

EnCana Corporation  
DEEP PANUKE OFFSHORE GAS DEVELOPMENT  
PROJECT DESCRIPTION

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## INTERPRETATION

In this Project Description, unless the context otherwise requires,

“*Accord Act*” means the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act, S.C. 1988, Chapter C-7.8, as amended*;

“Agency” means the Canadian Environmental Assessment Agency;

“*CEAA*” means the *Canadian Environmental Assessment Act, S.C. 1992, c. 37, as amended*;

“*CEPA*” means the *Canadian Environmental Protection Act, S.C. 1999, c. 33, as amended*;

“CNSOPB” means the Canada-Nova Scotia Offshore Petroleum Board established under the *Accord Act* and the *Provincial Accord Act*;

“CSR” means a comprehensive study report contemplated by Section 21 of *CEAA*;

“Cohasset Project” means the Cohasset-Panuke offshore oil project development plan approved by the CNSOPB, with conditions, in 1990;

“Cohasset Decommissioning Project” means the amendment to the Cohasset Project approved by the CNSOPB, with conditions, in 2004;

“COSEWIC” means the Committee on the Status of Endangered Wildlife in Canada, established by Section 14 of *SARA*;

“Deep Panuke” and “Project” means the Deep Panuke Offshore Gas Development Project;

“Development Plan Application” and “DPA” means an application filed by EnCana Corporation to the CNSOPB seeking approval for its development of the Project;

“EA” means Environmental Assessment;

“EIS” means Environmental Impact Statement;

“FEAC” means Federal Environmental Assessment Coordinator as that term is defined in *CEAA*;

“Federal Authority” means federal authority as that term is defined in *CEAA*;

“*Federal Authorities Regulations*” means the *Federal Authorities Regulations SOR/96-280*;

“*Federal Coordination Regulations*” means the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements, SOR/97-181*;

“*Law List Regulations*” means the *Law List Regulations, SOR/94-636*;

“M&NP” means Maritimes and Northeast Pipeline;

“MOPU” means Mobile Offshore Production Unit;

“NEB” means the National Energy Board;

“Offshore Chemical Selection Guidelines” means the guidelines by that name published by the CNSOPB;

“Offshore Waste Treatment Guidelines” means the guidelines by that name published by the CNSOPB;

“*Provincial Accord Act*” means the *Canada-Nova Scotia Offshore Petroleum Accord Implementation (Nova Scotia) Act, S.N.S. 1987, Chapter 3*, as amended;

“Responsible Authority” and “RA” means responsible authority as that term is defined in *CEAA*;

“SARA” means the *Species at Risk Act, S.C. 2002, Chapter 29*;

“SOEP” means Sable Offshore Energy Project.

# 1 INTRODUCTION

This document is a project description for the Deep Panuke Offshore Gas Development Project (the Deep Panuke Project, the Project) proposed by EnCana Corporation (EnCana). A project description is required to initiate the *Federal Coordination Regulations* process under the *Canadian Environmental Assessment Act (CEAA)* to which the Project is subject. The project description identifies the basic features of the Project and potentially affected areas. It is provided to Federal Authorities with potential decision-making responsibility under *CEAA* (Responsible Authorities) and expert knowledge relevant to the evaluation of potential project effects. The purpose of the project description is to determine the need for an environmental assessment (EA) and to promote efficient coordination of the EA process.

## 1.1 Project Overview

In 1996, EnCana, then PanCanadian Petroleum Limited, purchased a 50 percent interest in and became the operator of the Cohasset Project near Sable Island. While producing oil from the Cohasset Project, EnCana was also conducting exploration drilling in the area. In February of 2000, EnCana announced the discovery of a potentially significant natural gas reservoir in the Deep Panuke location. Further delineation drilling results led EnCana to file a Development Plan Application (DPA) with the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) in March 2002 and conduct an EA under *CEAA*. A Comprehensive Study Report (CSR) was submitted by EnCana and later approved by the Minister of Environment in December 2002. The DPA was withdrawn by EnCana in December 2003, prior to completion of the regulatory review cycle, to allow further evaluation of the reservoir. Between 2003 and 2006, EnCana completed the re-evaluation phase and intends to re-file the DPA and National Energy Board (NEB) application, amended as necessary to include the changes from the original applications. The EA, conducted on the variations between the Project basis in the approved 2002 CSR and the revised Project basis, will be filed under *CEAA* and as a component of the DPA and NEB applications.

EnCana holds a majority working interest in and is the operator of Deep Panuke, which is located approximately 250 kilometers (km) southeast of Halifax, Nova Scotia, on the Scotian Shelf. The Project design consists of a jack-up mobile offshore production unit (MOPU) in a water depth of approximately 44 meters (m). The Project will initially include re-completing four previously drilled wells and drilling one production well and one acid gas injection well. Up to three additional subsea production wells could be drilled based on pool performance. These wells would be drilled after production start-up and at least one full year of production. All subsea wells will have horizontal trees and will be tied back individually to the MOPU with subsea flowlines and control umbilicals. See Appendix 1 for the Location Map.

The export system will consist of a single subsea pipeline delivering Deep Panuke sales product to one of two delivery points:

- Goldboro, Nova Scotia, to an interconnection with M&NP (herein referred to as M&NP Option), or
- Sable Offshore Energy Project (SOEP) 26-inch subsea pipeline at a close point on the pipeline route to Goldboro (herein referred to as SOEP Subsea Option).

