APPENDIX B

Traditional Use Study

Traditional Use and Mi'kmaq Fisheries of the Shelburne Basin, Nova Scotia

Version 1

Submitted to

Stantec

Submitted by

Membertou Geomatics Solutions (MGS) &

Unama'ki Institute of Natural Resources (UINR)

May 15, 2014

Acknowledgements

We would like to thank the First Nation commercial fishery departments in the participating Mi'kmaq and Maliseet communities within Nova Scotia and New Brunswick for providing fishery and contact information; to the captains, commercial and food, social and ceremonial harvesters for their time and participation in this project; and to Tyson Paul and Katie McEwan for their time and effort to conduct interviews.

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Executive Summary

There are no areas currently identified within the Project Area for Food, Social, Ceremonial (FSC) harvest, however, this does not imply the area is not utilized for FSC fisheries, of significance, or that it may not be accessed for future FSC needs. The importance of this area is in the means by which it connects other ecosystems, such as the Bay of Fundy, the Scotian Shelf, the Gulf of St. Lawrence, and the Bras d'Or Lakes, for example, for which culturally significant species such as salmon, eels, mackerel, and striped bass migrate through.

Within the Regional Assessment Area, lobster, scallops, cod, herring, halibut, salmon, gaspereau, haddock, monkfish, pollock, and hake were identified as being fished for food, social, and ceremonial purposes.

Commercial fishery harvesting by the Mi'kmaq and Maliseet occurs within the boundaries of the Shelburne Basin Regional Assessment Area for 24 species: albacore tuna, bigeye tuna, Bluefin tuna, cod, cusk, flounder, gaspereau, haddock, hagfish, hake, halibut, herring, Jonah crab, lobster, marine worm, monkfish, Pollock, redfish, scallop, shark, shrimp, snow crab, swordfish, and yellowfin tuna.

The inner shelf is an important fishing area for groundfish (cod, and redfish) (Appendix B), herring (Appendix C), snow crab, shrimp, lobster and rock crab (Appendix D). The shelf area is important fishing grounds for groundfish, in particular cod and redfish and hagfish (Appendix B). The slope/channel areas are an important fishing area for redfish, cod, flounder and groundfish in general, and also for hagfish (Appendix B), and shrimp (Appendix D).

Some of the concerns and/or recommendations expressed by fishermen interviewed were primarily concerns over the effects on habitats and species because of any sort of development in the area, as well as any ecological impacts especially if there is a spill.

The information gathered and processed is highly dependent on the data provided by the informants during the interview process. This study should not be taken as an absolute measure of Mi'kmaq ecological knowledge and use of the land and sea.

1.0 Introduction

1.1 Project Description

Shell Canada Limited is proposing to conduct an exploratory drilling program approximately 250 kilometres off the coast of Nova Scotia, consisting of up to seven exploration wells within Exploration Licenses 2423, 2424, 2425, 2426, 2429, and 2430, over a four year period from 2015 to 2019. Specific drilling locations will be determined using seismic data gathered as part of the Shelburne Basin 3D Seismic Survey conducted in summer 2013.

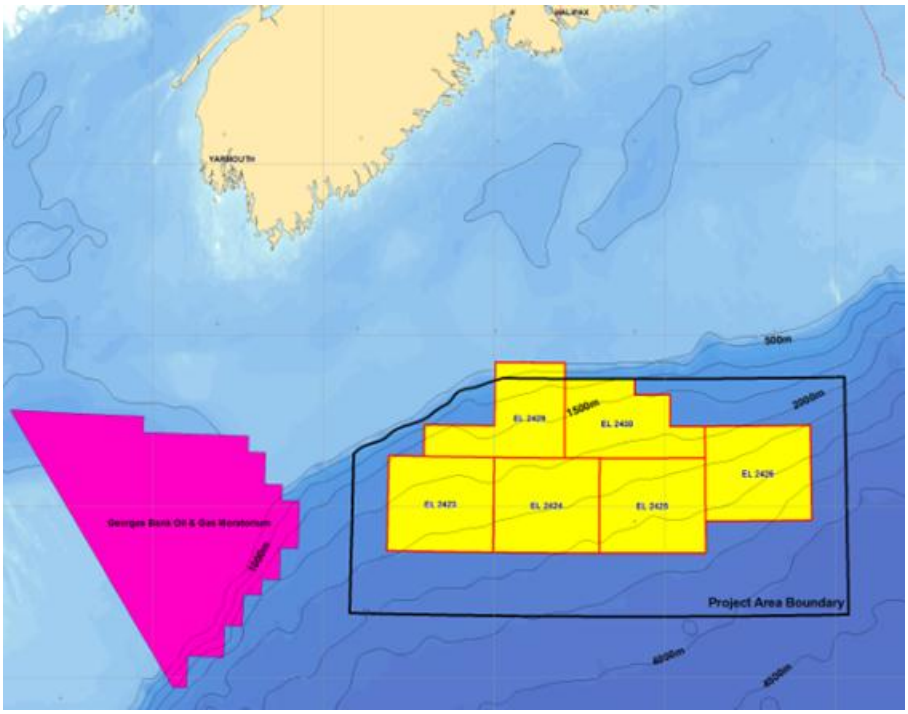

Figure 1. Shelburne Basin Exploration Licenses.

The purpose of this study was to define the extent and timing of current Mi'kmaq and Maliseet fisheries in the study area based on existing data and through interviews with participating community fishery directors and/or managers, fishers and associated fisheries organizations. A contextual review of the project site and surrounding areas was also conducted within this study.

1.2 Project Boundaries

The spatial boundaries delineated for the environmental effects assessment for fish and fish habitat as part of the Shelburne Basin Exploration Drilling Project Environmental Impact Statement (2014) were adopted for this study. The descriptions of each area were provided by Stantec (2014).

Exploration Drilling Project Area (PA): The Project Area is the site at which routine Project activities will occur. The Project Area includes portions of EL 2424, 2425, 2426, 2429 and 2430.

The Exploration Drilling Project Area (PA) is an irregular "L" shaped polygon of roughly 75 km x 160 km centered within the Project Area with the longer length orientated southwest to northeast and angled

roughly 24 degrees to the orientation of the Project Area. The angled orientation aligns the Exploration Drilling Project Area with the Continental Shelf Break approximately 40 km to the north-northwest (Stantec 2014).

Geographically, the PA is entirely within the Scotia Slope District 940 with the northwest corner having depths of approximately -1650m and the southeast corner of the PA has depths of approximately -3450m. The depths at the southwest corner of the EDPA are approximately -2650m and the upper northeast corner has approximately -2425m in depths (Stantec 2014).

Local Assessment Area (LAA): The LAA is the maximum area within which environmental effects from Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the Project Area and adjacent areas where Project-related environmental effects are reasonably expected to occur. Based on predicted propagation of Project-related sound pressure levels a buffer of 30 km around the Project Area boundaries has been established to represent the LAA. The LAA has also been defined to include routes for offshore support vessels travelling to and from the Project Area.

In addition to encompassing the PA on the Scotia Slope, the LLA limits span the entire Continental or Scotia Shelf from the Shelf Break to the Inner Shelf and encompasses a portion of the LaHave Bank, Emerald Bank and the more westerly bank of the 2 small Sambro Banks. Further inshore from the Shelf Break, the funnel portion of the LAA limits encompasses a portion of the LaHave Basin and the Emerald Basin before funneling to outer Halifax Harbour (Stantec 2014). The funnel shape was defined to include OSV routes to and from the Project Area

Regional Assessment Area (RAA): The RAA is the area within which residual environmental effects from Project activities and components may interact cumulatively with the residual environmental effects of other past, present, and reasonably foreseeable physical activities. The RAA is restricted to the 200 nautical mile limit of Canada's EEZ, including offshore marine waters of the Scotian Shelf and Slope within Canadian jurisdiction. The western extent of the RAA terminates at the international maritime boundary between Canada and the United States. The eastern extent of the RAA terminates at the eastern edge of Banquereau Bank. A portion of the Scotian Shelf and the Nova Scotia coastline to the Bay of Fundy is also included as part of the RAA boundary.

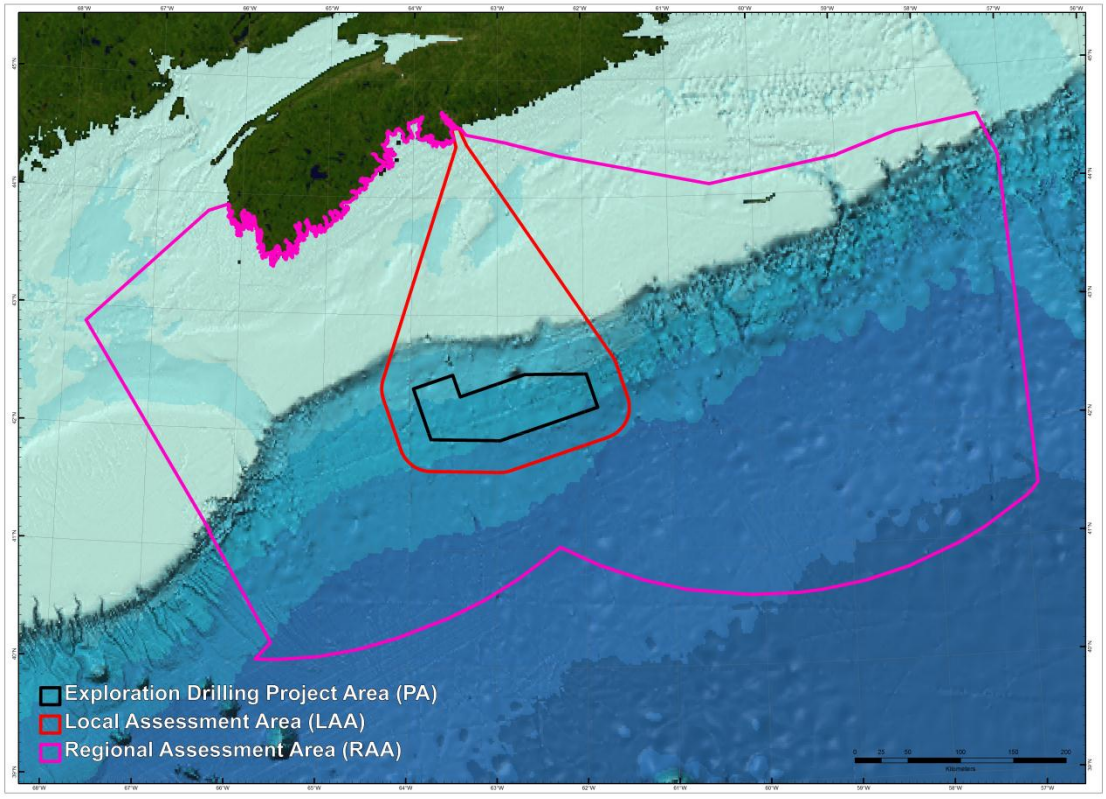

Figure 2. The location of the Project Area, Local Assessment Area, and Regional Assessment Area.

Table 1. Commercial fishery management zones located within the PA, LAA and RAA spatial boundaries.

