

## **4 DESCRIPTION OF THE UNDERTAKING**

Sections 4.1-4.5 provide an overview of site selection; the biophysical and socio-economic environment; the construction, operation and decommissioning phases of the project; and information on the workforce.

### **4.1 PROJECT SITE INFORMATION**

#### **4.1.1 Overview**

The Placentia Bay area is a very active location, with commercial fishing and fish processing, aquaculture, tourism, an oil refinery, an oil transshipment terminal, shipbuilding, offshore fabrication, passenger and cargo vessels and locations of ecological significance, such as the world renowned Cape St. Mary's Seabird Reserve.

Market studies have confirmed the economic basis for the development of a new refinery within Placentia Bay. Year-round access by road and sea; access to water depths of greater than 30 metres to accommodate very large crude carriers; enough available land for present needs and future expansion; and adequate water available to support processing were important attributes provided by the selected site for the refinery.

The presence of a skilled local workforce; established ice-free, deepwater shipping lanes; and proximity to both potential oil supplies and large markets for refined products along the east coast of North America and in Europe were also important attributes found within this region.

A Placentia Bay Integrated Management Planning Committee has been put in place over the last couple of years and a pilot project, SmartBay has been initiated to develop and implement an integrated electronic data and information management system for mariners. In addition, with recent real and proposed developments, such as the transshipment terminal and the VBNC proposed hydromet plant or smelter in Long Harbour, there has been considerable environmental research, field studies

and monitoring resulting in a good understanding of the socio-economic and biophysical environment.

#### **4.1.2 Geographical Location**

The Project, identified as the Newfoundland and Labrador Refinery Project (referred to in this document as 'the Project'), will be located at Southern Head, a peninsula between North Harbour and Come-by-Chance Bay at the head of Placentia Bay, Newfoundland and Labrador (Figure 4-1). Although there is considerable industrial infrastructure nearby in this area of Placentia Bay, Southern Head is a greenfield site, accessible only by boat. Information to date indicates that uses of the area is for limited recreational fishing and hunting occur on the peninsula (supported by a site visit September 8/06).

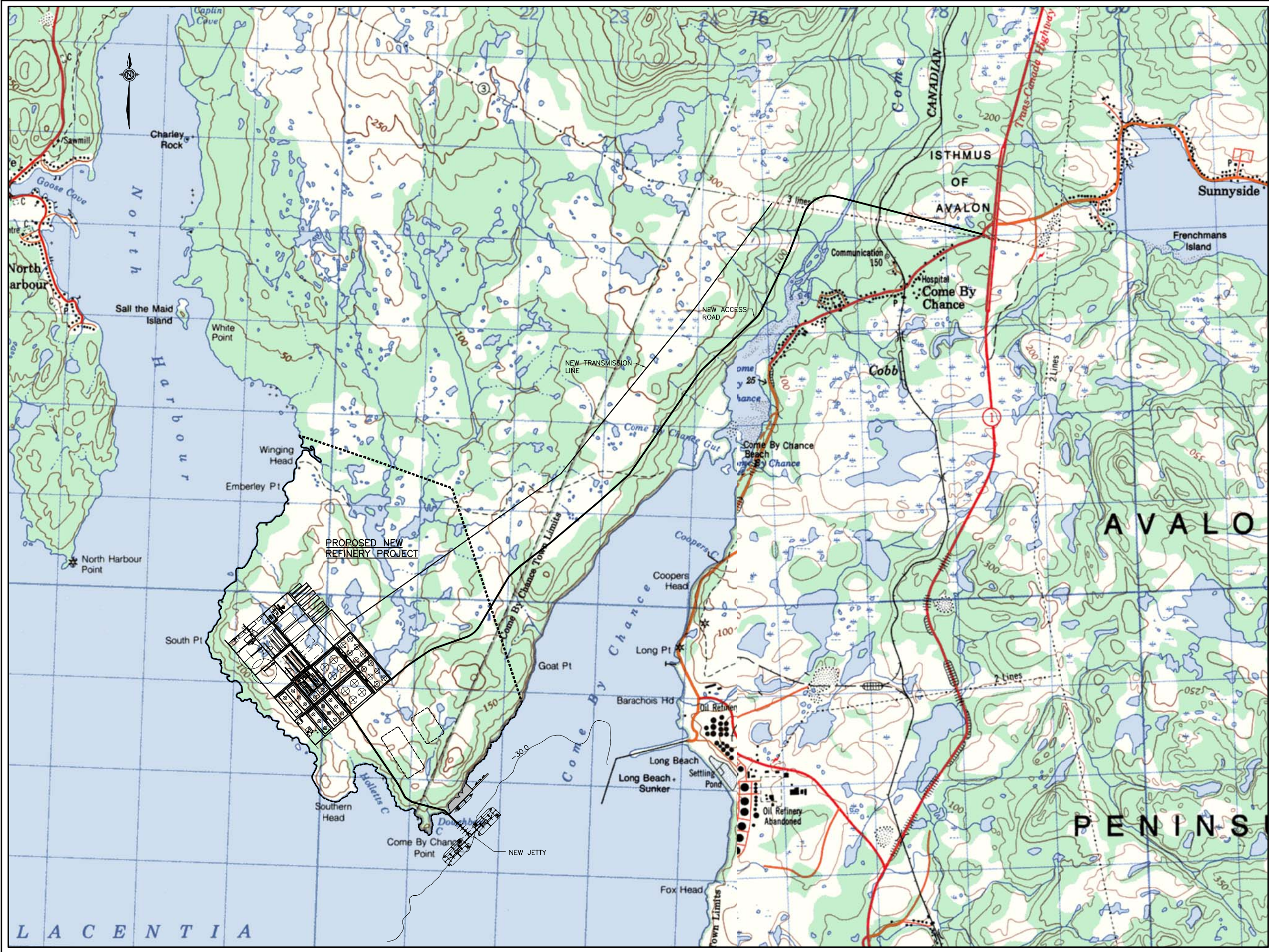
The land at Southern Head is Crown Land, owned by the Province, and has a temporary land freeze in place for this project. However, the marine facilities will extend below the high tide mark and be in federal jurisdiction. Figure 4-2 shows the land ownership map of the proposed project site and neighbouring industrial land use.

Placentia Bay was the focus for the site selection investigations. The strategic advantages of Placentia Bay include the presence of skilled local workforce; established ice-free, deepwater shipping lanes; and proximity to both potential oil supplies and large markets for refined products along the east coast of North America and in Europe.

The head of Placentia Bay (the innermost areas) already has significant infrastructure that is an integral part of the petroleum industry of Newfoundland and Labrador. A successful 105,000-barrel per day oil refinery operates near the communities of Come-By-Chance and Arnold's Cove. The complex includes one of the largest docks in North America and refines lower cost sour crude oil to produce premium refined petroleum products for markets around the globe.



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REFINING CORPORATION**

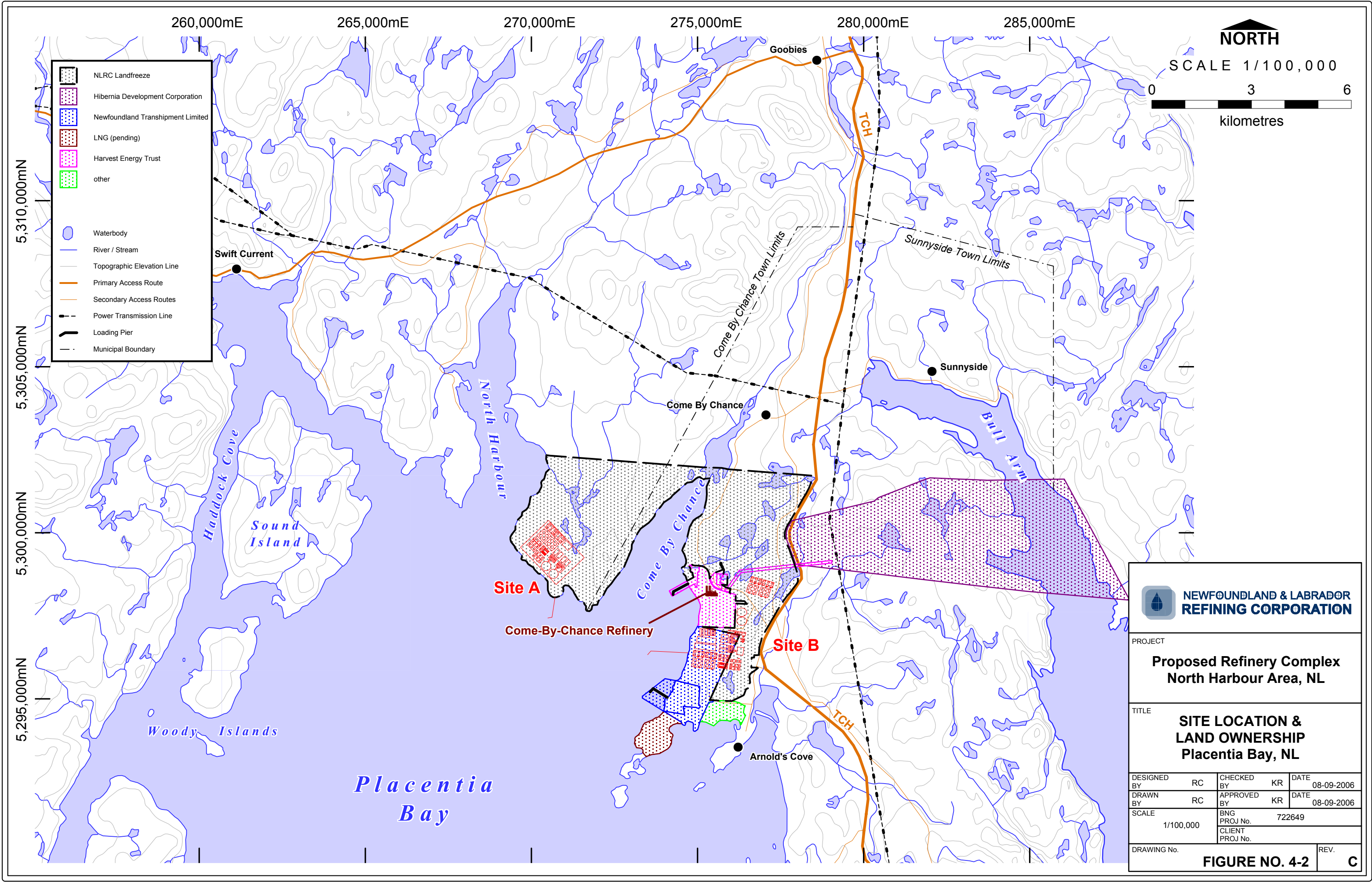
PROJECT  
**NEWFOUNDLAND & LABRADOR  
REFINERY**

TITLE  
**REFINERY LAYOUT,  
ACCESS ROAD & ASSOCIATED  
MARINE FACILITIES**

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Nearby is the Whiffen Head transshipment facility, which is owned by a consortium of major oil companies. The facility temporarily stores crude oil from producing fields in offshore Newfoundland and Labrador and makes shipments to oil refineries, primarily throughout eastern North America. The Bull Arm industrial site is located a few kilometres north (although facing another bay, Trinity Bay). The Hibernia gravity-based oil production platform was constructed and assembled at Bull Arm and is now producing oil offshore Newfoundland and Labrador. The Marystown Shipyard and adjacent Cow Head fabrication facilities located in western Placentia Bay continue to be an active service and supply centre for the province's offshore oil industry. As well, there is a potential industrial site at Argentia, the previous location of a USA military base.

Once the market studies confirmed the economic basis for the refinery, several sites in Placentia Bay were investigated. Attributes of importance in site selection for the new refinery included: year-round access by road and sea; access to water depths of greater than 30 metres to accommodate very large crude carriers; enough available land for present needs and future expansion; and adequate water available to support processing. There is a preference for a brownfield site (already with industrial activity ongoing or previous) to reduce environmental impacts and access to nearby industrial infrastructure.

The sites considered are:

- Expansion of the North Atlantic Refinery Site: Site selection was underway when the existing refinery was put on the market. The Proponent investigated the potential synergies between the existing operations and a new refinery; however, NARL was ultimately sold to a third party.
- Undeveloped land between the existing Come-By-Chance refinery and the transshipment terminal: Adequate land area, good potential synergies with neighbouring facilities and access to deep water; however, the land is presently under lease to Newfoundland Transshipment Limited. This would be the preferred site should this land become available.

- Southern Head: This is a green field site at the head of Placentia Bay, on a peninsula separating North Harbour and Come-by-Chance Bay. Road access would have to be created, but the site has adequate land, water resources and sites suitable for the wharf and jetty.

Two sites, Southern Head and the undeveloped land between the existing refinery and the transshipment terminal, have the preferred attributes. However, the undeveloped land is presently under lease to Newfoundland Transshipment Limited. Hence the preferred site for the new refinery is Southern Head.

#### **4.1.3 Physical Environment**

##### **4.1.3.1 Geology & Surface Water**

The general geology of the North Harbour area site for the proposed refinery complex consists mainly of bedrock and bedrock concealed by vegetation. The vegetation mat is developed on a thin layer of angular frost-shattered and frost-heaved rock fragments overlaying the bedrock; includes areas of shallow (less than 1 m), discontinuous overburden. There is also a small area of Colluvial deposit less than 1.5 m thick. Colluvium consists of coarse-grained bedrock derived materials, but may include sand, silt or clay, accumulates on the lower parts, or at the base of steep rock faces, transported by gravity (Catto et. el., 1998) (see Figure 4-3).

The project site area has one major drainage basin to the north of the proposed site that makes up the head waters for Watson's Brook. This basin drains most of the peninsula north of the project site from the high voltage transmission line south to Watson's Brook. This area has many small shallow ponds and streams that flow into this particular brook. To the south of the Watson's Brook drainage basin in the proposed project site, there are several small drainage areas that collect surface water and direct it toward the sea. There are only small quantities of surface water on the proposed project site outside of the Watson's Brook watershed. There is no specific data available on groundwater resources at this time, but given the geography of the area there may not be large quantities of groundwater available. Surveys are underway.

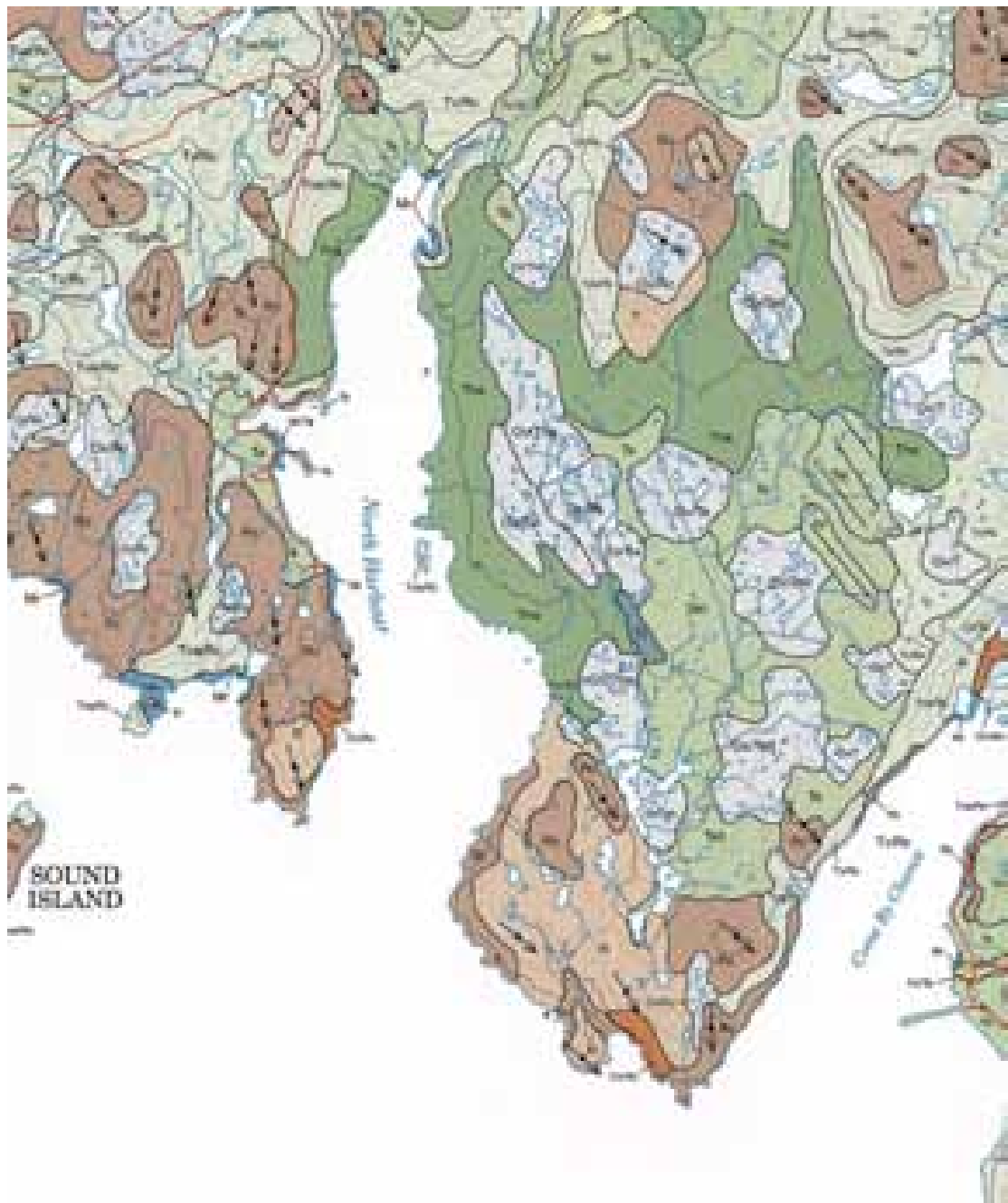


Figure 4-3: Surficial Geology of Study Area

#### **4.1.3.2 Meteorology & Climate**

The Atlantic Provinces have a climate that is heavily influenced by the ocean and predominating westerly winds resulting in relatively cool springs and summers and

relatively mild winters (Environment Canada, 1994). The climate of the study area is highly dependent upon its close proximity to water with Placentia Bay to the south and Trinity Bay to the North. During the winter months Trinity Bay is cooler than Placentia Bay due to the effects of the Labrador Current and Gulf Stream respectively. This close proximity to water has a mitigating effect on the climate of the study area, in particular temperature extremes.

