Project Description

for the Drilling of an Exploration Well

on the Old Harry Prospect – EL 1105

February 21, 2011

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1.0 INTRODUCTION

Corridor Resources Inc. (Corridor), an Eastern Canadian energy company, plans to drill one exploration well within Exploration License (EL) 1105 on a subsea geological structure called Old Harry (the "Project"). The structure is approximately 30 km long and 12 km wide and has the potential to contain significant hydrocarbon resources. As such, it is one of the largest undrilled geological structures in Eastern Canada. The proposed exploration well would evaluate the resource potential of the Old Harry prospect and form the basis of any related follow-up exploration programs. The short term drilling operation is anticipated to occur between mid-2012 and early 2014, with the specific timing dependent upon rig availability and regulatory approvals.

Corridor holds an exploration licence and oil and gas research permits over most of the Old Harry offshore prospect (Figure 1.1), including EL 1105 issued by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). The Old Harry prospect (EL 1105 plus PG963 and PG964) is located in the Gulf of St. Lawrence (Gulf) with the centre of the prospect approximately 80 km west-northwest of Cape Anguille, Newfoundland and Labrador. EL 1105 is located within the Laurentian Channel, in water depths of approximately 460 m.

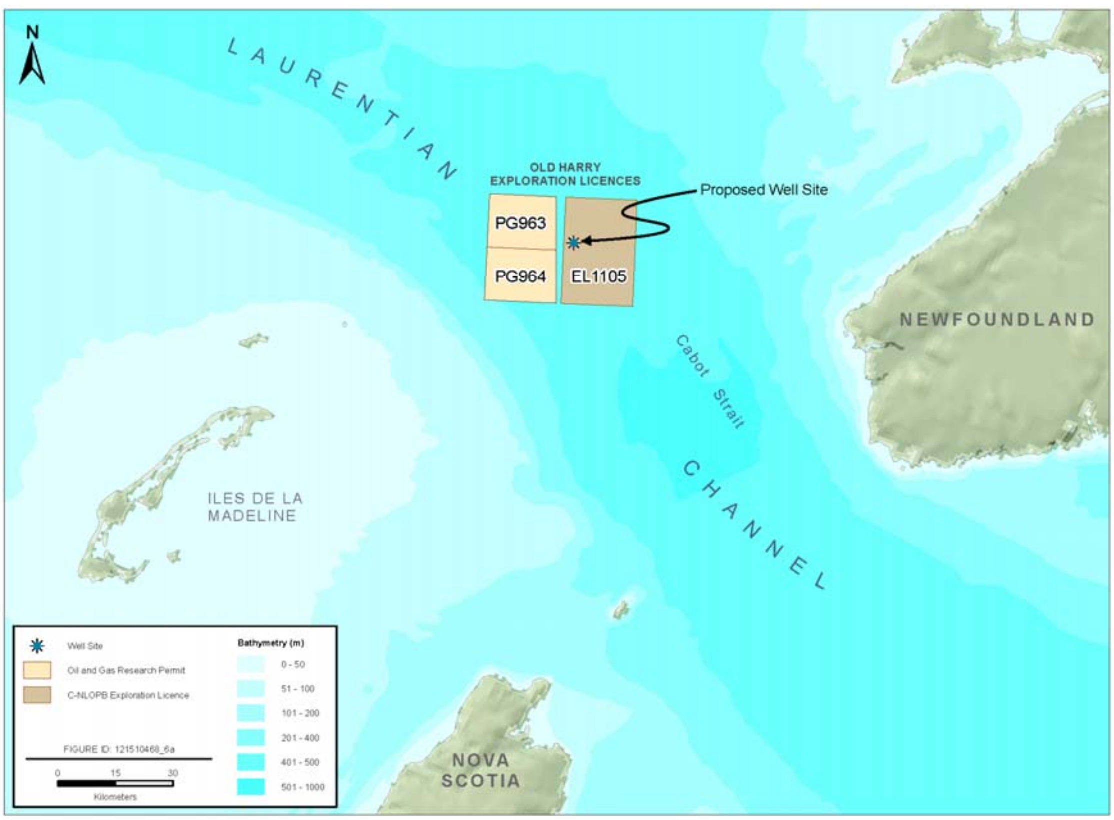

Figure 1.1 Location of EL 1105 and Quebec Oil and Gas Research Permits PG963 and PG964 covering the Old Harry Prospect

The Project will require authorizations pursuant to Section 138(1)(b) of the *Canada-Newfoundland Atlantic Accord Implementation Act* and Section 134(1)(a) of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act,* collectively known as the Accord Acts. Pursuant to Section 5(1)(d) of the *Canadian Environmental Assessment Act* (*CEAA*), the C-NLOPB is a Responsible Authority (RA) and Federal Environmental Assessment Coordinator and must undertake an environmental assessment (EA) of the Project.

Legislation that is relevant to the environmental aspects of this Project includes:

- the Accord Acts;
- *CEAA*;
- *Oceans Act*;
- *Fisheries Act*;
- *Navigable Waters Protection Act*;
- *Canada Shipping Act*;
- *Species at Risk Act*;
- *Migratory Birds Convention Act*; and
- *Canadian Environmental Protection Act*.

There is no federal funding of this Project. Frontier lands are involved and they are administered by the C-NLOPB.

2.0 THE OPERATOR

Corridor, an Eastern Canadian energy company, is engaged in the exploration for and development and production of petroleum and natural gas resources onshore in New Brunswick, Prince Edward Island and Quebec, and offshore in the Gulf of St. Lawrence in Quebec and Newfoundland and Labrador.

Corridor is headquartered in Halifax, Nova Scotia, with a production office for its McCully Field operations in Penobsquis, New Brunswick. Corridor has been producing natural gas from the McCully Field since 2003. In June, 2007, following construction of a field gathering system, a gas plant, and a pipeline lateral, the McCully Field was connected to markets through the Maritimes and Northeast Pipeline.

Corridor safely and successfully conducted seismic programs at Old Harry in 1998 and 2002, a seismic program offshore west coast of Cape Breton in 2003 and a geohazard survey at the Old Harry site in the fall of 2010.

2.1 Operator Contacts

Operator contacts for this Project are:

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2.2 Operator Objectives

The long-term goals of the Operator are to:

- conduct a safe and environmentally responsible exploration drilling program on the Old Harry prospect while meeting or exceeding all due diligence requirements;
- undertake the drilling of the Old Harry exploration well through the implementation of industry best practice and adherence to all applicable regulatory requirements and authorization conditions;
- establish and maintain positive relationships with regulators, other stakeholders, suppliers and contractors;
- explore and discover new oil and gas fields in Eastern Canada;
- create long-term benefits and enhance the energy infrastructure for Newfoundland and Labrador and the whole Eastern Canadian region; and
- execute a cost-effective program by phasing capital investment and carefully planning all aspects of the Project.

3.0 PROJECT OVERVIEW

The official name of the Project is *The Drilling of an Exploration Well on the Old Harry Prospect – EL 1105*. EL 1105 is located (see Figure 1.1) in the Laurentian Channel portion of the Gulf, approximately 80 km west-northwest of Cape Anguille, Newfoundland and Labrador. Corridor anticipates drilling one exploration well in EL 1105 on the western side of the license, as illustrated in Figure 3.1. The Project Area is approximately 304 km^2 and is bounded by: 48°10'59.740"N, 60°23'56.094"W (northwest corner); 48°10'0.084"N, 60°8'57.480"W (northeast corner); 48°04'45.681"N, 60°8'57.515"W (southeast corner); and 47°58'22.285"N, 60°23'55.732"W (southwest corner). The proposed well coordinates are in the vicinity of Latitude 48°03'05.294" and Longitude 60°23'39.385" (NAD83 datum, geographic coordinates). Depending on exploration drilling results, a decision will be made with respect to well testing. The drilling and testing program will be conducted in accordance with all C-NLOPB regulations and guidelines.

The information obtained from this well will assist Corridor in the ongoing evaluation of the hydrocarbon potential of the Old Harry prospect. If this initial exploratory drilling Project provides encouraging results, a follow-up program may be developed and could include additional seismic or subsequent wells within EL 1105 or Corridor's other Old Harry Oil and Gas Research Permits. The EA will address the drilling of one well on EL 1105. The well is anticipated to take between 20 to 50 days to drill. A testing program could take up to several additional weeks on location depending on the geological and operational requirements.

The mobile offshore drilling unit (MODU) to be used for the exploration well is under consideration and could be a semi-submersible drilling rig or a drill ship. The MODU will be supported by a number of supply vessels and offshore helicopters. Vertical seismic profiling (VSP) activities may also be conducted in conjunction with the drilling activities.

3.1 History of Exploration Activities in the Laurentian Channel and Gulf of St. Lawrence

The southern Gulf of St. Lawrence is underlain by a large sedimentary basin that is up to 12 km deep and contains all of the necessary components for a viable petroleum system. The basin contains abundant sandstone reservoir rocks, shale and coal for hydrocarbon source rock and numerous geological structures for potential trapping of hydrocarbons. A recent petroleum resource assessment by the Geological Survey of Canada (Lavoie et al. 2009) estimates 39 trillion cubic feet of in-place natural gas and 1.5 billion barrels of in-place oil for the Maritimes Basin, which covers the southern Gulf and adjacent areas. These petroleum resource estimates were made, in part, through the analysis of previously drilled offshore wells in the Gulf.