Management Zones	Zones in PA	Zones in LAA	Zones in RAA
Herring (mackerel and capelin)	HFA 20 (4VWX)	HFA 20 (4VWX)	HFA 20 (4VWX)
Lobster	LFA 41	LFA 33, 41	LFA 31B, 32, 33, 34, 40, 41
NAFO (groundfish, large pelagics)	4W, 4X	4W, 4X	4VS, 4W, 4X, 5Y, 5ZE
Scallop	FA25, FA26	FA25, FA26, FA29	FA25, FA26, FA27, FA29
Shrimp	SFA 15, SFA 16	SFA 15, SFA 16	SFA 14, SFA 15, SFA 16
Snow Crab	FA24	FA24	FA23, FA24
Squid	20	20	20

The project also occurs in seabed classes of the Scotian Shelf (WWF 2009) (Table 2):

Table 2. Seabed classes located within the PA, LAA and RAA spatial boundaries.

Seabed Name	PA	LAA	RAA
Scotia Slope West	**Yes**	**Yes**	**Yes**
Scotian Shelf East	No	**Yes**	**Yes**
Outer Scotian Shelf Saddle	No	**Yes**	**Yes**
Outer Scotian Shelf - Bank	No	**Yes**	**Yes**
Outer Scotian Shelf	No	**Yes**	**Yes**
Middle Scotian Shelf - Basin	No	**Yes**	**Yes**
Middle Scotian Shelf - Bank	No	**Yes**	**Yes**
Inner Scotian Shelf	No	**Yes**	**Yes**
Inner Gulf of Maine Shelf	No	No	**Yes**
Middle Gulf of Maine Shelf	No	No	**Yes**
Middle Gulf of Maine Shelf - Basin	No	No	**Yes**
Outer Gulf of Maine Shelf - Basin	No	No	**Yes**
Outer Gulf of Maine Shelf - Channel	No	No	**Yes**
Outer Gulf of Maine Shelf - Bank	No	No	**Yes**
Outer Gulf of Maine Shelf	No	No	**Yes**
Scotian Slope West - Fan	No	No	**Yes**
Scotian Slope East - Canyon	No	No	**Yes**
Scotian Slope East - Gully Fan	No	No	**Yes**
Scotian Rise	No	No	**Yes**
Scotian Rise - Debris Flow	No	No	**Yes**

1.2.1 The Water Column

In addition to the ocean surface and the ocean bottom coverage by the Project Area Boundary, the entire water column in-between the two surfaces are included in this study. The two Major divisions concerning the water column are the Pelagic Zone which encompasses the entire water column while the Benthic Zone encompasses the entire ocean bottom from the low tide mark. The Horizontal divisions include Neritic zone that includes all areas associated with the Continental Shelf and the Oceanic Zone which includes all areas beyond the Continental Shelf. The Vertical zones of the water column include from the water surface to -200m below the surface as the Epipelagic Zone where sunlight penetrates the water column to support photosynthesis and the Epipelagic Zone supports approximately 90% of marine life. Below the -200m depth down to the -1000m depth is the Mesopelagic Zone which is also referred to as the Midwater or Twilight Zone where sunlight penetration in the water column is too faint to support photosynthesis. The Bathypelagic Zone or Midnight Zone occupies the -1000m to -4000m depth range within the water column where there is no sunlight penetration and extremely cold habitat that supports roughly 1% of known marine life. From below -4000m to -6000m is the Abyssopelagic Zone where approximately 75% of the earth's ocean bottom is within this zone. The Hadalpelagic Zone of below -6000 to -10,000m is a zone of deep canyons and trenches where pressures

of approximately 8 tons per square inch provides habitat for only a very few known species of invertebrates and fish (NOC 2014).

The Project Area has all but the Hadalpelagic Zone within the water column. Moving across the Study Area in a southeastern direction, the chamfered northwest corner of the Study Area boundary roughly follows the -200m contour and a small 10 km x 50 km annex to the Study Area bounds has depths of approximately -150m and within the Epipelagic Zone. Moving further southeast and over the continental Shelf Break the ocean bottom drops dramatically down the Scotia Slope through the Mesopelagic Zone of -200m to -1000m and the Bathypelagic Zone of -1000m to -4000m. The width of the Bathypelagic Zone is approximately 150km horizontal distance northwest to southeast through the Project Area. The -4000m contour passes through the Study Area approximately 330 km off the coast at Liverpool and within 50 km inside the Study Area's Southeast corner placing the corner with depths of approximately -4450m and within the Abyssopelagic Zone of -4000m to -6000m (Stantec, Depth Data, 2014).

1.2.2 Continental Shelf

The Continental Shelf extends offshore between 125 and 230 km and to a depth of -200m. Regionally, the Continental Shelf is comprised of major areas of the Northumberland Strait, southeastern Gulf of St. Lawrence, Sydney Bight, Scotia Shelf, Georges Bank, Gulf of Maine and the Bay of Fundy. The shelf can have deep basins as much as -280m in depth as well as banks that rise as much as 26m above sea level as is the Sable Island Bank. Beyond the -200m contour the bottom of the Continental Shelf steeply slopes to depths in the -2000m range and gradually slopes to maximum depths in the -5000m range (Davis et al 1996:228-230).

The regional landscape of the sea bottom of the Continental Shelf is that of a submerged coastal plain that shows the influences of terrestrial erosion, continental ice sheets and more recent ocean influences (Davis et al 1996:228).

The Natural History of Nova Scotia divides the offshore and Continental Shelf into four districts. District 910 is the Inner Shelf and is the district closest to the land and is adjacent the shoreline. The Inner Shelf is characteristically the gradual sloping bottom that extends to the -110m contour (Davis et al 1996:228).

The Middle Shelf is District 920 in the Natural History of Nova Scotia and is characterized by fishing banks and deep basins throughout the middle zone of the Continental Shelf that includes the Scotia Shelf and the Gulf of Maine (Davis et al 1996:228).

District 930 is the Outer Shelf and is characterised by large offshore banks, water cut channels and geologic saddles on the outer edge of the Continental Shelf (Davis et al 1996:228).

District 940 is the deep water area beyond the Continental Shelf Break (-200m Contour) and includes the Scotia Slope, with the southeast district bounds at Canada's 200 Mile Limit (Davis et al 1996:228).

The Project Area is almost entirely beyond the Continental Shelf Break and therefore would be within the Natural History District 940, Scotia Slope. For the purpose of this Traditional Use Study all the Natural History Districts of the Continental Shelf relative to the area between the Study Area and the

adjacent Nova Scotia coastline will be reviewed. The review will reference a line drawn perpendicular to a line drawn through Lockeport and Sheet Harbour as a reference, extending from Liverpool, the perpendicular line seaward continues southeast for 250km to the approximate center of the Project Area. The review will cover the districts and features of relevance along the 250 km seaward reference line including any areas of significance or relevance within 150 km left or right of the reference line from Liverpool.

1.2.3 Geology

The inshore regions of the Continental Shelf are usually extensions of the adjacent terrestrial bedrock formations. Although mapping of the geologic formations comprising the Continental Shelf are not as detailed as onshore bedrock mapping, it is thought that the offshore geology is as varied offshore as onshore. There are four major bedrock units comprising the Continental Shelf: the Triassic rocks (251 to 199.6 million years) of the Acadian Basin of the Bay of Fundy and Gulf of Maine, terrestrial bedrock extending 25km offshore along the Atlantic Coast of Nova Scotia, the Jurassic (199.6 to 145.5 million years), Cretaceous (145.5 to 65.5 million years) and Tertiary rocks 65.5 to 3.6 million years) of the Middle and Outer Scotia Shelf including Georges Bank and the outer Gulf of Maine, the fourth major bedrock unit is the Carboniferous rocks (359.2 to 299.0 million years) of the Sydney Basin (Davis et al 1996:228).

1.2.4 The Inner Shelf

The Natural History of Nova Scotia describes the Inner Shelf District 910 of the Offshore/Continental Shelf as an extension of the Nova Scotia landmass extending seaward in a gradual slope offshore to a depth ranging from -100m to -120m. Along the Atlantic Coast (District 911), the bottom gradually slopes seaward extending approximately 25 km offshore to a depth of -110m (Davis et al 1996:232-233).

The topography of the Inner Shelf bottom is generally shaped by the ancient bedrock surface with some areas of exposed bedrock but is mostly covered by reworked glacial tills of sand, gravel and boulders. Rising sea levels have removed most of the glacial deposits covering bedrock leaving a bottom with extensive areas of bedrock exposure and reworked sediments of mostly coarse sand and gravel (Davis et al 1996:232-236).

Features found on the Inner Shelf bottom include sand waves, gravel waves, folded bedrock, submerged drumlins and glacial moraines. Ancient eroded features in the bedrock such as former river drainage cuts have since been in-filled with later sediments. Inner Shelf sediment composition varies locally based on the material composition eroded and the degree of exposure the local tills and bedrock have to wave action and currents (Davis et al 1996:232-236). The German Bank off the south coast of Nova Scotia has extensive areas of sand waves (Davis et al 1996:235).

Adjacent the coastline is a zone of seaweed growth that extends offshore over suitable rocky habitat to the -30m contour (Davis et al 1996:232). Kelp, knotted wrack and rockweed form a dense carpet along the coastline with dense kelp beds can be found below the tideline. These areas provide refuge and habitat for small fishes and invertebrates. Eel grass beds, tidal marshes, and encrusting coralline algae

can be found in shallower areas. Benthic invertebrates include horse mussel, sea cucumbers, sea stars, amphipods, barnacles, crabs, scallops and significant populations of lobsters (WWF 2009).

1.2.5 The Middle Shelf

The Middle Shelf District (District 920) is the submerged Atlantic Coastal Plain that has a topography that was shaped by erosional and tectonic processes during an earlier history of being above sea level. The Middle Shelf District extends from the near shore -110m contour to the near shore edges of the major offshore banks and is further broken down into sub-districts of Middle Shelf Banks (921), Middle Shelf Basins (922) and Valley and Plains (923) (Davis et al 1996:251).

Moving offshore from the -110 contour, the Valley and Plains District (923) is encountered in a depth zone between -100m and -200m and located between the Middle Shelf Banks and Middle Shelf Basins containing glacial features of moraines and glacial till of sand mixed with clay and silt (Davis et al 1996:251-255).

Middle Shelf Banks adjacent the Study Area include the Roseway Bank located approximately 50 km off the coastline at East Point near Lockeport and 30 km southwest of the Liverpool to Study Area reference line. The shallows of Roseway Bank are approximately -100m in depth. Other Middle Shelf Banks adjacent the Project Area are the Sambro Banks separated by the Emerald Basin with each located approximately 100 km off the coastline with the westerly of the two Banks of approximately -108m depth and being roughly 100 km northeast of the Liverpool to Study Area reference line The easterly Sambro Bank of -105m depth and roughly 160 northeast of the reference line. Both the Roseway Bank and the Sambro Bank are steep sided and flat topped Mesas (table land with steep sides) in the -80m to -100m depth range and predominantly covered in gravel with sand proportions increasing in shallow depths (Davis et al, Vol.1, 1996:71).

The Roseway Bank and the westerly Sambro Bank are separated by the LaHave Basin centered approximately 70 km off the coastline and approximately 50 km northeast of the Liverpool to Study Area reference line. The LaHave Basin has deep depths of approximately -200m. The large Emerald Basin is northeast of the Sambro Bank is centered roughly 80 km off the coastline and 125 km northeast of the Liverpool to Project Area reference line and has deep depths of approximately -207m (Davis et al, Vol.1, 1996:71)(Stantec 2014).