### Temperature

Newfoundland's temperature range (the difference between the average temperature of the warmest and coldest months) is 20°C with Come-By-Chance having a temperature range of 21.2°C. Daily maximum and minimum temperatures at Come-By-Chance during the period from 1971-2000 averaged -1.4°C to -7.1°C in February to 19 °C to 11.7 °C in August.

Winter temperatures in Newfoundland are characteristic of a stormy maritime climate due to its day-to day variability. Incursions of moist, mid Atlantic air are frequent. On the southeast coast, where the moderating influence of the ocean is greatest, the winter average is between -2°C and -4°C (Environment Canada, 2004).

Monthly air temperature statistics for Arnold's Cove are presented in Figure 4-4. These statistics are based on records from 1971 to 1994. As shown in Figure 4-4, mean air temperatures range from -5°C in winter to 15°C in summer. The daily maximum air temperature range from -1°C in winter to 19°C in summer. Temperatures as high as 11°C have been recorded in January and February (typically the coldest months) and extreme maximums of 28°C have been recorded in August.

### Precipitation

Figure 4-5 presents the precipitation statistics for Arnold's Cove. The average yearly rainfall (1971-1994) is 1,195 mm with 124.5 cm of snow. February is the most severe winter month with the minimum amount of rainfall (72.8 mm), the maximum snowfall (35 cm) with the highest daily extremes precipitation (108 mm).



Precipitation, in the form of rain, is heaviest during the fall in Newfoundland, with November being the wettest month. Snowfall dominates the winter precipitation, with normal amounts exceeding 300 cm in most place on the island (Environment Canada). Newfoundland also has the most frequent freezing rain storms in Canada. The area between St. John's and Gander usually has prolonged periods of freezing precipitation that lasts for several hours or intermittently for two to three days. This interrupts everyday activities and causes damage to trees and property. Freezing rain or freezing drizzle occurs an average of 150 hours each winter, with March being the worst month (Environment Canada, 2004).

The waters of the Avalon Peninsula and the Grand Banks are among the foggiest in the world. Fog, which is prevalent in the Placentia Bay area, develops when warm humid air from the south strikes the cold waters of the Labrador Current. Although these fogs are most frequent during spring and early summer when the contrast between sea temperature and air temperature is greatest, anywhere between 5°C and 15°C, they can occur during any season. The Southeast Newfoundland climate is unusual because strong wind may accompany heavy fog (VBNC, 2006).

Figure 4-4: Air Temperature – Arnold's Cove

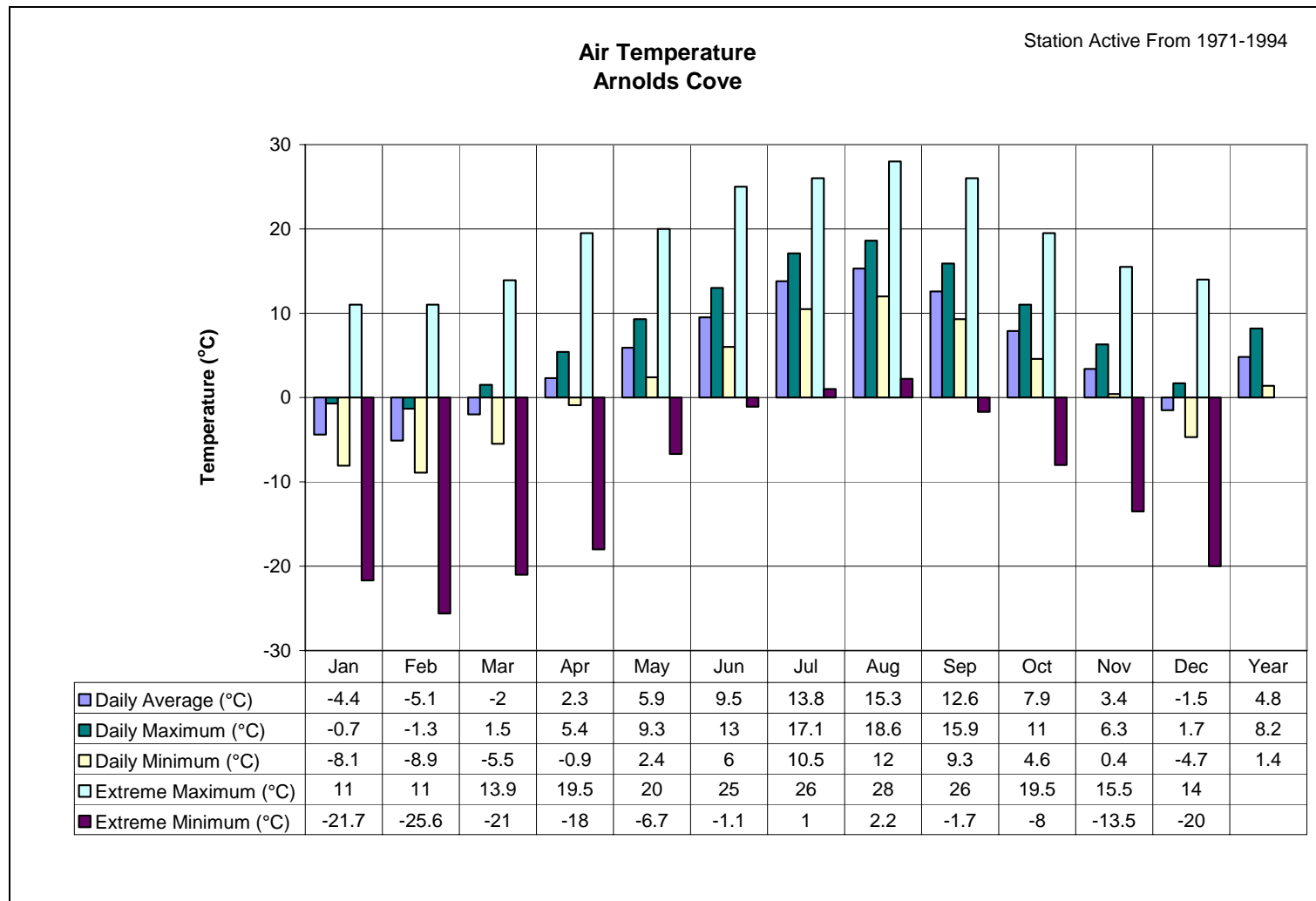
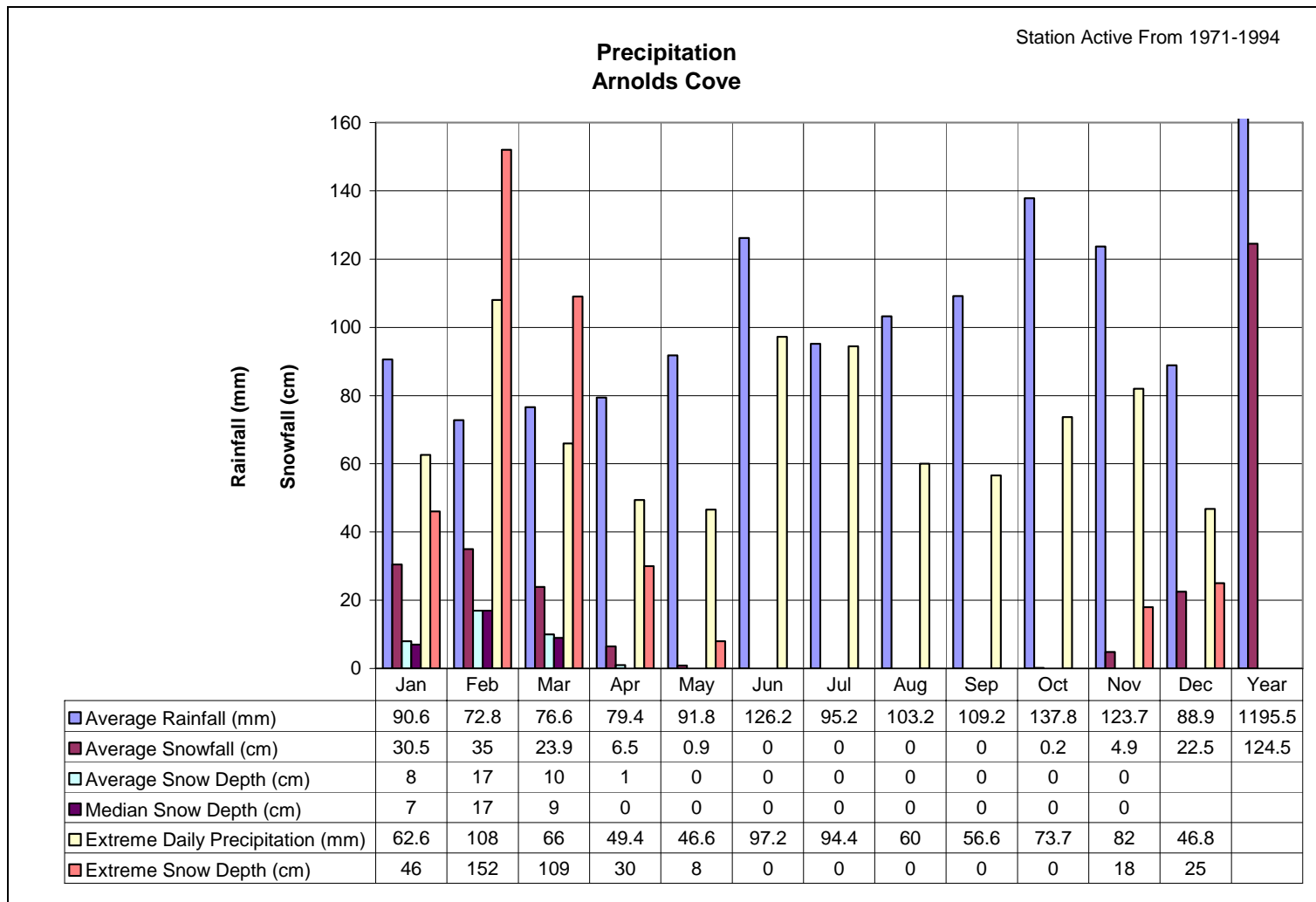


Figure 4-5: Precipitation – Arnold's Cove





## Wind

Newfoundland has the strongest winds of any province in Canada, with most stations recording average annual wind speeds greater than 20 km/h. Generally, coastal areas tend to have stronger winds than inland stations. Winds are predominately from the west year-round; however, variations are common both from month to month and location to location (Environment Canada, 2004).

Digital hourly wind speed and direction data have been obtained from the Meteorological Service of Canada (MSC) for the Arnold's Cove station from 11 July 1971 through 1 July 1993. Results are shown in Appendix D.

The monthly mean hourly wind speeds range from 17 km/h in July to 26 km/h in December. The lowest monthly maximum wind speed is 65 km/h in June and the highest is 93 km/h in December. In spring and summer, typical maximum values range from 72 to 80 km/h while fall and winter values range from 83 to 94 km/h. The upper 95% wind speed limit ranges from 30 km/h in July to 51 km/h in December.

The most predominant wind direction is from the southwest in most months. Annually 28% of the winds are from the southwest while 13 to 15% are from the northeast, northwest and south.

Wind roses for the area offshore Placentia Bay are shown in Figure 4-6 (Wind and Wave Climate Atlas, Volume 1 – The East Coast of Canada). The annual mean wind speed for the south east coast is 34 km/h with the prevailing direction being west. The maximum recorded wind speed in a gust is 147 km/h blowing from the west.

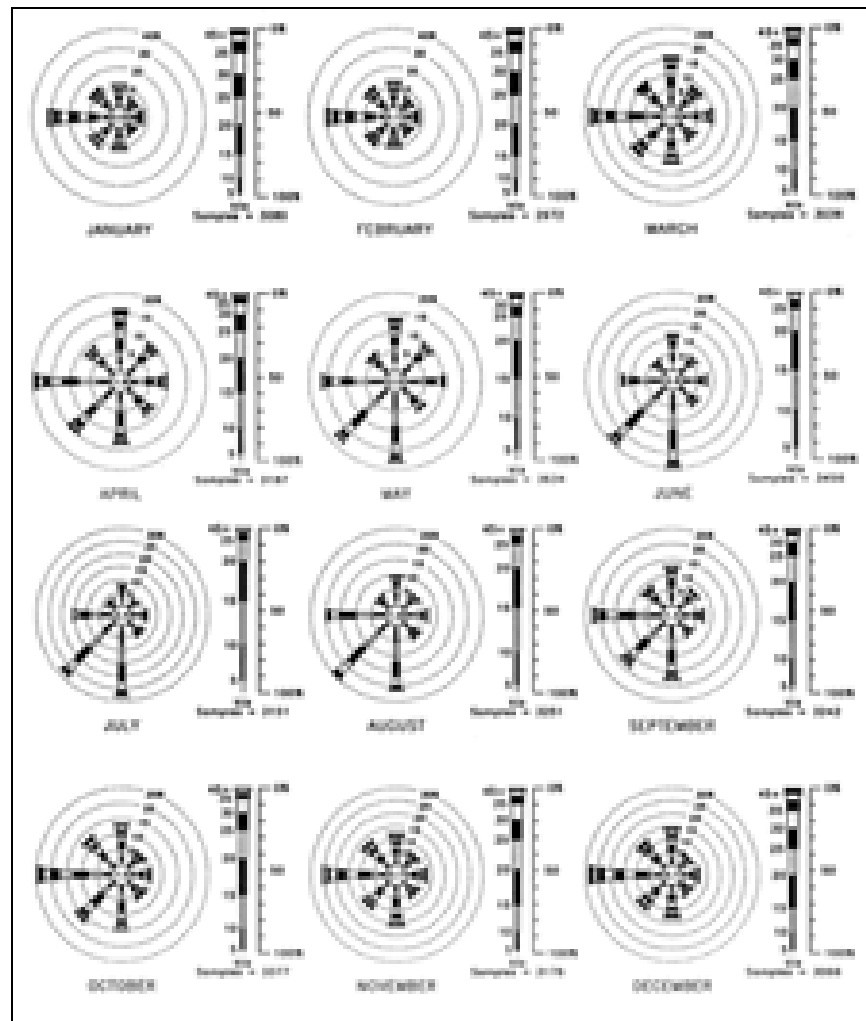


Figure 4-6: Monthly Wind Statistics for the South East Coast, Frequency of Wind Speed by Direction

#### 4.1.3.3 *Physical Oceanography*

There are at least three water types found in Placentia Bay:

- a deep water layer with limited seasonal variation;
- a surface water layer with seasonal variability; and
- a surface/freshwater mixture which is seasonally variable.

A thermocline develops in the warmer months at a depth of 50 to 60 meters which results in a stable water column with little mixing in the summer. More extensive mixing occurs during the winter due to winter storms. The Western Channel have lower salinities than the Eastern Channel, the area around Come By Chance is influenced by the freshwater input from Swift Current, which is a major source of freshwater into Placentia Bay.

See Appendix D for additional information.

#### **4.1.3.4 Bathymetry**

Placentia Bay is a major embayment of the south coast of Newfoundland, bounded by the west by the Burin Peninsula and on the east by the Avalon Peninsula. The bay faces onto the western reaches of the Grand Banks of Newfoundland. The opening at the mouth of the bay is approximately 87 km wide, with a depth at the middle of approximately 240 m, shoaling towards the middle (Chevron et al., 1996). The distance, along the eastern shore, from the mouth of the bay at Cape St. Mary's to the head of the bay at Come By Chance is about 105 km, and along the western shore from the head of Ferryland to Come By Chance is about 143 km (Chevron et al., 1996). There are many islands and shoals located in Placentia Bay. The eastern half of the bay is characterized by a well-defined channel, Eastern Channel, with depths of approximately 200 m, which run from the mouth to almost the head of the bay. The western half of Placentia Bay is characterized by numerous banks, shoals and reefs. The top end of the bay contains many islands including Merasheen Island, Long Island and Red Island. Placentia Bay is exposed to winds, waves and currents propagating in from the Atlantic Ocean due to the orientation of its mouth (Chevron et al., 1996).