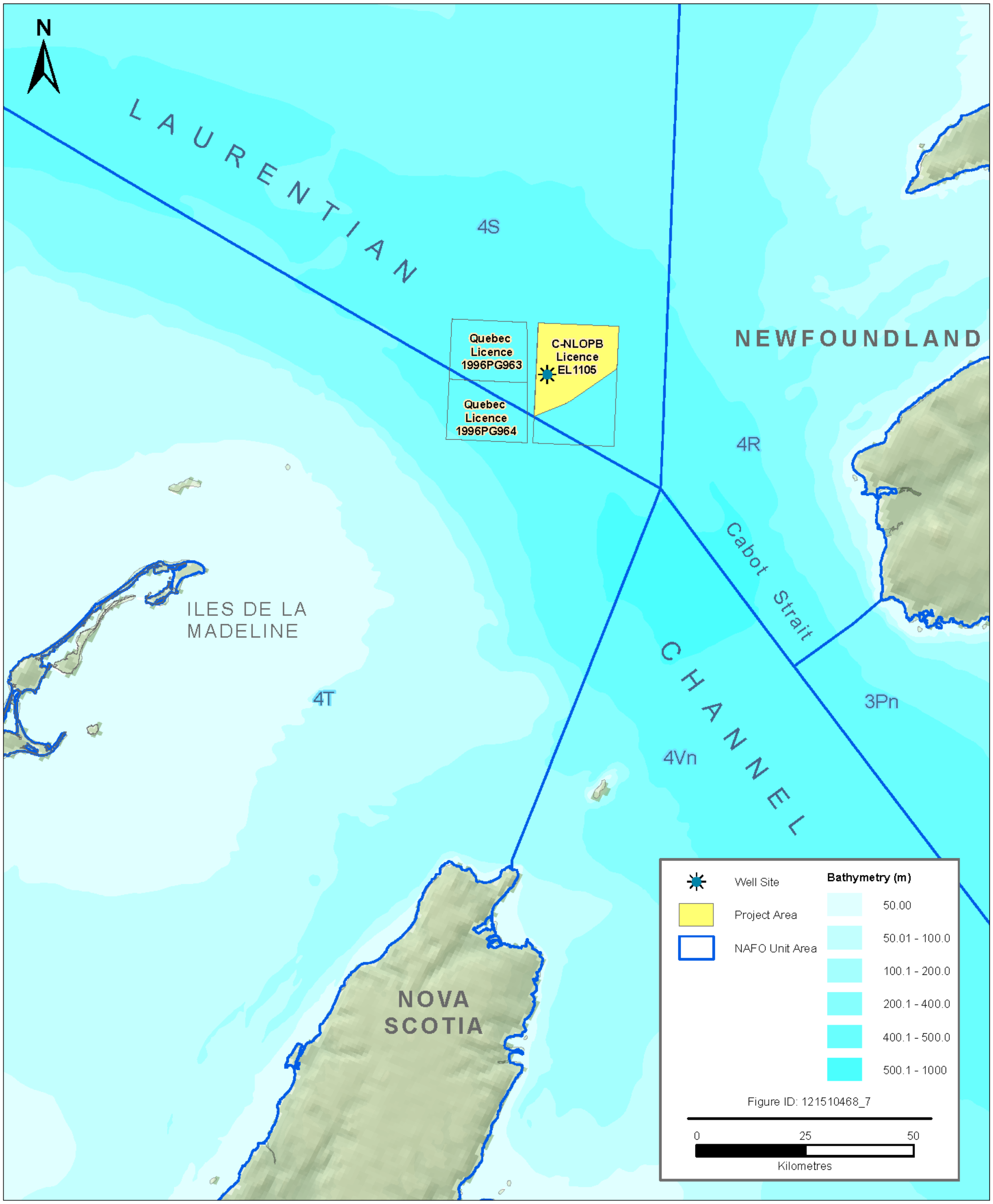


Figure 3.1 Project Area for the Exploration Well within EL1105

There is a long history of hydrocarbon exploration in the Gulf of St. Lawrence, starting with the first offshore exploration well drilled by the Island Development Company in Hillsborough Bay, Prince Edward Island, in 1944. Since that first well was drilled, nine more offshore wells were drilled and thousands of kilometres of seismic data were acquired (Table 3.1). The locations of the previous wells drilled and seismic programs conducted are shown in Figure 3.2. This extensive database of existing seismic and well information highlights the exploration potential of this area.

Most of the offshore wells were drilled in the 1970s and early 1980s (Table 3.1). At that time, the petroleum companies were seeking oil deposits, whereas the drilling results in the Gulf have yielded indications of natural gas. Of the offshore wells drilled, five yielded no hydrocarbon shows, four had minor natural gas shows, and one well (East Point E-49) was reported as a significant natural gas discovery. A subsequent delineation well at this site (East Point E-47) was unsuccessful and only yielded minor hydrocarbon shows. The most recent drilling in the Gulf occurred in 1996 at the Bay St. George A-36 well. This well was located about 10 km southwest of Cape George and about 120 km northeast of the Old Harry prospect. This well was unsuccessful and was subsequently abandoned.

Table 3.1 Offshore Wells Drilled in the Gulf of St. Lawrence

#	Well	Year Drilled	Total Depth (m)
1	Hillsborough No.1	1944	4479
2	Northumberland Strait F-25	1970	3001
3	Cable Head E-95	1983	3235
4	Beaton Point F-70	1980	1734
5	East Point E-49	1974	3526
6	East Point E-47	1980	2662
7	St. Paul P-91	1983	2885
8	Cap Rouge F-52	1973	5059
9	Bradelle L-49	1973	4421
10	St. George's Bay A-36	1996	3240

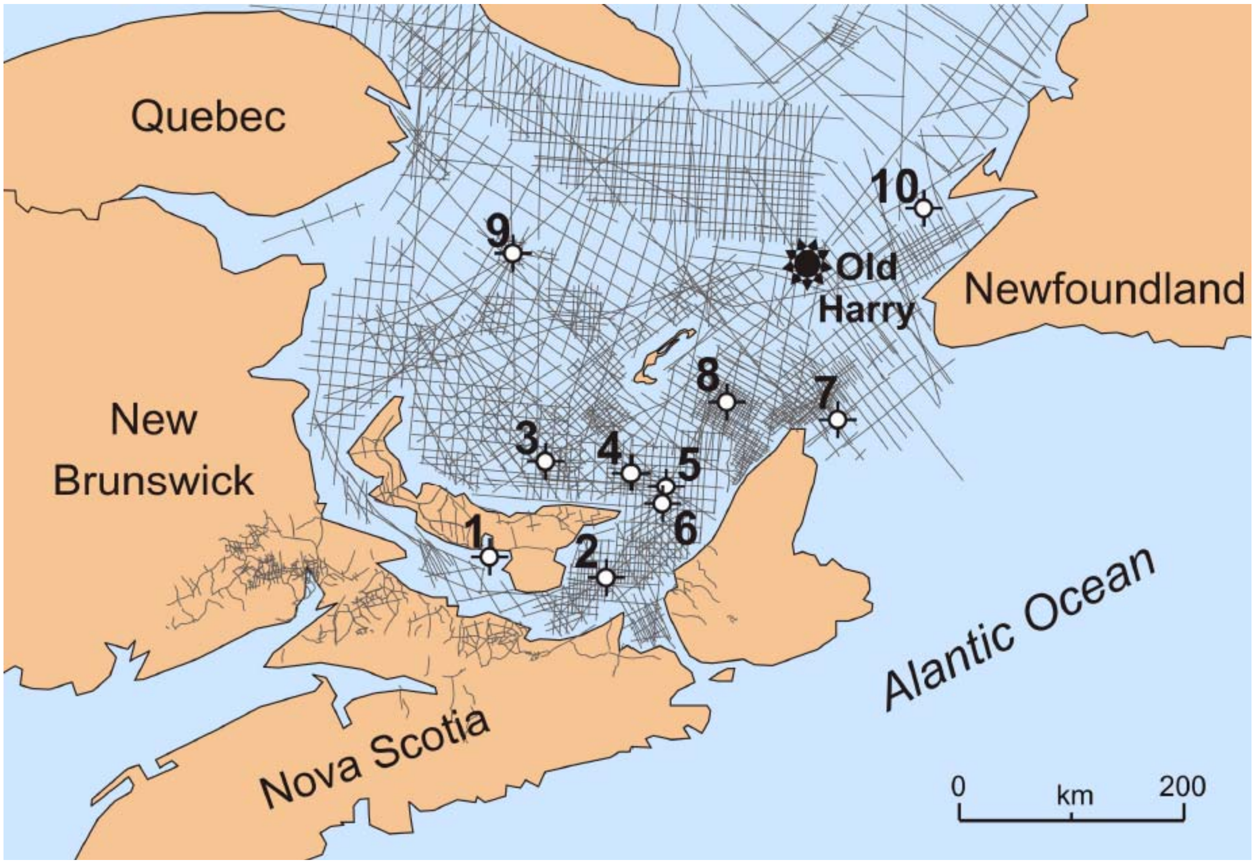


Figure 3.2 Location of Seismic Programs and Wells in the Gulf of St. Lawrence

The southern Gulf of St. Lawrence is an extremely large area, spanning approximately 600 km in an east-west direction and 300 to 400 km north to south. However, only 10 offshore wells have been drilled in this vast, under-explored area, where the Old Harry prospect is just one of many geological structures with hydrocarbon exploration potential. The results of the 10 offshore wells indicate the presence of a viable petroleum system on the Old Harry prospect. Corridor previously completed an extensive work program at Old Harry to identify a well location, including the collection of 2-D seismic data in 1998 and 2002, as well as a geohazard site survey in October, 2010. Old Harry has multiple drilling targets, the potential for large hydrocarbon resources, and, if results from the exploration well are promising and lead to further activity, the potential to generate significant economic benefits in Newfoundland and Labrador and the entire Eastern Canadian region.

3.2 Project Personnel

The Project will be managed out of an office in Newfoundland and Labrador where the Project Team will be located and key decisions will be made. The drilling activities will be managed by a Drilling Manager located in this office. The Drilling Manager will have the authority to effectively manage the operational aspects of the Project. Day-to-day drilling operations will be directed by the Operator's drilling superintendents. Offshore, the management team consists of the Senior Drilling Supervisors (Operator's offshore representative), the designated Offshore Installation Managers and Supply Vessel Masters.

3.3 Alternatives to and Within the Project

The alternative to this Project is to not drill on EL 1105. However, Corridor has been awarded rights to explore on EL 1105 through a regulated competitive bidding process and seeks to fulfill its commitments made as a part of the licencing process within the remaining time window.

Alternate means to be evaluated within the Project include the use of a semi-submersible drilling rig or a drill ship, both of which are considered MODUs. A harsh-environment jack-up rig is typically limited to water depths of approximately 120 m off the East Coast of Canada and therefore will not be considered within this Project. Additional information regarding MODUs is provided in Section 3.4.

Other alternatives to be considered will be the drilling program, selection and use of drilling fluids, supply base location, helicopter support base location, waste management and program timing. Selection of the alternatives for the program will be guided by a consideration of safety, environmental, technical, community and economic factors.

3.4 Mobile Offshore Drilling Units

For this Project Description and subsequent EA, it is necessary to describe and consider two MODU types because rig and contractor selection is still in progress. While there are differences among the rig types (which will be noted in the EA), drilling, testing, well abandonment / suspension and discharges and emissions considerations are similar.

Drilling may be conducted from an anchored semi-submersible (e.g., *GSF Grand Banks*), a dynamically-positioned (DP) semi-submersible rig (e.g., *Erik Raude*) or a DP drill ship (e.g., *Deepwater Millennium*). Rig selection will be based on the characteristics of the well site, physical environment, well site water depth, expected drilling depth, logistical considerations, and the mobility required based on well site weather and ice conditions (CAPP 2001), as well as other safety and environmental performance criteria.

A semi-submersible is a MODU where the drilling platform sits atop steel pontoons that are ballasted with water so that the unit floats with the main deck above water and the remainder below the water surface. Semi-submersibles are towed to the drilling site and are either moored to the bottom (with a series of 8 to 16 anchors which may extend up to 1 to 2 km from the rig) or are kept on station using a DP system (computer-controlled thrusters) in deeper waters (300 to 3,000 m). The maximum water depth is a function of many rig design criteria, including the length of the rig's riser, the main pressure containing pipe that runs from the blow-out preventer (BOP) on the seafloor to the MODU and through which drilling fluids and other material are conducted.

A drill ship is a MODU where a maritime vessel has been fitted with a drilling platform and station keeping equipment. The vessel transits to location on its own power and is usually kept on location through a DP system.

These MODUs (semi-submersible and drill ship) are self-contained units, with derrick and drilling equipment, a moon pool, a helicopter pad, fire and rescue equipment and crew quarters. The operations and discharges are similar for both drilling units. While there are differences between rig types with respect to capabilities, treatment facilities and effluent discharge depths, the characteristic volumes and types of waste streams are similar among drill units.

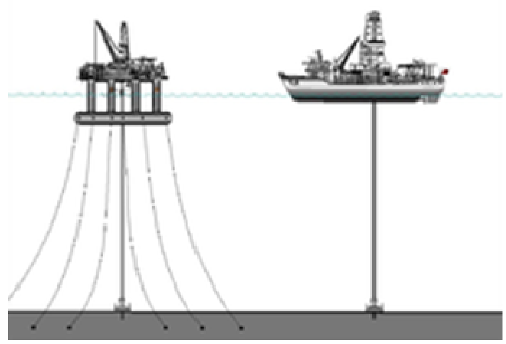


Figure 3.3 A Moored Semi-submersible and a Dynamically-positioned Drillship

3.5 Logistic Support

The Island of Newfoundland will be the base of operation and support centre for the Project. The Operator will engage a drill rig, supply vessels, helicopter and related goods and services on a direct hire or a contractual basis. To support these resources, the Operator will acquire marine support base, logistics and telecommunications services including, but not necessarily limited to, support vessels, meteorological and oceanographic services and emergency response services from third-party providers. All such goods and services will be acquired through a formal competitive process to the extent possible, which will be executed over a period of several months. The Operator will ensure that all selected contractors will meet the stringent competency requirements for working in the Newfoundland and Labrador offshore oil and gas sector.