The gas processing system will include inlet compression, separation, sweetening, dehydration, export compression, and measurement. Deep Panuke is a sour gas reservoir with raw gas containing approximately 0.2 percent hydrogen sulphide (H<sub>2</sub>S); therefore, gas sweetening equipment is required. Acid gas processing will be performed offshore through the application of an amine unit to remove H<sub>2</sub>S and carbon dioxide (CO<sub>2</sub>), also known as acid gas. Subsequent to its removal from the raw gas stream, the acid gas will be disposed by injection into a suitable reservoir.

For the M&NP Option, hydrocarbon dewpointing is required on the MOPU. The condensate stream will be treated and used for fuel. Currently, it is estimated that there will be no surplus condensate produced beyond fuel usage; however, in the event that condensate must be injected, it will be disposed with the acid gas stream in the injection well. For the SOEP Subsea Option, treated condensate will be re-combined with the gas in the multiphase export pipeline.

The production facility will have a design capacity of 300 MMscfd sales gas with turndown capability to 40 MMscfd.

The major differences between the revised Project basis and the Project basis as previously approved in the 2002 CSR include:

- subsea wellheads with subsea tie-backs versus platform wells;
- single integrated installation (MOPU) versus three fixed platforms;
- revised field center location;
- reduced gas export capacity; and
- increased produced water discharge rate.

In addition to these differences, the SOEP Subsea Option export pipeline consists of a multiphase pipeline tied into the SOEP 26 inch subsea pipeline at a close location.

## 1.2 Proponent Information

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## 1.3 Regulatory Overview

The Deep Panuke Project involves three separate but integrated regulatory processes:

- Comprehensive Study Process (*CEAA* Process);
- Development Plan Application Process (*CNSOPB* Process); and
- *NEB* Process.

Proposed production installations and development drilling for offshore oil and gas are subject to EA under *CEAA*. Amendments to the *Federal Authorities Regulations* in January 2001 designated the *CNSOPB* as a Federal Authority under *CEAA*. The *CNSOPB* will therefore be a Responsible Authority (RA) for the EA. The Canadian Environmental Assessment Agency is expected to be the Federal Environmental Assessment Coordinator (FEAC) and, together with the *CNSOPB*, will lead the Environmental Assessment process for the Project.

Application of the *Federal Coordination Regulations* process under *CEAA* requires federal departments with decision making responsibility or expert knowledge to declare their interest in the project. The likely RAs for this project and potential respective *CEAA* “triggers” include:

- *CNSOPB* (approval of a development plan, under Section 143(4)(a) of the *Accord Act*, referred to as item 1.2 in Schedule I, Part I of the *Law List Regulations*);
- Fisheries and Oceans Canada (authorizations under Sections 32, 35 and 37 of the *Fisheries Act*, referred to as item 6 in Schedule I, Part I of the *Law List Regulations*);
- Environment Canada (Disposal at Sea permit under paragraph 127(1) of the *CEPA*, referred to as item 3 in Schedule I, Part I of the *Law List Regulations*);

- Transport Canada (paragraph 5(1) of the *Navigable Waters Protection Act*, referred to as item 11 in Schedule I, Part I of the *Law List Regulations*);
- Industry Canada (paragraph 5(1)(f) of the *Radiocommunication Act*, referred to as item 13 in Schedule I, Part I of the *Law List Regulations*); and
- NEB (Certificate under Section 52 of the *National Energy Board Act* related to the pipelines, referred to as item 7 in Schedule II of the *Law List Regulations*).

The CNSOPB requires an Environmental Impact Statement (EIS) as a condition of their approval process. The NEB requires an EA as a condition of their approval process. Based on pre-filing consultation with the regulators, EnCana's EA report will also form the EIS portion of the DPA and the EA for the NEB application.

In 2002, EnCana conducted an EA in the form of a comprehensive study under *CEAA*. The Project basis at the time included three platforms, platform wells, delivery of 400 MMscfd sales gas to shore via a 24 inch pipeline, and interconnection with M&NP's facilities. EnCana submitted a CSR and received Ministerial approval in December 2002. In February 2003, EnCana requested a regulatory time-out to allow further evaluation of the Deep Panuke Project. In December 2003, EnCana withdrew the DPA to allow further review of the reservoir.

Between 2003 and 2006, EnCana re-evaluated the reservoir and facilities to determine the optimum project basis. As part of pre-filing consultation with regulators, EnCana identified elements of the previously approved CSR that are still valid for the revised Project. It is EnCana's position that those elements need not be reassessed during the revised Project's EA according to Section 24 of *CEAA*. Section 24 of *CEAA* requires that previous EAs be used to whatever extent is appropriate in conducting the EA of the revised Project.

"24. (1) Where a proponent proposes to carry out, in whole or in part, a project for which an environmental assessment was previously conducted and

- (a) the project did not proceed after the assessment was completed,
  - (b) in the case of a project that is in relation to a physical work, the proponent proposes an undertaking in relation to that work different from that proposed when the assessment was conducted,
  - (c) the manner in which the project is to be carried out has subsequently changed, or
  - (d) the renewal of a licence, permit, approval or other action under a prescribed provision is sought,
- the responsible authority shall use that assessment and the report thereon to whatever extent is appropriate for the purpose of complying with section 18 or 21.