#### **4.1.3.5 Current**

Currents in Come By Chance Harbour have speeds in the range of 5 cm/s to 30 cm/s and are weak and variable. The general surface circulation pattern in Placentia Bay is counter-clockwise, with an inward flow along the eastern shore and southwesterly flow on the western shore. Measurements also indicate that current flow exhibits diverse directions at the head of the bay, near Whiffen Head (Chevron et al., 1996).



#### **4.1.3.6    *Tides***

Tides in Placentia Bay are semi-diurnal with a typical mean tidal range of 1.6m and a large tide of 2.4m (Placentia Bay Hydrographic Chart 4839).

#### **4.1.3.7    *Sea Ice and Icebergs***

Placentia Bay is generally ice-free and capable of year-round shipping operations. The maximum mean sea ice edge rarely (<15%) extends far into Placentia Bay (VBNC, 2006).

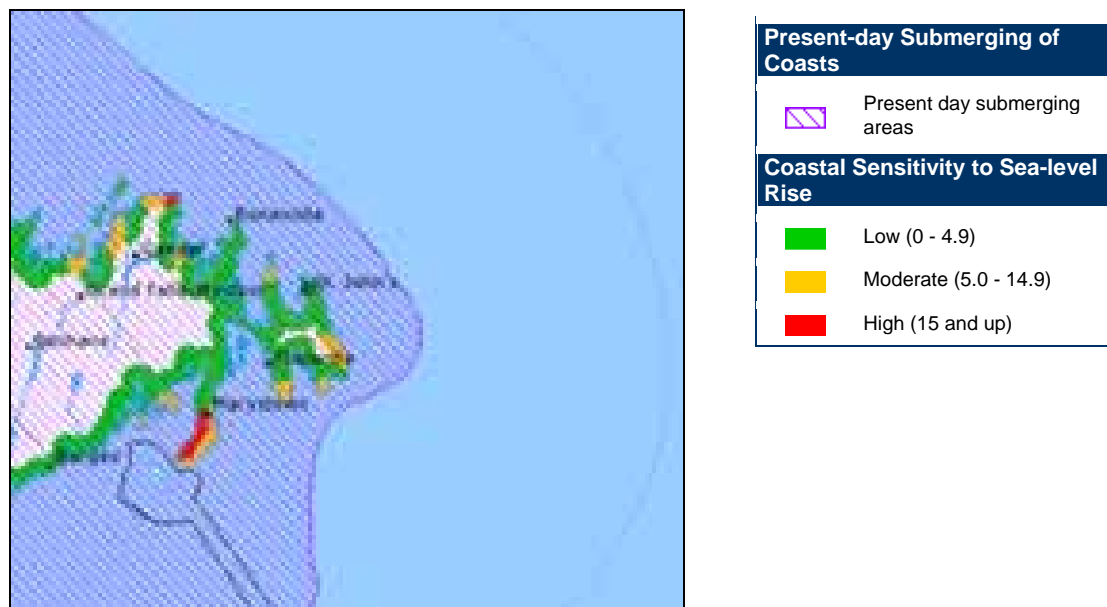
Icebergs are unlikely to drift to the head of Placentia Bay. Icebergs have been sighted in the Eastern Channel and near Argentia and are more likely to appear near the mouth of the Bay. Only once since 1960 have greater than eight icebergs entered the Bay - in 1961 32 icebergs entered. Most often there are no icebergs in Placentia Bay however, when they do drift in there are usually between one and three (Chevron et al., 1996).

#### **4.1.3.8    *Climate Change***

Climate warming is expected to cause warming of the oceans and the partial melting of glaciers and ice-caps, resulting in global rise in sea level. By the end of this century, the global mean sea-level rise could amount to 0.09 to 0.88 meters (Intergovernmental Panel on Climate Change 2001 Natural Resources Canada Website). Sea level rise in Canada is a significant issue because the coastline exceeds 203,000 km.

See Figure 4-7 for a map showing the sensitivity of the coastlines of the south east coast of Newfoundland and Labrador to sea level, due to climate warming. Sensitivity here indicates the degree to which a coastline may experience physical changes such as flooding, erosion, beach migration, and coastal dune destabilization. It is measured by a sensitivity index, which is obtained by manipulating scores of 1 to 5 attributed to each of the seven values: relief, geology, coastal landform, sea-level tendency, shoreline displacement, tidal range, and wave height. This index is a modified version of the coastal vulnerability index of Gornitz (1990).

The blue-shaded area on the map shows the expansions of the submerging areas in Canada's coasts due to climate warming.



**Figure 4-7: Coastal Sensitivity to Seal Level for South East Coast of Newfoundland and Labrador**

Storm surges will cause more damage to the communities located close to the level of the ocean as sea level rises. Placentia, Newfoundland and Labrador is one of the communities that will be affected by this.

#### **4.1.3.9 Effect of Physical Environment on the Undertaking**

The physical environment will provide the dominant set of design criteria for the project and will govern the design of many aspects of the proposed facility. The area is subject to high winds, large amounts of precipitation both in the form of rain and snow, fog seasonally and cold temperatures seasonally. Seasonally the head of Placentia Bay can experience high winds that generate heavy seas with large waves. All structures either located on land or in the marine environment will be designed to withstand the maximum expected environmental loads with the appropriate safety factors to provide a robust design.

Measures will be taken to minimize the effect of the environment during the construction and operation stages of the project. The physical design of temporary structures for the aid of construction, will take into account winter conditions, maximum wind and wave action and extreme sea state. Construction activities will be scheduled to avoid environmental impacts if there is a safety concern. A local weather office and wind monitoring station will be established for major heavy lifts and for marine construction. The SmartBay project will also play a role in this process, by providing real-time water quality and oceanographic/meteorological information.

#### **4.1.4 Biological Environment**

This section provides an overview of the Placentia Bay biological setting including those species considered at risk by the Species at Risk Act (SARA) and the Provincial Endangered Species Act.

As a result of discussions with researchers and regulators familiar with the Placentia Bay area, the Proponent has initiated studies to address identified information gaps and needs. These include freshwater and marine fish habitat, seabird and marine mammal surveys and coastal surveys for shorebirds and waterfowl.

##### **4.1.4.1 Terrestrial Mammals**

Most species of terrestrial mammals are localized in the Placentia Bay area. Moose (*Alces alces*) were introduced to Newfoundland in the early 1900s and have since occupied most of the island. There is a moose population in the isthmus area of the Avalon Peninsula, and they tend to be most abundant in the areas supporting more protected boreal habitats, such as river valleys. Overall, the isthmus does not provide optimal habitat to moose because there are extensive areas of barrens and exposed bedrock. Their preferred habitat is coniferous forest, especially near swamps and lakes in areas of secondary growth (Northcott 1974).

Furbearers in the Placentia Bay area include beaver (*Castor canadensis*), American mink (*Mustela vison*), long-tailed weasel (*Mustela erminea*), red fox (*Vulpes vulpes*), lynx (*Lynx canadensis*) and muskrat (*Ondatra zibethicus*). Black bear (*Ursus*



*americanus*) have been sighted recently in the Southern Head area (O. Johnson, personal communication, 2006). Rodents, including domestic rats and mice, would be expected as well as meadow voles (*Microtus pennsylvanicus*), snowshoe hares (*Lepus americanus*), and masked shrews (*Sorex cinereus*). The river otter (*Lutra canadensis*), a species of particular interest in Placentia Bay, is discussed below.

#### **4.1.4.2 Otters**

An important mammal in the Placentia Bay area, traditionally considered a terrestrial species, is the northern river otter, which is a year-round resident. River otters in Placentia Bay are unusual because they spend a great deal of time in coastal marine environments (Petro-Canada 1980). In areas such as Long Island and Merasheen Island, they occur in relatively large numbers. They are known to range up to 60 to 70 km, and may even move between Placentia Bay and Trinity Bay. Adults breed inland or along watersheds of the marine islands and exploit coastal foods, including lobsters, flounder, cunners and herring. These otters are known for their relatively large size and diverse food habits (E.H. Miller, MUN, pers. comm.), and are the focus of significant traditional trapping harvest. There is little documented information on this species, and its concentrated populations in the Placentia Bay area.

Voisey's Bay Nickel Company are currently carrying out surveys for river otters in Placentia Bay, including parts of the bay near the refinery project area.

#### **4.1.4.3 Marine Mammals**

Thirteen species of marine mammals are known to occur in Placentia Bay, including ten species of whales and three species of seals. Several additional species may occur, but because of their rarity in the area are not considered in this document. Although most species are seasonal inhabitants, the waters of Placentia Bay and surrounding areas are important feeding grounds for some. Data on marine mammal abundance and distribution in Placentia Bay are lacking. Marine mammal data were collected in Placentia Bay in 1993 and 1994 (Marques 1996) but these data are limited in scope. Of the marine mammal species that are may or are likely to occur in Placentia Bay, only the blue whale and harbour porpoise are considered at risk under SARA.

The Proponent has commissioned seasonal surveys of marine mammal occurrence and abundance in the project area and around the vessel traffic lanes.

#### Mysticetes (Baleen Whales)

Five species of baleen whales or *mysticetes* occur in Placentia Bay including humpback (*Megaptera novaeangliae*), blue (*Balaenoptera musculus*), fin (*B. physalus*), sei (*B. borealis*), and minke whales (*B. acutorostrata*). Based on surveys conducted in 1993 and 1994, it appears that humpback, minke, and fin whales occur regularly in Placentia Bay and that sei and blue whales occur less frequently (Marques 1996).

Each summer, whales arrive in Placentia Bay in late spring or early summer and the more abundant species remain until September or October. They feed primarily on capelin, but also feed on krill, squid, herring, and sand lance. The whales follow the migration of capelin and are common around inshore Newfoundland during the summer. The arrival of capelin to the head of Placentia Bay generally occurs in June and July and it is likely that baleen whales are most abundant during these months. Most whales have moved offshore and have begun to migrate south by late October (Lien 1985).

#### Odontocetes (Toothed Whales)

Five species of *odontocetes* or toothed whales have been regularly sighted in the Study Area including harbour porpoise (*Phocoena phocoena*), long-finned pilot whale (*Globicephala melaena*), Atlantic white sided dolphin (*Lagenorhynchus acutus*), white beaked dolphin (*Lagenorhynchus albirostris*), and common dolphin (*Delphinus delphis*). It appears that harbour porpoise, Atlantic white-sided dolphin, and white-beaked dolphin are sighted more regularly in Placentia Bay than pilot whale and common dolphin. The harbour porpoise is considered of "Special Concern" by COSEWIC and has no schedule or status under SARA given the recent (April 2006) re-assessment by COSEWIC.

Most *odontocetes* occur seasonally in Placentia Bay and little is known regarding their distribution and population size. Some species may remain in waters of

southern Newfoundland throughout the autumn and winter, but the seasonal movement patterns of most species are unknown. Most toothed whales that occur in Placentia Bay are known or thought to eat squid, fish (capelin, cod, sand lance, herring, mackerel), and/or amphipods. It is likely that the distribution patterns of most *odontocetes* are related to the occurrence of their prey.

#### Phocids (Seals)

Three species of seals are known to occur in and near Placentia Bay including harbour (*Phoca vitulina*), grey (*Halichoerus grypus*) and harp seals (*Phoca groenlandica*). Little is known about their distribution and abundance within Placentia Bay. Harbour seals are year-round residents along the south coast of Newfoundland. In 1973, approximately 930 harbour seals were estimated to be present in coastal areas in St. Mary's and Placentia Bay (Boulva and McLaren 1979). Small numbers of harbour seals are known to breed on the Island of Miquelon, just south of Placentia Bay (Renouf et al. 1983). In general, harbour seals have a varied diet, including pelagic and demersal fish as well as cephalopods and crustaceans (see, for example, Boulva and McLaren 1979; Bowen and Harrison 1996).

Grey seals that may occur in the Placentia Bay area are migrants from the Sable Island and Gulf of St. Lawrence breeding populations. The number of grey seals that migrates into the Study Area is unknown, but is believed low. This species may occur in the Placentia Bay area year-round, but are thought to be most common in July and August (Stenson 1994). The food of grey seals in the western North Atlantic includes at least 40 species, some of which are commercially important (for example, Atlantic cod, herring, and capelin) (Benoit and Bowen 1990; Hammill et al. 1995).

Harp seals in Placentia Bay are migrants from the Gulf of St. Lawrence and the "Front" breeding populations. The number of harp seals that migrates into the Placentia Bay area is unknown, but numbers may be increasing as the range of this species appears to be expanding southward (e.g., McAlpine et al. 1999). Harp seals would likely be most common in autumn and winter as individuals summer in the Arctic. Harp seals eat a variety of prey; on the Grand Banks, capelin predominate,

followed by sand lance, Greenland halibut and other pleuronectids (Wallace and Lawson 1997; Lawson et al. 1998).

#### 4.1.4.4 **Birds**

More than 70 species of birds regularly use Placentia Bay from the tidal zone to the offshore zone. Seabird breeding colonies are numerous on headlands and islands along the entire perimeter of the bay. Four seabird colonies rank as Important Bird Areas (IBA) (Table 4-1): Cape St. Mary's at the south east corner of Placentia Bay, and Corbin Island, Middle Lawn Island and Green Island off the southern Burin Peninsula. Cape St. Mary's supports the third largest Northern Gannet (12,156) colony in North America, third largest Common Murre colony (10,000 pairs) and fifth largest Black-legged Kittiwake colony (10,000 pairs) in Newfoundland and Labrador. Middle Lawn Island supports the only known active breeding colony of Manx Shearwater in North America. A significant portion of the world population of Greater Shearwaters spend the summer months moulting on the Grand Banks including Placentia Bay. The eastern half of Placentia Bay has been designated an IBA because of the large numbers of Greater Shearwaters (concentrations of up to 100,000) that occur in the summer. In winter, large numbers of Common Eiders winter at headlands, rocky islets and shoals in Placentia Bay. Cape St. Mary's supports the largest known concentration of wintering Harlequin Ducks in eastern North America.

The Proponent has initiated seasonal surveys of seabirds in the eastern areas of Placentia Bay, as well as waterfowl and shorebird surveys in the Southern Head area.

**Table 4-1: Number of Pairs of Breeding Birds at Important Bird Areas (IBA) of Placentia Bay**

	<b>Cape St. Mary's, Avalon Peninsula</b>	<b>Middle Lawn Island, Burin Peninsula</b>	<b>Corbin Island, Burin Peninsula</b>	<b>Green Island, Burin Peninsula</b>
Manx Shearwater	-	11 <sup>4</sup>		
Leach's Storm-Petrel	-	13,879 <sup>3</sup>	100,000 <sup>2</sup>	65,280 <sup>3</sup>
Northern Gannet	12,156 <sup>1</sup>			

	<b>Cape St. Mary's, Avalon Peninsula</b>	<b>Middle Lawn Island, Burin Peninsula</b>	<b>Corbin Island, Burin Peninsula</b>	<b>Green Island, Burin Peninsula</b>
Black-legged Kittiwake	10,000 <sup>2</sup>		50 <sup>2</sup>	
Common Murre	10,000 <sup>2</sup>			
Thick-billed Murre	1,000 <sup>2</sup>			
Razorbill	100 <sup>2</sup>			
Black Guillemot	present	present	present	

Sources: <sup>1</sup> Chardine 2000; <sup>2</sup> IBA web site: [www.bsc-eoc.org/iba/IBAsites.html](http://www.bsc-eoc.org/iba/IBAsites.html); <sup>3</sup> Robertson et al. 2002; <sup>4</sup> Robertson 2002

### Offshore Birds

#### *Procellariiformes (fulmars, shearwaters and storm-petrels)*

Northern Fulmar is a common species of the north Atlantic. Large numbers breed in the eastern Arctic and occur offshore Newfoundland in winter. However, relatively low numbers breed in eastern Newfoundland. Sub-adult Northern Fulmars remain in eastern Newfoundland waters through the summer. Northern Fulmar is expected to be present year-round in Placentia Bay, being less numerous in the summer months.

Three species of shearwater (Greater, Manx, Sooty) occur annually in Placentia Bay. The Manx Shearwater is the only species known to breed in Placentia Bay and Middle Lawn Island, off the southern Burin Peninsula contains the only known colony in North America. This European nesting species was discovered nesting at Middle Lawn Island in 1977. This satellite colony continues to maintain an existence. A census in 2000 resulted in totals of 11 active nests (Robertson 2002). The large number of empty nesting burrows (102) and the estimated 360 birds attending the island are indications the environmental conditions for breeding success are not optimal. In 2006, there were 13 nests with eggs or chicks (G. Robertson, CWS, pers comm.). Greater Shearwater and Sooty Shearwater breed in the Southern Hemisphere and spend the summer months in the Northern Hemisphere. A significant portion of the global population migrates to Newfoundland waters and occurs there from May to October (Brown 1986; Lock et al. 1994). Counts of 100,000 Greater Shearwater and numerous Sooty Shearwaters have been recorded



at the Cape St. Mary's area (P. Linegar, pers. comm.). Concentrations of spawning capelin are an important food source for shearwaters while moulting flight feathers during June and July.