3.5.1 Shorebase Facilities

The existing infrastructure and activity in Atlantic Canadian harbours enables the petroleum industry to optimize the use of supply vessels and other logistic assets. Existing facilities are capable of servicing multiple operations with the current infrastructure, including office space, crane support, bulk storage and consumable (fuel, water) storage and delivery capability. Additional harbours, which are not currently used by the industry but may be closer to the location of operations, will be investigated for suitability to supply the services necessary to support an offshore supply base. Warehouse facilities will be provided by third party contractors as required and will consist primarily of storage for tubular goods and the equipment belonging to the drill rig, which can be stored onshore.

Operation and coordination service of all aeronautical and marine voice and data communication services will be provided from a central facility by a third-party contractor. The primary communications link between the drill rig and the Project Operations office will be via a dedicated satellite service. Independent backup communications systems will be provided by high quality HF radio service, available through the coastal radio station. Details on communications systems will be outlined in the Emergency Response Plan, to be filed with the C-NLOPB.

3.5.2 Marine Support Vessels

Supply / standby vessels will meet Canadian standards and will be managed from the contractors' offices in Atlantic Canada. Letters of Compliance for each chartered supply / standby vessel will be in place prior to the onset of work. The vessels will be comparable to those presently operating on the Grand Banks in terms of power and capabilities. The vessels will be used for re-supply and safety standby.

3.5.3 Helicopter Support

Corridor will be cognizant of the recent Offshore Helicopter Safety Inquiry report issued by Commissioner Robert Wells, Q.C., and the Transportation Safety Board of Canada's Aviation Investigation Report. Contract helicopter support will be provided by offshore-rated helicopters. The helicopter contractor will also provide all auxiliary flight services for search and rescue, First Response equipment and technicians, alternate landing sites complete with weather station, aviation fuel, helicopter passenger transportation suits and an aircraft maintenance and passenger loading terminal located in Atlantic Canada. Several existing heliport locations will be investigated, as well as potential new locations in existing airports closer to the offshore operation.

3.6 Project Activities

A MODU will be contracted to drill one well on EL 1105. The MODU will be supplied and supported by vessels operating from a shorebase facility with the capability of storing and delivering drilling supplies, including drill fluids, casing, deck cargo, water, cement, diesel fuel and other bulk commodities including provisions. It is anticipated that two to three support vessel trips will be required per week. Helicopter support of approximately three trips per week will be required to transport personnel, and light supplies and equipment.

Well design is currently in development, with some preliminary design information provided in Section 3.6.3. The actual hole sizes and casing setting depths will be finalized for the specific well requirements and design criteria.

Following completion of the exploration well, well abandonment / suspension will be conducted in accordance with recent *Drilling and Production Guidelines* (C-NLOPB and CNSOPB 2009) and the *Newfoundland Offshore Petroleum Drilling and Production Regulations* (SOR/2009-316) under the *Canada-Newfoundland Atlantic Accord Implementation Act*.

3.6.1 Project Components

The Project will consist of the activities associated with a one well exploration program in EL 1105. These activities would include the mobilization of a MODU and the drilling, evaluation and subsequent abandonment / suspension of the well. The evaluation of the well may occur over a few stages and could include wireline logging, VSP and potentially well testing activities at a later date.

3.6.2 Project Scheduling

Corridor intends to drill one exploration well between mid-2012 and early 2014, with the specific timing dependent upon rig availability and regulatory approvals. This well is anticipated to take between 20 to 50 days to drill and will occur when there is no ice present in the Gulf. If testing is conducted, the rig will spend up to several additional weeks on location. The temporal scope of the EA will be year-round to allow flexibility in the event of an ice-free year. If this well provides encouraging results, a follow-up exploration program, including a seismic program or another exploration well, may be developed for EL 1105 or Corridor's other Old Harry Oil and Gas Research Permits.

All activities in EL 1105 will be conducted in accordance with stringent oil and gas regulatory requirements for working offshore Newfoundland and Labrador.

3.6.3 Exploration Drilling

The potential reservoir targets at the Old Harry structure are located between 850 and 2,000 m below the seafloor. The well would be started with a conductor hole either drilled or jetted to reach a depth typically 90 m below the seafloor (BSF). Following the cementing of this conductor pipe, a surface hole would likely be drilled without a marine riser to a depth between 300-600m BSP and cemented back to the seafloor. The high-pressure wellhead housing would be run on this string of pipe, facilitating the installation of the subsea BOPs. These two strings of steel pipe provide the structural support for the remainder of the drilling, as well as the pressure integrity required to reach the desired targets. The drilling fluids used from this point forward will be maintained as a closed loop system, with all fluids returned to the drilling unit through the BOPs and marine riser that connects the rig to the BOPs.

Depending upon the final well design, the intermediate hole could then be drilled to reach just above the upper reservoir targets and casing would be installed at this point. The final hole section to be drilled to total depth of the well would be the main hole section. A suite of evaluation logs would be run to gather data to confirm the presence of significant hydrocarbons. If the reservoir targets are hydrocarbon bearing, a final production casing string or liner may be installed to enable future testing or production from the wellbore. If the well is deemed to be unsuccessful, it may be abandoned without the installation of the final string of casing / liner and the open hole abandoned using appropriate cement plugs in accordance with the *Drilling and Production Guidelines* (C-NLOPB and CNSOPB 2009).

Table 3.2 provides an example hole size and casing profile for the Old Harry well. This design will be finalized as the engineering of the Project progresses.

Table 3.2 Description of Example Drill Hole and Casing Sizes

Hole Section	Hole Size (mm)	Casing Size (mm)	Setting Depth (m BSF)	Drilling Fluid Type	Drilling Fluid Return
Conductor	914	762	90	Seawater	Seafloor
Surface	660	508	300 to 600	Seawater with sweeps	Seafloor
Intermediate	444 to 311	340 to 245	800 to 1,200	WBM / SBM	Drilling Rig
Main / Production	311 to 216	245 to 178 (liner)	2,000 to 2,200	WBM / SBM	Drilling Rig

3.6.4 Vertical Seismic Profiling

VSP using an air-source array from a support vessel may be conducted as part of the exploration activities. The air-source array is similar to that employed by 2-D or 3-D seismic surveys, but is usually smaller and deployed in a small area for a limited amount of time (several days). An application for VSP activities may be included with the application to drill a well. For all geophysical surveys, the Operator will adhere to the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2008).

3.6.5 Well Testing

A Well Data Acquisition Program will be submitted to the C-NLOPB in support of the well approval at least 21 days prior to the anticipated spud date. There is no regulatory requirement to test the exploration well. The Operator will include in the Well Data Acquisition Program its intention with respect to testing; however, the final decision to test, suspend or abandon the well will only be made once the well has been drilled to total depth and the initial geological evaluation completed. The decision to test a well is dependent on the quality, quantity and content of the hydrocarbon-bearing formations encountered. If well testing is warranted, the Operator could suspend the well and return to the location at a later date with all the necessary equipment.

During typical well testing operations, downhole test tools complete with perforating guns are run into the cased wellbore. There are additional tools placed across the subsea BOPs to ensure well control is maintained at all times. Once the well has been perforated, reservoir fluids are allowed to flow up the test string in the wellbore (tubing or drill pipe) to the deck or the drilling unit. On the deck of the rig, a temporary flow testing facility will have been installed, pressure and function tested, and certified to handle the flow of the fluids from the wellbore in a controlled manner. These fluids may contain hydrocarbons (oil and gas) and/or formation water. The hydrocarbons are measured and separated from the produced water in the test package. Hydrocarbons and small amounts of produced water are flared using high-efficiency burners to combust the hydrocarbons and minimize emissions. If produced water occurs, it will either be flared or treated in accordance with the latest version of the *Offshore Waste Treatment Guidelines* (*OWTG)* (National Energy Board (NEB) et al. 2010) prior to ocean discharge. Once the testing is complete, the test string is removed from the well and, depending upon the results of the test, the well is either suspended or abandoned in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* (SOR/2009-316). If a well is suspended, the well will be left in a state to prevent hydrocarbons from flowing out of the well until the well is re-entered in the future for additional testing or long term production.

3.6.6 Well Abandonment / Suspension

Depending on the preliminary information received during drilling, the exploration well may be suspended for future re-entry. The wellbore is plugged below the seafloor using mechanical and/or cement plugs in accordance with the *Drilling and Production Guidelines* (C-NLOPB and CNSOPB 2009). A suspension cap is installed to protect the wellhead connector for potential future re-use.

If the offshore well is abandoned, the wellhead may be removed or in some cases approval may be granted for leaving the wellhead in place (i.e., not removed). When the wellhead is removed, the wellhead and associated equipment are removed to at least 1 m BSF. This is typically performed using mechanical cutters from the drilling unit. However, there are cases that require subsea cutting involving the use of shaped explosive charges. This option is employed only in instances where mechanical removal has failed. It is a requirement that operators have authorization from C-NLOPB before shaped charges are used. If a wellhead is left in place, several factors are considered, including the occurrence and type of fishery in the area, as well as water depth at the location of the wellhead.

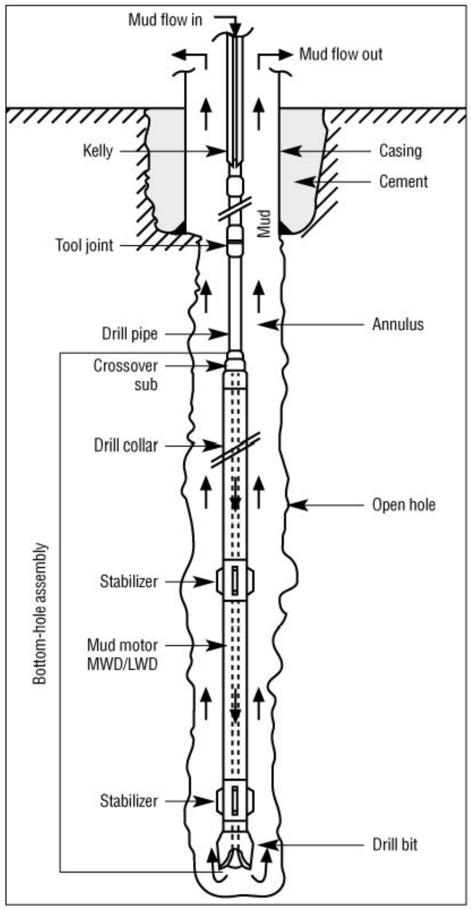
3.7 Waste Discharges, Air Emissions and Treatment

All discharges from the rig will be managed in compliance with the *OWTG*. Other requirements may be attached to individual authorizations from the C-NLOPB. Details are provided in the following sections on the discharges associated with exploratory drilling operations, which include drill muds and cuttings, produced water, grey and black water, ballast water, bilge water, deck drainage, discharges from machinery spaces, cement, BOP fluid (glycol / water) and air emissions.

3.7.1 Drill Mud and Cuttings

If technically feasible, the well at EL 1105 will be drilled to depth using water-based mud (WBM). However, it is recognized that during the drilling, conditions may be encountered (e.g., wellbore instability and formation damage concerns) that necessitate the use of synthetic oil-based mud (SBM). Therefore, the EA for EL 1105 will consider the use of both WBM and SBM.

The drill bit cuts the formation rock, producing drill cuttings, resulting in the creation of the well bore. Drill mud is circulated through the drill pipe and out through small jets or holes in the drill bit. The velocity and viscosity of the mud flushes drilled cuttings away from the bit, transporting them to the surface through the annulus, as illustrated in Figure 3.4 (CAPP 2001).



