including discussions with 43 informants who provided information with regard to past and current traditional use activities. These informants were Mi'kmaq people who are hunters, fishers, plant gatherers and/or have knowledge of the study area and traditional uses. Complete results of the MEKS are provided in Appendix G. The work undertaken by MGC for this EA report is not intended to replace governments' responsibility to consult with First Nations in the context of regulatory environmental assessment.

Results of the MEKS revealed that fishing remains the most prevalent traditional use activity in the area; both in Sydney Harbour and in other water bodies within a 10 kilometre radius around the Project footprint. The species currently fished include lobster, mackerel, clam, eel, mussels, oysters, scallops, bass, smelt, cod, gaspereau, flounder, catfish, perch, herring, and trout. Lobster and mackerel were identified as the most important species fished in Sydney Harbour, with 16 and 9 fishing areas identified, respectively. The majority of the lobster fishing sites are located in the Cabot Strait region, near Spanish Bay at the mouth of Sydney Harbour, while mackerel sites are located primarily at Muggah Creek, South Bar, and out in the Seaward Arm of the harbour. Trout, cod, and smelt were determined to be the most widely fished species in the areas outside the Project footprint, with 70, 21, and 21 fishing sites identified, respectively. The majority of fishing sites for these species were found to be near the North West Arm, North Sydney, Bras d'Or, and Blackett's Lake. The fish species identified in the MEKS are fished primarily for food, with trout and salmon being a common food source for the Mi'kmaq.

4.13 Land Use

The following section provides an overview of current land use at the Project site and in surrounding areas.

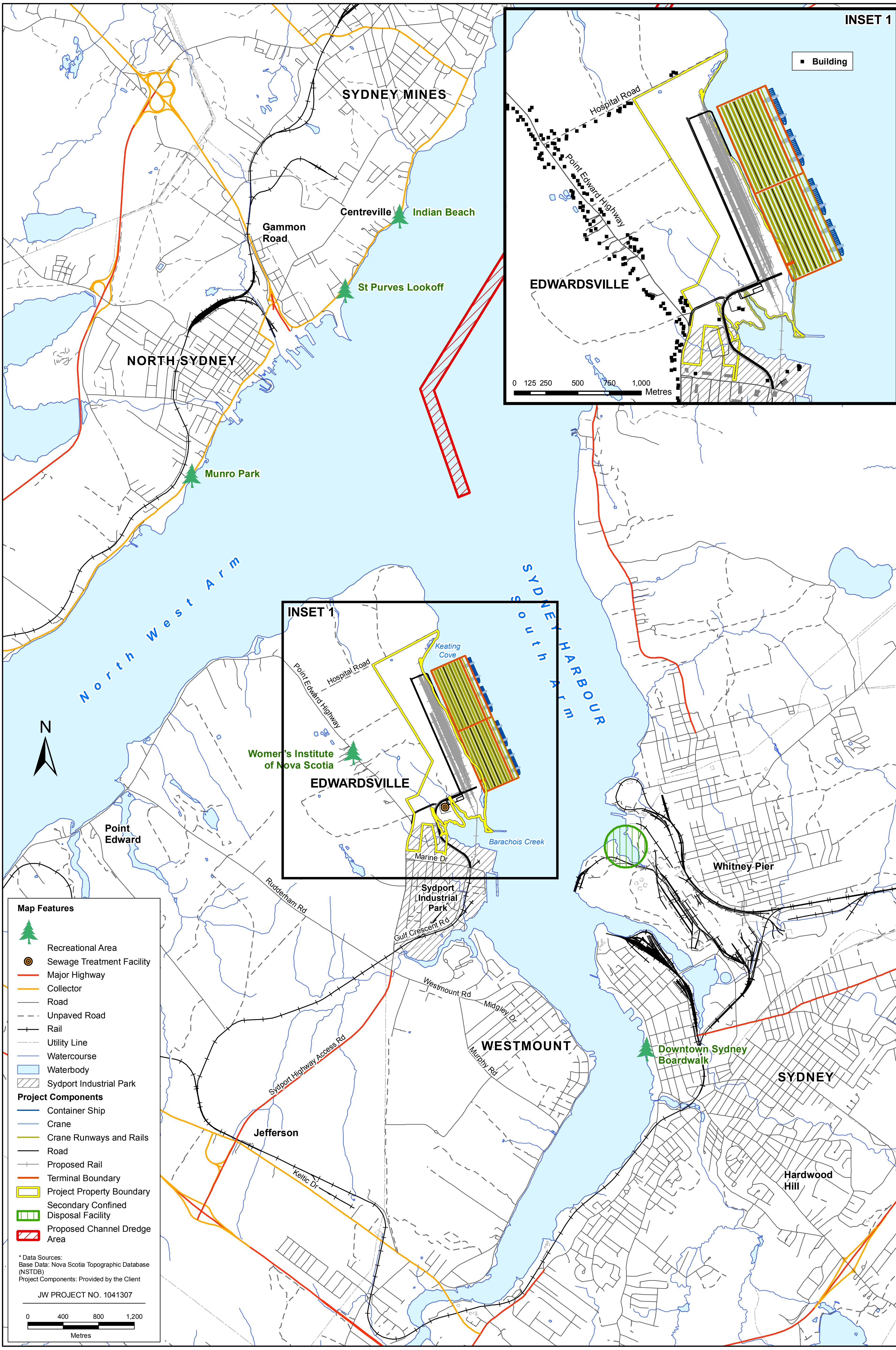
4.13.1 Project Site Description

The proposed terminal site is currently vacant, and consists primarily of vegetated land. The property has frontage on the Point Edward Highway toward the southwest end of the site. It is located in the community of Edwardsville and falls under the jurisdiction of the Cape Breton Regional Municipality (CBRM) (Figure 4.7). The site is bounded on the north edge by Hospital Road and on the southernmost edge by the Sydport Industrial Park. From approximately Keating Cove to Barachois Creek, the eastern property edge is bounded by the Sydney Harbour. There are no substantial land uses occurring on the site currently; apart from vegetation there is evidence of a small trail running from Hospital Road towards Keating Cove and the Sydney Harbour. Near Barachois Creek there is also a small sewage treatment facility owned by CBRM.

4.13.2 Municipal Planning Strategy

The *Municipal Government Act* (*MGA, 1998*); is the provincial legislation that governs municipalities in the regulation of land use and development. Part 8 of the *MGA* is one of the principal sections identifying municipal powers in regulating planning and development.

The Sydport site was considered during the Municipal Planning Strategy (MPS) review conducted by CBRM from 2003-2004. The Sydport site is referred to prominently in the CBRM MPS, which came into effect on September 17, 2004. (Pers.Comm., Gillis) The review included significant consultation, as required under the *MGA.* Part 3 of the MPS identifies the important role the CBRM harbours play in the community's future well-being. The importance of industrial capacity is noted: "One of the strongest statements in the CBRM's Regional Planning Strategy Interim Report is that the region must develop its industrial capacity and infrastructure if it is to achieve the international standard required to be competitive in fabrication and supply components." (Page 30, CBRM 2004a) The MPS also identifies the qualities of a port which would allow CBRM to develop a more competitive marine-based infrastructure.   Of the natural harbours that exist within the CBRM, the Sydney Harbour is identified as the key harbour to support this infrastructure. Sydport is identified as a key port facility in the Sydney Harbour, with significant assets, including self loading/unloading facilities, serviced land, rail access, road access and low potential for land use conflict'. Policy 7 is the enabling policy for the proposed land use (page 34, CBRM MPS).



DATE: 31/10/2008

PREPARED BY: L. Kendell

LAURENTIAN ENERGY

Sydney Harbour Access Channel Deepening and the Proposed Sydport Container Terminal

Land Use Features

FIGURE NO: **Figure 4.7**

Jacques Whitford

Policy 7 reads as follows:

"It shall be a policy of Council to designate Sydport as a business park for:

- Marine/road/rail related transportation terminus uses;
- Marine industrial uses and any industrial use providing service and fabrication support to offshore business endeavours;
- General manufacturing businesses;
- Regional tertiary service industry facilities (*e.g.,* wholesale, warehousing, general transport/contracting, fuel oil build storage and transmission); and
- Regional utility service facilities."