The Middle Shelf Basins are extensive depressions similar to lowlands and have been smothered with sediments and smoothed by currents. The grey clay sediments of the basins was formed during glacial retreat and settled in the basins. Beneath the clay are layers of silt from glacial melt water called Emerald Silt. Glacial moraines are features found within the basins that were deposited in marine conditions from the bottom of floating ice sheets. There is a rough chain of End Moraines on the middle shelf that parallels the coastline. Located approximately 225 km southwest of Cape Sable and beginning just east of the center of the Gulf of Maine, an area of End Moraine follows the northern edge of Georges Basin and Browns Bank. Continuing through the coastal side of the Roseway basin the chain of End Moraines is interrupted by the Roseway Bank before continuing through the coastal side of the LaHave Basin and northern edge of the Emerald Basin to continue paralleling the Eastern Shore and

Cape Breton. Some End Moraines are found within the LaHave Basin and the chain of End Moraines has many large gaps in the Chain parallel to the Eastern Shore and off the coast of Cape Breton. The Middle Shelf Basins have outlets to the edge of the Continental Shelf through saddles within the Valley and Plains District (923) of -100m and -200m depth range (Davis et al, Vol.1, 1996:71).

The Roseway Basin is centered approximately 45km south, south east off the coast at Shelburne, 45km southwest of the Liverpool to Project Area reference line and separates Browns Bank to the southwest and the Roseway Bank to the northeast (Davis et al, Vol.1, 1996:71).

Banks are home to a diversity of fishes, including rare species, and invertebrates. Sand dollars, amphipods, and sand lance are common on coarser substrate while horse mussels, brittle star, lobster and crab are found on gravel. The open basins of this area are rich in periodic influxes of nutrients which help sustain phytoplankton in deep areas. Zooplankton and krill provide food for most ocean organisms, especially to common species such as red and silver hake, witch flounder, urchins and sea stars. Basins are habitat for snow crab and shrimp. The area is frequented by the rare North Atlantic Right Whale (WWF 2009).

1.2.6 The Outer Shelf

The Outer Shelf District (930) is a 50km to 75km wide zone from the seaward extents of the Middle Shelf to the edge of the Continental Shelf. The Natural History of Nova Scotia further breaks the Outer Shelf District down into the Outer Shelf Banks (931) and the Bank Edges, Saddles, and Channels (932). The Outer Shelf area adjacent the Project Area are comprised of the Browns Bank, LaHave Bank, Emerald Bank, Western Bank and the western portion of the Sable Island Bank as well as the areas between the banks such as the outlet saddles and bank edges. There are no Basins within the Outer Shelf District (Davis et al, Vol.1, 1996:256).

The Outer Shelf Banks are large flat top Cuesta features of bedrock formed on a former coastal plain while above sea level in an earlier time period. The raised features have a gently sloping side with an opposite side of steeply sloped face or scarp face. Over time the bedrock was covered in glacial till of sand and gravel that have since been levelled by rising sea levels since the last ice sheets and reworked into extensive sand fields. The Outer Shelf Banks have depths in the -30m to -80m range and the topography of the banks is of moderate relief with tops ranging between 100m to 150m above the lower Saddles and Channels being comparable to North Mountain of Nova Scotia being approximately 200m above the Annapolis Valley and Bay of Fundy (Davis et al, Vol.1, 1996:256-261)(Stantec 2014).

Located approximately 100km off the coastline at Liverpool, the LaHave Bank (931c) is roughly centered on the Liverpool to Project Area reference line and the Continental Break is further 35km southeast. The LaHave Bank is has shallow depths in mid to low -80m range. Moving southwest from the LaHave Bank and the Liverpool to Project Area reference line, an outlet saddle approximately 25km wide and -150m deep separates the LaHave Bank from the Baccaro Bank (931b) centered roughly 90km to the southwest of the Liverpool to Project Area reference line. The Baccaro Bank has shallow depths in the mid -80's to mid-90's range. Very little in depth separates the Baccaro Bank from Browns Bank (931b) which is centered approximately another 60km further southwest from Baccaro Bank center and has shallow

depths in the -70 to -80 range. The Natural History of Nova Scotia includes both the Baccaro Bank and Browns Bank in the same District (931b). Moving 30km further southwest, the southwestern edge of Browns Bank slopes steeply down into to depths of approximately -200m within the Northeast Channel (Fundian Channel) of the Gulf of Maine. Roughly 35km wide, the Northeast Channel separates Browns Bank and Georges Bank which is a large bank further to the southwest and centered approximately 360km from the Liverpool to Study Area reference line. The eastern portion of Georges Bank within Canada's Fishing Limits has shallow depths in the high -50s to -70m range located roughly 130km west of the west limits of the Study Area and 270 km southwest of the Liverpool to Project Area reference line (Stantec 2014).

Moving northeast of the Liverpool to Project Area reference line, the Outer Shelf Banks includes the Emerald Bank centered approximately 145 km off the coast at Chebucto Head and roughly 110km northeast of the Liverpool to Project Area reference line. The Outer Shelf also includes the Western Bank centered approximately 180 km of the coastline at Jeddore Cape on the Eastern Shore and roughly 150 km northeast of the Liverpool to Project Area reference line. The Emerald Bank has shallow depths of approximately -90m and is separated from the LaHave Bank to the west by a 90km outlet Saddle with depths in the -160m to -150m range. The shallows of the Emerald Bank are mostly covered in gravels and areas below -110m have more sand cover with a small proportion of clay. The Natural History of Nova Scotia does not distinguish the Western Bank from the Sable Island Bank where most sources distinguish the Western Bank as the western portion of a large Outer Shelf Bank referenced as the Sable Island Bank, District (931e). The Western Bank is centered approximately 60 km east of the Emerald Bank center and the two banks are separated by a 2 km wide Saddle of depths in the -95m to -105m range before rising to approximately -10m and less within the Western Bank shallows (Davis et al, Vol.1, 1996:71)(Stantec 2014).

The shallows of the Outer Shelf Banks are surrounded by deeper water which the Natural History of Nova Scotia breaks down into bottom features of Bank Edges, Saddles and Channels or District 932. The Saddles are raised connections of gentle topography between the Bank features and usually have depths less than -200m. Saddles are usually covered in sand with some clay, silt and some boulders. The Channels are broad and deep such as the Northeast Channel of the Gulf of Maine. The Northeast Channel has the deepest recorded sand waves found on the Continental Shelf at depths in the -230m to -260m range. The edge of the Continental Shelf is notched with submarine canyons exiting further down the slope face (Davis et al, Vol.1, 1996:256-261). Most of the larger canyons are northeast of the Study Area with the Verrill Canyon and the Dawson Canyon approximately 30km northeast and adjacent the eastern limits of the Study Area and separate the Western Bank from the Sable Bank (Campbell et al, Map 2125A, 2008). The Mohican Channel is a wide Channel that is located within the Project Area at approximately 70km inside the eastern limit of the Project Area. A narrow channel is located in the face of the slope roughly midway between the Verrill Canyon to the east and Mohican Canyon to the west (Campbell et al, Map 2124A, 2008).

The area is known for its high productivity. Cold slope waters mix with waters at the edge of the shelf supplying nutrients to support phytoplankton and subsequent zooplankton growth. Offshore banks are important for groundfish like cod, haddock, pollock and silver hake for feeding and spawning. Gyres

created by mixing of waters create retention areas for larvae, invertebrates such as jellyfish and seaweeds such as *Sargassum*. Short-fin squid migrate to these areas in June to feed (WWF 2009).

1.2.7 The Scotian Slope

The Natural History of Nova Scotia District 940, Scotia Slope is the ocean beyond the -200m contour to Canada's 200 mile limit as a boundary for the district. Depths within the Scotia Slope District are in the -200m to -5000m (Davis et al 1996:263).

At the edge of the Continental Shelf in the area adjacent the Project Area, the sea bottom plunges to depths of approximately -4000m over 175km horizontal distance seaward with an overall slope of approximately 2.2%. More accurately, the steepness of the sea bottom is not constant as the steep upper portions of the slope change to a more gradual slope at deeper depths. From the -200m contour at the Continental Shelf Break to the -1000m contour the slope is 5.3% for a horizontal distance of 15km. From the -1000m contour to the -2000m contour the continental slope begins to flatten to 2.5% slope over a 40km horizontal distance. A further 55km horizontal distance is covered before the seabed slopes down at 1.8% for another -1000m vertical distance upon reaching the -3000m contour. The slope from the -3000m contour to the -4000m contour extends a further 65km seaward at a slope of 1.5% (Stantec 2014). The Natural History of Nova Scotia does not distinguish between Continental Slope and Continental Rise where the Slope is the steepest portion of the seabed where sediments slump over the Shelf Break and add to the thick accumulation of sediments that slump down the steep slope between -200m and -2000m. (Davis et al 1996:263-264) The Rise is where the majority of sediments flowing over the Continental Shelf Break and down the Continental Slope settle and accumulate at deeper depths forming a gradual rise between the steep Continental Slope and Abyssal Plain (Middleton 2014).

Offshore exploration has produced slightly different district classifications for the Continental Shelf off the coast of Nova Scotia based on the geological history of the region.

The Western Scotia Margin, as the offshore of Nova Scotia, west of the Sable Island Sub-Basin is referred, is further broken down into four structural provinces of the LaHave Platform (LP), Slope Detachment (SD), Allochthonous Salt and Minibasin (ASM) and the Outer East Coast Magnetic Anomaly (ECMA) province (CNSOPB 2014).

Approximately 200 million years ago at the end of the Triassic Period and the beginning of the Jurassic Period, the super continent of Pangea began to break up and the north eastern coast of North America and the north western coast of African were detached when a rift developed along the broad valley that separated the approximate areas of Nova Scotia and Morocco. The once joined regions of North West Africa and North Eastern North America were closer to the equator during this time and both moved north as the rift valley grew wider (OERA, PL.2-10, 2014). The area landscape 200 million years ago was most likely heavily vegetated and wet.

The rift valley was periodically flooded by an adjacent ancient sea and that was the beginnings of the Atlantic Ocean of today. The rift valley was poorly drained and the trapped seawater would eventually evaporate. The cycle of flooding and evaporation continued over time leaving thick deposits of salt in the shallow basins of the valley. As the rift widened by forming new crust in opposite directions of the

rift, the inland basins were eventually permanently flooded with seawater which started a 200 million year sediment deposition process (CNSOPB, Geoscience, 2014).

The Jurassic landscape including salt deposits are buried in sediments up to 24 km thick that hide the broken upper crust. These break-lines form the divisions between the four structural provinces (CNSOPB, Geoscience, 2014). The Lahave Platform (LP) approximates the same district as the Middle Shelf and Outer Shelf combined. A line approximating the Continental Shelf Break is referred to as the Hinge Zone. The Hinge Zone is the division between the LaHave Platform and the Slope Detachment Province (SD) and represents broken and detached blocks of 200 to 65 million year old Jurassic and Cretaceous strata heavily influenced by underlying salt tectonics. The SD Province blocks dips steeply seaward as underlying salt deposits are extruded through breaks in the younger and heavier overlying strata (CNSOPB, Fig. 15b, 2014).