Source: CAPP 2001

Figure 3.4 Drill String Components Illustrating Drill Mud Circulation

At pre-determined intervals as described in Section 3.6.3, steel casing is cemented into the wellbore (see Figure 3.4), thereby providing a conduit that returns muds and cuttings to the drill unit for treatment. Drilling mud is removed from the cuttings in a series of successive separation phases that may use shakers, hydrocyclones and/or centrifuges. The cleaned cuttings are then discharged overboard via a cuttings chute. Drill mud is recovered and reconditioned for reuse as much as possible. However, some mud will remain on the drill cuttings and be discharged. Discharged drill cuttings are required to meet the limits outlined in the *OWTG* for the disposal of drill solids (no limit for WBM cutting, 6.9 g of mud or less/100 g of cuttings for SBM cuttings overboard discharge.

The total volume of cuttings and drill mud discharged will be dependent upon the wellbore depth and drilling conditions encountered. Drilling of conductor and surface hole locations tend to be drilled with sea water and small amounts of WBM, with mud and cuttings discharged to the seafloor. For this well, the intermediate and production hole sections are planned to be drilled with WBM in a closed loop system, using a marine riser from the seafloor back to the drilling unit. SBM may be used, if it is required for wellbore integrity and safe drilling practices. The initial exploration well is planned to be drilled vertically; however, any deviated or directional drilling may require SBM. If SBM is used, it will be recycled, reused and brought to shore for disposal when spent.

The muds and the cuttings are dispersed in the water column and settle to the seabed, with heavier cuttings and particles settling near the well bore and the fines dispersed at increasing distances from the drill unit. The dispersion pattern for muds and cuttings is irregular, largely dependent on water depth and current direction, as well as discharge intensity. Drill mud and cuttings and their potential environmental effects have been discussed in several studies (Husky 2000, 2001; CAPP 2001; Hurley and Ellis 2004) and all confirm that exploratory drilling has no measureable environmental effect on the marine environment. The impact of drill cuttings dispersal on the seafloor at the Old Harry site will be fully evaluated during the EA process.

3.7.1.1 Water-based Muds

WBM employs freshwater or brines (salt water) as the continuous liquid phase and the solid phase is generally composed of barite, bentonite or other clays, silicates, lignite, caustic soda, sodium carbonate / bicarbonate, inorganic salts, surfactants, corrosion inhibitors, lubricants and other additives for unique drilling problems (Thomas et al. 1984; GESAMP 1993). The constituents of muds are screened via the *Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands* (NEB et al. 2009). Composition of an example of a typical WBM formulation is presented in Table 3.3. Spent and excess WBM may be discharged as per the *OWTG*.

3.7.1.2 Synthetic Oil-based Muds

SBM refers to a water-in-oil emulsion whose continuous phase is composed of one or more fluids produced by the reaction of a specific purified chemical feedstock, rather than the physical separation processes such as fractionation, distillation and minor chemical reactions. The synthetic-based fluids (SBFs) used in the preparation of SBMs are water insoluble and, as such, the SBM does not disperse in water in the same manner as a WBM (Hurley and Ellis 2004). The discharge of whole SBM is not permitted. SBM cuttings may be discharged provided they do not exceed 6.9 g/100 g time weighted average of oil on wet solids (see Section 2.4 of the *OWTG* (NEB et al. (2010)).

Table 3.3 Example of Drilling Fluid Components and Drill Cuttings Discharge

	Unit		Casting Strings		
		Conductor	**Surface**	**Intermediate**	**Main**
Hole Section	mm	914	660	445	311
Drilling Fluid System		Seawater / Gel	Seawater / Gel	WBM	WBM
Depth (See Notes)	metre (bsf)	+/-90	+/-320	+/-850	+/-2,100
Volume Usage	m^3	340	530	765	+/-600
Wash Out	%	50%	30%	20%	10%
Products					
Barite	MT	150	100	20	20
Bentonite	MT	50	100	-	-
Caustic	kg	250	350	450	350
Fluid Loss Agent	kg	-	-	3,200	1,700
Potassium Chloride	kg	-	-	87,500	67,500
Glycol Inhibitor	L	-	-	23,000	18,700
Soda Ash	kg	250	375	500	375
Viscosifier	kg	-	1,135	3,400	2,835
Biocide	L	-	-	800	800
Drilled Cuttings	kg	240,000	300,000	257,000	282,000
Volume of Cuttings	m^3	90	110	95	105

Notes:
1. The information provided is an example of a potential well design scenario. This will be finalized in the detailed design.
2. 914 mm (36-inch) and 660 mm (26-inch) hole sections will be drilled without a marine riser. It will have near seabed discharge of cuttings.
3. WBM is planned for the complete well.
4. The average water depth in the Project area is assumed to be 460 m.
5. All depths are measured below the sea floor (bsf) as the planned MODU has yet to be determined.

The most commonly used SBM on the Grand Banks uses PureDrill IA-35 or PureDrill 1A-35LL as the base fluid, together with weighting agents, wetting agents, emulsifiers and other additives. The SBM PureDrill IA-35 that is used on the Grand Banks is classified as a high purity synthetic alkane consisting of isoalkanes and cycloalkanes (Williams et al. 2002). PureDrill IA-35 has undergone an evaluation using the Offshore Chemical Management System. The fluid was screened from a facility, human health and environmental perspective (Williams et al. 2002). PureDrill IA-35 base oil is a component of a whole mud system called ParaDrill that received a Group E classification by the Offshore Chemical Notification System (OCNS) classification system employed in the UK. The Group E classification is the best rating achievable under the OCNS system and is assigned to chemicals that have relatively low toxicity and/or does not bioaccumulate or readily biodegrades. The formulation of ParaDrill-IA is presented in Table 3.4. If required for this program, a similar mud would be employed for this Project.

Table 3.4 Composition of ParaDrill-IA

Component	Purpose
PureDrill IA-35	Base Fluid
NOVAMULL L	Primary Emulsifier
NOVAMOD L	Rheology Modifier
NOVATHIN L	Thinner
MI-157	Wetting Agent
HRP	Rheology Modifier
TRUVIS	Viscosity
VERSATROL	Filtration Control
ECOTROL	Filtration Control (Alternative)
Lime	Alkalinity
Calcium Chloride	Salinity
Water	Internal Phase
Barite	Density
Source: Williams et al. 2002, in LGL Limited 2005a.	

3.7.2 Cement

The upper reaches of a well may be drilled into sediments with no casing by a process referred to as 'spudding'. The drill string is removed and a pipe (casing) is inserted and cemented into place. In order to avoid damaging subsurface equipment, excess cement from the conductor casing is not brought back to the drilling unit but discharged to the sea floor. The actual amount can only be estimated by remotely operated vehicle (ROV) survey after the discharge. Additional cement returns from surface, intermediate and production casings may be discharged according to the *OWTG.* Cement components will also meet the OCNS classification system.

3.7.3 Produced Water

If hydrocarbons are present and flow testing is conducted, then small amounts of produced water may be discharged by atomizing with hydrocarbons and flaring. If the flare capacity is exceeded, then small amounts of treated produced water will be brought onshore for disposal or discharged according to the *OWTG.*

3.7.4 Grey / Black Water

Typical drilling units will accommodate up to 150 personnel, depending upon the rig. Each rig will discharge up to approximately 50 m^3 of grey water per day. Black water or sewage will be macerated to 6 mm particle size or less and discharged as per the *OWTG*. Estimated amounts of black water are up to 25 m^3 per day per rig.

3.7.5 Machinery Space Discharges

Machinery space drainage will be through a closed system and treated to *OWTG* standards of 15 mg/L of oil or less.

3.7.6 Bilge Water

Bilge water will be treated to *OWTG* standards so that residual oil concentration in discharged bilge water does not exceed 15 mg/L.

3.7.7 Deck Drainage

Any deck drainage, such as the rotary table floor and machinery spaces, will undergo treatment in accordance with the *OWTG* so that residual oil concentration does not exceed 15 mg/L.

3.7.8 Ballast Water

Water used for stability purposes in both supply boats and drilling rigs is stored in dedicated tanks and thus does not normally contain any oil. If oil is suspected in the ballast water, it will be tested and if necessary treated to *OWTG* standards so that the residual oil concentration does not exceed 15 mg/L.

3.7.9 Cooling Water

Electrical generation on most modern rigs is provided by large diesel-fired engines and generators. These engines are cooled by pumping water through a set of heat exchangers. The water is then discharged overboard in accordance with the *OWTG*. Other equipment is cooled through a closed loop system, which may use chlorine as a disinfectant. Water from closed systems will be tested prior to discharge and will comply with the *OWTG*. Any proposals for alternate biological control will be submitted to C-NLOPB for consideration prior to use.

3.7.10 Solid Waste

All trash and garbage, including organic waste from galleys, will be containerized and transported to shore for disposal in approved landfills. Combustible waste such as oil rags and paint cans will be placed in hazardous materials containers for transport to shore. The rig will have a recycling program.

Any hazardous waste will be properly containerized, sealed, labelled and its disposal on shore at an approved facility will be the responsibility of a certified waste handler. All third-party waste management facilities will be assessed by the Operator to ensure they meet waste management standards.

3.7.11 Air Emissions

Exploration installations are usually in an area for a short duration (e.g., 20 to 50 days for the Old Harry well). The main source of air emissions associated with routine activities of exploration drilling includes the burning of diesel fuel for power generation on the drill unit and flaring during any required well testing. Fugitive emissions will be a negligible source.

The Project will release substances to the atmosphere from fugitive emissions (e.g., from fuel storage tanks) and from helicopter, supply vessel and drill rig engines, generators and machinery. Flaring may also occur if petroleum hydrocarbons are encountered during flow testing, if such testing is conducted. The specific amounts and types of emissions are not known at this time because the vessel and rig contractor selection process is still ongoing. However, marine diesel will be the primary fuel and operational emissions will be similar to other marine operations using vessels of comparable size and power.

3.7.12 Miscellaneous

With all subsea BOPs, the test fluid (glycol / water) is released at intervals. Chemicals potentially discharged offshore will be screened using the *Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands* (NEB et al*. 200*9). Excess chemicals or chemicals in damaged containers will not be discharged into the sea but returned to shore on a supply vessel. Any spent or excess acids will be neutralized as approved by C-NLOPB and discharged.

Substances not discussed above or covered in the *OWTG* will not be discharged without prior notification and approval of the C-NLOPB.

4.0 ENVIRONMENTAL OVERVIEW

The Project has the potential to interact with air, water, species at risk, fish and fish habitat, commercial fisheries, marine birds, marine mammals and sea turtles through emission and discharges, both routine and accidental. There are no known special or unique areas in the Project Area. A description of the physical and biological environment for the Project Area and potential Project interactions will be provided in the EA. A valued ecosystem component (VEC) approach is typically used in an EA. Typical VECs that would normally be considered for this Project Area include species at risk, fish and fish habitat, marine birds, marine mammals and sea turtles, sensitive areas and commercial fisheries. Environmental effects on VECs, including cumulative environmental effects, are assessed in the EA. A brief summary of physical and biological environments is presented in the following sections.

4.1 Physical Environment

The Gulf is a highly stratified semi-enclosed sea, exchanging salt water with the North Atlantic Ocean and receiving fresh water from the St. Lawrence River. The Gulf has a surface area of approximately 240,000 km^2, a volume of 3,553 km^3, an average depth of 152 m and maximum depths up to 535 m (DFO 2007a). Present within the Gulf are numerous shallow areas and deep troughs. One particularly well-known trough, the Laurentian Channel, is a long, continuous trough, which has a maximum depth of 535 m and extends approximately 1,500 km from the Continental Shelf in the Atlantic Ocean to its end point in the St. Lawrence Estuary. Another predominant feature is the Magdalen Shallows, which is a plateau located in the southern Gulf (DFO 2007a).