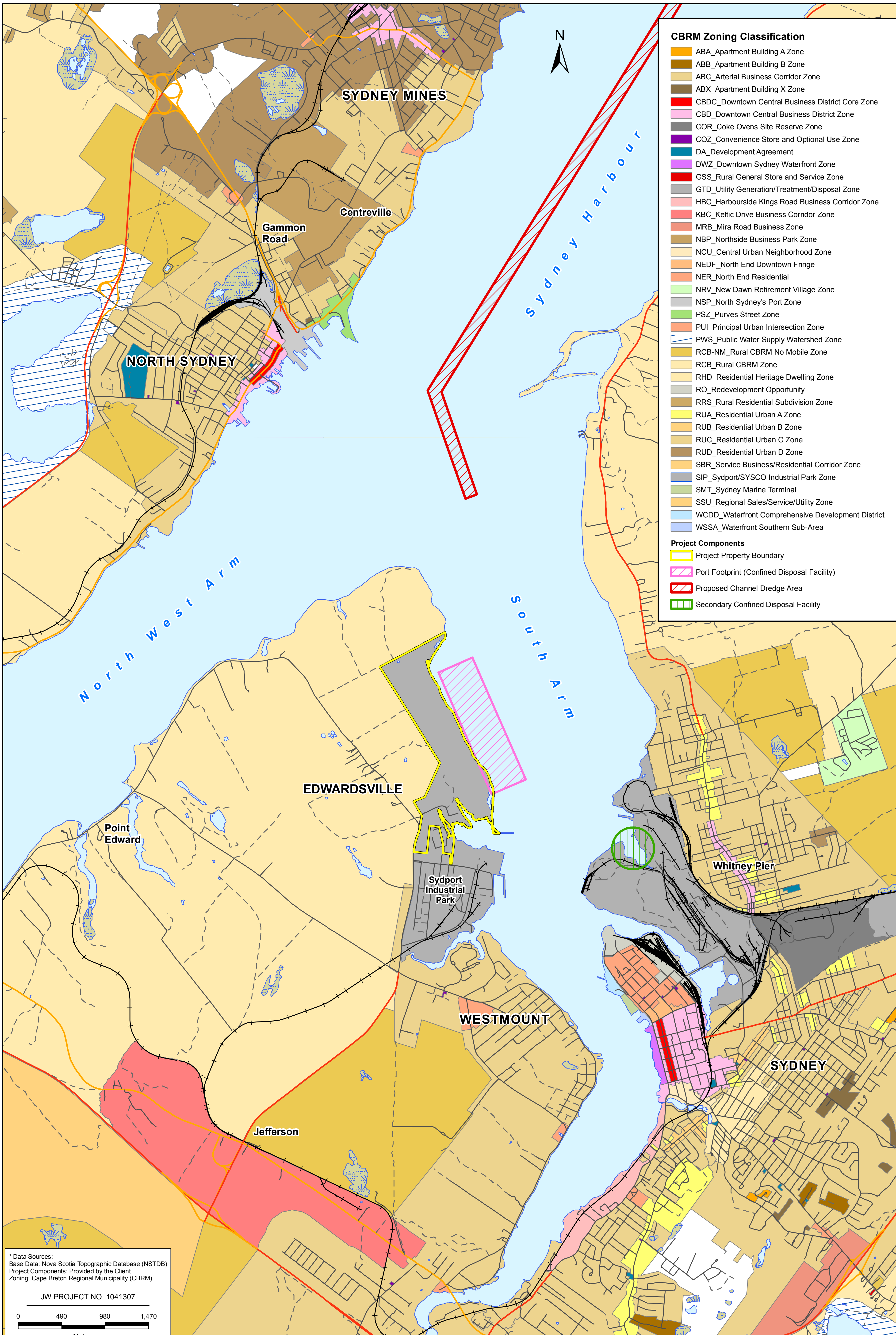
The zone in effect in the Land Use By-law implementing this policy directive is titled the Sydport/Sysco Industrial Park (SIP) Zone.

CBRM adopted the current MPS and Land Use Bylaw (LUB) following the procedures and requirements outlined under the *MGA*. CBRM planning staff indicated that extensive consultation was held during the preparation and adoption of the MPS and LUB. CBRM Planning noted that:

"A formal Public Participation Program began in October 2003 and it lasted right up until the Public Hearing of Council in August 2004. It included two rounds of public meetings and open houses throughout the Regional Municipality, public notifications including full page advertisements in the Cape Breton Post and the circulation of over 100,000 flyers to taxpaying property owners, and updates on our website on the internet. The Minister of Service Nova Scotia & Municipal Relations approved CBRM's Municipal Planning Strategy and it's implementing Land Use By-law in September 2004." (Pers. Comm, Gillis).

4.13.3 Land Use Bylaw

The Land Use Bylaw (LUB; CBRM 2004b) identifies the specific rules and regulations guiding development that occurs within CBRM. The Project site is zoned SIP (see Figure 4.8) which enables a wide variety of uses. The primary permitted uses identified in the zone include manufacturing, recreational, sales (accessory to other main uses), and transportation uses. Generally, any use that would fit into one of these four categories would be permitted in the zone, although there are some identified limitations outlined in the bylaw. The LUB permits other uses, including forestry, service and utility uses. The Zone is further regulated under the General Provisions Section of the LUB, which outlines a variety of provisions including parking, lot size, setback and signage regulations.



DATE: 31/10/2008	Sydney Harbour Access Channel Deepening and the Proposed Sydport Container Terminal	FIGURE NO: Figure 4.8
PREPARED BY: L. Kendell		
LAURENTIAN ENERGY	**CBRM Land Use Zoning**	Jacques Whitford

4.13.4 Surrounding Uses

Industrial Uses

The developed portion of the Sydport Industrial Park is located directly adjacent the southern boundary of the proposed terminal site, as shown in Figure 4.7. The SIP is privately owned with approximately 102 ha (250 acres) of serviced land (CBRM 2004a). There are approximately 40 businesses. With a number of vacant lots in the SIP, and some infrastructure appears to be neglected. There is an active rail spur running throughout, and businesses in the SIP are also readily connected to the transportation network through the Sydport Highway Access Road. Primary entrances to the site are from the Point Edward Highway along Gulf Crescent Road and Marine Drive. Other industrial lands in close proximity to the proposed Project site included the Sysco and Logistec Piers. This land is located across the Sydney Harbour to the East of the proposed site and is near Downtown Sydney and the community of Whitney Pier.

Commercial Uses

There are no commercial areas adjacent to the Sydport Industrial Park; the closest is located in the Westmount Road, Murphy Road and Midgely Drive area. This is identified as a Principal Urban Intersection Zone (PUI Zone), which is essentially a smaller urban commercial service centre with a limited number of commercial uses (See Figure 4.7). The commercial area of significance in closest proximity to the site is the Keltic Drive Business Corridor Zone (See Figure 4.7). The Keltic Drive Business corridor is identified in the MPS as an 'established business industrial/utility corridor' (CBRM 2004a); it is located approximately 5 km from the Project site, to the southwest. It is one of the more significant commercial areas within CBRM; the MPS estimates that it has an 'aggregate business assessment of approximately 7 million dollars' (CBRM 2004a).

Residential Uses

The majority of the land surrounding the Project site is zoned as Rural CBRM. This rural use zone permits a fairly wide variety of uses including agricultural, fishery, forestry, manufacturing, recreational, residential, sales and service uses. The land directly adjacent the site is consistent with Rural use; it consists primarily of large unserviced lots, fronting directly on Point Edward Highway. There are approximately 18 residences located along Hospital Road, ranging in type from mini-homes to large single-family houses, as shown on Figure 4.7. For the most part these houses are screened from the Project site by topography and vegetation, however there is one single-family house directly adjacent the northern portion of the site, located on Hospital Road.

There are approximately 65 homes located along the Point Edward Highway consisting primarily of single-family homes approximately 600 m or greater from the terminal (from the intersection of the Sydport Access road and Rudderham Road to the intersection of the Point Edward Highway and Hospital Road). Some small-scale agricultural uses exist, consisting primarily of small hobby farms, as shown on Figure 4.7. Most of these uses are screened from the Project site because of existing vegetation and topography.

CBRM Planning has indicated that there are two building permit applications on file within a 1.2 km (4000ft) radius of the site. Both of these properties are located along the Point Edward Highway (PID

15834302 and PID 15209570). The applications are for a single-family unit and a two-unit dwelling.

The urban community in closest proximity to the proposed Terminal site is the community of Westmount. Development in the Westmount area follows a typical suburban development pattern. The land in this area is zoned Residential Urban C, which acts as a mixed-use zone. Although the Westmount area consists primarily of single-family homes, the zone is not exclusively residential; it permits agricultural, residential and service uses.

Recreational Uses

The CBRM LUB does not designate specific recreational zones; instead, recreation, as a use, is permitted in a wide variety of zones. CBRM recently completed an Active Transportation Plan (May 2008; CBRM 2008) which further delineates goals for recreation, and includes a focus on connecting key urban areas of the municipality with cycling and pedestrian trails/travel ways. While there no formally designated recreational areas in close proximity to the proposed Project site, there is a community-based facility (*Women's Institute of Nova Scotia,* WINS), located along the Edwardsville Road, which is used regularly for community events. A small playground can also be found on this site. The WINS facility is screened from the Project site by existing vegetation and topography. There are a number of public recreational areas that have a view of the proposed Project site. These include the Downtown Sydney Boardwalk, which is a well used walking trail used by tourists and residents alike, located along the Sydney waterfront. Also of significance is the Munro Park, one of the primary recreational areas for North Sydney residents. The Purves St. Look-off and Indian Beach have a view of the site, and are located in North Sydney in close proximity to Sydney Mines. These are referenced on Figure 4.7.

Mi'kmaq Land Use

Membertou Geomatics Consultants (MGC) identified and gathered information on Mi'kmaq traditional knowledge with respect to land and resource use within the study area. Specifically, MGC conducted a historical review, examining traditional land and resource use activities, and analyzing significant species. To determine traditional land and resource use in the study area, 20 interviews were conducted, including discussions with 43 informants who provided information with regard to past and current traditional use activities. These informants were Mi'kmaq people who are hunters, fishers, plant gatherers and/or have knowledge of the study area and traditional uses. Complete results of the MEKS are provided in Appendix G. The work undertaken by MGC for this EA report is not intended to replace governments' responsibility to consult with First Nations in the context of regulatory environmental assessment.

The results of the historical review indicate that the Mi'kmaq people have occupied the Sydney area since time immemorial. There was a Mi'kmaq reserve located on King's Road (roughly 1 km form the study area) during the 1800's. This community referred to Sydney Harbour as 'Sibou', meaning Brook or Harbour in Mi'kmaw. This reserve was abandoned in the late 1920's when the community was forced to relocate to the present day location of Membertou. A second Mi'kmaq community was forced to relocate at the same time as well. This community was located in North Sydney, near Pottie's Lake (less than 5 km from the study area).