The zone where these salt extrusions occur marks the division between the Slope Detachment Province (SD) and the Allochthonous Salt and Minibasin (ASM) Province. The salt extrusions (Allochthonous Salt Diapir) deform overlying strata as the salt is forced through weaknesses and in some conditions forming large areas of Salt Canopies over the overlying strata such as the Shelburne Canopy. The Shelburne Canopy is an Allochthonous Salt deposit approximately 80 km long and adjacent and paralleling the Nova Scotia Coastline from Georges Bank to Browns Bank. While the Salt Layers are several kilometres below the present ocean bottom, the (ASM) Province is horizontally located between the -1500m and -3000m contour line in the area directly south of the LaHave Bank and between the -2000m and 4000m contours lines directly south of the Emerald Bank and Western Bank and within the Project Area. Another large salt canopy is the Southwest Sable Canopy several km below the ocean bottom located south of the Sable Island Bank and roughly 80 km east of the Project Area (CNSOPB, Fig.15b, 2014).

Beyond the Allochthonous Salt and Minibasin (ASM) Province is the outer East Coast Magnetic Anomaly (ECMA). Offshore exploration has identified magnetic linear anomalies interpreted as volcanic margins. The (ECMA) Province's landward division with the (ASM) Province is where the Autochthonous (undisturbed) salt deposits end while the seaward limit is where the seismic reflections below the sea bottom shows oceanic crust abruptly changing from rugged to smooth which is used as a reference to mark the transition from Continental Crust to Oceanic Crust (CNSOPB 2014).

The Slope Detachment Province (SD), the Allochthonous Salt (Diapir) and Minibasin (ASM) Province and the East Coast Magnetic Anomaly (ECMA) combined share the same district as the Natural History of Nova Scotia District 940, Scotia Slope but the seaward limit of the of District 940 is the 200 Mile Limit political bounds, the East Coast Magnetic Anomaly (ECMA) is horizontally located roughly along the -4000m contour line (CNSOPB, Fig. 15b, 2014).

Another major event adjacent the Project Area that happened approximately 51 million years ago had a major impact on the geologic history of the western portion of the Scotia Slope. The Ypresian Age (56.0 to 47.8 million years ago) of the Eocene Epoch (56.0 to 38.1 million years ago) was a time when the continents had not yet reached their position of today. (Freie 2014) A Bolide (Asteroid or Comet) impacted the Scotia Shelf south of the LaHave Bank and just before the Continental Shelf Break. It is

estimated that there was 300m of ocean cover at the impact site and the 45 km wide impact crater was discovered in the mid 1980's during offshore exploration as the first marine impact discovered and referred to as the Montagnais Structure (Deptuck et al 2012). The structure created by the impact extended 2.7 km deep into the crust with a central structural uplift region 11.0 km wide (Lubomir et al, Abstract, 2014). The center of the crater, the surrounding trough and raised crater edge are covered in a layer of Breccia (a conglomerate of rock fragments) formed in the heat created at impact. The Montagnais Impact Site is now buried under 510m of Eocene and younger sediments forming the seabed and covered by a further 110m of ocean (Deptuck et al 2012).

It is hypothesized that the impact may have caused a collapse of the continental margin adjacent the Montagnais Impact Site (Deptuck, after Jansa, 2014). Further to the hypothesis of a margin collapse, it is also proposed that the shock of the impact and force of the sea rushing back into void caused the largest known mass transport of failed sediment material along the face of the Scotia Slope (Deptuck, Seminar, 2012), through the Project Area and deposited near and beyond the -5000m contour (CNSOPB, Figure 5b, 2014).

Because of its high productivity, the Scotian Slope is a stopover for migrating species. Whales, porbeagle, Greenland sharks, swordfish, tuna, seabirds and the leatherback turtle are attracted to the regions high productivity. Shallow to deep-water fish species are found here, including halibut and hagfish. It is an overwintering area for the offshore lobster population. The area beyond the slope known as the Scotian Rise is a high energy environment dominated by a unique mix of deep ocean species and species that are adapted to such a dynamic environment. There are exceptionally high densities of bacteria, feather polychaete worms, bivalve shellfish and species that burrow into the mud (WWF 2009).

1.2.8 Ice Sheets

Deep ocean sediment core samples show that were at least 16 Glaciations during the Quaternary Period (2,588,000 years ago to the Present) with each lasting approximately 100,000 years each.

The extent of the glaciation offshore on the Scotia Shelf is uncertain as each glacier event erases the evidence of previous events as does time and environment. Although North America experienced Glaciation or Ice Ages as early as 800,000-900,000 years ago, only the Illinoian (began 200,000 years ago) and Wisconsin glaciations have been identified within terrestrial Nova Scotia. The landforms and deposits present on the landscape today are evidence of the last Wisconsin Glaciation which began approximately 75,000 years ago and the Wisconsin ice within Nova Scotia had disappeared between 12,000 to 10,000 years ago (Davis et al, Vol. 1, 1996:57-63).

In the last 75,000 years there were 4 distinct phases of glaciation over the province that ended approximately 10,000 years ago. This period of glaciation is known as the Wisconsin Period and in Phase 1 a large ice flow moved eastward across the region including Prince Edward Island and Cape Breton Island before shifting flow direction southeastward across the present day Bay of Fundy, Mainland Nova Scotia and Cape Breton Island (Davis et al, Vol. 1, 1996:57-63).

The Phase 2 ice center was located north of present day Prince Edward Island with flow direction south over mainland Nova Scotia and southeast over lower southeast portions of Cape Breton Island (Davis et al, Vol. 1, 1996:58).

The Phase 3 ice centre (Scotian Ice Divide) was parallel to the present day Nova Scotia Atlantic Coast and extended on land from Cape Sable, through Cape Canso to offshore and approximately south of present day Louisbourg, Cape Breton Island. From this ice divide, ice flows moved northeast across eastern portions of Cape Breton Island, northwest across western portions of Cape Breton Island, northeast across northern portions of the mainland from Cape George to Minas Basin west to northwest across the present day Annapolis Valley and Digby Neck. On the Atlantic side of the ice divide, all flow directions were in a southeast direction over the Scotia Shelf (Davis et al, Vol. 1, 1996:59).

Phase 4 was a period when several remnant ice sheets were located throughout the province and advanced and receded in a radial direction from the ice centers. Cape Breton had two glaciers where 1 was centered on the Highlands and another centered on the Bas d'Or Lakes. The Chignecto Glacier was centered near Baie Verte and Cape Tormentine. The Chedabucto Glacier filled the present day Chedabucto Bay and St. Georges Bay and had a westward ice flow direction across the central portion the province into the Northumberland Strait, Minas Basin and the Atlantic. The Chedabucto Glacier westward ice flow to the Atlantic extended from the ice center near the Strait of Canso to approximately St. Margarets Bay on the south shore and offshore along the eastern shore. There was the South Mountain Ice Cap centered near present day Kejimkujik National Park and had a westward radial ice sheet flow direction (Davis et al, Vol. 1, 1996:59).

The seaward extent of the Glacial Ice flow on the Scotia Shelf is inconclusive at this time. The first three phases would seem to have more impact on the landscape of the Scotia Shelf than the last phase as there were only remnants of ice sheets remaining during Phase 4 that were mostly confined to the inland highlands of the province (Davis et al, Vol. 1, 1996:59).

There exists a major moraine system ranging 40 km to 80km offshore paralleling the Nova Scotia coastline and referred to as the Scotia Shelf Moraine System. It was thought that the Scotia Shelf Moraine System represented the extent of the ice flows but flows from the Phase 4, Scotian Ice Divide may have been more extensive than earlier thought. Although the extent of the Glaciation on the Scotia Shelf is undetermined, the extent of the Glacial Tills extends beyond the Scotia Shelf Moraine System. Adjacent the Study Area, the known seaward limits of Glacial Tills are the top edges of Georges Bank and the northwestern portion of Browns Bank including the seaward side of Roseway Basin. The seaward limits of the Glacial Tills on the Scotia Shelf continue along the coastal side of the LaHave Bank and rounding the eastern side of the LaHave Bank to the Continental Shelf Break edge and following the edge eastward to the western edge of the Emerald Bank. The Glacial Till seaward limits continue along the western edge of the Emerald Bank and rounding the northwestern or coastal side of the Emerald Bank, Western Bank and the entire coastal side of the Sable Island Bank to the large Canyon known as the Gully. Following the Continental Shelf Break Edge to the Western Bank marks the extent of significant gravel occurrences on the Scotia Shelf adjacent the Study Area (Davis et al, Vol. 1, 1996:71).

1.3 Ecological Significance of the Area

The area adjacent to the project area is a region known for enhanced primary productivity (phytoplankton). Phytoplankton are the base of the marine food-web and the primary food source for the animal component of the plankton (zooplankton).The band stretching along the outer edge of the Scotian Shelf where shelf and slope waters meet and nutrients come to the surface is of particular importance for plankton productivity. These areas, where major currents and local circulation patterns interacts, create gyres or partial gyres that collect plankton and other organisms like jellyfish which attract predators like sea turtles, whales to the area (Coin Atlantic 2014) and provide food for most organisms that live in, or depend on, the ocean at some point in their development (NS Museum 1996). The area is dominated by migratory species such as whales (Bottlenose, Humpback, and Northern Right Whale), sharks (porbeagle and Greenland sharks), squid, sea turtles, and large pelagic fishes (tuna and swordfish). Seabirds use the area as a stopover for feeding and resting (NS Museum 1996). This highly productive area supports life for local marine species and migrating species of the Atlantic Ocean.

2.0 Mi'kmaq and Maliseet Aboriginal and Treaty Rights and Mi'kmaq Fisheries

The Mi'kmaq of Atlantic Canada have affirmed and recognized validity of Mi'kmaq treaties with constitutional protection (*R. v. Simon* 1985), the Aboriginal right to fish for food (*R. v. Denny, Paul and Sylliboy* 1990), the collective Aboriginal right to fish, priority of Aboriginal fish for food over commercial and recreational user needs, and meaningful participation in co-management (*R. v. Sparrow*, 1990), and the right to fish for a moderate livelihood (*R. v. Marshall* 1999). The Mi'kmaq participates in the commercial fisheries under the same legal framework as non-Aboriginal fishers. First Nation harvesters have been active in the commercial fishery since the mid1990's and have greater visibility since 2000 as the result of the *Marshall* Decision and subsequent *Marshall* Response Initiative.

2.1 Mi'kmaq Access to Food, Social and Ceremonial Fisheries

The Mi'kmaq participates in the fisheries under the constitutional umbrella of Aboriginal and Treaty rights for food, social and ceremonial purposes. Access to a diversity of fish and invertebrate species for food, social and ceremonial purposes[1] is through community negotiated agreements known as Aboriginal Fisheries Strategy (AFS) agreements, imposed licenses by the Government of Canada, or by community assertion of Aboriginal and Treaty rights for species in which conservation is not a concern. AFS agreements could contain the following (DFO 2014a):

- provisions with respect to amounts that may be fished for food, social and ceremonial purposes;
- terms and conditions that will be included in the communal fishing licence (e.g. species, amount that may be fished, area, gear, times, reporting requirements);
- arrangements for co-operative management by the Aboriginal group and DFO of fishing by the group for food, social and ceremonial purposes;

[1] Fisheries in which the intent is nourishment, or for traditional means, such as in ceremonies or social events. The Supreme Court found that where an Aboriginal group has a right to fish for food, social and ceremonial purposes, it takes priority, after conservation, over other uses of the resource.