(2) Where a responsible authority uses an environmental assessment and the report thereon pursuant to subsection (1), the responsible authority shall ensure that any

adjustments are made to the report that are necessary to take into account any significant changes in the environment and in the circumstances of the project and any significant new information relating to the environmental effects of the project."

Based on that pre-filing consultation, the expected RAs have put together a draft work plan for the EA of the Deep Panuke Project in order to streamline the regulatory review process. The draft work plan indicates that the assessment would be a new comprehensive study, but that it would solely address the variations between the Project basis of the approved 2002 CSR and the revised Project basis.

See Table 1.1 for a comparison between the previously approved Project basis and the revised Project basis.

Table 1.1 Comparison of Approved Project Basis and Revised Project Basis			
Project Item	Base Case (Approved CSR)	M&NP Option	SOEP Subsea Option
Well count and configuration	Maximum of 8 – Platform Wells <ul style="list-style-type: none"> <li>• 5-6 new drill prod wells: H-08, PI-1B, M-79A, PP-3C and 1-2 futures</li> <li>• 1-2 new drill injection wells</li> </ul>	Maximum of 9 – Subsea Wells <ul style="list-style-type: none"> <li>• 4 re-entry wells: H-08 [PL 2902], M-79A [PL 2902], F-70 [EL 2387], and D-41 [SDL 2255H]</li> <li>• 1 new production well: H-99 [PL 2902]</li> <li>• 1 new injection well: D-70 [EL 2387]</li> <li>• up to 3 future wells [currently undefined location on PL 2901, SDL 2255H, PL 2902 or EL 2387]</li> <li>• Buried flowlines and umbilicals from wellheads to installation</li> </ul>	
Project Life	Expected mean case: 11.5 years	Expected mean case: 13.3 years Expected range: 8 – 17.5 years	
Field Center	Base Case	Relocated 3.6 km NNE	
Base Structure	3 fixed platforms including <ul style="list-style-type: none"> <li>• production platform</li> <li>• utilities/quarters platform</li> <li>• wellhead platform</li> </ul>	1 MOPU integrated facility	
Discharge of muds / cuttings for new wells	drilled from field center WBM/cuttings overboard SBM/cuttings skipped and shipped or injected	drilled from individual well locations WBM/cuttings overboard no SBM	
Delivery Point	M&NP tie-in onshore, adjacent to SOEP		SOEP subsea tie-in SOEP 26" pipeline
Export pipeline	24 inch, 176 km single phase Trenched ~ 50% of route	22 inch, 176 km single phase Trenched ~ 50% of route	20 inch, 15 km multiphase Trenched 100% of route
Export gas	11300 10 <sup>3</sup> m <sup>3</sup> /day 400 MMscfd sales quality	8500 10 <sup>3</sup> m <sup>3</sup> /day 300 MMscfd [at plateau production rate] sales quality	8500 10 <sup>3</sup> m <sup>3</sup> /day 300 MMscfd [at plateau production rate] sweet and dehydrated
Export condensate	N/A		200 m <sup>3</sup> /day sweet and stabilized, commingled with gas
Condensate Use	Fuel, surplus injected		Sales product
Produced water	1100 to 1600 m <sup>3</sup> /day [7000 to 10,000 bpd] discharged overboard	6,400 m <sup>3</sup> /day [40,000 bpd] discharged overboard	
Acid Gas	dedicated injection well approximately 180 10 <sup>3</sup> m <sup>3</sup> /day [6 MMscfd]	dedicated injection well approximately 130 10 <sup>3</sup> m <sup>3</sup> /day [4.5 MMscfd]	

## 1.4 Consultation

EnCana will initiate and conduct early consultation with external stakeholders and communities potentially affected by the proposed changes in the revised Project. EnCana is currently developing a consultation plan to apply throughout the Project approval process and into the construction and operation phases of the Project.

The objectives of this plan are to:

- provide information about the Project in a timely fashion;
- identify issues and concerns to be addressed (a) through the design of the Project, (b) during the preparation of the environmental assessment, and (c) throughout the construction and operation of the Project;
- seek input from local communities and interest groups so their knowledge regarding the local environment can be considered during environmental (biophysical and socio-economic) assessment of the Project and Project design; and
- develop effective relationships with all stakeholders that can lead to effective working relationships throughout the life of the Project and also contribute to effective communications regarding other EnCana offshore activities.

## **2 PROJECT DESCRIPTION**

### **2.1 Project Components**

The main project components include the MOPU, subsea flowlines and umbilicals, subsea wells, and export pipeline.

#### **2.1.1 Mobile Offshore Production Unit (MOPU)**

The MOPU comprises the hull and topsides facilities. The hull includes all facilities and equipment that would normally be supplied with a mobile jack-up unit including jacking systems, legs, foundations, accommodations, helideck and utilities. The topsides facility will include all equipment required for processing hydrocarbon fluids from the reservoir. The topsides equipment will generally be located on top of the main deck but may also include equipment located within the hull such as the central control room.