The review of current use activities indicate that there are currently no reserve lands located within the study area, although there are reserve lands in several areas located within a 10 km radius of the

Project footprint. These reserves include Caribou Marsh, Lingan, and Membertou. The number of hunting areas identified in the area of the Project was minimal, with no hunting activities known to be occurring within the Project footprint. Only rabbit hunting is thought to occur in two areas near the Project site. The majority of Aboriginal hunting in the general area is thought to be in the Mira Road and Caribou Marsh areas, which are located several kilometres away from the Project footprint. Species hunted in these areas include deer, rabbit, partridge, fox, beaver, muskrat, mink, duck, and otter.

4.14 Marine Mammals and Marine-Related Birds

The following section provides an overview of existing conditions in Sydney Harbour and its approaches for marine mammals and marine-related birds.

4.14.1 Marine Mammals

Coastal and offshore regions of Nova Scotia provide habitat for a variety of marine mammal species. There are twenty-one species of cetaceans (dolphins, porpoises, and whales) and six species of pinnipeds (seals) which have been recorded in the waters around Nova Scotia (NSMNH 1997); however, many of these species are only occasional visitors to the area. Data available on marine mammals for this assessment are anecdotal as there have not been directed marine mammal studies in Sydney Harbour or its approaches.

Marine mammals are important components of North Atlantic coastal and pelagic ecosystems as they are at or near the top of the marine food chains. In the past, marine mammals have been the target of commercial hunts in the region; for example several industrial whaling stations were operational in Nova Scotia up until the 1970's. Although commercial whaling has largely ceased, marine mammals are still threatened by coastal development, accidental ship strikes, entanglement in fishing gear, and chemical and noise pollution. Several whale species that occur in Nova Scotia waters are considered at risk under *SARA*. Nova Scotia seal populations are healthy and not considered threatened or vulnerable at the present time.

Marine mammals are now sought after by eco-tourists on whale watching cruises and whale/seal watching has become an important source of income in many coastal communities throughout Nova Scotia. Whale-watching cruises in Cape Breton leave from such ports as Ingonish, Cheticamp and Pleasant Bay. No organized whale watching tours currently leave from Sydney and no whale watching occurs in the Harbour or its approaches. Interest in marine mammals extends beyond their ecological and economic importance; they have become a symbol for ocean conservation and their protection is of concern to the wider public.

Cetaceans

The taxanomic order cetacea is composed of the dolphins, porpoises, and whales. Within this order there exist two subgroups, the mysticeti whales, known as "baleen whales", and the odontoceti, known as "toothed whales". Baleen whales use specialized keratin plates to sieve prey items from the water column or bottom sediments, whereas toothed whales have teeth for grasping individual prey items. Many of the cetacean species recorded from Nova Scotia waters are offshore species and are very unlikely to be found within the coastal and highly developed waters of Sydney Harbour. The list of marine mammals that may occur in Sydney Harbour has been compiled by contacting people familiar with the area (B. Hatcher, pers. com., 2008) and from general distribution trends, as no published literature exists on cetacean occurrences in Sydney Harbour. Based on the available information, it is apparent that Sydney Harbour does not provide critical or important habitat for any cetacean species; however, it is expected that several species occur on occasion on a seasonal basis. The following sections provide brief descriptions of cetaceans that could occur in Sydney Harbour or its approaches.

The harbour porpoise (*Phocoena phocoena*) has a wide distribution in cool waters of the North Atlantic. Harbour porpoises are particularly common in the Bay of Fundy, and to a lesser degree along the outer coast of Nova Scotia, the Northumberland Strait, and the Gulf of St. Lawrence. They are rarely found in water deeper than 125 m (Gaskin 1992), and feed on various coastal schooling fish species, such as herring and mackerel. Harbour porpoises usually travel in loose groups, and larger concentrations will often aggregate in rich feeding areas. Migratory movements of the harbour porpoise are poorly understood. It is thought that most animals move offshore and southward during the winter to calve, although they are observed in the winter months in the Bay of Fundy.

Harbour porpoises are small animals when compared to other cetaceans, rarely exceeding more than 1.5 m in length, and mature quickly in three to four years (Gaskin 1992). Harbour porpoises are relatively short-lived, usually not living past the age of fifteen. Although reproduction rates are higher than most other cetaceans, harbour porpoises are still threatened by accidental entanglement in commercial fishing gear. They are also threatened by habitat destruction and human disturbance in their coastal habitat. For these reasons, the harbour porpoise is listed as a species of Special Concern under *SARA*. Harbour porpoises are likely the most common cetacean in Sydney Harbour and its approaches, given their preference for shallow waters, and can be expected during the late spring, summer and early fall months. Harbour porpoise presence and density would likely be related to schooling fish prey species in the general region.

The minke whale (*Balaenoptera acutorostrata*) has a wide distribution in coastal and offshore waters of the globe, being the most abundant baleen whale along the Atlantic coast of Nova Scotia. The minke whale is the second smallest of the baleen whales, usually not exceeding 10 m in length. The minke whale is usually found singly and individuals are often repeatedly observed in the same general areas, indicating that they may maintain loosely defined home ranges for part of the year. Migratory movements of minke whales are not well known in the North Atlantic. Although they are observed throughout the year, it is thought that many individuals move offshore and/or to the south for the winter months (Breeze *et al*. 2002). The minke whale is considered common in Atlantic Canadian waters and has no special regulatory status. Minke whales are frequently observed in coastal waters around Nova Scotia and may be present in the approaches of Sydney Harbour during the spring, summer and fall, especially when high concentrations of prey species are in the area.

The long-finned pilot whale (*Globicephala melaena*) is found in cool to temperate waters and uses a wide variety of habitats, from deep pelagic regions off the Continental Shelf, to inshore bays and fjords. The presence of long-finned pilot whales in inshore waters is attributed to high concentrations of prey species, most notably squid. Pilot whales are highly social animals and live within tightly knit social groups or pods, large groups of several or more pods are often observed in rich feeding areas. Pilot whales are a heavy-bodied species and grow to over 6 m in length. In the past, pilot whales were hunted in Atlantic Canada in “drive fisheries”, where pods of whales were forced to beach themselves with the aid of motorized vessels. These hunts have ceased and pilot whale populations appear to be healthy off of Nova Scotia resulting in no special status. Pilot whales are particularly abundant in the summer months around Northern Cape Breton and especially in Gulf of St. Lawrence waters (Breeze *et al*. 2002). Pilot whales are one of the main species targeted by whale watching cruises leaving such Cape Breton ports as Ingonish, Pleasant Bay, and Cheticamp. Pilot whales may be found in Sydney Harbour and approaches on occasion in the summer months, likely entering shallow waters in pursuit of prey, but their presence is not likely to be regular.

There is the potential for other whale species to be present in Sydney Harbour and approaches; however, these species would be uncommon transients given their preference for deeper waters. Species that are known to occur off the coast of Cape Breton include fin whale (*Balaenoptera physalus*), Atlantic white sided dolphin (*Lagenorhynchus acutus*), white-beaked dolphin (*Lagenorhynchus albirostris*), and humpback whale (*Megaptera novaeangliae*), among others. The presence of these species in Sydney Harbour would be rare. The highly endangered North Atlantic right whale (*Eubalaena glacialis*) is extremely unlikely to occur in Sydney Harbour. This species congregates mainly in the Roseway Basin, the Grand Manan basin near the mouth of the Bay of Fundy and, to a lesser extent, the north shore of the Gulf of St. Lawrence and off southern Newfoundland. While in Canadian waters right whales feed on copepods and smaller quantities of other pelagic invertebrates. Critical habitat areas as well as suitable habitat types (*i.e.,* deep basins with high densities of copepods) for right whale are located far from Sydney Harbour.

Pinnipeds

Historically, six species of seals have been recorded from Nova Scotia waters; however, only four species are likely to be encountered in Sydney Harbour. These include: harbour seal (*Phoca vitulina*); grey seal (*Halichoerus grypus*); hooded seal (*Cystophora cristata*); and harp seal (*Phoca groenlandica*). Grey and harbour seals occur year-round in Nova Scotian waters and are expected to be common in Sydney Harbour and its approaches, whereas hooded and harp seals are only seasonal visitors to Nova Scotia waters.

Grey seals are large animals, with males averaging 225 cm in length and weighing between 300-350 kg. Females are considerably smaller; the average female is 200 cm and weighs 150-200 kg. Grey seals eat a wide variety of fish and invertebrate species, with herring, cod and mackerel being the most important in Nova Scotia waters (NSMNH 1997). Grey seals in Nova Scotia waters belong to the western North Atlantic stock. Several breeding colonies exist in Nova Scotia, including: Amet Island in the Northumberland Strait; Hay Island and the Basques Islands off Cape Breton; Sable Island, Camp Island off the east coast of Nova Scotia; and a group which breeds on the shifting sea ice in the Northumberland Strait. Grey seals form large breeding groups on sea ice or undisturbed coasts and islands, and give birth to their pups on land or ice between December and February. After mating, grey seals disperse widely from their breeding grounds. In spring, summer, and fall they often feed in coastal areas, are common all along the coast of Nova Scotia during this time, and thus are likely found within Sydney Harbour and approaches. Grey seals are common and have no special regulatory status.