- co-operative management projects for the improvement of the management of fisheries in general, such as stock assessment, fish enhancement and habitat management; and
- provisions related to communal licences under the Allocation Transfer Program (ATP) for obtaining access to commercial fisheries and/or other economic development opportunities.

AFS agreements provide communities or organizations such as the Native Council of Nova Scotia (NCNS), with funding to carry out objectives specified in the agreements. Imposed licenses for food, social and ceremonial fisheries do not have associated funding.

2.2 Mi'kmaq Access to Commercial Fisheries

The Mi'kmaq has access to the commercial fisheries since the 1994-1995 through community negotiated AFS agreements and more recently through the Marshall Response Initiative.

The ATP is an integral component of the AFS. This program facilitates the voluntary retirement of commercial licences and the issuance of licences to eligible Aboriginal groups in a manner that does not add to the existing fishing effort, thereby providing Aboriginal groups with much-needed employment and income. Since 1994-95, when the ATP was first launched, approximately 900 commercial licences have been issued to Aboriginal groups (DFO 2014a).

Through the *Marshall* Response Initiative (MRI), the government of Canada reached agreements with 32 of the 34 eligible First Nations. This initiative, which ended March 31, 2007, provided significant support for increased commercial fisheries access (including vessels and gear, and commercial fisheries infrastructure) and internal governance development, and has become a significant driver for economic development in those communities.

As a result of the MRI, the Mi'kmaq and Maliseet First Nations hold approximately 1,300 communal commercial fishing licences and constituting 520 fishing enterprises, are provided with a potential economic return that exceeds $45 million annually, have more than 1,000 community members earning income from fishing, and have had an estimated 2,000 First Nations community members receive training or mentoring that covers a broad range of practical fishing skills from boat safety to mechanics and ecotourism (DFO 2014b).

Commercial fisheries access, whether by ATP or MRI, is governed through license mechanism known as commercial communal licenses. In most cases, the owner of the license is the community. Incorporated bodies such as the Native Council of Nova Scotia[2] have been issued licenses. Each community (or incorporated body) designates a commercial fishing department who manages the daily activities of

[2] Native Council of Nova Scotia (NCNS) is the self-governing authority for the large community of non-status and status Mi'kmaq/Aboriginal peoples residing off-reserve in Nova Scotia throughout traditional Mi'kmaq territory. Their goal is to operate and administer a strong and effective Aboriginal Peoples Representative Organization that serves, advocates and represents the off-reserve community. Native Council of Nova Scotia did not receive access to commercial fishing from the Marshall Response Initiative. Through the Netukulimkewe'l Commission, the natural life management institution authority for NCNS, increases in access to commercial fishing licenses were granted through enhanced Allocation Transfer Program (ATP) over a three year period. NCNS has and Aboriginal Fisheries Arrangement under Department of Fisheries and Oceans' Aboriginal Fisheries Strategy.

fishing fleets. Revenues are reinvested in the community. Revenues from commercial access comprise a significant portion of community revenues and create the majority of shorter-term employment opportunities for the community in the fishing sector, and for administrative and field support.

2.3 Moderate Livelihood Fishery

The Mi'kmaq plans to participate in the fisheries under the constitutional umbrella of Aboriginal and Treaty rights for a moderate livelihood. At the time of writing this report, the Mi'kmaq have not implemented a moderate livelihood fishery in Nova Scotia.

3.0 Methods

The scope of this study will include the project area, local area assessment and regional assessment as defined in the Environmental Impact Statement.

3.1 Literature Review

Several sources were used to complete this report. Particularly,

- DFO Issued licenses for communal commercial, imposed food, social and ceremonial and community negotiated food, social and ceremonial agreements, from community-based interviews with commercial fishing managers;
- Mi'kmaq ecological knowledge
- Archival accounts of Mi'kmaq history and use
- Verification of fishing activities through interviews with fishers[3]

Special attention was given to literature that was specific to, and adjacent to, the area. Specifically, the State of the Scotian Shelf Report (2011), Natural History of Nova Scotia Volume I & II (Region 900 Offshore/Continental Shelf), An Ocean of Diversity The Seabeds of the Canadian Scotian Shelf and Bay of Fundy (WWF 2009), and the Canada – Nova Scotia Offshore Petroleum Board.

3.2 Interviews

Prior to the commencement of the project, communities were solicited for their participation. Once the community agreed to participate (either agreement by fishery departments within each community or via meetings/presentations to Chief and Councils), interviews with community fishery departments were arranged. In most communities, the same individual coordinates both the commercial communal and the traditional fisheries. From these initial interviews, a list of commercial communal licenses and information regarding the traditional fishery were obtained, with fishing areas specified, and other related fishing information. Potential contacts for further interviews were obtained from the community to verify and narrow areas of Mi'kmaq fishing activities within defined fishing areas. This referral-type methodology improves quality of, and confidence in, information provided in the study.

Commercial communal fishing licenses acquired by participating communities were provided by the community and NCNS. A list of species traditionally fished, as part of the AFS agreement, community

[3] Fishers refer to those individuals who are communal commercial and/or traditional fishers.

harvest guidelines, or imposed licenses, were provided. Fishers were selected based on the recommendation of the community fishery manager. Recommendations were based on the diversity of species fished and experience in the assessment area.

Fishers were provided with a map highlighting project specific information, as well as details providing the informants location references, such as lobster fishing areas, NAFO (Northwest Atlantic Fisheries Organization) fishing zones and bathymetry data. The fishers were then asked a series of questions related to their fishing activities as well as any other information they may have pertaining to fish in the area (i.e., spawning or nursery areas, migratory routes, etc.). Finally, the fishers were provided an opportunity to relate any special concerns or comments they may have in relation to either the Project/Project Site or fish species in the area. Interviews for this project took place through November 2013 until April 2014.

3.3 Limitations

Gathering of information regarding commercial and traditional fishing, including Traditional Ecological Knowledge is highly dependent on the information that is provided to the team. Because not all traditional activity users are interviewed, there is always the possibility that some traditional use activities and areas may not have been identified by this study. Furthermore, only a sample of communities was interviewed. The communities of Millbrook, Shubenacadie, and Acadia were targeted for the project because of their proximity to the project site. Additional Mi'kmaq communities in Nova Scotia, including Eskasoni, Glooscap, and Bear River were later included within the scope of this study at the request of the Canadian Environmental Assessment Agency (CEAA) and/or Shell because of known existing fishing activity by these communities within or near the project area. The 6 Mi'kmaq communities of Nova Scotia that are included represent 59.9% (60.9% with Bear River) of the on-reserve Mi'kmaq population in Nova Scotia. It should be noted that because of the timeframe in which Bear River was included within the scope of this study, information from this community was not obtained, nor included, within this version of the report and will be amended to the report at a later date.

Three additional communities within New Brunswick were also later asked to participate at the request of CEAA. These three communities include the Maliseet communities of Woodstock First Nation and St. Mary's First Nation as well as the Mi'kmaq community of Fort Folly First Nation. Woodstock is the only community which is included within this report at this time. St. Mary's and Fort Folly are not included because of the shortened timeframe in which the project team had to meet and collect information from these communities. Fort Folly has explicitly expressed that they want to be included within this study as soon as possible and efforts are currently being made to do so. St. Mary's had indicated that because of the location of the project site relative to their fishing activities, they are not interested in participating within the study at this timeframe

The views and concerns expressed in this report do not represent those of the entire Mi'kmaq or Maliseet nations. Be aware that participation by MGS and UINR in the project and the assessment of the area should not be construed as ***CONSULTATION*** or ***APPROVAL*** of the proposed project. Any new areas being proposed by the Crown(s) to have expanded legal protection would require separate consultation under the Mi'kmaq-Nova Scotia-Canada Consultation process.

Information obtained from DFO issued licenses for food, social and ceremonial purposes, through negotiated agreements such as Aboriginal Fishery Strategy (AFS agreements), community harvest agreements, or imposed licenses for FSC, should not be considered an exhaustive list of species fished and may not define fishing activities for all aquatic species harvested for food, social and ceremonial needs.

4.0 Results

4.1 Mi'kmaq Worldview and Spiritual, Cultural and Social Uses (Past and Present) of the Assessment Area

4.1.1 Mi'kmaq Worldview

The Mi'kmaq are part of the Algonquin-speaking confederacy known as Wabanaki which includes four other Nations - Maliseet, Passamaquoddy, Penobscot and Abenaki. Mi'kma'ki, or land of the Mi'kmaq, encompasses the five Atlantic Provinces and northern Maine.

Mi'kma'ki was held in communal ownership. Land, water, and its resources are considered gifts from the Creator. Mi'kmaq are the caretakers and strived to live in harmony within Mi'kma'ki. This belief remains strong in the culture today.

The Mi'kmaq view the world and all that was in it as having spirit. All life is equal and treated with respect. By developing an intimate understanding of the relationships between the living and non-living, each plant, animal, constellation, full moon or red sky told a story to guide the Mi'kmaq so they could survive. These beliefs affect the manner in which the natural world is treated for sustenance and survival. Animals and plants are not taken if they are not needed. All spirits are acknowledged and respected as relations and are offered tobacco, prayer or ceremony (or combination of) when taken. No part of an animal is wasted. All parts that could not be used are returned to the Creator in ceremony.

All life serves purpose and cannot exist in isolation. The Mi'kmaq worldview is interconnected, interdependent and must exist in its entirety. Animals and plants are viewed within the realm of their habitat. The preservation of biodiversity and habitats maintains balance and harmony on Mother Earth.

4.1.2 Uses and History of Assessment Area

Sea Level Changes

As the last of the Wisconsin ice receded and the weight of the ice on the landscape diminished the elevation of the land increased as the landscape slowly rebounded. The last of the large regionally centered ice sheets was centered in the Gulf of St. Lawrence and this would have been the ice sheet's thickest and heaviest portion and gradually thinning toward the margins on the Scotia Shelf. The amount of rebound in the landscape is directly related to the thickness and weight of the previous ice cover. The Gulf of St. Lawrence has the most rebound as the ice center and the least rebound is along the ice margins such as along the Scotia Shelf (Davis et al, Vol. 1, 1996:60).

As the land rebounded the sea level rose as water was released from the melting ice sheets. When the isostatic rebound of the landscape occurred and outpaced the rising sea levels, the terrestrial surface of the landforms in the region increased such as the coastlines of Nova Scotia, Cape Breton Island, Prince Edward Island of today were at one time one large single terrestrial landform. Based on evidence of plants and animals found on the bottom of the Gulf of Maine, an unglaciated landform of a strip or series of islands connected the New England coastline of today with Nova Scotia that eventually flooded some 15,000 years ago. Since the Landscape rebound was uneven across the region some areas maintained the basic coastline of today when the rate of landscape rebound and sea level rise were matched and some areas such as most of the Atlantic Coastline were flooded as sea level rise superseded the minimal isostatic rebound (Davis et al, Vol. 1, 1996:60-61).