The topsides facility will contain processing equipment to separate, measure, dehydrate, and sweeten the raw gas. Acid gas and water handling equipment will also be installed on the MOPU. Hydrocarbon dew pointing will be required for the M&NP Option and the condensate will be used as fuel for power generation and compression. Currently, it is estimated that there will be no surplus condensate produced beyond fuel usage; however, in the event that condensate must be injected, it will be injected down-hole with the acid gas stream. For the SOEP Subsea Option, condensate separated from the gas will be dehydrated, sweetened, and recombined with the export gas for delivery to SOEP. The production facility is designed to process 300 MMscfd.

#### **2.1.2 Subsea Wells and Flowlines**

The initial development well program will consist of re-completing four existing production wells (H-08, M-79A, F-70, and D-41) and drilling one new injection well in Margaree (EL 2387) and one new production well in Panuke (PL 2902). Up to three new production wells could be drilled after first gas in Cohasset (PL 2901), Deep Cohasset (SDL 2255H), Panuke (PL 2902) or Margaree (EL 2387).

All wells will be completed with horizontal subsea trees and tied back to the MOPU with individual subsea flowlines and control umbilicals. All subsea flowlines and control umbilicals will be trenched and buried.

### 2.1.3 Export Pipeline

EnCana proposes to transport sales product via a subsea pipeline from the MOPU to one of two delivery points:

- Goldboro, Nova Scotia (M&NP Option); or
- SOEP 26-inch pipeline tie-in (SOEP Subsea Option).

The Deep Panuke export pipeline will have a maximum capacity of 300 MMscfd at mean environmental conditions. The proposed routes of the export pipeline will minimize its footprint by using existing pipeline and flowline corridors where practical. The pipeline details for both options are presented in Table 2.1. All values are approximate.

Table 2.1 Export Pipeline			
	Pipeline diameter [inch]	Pipeline length [km]	Pipeline phases
M&NP Option	22	176	Single phase
SOEP Subsea Option	20	15	Multiphase

Onshore facilities are required for the M&NP Option only. In this option, EnCana’s onshore facilities will consist of the physical components necessary for interconnection of EnCana’s natural gas pipeline with M&NP’s facilities. EnCana will install metering and quality monitoring equipment, pressure control facilities and pig launcher/receiver facilities, as required. Additionally, a small building housing supervisory control and data acquisition (SCADA) and monitoring equipment for the natural gas pipeline will be constructed onshore as part of the Project facilities.

For the SOEP Subsea Option (sales product to SOEP pipeline), the export pipeline tie-in point will be at a subsea location. The tie-in facility will likely consist of a pile-driven subsea template including a protection structure. Final processing of the Deep Panuke fluids will be done by SOEP at the onshore plants.

## **2.2 Project Activities**

### **2.2.1 Construction and Installation**

#### **2.2.1.1 Offshore Production Facilities**

The MOPU will be fabricated atshore, towed to the field, and jacked up on location. The jack-up will be situated on specifically designed footings such as spud cans or equivalent. The topsides facilities will be fabricated separately and installed on the MOPU at an atshore location. The Project has no requirement for an offshore heavy lift.

#### **2.2.1.2 Pipeline**

Steel pipe, coated with concrete, will be laid on the bottom of the ocean by a pipe laying vessel. It is anticipated that the natural gas pipeline will be buried in water depths of less than approximately 85 m and where necessary for span correction per standard industry practice.

For the M&NP Option, the route will head towards a close point in the existing SOEP pipeline and then follow the previously approved route paralleling the existing SOEP pipeline to shore. The two lines will be approximately 1 km apart, except where on bottom topography necessitates close proximity. In the near shore area, approximately 7 km from land, the two lines will be approximately 100 m apart. In the onshore area, the pipeline route will be reviewed taking into consideration changes to the onshore environment and changes as a result of consultation.

For the SOEP Subsea Option, the route will head towards a close tie-in location.

Detailed route studies will be conducted for both options early in the development schedule to confirm preliminary routing and construction methods. Pipelines will be hydrostatically tested during commissioning.

#### **2.2.1.3 Subsea Flowlines and Umbilicals**

A total of six to nine subsea flowlines will be installed on the seafloor to tie-in the five to eight production wells and one injection well. It is expected that the subsea production flowlines will be 8 to 10 inches in diameter and range from 1 to approximately 10 km in length. The injection flowline is expected to be 3 inches in diameter and less than 1.7 km in length. The flowlines may be a flexible or rigid design and may be installed by reel-lay or s-lay pipelay methods. The flowlines will be trenched and buried. Flowline lengths, diameters, and installation method will be confirmed during detailed design.

A dedicated subsea umbilical will be required for each well in order to control, monitor, and supply chemicals to the wells. All umbilicals will be trenched and buried. Flowlines will be hydrostatically tested during commissioning.

### **2.2.2 Development Drilling**

Re-completion and drilling of production wells and the injection well will be conducted by a jack-up drilling unit.

### **2.2.3 Production**

Production facilities will be operated to optimize production while maintaining high safety standards. The production facilities will be attended with 24-hour coverage. Facility maintenance and inspection requirements will be managed through a comprehensive maintenance management system that will incorporate proactive and predictive methods and intelligent condition monitoring techniques.

### **2.2.4 Decommissioning and Abandonment**

Decommissioning and abandonment of both production and pipeline/flowline facilities will be undertaken in accordance with the regulatory requirements applicable at the time of such activities.