Harbour seals are smaller than grey seals, with males reaching a maximum weight of 110 kg. Harbour seals have a varied diet and common food items include herring, squid, flounder and gaspereau (NSMNH 1997). Harbour seals pup on remote ledges, islands, sandbars and rocky beaches from late

April to June. They also haul out on land in early August to molt. For the balance of the spring, summer and fall months, harbour seals are common all around Nova Scotia in bays, inlets, and estuaries. Harbour seals can be expected to occur in Sydney Harbour. In winter, harbour seals move further offshore to avoid sea ice and frozen coastal bays and inlets. Harbour seal populations are considered to be stable in Nova Scotia (NSMNH 1997) and have no special regulatory status. No harbor seal haul-out areas are known in Sydney Harbour.

Harp seals are distributed mainly to the north of the study area (Thomson *et al.* 2000). They pup and breed on pack ice in the Gulf of St. Lawrence and off the coast of Labrador (Sergeant 1991). Juvenile harp seals have been observed more frequently in Nova Scotia waters in recent years, perhaps due to a growing population (Stevick and Fernald 1998). Harp seals would likely be winter and spring visitors to Sydney Harbour.

Hooded seals are a northern species, breeding on pack ice off southern Labrador, northeastern Newfoundland, off southern Greenland, and to a lesser extent in the Gulf of St. Lawrence. Hooded seals are known to be great wanderers, appearing in unexpected places. Juveniles have been found as far south as Florida, and they are regularly observed on Sable Island during the winter months (Reeves *et al.* 1992). Given hooded seals' tendencies to travel far distances from their northern breeding grounds, they have the potential to be found within Sydney Harbour.

4.14.2 Marine-Related Birds

Sydney Harbour is part of the larger coastal zone known as Sydney Bight (SHACI Unit 11 – Significant Habitats, Atlantic Coast Initiative), which includes the coastal waters off East Cape Breton Island, and extends from Scatarie Island to Cape North (Figure 4.3). Sydney Bight is host to a wide variety of seabirds, shorebirds, and waterfowl throughout the year, including species that breed in the area and others that visit during spring and fall migrations (Schaefer *et al*., 2004). Details on specific marine-related bird populations and movements in Sydney Harbour are limited and have been supplemented with information on birds known to be present more generally in Sydney Bight to provide a general picture of birds that could be present in the harbour over the course of the year. Birds that rely primarily on terrestrial habitats are discussed in Section 4.9.4 and 6.4.

Seabirds

Important breeding seabird colonies in Sydney Bight include Atlantic Puffin, Razorbill, Black Guillemot, and Leach's Storm-petrel. Colonies for these species are located primarily on the Bird Islands, which are located well northwest of Sydney Harbour. The only seabird known to breed in Sydney Harbour is the Common Tern (*Sterna hirundo*) (Schaefer *et al*., 2004). Colonies for this species are found at South Bar (located 2-3 km north of Whitney Pier, just south of Fishery Cove on the eastern bank of the South Arm), and also at Glace Bay Beach and Dominion Beach, which are located just east of the mouth of Sydney Harbour. During breeding bird surveys conducted on the Project site in June 2007, Common terns were observed flying and foraging over the waters off the coastline; however, there was no evidence of breeding activity by Common terns on the site. The Common Tern is the most widespread and numerous of the North American terns and breeds across Canada and winters in the Southern Hemisphere. Terns nest in large colonies on sandbars, beaches or islands, laying 2-3 green to buff eggs with brown markings on open ground. Common terns fly slowly over water, diving to catch fish or other aquatic prey (Vanner, 2003). Common terns are Yellow-listed species under the *Nova Scotia Endangered Species Act*, indicating that they are sensitive to human activities or natural events. It is possible that many seabirds that do not breed in Sydney Harbour could still be present in the harbour at various times of year. In particular these include seabird species that are common to most Atlantic Canadian harbours and estuaries, such as double-crested cormorants, great black-backed gulls, and herring gulls. Bird surveys conducted at Lingan, which is just east of the mouth of Sydney Harbour, found that Ring-billed Gulls and Herring Gulls were common in the area in the fall (McCorquodale, 2005).

Herring Gulls (*Larus argentatus*) will eat almost anything, and their populations are expanding in many areas of North America and driving out weaker species. They breed in large colonies on islets or cliffs, building a nest of seaweed or grass on the ground to hold their eggs. Herring gulls scavenge on garbage dumps and in harbours, but also catch fish and small crustaceans. Ring-billed gulls (*Larus delawarensis*) are an abundant and widespread gull, breeding in large colonies. They typically eat worms, molluscs, insects, and grasshoppers, and will also scavenge near urban areas (Vanner 2003).

At least 13 non-breeding seabird species are known to frequent Sydney Bight during some part of the year, including various shearwaters, jaegers, and murres. Non-breeding species in Sydney Bight include pelagic visitors during the summer and autumn, species migrating through during spring and autumn, and species overwintering along the Atlantic Coast. It is possible that many of these 13 species could be present in Sydney Harbour at particular times of year; however specific details are not available on their movements and these species are not known to regularly occur in the harbour. Of the seabirds that could be present in Sydney Harbour, there are no species listed under *SARA*.

Shorebirds

Two species of shorebirds are known to breed in Sydney Bight; the Piping Plover (*Charadrius melodus*) and the Greater Yellowlegs (*Tringa melanoleuca*). There are no shorebirds known to breed in Sydney Harbour (Schaefer *et al*., 2004). Many shorebirds that do not breed in Sydney Bight are still known to frequent beaches and coastal areas throughout the area during their migrations north in the spring and south in the fall, feeding on small invertebrates in intertidal zones. Regular shorebird surveys are conducted at various locations in Sydney Bight, including South Bar in Sydney Harbour. Up to 24 species of shorebirds have been observed at South Bar between 1980 and 2006 (Table 4.16). Over half of these species are classified as rare visitors to the area, while the three common species are black-bellied plovers, Semipalmated plovers, and Semipalmated sandpipers (P. Hicklin, pers. comm., 2008). Bird surveys conducted at Sydney Tar Pond sites in 2005 did not identify any shorebird species beyond those listed in Table 4.16 (AMEC, 2005). Of the shorebirds known to be present in Sydney Harbour over the course of an average year, there are no species currently listed under *SARA*. One Piping Plover was spotted at South Bar between 1980 and 2006, and this species is listed as a Schedule 1 Endangered species under *SARA*. The Red Knot is listed as Endangered under COSEWIC and under the Nova Scotia Endangered Species Act. Neither of these species is common in Sydney Harbour and have both been only rare visitors since 1980.

Black-bellied Plovers (*Pluvialis squatarola*) spend the summer on Arctic tundra, and winter mostly in the Southern Hemisphere. They are found along the coasts of North America as they migrate between seasons. The black-bellied plover moves over the ground in short staccato runs, taking marine worms, insects, and other invertebrates. Semipalmated Plovers (*Charadrius semipalmatus*) are the most common of the small plovers, and are found along the shores of Nova Scotia during spring and fall migrations. They forage for food by running quickly, stopping suddenly, and making a swift jab to catch a crustacean or insect. Semipalmated Sandpipers (*Calidris pusilla*) are seen in large flocks in spring and fall across much of North America as they migrate from their breeding grounds in the far north to spend the winter in South America. When feeding, Semipalmated sandpipers walk over soft mud in intertidal zones foraging for marine animals and aquatic insects.

TABLE 4.16 Shorebird Species Recorded at South Bar in Sydney Harbour, 1980 to 2006

Species – Common Name	Max. Number Recorded	Presence in Sydney Harbour	Nova Scotia Status	NS Endangered Species Act
Black-bellied Plover	65	Common Species	Green	
American Golden Plover	9	Rare Visitor	Green	
Piping Plover	1	Rare Visitor	Red	Endangered
Semipalmated Plover	87	Common Species	Green	
Killdeer	8	Rare Visitor	Green	
Greater Yellowlegs	21	Infrequent Species	Green	
Lesser Yellowlegs	65	Infrequent Species	Green	
Spotted Sandpiper	18	Infrequent Species	Green	
Eastern Willet	6	Rare Visitor	Green	
Whimbrel	20	Rare Visitor	Green	
Husdonian Godwit	1	Rare Visitor	Undetermined	
Ruddy Turnstone	56	Infrequent Species	Green	
Purple Sandpiper	10	Rare Visitor	Yellow	
Red Knot	37	Rare Visitor	Yellow	Endangered
Sanderling	49	Infrequent Species	Green	
Dunlin	6	Rare Visitor	Green	
Pectoral Sandpiper	15	Rare Visitor	Green	
White-rumped Sandpiper	72	Infrequent Species	Green	
Semipalmated Sandpiper	318	Common Species	Green	
Least Sandpiper	54	Infrequent Species	Green	
Stilt Sandpiper	1	Rare Visitor	Accidental	
Short-billed Dowitcher	5	Rare Visitor	Green	
Buff-breasted Sandpiper	1	Rare Visitor	Accidental	
Red Phalarope	7	Rare Visitor	Green	

- Source: Bird names, number recorded, and presence information from (P. Hicklin, pers. comm., 2008); Nova Scotia Status and NS Endangered Species Act status from NS Dept of Natural Resources, 2008.
- Note: Nova Scotia Status Ranks: Green – not believed to be sensitive or at risk; Yellow – sensitive to human activities or natural events; Red – known to be, or that is thought to be, at risk; Accidental – occurring infrequently or unpredictably, outside their usual range; Undetermined – insufficient data exists to assess status

Waterfowl

Migrating waterfowl use the coastal marshes and wetlands of Sydney Bight for feeding and overwintering. During migration, waterfowl stop to feed in shallow, salt or brackish water areas on eel grass. Summer distributions of waterfowl in Sydney Bight are not well-documented. Generally, waterfowl arrive in late spring and leave the area by October (Schaefer *et al*., 2004).