During the Quaternary period (2,880,000 years ago to Present) the relative sea level cycled through 120m of changing sea levels. Another figure proposed is 80-90m range of sea level changes. In a period of 120,000-100,000 years ago the sea level was 4-6m above today's level and left elevated wave cut and coastal features. Approximately 15,000 years ago the last ice sheets were receding on the Scotia Shelf and the sea level was estimated to be -80m of the sea level today. Sea level rose to -40m of today's sea level approximately 10,000 years ago and rose at a rate of 1.1m/Century prior to 7,000 years ago. Other theories suggest that relative sea level rise occurred in 3 stages with a very rapid rise in sea level between 12,000 and 11,000 years ago then slowed between 11,000 and 8,000 years ago and again a rapid rise between 8,000 and 5,000 years ago. Approximately 2,500 years ago is a marker for relative sea level rise rates as prior to 2,000 years ago the sea level rise was as high as 1m per Century and after 2,500 years ago the relative sea level rise rate slowed to 20cm per Century. However relative sea level rise near the Continental Shelf Break has not changed in 4,500 years. Rates of relative sea level rise along Nova Scotia coastlines range between 25 and 30cm per Century as determined in the mid 1990's (Davis et al, Vol. 1, 1996:60-61).

Early Peoples

Based on material evidence first found in New Mexico and more recently in Oregon, (Stastna 2012) the earliest time known when people occupied North America is approximately 13,500 years ago. (Mann 2013) During that time, the ice sheet covering the entire province of Nova Scotia had receded to the approximate coastline of today along the Eastern Shore and approximately 20km offshore along the South Shore (Stea 1992). During this time the earlier proposed land bridge or island chain between the present New England Coast and Nova Scotia had already been flooded some 1,500 years earlier by rising sea levels (Davis et al, Vol. 1, 1996:60-61). The relative sea level on the outer Scotia Shelf at that time was approximately -80m lower than today's sea level (Davis et al, Vol. 1, 1996:60-61). To put in perspective and ignoring the erosion loss and movement of sediment materials during submergence, at a -80m sea level, a portion of the Western Bank today would be exposed as an island of approximately 70m elevation. A large portion of the Sable Island Bank today would be exposed as an island of roughly 50m in elevation with a an additional 76m elevation for Sable Island (Stantec, Depth Data, 2014).

The Natural History of Nova Scotia lists 5 Archaeological time periods for the Province of Nova Scotia that are prior to and including European contact with the Mi'kmaq:

11,000-10,000 Years BP, Paleo-Indians

The earliest evidence of early peoples east of the State of Maine is found at Debert, Nova Scotia with evidence of an encampment on the site dated to be in use roughly 11,000 to 10,500 years BP (Canadian 2014). At that time, local ice sheets remained centered at locations of Bras d'Or Lakes/Highlands of Cape Breton, Canso, Baie Verte and South Mountain adjacent the Annapolis Valley. There was a large ice sheet centered on the Eastern Mainland of province with ice flows into St. Georges Bay, Minas Basin and along the Eastern Shore (Stea 1992). The time of the Debert Site occupation is within the same period of the glacial re-advances of the Younger Dryas Period of 11,000 and 10,000 years BP. Increasingly harsh conditions are thought to have caused the early peoples to abandon the region (Davis et al, Vol. 1, 310-311, 1996).

An inventory and study of archaeological site occurrences on the Atlantic Outer Continental Shelf off the U. S. A. east coast including Georges Bank and Gulf of Maine set the archaeological sensitivity based on the Last Glacier Maximum (LGM) (TRC 2012).

No Sensitivity: Areas that would have been submerged at LGM and have no potential for terrestrial sites and set at -60m and deeper for the Gulf of Maine Study Area (TRC 2012).

Low Sensitivity: Areas that were subaerial between LGM and Paleoindian Period (12,500-10,000 BP for this study) (TRC 2012).

High Sensitivity: Areas that were subaerial beginning with the Paleoindian Period (12,500-10,000 BP for this study) to the present and set at -60m and shallower (TRC 2012).

The settlement models referenced in the study support Paleoindian Period peoples utilizing the subaerial exposed areas on the outer continental shelf depending on connections with the mainland coastline being available, or possessing ability to navigate on open water (TRC 2012).

10,000-5,000 Years BP, The Great Hiatus

The rising sea levels and submerging coastlines are thought to be responsible for the lack of physical evidence of early peoples for this time period. Any evidence of coastal settlements of that period would be lost to coastal erosion and submergence (Davis et al, Vol. 1, 310-311, 1996).

5,000-3,500 Years BP, The Archaic Period

A period characterised by physical evidence of stone tools some of which are found offshore and possibly lost during deep water fishing. There was an influence or peoples present in the southern part of the province dated at a time between 3,500 and 2,500 BP known as the Susquehanna Tradition. The Susquehanna Tradition originated in area of the mid-Atlantic states of today and is identified by some unique artifacts (Davis et al, Vol. 1, 310-311, 1996).

2,500-500 Years BP, The Ceramic Period

Evidence of pottery is introduced to the archaeological record during this period as are burial mounds. Ceramic period sites are scattered throughout the province and a 10m diameter burial mound was discovered at Whites Lake, HRM dated at 2,300 BP (Davis et al, Vol. 1, 310-311, 1996).

500-100 Years BP, The Contact Period

The first European contact with the Mi'kmaq was most likely with Portuguese fishermen roughly 500 years ago (Davis et al, Vol. 1, 310-311, 1996).

The Contact Period is followed by the Acadian Period of 1605-1755 and the overlapping British Period of 1749-1867, followed by the Twentieth Century period with each period having significant impact on Mi'kmaq history (Davis et al, Vol. 1, 310-311, 1996).

As the sea level continues to rise, earlier coastlines are were eroded, drown and materials were carried away building beaches and spits which in turn were eventually flooded and eroded in a process that continues today. One source author often cited in discussion of the archaeological history of the Maritime Region proposes that as early as the Paleo-Indian Period, early peoples would have exploited the coastal and marine food resources available at any given time throughout the last 11,000 years, much as the Mi'kmaq did at the time of European contact and continuing through to present day (Murphy, After Tuck, 1998) (Tuck 1984).

4.2 Past and Present Fishing Activity in the Assessment Area

4.2.1 Food/social/ceremonial fishing activity by species

Mi'kmaq had an intimate knowledge of the ecology of their territory and fit their lives to seasonal cycles of the vegetation, animals and fish. Highly mobile Bands consisting of several related families would assemble at favorite camp sites. In the fall and winter small groups of 10-15 people would disperse for winter hunting (Prins 1996).

The traditional seasonal diet of the Mi'kmaq consisted mainly of seafood gathered from the waters near warm season coastal camps until the Mi'kmaq moved inland to hunt and fish during the cold months of the year (Table 3).

In the past, the Mi'kmaq harvested from the coast in all seasons, targeting a variety of fish, invertebrates and mammals from the sea (Table 3).

There are currently no FSC harvest activities in Project Area. FSC identified for lobster is concentrated around the coast, from the Bay of Fundy around the southern tip of Nova Scotia to Sheet Harbour. (Appendix A). Typical fishing for lobster occurs between June and Dec. 3.

Table 3. Traditional seasonal food sources, camp locations, and camp size. Taken from Mi'kmaq Annual Sustenance, Cape Breton Magazine 1972.

Month	Seasonal Locations	Seasonal Groupings	Food Resource
Jan.	Sea Coast	Bands	Smelt, Tomcod, Seals & Walrus Beaver, Moose, Bear, Caribou
Feb. (Period of Winter Famine Begins)	Inland	Bands & Family Units	Smelt, Tomcod (ending) Seals & Walrus, Beaver, Moose, Bear, Caribou
Mar. (Period of Winter Famine)	Inland	Bands & Family Units	Smelt, Seals & Walrus (ending) Scallops, Crab, Urchins, Winter Flounder, Beaver, Moose, Bear, Caribou
April (Period of Winter Famine ends)	Sea Coast	Villages	Smelt, Winter Flounder, Scallops, Crab, Urchins, Sturgeon, Brook Trout, Alewife, Herring, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
May	Sea Coast	Villages	Smelt, Scallops, Crab, Urchins, Sturgeon, Salmon, Brook Trout Alewife, Codfish, Capelin, Shad, Mackerel, Skates, Herring, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
Jun.	Sea Coast	Villages	Scallops, Crab, Urchins, Sturgeon, Salmon, Brook Trout Alewife, Codfish, Capelin, Shad, Mackerel, Skates Lobsters, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
Jul.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Capelin, Shad, Mackerel, Skates Lobsters, Spring Bird Migrations, Beaver, Moose, Bear, Caribou, Strawberries, Raspberries
Aug.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Skates Lobsters, Beaver, Moose, Bear, Caribou, Strawberries, Raspberries, Blueberries, Ground Nuts
Sept.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Skates, Salmon, Herring, Eels, Fall Bird Migrations, Beaver, Moose, Bear, Raspberries, Blueberries, Ground Nuts, Cranberries
Oct.	Small Rivers	Villages	Scallops, Crab, Urchins, Smelt Codfish, Skates, Salmon, Herring, Eels, Brook Trout, Fall Bird Migrations, Beaver, Moose, Bear, Blueberries, Ground Nuts, Cranberries
Nov.	Inland	Bands	Smelt, Tomcod, Turtles, Seals, Beaver, Moose, Bear, Ground Nuts, Cranberries
Dec.	Rivers	Bands	Smelt, Tomcod, Turtles, Seals, Beaver, Moose, Bear, Ground Nuts,

4.3 Summary of Mi'kmaq Communal Commercial Fisheries

4.3.1 Mi'kmaq of Nova Scotia

Presently, five of the total thirteen Mi'kmaq communities within Nova Scotia, included in this study have commercial access to 29 species (Table 4) in the RAA. For the purpose of this report, information regarding the commercial fishery is considered current (2003 to present).

Table 4. Commercial communal fisheries access (includes seal) for the Mi'kmaq and timing of fishing activity (directed and as by-catch, and as exploratory or experimental) occurring within the project boundaries of project area (PA), local assessment area (LAA) and regional assessment area (RAA). Symbols refer to those species as listed under COSEWIC (•) and SARA (▪).

Species	Fishing Activity	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
•▪Atlantic cod	Mar to Dec	Yes	Yes	Yes
•▪American Eel	Year Round	No	No	No
•▪Bluefin Tuna	Aug to Nov	Yes	Yes	Yes
Atlantic Herring	Jul to Sept	No	Yes	Yes
Atlantic Mackerel	May to Aug	No	No	No
Clams	Apr to Dec	No	No	No
•Cusk (By-catch)	Mar to Dec	No	Yes	Yes
Flounder	Mar to Dec	No	Yes	Yes
Gaspereau (Alewife or Blueback herring)	May to Jun	No	No	No
Haddock	Mar to Dec	Yes	Yes	Yes
Hagfish	Year Round	No	Yes	Yes
Halibut (By-catch)	Jan to Dec	Yes	Yes	Yes
Harp Seal	INACTIVE	No	No	No
Jonah Crab	Jun to Oct	No	Yes	Yes
Lobster	Year round	No	Yes	Yes
Marine Worms	Apr to Dec	No	No	No
Monkfish (By-catch)	Mar to Dec	No	No	No
Northern Shrimp	Feb to Jun; Sept to Dec; Apr to Jan	No	No	Yes
Pollock	Mar to Dec	No	Yes	Yes
Quahaug	Year Round	No	No	No
Redfish	Mar to Dec	No	Yes	Yes
Rock Crab	INACTIVE	No	No	No
Scallop	Year Round	No	No	Yes
Sea Urchin	Nov to Jan	No	No	No
Silver hake (By-catch)	Mar to Dec	No	Yes	Yes
Snow Crab	Nov to Mar	No	Yes	Yes
Swordfish	Sept to Nov	Yes	Yes	Yes
Whelk	Aug to Apr	No	No	No
White hake (By-catch)	Mar to Dec	No	Yes	Yes

Ten (10) Mi'kmaq communities were identified by DFO as having commercial licenses pertaining to the Shelburne Basin Project Area as a sub-area within the larger fishing districts for the following species:

- Fishes (demersal and pelagic): Groundfish, tuna, herring, mackerel, hagfish, swordfish
- Invertebrates: Squid, shrimp, rock crab, snow crab, sea urchin, and lobster

4.3.2 Native Council of Nova Scotia

The Native Council of Nova Scotia has commercial communal access to 5 species in the project area, 6 species in the LAA, and 17 species in the RAA (Table 5). A fishery for large pelagic species (tunas and swordfish) occurs in the project area, and a fishery for smaller pelagic species (Atlantic herring) occurs in the LAA. A larger collection of species are commercially fished within the RAA. These include ground fish (cod, haddock, and pollock), by-catch species (cusk, halibut, and monkfish), invertebrates (lobster, jonah crab, marine worms, and snow crab), and anadromous fish species (gaspereau) (Table 5).