The climate in the Project Area is dominated by the effects of the Gulf water that surrounds it and by the eastward movement of continental air masses and their associated pressure systems (Stantec 2010). The climate is categorized as Maritime temperate. The air temperatures in the vicinity of the Project Area follow a normal annual cycle, with minimum mean temperatures recorded in February (-6.5°C) and maximums in August (15°C). Above-zero temperatures were recorded for all months except December, January, February and March. In terms of sea surface temperatures, the minimum mean temperatures for February and March are approximately -0.8°C and the maximums occur in August and September and are approximately 15°C (LGL 2005b).

Precipitation tends to be in the form of rain or drizzle, with infrequent periods of continuous snow. Visibility can be reduced during times of frontal and advection fogs, in snow and during snow shower activity. Sea ice is typical in the Project Area; however, there has only been isolated reporting of icebergs (LGL 2005b). The highest amount of precipitation was recorded for the month of December and the least amount for the month of March. October was the month that recorded the highest amount of days (1.6) with rainfall greater than 25 mm (Stantec 2010).

Fog is an important weather condition that results in poor visibility for the ships, helicopters and aircraft operating offshore. Sea fog can be dense and may often cover large areas. During the period from 1971 to 2000, the number of hours with visibility less than 1 km was greatest during June and July. The number of hours with visibility greater than 9 km was highest during September, October and November.

Wind is an important aspect related to planning due to its role in current and wave generation, which, in turn, could produce forces on support vessels and drilling platforms. Knowledge of the frequency of occurrence of wind speed is necessary to the planning of operations. From autumn through the winter and spring, many cyclonic disturbances pass through or near the Gulf. These storms can produce gale-force winds that may persist for many hours and in some cases, for several days. During the summer months when the tracks of cyclonic activity are displaced farther north, the persistent strong wind become less frequent over the Gulf (Stantec 2010).

The occurrence of high wind speeds in the Project Area is most common during November, December and January. Storm-force winds (24.5 to 32.6 m/s) have occurred in January and February and gale force winds (17.2 to 24.4 m/s) have occurred in all months except July and August (LGL 2005b).

Circulation in the Gulf is influenced by a number of factors, including tides, regional meteorological events, freshwater runoff and water exchange through the Strait of Belle Isle and the Cabot Strait. Generally, the movement of water follows through the Cabot Strait, flowing counter-clockwise around the Gulf to the mouth of the St. Lawrence River, across the Magdalen Shallows, and exits via the Cabot Strait. There are large, seasonally-variable runoffs of freshwater into the Gulf, mainly from the St. Lawrence River and rivers of the northern shore of Quebec. Oceanographic conditions in the Gulf are complex. Masses of water with acutely contrasting temperature and salinity come together and mix. The Gulf can be considered a three-layer system during summer; the two upper layers undergo seasonal variations and become one during the winter months (DFO 2005).

Driven by wave and tidal movement, cold, dense water flows into the Gulf along the Strait of Belle Isle from the Arctic via the Labrador Current. Waters from the Atlantic Ocean enter the Gulf via the Cabot Strait, in the Laurentian Channel. The contrasting temperature and salinity is produced during the spring, when an increase in freshwater flow enters the Gulf via the St. Lawrence River, the Saguenay River and other smaller rivers along the shores of Quebec. The result is a higher temperature, low salinity surface layer of water that then begins to flow out of the Gulf into the Atlantic Ocean. Additional freshwater runoff occurs in the fall, driving circulation patterns in the Gulf, and causing the area to show properties of an estuarine environment (DFO 2007a).

At the start of winter, the warmer, low-salinity surface layer flowing into the Atlantic Ocean becomes less buoyant, due to the drop in air temperature and ice formation, and moves downward in the water column. Once spring arrives, a new summer surface layer is created, causing the winter layer to be trapped below. This is referred to as the Cold Intermediate Layer

(DFO 2007a). Water depth in the area is in the range of 400 m to 500 m and the highest waves typically occur between October and January (LGL 2005b).

Further details on the physical environment in and surrounding the Project Area will be discussed in the EA.

4.2 Biological Environment

The majority of the information presented below regarding the biological environment was obtained from the *Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment Amendment Report* (LGL 2007) and the *Environmental Assessment of the Old Harry Prospect Geohazard Program 2010-2020* (Stantec 2010). The sections below provide a highlight of the biological environment. Further details on the biological environment within the Project Area will be presented in the EA.

4.2.1 Species at Risk

The species at risk (according to their Schedule 1 status under *SARA*) that could potentially occur in the Project Area are listed in the Table 4.1. *S*pecies that are not on the *SARA* schedule 1 and may be assessed / designated as *endangered, threatened, or special concern* species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and could potentially occur in the Project Area are listed in Table 4.2. A more detailed analysis will be carried out during preparation of the EA.

Table 4.1 Schedule 1 Species at Risk that could Potentially Interact with the Project

Species	*SARA* Schedule 1 Status
Blue Whale *(Balaenoptera musculus)*	Endangered
North Atlantic Right Whale *(Eubalaena glacialis)*	Endangered
Leatherback Sea Turtle *(Dermochelys coriacea)*	Endangered
Northern Bottlenose Whale *(Hyperoodon ampullatus), Scotian Shelf population*	Endangered
Ivory Gull *(Pagophila eburnean)*	Endangered
Eskimo Curlew (*Numenius borealis*)	Endangered
Piping Plover *melodus* subspecies (*Charadrius melodus melodus*)	Endangered
Roseate Tern (*Sterna dougallii*)	Endangered
Beluga Whale *(Delphinapterus leucas), (St. Lawrence Estuary population)*	Threatened
Northern Wolffish *(Anarhichas denticulatus)*	Threatened
Spotted Wolffish *(Anarhichas minor)*	Threatened
Peregrine Falcon *anatum* subspecies (*Falco peregrines anatum*)	Threatened
Atlantic (striped) Wolffish *(Anarhichas lupus)*	Special Concern
Fin Whale *(Balaenoptera physalus)*, (Atlantic population)	Special Concern
Barrow's Goldeneye (*Bucephala islandica*), (Eastern population)	Special Concern
Harlequin Duck (*Histrionicus histrionicus*), (Eastern population)	Special Concern

Table 4.2 Species Designated 'At Risk' by the Committee on the Status of Endangered Wildlife in Canada that could Potentially Interact with the Project

Species	COSEWIC Designation
Atlantic Cod *(Gadus morhua)*, (Laurentian North Population*)*	Endangered
Atlantic Cod, (Laurentian South Population)	Endangered
Atlantic Cod, (Newfoundland and Labrador Population)	Endangered
Atlantic Cod*)*, (Southern Population)	Endangered
Winter Skate *(Leucoraja ocellata), (Southern Gulf of St. Lawrence population)*	Endangered
Roundnose Grenadier (*Coryphaenoides rupestris)*	Endangered
Porbeagle Shark (*Lamna nasus*)	Endangered
White Shark (*Carcharodon carcharias*), (Atlantic population)	Endangered
Deepwater Redfish (*Sebastes mentella*), (Gulf of St. Lawrence - Laurentian Channel population)	Endangered
Loggerhead Sea Turtle (*Caretta caretta*)	Endangered
Atlantic Salmon (*Salmo salar*), (Anticosti island population)	Endangered
Horned Grebe (*Podiceps auritus*) (Magdalen Islands population)	Endangered
Atlantic Salmon (South Newfoundland population)	Threatened
Deepwater Redfish (Northern Population)	Threatened
Acadian Redfish (*Sebastes fasciatus*), (Atlantic population)	Threatened
Shortfin Mako (*Isurus oxyrinchus*)	Threatened
American Plaice (*Hippoglossus platessoides*), (Maritime population)	Threatened
American Plaice (Newfoundland and Labrador Population)	Threatened
Striped Bass *(Marone saxatilis),* (Southern Gulf of St. Lawrence population)	Threatened
Cusk (*Brosme brosme*)	Threatened
Roughhead Grenadier (*Macrourus berglax*)	Special Concern
Spiny Dogfish (*Squalus acanthias*), (Atlantic population)	Special Concern
Blue Shark (*Prionace glauca*), (Atlantic population)	Special Concern
Basking Shark (*Cetorhinus maximus*), (Atlantic population)	Special Concern
American Eel *(Anguilla rostrata)*	Special Concern
Atlantic Salmon (Gaspé-Southern Gulf of St. Lawrence population)	Special Concern
Atlantic Salmon (Quebec Eastern North Shore population)	Special Concern
Harbour Porpoise *(Phocoena phocoena),* (Northwest Atlantic population)	Special Concern
Killer Whale (*Orcinus orca*)	Special Concern

4.2.2 Fish and Fish Habitat

The marine waters of the Gulf are home to many species of marine fish and shellfish. One of the main reasons for this diversity is the presence of warm, productive waters in the summer followed by cold waters, covered in ice, during the winters. Approximately 20 species of marine fish are currently or have historically been fished commercially or experimentally in the Gulf (DFO 2005).

The Gulf is divided into two zones, the northern and southern Gulf (including the Magdalen Islands). Within each of these zones, fish habitat is divided into two areas, the shelf areas and the deep channels. The shallow waters along the shelf areas are characterized by warm, highly productive waters in the summer, and serve as feeding, nursing and spawning grounds for both demersal and pelagic fish. The shallow waters surrounding the Magdalen Islands support high densities of American plaice and Atlantic cod. These species are the most dominant demersal fish found in the southern Gulf (DFO 2007a). The highly productive, warm water areas also serve as important feeding areas for marine fish that migrate to the area looking for food, such as spiny dogfish and bluefin tuna.

During the winter, the waters in the shelf areas become cold and tend to freeze, resulting in the majority of the marine fish that feed in these areas during the summer migrating out of the area for the winter. Spiny dogfish and mackerel migrate completely out of the Gulf to more southern areas, whereas other species, including Atlantic herring, Atlantic cod, white hake, American plaice, witch flounder and thorny skate, stay within the Gulf, moving into the deeper, warmer waters of the Laurentian Channel and slope. Some of these species remain in this area for the entire winter, while others (Atlantic cod and Atlantic herring) migrate to the entrance of the Laurentian Channel in the Cabot Strait (DFO 2007a). The warmer, deep waters of the Laurentian Channel and slope also serve as feeding, nursing and spawning grounds for certain deep-water and slope species, including redfish, Greenland halibut and witch flounder. Therefore, they do not need to migrate during the winter to avoid harsh conditions (DFO 2007a).

There are three main types of marine fish present in the Gulf: pelagic fish, those that live and feed close to the surface; demersal or groundfish, those that live and feed close to the bottom; and shellfish, which include crustaceans and bivalves. Approximately two-thirds of all marine fish species known to occur in the Gulf are demersal.

A list of the most commonly occurring pelagic and demersal marine fish and shellfish known to inhabit the Gulf in the vicinity of the proposed Project Area are presented in Table 4.3.