Although regulatory requirements could change prior to the time of decommissioning and abandonment, current practices would see the facility degassed, degreased and cleaned to applicable standards, the MOPU towed to another location for re-use or retrofit, the wells abandoned and conductors cut below the seafloor, and the pipeline, flowlines and umbilicals flushed, cleaned, and abandoned in place.

## **2.3 Project Schedule**

The project is currently in the bid competition phase. The initial phase of detailed design will be conducted as a competition with an expected duration of six to nine months. The competition phase will be followed by further detailed engineering and procurement. Fabrication is anticipated to take approximately 30 months. Pipeline construction, to be carried out concurrently with offshore installation and commissioning is anticipated to take from four to six months to complete. First gas is anticipated to be produced in late 2010.

## 2.4 Facility Emissions and Waste Discharges

EnCana will meet or improve upon the compliance standards outlined in applicable regulations or standards with respect to emissions and waste management. Treatment and disposal of wastes will be in accordance with the Offshore Waste Treatment Guidelines (2002 or updates), or applicable regulatory standards. EnCana will minimize, to the extent practical, both the volumes of wastes being discharged and the concentration of contaminants entering the environment.

Typical wastes and emissions to be generated during construction and/or production will likely include:

- drilling fluids/muds and drill cuttings;
- hydrostatic testing fluid;
- produced water;
- ballast and storage displacement water, bilge water, and deck drainage;
- well treatment fluids and completion fluids;
- production fluids (e.g., glycol, methanol);
- cooling water;
- sewage effluent and grey water;
- fire control system testing water;
- fuels (natural gas liquids, natural gas, diesel, aviation fuel);
- byproducts from gas sweetening process (e.g., amines) and dehydration (e.g., glycol);
- air emissions (e.g., H<sub>2</sub>S, CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub>, VOC);
- domestic (solid) waste;
- platform/vessel lights and flaring; and
- noise from construction (flowline/pipeline installation; pile driving), drilling and production operations.

Spent water-based muds and cuttings are approved for ocean discharge according to regulations. No synthetic-based muds or low toxicity mineral oil-based muds will be used. Produced water will be treated to reduce concentrations of dispersed oil, in accordance with applicable regulations, prior to ocean discharge.

Bilge and ballast water from ships will be treated to reduce oil concentrations to <15 mg/L prior to ocean discharge. Sewage wastes and food wastes will be macerated to a particle size of 6 mm or less prior to ocean discharge. Liquids not approved for ocean discharge, and all solid wastes generated on the MOPU, will be recovered and transferred to shore and disposed of in a manner approved by local regulatory authorities.

The acid gas generated during the gas sweetening process will be injected into a disposal well.

Flaring during production will be conducted during upset conditions, emergency situations, or intermittently during well testing. Typical flare emissions will consist of combustion gases, particulate matter and unburned hydrocarbons. Routine air emissions during production will be limited primarily to exhausts from engines, gas turbine driven generators or engine exhaust from support ships and helicopters.

Light emissions will include navigation lights and warning lights. Working areas will be illuminated with floodlights and the helipad will be floodlit and have omni-directional guidance lights. Noise emissions will mainly be generated during construction (including flowline/pipeline trenching and laying and pile driving) and drilling operations. Other noise generating activities will include ship and air traffic. Materials will be transported to the platforms primarily by supply vessels, making approximately two trips per week. Personnel will be transported to and from the platform primarily via helicopters with flights occurring at least twice per week.

## **2.5 Hazardous Materials**

Hazardous materials will be used on Project facilities. EnCana will ensure that all staff working on Project facilities is appropriately trained to handle, store and dispose of hazardous materials. Hazardous materials anticipated to be used throughout the life of the Project include:

- drilling fluids;
- amines;
- glycols;
- methanol;
- corrosion and scale inhibitors;
- paints;
- industrial cleaners;
- lubricating oils and fuels (aviation fuel, diesel fuel);
- explosives in sidewall core guns; and
- radioactive sources for certain instruments, and any NORM contaminated waste that may be generated during production.

EnCana will use the Offshore Chemical Selection Guidelines (2002 or updates) as a selection process to evaluate drilling and production chemicals and to identify chemical alternatives with acceptable environmental impacts, as required.

## 2.6 Malfunctions and Accidents

EnCana will study the impact of potential accidental releases as part of the EA, including marine spills and accidental atmospheric releases. Prevention and Risk Management measures will consider such incidents as well blowouts and pipeline and flowline ruptures (especially those involving sour gas release), although these incidents have a very low probability of occurrence.

This EA study will consider:

- probability of accidental releases (blowout and spill scenarios); and
- fate and transport of atmospheric releases and spilled material.

### **3 ENVIRONMENTAL SETTING**

This section provides a brief overview of the biophysical and socioeconomic settings in the Project area. This information is based on previous studies conducted for the Cohasset, SOEP, Deep Panuke and Cohasset Decommissioning projects. More detailed and updated information regarding existing conditions in the study area will be gathered during the course of the EA for the Project. The EA, conducted pursuant to *CEAA*, will identify potential Project related biophysical and socioeconomic effects, including cumulative effects; mitigative measures, and follow-up activities.