Leach's Storm-Petrel is an abundant seabird in eastern Canada from April to October. More than three million pairs, greater than a third of the world's population breed on Baccalieu Island on the northeast Avalon Peninsula (Sklepkovych and Montevecchi 1989). Significant nesting colonies in Placentia Bay are located off the southern Burin Peninsula at Corbin Island (100,000 pairs), Middle Lawn Island (13,789 pairs) and Green Island (65,280 pairs) (Table 4-2) (Robertson et al. 2002). In addition, 100,000 pairs nest on Grand Colombier Island in the St. Pierre et Miquelon Archipelago (Cairns et al. 1989).

Wilson's Storm-Petrels nest in the Southern Hemisphere and fly to the Northern Hemisphere from May to October. It is uncommon in southern Newfoundland waters, including Placentia Bay.

**Table 4-2:**  
**Significant Leach's Storm-Petrel Breeding Colonies in the Placentia Bay Area**

Colony	Location	No. of Pairs	Census Year	Source
Corbin Island	46.97° N 55.22° W	100,000	1974	CWS data base
Middle Lawn Island	46.87° N 55.62° W	13,879	2001	Robertson et al. 2002
Green Island	46.52° N 56.05° W	65,280	2001	Robertson et al. 2002
Grand Colombier Island, St. Pierre et Miquelon	46.49° N 56.10° W	100,000	1989	In Cairns et al. 1989

#### *Pelecaniformes (gannets)*

Northern Gannet is the only member of this group to occur regularly in Newfoundland. There are six Northern Gannet breeding colonies in Canada. There are three in Quebec and three in Newfoundland. Cape St. Mary's is the largest of three Newfoundland breeding colonies containing 12,156 pairs in 1999 (Chardine

2000). This is about 51% of the total Newfoundland breeding population and 15% of the Canadian breeding population. Northern Gannets are common in Placentia Bay where they prey on capelin, herring, mackerel and squid throughout the area.

*Phalaropodinae (phalaropes)*

Two species of phalaropes occur regularly in the pelagic zones of Placentia Bay. Red Phalarope and Red-necked Phalarope use Placentia Bay to feed on zooplankton during spring and fall migrations and small concentrations can be expected in late May to early June and again from mid July to September.

*Laridae (gulls and terns)*

Four species of large gulls occur regularly throughout Placentia Bay. They are Herring Gull, Great Black-backed Gull, Glaucous Gull and Iceland Gull. Herring and Great Black-backed Gulls are common year-round residents. They breed on islands and headlands around the perimeter of Placentia Bay and forage in coastal and pelagic areas of the bay. Glaucous Gulls and Iceland Gulls breed north of Newfoundland and occur in Placentia Bay mainly during the winter season. Iceland Gulls outnumber the larger but similar plumaged Glaucous Gull.

Smaller gulls which occur in Placentia Bay include Black-legged Kittiwake and Ringed Bill Gull. About 10,000 pairs of Black-legged Kittiwake nest at Cape St. Mary's and a colony of 788 pairs nests on Goose Island near Arnold's Cove (CWS, unpubl. data, 2005); this species is a common year round resident in Placentia Bay. Ring-billed Gulls nest in several closely packed colonies around Placentia Bay including 992 pairs on Crawley Island and 304 pairs on Goose Island (CWS, unpubl. data, 2005). Ring-billed Gulls feed close to shore and in tidal areas and are less frequently encountered offshore.

Common Tern and Arctic Terns nest in numerous colonies of varying size around the entire coastline of Placentia Bay. Tern colonies were identified at 22 sites with an estimated 1,635 individuals during aerial surveys in 2005 by CWS. These aerial surveys only sampled a portion of the available nesting habitat in Placentia Bay. Additional tern breeding colonies are known to exist in Placentia Bay. Both species

are common near shore with smaller numbers occur offshore from late May to mid September.

*Stercorariidae (skuas and jaegers)*

There are two species of skua and three species of jaeger occurring in Placentia Bay and the North Atlantic. Great Skua and South Polar Skua occur in low densities in Placentia Bay from late spring to mid fall. The three species of jaeger, Pomarine, Parasitic and Long-tailed Jaeger nest in the Arctic and winter at sea in the middle latitudes. They migrate through Newfoundland waters in spring and fall. Non-breeding sub-adult birds summer south of the breeding range including Newfoundland waters. The jaegers occur in low densities in Placentia Bay from May to October. Pomarine is generally the most numerous species and Long-tailed the least numerous.

*Alcidae (auks)*

There are six species of auks in the North Atlantic. All of them are common during part of the year in Placentia Bay. Dovekie nests by the millions in Greenland, Iceland and Norway. Newfoundland waters, including Placentia Bay, are an important wintering area for the Dovekie (Lock et al, 1994). It is common in Placentia Bay from October to April. There are two species of murre: the Common Murre and Thick-billed Murre; one or both are common in Placentia Bay throughout the year. Ten thousand pairs of Common Murres nest at Cape St. Mary's (Cairns et al 1989). These birds use Placentia Bay as part of their feeding area during the breeding season. Common Murres from other colonies in eastern Newfoundland may be present in Placentia Bay during migration and winter. Thick-billed Murre is abundant during winter. Small numbers breed in Newfoundland but the majority of birds present during the winter season (October to April) are from large Arctic breeding colonies. Razorbill Murres are much less common than the other murre species. At least 100 pairs nest at Cape St. Mary's. The majority of the Razorbill population winters south of Placentia Bay, mainly in the Bay of Fundy and Georges Bank. Black Guillemot is a ubiquitous breeding and winter resident of the coastal zone area of Placentia Bay. Atlantic Puffin is a locally abundant breeder on the

eastern Avalon Peninsula. The closest known breeding population to Placentia Bay is the 400 pairs breeding on Grand Colombier, St. Pierre et. Miquelon. Atlantic Puffins are fairly common in Placentia Bay from May to October.

#### Near Shore and Tidal Zone Birds

##### *Anatidae (geese and ducks)*

Both diving and non-diving species of geese and ducks occur in Placentia Bay. Canada Goose, Black Duck, Northern Pintail and Green-winged Teal are the non-diving members of this group. They feed mainly in shallow fresh water but also in rich tidal areas. Arnold's Cove has designated full protection against hunting to a shallow tidal barachois where several hundred Black Ducks spend the non-breeding season. Smaller numbers of the aforementioned species may be found at variety of locations in coastal Placentia Bay, particularly during spring and fall migration. Diving ducks are more adapted to salt water conditions than non-diving waterfowl. Common Eider is a common winter sea duck in Newfoundland. Wintering concentrations of several thousand birds are known to occur at Cape St. Mary's, Virgin Rocks and several island locations off the Burin Peninsula. The eastern North American population of the Harlequin Duck is currently listed as a 'species of special concern' by COSEWIC. The largest concentration of wintering Harlequin Ducks in Atlantic Canada occurs at Cape St. Mary's. Up to 200 individuals wintered there in the winters of 2004/2005 and 2005/2006. Other species of sea ducks found regularly during the fall, winter and spring seasons in Placentia Bay are the three species of scoter (White-winged, Surf and Black), Long-tailed Duck and Red-breasted Merganser.

##### *Gaviidae, Podicipedidae and Phalacrocoracidae (loons, grebes and cormorants)*

Common Loon is a common breeder in inland Newfoundland and birds breeding near the coast will fly to sea to feed. Although there have been no official surveys for wintering loons, good numbers of common loon winter along the south coast of Newfoundland including Placentia Bay. Red-throated Loons breed north of insular Newfoundland but migrate through Newfoundland coastal waters in spring May and

June and in September and October. Red-necked Grebe is the only regularly occurring species of grebe found in Placentia Bay. The species nests in western Canada but there is a small, though relatively substantial wintering population on the southern Avalon Peninsula and Placentia Bay. There are two species of cormorant occurring in Atlantic Canada and both are locally common breeders in Placentia Bay. Double-crested Cormorants migrate south of Newfoundland in winter but the Great Cormorant is a year-round resident. Both species of cormorant nest in small isolated cliff side colonies on the eastern shore of Placentia Bay.

*Accipitridae (Bald Eagle and Osprey)*

One of the densest breeding concentrations of Bald Eagles in eastern North America is in Placentia Bay, Newfoundland (Dominguez 1998). The Wildlife Division of the NL Department of Environment and Conservation has conducted Bald Eagle surveys in Placentia Bay most years since 1983. Since the early 1990s, permanent survey plots in the area of high nesting density of Bald Eagles was established on Long Island, Merasheen Island, Ragged Island and a section of coastline along the adjacent western Placentia Bay. This area contains 20-30 active nests annually (J. Brazil, Department of Environment and Conservation, Wildlife Division, pers. comm.). Bald Eagles are year round residents in Placentia Bay. Osprey is less numerous than the Bald Eagle in Placentia Bay but occurs regularly from late April to September.



#### *Charadriiformes (shorebirds)*

There are seventeen species of shorebirds that occur regularly in Placentia Bay (Table All Species). Most of these are migrants from breeding areas north of Newfoundland. The largest numbers of shorebirds migrate through Newfoundland during the fall migration period from mid July to mid November when they feed in tidal areas. Come By Chance and Arnolds Cove are two of the more significant areas for shorebird migration. Concentrations of up to 200 shorebirds have been recorded at Arnolds Cove. Purple Sandpiper is the only shorebird that winters in Placentia Bay.

#### **4.1.4.5 Benthos**

Benthic communities within Placentia Bay vary with habitat type, especially as it relates to substrate characteristics and water depth. Flora of the rocky intertidal zone is typified by rockweeds (*Fucus spp.*) and knotted wrack (*Ascophyllum nodosum*). Intertidal fauna are characterized by gastropods (*Littorina obsusata*, *Thais lapillus* and *Skenia planorbis*), bivalve mollusks (*Mytilus edulis*, *Volsella modiolus*), amphipods (*Hylae nilssoni*, *Gammarus accidentalis*), isopods (*Jaera marina*) and species of platyhelminthes, polychaetes, oligochaetes and copepods. Typical subtidal flora includes various filamentous algal and kelp species. Common benthic fauna in the subtidal zone includes various invertebrate groups including crustaceans (e.g., crabs, lobster), echinoderms (e.g., sea stars, sand dollars), and molluscs (mussels, scallops), and fish that live on the bottom (e.g., flatfish).

Some commercially important benthic species are discussed in the following sections.

#### **4.1.4.6 Marine Finfish and Shellfish**

Examples of the numerous species of finfish and shellfish occurring in Placentia Bay are indicated in the following Table 4-3:

**Table 4-3: Fish Species: Groundfish, Pelagic and Shellfish Species in Placentia Bay  
(adapted from DFO 2003)**

Common Name	Scientific Name
<b>GROUND FISH</b>	
Atlantic cod	<i>Gadus morhua</i>
White hake	<i>Urophycis tenuis</i>
American plaice	<i>Hippoglossoides platessoides</i>
Lumpfish	<i>Cyclopterus lumpus</i>
Winter flounder	<i>Pleuronectes americanus</i>
Cunner	<i>Tautoglabrus adspersus</i>
Radiated shanny	<i>Ulvaria subbifurcata</i>
Arctic shanny	<i>Stichaeus punctatus</i>
Arctic eelpout	<i>Lycodes reticulatus</i>
Ocean pout	<i>Macrozoarces americanus</i>
Wrymouth	<i>Cryptacanthodes maculatus</i>
Sculpins	<i>Myoxocephalus</i> sp.
Skate	<i>Raja</i> sp.
Tomcod	<i>Microgadus tomcod</i>
Sea snail	<i>Liparis</i> sp.
<b>PELAGIC FISH</b>	
Sand lance	<i>Ammodytes</i> sp.
Smelt	<i>Osmerus mordax</i>
American eel	<i>Anguilla rostrata</i>
Brown trout	<i>Salmo trutta</i>
Atlantic salmon	<i>Salmo salar</i>
Atlantic herring	<i>Clupea harengus</i>
Capelin	<i>Mallotus villosus</i>
Atlantic mackerel	<i>Scomber scombrus</i>
Stickleback	<i>Gasterosteus</i> sp.
<b>SHELLFISH</b>	
American lobster	<i>Homarus americanus</i>
Blue mussel	<i>Mytilus edulis</i>
Scallop	<i>Placopecten magellanicus</i>
Snow crab	<i>Chionoecetes opilio</i>

Several of the finfish and all of the shellfish listed in the above table spawn in Placentia Bay. Commercially-important finfish known to spawn in Placentia Bay include Atlantic cod (Hutchings et al. 1993), capelin, lumpfish, and Atlantic mackerel.

#### **4.1.4.7 Commercial Fisheries**

Several species of finfish and shellfish are harvested commercially in Placentia Bay. Historically, prior to the moratorium, the inshore fixed-gear cod fishery dominated the catch landings (i.e., weight) and value (dollars). Since the moratorium, the importance of the cod fishery has been quite variable. Some years have been characterized by negligible landings while in others cod has accounted for the highest landings. In recent years, the catch value of the cod fishery has been rivaled by the snow crab. Other important commercial species include herring, lumpfish, lobster, white hake (*Urophycis tenuis*) and American plaice (*Hippoglossoides platessoides*).

There are several sites (e.g., Placentia, Merasheen Island) in Placentia Bay that support commercial or developmental aquaculture ventures. Blue mussels and Atlantic cod are the primary farmed species and most aquaculture sites are small, family-run operations.

See Section 4.1.5.12 and Appendix C for more information about the commercial fishery, including processing, and aquaculture.

#### **4.1.4.8 Freshwater Resources**

In the inner portions of Placentia Bay, lakes and ponds are numerous, and small watersheds drain the many catchments basins of this landscape. Larger watersheds support significant rivers that typically form bar lagoons (barasways) at the estuary, notably Come-By-Chance River, Arnolds Cove Brook, Southern Harbour Brook. The water in these bar lagoons is brackish and probably with seawater intrusion from Placentia Bay through the 'gut' and/or cobble ridge between the pond and the ocean, and by waves and spray overtopping the gravel bar during severe storms or high tide events.

Bar lagoons often support enriched habitats with flora and fauna associated with intertidal mud flats, eelgrass (*Zostera marina*), and saltmarsh (including *Spartina alterniflora*). Diverse invertebrates provide a food base for fish and waterbird

populations, for example, the large numbers of waterfowl using the Arnolds Cove 'sanctuary' area.

Atlantic salmon, an anadromous fish that live in freshwater rivers for the first two years of life before migrating to sea occur in Placentia Bay and its adjacent brooks and rivers. Lesser numbers of resident and anadromous brook trout (*Salvelinus fontinalis*) and catadromous American eel are present in these rivers.

Come-By-Chance River, Watson Brook, North Harbour River, Black River and Pipers Hole River are five of twenty scheduled salmon rivers in Placentia Bay. Come-By-Chance River has an established run of Atlantic salmon, and is the focus of a local angling tradition. This river accounts for annual salmon catches <1% of the total in Newfoundland. A management strategy has been adopted for the region based on a river classifications system where individual rivers are rated Class I (highest) to Class IV (lowest), according to their ability to sustain angling activity and retention. All rivers in Placentia Bay are classified as III or IV and, in 2006, seasonal bag limits are set at two salmon and hook and release, respectively (DFO 2006). The aforementioned rivers are classified as Class III, and generally report low annual catches.

Canada's Department of Fisheries and Oceans (DFO) has established a policy of no net loss of habitat, applicable to both the freshwater and marine environments. In recognition that development can and does affect environments, over the years, DFO has developed a mechanism to address this policy – Habitat Alteration, Disruption or Destruction (HADD). This policy requires characterisation of the habitat that is anticipated to be impacted before any development related work and an assessment of the impacts on that habitat: this provides the basis for habitat compensation.

The Proponent's representatives have met with DFO fish habitat and HADD implementation officials to begin to address HADD for the refinery Project. The necessary field studies have been initiated in order that a fish habitat compensation strategy can be described in the Environmental Assessment.

The methodology being used for the field program is as outlined in several key guidance documents developed by DFO:

- 'Standard Methods Guide for the Classification and Quantification of Fish Habitat in Rivers of Newfoundland and Labrador'
- 'Life History Characteristics of Freshwater Fishes Occurring in Newfoundland and Labrador with Major Emphasis on Riverine Habitat Requirements'
- 'Standard Methods Guide for the Classification/Quantification of Lacustrine Habitat in Newfoundland and Labrador'
- 'Life History Characteristics of Freshwater Fishes Occurring in Newfoundland and Labrador, with Major Emphasis on Lake Habitat Requirements'

DFO is currently developing comparable information for habitat classification in the marine environment and will provide information from this work to assist design of the marine habitat characterisation field program.

#### **4.1.4.9 Species at Risk**

One species of plant, six species of fish, four species of bird, two species of marine mammals, and one reptile species considered at risk by SARA are known to occur, or potentially may occur, in the Placentia Bay area (Table 4-4). Seven of these species are also protected under the Provincial Endangered Species Act (see Table 4-4). This list will be re-evaluated and monitoring of status reports and candidate lists by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the authority recognized by SARA for assessing the status of species at risk in Canada, will occur on a regular basis.



