipated or unavoidable contact with mammals, particularly polar bears and walrus, individuals working at Brevoort Island will react in accordance with a

wildlife encounter contingency plan which attempts to prevent injury to either party.

4.1.1.8 Impact on seabirds is seen as the most likely effect of increased human activity on Brevoort Island. Colonial sea birds are sensitive to fly-overs and close approaches by boats or pedestrians. They will fly off their nests, leaving eggs bare or nestlings unattended. This behaviour, if repeated often, will increase chick mortality and nest failure.

4.1.1.9 The potential impact of the project on solitary nesters and pelagic seabirds visiting the waters around Brevoort Island will be insignificant because these species are cliff nesters and do not frequent the development sites. Other than the sealift vessels, there will be few watercraft of any size using the waters of Brevoort Harbour.

4.1.1.10 As with marine mammals, vehicle and aircraft movements will attempt to avoid bird colonies and refuse dumps will be made as unattractive to animals as possible.

4.1.1.11 Arctic vegetation is fragile, slow-growing, and easily disturbed. It is a food source for terrestrial birds and mammals and serves to protect the surface from wind and water erosion. Pedestrian and vehicle traffic have the potential to disrupt vegetation at the LRR site, resulting in reduced productivity and increased erosion. However, because

virtually all of the project area has already been disturbed and activities will be restricted to the site proper, the impacts are expected to be negligible.

4.1.1.12 The need for vehicle movement at the site has been anticipated in the project design, providing for the upgrading of appropriate roadways. Vehicular movement will be restricted to approved roadways and tracks.

4.1.1.13 No new roads will be constructed. Road upgrading will be to current construction standards for drainage control and consequently surface erosion at the site is unlikely. Erosion was not a serious problem during previous use of the site primarily due to the coarse texture of the surficial materials. Further, the large amount of fill, already in place is expected to prevent degradation of permafrost. Specific measures to prevent terrain degradation include:

a. vehicular movement will be restricted to approved roadways; offroad vehicle travel will be for emergency reasons only;

b. Appropriate drainage and erosion control structures will be installed along access roads;

c. beach landing sites will be upgraded prior to sea-lift by adding granular material; and

d. environmental aspects of construction-camp establishment and operation are covered in the contract technical specifications.

4.1.1.14 Since no source of granular material is available on Brevoort Island, a rock quarry was established and crushing equipment used to produce the required materials. The main environmental concerns associated with quarry development include terrain degradation caused by thawing of permafrost, erosion, alteration of existing drainage patterns and disturbance to wildlife due to noise.

4.1.1.15 The quarry size will be restricted to that necessary to meet material volume requirements. Berm construction and other erosion control measures will be used where appropriate.

4.1.1.16 Generation of wastes and refuse is an unavoidable consequence of site occupation. Depending on the disposal method adopted, waste materials can pollute surface water, groundwater, and soils, degrade permafrost, and attract wildlife, notably polar bears and foxes.

4.1.1.17 A sanitary landfill site has been selected to receive all non-combustible refuse. This site is in an existing borrow pit and has a disposal capacity of 10,000 m^3. This capacity can be increased. A daily output of less than 1 m^3 of non-combustible solids is anticipated and this volume will be

further reduced by compaction. A projected volume of about 75 m^3 per year will be land-filled. Solids from the septic tank and ash from the incinerator will also be disposed of in the landfill pit. Layers of refuse not exceeding 1.0 m in depth will be covered by 0.5 m of granular material. The capacity of the waste disposal site suggests a functional life of at least 50 years.

4.1.1.18 Combustible solids will be burned in a high efficiency incinerator. Liquid wastes (toilet and sink discharge) will be treated in a 6000 L septic tank then discharged at a safe distance from the camp.

4.1.1.19 The majority of the existing facilities at Brevoort will be demolished prior and during to construction of the new facilities. All hazardous materials have been stored and will be removed from site per existing health, safety and transport regulations.

4.1.1.20 Non-hazardous materials will be cut into managable pieces, buried in a landfill, and covered with 1.0 m of granular material. To limit excavation activities, an existing borrow pit will be used as the landfill site.

4.1.2 Socio-economics

4.1.2.1 Hunters from Iqaluit and other parts of eastern Baffin Island occasionally visit Brevoort Island and the nearshore

waters to hunt. Apart from this infrequent nomadic use, no other use of the area by Inuit has been reported. However, native people desire to continue this occasional use outside the boundaries of the LRR site. The construction of the site is not expected to interfere with this land use.

4.1.2.2 Through public consultation meetings and interviews with native and public officials in Iqaluit, areas of importance on Brevoort Island for hunting by native people have been identified. Every effort will be made by site personnel to not interfere with traditional native hunting or fishing pursuits. The presence of the base may have a positive effect for Inuit using this region by providing emergency support to hunters.

4.1.2.3 Brevoort Island, and in particular, the airstrip have been used by various types of industry using the eastern Baffin Island coast. This includes military, and civilian aircraft and ships. It is probable that these use activities will continue and will be unaffected by the construction and operation of BAF-3.

4.1.3 Heritage Resources

4.1.3.1 Very little is known about the archaeology of Brevoort Island. Current use of nearby areas by native people suggests that Brevoort may be a region of traditional camp sites used by hunters. The value of archaeological resources

is greatly diminished if they are disturbed or moved before proper mapping can be done. Consequently, there is the potential for disturbance to archaeological sites within the work area.

4.1.3.2 An on-site archaeological survey was conducted prior to the commencement of site construction in 1986 and did not identify any archaeological sites within the construction area. However, should heritage sites be identified, they will be designated as protected areas and to prevent disturbance, all on-site personnel will be discouraged from visiting them.

4.2 Residual Effects

4.2.1 It is not anticipated that there will be any residual impacts from the station construction or operation because the general site will be upgraded in design, utilize less space, operate more efficiently and have fewer persons on site during the normal operating period. Environmental awareness and impact mitigation measures are now part of the ongoing operating regime and there should be less disturbance to the environment. Fuel spill contingency plans, wildlife encounter procedures and overall environmental awareness will ensure an environmentally safe site.

4.3 Monitoring Programs

4.3.1 Site monitoring will concentrate on construction procedures to limit wildlife disturbances, prevent fuel spills and prevent erosion or damage to permafrost. On- going site operations will continue these procedures.

4.4 Trade-offs and Alternatives

4.4.1 The BAF-3 site was chosen on the basis of technical radar requirements, accessibility and economics. Construction was begun in 1986 and has been undertaken in an environmentally responsible manner. At this time it is believed that there are no trade-offs or alternatives which warrant discussion.