#### **3.1 Offshore Environment**

##### **3.1.1 Biophysical Setting**

###### **Climate and Physical Oceanography**

The Deep Panuke field is located on the Sable Island bank approximately 47 km to the southwest of Sable Island in 44 m of water. The weather conditions in the Project area have been studied extensively as a result of offshore exploration activities and the long established weather station on Sable Island. The area is subject to rapidly changing weather conditions. Tropical storms, particularly in late summer and fall, track up the east coast of North America and through the study area. Extratropical storms are frequent throughout the winter months.

On an annual basis, the dominant winds at Sable Island are westerly. In the winter months, winds from the west through north quadrant are most frequent; in the summer months, the south through west quadrant winds are most frequent. Calms are rare, averaging less than one percent of the winter, and about two percent in summer. The median wind speed is near 20 kt (37 km/hr), and hourly extremes of 70 kt (130 km/hr) have been recorded. Although west sector winds predominate, there are significant periods of easterly winds, particularly during the passage of cyclonic storms. Fog is frequent in the area, averaging 130 days per year, contributing to an average of 47 days per year with visibility less than 1 km. Extreme air temperatures offshore of the Sable Island area reach +30°C in the summer and can fall below -20°C in the winter.

In shallow continental shelf areas such as the Deep Panuke site, wind and current-driven water movement can result in the presence of high levels of suspended particulate matter. Strong current patterns can cause the predominately sand bottom to form irregular bedform morphology. Sand transport across Sable Island Bank is generally to the northeast and east and principally occurs during storms. Average currents from surface to 30 m depths are in the order of 10 cm/s. The annual sea temperature in the vicinity of the Deep Panuke field at a depth of approximately 10 m ranges from a low of 1.55 °C in February to a high of 16.36 °C in September.

### **Marine Benthos**

The area west of Sable Island is characterized by well-sorted, fine to coarse sand, with periodic disturbances brought on by storms; large mega-ripples are common. A thin veneer of organic material accumulates in micro depressions in the sand.

Benthic surveys were conducted by EnCana at the Cohasset platform, Panuke platform and Panuke H-08 wellsite in 2000, and at the original Deep Panuke site in 2001. The surveys showed that the epifaunal benthic community (*i.e.*, organisms living on or moving above the sediment) in the area had low abundance, and mainly consisted of sparsely distributed small crustaceans, small mollusks, green sea urchins and sand dollars. The predominant infaunal organisms (*i.e.*, living in the sediment) were ocean quahog, surf clam and polychaetes within 500 m of the Panuke platform; ocean quahog within 500 m of the Cohasset platform, and polychaetes within 1000 m of the original Deep Panuke site.

### **Marine Fish**

The area of Sable Island Bank where the Deep Panuke field is located is not known as a productive fishing area, even before the cod and haddock moratoriums. The lack of obvious food resources is likely a significant factor. Flounder was abundant near the Panuke jacket, feeding on the organic debris which had fallen from the structure. A few demersal fish were observed in the September 2000 underwater video but not positively identified. Species that may occur on a seasonal basis include Atlantic cod, haddock, yellowtail flounder, sandlance, winter skate, red hake, white hake, pollock, American plaice, halibut, and witch flounder.

### **Marine Mammals and Turtles**

Three species of sea turtle (Leatherback, Atlantic Loggerhead and Kemp's Ridley) have been recorded in the study area. All three species are considered threatened or endangered in Canada and/or the US. Major breeding grounds are in warmer waters well to the southwest of the study area, and individuals recorded are summer occasional migrants.

Seventeen species of whales, dolphins and porpoise and four species of seals are found in the Scotian Shelf waters, including three endangered whale species. Their distributions change seasonally. Most baleen whales come to feed on the Scotian Shelf in the summer and move back toward the south for the winter. Sperm whales and Northern Bottlenose whales occur in deeper waters along the Scotian slope. Smaller toothed whales, dolphins and porpoises could be in the area year-round, although most species move southwest as winter approaches. Harbour and Grey seals are present in the Sable Island area throughout the year.

### **Marine Birds**

The distribution of seabirds over the Scotian Shelf is dependent on availability and distribution of preferred prey and on the breeding status of the bird. In offshore waters, prey distribution is generally of prime importance. In the Deep Panuke area, the waters are also used by breeding birds from Sable Island. Over 25 species of marine birds may be observed in the waters over the Scotian Shelf.

### **Sable Island**

Sable Island is a remnant of a much larger land mass that once extended along the outer edge of the Scotian Shelf. The Island has changed shape over recorded history, but can presently be described as a crescent shaped sandbar roughly 43 km long with a maximum width of 1.4 km.

The Island is partially vegetated (39 percent), and contains a number of small freshwater and brackish ponds. A fairly diverse plant community common to dune type systems is supported and includes several species of plants endemic to Sable Island.

The Island serves as home to breeding colonies of seabirds including: two species of gulls (Herring and Great Black-backed); three species of terns (Arctic, Common, and the endangered Roseate tern); Semipalmated plovers; several pairs of Common crow; and the Ipswich sparrow, a subspecies of the Savannah sparrow which is endemic to Sable Island.

The Island also provides an important breeding, whelping and moulting area for Harbour and Grey seals. Hooded and Harp seals are becoming more numerous. The Sable Island horse is the only terrestrial mammal on the Island. It is not a distinct species but is considered endemic to the Island and is listed as endangered in Nova Scotia.