**Table 4-4: SARA and Endangered Species Act Listed Species Known or Potentially Occurring in the Placentia Bay Area**

Species	SARA Status	Provincial Endangered Species Act Status
Boreal felt lichen ( <i>Erioderma pedicellatum</i> ) (Boreal population)	Schedule 1: Special Concern	Schedule C: Vulnerable
Atlantic salmon ( <i>Salmo salar</i> ) (Bay of Fundy)	Schedule 1: Endangered	Not Listed
Atlantic cod ( <i>Gadus morhua</i> ) (NL population)	Schedule 3: Special Concern	Not Listed
Northern wolffish ( <i>Anarhichas denticulatus</i> )	Schedule 1: Threatened	Not Listed
Spotted wolffish ( <i>Anarhichas minor</i> )	Schedule 1: Threatened	Not Listed
Atlantic wolffish ( <i>Anarhichas lupus</i> )	Schedule 1: Special Concern	Not Listed
Banded killifish ( <i>Fundulus diaphanous</i> )	Schedule 1: Special Concern	Schedule C: Vulnerable
Barrows Goldeneye ( <i>Bucephala islandica</i> )	Schedule 1: Special Concern	Schedule C: Vulnerable
Harlequin duck ( <i>Histrionicus histrionicus</i> )	Schedule 1: Special Concern	Schedule C: Vulnerable
Red Crossbill ( <i>Loxia curvirostra percna</i> )	Schedule 1: Endangered	Schedule A: Endangered
Short-eared Owl ( <i>Asio flammeus</i> )	Schedule 3: Special Concern	Schedule C: Vulnerable
Blue Whale ( <i>Balaenoptera musculus</i> )	Schedule 1: Endangered	Not Listed
North Atlantic Right Whale ( <i>Eubalaena glacialis</i> )	Schedule 1: Endangered	Not Listed
Leatherback Sea Turtle ( <i>Dermochelys coriacea</i> )	Schedule 1: Endangered	Not Listed

The only remaining viable populations in the world of the Boreal felt lichen occur in Newfoundland, and especially the forests on the Avalon Peninsula. It is listed as Special Concern under SARA. It has been reported from stands in the Long Harbour area and in the southeast section of the Avalon Peninsula (E. Conway, pers. comm., 1997).

There are no known critical nesting, feeding, staging or over-wintering areas for bird species considered at risk in the immediate area of inner Placentia Bay. In the outer reaches of Placentia Bay, notably the area of Cape St. Mary's and Jude Island archipelagos, significant numbers of the listed (Special Concern) eastern population of Harlequin Ducks occur.

It is possible that several species of fish species considered at risk may occur in Placentia Bay. However, the most likely species to occur is the Atlantic cod (Special Concern).

The blue whale is listed under Schedule 1 of SARA. The DFO marine mammal sightings database does not have any records of blue whales in Placentia Bay but it is possible that they occur there (J. Lawson, DFO, pers. comm., 2006). Fin whales are under consideration for addition to Schedule 1 of SARA; this species occurs regularly in Placentia Bay during summer months. (J. Lawson, DFO, pers. comm., 2006).

Leatherback sea turtles are listed on Schedule 1 of SARA. This species is known to occur in Placentia Bay, primarily in the outer reaches of the bay.

#### **4.1.5 Existing Socio-Economic Environment**

The following sections describe the current socio-economic environment within the Study Area. Data collection and analysis was undertaken at three geographic scales:

- The Isthmus, Clarenville and Placentia/Argentia region within a 50 km radius of Come-By-Chance;
- The Avalon Peninsula, and
- The Province of Newfoundland and Labrador.

The focus of the analysis is on the Isthmus area, in particular Come-By-Chance, Sunnyside, Arnold's Cove, Southern Harbour and Little Harbour on the east side of the head of Placentia Bay as well as North Harbour, Garden Cove and Swift Current on the west side of the head of Placentia Bay. Data was gathered from secondary

sources including the province of Newfoundland's Community Accounts, the Internet and telephone interviews.

The proposed project has the potential to impact the socio-economic environment through employment, the purchase of goods and services, as a source of revenue for the three levels of government, through the use existing land and the need for municipal, provincial and federal infrastructure. While final VEC selection will follow public consultation and review of the Project Description/Registration, the following five key valued components have been suggested for use in the Project Registration:

- Demography,
- Economy and business,
- Employment and income levels,
- Land use,
- Municipal, provincial and federal infrastructure and services

#### **4.1.5.1 Demography**

The population of the Province has been declining since 1991. Between 1996 and 2001, it decreased 7%. This drop is attributable to a number of factors, primarily out-migration due to a lack of diversified employment opportunities in the province, particularly in the rural areas, as well as declining birthrates. Table 4-5 shows the population statistics (2001, 1996) for the 50 incorporated and unincorporated communities within the 50 km commuting area of Come-By-Chance.

**Table 4-5: Population Change for the Communities in the Clarenville, Isthmus of Avalon, Placentia and Whitbourne/Blaketown Area, 1996-2001**

<b>Town</b>	<b>2001</b>	<b>1996</b>	<b>% change from 2001</b>	<b>Pop. loss</b>
<b>Clarenville Area</b>				
Clarenville including all communities on Random Island except Britannia, Hickman's Harbour and Lower Lance Cove. Also includes communities from Milton to Waterville	5,670	6,245	-9.2%	-575
Shoal Harbour	1,330	1,120	18.8%	=210

Town	2001	1996	% change from 2001	Pop. loss
Hillview including Adeytown, Butter Cove, Caplin Cove, Deep Bight, Hatchet Cove, Ivany Cove, Long Beach, Queen's Cove, Southport, St. Jones Within and parts of Gooseberry Cove, Hodge's Cove and Little Heart's Ease	1,620	1,890	-14.3%	-270
<i>Sub-total</i>	<i>8,620</i>	<i>9,255</i>	<i>-6.9%</i>	<i>-635</i>
<b>Isthmus of Avalon Area</b>				
Swift Current	275	285	-4%	-10
Garden Cove	115	160	-28.1%	-45
North Harbour	290	315	-7.9%	-25
Come-by-Chance	385	440	-12.5%	-55
Sunnyside	470	620	-23.4%	-150
Arnold's Cove including Arnold's Cove Station	1,060	1,150	-7.8%	-90
Southern Harbour	590	635	-7.1%	-45
Little Harbour	150	175	-14.3%	-25
Chance Cove	335	395	-15.2%	-60
Tickle Harbour	N/A	N/A	N/A	NA
Fair Haven	120	145	-17.2%	-25
Bellevue	395	510	-22.5%	-115
Norman's Cove including Long Cove and parts of Thornlea	860	985	-12.7%	-125
Chapel Arm	500	575	-13%	-75
Long Harbour	265	345	-23.2%	-80
Mount Arlington Heights	N/A	130	N/A	N/A
<i>Sub-total</i>	<i>5,810</i>	<i>6,865</i>	<i>-15.4%</i>	<i>-1,055</i>
<b>Placentia Area</b>				
Placentia/Argentia	2,115	2,455	-13.8%	-341
Dunville	1,475	1,600	-7.8%	-125
Freshwater	750	945	-20.6%	-195
Jerseyside	520	590	-11.9%	-70
Ship Harbour	180	190	-5.3%	-10
Fox Harbour	345	395	-12.7%	-50
<i>Sub-total</i>	<i>5,385</i>	<i>6,175</i>	<i>-12.8%</i>	<i>-790</i>
<b>Whitbourne/Blaketown Area</b>				
Whitbourne	1,265	1,330	-4.9%	-65
Blaketown	560	585	-4.3%	-20
<i>Sub-total</i>	<i>1,825</i>	<i>1,915</i>	<i>-4.7%</i>	<i>-90</i>
<b>Total</b>	<b>21,640</b>	<b>24,210</b>	<b>-10.6%</b>	<b>-2,570</b>
<b>Avalon Region</b>	<b>242,875</b>	<b>251,523</b>	<b>-3.4%</b>	<b>8,648</b>
<b>Province</b>	<b>512,930</b>	<b>551,795</b>	<b>-7%</b>	<b>-38,865</b>

Source: Community Accounts, Government of Newfoundland and Labrador

Within a 50 km community range of Come-By-Chance are approximately 50 incorporated and incorporated communities. Between 1996 and 2001, the population

in this area dropped from 24,210 to 21,640, representing a 10.6% decline in population compared with a 7% population decline for the province as whole for the same time period. Eight communities including Come-By-Chance (Come-By-Chance, Sunnyside, North Harbour, Garden Cove, Swift Current, Arnold's Cove, Southern Harbour, and Little Harbour) are located on both the east and west side of the head of Placentia Bay. Between 1996 and 2001 the population of these communities dropped from 3,780 to 3,335 representing a decline of approximately 11.8% (445 people).

On the Isthmus of Avalon are a total of 16 incorporated and unincorporated communities. Between 1996 and 2001 the population of the Isthmus dropped from approximately 6,865 to 5,810, a decline of 15.4%. Thus, for the entire area, the population between 1996 and 2001 has been declining at more than double the rate of the province as a whole. The eight communities near and including Come-By-Chance have declined less on a percentage basis than the total population of the 19 communities on or near the Isthmus of Avalon and the Placentia area, but more than the Clarenville area and Whitbourne/Blaketown.

On an anecdotal basis, the population decline of all 50 incorporated and unincorporated communities has continued since 2001, but until the 2006 census statistics are released, it will be difficult to determine the extent of that population decline. As discussed earlier, this population loss is attributed to lack of employment opportunities in the traditional industries (e.g. fishing and fish processing) as well as the closure of some of the larger industries in the immediate area (e.g. ERCO at Long Harbour, Bull Arm Fabrication Site) and the current draw of other better economies such as Alberta. The population loss is compounded by continuing declining birth rates. Unfortunate to any future industry in the area is that many of those who have out-migrated from the Isthmus area are skilled workers who may have worked at ERCO or the Bull Arm Fabrication Facility. This region of the province as well as the Conception Harbour area is known for its skilled trades' people.

Due to its more diversified economy, the Avalon Peninsula has experienced less of a population decline than all other areas of the province, losing only 3.4% of its



population during the 1996-2001 period. Out-migration from many of the smaller communities within the Study Area has occurred to other parts of Canada, but also to the St. John's region, thereby minimizing the overall population drop of the Avalon, although helping to maximize it within the Study Area.

#### **4.1.5.2 *Economy and Business***

The following describes the baseline economic conditions of the three study areas.

Relatively speaking, Placentia Bay has considerably more industry (e.g. Whiffen Head, Come-By-Chance Oil Refinery, Marystown Shipyard and Cow Head Offshore Fabrication Facility as well as the industrial cluster at Argentia) than other parts of the Island of Newfoundland. Both the Marystown Shipyard and the fabrication facility as well as the Bull Arm Site are currently experiencing a slowdown, but the proposed VBNC nickel processing plant at Long Harbour will add to a positive economic industrial mix within the Placentia Bay region.

The Avalon Peninsula will continue to be the driving force in the province due to its diversified economic base and will lead the province in terms of business expansion and development. Housing investment in the province has been robust in recent years increasing 3.1% in 2005 although decreasing by 13% in actual units reflecting the higher valued houses and strong renovation spending, the majority of which has occurred on the Avalon Peninsula and, in particular, in the greater St. John's region. Housing starts, again primarily on the Avalon Peninsula and, in particular, the St. John's region, are expected to decline in 2006 with the pent-up demand for residential housing now satisfied. This should free up some of the province's skilled workers for other opportunities.

The province as whole has continued to do well primarily as a result of oil and gas revenues. In 2005, the GDP experienced a modest 1.7% growth in consumption, government spending, investment and exports, but it is expected to increase by 6.2% due to higher mineral and oil production. However, capital investment is projected to decrease by 6.9% to \$4.0 billion as a result of completion of the very large Voisey's Bay and White Rose construction projects. In 2006 construction investment is projected to drop by 7.6% to \$2.9 billion and non-residential spending is expected to

decrease by 10.7% to \$1.9 billion, both due to declining mega-project investment and spending.

The majority of non-residential investment in construction (73%) was in mining and oil and gas industries. Current major projects underway in 2006 include refinery upgrades at North Atlantic Refining, Husky Oil capital expenditures, Iron Ore of Canada's multi-year capital investment program in Labrador West, Terra Nova and Hibernia capital drilling costs in 2006, ongoing Voisey's Bay mineral development expenditures in 2006, upgrades at both of Memorial's campuses (i.e. St. John's and Corner Brook) as well as significant investment in health care facilities in Labrador and Corner Brook; infrastructure funding to municipalities, ongoing St. John's harbour clean-up and highway upgrade programs.

Natural resources continue to define this province's growth. Mineral exports including iron ore shipments will increase in 2006, but newsprint as a result of the Stephenville closure, tourism as a result of recent world airplane terrorism threats, manufacturing as a result of lower newsprint and the completion of the White Rose project are expected to decrease and fisheries landings will decrease as a result of lower crab quotas and, therefore, lower landings (Government of Newfoundland, Department of Finance, 2006).

#### **4.1.5.3    *Employment and Income***

The provincial unemployment rate has dropped from 18.6% in 1997 to 15.3% in 2001 to 14.6% in 2006 while the size of the labour force has grown from 251,900 in 2001 to 369,400 in 2006. Labour participation rates rose during this period from 52.% in 1997 to 57.3% in 2001 to 62.12% in 2006 (Government of Newfoundland, Department of Finance). Table 4-6 and 4-7 shows selected statistics for population, income Levels, labour market and education for selected Communities on the Isthmus of Avalon using 2001 Statistics Canada Census data.

The provincial unemployment rate will continue to fall as more and more people leave the province. In fact, a current shortage of skilled labour for certain trades and professions currently exists in pockets of this province, notably in western Labrador and the Avalon region. If any of the proposed projects come to fruition, the province

and associated industries will need to escalate their recruitment efforts to attract many of our skilled workers and professionals back to this province.

The proponent is committed to the employment of residents of Newfoundland and Labrador. Pending approval of this project, hiring plans and policies will be put into place to ensure that first consideration for training and employment opportunities are to residents of this province. Initial meetings with key provincial initiatives addressing skilled labour supply in the province have been scheduled. See Section 4.6.1 for greater detail.

**Table 4-6: Population, Income Levels, Labour Market and Education for Selected Communities on the Isthmus of Avalon (2001 Statistics Canada Census)**

	Come-by- Chance/Goobies		Sunnyside		Arnold's Cove		Southern Harbour		Little Harbour		Province	
<b>Population</b>												
Population	385		470		1,060		590		150		512,930 (521,986-2001)	
Population change (1996-2001)	-12%		-24.2%		-8%		-7.1%		-14.3%		-7%	
Age/Sex distribution	195(M)	185(F)	245(M)	230(F)	525(M)	530(F)	310(M)	285(F)	80(M)	65(F)	253,439 (257,177 2001)	262,522 264,809 (2001)
Less than 20 yrs.	21%		20%		20%		29%				25%	
More than 65 yrs.	14%		12%		16%		8%				12%	
Migration rate	-4.0%		-0.9		N/A		-15.3%		-6.6%			
<b>Income levels</b>												
Personal Income per capita	\$20,900		\$21,300		\$21,400		\$20,100		\$20,400		\$19,800	
Average couple family income	\$57,600		\$64,300		\$64,700		\$65,700		\$51,200		N/A	
Employment Insurance Incidence	43.2%		48.2%		58.8%		70.8%		58.9%		37%	
Social Ass't Incidence	6.4%		10.4%		4.1%		3.1%		5.3%		13%	
<b>Labour market</b>												
Employment rate	77.8%		71.7%		81.7%		77.5%		72.0%		74%	
Change in employment	0%		-6.7%		1.6%		-2.8%		-10%			
<b>Education</b>												
High school or above	61.7%		32.4%		47.1%		49.4%		46.4%		60%	
Bachelor's degree or higher	N/A		7.5%		5.0%		3.6%		N/A		13%	
Self-reliance ratio**	77.9%		77.7%		76.3%		61.5%		58.6%		77.0%	

Source: Government of Newfoundland and Labrador, Community Accounts

\*Includes surrounding communities of Angels Cove, Cuslett, Great Barasway, Patrick's Cove, Point Verde and Ship Cove

\*\*A measure of community's dependency on government transfers (e.g. Canada Pension, Old Age Security, employment Insurance, social assistance, etc.) the higher the % of income that comes from transfers, the lower the self reliance ratio.