Bird surveys conducted at Sydney Tar Ponds sites in 2005 found that areas around Muggah Creek provide overwintering habitat and summer breeding habitat for American Black Ducks. A fall migratory waterfowl survey conducted for the same project in September of 2005 identified American Black Duck as the most common waterfowl species, with a few sightings of Mallards and Green-Winged Teal

(AMEC, 2005). American Black Ducks are common in the Northeast, and prefer woodland ponds and coastal salt marshes. They are a very wary bird, flying away at great speed if disturbed. They nest in vegetation near water, lining a hollow with grass and stems to hold 5-17 eggs. This species dabbles in spring to eat submerged plants and will also consume worms, snails, frogs, and seeds (Vanner, 2003).

Eiders are the only ducks considered to be found abundantly in coastal zones of Cape Breton during the summer (Schaefer *et al*., 2004). Bird surveys conducted for a wind turbine project at Lingan in 2005 found that Eiders were present in the summer and autumn (McCorquodale, 2005). The Common Eider is the largest sea duck in North America, and is abundant in the far north. Eiders breed on tundra ponds, but prefer the open ocean in other seasons. Eiders eat molluscs, star fish, crustaceans, and fish (Vanner 2005). Although Eiders may occasionally visit Sydney Harbour, they are not believed to be common at this location.

Harlequin Ducks are classified as species of concern under COSEWIC and a Schedule 1 species of Special Concern under *SARA*. This species breeds further north but migrates along the coast of Nova Scotia and winters in southern Newfoundland. Harlequin Ducks have been recorded in Glace Bay, Ingonish, Port Morien, Round Island, and Sydney, but are not common visitors to Sydney Harbour (Schaefer *et al*. 2004).

5.0 EFFECTS ASSESSMENT METHODS

The following section provides an overview of the scope and methodology for the environmental assessment.

5.1 Scope of the Assessment

The methods and approach used to conduct the EA of this Project are described in this section. The EA methodological framework was developed by Jacques Whitford to satisfy the factors to be considered in accordance with section 16 of *CEAA*. It is anticipated that this approach will also satisfy the requirements of a Class I Registration under the *Nova Scotia Environment Act* and Environmental Assessment Regulations. The methods and approach to the environmental effects assessment focused on environmental components of greatest concern to potentially affected parties and/or as key indicators of ecological health. In general, the methods are intended to:

1) focus on issues of greatest concern;
2) address regulatory requirements;
3) consider all federal and provincial regulatory requirements for the assessment of environmental effects;
4) address issues raised by the public, and stakeholders during consultation and engagement activities; and
5) integrate engineering design and mitigation and monitoring programs into a comprehensive environmental planning process.

Scope of the Project to be Assessed

The following text describes the scope of the Project to be assessed for purposes of this EA and is consistent with the revised Scoping Document (LEC 2008) provided to the federal government on August 14, 2008.

Phase I of the project will involve channel and berth dredging to accommodate Post-Panamax size container vessels (8,500 – 16,000 TEU container capacity), infilling of approximately 72 ha of land to construct a marine container terminal and constructing an on dock Intermodal Container Transfer Facility on the Sydport site. Construction of the proposed marine container terminal facility will occur in two phases. Phase I will consist of two berths (a total length of 750m-850m) capable of handling approximately 750,000 TEU's per year. As required, Phase II will involve the construction of two additional berths doubling the handling capacity. This EA addresses both phases of operation.

Spatial and temporal boundaries of the assessment are included for each VEC as noted in the Scoping Document (LEC 2008); key spatial considerations detailed in the scoping document include:

- environmental effects assessment on benthic communities, marine fish and fish habitat and marine mammals limited to Sydney Harbour;
- air and noise emissions assessment limited to vessels and trains at or adjacent to the terminal;

- truck and train traffic considered at and adjacent to the terminal but not offsite; and
- environemntal effects assessment on fisheries to limited to Sydney Harbour and areas that could be reasonably affected by dredging activities.

Refer to Section 2.0 Project Description for additional Project detail.

Factors to be Assessed

The EA screening method for this Project includes an evaluation of the potential effects of construction, operation, malfunctions, and accidents and decommissioning and abandonment on the identified Valued Environmental Components (VECs) (including both biophysical and socioeconomic components). Project-related effects are assessed within the context of temporal and spatial boundaries established for the assessment.

The evaluation of potential cumulative effects with regard to other projects and activities generally includes past, present, and future activities that will be carried out and will overlap temporally or spatially with the Project environmental effects.

This report addresses effects of the environment on the Project. Potential effects will include consideration of extreme weather (*e.g.,* winds, waves, fog, and storm surge), climate change (*e.g.,* sea level rise) and sea ice.

For the purpose of this EA, the term “environment” refers broadly to the combined biophysical and human environment and encompasses the definition of environment in *CEAA* where:

"environment" means the components of the Earth, and includes:

(a) land, water and air, including all layers of the atmosphere,

(b) all organic and inorganic matter and living organisms, and

(c) the interacting natural systems that include components referred to in paragraphs (a) and (b).

The assessment focuses on specific environmental components (VECs) that are of particular value or interest to regulatory agencies, the public and other stakeholders. Environmental components typically are selected for assessment on the basis of regulatory issues and guidelines, consultation with regulatory agencies and stakeholders, field reconnaissance, and the professional judgment of the Study Team. An environmental effect is as defined in *CEAA* and broadly refers to a change in the environment in response to a Project activity, specifically:

“environmental effect" means, in respect of a project,

(a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act,

(b) any effect of any change referred to in paragraph (a) on

(i) health and socio-economic conditions,

(ii) physical and cultural heritage,

(iii) the current use of lands and resources for traditional purposes by aboriginal persons, or

(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

(c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.

It is noted that in the context of this Report, the term "environment" includes the biophysical, human, and socio-economic components as defined in CEAA and is also expected to be sufficient under the Nova Scotia Environmental Assessment Regulation.

It is understood the Responsible Authorities (RAs) under CEAA are responsible to develop the scope of the assessment. The Proponent prepared a scoping document to help facilitate an efficient scoping process and focus for the EA. The scoping document was submitted to regulators in August, 2008 after one round of regulatory comments on a draft report initially submitted in March, 2008. This document includes: a description of the scope of the Project to be assessed; the factors to be considered in the environmental assessment, and the scope of those factors. This assessment has been carried out in consideration of the scoping considerations in the scoping document (LEC 2008).

The scope of the factors to be assessed is discussed in Section 5.2.

5.2 Issues Scoping and Selection of Valued Environmental Components

An important part of the EA process is the identification of a concise list of those components of the environment that are considered "valued" (socially, economically, culturally, and/or scientifically) and thus of interest when considering the potential environmental effects of a project. VECs are defined as broad components of the biophysical and human environments that if altered by the project, would be of concern to regulators, resource managers, scientists and the public.

VECs for the biophysical environment typically represent major components or aspects of the physical and biological environment (*i.e.,* atmospheric environment, fisheries, and vegetation) or processes (*e.g.,* hydrological processes) that might be altered by the Project, and are widely recognized as important for ecological reasons. VECs for the human environment are aspects of the human environment such as social conditions, economic conditions, infrastructure, land and resource use, and archaeological resources that might be altered as a result of the Project.

VECs were identified through issues scoping activities that included:

- a review of regulatory requirements;
- field programs and preliminary background research;
- discussions with technical experts from Environment Canada, Fisheries and Oceans Canada, Transport Canada and Nova Scotia Environment;
- public meetings and presentations (Section 3.0 of this report provides an overview of the public consultation program undertaken by the Proponent);
- a review of listed species and/or species at risk found within the area using existing regional

information and baseline surveys; and

- the professional judgment of the Study Team.

Table 5.1 provides the environmental components proposed for this assessment, scoping considerations and VECs selected as the focus for assessment (*i.e.,* scope of the factors to be assessed).