Table 4.3 Summary of Fish Species with the Potential to Occur in the Project Area

Common Name	Latin Name	Relative Level of Occurrence in the Project Area	Potential Presence in the Project Area
Atlantic Argentine	*Argentina silus*	Low	Year round
Atlantic Hagfish	*Myzine glutinosa*	Moderate	Year round
Atlantic Herring	*Clupea harengus*	Moderate	Year round; Fall Spawning
Atlantic Mackerel	*Scomber scombrus*	Low	Migrate inshore in the spring; occupy moderately deep waters in winter.
Atlantic Salmon	*Salmo salar*	Low	Year round (adults)
Blue Shark	*Prionace glauca*	Low (anticipated)	Near surface in temperate waters.
Bluefin Tuna	*Thunnus thynnus thynnus*	Low (anticipated)	Migrate in to feed; leave October
Capelin	*Mallotus villosus*	Low	Mature fish migrate inshore in summer (to spawn)

Common Name	Latin Name	Relative Level of Occurrence in the Project Area	Potential Presence in the Project Area
Porbeagle Shark	*Lamna nasus*	Low (anticipated)	More common in Canadian waters in spring, summer and fall.
Smooth Skate	*Raja senta*	Moderate	Year round
Thorny Skate	*Raja radiata*	High	Year round
Winter Skate	*Raja ocellata*	Low	Year round
American Plaice	*Hippoglossus platessoides*	High	Year round
Atlantic Cod	*Gadus morhua*	High	Year round
Atlantic Halibut	*Hippoglossus hippoglossus*	Moderate	Migrate to shallow waters in summer, return for winter
Atlantic Hookear Sculpin	*Artediellus atlanticus*	Low	Year round; Fall spawning
Atlantic Softpout	*Melanostigma atlanticum*	Moderate	Year round
Atlantic Wolffish	*Anarhichas lupus*	Low	Year round; Fall spawning
Black Dogfish	*Centroscyllium fabricii*	Moderate	Year round
Checker Eelpout	*Lycodes uahi*	Low	Year round
Deepwater Redfish	*Sebastes mentella*	High	Year round; Fall spawning
Acadian Redfish	*Sebastes fasciatus*	High	Year round; Fall spawning
Fourbeard Rockling	*Enchelyopus cimbrius*	Low	Year round
Greater Eelpout	*Lycodes esmarki*	Low	Year round
Greenland Halibut	*Reinhardtius hippoglossiodes*	High	Year round
Haddock	*Melanogrammus aeglefinus*	Low	Move to deeper water in winter; inhabit shallow banks in summer
Longfin Hake	*Urophycis chesteri*	High	Year round; Fall spawning
Lumpfish	*Cyclopterus lumpus*	Moderate	Migrate to shallow waters to spawn, return during Fall
Marlin-spike Grenadier	*Nezumia bairdi*	High	Year round; Fall spawning
Monkfish (goosefish)	*Lophius americanus*	Moderate	Year round
Northern Wolffish	*Anarhichas denticulatus*	Low	Year round; Fall spawning
Polar Sculpin	*Coltunculus microps*	Low	Year round

Common Name	Latin Name	Relative Level of Occurrence in the Project Area	Potential Presence in the Project Area
Pollock	*Pollachius virens*	Low	Migrate inshore during summer, winter offshore; Fall spawning
Roundnose Grenadier	*Coryphaenoides rupestris*	Low	Year round; Fall spawning
Roughhead Grenadier	*Macrourus berglax*	Moderate	Year round
Sea Raven	*Hemitripterus americanus*	Low	Year round; Fall spawning
Shortfin Mako	*Isurus oxyrinchus*	Low (anticipated)	Year round
Silver Hake	*Merluccius bilinearis*	Low	Year round
Spiny Dogfish	*Squalus acanthias*	Low	Present off southwestern NL in June, moves to southern Labrador late summer
Spotted Wolffish	*Anarhichas minor*	Low	Year round; Fall spawning
Threebeard Rockling	*Gaidropsarus ensis*	Low	Year round
White Barracudina	*Notolepis rissoi*	Moderate	Year round
White Hake	*Urophycis tenuis*	High	Year round
Windowpane Flounder	*Scophthalmus aquosus*	Low	Year round
Witch Flounder (greysole)	*Glyptocephalus cynoglossus*	High	Year round
Wrymouth	*Cryptacanthodes maculatus*	Low	Year round
Yellowtail Flounder	*Limanda ferruginea*	Low (anticipated)	Move from shallow to deep waters in the Fall

Both the Atlantic cod and redfish (both ‘at risk’ species) are known to spawn in the vicinity of the Project Area. Spawning of Atlantic cod typically occurs between April and June. Redfish tend to mate in the fall (September to December) and larval extrusion occurs between April and July. A few other species are believed to spawn during the winter in the Laurentian Channel and include the Greenland halibut and various species of wolffish (an ‘at risk’ species).

4.2.3 Marine Birds

Hundreds of species of marine birds can be found in the Gulf and are divided into four groups:

- inshore birds;
- waterfowl;
- shorebirds; and
- offshore / pelagic birds.

The most common inshore seabirds found in the Gulf include the Great Black-backed Gull (*Larus marinus),* Herring Gull (*Larus argentatus*), Ring-billed Gull (*Larus delawarensis*), Black-headed Gull (*Larus ridibundus*), Caspian Tern (*Sterna caspia*), Common Tern (*Sterna hirundo*), Arctic Tern (*Sterna paradisaea*) and Leach's Storm-Petrel (*Oceanodroma leucorhoa*). The most common offshore seabirds in the Gulf include the Northern Gannet (*Morus bassanus*), Great Cormorant (*Phalacrocorax carbo*), Double-crested Cormorant (*Phalacrocorax auritus*), Black-legged Kittiwake (*Rissa tridactyla*), Atlantic Puffin (*Fratercula arctica),* Black Guillemot (*Cepphus grille*), Common Murre (*Uria aalge*), Thick-billed Murre (*Uria lomvia*), and Razorbill (*Alca torda*).

Inshore birds feed in shallow waters, including shelf areas, and tend to return to land to rest over night. They include species such as cormorants, gulls and terns. Waterfowl species include eiders and scoters and there are approximately 18 different species of waterfowl found in the Gulf. Shorebirds are not present in the Gulf year-round; instead, they stop to feed in the area (in late summer to early fall) during their migration from the Arctic to more southern environments. Offshore or pelagic birds feed at sea over deep waters and do not have to return to land to rest. However, they do return to land to breed in rocky cliffs and on islands. Such species include auks and petrels (DFO 2007a).

Inshore and offshore birds can be referred together as seabirds, and there are approximately 18 different species of breeding seabirds found in the Gulf. The majority of seabirds found in the Gulf nest in the Gaspé Peninsula and along Quebec's north shore, with smaller numbers found in western Newfoundland and the southern Gulf, due to the lack of suitable breeding habitats. At the end of the breeding season (typically fall), seabirds return to their offshore feeding areas (most commonly the waters of the Cabot Strait as they do not freeze over) or migrate to subtropic areas (DFO 2007a).

Generally, the marine coast and waters of western Newfoundland have lower abundances of seabirds, as these areas are less influenced by major oceanic currents, the adjacent waters have lower productivity and there is limited breeding habitat along the west coast of Newfoundland. Seabirds that could be present in the Project Area include shearwaters, fulmars, petrels, jaegers, skuas, phalaropes, gannets, cormorants, alcids, kittiwakes and gulls (LGL 2007). Some species of seabirds nest in the South Atlantic during the northern hemisphere winter, such as the Greater Shearwater (*Puffinus gravis*), Sooty Shearwater (*Puffinus griseus*) and Wilson's Storm-Petrel (*Oceanites oceanicus*), and are present in Newfoundland waters during the summer and early fall (July to October) (LGL 2005b).

Seabirds, in general, tend to be most abundant near the Project Area between January through September and least abundant during October to December (LGL 2007). During the nesting season, seabirds concentrate around large nesting colonies. Birds nesting along the western portion of Newfoundland and the Magdalen Islands can be found in the Project Area. Nesting species include waterfowl (eiders and scoters), seabirds (gannets, gulls, kittiwakes, terns and alcids) and shorebirds. Eggs are typically laid in late May to June and most species have left the area by July to August, with Northern Gannets leaving later in October to November.

Of all the seabirds that could be found within or near the Project Area, only the Ivory Gull is listed as endangered under Schedule 1 of *SARA* and is also designated endangered by COSEWIC.

4.2.4 Marine Mammals and Sea Turtles

Marine mammals present in the Gulf can be sub-divided into two orders: Pinnipedea (seals) and Cetacea (whales, dolphins, and porpoises). A total of 22 species of marine mammals and sea turtles can be found near the Project Area in the Gulf (LGL 2007). A summary of the species of marine mammal and sea turtles potentially present in the Gulf within the vicinity of the Project Area are listed in Table 4.4; some of these are species at risk (see Section 4.3.1). The majority of these mammals are seasonal inhabitants as the waters of the Gulf serve as feeding grounds. The majority of the sightings of these species have occurred during the spring, summer and early fall months.

Table 4.4 Marine Mammals and Sea Turtles Found Within or Near the Project Area

Common Name	Latin Name	Potential Presence in the Project Area
Mysticetes (Toothless or Baleen Whales)		
North Atlantic Right Whale	*Eubalaena glacialis*	Rare
Minke Whale	*Balaenoptera acutorostrata*	Common
Fin Whale	*Balaenoptera physalus*	Common
Sei Whale	*Balaenoptera borealis*	Data Deficient
Blue Whale	*Balaenoptera musculus*	Uncommon
Humpback Whale	*Megaptera novaeangliae*	Common
Odontocetes (Toothed Whales)		
Harbour Porpoise	*Phocoena phocoena*	Common
Atlantic White-sided Dolphin	*Lagenorhynchus acutus*	Common
White-beaked Dolphin	*Lagenorhynchus albirostris*	Common
Long-finned Pilot Whale	*Globicephala melas*	Common
Killer Whale	*Orcinus orca*	Uncommon
Beluga	*Delphinapterus leucas*	Rare

Common Name	Latin Name	Potential Presence in the Project Area
Northern Bottlenose Whale	*Hyperoodon ampullatus*	Uncommon
Sperm Whale	*Physeter macrocephalus*	Common
Common (short-beaked) Dolphin	*Delphinus delphis*	Common
Pinnipedea (Seals)		
Harbour Seal	*Phoca vitulina*	Uncommon
Grey Seal	*Halichoerus grypus*	Common
Harp Seal	*Phoca groenlandica*	Common
Hooded Seal	*Crystophora cristata*	Common
Sea Turtles		
Leatherback Sea Turtle	*Dermochelys coriacea*	Seasonally Common
Loggerhead Sea Turtle	*Caretta caretta*	Uncommon
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Very Rare

Of the 15 Cetacean species found in the Gulf, there are six species of baleen whales (fin, minke, blue, humpback, sei and North Atlantic right whale). The majority of these species use the Gulf as feeding grounds, with the Laurentian Channel and the Magdalen Islands being popular areas (DFO 2005). Humpback, fin and minke whales are less common off the west and southwest coasts of the Island of Newfoundland than elsewhere off the coast of insular Newfoundland (LGL 2005b). Humpback whales feed in the Gulf during the summer; however, the majority of their sightings have been in the northeastern part of the Gulf. There is evidence that fin whales are present in the Gulf from July to September and tend to migrate through the Laurentian Channel to winter off northern Nova Scotia. Minke whales have also been observed in the Gulf from July to September but are more frequent in the northern Gulf (LGL 2005b). Blue whales can be found in the Gulf from January through November. However, they are most abundant from August to October (LGL 2005b). North Atlantic right whales are only occasionally sighted in the Gulf and are rare to waters off western Newfoundland (LGL 2005b). Sei whale sightings in the vicinity of the Project Area have also been limited (LGL 2007).

The blue whale and the North Atlantic right whale are both listed as endangered under Schedule 1 of *SARA*. The fin whale has been listed as a species of special concern under Schedule 1 of *SARA*. There are nine species of toothed whales that could potentially be found near or within the Project Area. The sperm whale, long-finned pilot whale, Atlantic white-sided and common dolphin and harbour porpoise are likely to be common in the western Newfoundland offshore region, whereas the northern bottlenose whale, killer whale and white-beaked dolphin are likely to be uncommon in this area and the beluga is considered rare (LGL 2005b).