**Table 4-7: Population, Income Levels, Labour Market and Education for Selected Communities on the Isthmus of Avalon (2001 Statistics Canada Census)**

	<b>Placentia*/ Argentia</b>		<b>Dunville</b>		<b>Freshwater</b>		<b>Jerseyside</b>		<b>Province</b>	
<b>Population</b>										
Population	2,115		1,475		750		520		512,930 (521,986-2001)	
Population change (1996-2001)	-13.8%		-7.8%		-20.6%		-11.9%		-7%	
Age/Sex distribution	1,010(M)	1,100(F)	735(M)	745(F)	355(M)	390(F)	260(M)	260(F)	253,439 (257,177 2001)	262,522 264,809 (2001)
Less than 20 yrs.	25%		29%		24%		24%		25%	
More than 65 yrs.	17%		11%		15%		16%		12%	
Migration rate	-13.0%		-11%		-11.1%		-11.1%			
<b>Income levels</b>										
Personal Income per capita	\$17,100		\$17,400		\$15,700		\$15,800		\$19,800	
Average couple family income	\$55,800		\$57,600		\$48,400		\$49,000		N/A	
Employment Insurance Incidence	45.6%		39.7%		51.0%		56.2%		37%	
Social Ass't Incidence	14.1%		13.1%		19.3%		12.1%		13%	
<b>Labour market</b>										
Employment rate	75%		78.8%		66.0%		70.5%		74%	
Change in employment	2.0%		-2.7%		0%		0.0%			
<b>Education</b>										
High school or above	58.7%		73.4%		55.9%		57.5%		60%	
Bachelor's degree or higher	3.6%		7.6%		4.7%		N/A		13%	
Self-reliance ratio**	69.0%		74.9%		67.0%		63.6%		77.0%	

Source: Government of Newfoundland and Labrador, Community Accounts

\*Includes surrounding communities of Angels Cove, Cuslett, Great Barasway, Patrick's Cove, Point Verde and Ship Cove

\*\*A measure of community's dependency on government transfers (e.g. Canada Pension, Old Age Security, employment Insurance, social assistance, etc.) the higher the % of income that comes from transfers, the lower the self reliance ratio.

#### **4.1.5.4    *Community Health***

A community health survey will be completed by the Health Research Unit through the Faculty of Medicine at Memorial University of Newfoundland. This study will allow an overall picture of the current health levels of residents in communities near the project site to be obtained. This survey will provide population-level baseline data on the health status of the residents in the area and potentially indicate health determinants, allowing for the potential impact of the project to be determined in future years.

#### **4.1.5.5    *Land Use***

The general area where the Project will be located is in the vicinity of the existing Come-By-Chance Oil Refinery and transshipment terminal which are brown field sites, however Southern Head is a greenfield site. There are a variety of industries located within a 50 km radius of the proposed refinery site. They are described in the following sections. The site is accessible only by boat and it is not anticipated that uses other than limited recreational fishing and hunting occur on the peninsula (supported by a site visit September 8/06). In addition, no domestic/commercial cutting occurs near the proposed site. See map in Figure 4-8 - Industrial Study Area for Proposed Refinery in Newfoundland and Labrador.

##### *Petroleum and Refining Industries*

Placentia Bay, where both the Come-by-Chance oil refinery and Whiffen Head transshipment terminal are located, has become an important location for the Newfoundland Petroleum Industry – an industry that began in the Bay in the 1960s and has seen substantial growth in the past 15 years. In fact, by 2004 it had become Canada's largest petroleum transshipment centre. Part of the reason for its growth is its depth and ice-free characteristics. It is also one of a limited number of places in eastern North America that can accommodate supertankers, also known as Very Large Crude Carriers (VLCC), that can hold between 100 000 and 326 000 deadweight tonnes (dwt) (North Atlantic Petroleum, [www.na-refining.nf.ca](http://www.na-refining.nf.ca), 2006).

# Industrial Study Area for Proposed Refinery



**Figure 4-8: Industrial Study Area for Proposed Refinery in Newfoundland**  
Resource mapping provided by the Government of Newfoundland and Labrador

1:800,000  
World Geodetic System 1984  
Zone 22N

### *North Atlantic Refining*

The North Atlantic Refining facility in Come-by-Chance was built in 1971 by Procon Limited for Shaheen Natural Resources, but went through a bankruptcy and closure in 1976 as well as several owners including Petro-Canada before North Atlantic Refining Limited ( NARL) bought and reopened it in 1994. One of the competitive advantages of this facility is its position on international shipping routes that are relatively close to important suppliers of crude oil in the North Sea, West Africa and the Arabian Gulf. Also these ships can tie up for extended time periods at the facility's deep water ice-free port. Annually the refinery receives deliveries of about 40 million barrels of input (5.5 million tonnes) and exports a similar amount of refined oil. 7.2 million barrels (a million tonnes) can be stored there at a time. The primary market of NARL is the Northeastern United States. The facility employs between 500 and 700 workers (North Atlantic Petroleum, [www.na-refining.nf.ca](http://www.na-refining.nf.ca), 2006).

### *Whiffen Head Marine Oil Terminal*

The Whiffen Head Newfoundland Transshipment Ltd. facility located approximately 12 km south of Come-By-Chance by road was built by the oil companies involved with the Hibernia and Terra Nova oil fields in 1998 for the purpose of year-round temporary storage and transshipment of crude oil from these fields. Major marine facilities located at the terminal site include: a causeway, tug basin, approach trestle, jetty with berthing and two loading platforms with marine topside facilities (crude transfer and control system). Major onshore facilities include a tank farm, tank heating system, interconnecting flow-lines, supporting facilities, waste-water handling system and a fire protection system. It is operated by the American company International Matex Tank Terminals (IMTT), which is a consortium associated with the oil companies.

Oil from Newfoundland's offshore production areas is shipped there year-round by three shuttle tankers built specifically for this purpose, each with about 850,000 barrel capacity. From Whiffen Head the crude oil is shipped to markets by ships owned by those purchasing the oil. In 2004 the terminal employed 21 people and received about 325 incoming vessels. During its life the terminal is expected to



receive approximately 60 loads of 850,000 barrels of crude oil from its two shuttle tankers and another 90 trips per year from second-leg tankers. This activity totals 25% of the current crude oil tanker trade in Canada (Community Resource Services Limited & Jacques Whitford Environmental Limited, 2001: 54).

#### *Bull Arm Fabrication Site*

The Bull Arm Fabrication Site was developed in 1990 to meet the needs of the growing offshore oil industry. The site has been used for the Hibernia, White Rose, and Terra Nova oil field projects and continues to change to accommodate the oil industry. Currently the site is internationally certified to receive any vessels or rigs.

Features of the site include a 16 km paved access road, self-sustained power supply and communications, onsite water system for drinking water, fire fighting and industrial water, and a sanitary system with a sewage treatment plant.

The Bull Arm site contains three major areas. The dry dock construction and fabrication site expands over an area of 140,000 m<sup>2</sup> and includes a 9,000 m<sup>2</sup> superpipeshop/ warehouse with ten overhead cranes. Also included are a carpentry/ warehouse building, a concrete batch plant, a high strength concrete testing laboratory, administration/office buildings, and marine facilities including the former drydock and seven quays located inside and outside the drydock area. The topsides fabrication and assembly area encompasses a 120,000m<sup>2</sup> area. Facilities include an administration building, pipe shop, cutting shop, assembly hall, blast/paint shop, heated warehouse and a large fully equipped module fabrication hall. The final area at the Bull Arm site is the back cove industrial area and deepwater site. This area features extensive lay-down and docking areas used to facilitate deepwater construction.

Employment at the site varies depending on the needs of the project. During the construction of Hibernia the work force peaked at 2400, where as subsequent projects have averaged about 250 employees (Bull Arm Site Corporation, 2006).

### Mining and Mineral Processing

#### *Long Harbour Commercial Nickel Processing Plant*

Voisey's Bay Nickel Company (VBNC), a subsidiary of INCO, submitted a proposal in the winter of 2006 to build and operate a commercial nickel processing plant in the town of Long Harbour, Placentia Bay, which is about 50 km from Come-by-Chance by road. The processing plant is proposed to be built on a green field site on the south side of Long Harbour. Currently, the objective is to build a hydrometallurgical plant that would produce 50,000 tonnes of finished nickel product annually, as well as copper and cobalt products. The plant will require 65 hectares, as well as 85 hectares for residue ponds and pipelines. The port of the former phosphorous plant owned by ERCO and Albright and Wilson Americas will be upgraded to accommodate the new infrastructure.

If VBNC finds that the 'hydromet' plant is not technically or economically feasible, a traditional smelting plant or 'matte' plant will be built instead that will require different infrastructure. Regardless of which type of processing facility is finally chosen, construction is slated to begin in 2009 with operations beginning in 2012. Labour projections for the operations phase are 400 personnel for the "hydromet" plant and 350 personnel for the "matte" plant.

Long Harbour is the former site of a phosphorous plant operated by the Electric Reduction Company of Canada (ERCO). Built in 1968, it closed in 1989 due to declining world markets as well as high pollution rates (Voisey's Bay Nickel Company, 2002: 3-5).

#### Other - Quarries

The only producing mine in the immediate vicinity of the Come-By-Chance area has been a small granite producing operation in the Piper's Hole River area that has been operated by Dimension Stone Inc. Numerous small quarries operate within the immediate vicinity of Come-By-Chance. Table 4-8 describes these quarries and their operators.

**Table 4-8: Quarries in the Immediate Study Area**

<b>Location</b>	<b>Operator</b>
Off Tower Road	Kevin Wareham Ltd.
Northeast of TCH, Near Arnolds Cove Intersection	Terra Nova Industries Ltd.
0.5 km North of Arnolds Cove Intersection & TCH	J-1 Contracting Ltd
North of Spur Line Near Mill Building, Come-By- Chance	Three R. Enterprises
¼ mile from Old Mill Building, Come-By- Chance	Town Council of Come-By-Chance
Come-By-Chance	William Best
West Side of TCH 4 km North of Come-By- Chance	Derek Short Equipment Rentals
Behind Transport Weigh Scales, East of Goobies	Municipal Construction Ltd.
750m South of Goobies Weigh Scales, Off Route 1	J-1 Contracting Ltd.
Loadstar Pit, 3.5 km East of Goobies	Keith Green Ltd.
Behind Highway Depot, Goobies	Dept. Transportation and Works, Goobies
4 km West of the TCH off 210	Dept. Transportation and Works, Goobies
400m South of North Harbour Intersection	Dept. Works Services and Transportation, Burin Bay Arm
12 km from TCH toward Swift Current	Carew Services Ltd.
3 km West of Piper's Hole River Bridge	Mirkey Construction
Piper's Hole	10250 NFLD Ltd.
Piper's Hole	Hickey's Contracting
Piper's Hole	Hickey's Contracting
Piper's Hole	Nortech Construction
Piper's Hole	Dean Clarke
Piper's Hole	Dept. of Transportation, Goobies
Piper's Hole	Cluetts Construction
Piper's Hole	Goobie Rentals & Contracting
Piper's Hole	Provincial Paving

Source: Government of Newfoundland, Department of natural Resources, Mining Division

#### **4.1.5.6 Marine Industry**

##### Fish Processing

Currently, seven fish plants are located within approximately 50 km of Come-By-Chance by road. The largest of these, Icewater Seafoods Ltd., is located in Arnold's Cove. A variety of seafood is processed there, including Atlantic cod, redfish, mackerel, herring and flounder. The other fishplants in the area are located in Clarenville, Chance Cove, Southern Harbour, Fairhaven, Norman's Cove-Long Cove and Ship Harbour. Additional information is available in Appendix C.

##### Shipbuilding

Although no shipbuilding or related industries currently exist within 50 km by road of Come-by-Chance, two such industries are located on the western side of Placentia Bay: the Cow Head Offshore Fabrication Facility, located in Spanish Room, and the Marystown Shipyard, located approximately seven kilometers to the south of the fabrication facility. Both of these industries are owned by Kiewit Offshore Services Ltd. (KOS) that had involvement in the construction of the White Rose project (2002 – 2005). Marystown Shipyard has 300 m of water frontage and a 9,358 m<sup>2</sup> in-house fabrication area. Work at the yard ranges from construction and repair of fishing vessels to the commissioning, maintenance and decommissioning of offshore oil rigs. The Cow Head fabrication facility, completed in the early 1990's includes approximately 81,000 m<sup>2</sup> of land area and on which is situated a 14,000 m<sup>2</sup> of covered in-house fabricating area (Community Resource Services and Jacques Whitford, 2001).

#### **4.1.5.7 Other Businesses**

A few larger businesses are located in the Study Area. One of these is Smith Snack Service Ltd., in Norman's Cove, which has existed for about 30 years. This company manufactures and distributes food, such as subs and sandwiches, to schools, stores and institutional cafeterias throughout Newfoundland. The company currently employs 25 people year-round and has plans to expand, creating possibly 15-20 more jobs.

Another larger business in the Study Area is Avalon Ocean Products Inc. in Arnold's Cove. Established in 1989, the company distributes products such as sea scallops, squid, Atlantic cod, blackback, flounder, capelin and lobster to markets in Canada, Europe and the United States. The company is seasonal, working from March to December of each year, with employment varying from 25-40 workers. The company operates a fish plant in Fairhaven and a storage facility in Arnold's Cove.

Although outside the 50 km radius of Come-By-chance, a variety of industries are located on both the North and South sides of the Argentia Harbour besides the Marine Atlantic Ferry. These include Argentia Freezers (EIMSKIP), Collin's Contracting, Penny Industrial, Public Works Canada, Argentia Management Authority, Argentia Property Management, Argentia Dry Cleaning, Stellar Woodworks, Town of Placentia, St. Lawrence Cement, Tacamor, Rogers International, Pier Water Sales, Northland Contracting, Fusion Services and Voisey's Bay Nickel Company. Approximately 180 people are employed on the Argentia Peninsula, totaling 3,540 person months.

#### **4.1.5.8 Agriculture**

The primary agriculture area on the Isthmus is located in Whitbourne and Markland. Whitbourne has acted as a railway junction, sawmill centre and during the Commission of Government it became a centre for government services. Today the Newfoundland Youth Centre is located there as well as some agriculture operations. However, Markland is one of the primary agriculture areas in this province (Cormack and Lethbridge are the other two) established for ex-service men and other interested parties during Commission of Government in the 1930's. Today the area has a number of farms, including some involved in experimental crops, and the very successful Rodrigues Winery located in the former Markland Hospital that produces more than 300,000 cases of berry based wine a year to Newfoundland, Canada and internationally.

With a growing interest in agriculture and an increase in the number of older people in the province including the Isthmus area, a small but increasing interest in agriculture has occurred for growing flowers and vegetables as well as raising

livestock on a small commercial as well as hobby basis. One of the largest fox farms in North America is located in North Harbour and several other fur and sheep farms are located near Cape St. Mary's. Within zone 18 (east side of Placentia Bay) are located dairy, sheep, beef, medicinal root farms, root farms, hay and crop, winery, greenhouse-floral, fox, cattle, emu, ostrich, and Christmas tree. Sheep farming represents 43.2% of the farming activity within Zone 18 (<http://www.avalongateway.ca/>).

#### **4.1.5.9 Transportation**

##### Marine

##### *Ferry*

Marine Atlantic, a Canadian Federal Crown Corporation, operates a ferry service between Newfoundland and Nova Scotia. One of the two terminals in Newfoundland is located on the Argentia Peninsula near the site of the former Argentia Naval Base. Service is provided three days per week between Argentia and North Sydney, Nova Scotia from mid June to late September each year. At its peak, Marine Atlantic employs about 1,200 people between its three terminals (Argentia and Port-Aux-Basques, Newfoundland and Sydney, Nova Scotia. The ferry takes approximately 14 hours to travel between Argentia and North Sydney (Marine Atlantic, 2006)

##### *Harbours and Shipping*

Within Placentia Bay are several major harbours capable of accommodating large ocean-going vessels such as oil tankers, ferries, container and bulk carriers, general cargo vessels, Canadian Coast Guard (CCG) boats, and naval and fishing vessels. The main ports are Argentia, Burin, Cow Head, Come-By-Chance, Marystown, and Whiffen Head. There are also 44 small craft harbours, two of which are maintained by Transport Canada and the rest by DFO. Larger vessels use the eastern Channel of Placentia Bay to travel to and from Come-By-Chance and Whiffen Head.

In some Placentia Bay ports (i.e. Come-By-Chance and Whiffen Head), pilotage is required and all tankers or vessels must pay a fee for the service. This service is

provided by the Atlantic Pilotage Authority (APA) which employs two pilot vessels and eight harbour pilots. A "Pilot Boarding Station" (PBS) is located at Red Island, where vessels carrying oil must be boarded by the pilots and then accompanied into port. Additionally, at Come-By-chance and Whiffen Head, the two mandatory ports, purpose-built tugs help oil tankers discharge or load product.

CCG is responsible for vessel traffic management in Placentia Bay and has a Marine Traffic Communications and Traffic Services facility in Argentia that maintains a voluntary traffic management scheme.

The need for the services of the APA and CCG has increased over the past few years, along with an increase in vessel traffic. In 2001, for example, monitored vessel traffic in the area totaled 6,906, and by 2003 the count had increased to 9,009. Oil tanker traffic increased by 136% during this time period from 570 to 1,345 movements (Canning & Pitt Associates, Inc., 2004).

#### Land

##### *Highway*

Route 1, the Trans Canada Highway, connects all communities on the Isthmus. This is the main route used by bus services. DRL Coachlines operates a daily bus service along the entire Trans Canada in Newfoundland from St. John's to Port-aux-Basques with scheduled stops at Whitbourne Junction, Goobies Junction and Clarenville. Other private transportation companies that service the Isthmus include Marsh's Taxi, which operates between St. John's and Bonavista, with stops in Whitbourne and Clarenville, and Newhook's Taxi, that operates between St. John's and Placentia (and Argentia in the summer when the ferry is running), and makes a stop in Whitbourne.