Table 5. Commercial communal fisheries access (directed and as by-catch, and as exploratory or experimental) for the Native Council of Nova Scotia occurring within the project boundaries of project area (PA), local assessment area (LAA) and regional assessment area (RAA). Symbols refer to those species as listed under COSEWIC (•) and SARA (▪).

Species	Fishing Activity	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
Albacore Tuna	Jun to Nov	Yes	Yes	Yes
•▪Atlantic cod	Jan 1 to Oct 30	No	No	Yes
Atlantic Herring	Year Round	No	Yes	Yes
•▪Bluefin Tuna	Jun to Nov	Yes	Yes	Yes
Bigeye Tuna	Jun to Nov	Yes	Yes	Yes
•Cusk (By-catch)	Jan 1 to Oct 30	No	No	Yes
Gaspereau	N/A	No	No	Yes
Haddock	Jan 1 to Oct 30	No	No	Yes
Halibut (By-catch)	Jan 1 to Oct 30	No	No	Yes
Jonah Crab	N/A	No	No	Yes
Lobster	N/A	No	No	Yes
Marine Worms	N/A	No	No	Yes
Monkfish (By-catch)	Jan 1 to Oct 30	No	No	Yes
Pollock	Jan 1 to Oct 30	No	No	Yes
Silver Hake	Jan 1 to Oct 30	No	No	Yes
Snow Crab	Apr to Mar	No	No	Yes
Swordfish	Jun 1 to Oct 30	Yes	Yes	Yes
Yellowfin Tuna	Jun to Nov	Yes	Yes	Yes

4.3.3 Mi'kmaq and Maliseet of New Brunswick

At the request of CEAA and Shell Canada, three New Brunswick communities were proposed to be included in the study. However, due to project time constraints, only one community was included at the time of this report.

Table 6. Species fished by the one New Brunswick Maliseet Community (directed and as by-catch, and as exploratory or experimental) occurring within the project boundaries of project area (PA), local assessment area (LAA) and regional assessment area (RAA). Symbols refer to those species as listed under COSEWIC (•) and SARA (▪).

Species	Fishing Activity	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
•▪Bluefin Tuna	Jun to Sept	Yes	Yes	Yes
Big Eye Tuna	Jun to Sept	Yes	Yes	Yes

Swordfish	Jun to Sept	Yes	Yes	Yes
Scallop	Jan	No	No	No
Lobster		No	No	No
Sea Urchin	May to June	No	No	No
Yellow fin Tuna	Mar to Dec	Yes	Yes	Yes
Halibut	Jan to Dec	No	No	No

4.4 Summary of Mi'kmaq Food, Social and Ceremonial Fisheries

4.4.1 Mi'kmaq of Nova Scotia

Thirty-seven (37) fish species (Table 7), one (1) mammal (seal) and nine (9) invertebrate groups (Table 8) were identified as species harvested for food, social and ceremonial purposes. Where possible, the Mi'kmaq name is also provided. Marine macrophytes are not included. **The following list should not be considered an exhaustive summary. Due to time constraints with the project, some species may not have been identified.** Species fished in other management areas such as the Gulf region or other fishery zones that did not fall within the RAA were not included.

Table 7. Fish species and season of harvest by the Mi'kmaq of Nova Scotia. Symbols refer to those species as listed assessed by COSEWIC (•) and under consideration for listing by SARA (▪). At the time of this report, information from Bear River, Glooscap and Shubenacadie were not included in this list.

Species	Season	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
•▪ American Eel (Katew)	Year round	No	No	No
•▪ Striped Bass (*Ji'ka'w)*	Year round	No	No	No
•▪ Atlantic Cod (Peju)	Year round	No	No	No
•American Plaice (Anakwe'j)	Year round	No	No	No
•▪Atlantic salmon (Plamu)	Year round	No	No	No
Atlantic Herring (Alanj)	Year round	No	No	No
Atlantic Mackerel (Amlamekw)	Year round	No	No	No
•Blue Shark	Year round	No	No	No
Brook Trout (Atoqwa'su)	Year round	No	No	No
Brown Trout (Atoqwa'su)	Year round	No	No	No
Bull Brownhead (catfish)	Oct to May	No	No	No
Capelin *(Akukmekw)*	Year round	No	No	No
Chain Pickerel	Oct to May	No	No	No
Gaspereau (Alewife) (Kaspalaw)	May to June	No	No	No
Haddock (Putomaqanej)	Year round	No	No	No
Halibut (Anakwe'j)	Year round	No	No	No
Lake Trout (Atoqwa'su)	Year round	No	No	No
Lake Whitefish	Oct to May	No	No	No
Landlocked Salmon	Year round	No	No	No
Periwinkle (Jik'jij)	Year round	No	No	No
Pollock (Pestm)	Year round	No	No	No
Rainbow Smelt *(Kaqpesaw)*	Year round	No	No	No
Rainbow Trout (Atoqwa'su)	Year round	No	No	No

Redfish	Year round	No	No	No
Shad *(Msamu)*	Year round	No	No	No
Silver Hake (Ne'kapitalow)	Year round	No	No	No
Small Mouth Bass	Year round	No	No	No
Smooth Flounder (Anakwe'j)	Year round	No	No	No
Squid	Year round	No	No	No
Tomcod	Year round	No	No	No
White Perch	Oct to May	No	No	No
White Sucker	Oct to May	No	No	No
Windowpane Flounder (Anakwe'j)	Year round	No	No	No
Winter Flounder (Anakwe'j)	Year round	No	No	No
Witch Founder (Anakwe'j)	Year round	No	No	No
Yellow Perch	Oct to May	No	No	No
Yellowtail Flounder (Anakwe'j)	Year round	No	No	No

Table 8. Invertebrate and mammalian species and season of harvest by the Mi'kmaq of Nova Scotia

Species	Season	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
American Lobster (Jakej)	June to Dec. 3	No	Yes	Yes
American Oysters (Mn'tmu'k)	Year round	No	No	No
Bay Quahaug (Pukanamowe's)	Year round	No	No	No
Blue Mussels (N'kata'laq)	Year round	No	No	No
Clams: Bar, surf, softshell clam (E's)	Year round	No	No	No
Crabs (except Snow Crab)	Year round	No	No	No
Periwinkle	Year round	No	No	No
Scallops (Saqskale's)	Year round	No	No	Yes
Squid	Year round	No	No	No
Seal	Year round	No	No	No

4.4.2 Native Council of Nova Scotia

Thirty-three (33) fish species (Table 9) and twelve (12) invertebrate species (Table 10) were identified as species harvested for food, social and ceremonial purposes. Where possible, the Mi'kmaq name is also provided. Marine macrophytes are not included. **The following list should not be considered an exhaustive summary and may include other species in the aquatic environments.**

Species information in tables 9 & 10 were summarized through documentation provided during the study.

Table 9. Fish species and season of harvest by the Native Council of Nova Scotia. Symbols refer to those species as listed assessed by COSEWIC (•) and under consideration by SARA (▪).

Species	Season	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
• ▪**American Eel (Katew)**	Year round	No	No	No
•**American Plaice (Anakwe'j)**	Year round	No	No	No

•▪ Atlantic Cod (Peju)	Year round	No	No	Yes
Atlantic Herring (Alanj)	Year round	No	Yes	Yes
Atlantic Halibut (Putomaqanej)	Year round	No	No	Yes
Atlantic Mackerel (Amlamekw)	Year round	No	No	No
•▪Atlantic salmon (Plamu)	Jan.1 to Nov. 15	No	No	Yes
•Cusk	Year round	No	No	No
Brook Trout (Atoqwa'su)	Year round	No	No	No
Brown Trout (Atoqwa'su)	Year round	No	No	No
Capelin *(Akukmekw)*	Year round	No	No	No
Chain Pickerel (Wisnak)	Year round	No	No	No
Gaspereau (Alewife) (Kaspalaw)	Year round	No	No	Yes
Greenland Halibut (Putomaqanej)	Year round	No	No	No
Haddock (Putomaqanej)	Year round	No	No	Yes
Lake Whitefish	Year round	No	No	No
Landlocked Salmon	Jan. 1 to Oct. 31	No	No	No
Monkfish	Year round	No	No	Yes
Pollock (Pestm)	Year round	No	No	Yes
Rainbow Smelt *(Kaqpesaw)*	Year round	No	No	No
Rainbow Trout (Atoqwa'su)	Year round	No	No	No
Red Hake (Ne'kapitalow)	Year round	No	No	Yes
Redfish	Year round	No	No	No
Shad *(Msamu)*	Year round	No	No	No
Silver Hake (Ne'kapitalow)	Year round	No	No	Yes
Small Mouth Bass (Maqtewe'kji'ka'w)	Jan. 1 to Oct. 31	No	No	No
• ▪Striped Bass (*Ji'ka'w)*	Year round	No	No	No
Summer Flounder (Anakwe'j)	Year round	No	No	No
White Hake (Ne'kapitalow)	Year round	No	No	Yes
White Perch	Year round	No	No	No
Witch Founder (Anakwe'j)	Year round	No	No	No
Yellow Perch	Year round	No	No	No
Yellowtail Flounder (Anakwe'j)	Year round	No	No	No

Table 10. Invertebrate species and season of harvest by the Native Council of Nova Scotia.

Species	Season	Occurrence in PA	Occurrence in LAA	Occurrence in RAA
Clams: Bar, softshell clam (E's)	Year round	No	No	No
American Lobster (Jakej)	June to Dec. 3	No	No	Yes
Blue Mussels (Nkata'laq)	Year round	No	No	No
American Oysters (Mn'tmu'k)	Year round	No	No	No
Northern Quahaug (Pukanamowe's)	Year round	No	No	No
Scallops (Saqskale's)	Year round	No	No	No
Rock Crab (Mnjinikej)	Year round	No	No	No
Jonah Crab (Mnjinikej)	Year round	No	No	Yes
Green Crab	Year round	No	No	No

Shrimp	Year round	No	No	No
Squid (Sete'su)	Year round	No	No	No
Marine Worms	Year round	No	No	Yes

4.4.3 Mi'kmaq and Maliseet of New Brunswick

One species (lobster) was identified as a species harvested as food, social or ceremonial needs. This fishing area does not coincide with the proposed project area; occurring in the Bay of Fundy.