TABLE 5.1 VEC Scoping

Environmental Component	Scoping Considerations	Selected VEC
Marine Water Quality	Marine water quality is inherently linked to habitat quality for aquatic species; introduction of deleterious substances are prohibited under Section 36 of the *Fisheries Act.*	Marine Fish and Water Quality
Marine Fish and Fish Habitat	Focus on marine commercial species offshore and nearshore. Concern for marine fish and fish habitat regarding species of special status and their habitat that may occur in the area. Habitat support for commercial, recreational and aboriginal fisheries. Fish habitat is protected under the *Fisheries Act.* Species of special concern are protected under the *Species at Risk Act*.	Marine Fish and Water Quality Commercial Fisheries
Mammals	Protection of species biodiversity and critical habitat. Link to resource use (*e.g.,* subsistence and recreational hunting). Regulatory protection under the *Species at Risk Act*, Nova Scotia *Endangered Species Act*, Nova Scotia *Wildlife Ac*t and Canada *Fisheries Act*. Offshore, the focus is on cetaceans and pinnipeds that may migrate through the area. Onshore, the focus is on rare species.	Marine Mammals and Marine Related Birds Terrestrial Habitats and Wildlife
Benthic Habitat	Focus on direct physical effects on marine benthic habitat and communities. Species of special concern are protected under the *Species at Risk Act*. Fish and fish habitat, are protected under the *Fisheries Act*. Effects on shellfish (*e.g.,* lobster and crab) from dredging and sediment resuspension will be addressed under the Benthic Habitat and Sediment Quality VEC.	Benthic Habitat and Sediment Quality
Sediment Quality	Marine sediment is a pathway for potential ecosystem effects on benthic communities. Fish habitat is protected under the *Fisheries Act.*	Benthic Habitat and Sediment Quality
Vegetation	Concerns with protection of species biodiversity and unique or uncommon habitats. Species of special concern are protected under the *Species at Risk Act* and *Nova Scotia Endangered Species Act*. Focus on potential interaction of onshore facilities with rare vegetation.	Terrestrial Habitats and Wildlife
Wetlands Habitats	Wetlands are an important habitat type often associated with high species diversity including species at risk. Important regulator of surface water and groundwater. In Nova Scotia, wetlands are protected by the *Environment Act* and the Activities Designation Regulations , as outlined in the *Operational Bulletin Respecting Alteration of Wetlands (2006).* The potential to alter wetlands, including direct and indirect impacts, require a Water Approval under the Activities Designation Regulation. If the impacts of the alterations to a wetland exceeds 2 ha the project is also subject to registration under the Environmental Assessment Regulations.	Terrestrial Habitats and Wildlife
Birds and Bird Habitat	Concern with protection of species diversity. Migratory and non-migratory birds with focus on rare or sensitive species potentially feeding, breeding, moving and/or migrating through the Project area and their habitat. Protection of migratory species and species of concern are mandated by the *Migratory Birds Convention Act*, *Species at Risk Act*, Nova Scotia *Endangered Species Act* and Nova Scotia *Wildlife Act*.	Marine Mammals and Marine Related Birds Terrestrial Habitats and Wildlife

TABLE 5.1 VEC Scoping

Environmental Component	Scoping Considerations	Selected VEC
Species at Risk	Species at risk are discussed within their relevant environmental component. Protection of species biodiversity is administered through the *Species at Risk Act*, *Fisheries Act, Nova Scotia Endangered Species Act*, *Nova Scotia Wildlife Act* and *Migratory Birds Convention Act*.	Marine Fish and Water Quality Marine Mammals and Marine Related Birds Terrestrial Habitats and Wildlife
Noise	Concern regarding potential increases in ambient noise levels. Administered under noise guidelines of the Nova Scotia Environment, Health Canada and municipal guidelines.	Atmospheric Environment
Air Emissions	Concerns with human health and safety, ecological health and aesthetics. Concerns with greenhouse gas emissions. Provisions under the Nova Scotia Air Quality Regulations and relevant federal standards.	Atmospheric Environment
Groundwater Resources	Groundwater resources are important in the hydrologic cycle and ecological function (*e.g.,* surface water discharge), as well as important as a water supply, particularly to rural users. Potable water at the Sydport Industrial Park is supplied by the Cape Breton Regional Municipality. The nearest potable water well is 500 m from the site and the proposed Project is located downgradient from existing water supplies in the area; therefore groundwater is not anticipated to be adversely effected by site construction or operation. Groundwater Resources are described in Section 4.0 of this report. Further consideration is not warranted at this time.	N/A
Freshwater Habitat	Concern for freshwater fish and fish habitat. Protection of freshwater habitats is administered through Nova Scotia Environment, *Fisheries Act*, *Species at Risk Act and* Nova Scotia *Endangered Species Act.* Based on aquatic assessments completed at the Project site, the onsite watercourses are heavily influenced by the marine environment and consist of brackish or estuarine habitats and are thus discussed in the context of marine habitat.	Marine Fish and Water Quality
Marine and Land Based Archaeological and Heritage Resources	Concerns with the effective management of archaeological and heritage resources. Administered under the Nova *Scotia Special Places Protection Act*.	Archaeological and Heritage Resources
First Nations and Aboriginal Land and Resource Use	*CEAA* requires consideration of current use of land for traditional purposes and directed engagement with First Nations people.	Land Use Commercial Fisheries Appendix G: Mi'kmaq Environmental Knowledge Study
Land Use	It is important to consider the compatibility of the Project with existing land uses, municipal land use plans and zoning designations.	Land Use

TABLE 5.1 VEC Scoping

Environmental Component	Scoping Considerations	Selected VEC
Transportation	Marine, rail and vehicular transportation will increase as a result of the Project. The proponent is required to submit an application for authorizations to the Navigable Waters Protection Program NWPP of Transport Canada for the watercourses involved in this project. Any prescribed requirements pursuant to the Navigable Waters Protection Act as determined by the NWPP, Transport Canada shall be strictly adhered to. Approvals under NWPA sections 5.(1)(a), 6.(4), 16, and 20 trigger the need for an EA under the CEAA. However, environmental effects of the project on navigation are taken into consideration as part of the environmental assessment only when the effects are indirect, i.e., resulting from a change in the environment affecting navigation. Direct effects on navigation are not considered in the environmental assessment, but any measures necessary to mitigate direct effects will be included as conditions of the Navigable Waters Protection Act approval. As determined by Transport Canada with respect to this Project, only direct effects were identified; therefore the effects of the Project on navigation are not addressed in this environmental assessment. Increased rail and truck traffic could add noise and air pollutants to the surrounding area.	Land Use Atmospheric Environment
Fisheries and Aquaculture	Fisheries and aquaculture are considered a VEC due to their importance to the regional economy and importance as a socio-cultural activity among maritime communities.	Commercial Fisheries
Economic Development	Fundamental socio-economic determinant. Related to increased economic activity related to the Project. Information on employment and expenditures included in the Project Description in Section 2.0. Further consideration is not warranted at this time.	N/A

The environmental effects analysis for each VEC is presented in its own dedicated section of the EA Report in Section 6.0. An overview of existing conditions with respect to each VEC is presented in Section 4.0. Cumulative effects and accidents, malfunctions and unplanned events are assessed and presented in separate dedicated chapters of the document (Sections 7.0 and 8.0). In addition to each VEC assessment, the effects of the environment on the Project will be assessed.

5.3 Overview of Approach

The environmental assessment methods address Project-related and cumulative environmental effects. Project-related environmental effects are changes to the biophysical or human environment that will be caused by a project or activity arising solely as a result of the proposed principal works and activities, as defined by the scope of the Project (Section 5.1). Cumulative environmental effects are changes to the biophysical or human environment that are caused by an action associated with the Project, in combination with other past, present and future projects and activities that have been or will be carried out.

Project-related environmental effects and cumulative environmental effects are assessed sequentially using a standardized methodological framework for each VEC. The methodological framework is generally consistent between VECs and standard tables and matrices are used to facilitate the evaluation. The Project-related environmental effect is discussed first, taking into account Project design measures and mitigation that help to reduce or avoid Project-VEC interactions that could result in this environmental effect. The residual Project-related environmental effect is then characterized in light of planned mitigation. At minimum, all Project-related environmental effects are characterized using specific criteria (*e.g.,* direction, magnitude, geographic extent, duration, frequency, reversibility and prediction confidence) that are defined for each VEC. The significance of the Project-related environmental effect is then determined based on pre-defined criteria or thresholds for determining the significance of the environmental effects (also called significance criteria). If applicable, the likelihood of significant environmental effects will be characterized.

The scope of assessment with respect to each VEC is described in the following sub-sections.

5.3.1 VEC Selection

The rationale for the selection of each VEC is first described in its own dedicated environmental analysis section. The regulatory setting, ecological and socio-economic context of each VEC, is also described briefly.

5.3.2 Environmental Assessment Boundaries

5.3.2.1 Spatial and Temporal

Spatial boundaries have been established for the assessment of potential environmental effects for each VEC. The primary consideration used to establish boundaries of these assessment areas is the probable geographical extent of the environmental effects (*i.e.,* the zone of influence) to the VEC.

Spatial boundaries represent the geographic extent of the VEC, as they pertain to potential Project-environment interactions. Spatial boundaries are be selected for each VEC to reflect the geographic extent over which Project activities will or are likely to occur, and as such, they may be different from one VEC to another depending on the characteristics of the VEC. Generally, the spatial boundaries are referred to as the Assessment Area.

The temporal boundaries for the assessment are defined based on the timing and duration of Project activities and the nature of the interactions with each VEC. The purpose of a temporal boundary is to identify when an environmental effect may occur in relation to specific Project phases and activities. Temporal boundaries for the Project generally include the following Project phases:

- construction;
- operation; and
- decommissioning and abandonment.

Decommissioning and Abandonment is not addressed separately for each VEC but generically in Section 2.0 and 6.10 given the indefinite life of the Project and speculative nature of the activities involved.

5.3.2.2 Administrative and Technical

As appropriate, Administrative and Technical Boundaries are identified and justified for each VEC. Administrative boundaries include specific aspects of provincial and federal regulatory requirements, standards, objectives, or guidelines, as well as regional planning initiatives that are relevant to the assessment of the Project's environmental effects on the VEC.

Technical boundaries are the technical limitations for the evaluation of potential environmental effects of the Project, and may include limitations in scientific and social information, data analyses and data interpretation.

5.3.3 Residual Environmental Effects Evaluation Criteria

Threshold criteria or standards for determining the significance of environmental effects are identified for each VEC, beyond which a residual environmental effect would be considered significant. These are generally selected in consideration of provincial and federal regulatory requirements, standards, objectives, or guidelines that are applicable to the VEC.