### **Species at Risk**

Table 3.1 lists the species at risk (under the *Species at Risk Act (SARA)* and/or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) that could occur in the project area, with their COSEWIC and *SARA* risk status. The EA will assess potential interactions between these species at risk and the revised Project.

<b>Table 3.1 Species at Risk in the Offshore Study Area</b>				
<b>Common name (relevant population or species range)</b>	<b>Latin name</b>	<b>SARA Schedule #</b>	<b>Risk category SARA Schedule 1 (listing year)</b>	<b>Last COSEWIC designation (year assessed)</b>
<b>FISH</b>				
Northern wolffish (Atlantic)	<i>Anarhichas denticulatus</i>	1	Threatened (2002)	Threatened (2001)
Spotted wolffish (Atlantic)	<i>Anarhichas minor</i>	1	Threatened (2002)	Threatened (2001)
Atlantic wolffish (Atlantic)	<i>Anarhichas lupus</i>	1	Special Concern (2002)	Special Concern (2000)
Atlantic cod (Maritimes)	<i>Gadus morhua</i>	Recommended not to be listed (2005)	N/A	Special Concern (2003)
Cusk (Atlantic)	<i>Brosme brosme</i>	Referred back to COSEWIC for further consideration (2005)	N/A	Threatened (2003)
Porbeagle shark (Atlantic)	<i>Lamna nasus</i>	Under consideration for 1	N/A	Endangered (2004)
Winter skate (Eastern Scotian Shelf)	<i>Leucoraja ocellata</i>	Under consideration for 1	N/A	Threatened (2005)
White shark (Atlantic)	<i>Carcharodon carcharias</i>	N/A	N/A	Endangered (2006)
Shortfin mako (Atlantic)	<i>Isurus oxyrinchus</i>	N/A	N/A	Threatened (2006)
Blue shark (Atlantic)	<i>Prionace glauca</i>	N/A	N/A	Special Concern (2006)
<b>MARINE MAMMALS</b>				
Blue whale (Atlantic)	<i>Balaenoptera musculus</i>	1	Endangered (2005)	Endangered (2002)
North Atlantic right whale (Atlantic)	<i>Eubalaena glacialis</i>	1	Endangered (2005)	Endangered (2003)
Northern bottlenose whale (Scotian Shelf)	<i>Hyperoodon ampullatus</i>	1	Endangered (2006)	Endangered (2002)
Fin whale (Atlantic)	<i>Balaenoptera physalus</i>	3	N/A	Special Concern (2005)
Harbour porpoise (Northwest Atlantic)	<i>Phocoena phocoena</i>	Referred back to COSEWIC for further consideration)	N/A	Special Concern (2006)
Sowerby's Beaked whale (Atlantic)	<i>Mesoplodon bidens</i>	3	N/A	Special Concern (1989)
<b>REPTILES</b>				
Leatherback sea turtle (Atlantic)	<i>Dermochelys coriacea</i>	1	Endangered (2002)	Endangered (2001)
<b>BIRDS</b>				
Barrow's goldeneye (Eastern)	<i>Bucephala silandica</i>	1	Special Concern (2002)	Special Concern (2000)
Harlequin duck (Eastern)	<i>Histrionicus histrionicus</i>	1	Special Concern (2002)	Special Concern (2001)
Ipswich sparrow (Nova Scotia, Sable Island)	<i>Passerculus sandwichensis princeps</i>	1	Special Concern (2002)	Special Concern (2000)
Roseate tern (Atlantic)	<i>Sterna dougallis</i>	1	Endangered (2002)	Endangered (1999)
Ivory Gull (Northwest Territories, Nunavut, Newfoundland and Labrador)	<i>Pagophila eburnea</i>	1	Special Concern (2002)	Endangered (2006)

Source: COSEWIC 2006; SARA 2006

### **3.1.2 Socioeconomic Setting**

#### **Fishery**

As noted above, the area of Sable Island Bank where the Deep Panuke Project is located is not known as a productive fishing area for traditional commercial species.

Historical data shows very little groundfish fishing in the Project area. The primary fishery on Sable Island Bank is scallop. However, the scallop fishery is directed along the shelf edge and north of Sable Island, and there is no scallop fishery in the Project area. Crab is typically caught to the northeast (Snow crab) and south (Jonah crab) of the Project. Stimpson's surf clam is a cold-water, slow-growing species present on Sable Island and Western Banks. A 2003 research survey from Fisheries and Oceans Canada identified commercial quantities of Ocean quahog on Sable Island Bank. A license for Ocean quahog was granted in 2005, and fishing is expected to commence in 2006. Although there is an offshore lobster fishery, at this time there is no directed fishery for lobster in the Project area. Updated fisheries information will be provided in the EA and the cumulative impact from subsea equipment with other existing and planned fishing obstructions on Sable Island Bank (e.g. SOEP pipelines, telecommunication cables) will be assessed.

#### **Marine Shipping**

Oil tanker, commercial and merchant shipping follow routes that criss-cross the north Atlantic. There is no single corridor by which the vessels pass. Relative to the Port of Halifax, the majority of the marine shipping traffic travels north of Sable Island. However, because Sable Island is close in proximity to other major ports, shipping traffic occurs in the general Project area. It is not expected that the Project facilities will present any significant obstacles for marine traffic.