#### **4.1.5.10 Tourism and Recreation**

The Isthmus of Avalon offers a number of attractions and recreational opportunities to visitors and residents, including Sunnyside's hiking trail, lookout point and museum; Arnold's Cove look out point, walking trail and Big Pond Bird Sanctuary;

and near by Norman's Cove's and Long Cove's walking trails. Swift Current has the 4 Star Kilmory Resort and Whitbourne has a Heritage Museum. Blaketown is known for its Beothuck Site. Clarenville is a service hub and gateway to the increasingly popular Bonavista Peninsula. Winter recreation is focused on the White Hills ski resort just outside of Clarenville as well as the numerous cross country trails in the vicinity of Clarenville.

Outside of the 50 km radius of Come-By-Chance, but within the Placentia Bay area are a number of other cultural and tourism sties including the Castle Hill National Historic Site where lies the remains of an old French Fort, O'Reilly House Museum and significant archaeological digs in Placentia. There is also a Heritage Trail. At the eastern entrance to Placentia Bay is Cape St. Mary's Ecological Reserve, where the third largest nesting colony of gannets in North America is located. North of the community of Placentia is Ship Harbour where the Atlantic Charter Monument is located that commemorates the drafting of the Atlantic Charter in 1941 by then British Prime Minster, Sir Winston Churchill and United States President, Franklin Roosevelt. The Charter, which was signed just offshore of Ship Harbour, is a joint declaration on the purposes of the war against fascism.

The greater Placentia Bay area is of interest to both the tourist and residents in terms of recreational opportunities including pleasure cruising, sea kayaking, cruising/remote island stay experience, bird watching, national historic sites, and provincial parks.

The 2004 Product Development study of the province, (A Special Place, A Special People, 2004) does not discuss the Isthmus of Avalon as a potential or growing tourism area, but the Cape Shore drive from Argentia to Cape St. Mary's is rated as a tier two destination area (i.e." have some, but not sufficient critical mass of anchor attractions, secondary attractions and/or service, but has the potential to rate well on the criteria if some identifiable and feasible things can be done to enhance their rating), is considered a priority themed touring route and Argentia/Placentia has been designated as a service centre/hub and gateway. and is rated as a two star attraction by the Michelin guide, 'worth a Detour". The top priority influencers in attracting visitors to this province are regional and provincial packages and tours and key



natural attractions and selected ecological reserves including Cape St. Mary's Ecological Reserve.

#### **4.1.5.11 *Municipal, Provincial, and Federal Infrastructure and Services***

Local infrastructure and services in the Study Area are shown in Figure 4-9.

##### Educational Facilities and Capacity

Twelve schools located within the 50 community Study Area are listed in Table 4-9 along with their enrolment increase/decrease between the school years of 2001-2002 and 2004-2005 as well as the number of teachers in the school as of the school year 2005-2006.

Additionally, the College of the North Atlantic (CNA) has a campus in both Placentia and in Clarenville. The Placentia campus has an enrollment of about 130 full-time and 25 part-time students per semester and offers teaching programs such as Welding and Heavy Duty Equipment Technology. The Clarenville campus has about 250 full-time and 50 part-time students per semester and provides programs such as Adult Basic Education and Business Administration. The Clarenville campus also houses the province's Distributed Learning Centre.

As is the case throughout the province, with a substantial decrease in school enrolment due to out-migration and declining birth rate, a rationalization of schools has occurred and will continue to occur. This is true for the isthmus area. Overall, sufficient classroom capacity exists in all schools, but the ratio of teachers to students has not dropped.

# Local Infrastructure in Study Area for Proposed Refinery

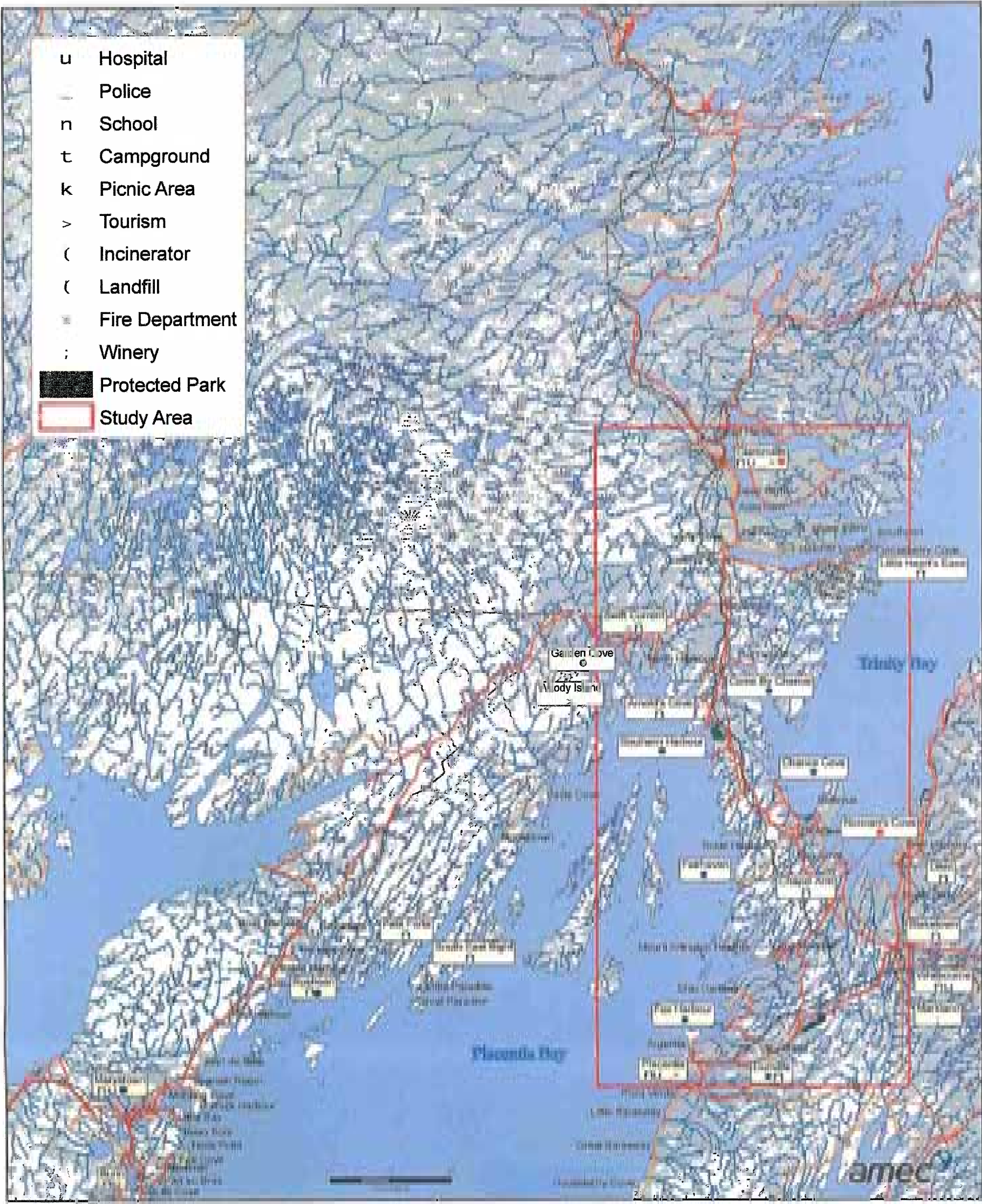


Figure 4-g: Local Infrastructure in Study Area for Proposed Refinery in Newfoundland  
Resource mapping provided by the Government of Newfoundland and Labrador

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**Table 4-9:  
Schools Located Within the 50 km Radius of Come-By-Chance,  
Their Enrolment and Number of Teachers**

Town	School	Enrolment		No. of teachers
		2004-05	2001-02	2006
Arnold's Cove	Tricentia Academy (K-12)	379	382	26
Blaketown	Crescent Collegiate (7-12)	743	782	45
Chapel Arm	Holy Family Elementary (K-6)	139	92	45
Clareville	High School (9-12)	402	412	25
	Middle School (4-8)	299	280	25
	Primary School (k-3)	228	213	18
	Balboa Elementary (K-8)	341	380	25
Dunville	St. Ann's Academy (K-9)	268	359	22
Placentia	Laval High School (9-12)	282	305	25
	St. Edward's Elementary(K-8)	243	304	25
Swift Current Academy	Swift Current Academy (K-12)	82	99	12
Whitbourne	Whitbourne Elementary (K-12)	91	95	7
	Perlwin Elementary (closed)		150	
	NL Youth Centre	25		

Source: Individual Schools

#### Medical and Emergency Services/Capabilities

The Dr. G.B. Cross Memorial Hospital in Clareville services the Study Area. This facility has 49 acute care beds, 14 long-term care beds and two respite care beds. Many services are provided including: anesthesia; chemotherapy; diabetes education; family practice; general surgery; gynecology; ICU/cardiac; internal medicine; laboratory; long-term care; mammography; nursing; rehabilitation; CT services; nutritional services; obstetrics; occupational therapy; palliative care; pastoral care; pathology; pediatrics; pharmacy; phototherapy; psychiatry; physiotherapy; podology; recreation therapy; respiratory therapy; social work; speech language pathology; ultrasonography; visiting specialty clinics; and 24-hour emergency services. The full complement for the hospital is 22 doctors, of which, 17 are specialists. Currently the hospital is operating 2 doctors less than their full complement.

The Dr. William H. Newhook Community Health centre is located in Whitbourne and is used as a teaching facility for Memorial University's Faculty of Medicine. The facility maintains 3 observation/holding beds and a full range of services including diagnostic, environmental, outreach programs, visiting disciplines in audiology, dietetics, and occupational therapy, and 24-hour emergency services. The Placentia Health Centre maintains 10 acute care beds, 75 nursing home beds (Level II and III care), two respite care beds and 40 independent living units. This facility also offers a full range of services similar to the Whitbourne facility. Additionally, some of the communities have specialized health services such as dentists (i.e. Placentia, Clarenville).

As is the case throughout the province, it is becoming increasingly difficult to attract medical professionals to the rural areas of this province and as the population increasingly declines to out-migration and a lower birthrate, this situation will become exacerbated.

#### Fire Fighting and Police

All of the Study Area is policed by the Royal Canada Mounted Police (RCMP). Headquartered in St. John's, the RCMP also has regional detachments. The Clarenville detachment is responsible for the Clarenville to Bonavista district, and the Placentia detachment covers the Placentia to Whitbourne district. The Clarenville detachment includes a highway unit and employs 14 officers. The Placentia detachment employs seven officers.

As is the case in other rural Newfoundland and Labrador communities, those in the Study Area receive fire protection services through volunteer fire departments. Even smaller communities, such as Come-By-Chance, Sunnyside and Southern Harbour have their own volunteer fire department. Additionally, an industrial fire department is located at the North Atlantic Refinery in Come-By-Chance.

In addition to residential fire services fire protection of natural areas is provided through the provincial Department of Natural Resources. One of the duties of conservation officers throughout the province is to respond to emergency fire

situations. A district office is located in Clarenville and a satellite office is located in Whitbourne.

### Water and Sewer

Most towns within the Study Area provide water and sewer services to residents. Homes and businesses in Come-By-Chance, Southern Harbour and Arnold's Cove are all connected to their town's system, while Sunnyside is in the process of connecting all homes to the services, with about 75% complete to date. The rate charged for this service varies by community, but in Arnold's Cove, for example, water for residential use is \$144/year and for commercial use is \$240/year. The cost for connection to the sewage system is \$48/year for both residences and businesses.

### Waste Management

Waste pick-up and disposal is a service provided by almost all towns in the Study Area. Arnold's Cove, Sunnyside and Southern Harbour have their own waste disposal sites, while Come-by-Chance uses the one in Sunnyside.

### Communications

All of the communities in the Study Area have access to the Internet. Arnold's Cove, Southern Harbour, Come by Chance and Sunnyside, as well as other small communities, have dial-up connections. However, the larger centres (i.e. Clarenville and Placentia) have access to both dial-up and high-speed Internet connections.

### Community Spill Response Capabilities

According to the Placentia Bay Project Benefits Study (2004), significant investment has been made in Newfoundland in oil spill response equipment and technology. Much of this is focused on the Placentia Bay area, due to its importance to the oil industry and its general high volume of. CCG can respond to spills of 10 00 tonnes or less. The North Atlantic Refining Ltd. facility has equipment on-site to deal with spills of <50 tonnes, as does the Whiffen Head terminal. Additionally, the Eastern Canada

Response Corporation (ECRC) has capacity to respond to a spill of 2,500 tonnes and, if needed, 7,500 tonnes using equipment from other ECRC centres. The corporation also maintains a “sub-depot” at Whiffen Head with capability to deal with a 150 tonne spill.

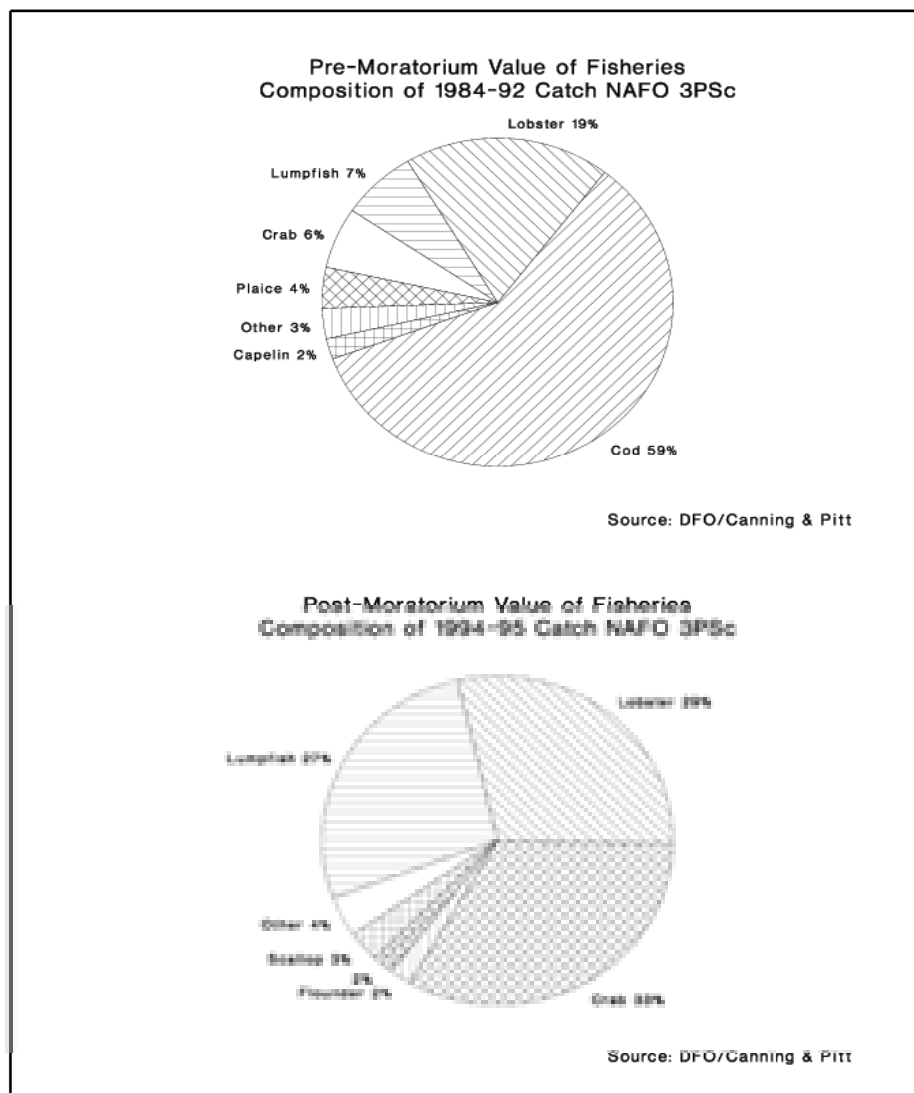
#### **4.1.5.12 Commercial Fisheries and Aquaculture**

A brief description of these the commercial fisheries and aquaculture industries within Placentia Bay follows. A detailed outline of the existing commercial fishery and aquaculture industry is included with this report in Appendix C.