4.5 Summary of Interviews Completed

Between November 2013 and April 2014, interviews were completed with thirty one (31) Nova Scotia Mi'kmaq, New Brunswick Mi'kmaq and Maliseet, and NCNS fishermen who agreed to provide information for the project.

This summary of the data gathered and analyzed will be classified into the environmental effects assessment areas: Project Area, Local Assessment Area, and Regional Assessment Area.

Project Area

Among the Mi'kmaq of Nova Scotia fishermen, swordfish, tuna, and halibut were found to be fished the most in the Project Area at two (2) fishing areas each. Other species caught in this area include cod, haddock, and shark.

The communities of New Brunswick provided information that identified only one (1) area where tuna, swordfish, and shark were caught.

Fishing areas described by NCNS fishermen were predominantly various tuna fishing species (Bluefin, Yellowtail, Albacore, and Bigeye) with seven (7) areas identified. Two (2) other areas were reportedly swordfish fishing areas.

There was no FSC fishing information for the Project Area gathered during the interviews; all fishing areas identified by the Mi'kmaq of Nova Scotia, NCNS, and the communities of New Brunswick, were utilized for commercial fisheries.

Local Area Assessment

Inside the Local Assessment Area, Mi'kmaq of Nova Scotia fishermen reported to have nine (9) cod and haddock fishing areas, eight (8) halibut fishing areas, and five (5) tuna fishing areas. Other species identified by informants were:

- Lobster (4 areas)
- Swordfish (4 areas)
- Pollock (4 areas)
- Cusk (3 areas)
- Snow Crab (3 areas)
- Hake (2 areas)
- Shark (2 areas)

- Flounder (1 area)
- Hagfish (1 area)
- Herring (1 area)
- Jonah Crab (1 area)
- Redfish (1 area)

The communities New Brunswick reported to fish silver hake in three (3) areas, swordfish in two (2) areas, shark in two (2) areas, and tuna in two (2) areas. Other species fished in the LAA are:

- Cod (1 area)
- Haddock (1 area)
- Pollock (1 area)
- Redfish (1 area)

Fishermen representing the NCNS reported the majority of fishing activity in the LAA was fishing various species of tuna (Bluefin, Yellowtail, Albacore, and Bigeye) in seven (7) areas. In addition to tuna, swordfish was also reportedly fished in two (2) areas, and herring in one (1) area.

All fishing areas described in the Local Assessment Area were utilized for commercial fisheries.

Regional Assessment Area

Based on the information gathered from the information gathered from informants, the vast majority of fishing activities undertaken by Mi'kmaq fishermen of Nova Scotia were for commercial purposes. Species identified by fishermen were:

- Haddock (19 areas)
- Cod (18 areas)
- Halibut (16 areas)
- Lobster (15 areas)
- Tuna (15 areas)
- Snow Crab (14 areas)
- Flounder (10 areas)
- Pollock (10 areas)
- Swordfish (7 areas)
- Hake (7 areas)
- Cusk (5 areas)
- Scallop (4 areas)
- Jonah Crab (3 areas)
- Shark (3 areas)
- Herring (2 areas)
- Redfish (2 areas)
- Shrimp (2 areas)
- Hagfish (1 area)

FSC fishing activities identified by Mi'kmaq fishermen in Nova Scotia consisted of two (2) lobster fishing areas within the RAA.

Within the RAA, Mi'kmaq and Maliseet fishermen from New Brunswick only reportedly utilized the area for commercial fisheries. Fish species fished in the area are silver hake in three (3) areas, swordfish in two (2) areas, shark in two (2) areas, scallops in two (2) areas, and tuna in two (2) areas. Other species fished in the RAA are:

- Cod (1 area)
- Haddock (1 area)
- Pollock (1 area)
- Redfish (1 area)

Fishermen representing the Native Council of Nova Scotia reported the majority of fishing activity in the RAA was fishing various species of tuna (Bluefin, Yellowtail, Albacore, and Bigeye) in ten (10) areas. The following species were also reported to be caught in the RAA:

- Swordfish (3 areas)
- Gaspereau (2 areas)
- Halibut (2 areas)
- Herring (2 areas)
- Lobster (2 areas)
- Snow Crab (2 areas)
- Cod (1 area)
- Cusk (1 area)
- Haddock (1 area)
- Hake (1 area)
- Jonah Crab (1 area)
- Marine Worm (1 area)
- Monkfish (1 area)
- Pollock (1 area)

4.5.1 Significance of Area

Through the analysis of the information gathered for the Study Area, informants were asked to identify other activities or other important information about the area, including spawning areas, nursery areas, etc.

- Migration routes of tuna, swordfish, and haddock along the Scotian Shelf
- Tuna migration route along the coast of Nova Scotia through to Georges Basin
- Cod spawning areas in LaHave Bank, Baccaro Bank, Roseway Bank, Browns Bank, Georges Basin, and Georges Bank
- Sightings of whales, porpoises, and swordfish from the southern coast of Nova Scotia through Roseway Basin, Baccaro Bank, Browns Bank, and Georges Bank

- Spawning areas for groundfish spanning from Bay of Fundy, to Browns Bank

4.6 Documented Concerns and/or Recommendations for Further Study

- Concern on effect of all species especially since the area is rich in biodiversity
- Concern for area as it is important to species at risk such as the leatherback turtle
- Concern with ecological impacts especially if there is a spill (effects to food web).
- All food fisheries in all of Nova Scotia are an inherent treaty right to the Mi'kmaq

5.0 Conclusions and Information Gaps

There are no areas currently identified within the Project Area for FSC harvest, however, this does not imply the area is not utilized for FSC fisheries, of significance, or that it may not be accessed for future FSC needs. The importance of this area is in the means by which it connects other ecosystems, such as the Bay of Fundy, the Scotian Shelf, the Gulf of St. Lawrence, and the Bras d'Or Lakes, for example, for which culturally significant species such as salmon, eels, mackerel, and striped bass migrate through.

Within the Regional Assessment Area, lobster, scallops, cod, herring, halibut, salmon, gaspereau, haddock, monkfish, pollock, and hake were identified as being fished for food, social, and ceremonial purposes.

Commercial fishery harvesting by Mi'kmaq and Maliseet occurs within the boundaries of the Shelburne Basin Regional Assessment Area for 24 species: albacore tuna, bigeye tuna, Bluefin tuna, cod, cusk, flounder, gaspereau, haddock, hagfish, hake, halibut, herring, Jonah crab, lobster, marine worm, monkfish, Pollock, redfish, scallop, shark, shrimp, snow crab, swordfish, and yellowfin tuna.

The Inner Shelf is an important fishing area for groundfish (cod, and redfish) (Appendix B), herring (Appendix C), snow crab, shrimp, lobster and rock crab (Appendix D). The shelf area is important fishing grounds for groundfish, in particular cod and redfish and hagfish (Appendix B). The slope/channel is an important fishing area for redfish, cod, flounder and groundfish in general, and also for hagfish (Appendix B), and shrimp (Appendix D).

Landings, value and employment generated information specific to fishing activities within Shelburne Basin Project Area is unavailable at the community level. Revenue generated from commercial fishing activities is an important contribution to the overall economy of Mi'kmaq communities. Any limitations to current fishing practices and/or locations of fishing will have a direct impact to employment and revenues generated by Mi'kmaq communities.

The information gathered and processed is highly dependent on the data provided by the informants during the interview process. This study should not be taken as an absolute measure of Mi'kmaq ecological knowledge and use of the land and sea. As the study documents current and past harvesting, questions relating to future plans for fishing for other species in the study area were not posed during

the interviews. There may be Mi'kmaq communities with interests in emerging fisheries that are not documented.

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7.0 Appendices

Appendix A Commercial and FSC harvest

Appendix B Demersal by Species

Appendix C Pelagic by species

Appendix D Invertebrates by species

Appendix A

Commercial and FSC harvest

Shelburne Basin Exploration Project Traditional Use Study

Interview Data: Commercial and FSC Fisheries

Legend

- FSC Fisheries
- Commercial Fisheries
- Regional Assessment Area (RAA)
- Local Assessment Area (LAA)
- Exploration Drilling Project Area
- Bathymetry (Meters)

Disclaimer

This map is a graphical representation of Mi'kmaq ecological knowledge gathered throughout the study, and should not be used for navigation purposes. Features presented may not accurately representaactual topographical or proposed features.

This map service displays bathymetric countours, depths are in meters.

N
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Datum: UTM NAD83 Zone 20
Scale: 1:3,000,000

Version: 1
15 May 2014

Membertou
GEOMATICS SOLUTIONS

0 25 50 100 150 200
Kilometers

69°W 68°W 67°W 66°W 65°W 64°W 63°W 62°W 61°W 60°W 59°W 58°W 57°W 56°W

45°N 44°N 43°N 42°N 41°N 40°N

Bay of Fundy
Grand Manan Basin
Jordan Basin
Gulf of Maine
Georges Basin
Georges Bank
Canso Bank
Misaine Bank
Middle Bank
Banquereau
Sable Island Bank
Western Bank
Emerald Bank
LaHave Bank
Baccaro Bank
Browns Bank
Scotian Shelf
Scotian Slope
Logan Canyon
Dawson Canyon
Verrill Canyon
Shortland Canyon
Haldimand Canyon
The Gully
Laurentian Channel
Physalia Seamount
Retriever Seamount

Appendix B

Demersal by Species

Shelburne Basin Exploration Project Traditional Use Study

Interview Data:
Demersal Fisheries
by Species

Legend

- Flounder
- Halibut
- Pollock
- Redfish
- Hake
- Hagfish
- Cod
- Haddock
- Bathymetry (Meters)
- Regional Assessment Area (RAA)
- Local Assessment Area (LAA)
- Exploration Drilling Project Area

Disclaimer

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Bay of Fundy
Grand Manan Basin
Jordan Basin
Gulf of Maine
Georges Basin
Georges Bank
Physalia Seamount
Retriever Seamount
Canso Bank
Misaine Bank
Middle Bank
Banquereau
Sable Island Bank
Western Bank
Scotian Slope
The Gully
Shortland Canyon
Haldimand Canyon
Logan Canyon
Lawson Canyon
Laurentian Channel

Appendix C

Pelagic by species

Shelburne Basin Exploration Project Traditional Use Study

Interview Data:
Pelagic Fisheries
by Species

Legend

- Tuna
- Herring
- Shark
- Swordfish
- Regional Assessment Area (RAA)
- Local Assessment Area (LAA)
- Exploration Drilling Project Area
- Bathymetry (Meters)

Disclaimer

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Datum: UTM NAD83 Zone 20
Scale: 1:3,000,000

Version: 1
15 May 2014

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Appendix D

Invertebrates by species

Shelburne Basin Exploration Project Traditional Use Study

Interview Data:
Invertebrate Fisheries
by Species

Legend

- Marine Worm
- Scallop
- Jonah Crab
- Snow Crab
- Lobster
- Bathymetry (Meters)
- Regional Assessment Area (RAA)
- Local Assessment Area (LAA)
- Exploration Drilling Project Area

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N
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Datum: UTM NAD83 Zone 20
Scale: 1:3,000,000

Version: 1
15 May 2014

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