The distribution of sperm whales is based highly on their social structure, whereby adult females and young are typically found in tropical and subtropical waters and adult males in higher latitude waters. Sperm whales are capable of diving to depths greater than 1,200 m to feed and can stay submerged for greater than two hours at a time; however, they majority of their dives last approximately a half hour. Sperm whales are generally distributed over areas of steep underwater topography, as are the long-finned pilot whale. The majority of the sightings of the Atlantic white-sided dolphin the Gulf were also recorded in areas with steep bottom topography. Evidence suggests that the harbour porpoise is common to the northern portion of the Gulf from July to September; however, sightings also show this species to be present in the southern and central portions of the Gulf as well (LGL 2005b).

A cetacean distribution study conducted by DFO in the summer of 2007 (Lawson and Gosselin 2009) found dolphins (unknown species) to be the most abundant species sighted in the Cape Breton, Gulf and Scotian Shelf survey area, overall. This was also true within the vicinity of the Project Area.

The northern bottlenose whale (Scotian Shelf population) has been listed as endangered under Schedule 1 of *SARA* and the beluga whale (St. Lawrence Estuary population) is listed as threatened under Schedule 1 of SARA. The harbour porpoise is designated as a species of special concern by COSEWIC. The killer whale is designated as a species of special concern by COSEWIC.

There are four species of seals potentially found near and within the Project Area (harbour seal, harp seal, hooded seal and the grey seal). Both the harp and hooded seals are migratory species, whereas the harbor and grey seals are year round resident species (DFO 2005). The harp seal is likely common in the Project Area during late fall to early spring and rare during other times of the year (LGL 2005b). The hooded seal is likely to be common in the Project Area in the spring and rare during other times of the year. Both the harbour and grey seals are likely to be common in the Project Area, with the distribution of the harbour seal being continuous in the Gulf and that of the grey seal to be more concentrated in the south (LGL 2005b).

There are three species of sea turtles that could potentially inhabit the proposed Project Area: leatherback sea turtle; loggerhead sea turtle; and Kemp's ridley sea turtle.

The leatherback sea turtle is a migratory species, moving between breeding and feeding areas. They tend to migrate into the Gulf during the summer to feed on the abundance of jellyfish (DFO 2005). The leatherback turtle is listed as an endangered species under Schedule 1 of *SARA*. The presence of both the loggerhead turtle and Kemp's ridley turtle in the offshore area of western Newfoundland is considered to be rare. The loggerhead turtle is designated as endangered by COSEWIC.

4.2.5 Sensitive Areas

The Project Area is within the Gulf of St. Lawrence Large Ocean management Area (Gulf LOMA) (Figure 4.1). Within the Estuary and Gulf, 10 areas have been designated / nominated as ecologically and biologically significant areas (EBSA) and they include:

- Western Cape Breton;
- St. George's Bay;
- Northumberland Strait;
- the southern fringe of the Laurentian Channel;
- the south-western coast of the Gulf;
- the lower estuary;
- Western Anticosti Island;
- Northern Anticosti Island;
- the Strait of Belle Isle; and
- the west coast of Newfoundland.

The two ESBAs that would be of interest with respect to the proposed Project include the southern fringe of the Laurentian Channel and the west coast of Newfoundland. However, neither of these ESBAs fall within the Project Area.

The southern fringe of the Laurentian Channel EBSA covers approximately 5,941 km^2 and is illustrated in Figure 4.1 (DFO 2007b). This area is characterized by its average to maximum uniqueness, average concentration and adaptive values for pelagic fish and for its low to average uniqueness and average concentration and adaptive values for groundfish. However, this area only partially covers a critical wintering area for the Atlantic cod, omitting the southern slope in the Cabot Strait. The middle of the channel also serves as wintering areas for a number of groundfish species. The southeastern boundary of this area overlaps slightly with the Cape Breton Channel, which serves as a migration corridor for the southern Gulf stock of the Atlantic cod, coastal white hake and other groundfish species during the spring and fall. This area also serves as feeding grounds for witch flounder and deep-water white hake. The northeastern boundary of this area is also important for marine mammals (DFO 2007b).

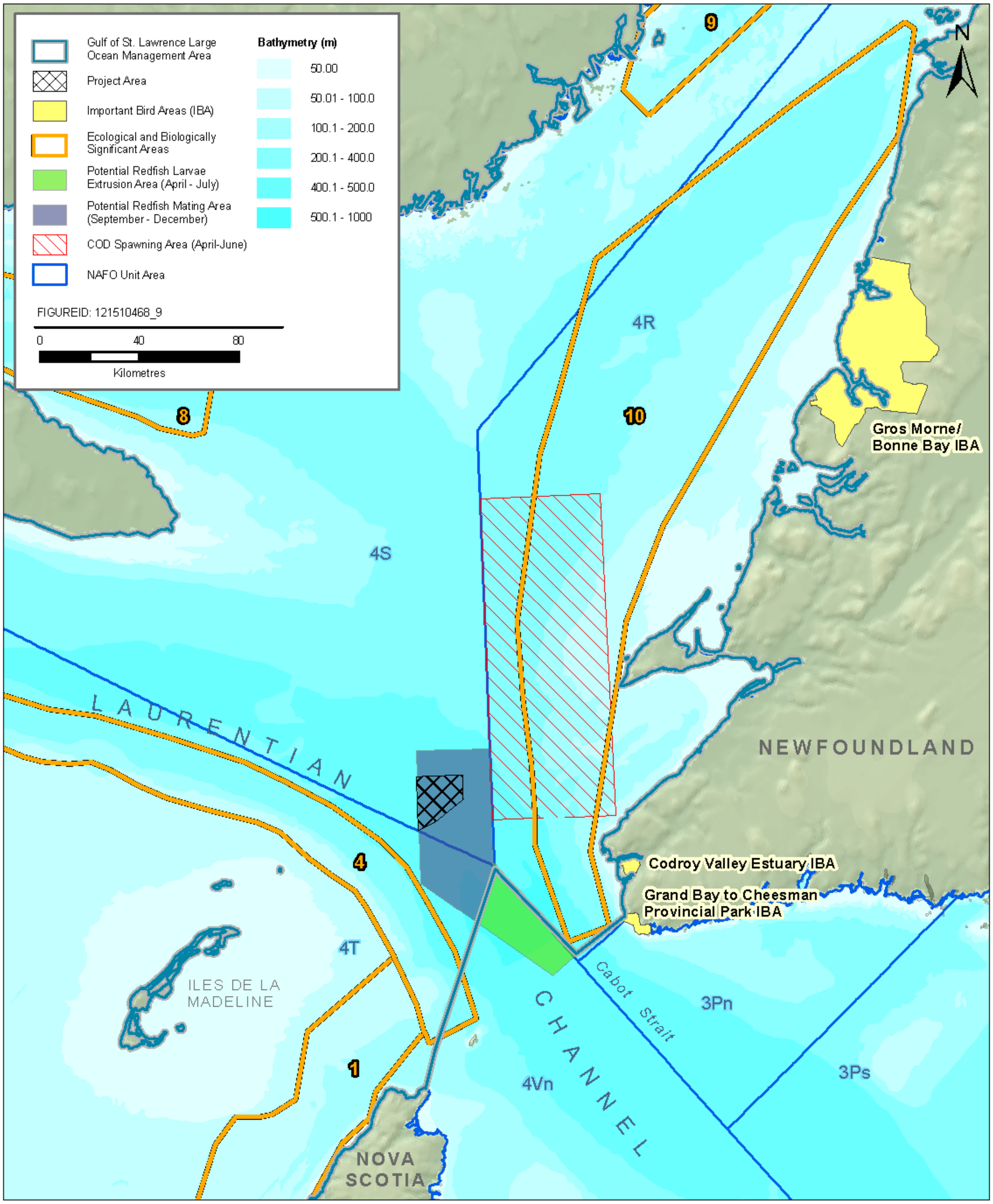


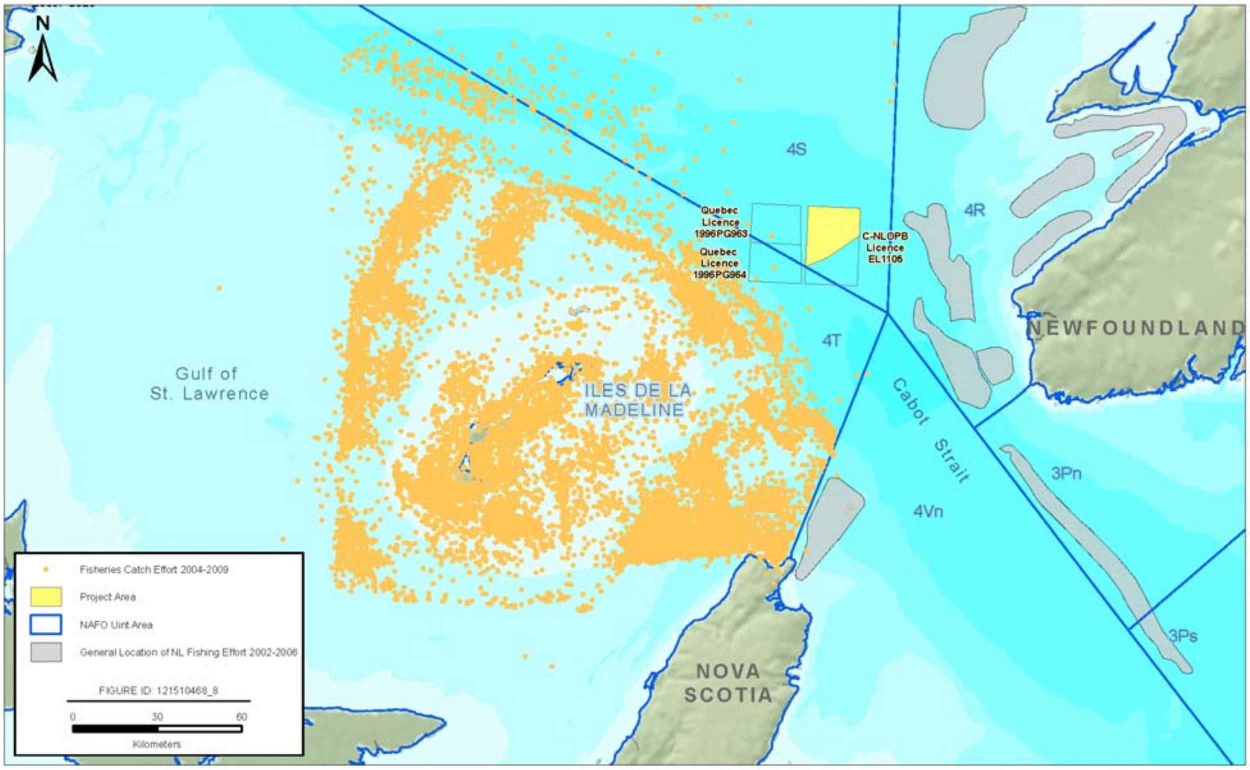
Figure 4.1 Sensitive Areas near EL 1105

The west coast of Newfoundland EBSA covers approximately 18,238 km^2 and is illustrated in Figure 4.1 (DFO 2007b). This area is characterized for its maximum uniqueness, concentration and adaptive values for groundfish, its low to average uniqueness, average to maximum concentration and adaptive values for pelagic fish and its low to maximum uniqueness, concentration and adaptive values for marine mammals. Groundfish populations concentrate in a number of areas found within or partially within this EBSA. Western Newfoundland serves as the main area for juvenile Atlantic cod, redfish, American plaice and Atlantic wolffish (all designated as 'at-risk' species). The Esquiman Channel, which is not entirely covered by this EBSA, is used as a migration corridor for Atlantic cod and redfish. This corridor can be heavily populated during spring and fall. The Esquiman Channel serves as a refuge area for Atlantic herring and a summer feeding ground for the Atlantic herring, spiny dogfish, silver hake and pollock. This area also serves as the principal cod spawning area and capelin and Atlantic herring larvae are also in abundance. The northern- and southern-most areas of this EBSA are most important for marine mammals.