##### Commercial Fisheries

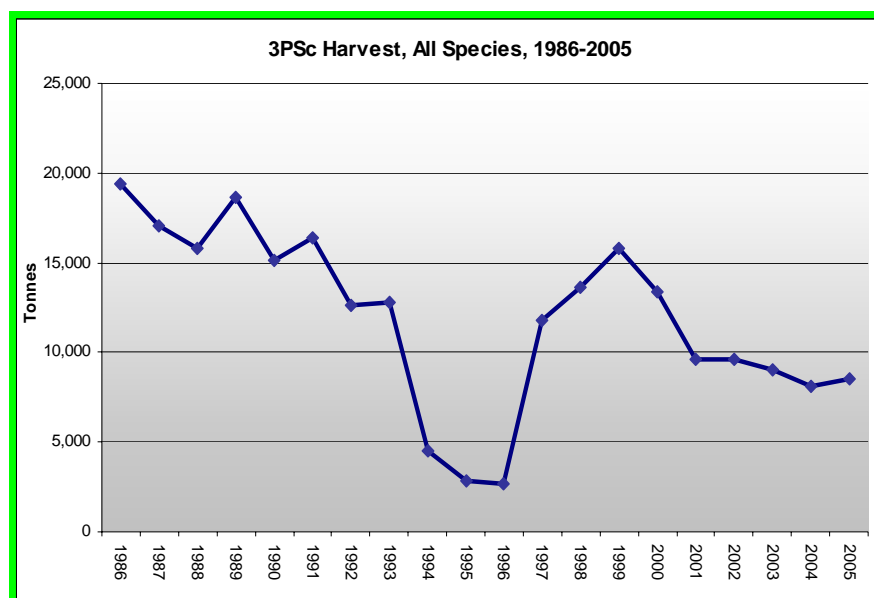
Drastic changes occurred in the Placentia Bay commercial fisheries in the early 1990s when fisheries moratoria were imposed because of declining groundfish stocks. For example, within 3PSc for the period 1984-1990, 74% of the catch by quantity was cod while snow crab made up just 3%; during 1994-1995, immediately after the moratoria were imposed, cod made up only 6% of the harvest and snow crab catches had increased to 24%. In terms of value, cod accounted for nearly 60% of the value of the 3PSc harvest (1984-1992), but only a negligible amount in 1994-1995 (see Figure 4-10).

Between the landings highpoint in 1986 and the 1995 harvest, the quantity of biomass taken from Placentia Bay declined from more than 19,000 tonnes to under 3,000 tonnes, a drop of 85%. However, the landed value of the 3PSc fishery did not experience a similar decline, owing to the changed composition of the catch, made up - in 1995 - primarily of high-priced species such as lobster, snow crab and lumpfish roe. Total value continued to rise after 1995 and, by 2002, the harvest from 3PSc was worth more than \$18 million; this was nearly 180% of the value of the harvest in 1986 - the peak harvesting year within the 1986-2005 timeframe. Even with weaker prices in recent years, snow crab is still a very valuable species in this area.

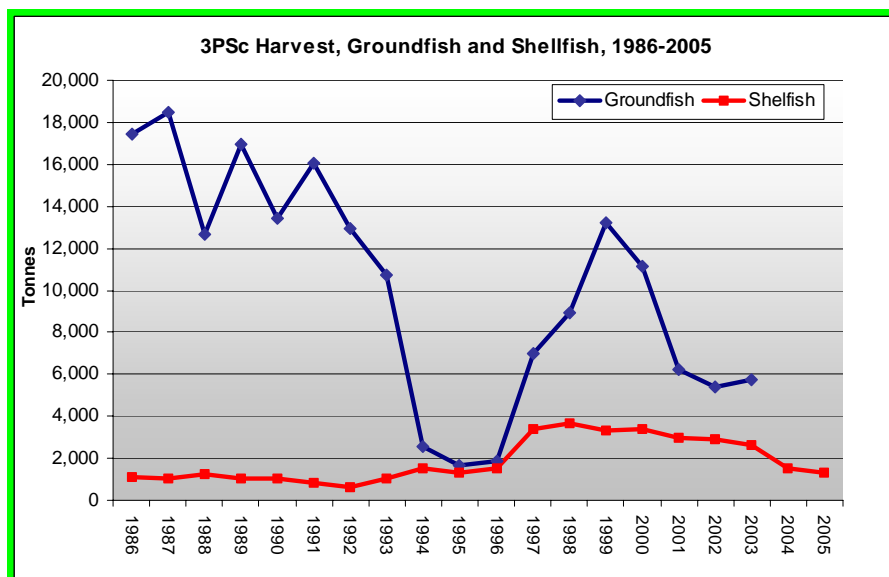


**Figure 4-10: Value of Fisheries**

Figure 4-11 shows the overall quantity harvested (all species), and Figure 4-12 contrasts groundfish and shellfish harvests (mainly snow crab, scallops and lobster) over this period.



**Figure 4-11: 3PSc Harvest, All Species, 1986-2005**



**Figure 4-12: 3PSc Harvest, Groundfish and Shellfish, 1986-2005**

Since the mid-1990s, the fisheries and fisheries management and licencing regimes in Placentia Bay have continued to evolve. Most significantly, a fish harvesting rationalization strategy was implemented in the province that reduced the number of participants in the harvesting sector, and a professionalization process was introduced which prescribed specific levels of experience and training required to be a professional fish harvester. Along with this system, DFO introduced the "core"



harvesting enterprise designation, with restrictions on harvesting by those who are not part of such an enterprise.

In present-day Placentia Bay fisheries, cod is still by far the most important species harvested in the area, with snow crab, herring and lumpfish (roe fishery), scallops and a few other groundfish species making up most of the remainder.

Some harvesting is conducted year-round, however, since 1996, the peak harvesting months have been June and July with a fairly strong fishery in the late fall (primarily for cod).

In terms of economic value, the area's commercial fishers currently depend on three, high-value species - lobster, snow crab and cod - for the bulk of their annual fishing income. While lobster accounts for only a small percentage by weight of the annual catch, given its high value this species remains very important to many study area fishers.

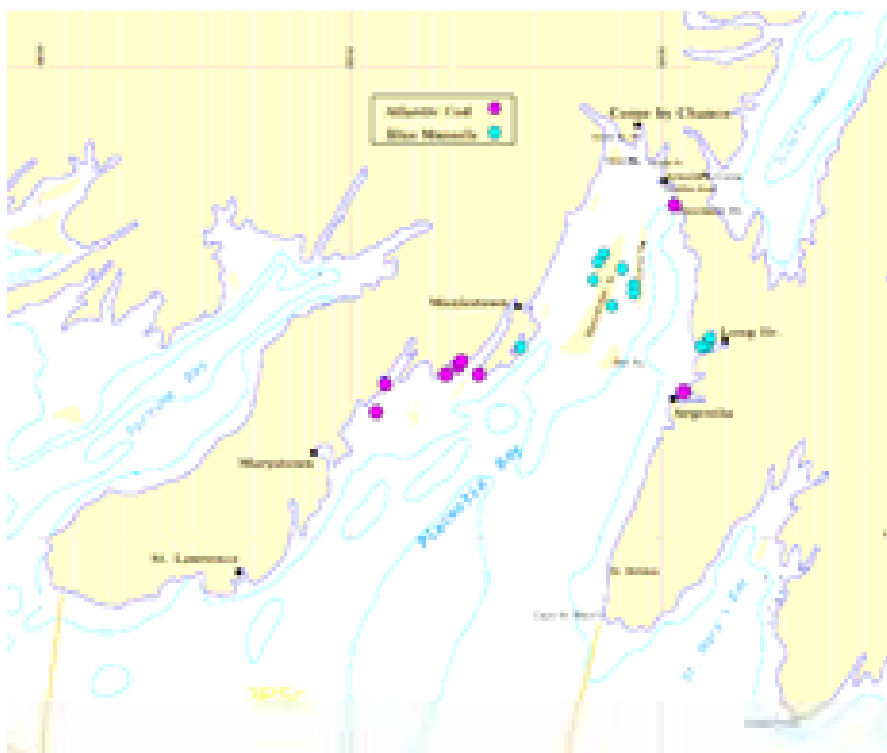
#### Aquaculture

The development of aquaculture resources in Placentia Bay has been underway since about the mid-1990s. In 1997 there were about seven licenced aquaculture operations, and several applications pending to investigate and/or develop additional sites.

However, DFA reports that, during 2000-2003, there was significant level of expansion in the Placentia Bay aquaculture sector, and a considerable interest in the development of new sites - particularly on the Burin Peninsula side of the bay, and around Merasheen Island.

At present, there are 19 "active" (commercial or "developmental") aquaculture operations in the Placentia Bay area. DFA managers note that several 2006 sites are still awaiting final approval and discussion by the Proponent with Transport Canada indicate that up to a dozen applications for aquaculture sites are in progress. Transport Canada also commented that the size of individual farms is increasing

Figure 4-13 shows the geographic location of existing aquaculture activities in Placentia Bay.



**Figure 4-13: Existing Aquaculture Sites in Placentia Bay (2006)**

The Project will import crude oil feedstocks and refine them into value-added petroleum products for export and domestic consumption. Figure 4-14 shows the footprint of the refinery and the associated marine facilities. The area required for the refinery site is approximately 5 km<sup>2</sup> and the two-lane access road is approximately 8 km in length. The Come-By-Chance River will be crossed by a single span bridge as part of the site access road. This will be located well upstream and away from major tidal influences. As part of the Department of Transportation

and Works' long-term planning, a new interchange has also been designed for the Trans Canada Highway, near the existing intersection, to deal with the increased traffic that will result from development of the project in this area.

The Project's initial planned capacity will be 300,000 bbl/d expandable to 600,000 bbl/d in the future if market conditions allow. The Project will provide a new state-of-the-art oil refinery that is safe, efficient and environmentally in tune with today's expectations for a modern industrial development. The Project will be designed and constructed in a manner that will minimize the impact on the environment and will meet or exceed all applicable National and Provincial Acts, regulations and standards.

The main Project components are discussed in more detail in Section 4.4 and are:

- Refinery Processing Facility
- Storage Tanks and Pipelines
- Sulphur and Coke Storage and Export Facilities
- Utilities, Infrastructure and Support Systems
- Water Treatment and Discharges and Emissions Control Facilities
- Marine Terminal

Greater description of the physical and biological environments within the area potentially affected by the project can be found in Sections 4.1.3 and 4.1.4.

The main Project Activities are discussed in Sections 4.3 - 4.5 and are:

- Site Preparation
- Construction and Fabrication
- Operations



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FIGURE 4-14	A

### 4.3 CONSTRUCTION

The proposed project is quite large and will demand a significant number of construction trades and construction activities to complete. The magnitude of this project means that off-site fabrication of many components will take place within the province, nationally, and internationally. It is expected that all major fabrication yards in the province will participate in the project at some stage. Given the size and complexity of some of the components, there will be some prefabrication of large modules outside the province. Project components fabricated or manufactured elsewhere would be brought to site both by road and by sea transport.

Construction activities will generally include such things as;

- Clearing and grubbing.
- Access road and bridge construction.
- Major earth works to level the site which may involve the use of explosives.
- Site grading.
- Road construction in the plant area.
- Construction of earth works for the dyking around the tank farm.
- Surface drainage around the project area.
- Construction of water treatment plant and containment ponds.
- Construction of a desalination plant.
- Construction of all buried utilities.
- Construction of concrete foundations for tanks in the tank farm.
- Construction of equipment foundations in the process areas.
- Construction of transmission lines.
- Construction of marine facilities that will include a rock fill causeway, sheet pile cell construction, steel piles supported concrete decks for access trestle, mooring



dolphins, breasting dolphins and offloading and receiving platforms as well as cooling water intakes and effluent discharge structures.

- The construction of process plant infrastructure including the installation of very large prefabricated heavy wall pressure vessels, pumps and compressors, large crude heaters, pipe racks, piping, instrumentation and electrical cabling.
- Construction of a high voltage electrical distribution system, including switch gear, transformers and substations.
- Construction of support buildings including, administrative and engineering offices, warehouses and maintenance buildings, laboratory and other support buildings.

Mitigation measures to reduce noise, dust, and silt-runoff will be implemented to minimize the impacts through application of proper construction methods and implementation of the proposed environmental management plans.

The resources required to support the refinery construction and operation have been identified to the extent practical at this point in Project development, in particular the land area required (Section 4.1.2, Figures 4-1 and 4-2 ); the volume and type of crude and resulting volume and types of products to be produced (Section 4.4.2.1); the workforce needed during construction and operation (Section 4.6); and the supply and source of water and power (Section 4.4.5.3). Additional detail will be available as the engineering design progresses and will be presented in the Environmental Assessment.

The project schedule shows that approvals and permits must be in place to allow for construction start no later than January 2008. This start date enables a production start date of late 2010/early 2011. With the large number of refineries currently conducting feasibility studies, the economic viability of this refinery depends on an early entry into the market.

#### **4.3.1 Construction Period**

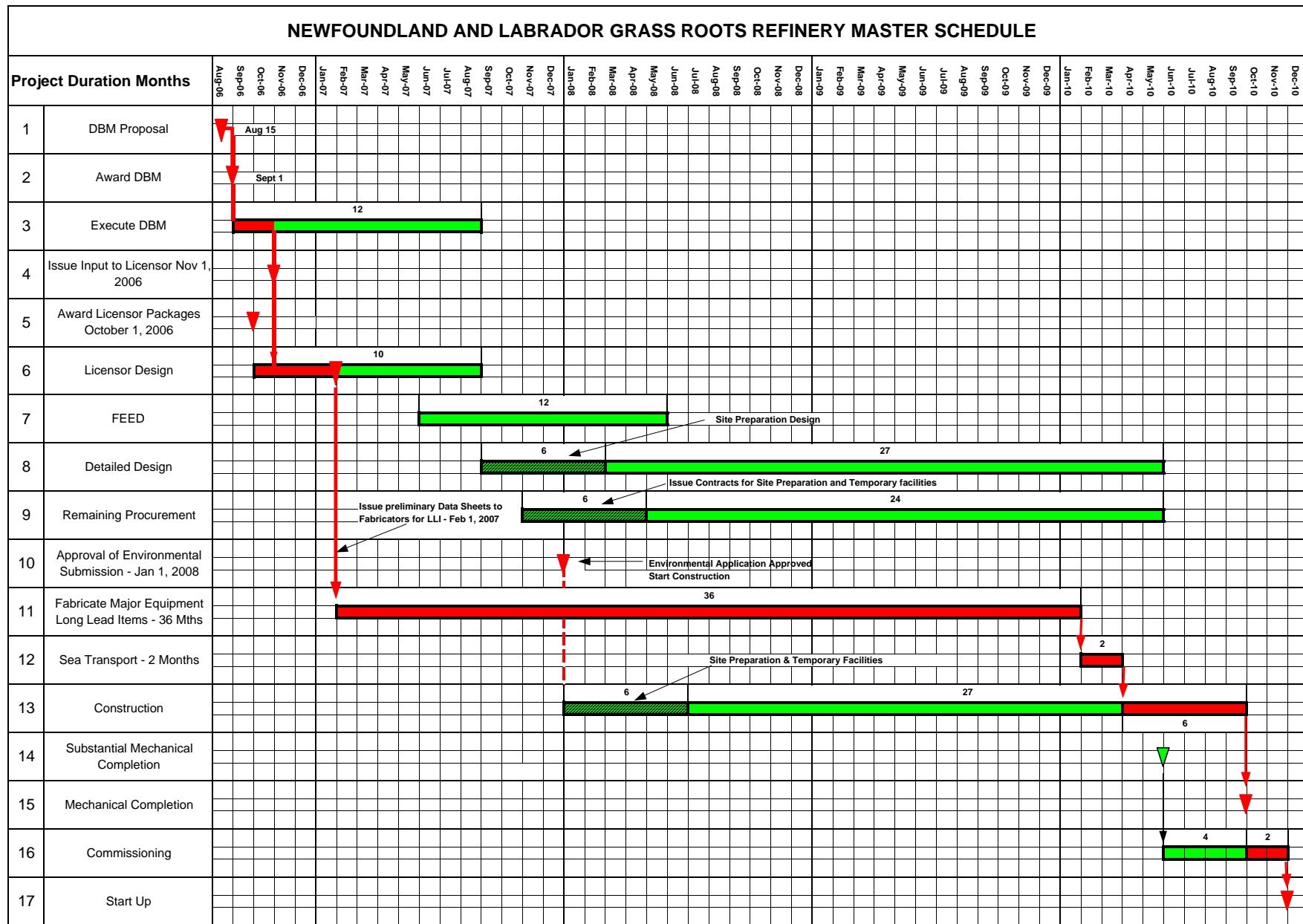
Pre-construction activities will commence immediately upon receipt of the environmental approvals and necessary permits. Clearing and grubbing of the access road and site would begin as soon as possible. Other site preparation activities include levelling/in-filling and installation of temporary housing and offices with associated services (power, potable water, water and sewer).

Construction of the refinery and associated utilities and support systems is proposed to begin in January 2008 and is expected to be complete within three years of start. Construction of the marine terminal will also occur during this time frame. Commissioning will require another few months and it is anticipated that the first shipments of crude will be in early 2011. For greater detail on the schedule of activities, see Master Schedule (Figure 4-15).

Accommodation for workers during the construction stage has not been finalised, but the Proponent is familiar with the Bull Arm site and the potential of using this site for temporary accommodations. The Bull Arm site was used very effectively during the construction of the Hibernia offshore platform, housing a comparable workforce.

#### **4.3.2 Environmental Considerations**

Environmental Protection Plans and procedures will be in place for all construction activities such as: clearing; grubbing; quarrying and aggregate removal (at the Project site or other areas); buffer zones; erosion and silt-runoff control; excavation, embankment and grading; stream and river crossings; dust; noise; blasting; groundwater; drilling, including geotechnical drilling in the marine environment; sewage disposal; waste management. No blasting is planned for marine construction. Booms and silt curtains, etc, will be employed where necessary to eliminate or minimize adverse impacts on the marine environment. For each of these activities during the construction stage, mitigation measures will be put into place to reduce the impact of such activities on the environment and other resource-users in the area. For more information on the Environmental Protection Plan see Section 4.4.10.5.



**FIGURE 4-15**