In some cases, standards or thresholds are defined for measurable parameters or environmental effects for a VEC. Thresholds will reflect the limits of an acceptable state for an environmental component based on resource management objectives, community standards, scientific literature, or ecological processes (*e.g.,* desired states for fish or wildlife habitats or populations), and in the absence of standards, are provided by the Study Team based on professional judgment.

5.3.4 Potential Interactions, Issues and Concerns

Interactions between all relevant Project activities and each VEC are summarized in tabular format. Detailed information on the Project activities is provided in Section 2.0. Interactions are ranked according to the potential for an activity to interact with each VEC, according to the following.

- If there is no potential for substantive interaction between a Project activity and a VEC, an assessment of environmental effects is not required. These interactions are categorized as "0", and are not considered further in the assessment. The environmental effects of these activities are thus, by definition, rated not significant.
- If a potential interaction between a Project activity and a VEC is identified, but not likely to be substantive in light of planned mitigation, the interactions are categorized as "1". Such interactions are well understood and are subject to prescribed mitigation or codified practices. These interactions are subject to a less detailed environmental effects assessment and rated not significant; however, justification is provided for such categorizations and the proposed mitigation described. Such interactions can be mitigated with a high degree of certainty with proven technology and practices.
- If a potential interaction between a Project activity and a VEC is identified that may result in more substantive environmental effects despite the planned mitigation, or if there is less certainty regarding the effectiveness of mitigation and/or substantial public or government concern, the interaction is categorized as "2". These potential interactions are subject to a more detailed analysis and consideration in the assessment in order to predict, mitigate, and evaluate potential environmental effects.

Justification for assigning these ranks for each VEC is provided in the text following the tabular ranking.

For each VEC, one or more measurable parameters will be selected to facilitate measurement of potential environmental effects. The degree of change in these measurable parameters will used to characterize and evaluate the significance of the potential environmental effects.

5.3.5 Analysis, Mitigation and Environmental Effects Prediction

For each Project-related activity ranked as a 2, as discussed above, the assessment of each Project-related environmental effect begins with a description of the mechanisms whereby specific Project activities and actions could result in the environmental effect. Where possible, the spatial and temporal extent of these changes (*i.e.,* where and when the environmental effect might occur) is also described.

The environmental assessment focuses on residual environmental effects; environmental effects before mitigation are not quantified or characterized. The significance of the environmental effect before mitigation is not described or assessed.

Mitigation measures that will help reduce or eliminate an environmental effect are described. Mitigation is generally considered to be those environmental management activities that are over and above the Project design aspects described in Section 2.0. In addition, mitigation can include specialized measures such as habitat compensation.

Residual environmental effects (*i.e.,* the environmental effects that remain after mitigation has been applied) are described for a VEC during each Project phase, taking into account how the proposed mitigation would alter or change the environmental effect. The analysis considers mitigation measures to reduce adverse environmental effects or to enhance positive environmental effects, as applicable and appropriate. Once mitigation measures are applied, any remaining environmental effect will be residual. Only residual environmental effects are assessed for significance.

5.3.6 Follow-up and Monitoring

Follow-up programs are used, where applicable, to verify environmental effects predictions and effectiveness of mitigation measures. Monitoring programs include compliance programs used to verify that mitigation was applied and/or regulatory requirements achieved. Appropriate follow-up and/or monitoring programs are proposed where a need has been identified or where the scientific certainty of the environmental effects predictions or the effectiveness of mitigation warrants the need for such programs.

5.3.7 Summary of Residual Environmental Effects Prediction

Environmental effects for each VEC are characterized for each applicable Project phase and presented in an environmental effects summary table. The following criteria are used to characterize potential residual environmental effects:

- **Direction** – the ultimate long-term trend of the environmental effect (*i.e.,* positive, neutral, or adverse);
- **Magnitude** – the amount of change in a measurable parameter or variable relative to existing (baseline) conditions;
- **Geographic Extent** – the area where an environmental effect of a defined magnitude occurs;

- **Frequency** – the number of times during the Project or a specific Project phase or activity that an environmental effect might occur (*e.g.,* one time or multiple times);
- **Duration** – the period of time required until the VEC returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived (*e.g.,* short-term, mid-term, long-term, and may include permanent);
- **Reversibility** – the likelihood that a measureable parameter will recover from an environmental effect, including through active management techniques (*e.g.,* habitat restoration);
- **Ecological or Social Context** – the general characteristics of the area in which the Project is located, as indicated by past and existing levels of human activity; and
- **Prediction Confidence** - based on scientific information and statistical analysis, professional judgment and effectiveness of mitigation.

The key for each environmental effects summary table provides summary criteria that is modified as necessary for each VEC based on the specific boundaries (temporal, spatial, administrative and technical) and significance criteria selected for each VEC. Where possible, these characteristics are described quantitatively for each residual environmental effect. Where these characteristics cannot be expressed quantitatively, they are described using qualitative terms that were defined specifically for the VEC or environmental effect.

Following the rating, residual environmental effects are described and discussed for the VEC during each Project phase, taking into account how the proposed mitigation will alter or change the environmental effect.

A determination of the significance of Project environmental effects is made using standards or thresholds of significance defined for the VEC and/or the measurable parameters, beyond which a residual environmental effect would be considered significant.

Where residual adverse effects are predicted to be significant, the determination includes consideration of the level of confidence in the prediction based on the following criteria:

- scientific certainty (professional judgment) of the rating, in consideration of the Technical Boundaries; and
- likelihood of the environmental effect occurring.

5.4 Cumulative Effects Assessment

After completing the assessment of potential Project-related environmental effects on the VEC, where residual environmental effects are identified, a cumulative environmental effects assessment is conducted for those Project-related environmental effects that may overlap with other projects and activities that have been or will be carried out.

As required under *CEAA*, a cumulative effects assessment is included, to identify past, present and future projects that will be carried out that overlap spatially and temporally with the Project and act in combination with the Project to create environmental effects. For the purposes of the assessment, it is assumed that the existing status or condition of each VEC reflects the influence of other past and current projects and activities occurring within or outside of the Project area. It also assumes (unless there is evidence to the contrary, such as predictable down or upward trend in a population) that these existing activities will continue to be carried out in the future and to have similar effects as currently observed. The assessment will therefore integrate the cumulative effects of these ongoing projects and activities. It is also recognized that future projects and activities in addition to the Project may result in additional effects on the VECs in the Project area. The effects of these other projects and activities are considered and assessed for each VEC. The method used in assessing cumulative effects for this Project follows current practice and is consistent with *CEAA* and informed by the assessment framework presented in the Cumulative Effects Assessment Practitioners Guide (CEA Agency 1999).

Projects and activities which may potentially interact cumulatively with the Project have been identified through an informal scoping process which includes a review of regional activity, relevant results of assessment of project specific effects from other projects that have been assessed, and the professional judgment of the Study Team. Cumulative effects reviewed are limited to projects and activities within the Sydney Harbour. Past and present projects and ongoing activities will have been reviewed under the description of existing conditions for each VEC. These projects include:

- development in the Sydport Industrial Park;
- other port related industrial development in Sydney Harbour (*e.g.,* steel manufacturing, coal unloading);
- shoreline infilling/wharf development;
- marine transportation; and
- commercial fisheries.

CEA Agency guidance states that only those future projects and activities that have a reasonable certainty of proceeding (*e.g.,* have received regulatory approvals or are currently in the approval process) should be considered for the cumulative effects assessment.

Future projects and activities for the purpose of cumulative effects assessment include:

- Muggah Creek Remediation Project (Sydney Tar Ponds Clean up);
- other port related industrial development in Sydney Harbour (*e.g.,* coal unloading);
- marine transportation including the construction of a second berth at the Sydney Marine Terminal to accommodate cruise ships; and
- commercial fisheries.

It is helpful to consider the clarification provided by the Joint Review Panel for the Express Pipeline Project in Alberta. Following an analysis of subsection 16(1)(a) of *CEAA*, the Joint Review Panel determined that certain requirements must be met for the Panel to consider cumulative environmental effects:

- there must be a measurable environmental effect of the project being proposed;
- that environmental effect must be demonstrated to interact cumulatively with the environmental effects from other projects or activities; and
- it must be known that the other projects or activities have been, or will be, carried out and are not hypothetical (NEB and CEA Agency 1996).

Furthermore, the Joint Review Panel indicated that it is an additional requirement that the cumulative environmental effect is *likely* to occur, that is, there must be some *probability*, rather than a mere possibility, that the cumulative environmental effect will occur. These criteria were used to guide the assessment of cumulative environmental effects of the proposed Project.

A series of three questions is used to screen cumulative environmental effects:

- Is there a Project-related environmental effect;
- Does the Project-related environmental effect overlap with those of other past, present and future projects and activities that have been or will be carried out; and
- Is the Project contribution to cumulative environmental effects substantive and measurable or discernible such that there is some potential for substantive cumulative environmental effects that are attributable to the Project.

If, based on these three questions, there is potential for cumulative environmental effects, it is assessed to determine if it has the potential to shift a component of the natural or human environment to an unacceptable state.

The assessment of each cumulative environmental effect begins with a description of the environmental effect and the mechanisms whereby the Project environmental effects may interact with other projects and activities in the Cumulative Effects Assessment Area. Where possible, the cumulative environmental effect is quantified in terms of the degree of change in the appropriate measurable parameter(s) and the spatial and temporal extent of these changes (*i.e.,* where and when the interactions between the Project residual environmental effects and the residual environmental effects of other projects and activities might occur).