The Project Area is within a potential redfish mating area (blue area in Figure 4.1) and is north of potential redfish larvae extrusion area (green area in Figure 4.1). In addition, there are three IBAs in insular Newfoundland that could interact with the Project (yellow areas in Figure 4.1).

4.2.6 Commercial Fisheries

This area of the Gulf is commercially fished by fleets from Quebec and all four Atlantic provinces. Management of the commercial fishing activity in the Gulf by Fisheries and Oceans Canada (DFO) is conducted through the Quebec, the Maritimes, the Gulf and the Newfoundland Regional offices. Many of the major species are fished according to quota systems (e.g., groundfish and crab), while others are fished according to availability (e.g., herring and mackerel) or specific season lengths (e.g., lobster and crab). Licenses and quotas are set by DFO for individual species management areas, Northwest Atlantic Fisheries Organization (NAFO) divisions and subdivisions. The NAFO divisions and species capture in these NAFO areas are illustrated in Figure 4.2. All major fish groups, including groundfish, pelagic and shellfish, harvested in the Project Area occur in NAFO subdivisions 4Tf and 4Ss and include mackerel, herring, spiny dogfish, eel, skate, blue shark, shortfin mako, porbeagle, American plaice, Atlantic halibut, catfish, cod, Greenland halibut, haddock, witch flounder, winter flounder, monkfish, pollock, redfish, scuplins, tomcod, white hake, windowpane flounder, yellowtail, lobster, shrimp, snow crab, rock crab, toad crab, Atlantic razor clam, scallop, soft-shell clam, squid, Stimpson's surf clam, surf clam and whelk. Fisheries around insular Newfoundland include snow crab, redfish, Atlantic cod, herring, monkfish and white hake (the shaded polygons in Figure 4.2 indicates the general location of all species harvested around insular Newfoundland from 2002 to 2006). Updated commercial catch data has been requested and will be incorporated into the EA.



Note: General location of NL fishing effort is based on information in Jacques Whitford (2007) and LGL (2007).

Figure 4.2 Fishing Effort in the Vicinity of the Project Area

Fish species typically caught in the vicinity of the Project Area include redfish, Atlantic cod, snow crab, Greenland halibut, Atlantic halibut and white hake. The timing of the harvesting of these species is dependent upon weather, ice conditions, species availability and fish management plans. Harvesting of the above species can occur from June to November, with the busiest months from July and August.

Plans will be developed to avoid or lessen any potential effects on the commercial fishery as a result of the proposed Project, if necessary. These plans will be identified in the EA.

4.3 Marine Traffic

The Project Area is adjacent to the major shipping route that traverses the St. Lawrence River estuary and across the Gulf immediately south of Anticosti Island (LGL 2005b). Traffic density in this vicinity is four to eight ships per day, many of which are container vessels (LGL 2005b). DFO carries out stock assessment surveys and research activities throughout the maritime marine environment, which may overlap with proposed Project activities. The DFO Science Advisory Schedule will be accessed on-line (http://www.meds-sdmm.dfo-mpo.gc.ca/csas/applications/events/eventIndex_e.asp#March) closer to the time of the proposed surveys to determine if there are any DFO activities scheduled to overlap with the Project.

There is no known military use of the Project Area, nor any anticipated active petroleum industry sites within the vicinity of Old Harry Prospect. While there are several exploration licenses in the coastal waters of Western Newfoundland, none exist in the offshore Old Harry Prospect area other than those held by Corridor. As such, marine transportation dominates other potential users of the Laurentian Channel area and further discussion of other users will focus on marine traffic.

Vessel traffic in the area of the proposed location of the exploration well is an important consideration. The main navigation lane between the Cabot Strait and the St. Lawrence River is in the vicinity of the proposed Project location. The majority of vessels enter the Gulf via the Cabot Strait. However, there may be other vessel traffic along shipping routes through the Strait of Canso and the Strait of Belle Isle. The main shipping lanes through the Gulf St. to Montreal overlap with the proposed work. Additional global shipping lanes exist in close proximity to the proposed Project Area, including those routes between the Maritimes and Europe, the Maritimes and the US and within the Atlantic Provinces (Geocommons 2010).

Vessel traffic and vessel size in the Gulf tends to fluctuate due to freezing during the winter months. Traffic between the Magdalen Islands and St. Lawrence, Newfoundland and Labrador, is highest during July and August, but remains steady from April to November. Traffic between St. Anthony and the Magdalen Islands tends to be steady from June to November. Further discussions regarding shipping routes will be presented in the EA.

5.0 PUBLIC CONSULTATION

Corridor understands the importance of communicating with key stakeholders, including fisheries organizations, environmental organizations, First Nations representatives, regulators, provincial, federal and municipal governments, media and others. Corridor has already begun the consultation process and will continue with its efforts throughout the EA process.

In order to assist in the scoping of the effects assessment, the identification of appropriate mitigation and addressing of any issues of concern, Corridor and its consultants will undertake a consultation program with key stakeholders, including but not limited to:

- DFO;
- Environment Canada;
- Canadian Environmental Assessment Agency;
- NEB;
- Government officials and elected representatives, in particular inside the provincial governments of Newfoundland and Labrador and Quebec;
- Fisheries groups and civic leaders in Newfoundland and Labrador, including One Ocean, the Fish Food and Allied Workers (FFAW), the Seafood Producers' Association, and representatives in Western Newfoundland; and
- Fisheries groups and municipality representatives on Quebec's Magdalen Islands, including Regroupement des pêcheurs professionnels des Îles-de-la-Madeleine (RPPIM), Regroupement des palangriers et pétoncliers uniques madelinots (RPPUM), Association des pêcheurs propriétaires des Îles-de-la-Madeleine (APPIM), and Association of Inshore Fishermen of the Magdalen Islands.

Corridor also intends on participating in an Oil and Gas Forum being organized by the municipality of the Magdalen Islands for mid-April 2011. This will be an opportunity for Corridor to make a presentation on its proposed one well exploration program, reaching the broad range of stakeholders invited from the communities around the Gulf.

The Corridor website will also be used as an information tool. A description of the proposed exploration well will be posted as well as regular updates.

Overall, the consultation for the proposed exploration project is designed to foster open, two-way dialogue with key stakeholders. Through this process, Corridor will identify important issues and reflect those in its planning for this proposed exploration well. The results of the public consultation program will be compiled in the Environmental Assessment Report.

6.0 REFERENCES

CAPP (Canadian Association of Petroleum Producers). 2001. *Offshore Drilling Waste Management Review*. Technical Report, 2001-0007: 268 pp.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2000. *Guidelines Respecting Drilling Programs in the Newfoundland Offshore Ar*ea.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2008. *Geophysical, Geological, Environmental and, Geotechnical Program Gu*idelines. Available at URL: http://www.cnlopb.nl.ca/pdfs/guidelines/ggegpg.pdf

C-NLOPB and CNSOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2009. *Drilling and Production Guidelines*. Draft.

DFO (Fisheries and Oceans Canada). 2005. *The Gulf of St. Lawrence, a Unique Ecosystem*. Oceans and Science Branch.

DFO (Fisheries and Oceans Canada). 2007a. Estuary and Gulf of St. Lawrence Marine Ecosystem Overview and Assessment Report. *Canadian Technical Report of Fisheries and Aquatic Sciences*, 2744E.

DFO (Fisheries and Oceans Canada). 2007b. Ecologically and Biologically Significant Areas (EBSA) in the Estuary and Gulf of St. Lawrence: Identification and characterization. *Canadian Science Advisory Secretariat Report*, 2007/016.

GESAMP (Group of Experts on the Scientific Aspects of Marine Pollution). 1993. *Impact of Oil and Related Chemicals and Wastes on the Marine Environment*. GESAMP Reports and Studies No. 50. IMO / FAO / UNESCO / WMO / WHO / IAEA / UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution, London, UK. 180 pp.

GeoCommons. 2010. *The Global Shipping Lane Network at GeoCommons Maker*. Available at URL: http://maker.geocommons.com/maps/5254 (accessed on March 7, 2010).

Hurley, G. and J. Ellis. 2004. *Environmental Effects of Exploratory Drilling Offshore Canada: Environmental Effects Monitoring Data and Literature Review - Final Report*. Prepared for the Canadian Environmental Assessment Agency - Regulatory Advisory Committee.

Husky Oil Operations Limited. 2000. *White Rose Oilfield Comprehensive Study*. Submitted by Husky Oil Operations Limited as Operator, St. John's, NL.

Husky Oil Operations Limited. 2001. *White Rose Oilfield Comprehensive Study Supplemental Report Responses to Comments from Canada-Newfoundland Offshore Petroleum Board, Department of Fisheries and Oceans, Environment Canada, Natural Resources Canada and Canadian Environmental Assessment Agency*. Submitted by Husky Oil Operations Limited (Operator). 265 pp. + Appendices.

Jacques Whitford. 2007. *Strategic Environmental Assessment Sydney Basin Offshore Area*. Prepared for the Canada-Newfoundland and Labrador Offshore Petroleum Board, St. John's, NL.

Lawson, J.W., and J.-F. Gosselin. 2009. Distribution and preliminary abundance estimates for cetaceans seen during Canada's marine megafauna survey – A component of the 2007 TNASS. *Canadian Science Advisory Secretariat Research Document*, 2009/031: vi + 28 pp.

Lavoie, D. N. Pinet, J. Dietrich, P. Hannigan, S. Castonguay, A.P. Hamblin and P. Giles. 2009. *Petroleum Resource Assessment, Paleozoic Successions of the St. Lawrence Platform and Appalachians of Eastern Canada*. Geological Survey of Canada, Open File Report 6174, 273 pp.

LGL Limited. 2005a. *Husky Delineation / Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment*. LGL Report SA845 by LGL Limited, Oceans Limited, Canning & Pitt Associates Inc., and PAL Environmental Services for Husky Oil Operations Limited, St. John's, NL.

LGL Limited. 2005b. Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment, prepared for C-NLOPB.

LGL Limited. 2007. *Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment Amendment*. Prepared for the Canada-Newfoundland and Labrador Offshore Petroleum Board, St. John's, NL.

NEB, C-NOPB and CNSOPB (National Energy Board, Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2009. *Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands*.

NEB, C-NLOPB and CNSOPB (National Energy Board, Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2010. *Offshore Waste Treatment Guidelines.*

Stantec Consulting Ltd. 2010. Environmental Assessment of the Old Harry Prospect Geohazard Program: 2010 – 2020. Prepared for Corridor Resources Inc., Halifax, NS. v + 128 pp. + Appendices.

Thomas, D.J., G.D. Greene, W.S. Duval, K.C. Milne and M.S. Hutcheson. 1984. *Offshore Oil and Gas Production Waste Characteristics, Treatment Methods, Biological Effects and Their Application to Canadian Regions*. Final Report. Environment Canada, Ottawa, ON.

Williams, U., F. Power, B. Wylie, R. Dugal, M. Fefer, J. Kiceniuk, B. Hunter, J. Payne and E. DeBlois. 2002. *Update on Environmental Implications of the Cuttings Management Option Selected for Use on the Terra Nova Offshore Oil Development*. Presented at IBC 10th Annual International Conference, Minimizing the Environmental Effects of Drilling Operations, 4-5 March, 2002. London, UK. 43 pp.