As the assessment focuses on residual environmental effects, cumulative environmental effects before mitigation are not characterized. The significance of the environmental effect before mitigation will not be described.

As with Project-related environmental effects, mitigation measures that would reduce the cumulative environmental effects will be described, with an emphasis on those measures that would help to minimize the interaction of the Project-related environmental effect with similar environmental effects from other projects, activities, and actions. Three types of mitigation measures are generally considered, as applicable:

- measures that can be implemented solely by the Proponent;
- measures that can be implemented by the Proponent in cooperation with other project proponents, government, Aboriginal organizations, the public, and/or other stakeholders; and
- measures that can be implemented independently by other project proponents, government, Aboriginal organizations, the public, and/or other stakeholders.

Residual cumulative environmental effects are described and assessed, taking into account how the proposed mitigation will alter or change the cumulative environmental effect. As described for Project-related environmental effects, cumulative environmental effects are characterized where applicable and appropriate in terms of the direction, magnitude, geographic extent, frequency, duration, reversibility and ecological or socio-economic context. The contribution of the Project to cumulative environmental effects will be assessed where there will be a potential for substantive overlapping environmental effects to occur.

A determination of the significance of residual adverse cumulative environmental effects will then be made using the same standards or thresholds for significance developed for the VEC and/or the measurable parameters. As with residual Project-related environmental effects, the determination of residual cumulative environmental effects will include a discussion of the level of confidence in the prediction. Cumulative effects are evaluated in Section 8.0.

5.5 Assessment of Potential Accidents, Malfunctions and Unplanned Events

Accidents, Malfunctions and Unplanned Events are assessed for the Project in Section 7.0. The focus of the evaluation is on credible accidents, malfunctions, and unplanned events that have a reasonable likelihood of occurring during the lifetime of the Project based on the nature of the Project and the environmental effects that may occur, or for those that could result in significant environmental effects even if their likelihood of occurrence is low.

Potential interactions with VECs are ranked using the same criteria as for Project interactions with the environment and are discussed qualitatively. Environmental effects are characterized using the same terms as routine Project-related environmental effects.

Cumulative environmental effects of accidents, malfunctions, or unplanned events, however, are not assessed as it is not reasonably foreseeable to have overlapping Project-related accidents with those from other projects and activities that will be carried out.

The significance of the Project-related environmental effects for each accident, malfunction, or unplanned event and its likelihood of occurrence is then determined using the same thresholds as determined for the Project-related environmental effects on each applicable VEC.

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The following section summarizes the environmental effects assessment for each of the selected VECs and provides significance predictions for residual environmental effects.

6.1 Benthic Habitat Communities and Sediment Quality

Benthic Habitat Communities and Sediment Quality is a VEC in consideration of the potential environmental effects of Project-related activities on the existing benthic communities and marine sediments in Sydney Harbour. For the purpose of this assessment, the term “benthic community” refers specifically to benthic plant and animal life. Benthic communities are critical components of the overall marine ecosystem. Plants in benthic communities stabilize sediment, and provide shelter and food to the marine ecosystem. Animals of benthic communities make up a significant portion of the marine food web, acting as herbivores, as a food source for some carnivorous pelagic and demersal fish species, and as detritivores, thereby contributing to marine nutrient cycling. It is estimated that up to 30% of total human fish consumption is linked to the health of benthic communities (Steele 1965; cited in Newell 1998). In addition, Joiris (1982, cited in Newell 1998) suggests that as much as 50% of phytoplankton sinks to the sea bed, where it is recycled back into the food chain, further highlighting the importance of benthic communities in marine material cycling and food chains.

The term “sediment quality” refers to the chemical and physical properties of the sea bed substrate. Benthic communities live and interact directly in or on sediments, and as such, changes to sediment quality can have a direct impact on the health of benthic communities, either through physical interactions (effects on animal locomotion, burrowing sites; and effects on plant growth) or chemical interactions (uptake of nutrients and toxins). Changes in sediment quality can therefore result in changes to benthic communities, which in turn can affect higher trophic levels in the marine food web. Sydney Harbour supports several species of marine fish and shellfish and a commercial fishery, and it is therefore important to assess the potential environmental effects of the Project on the benthic communities and sediments that support these animals. The assessment of Benthic Habitat Communities and Sediment Quality is therefore closely linked to the assessment of Marine Fish and Water Quality (Section 6.2), Marine Mammals and Marine Related Birds (Section 6.3), and Commercial Fisheries (Section 6.7). A description of the existing conditions for Benthic Habitat Communities and Sediment Quality is provided in Section 4.7.

6.1.1 Environmental Assessment Boundaries

Spatial and Temporal Boundaries

The spatial boundaries for the assessment of Benthic Habitat Communities and Sediment Quality include the dredge channel in the Seaward Arm of Sydney Harbour, as well as the Confined Disposal Facility (CDF) and marine terminal, and the potential secondary CDF in the South Arm. Sediments and benthic communities in the Northwest Arm were also described in Section 4.7; however Project activities are not expected to occur in this area of the Harbour. The spatial boundaries also include the zone of influence from any sediment plumes associated with Project activities that disturb the seafloor (*e.g.,* dredging). Conservatively, then, the spatial boundary for this component of the assessment encompasses all of Sydney Harbour which will be referred to as the Assessment Area.

The temporal boundaries for the assessment of Benthic Habitat Communities and Sediment Quality include the Construction and Operation phases of the Project. The temporal scope also includes the recovery time for benthic communities and sediments that are affected by Project activities, and the period of sediment re-suspension and subsequent return to baseline water quality conditions once dredging of the channel is complete.

Administrative and Technical Boundaries

Marine benthic habitat is a component of fish habitat. Any Project activities that could affect the marine benthic habitat are subject to regulations under the federal *Fisheries Act*. Federal policy for Management of Fish Habitat applies to projects with potential to alter or destroy or disrupt fish habitat.

The analysis of benthic habitat and sediment quality was based on a review of existing knowledge for the study area as well as a habitat and sediment chemistry sampling program, video survey of the benthic environment in Sydney Harbour, sediment plume modeling, and any limitations therein.

Benthic videos and sediment sampling provide a general picture of existing conditions; however, they do not provide comprehensive data for the entire harbour seabed. The ability to predict environmental effects with a high level of confidence is limited by the nature of these surveys.

6.1.2 Residual Environmental Effects Evaluation Criteria

It is understood that with a project of this nature, some environmental effects to benthic communities and habitat cannot be avoided, particularly in the case of channel dredging operations. The significance of these effects will vary depending on mitigation, compensation, and recovery of the affected area of seafloor. DFO has the regulatory authority to authorize a project of this nature with an agreement that the proponent will take the necessary mitigative steps and provide appropriate habitat compensation for any harmful effects to fish and fish habitat. A significant adverse residual environmental effect on Benthic Habitat Communities and Sediment Quality is therefore defined as an unmitigated, unauthorized, or uncompensated alteration of marine benthic habitat and sediment quality, either physically, chemically, biologically, in quality or extent, to such a degree that there is a permanent decline in the species diversity of the habitat.

6.1.3 Potential Interactions, Issues and Concerns

Based on the regulatory requirements and the issues raised by the public and key stakeholders, the environmental effect selected for the assessment of Benthic Habitat Communities and Sediment Quality is:

- Change in Benthic Habitat Communities and Sediment Quality.

This environmental effect relates to the interaction between Project-related activities (including dredging, vessel traffic, and marine infrastructure) with the benthic communities and sediments of Sydney Harbour. A change could consist of direct mortality of benthic species or changes to the use or quality of benthic habitat or sediments resulting from the disturbance of the seafloor.

The potential interactions between Project-related activities during each phase of the Project and potential environmental effects to Benthic Habitat Communities and Sediment Quality are shown in Table 6.1.

Table 6.1 below lists Project activities and physical works associated with the Project and ranks each interaction as "0", "1" or "2". These rankings are defined in Table 6.1 and are indicative of the level of interaction each activity or physical work will have with Benthic Habitat Communities and Sediment Quality.

TABLE 6.1 Potential Interactions, Issues and Concerns for Benthic Habitat Communities and Sediment Quality

Project Activities and Physical Works	Potential Environmental Effects		
	Change in Habitat Quality	Change in Habitat Use	Mortality
Construction and Commissioning			
Dredge and Dewatering	2	2	2
Vessel Transportation (barging offshore structures, delivery of construction materials and equipment)	0	0	0
Construction of confined disposal facility (placement of offshore structures, driving or drilling/grouting of piles, placement of decking)	2	2	2
Site Preparation (clearing and grubbing, grading)	1	1	1
Construction of land components (including road, rail, buildings)	0	0	0
Operation			
Marine Vessel Traffic	1	1	1
Loading and Unloading Vessels/Trains	0	0	0
Site stormwater and wastewater Management	1	1	1
Equipment and Materials Storage	0	0	0
Maintenance/Repairs to Terminal	0	0	0

Note: Project-Environment Effects were ranked as follows:
0 No interaction. No substantive interaction contemplated.
1 Interaction will occur. However, based on past experience and professional judgment, the interaction would not result in a significant environmental effect, even without mitigation, or the interaction would clearly not be significant due to application of codified practices
2 Interaction may, even with codified mitigation, result in a potentially significant environmental effect and/or is important to regulatory and/or public interest. Potential environmental effects are considered further and in more detail in the EIA.

Table 6.2 describes the measurable parameters that will be used for the environmental effects assessment, and the rationale for the selection of the measurable parameters.