#### **Military Use**

The Department of National Defence has designated operational areas that cover the entire offshore region of Nova Scotia. The Project area is not designated on hydrographic/nautical charts as a target-firing range. To date, the military has not conducted offshore training exercises in the vicinity of any of the offshore oil and gas operations.

#### **Ocean Mining**

At present there are no active or leased areas for ocean mining of offshore aggregates or other mineral resources on the Scotian Shelf.

#### **Cables**

There are no active telecommunication cables near the Deep Panuke site. A portion of the former trans-Atlantic telecommunication cable, the Cantat II Cable, had been reactivated and redirected to Sable Island to improve cellular communications for the petroleum industry. However, that cable subsequently failed and remains inactive and abandoned in-situ.

## **Petroleum Industry**

The search for petroleum resources on the Scotian Shelf has slowed in the last two years. Licenses control the physical locations of exploration and development. Latest exploration activities have been directed towards both the shallow waters of Sable Island Bank and the deep waters of the Scotian Slope ranging in depths from 300 to 3,000 m.

The SOEP Thebaud platform is approximately 40 km east of the Deep Panuke Project field center.

The Cohasset oil development project, in the immediate vicinity of Deep Panuke, was decommissioned in the fall of 2005. Both platforms and PLEM topsides were removed and the flowlines and umbilicals abandoned in-situ.

## **3.2 Onshore Environment - applicable to the M&NP Option only**

### **3.2.1 Biophysical Setting**

The proposed landfall for the pipeline will be Country Harbour, Guysborough County, Nova Scotia. The pipeline will travel over land to the tie-ins with the respective existing pipeline facilities.

Shoreline topography includes slightly to steeply sloping fore and back shores. The landfall area is underlain by rocks of the Meguma Group, consisting primarily of the older Goldenville Formation and the younger Halifax Formation. Surficial geology in the Country Harbour area is mainly quartzite till. Well water records from the Goldboro area indicate a range of overburden thickness from 2.7 m to 4.6 m. A surficial aquifer is the primary domestic water supply source in the area.

Surface water resources in the area include, but are not limited to: Betty's Cove Brook, Gold Brook, Crane Lake, and Seal Harbour Lake. Atlantic salmon, brook trout and brown trout are valued fish species in the region for recreational angling.

Vegetation in the area near the proposed onshore facilities is characterized by forest, shrub thickets, wetlands, and disturbed areas. Forests in the area are boreal in nature and characterized by relatively low species richness. Forest plant communities present in the study area are dominated by various combinations of black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), and mountain white birch (*Betula cordifolia*). Shrub thickets are typically found on stony knolls, and in some cases are associated with disturbed areas such as abandoned mine sites. Wetlands in the area consist mainly of bogs, swamps, and marshes.

A vascular plant inventory conducted for the SOEP Baseline Environmental Effects Monitoring program for the SOEP Gas Plant revealed the presence of two provincially rare species (Pronych and Wilson

1994) in the vicinity of the Gas Plant: Newfoundland dwarf birch (*Betula michauxii*); and variegated horsetail (*Equistem variegatum*).

Sensitive and critical habitat in the general area includes deer wintering areas west and southeast of Goldboro, and significant nesting and breeding areas for Eider ducks (*Somateria mollissima*) located on Goose Island and Harbour Island. Country Island is a sensitive nesting area for the endangered Roseate tern (*Strena doughallii*).

### **3.2.2 Socioeconomic Setting**

Guysborough County, with a land area of 4,371 square kilometers and a 2001 population of approximately 9,800, is located in the northeastern part of Nova Scotia. It is a distinctly rural area with a long coastline and rich history.

The population of the county, which includes the incorporated towns of Canso and Mulgrave and the Municipal Districts of Guysborough and St. Mary's, has declined by approximately 10% between 1996 and 2001. The largest aggregations of population are located in the towns of Canso, Mulgrave and the Shire towns of Guysborough and Sherbrooke; the balance is distributed in smaller unincorporated communities throughout the county. The more important of these in the vicinity of the proposed Deep Panuke landfall include Goldboro, Isaac's Harbour, Drumhead, Seal Harbour, Coddles Harbour, Larry's River, Stormont, Middle Country Harbour, Country Harbour Mines and Cross Roads Country Harbour. The population of this area is less than 1000.

The study area's economy has been dependent upon the fishery and forestry, and intermittently upon mining. Today, fishing and forestry remain important, with the largest employer in the manufacturing sector being the fish processing plant at Port Bickerton. Aquaculture is a significant industry in the area, with blue mussels and sea scallops the most frequently farmed species. Lobster and sea urchins have been the most valuable inshore fisheries species for the area. Pelagic landings are made up of mackerel (taken by inshore boats) and herring (taken by inshore and offshore vessels).

Despite its reliance on fishery and forestry, the economy is both changing and diversifying. The service sector has grown in importance, and more facilities and improved marketing are increasingly drawing visitors into the area. Recent investment, for example, in the redevelopment of the waterfront and in sports and drama facilities at Chedabucto Place, both in Guysborough, are investments both for the local population and to attract others to the area either as visitors or permanent residents.

Several archaeological and heritage resources have been identified in, or in proximity to, the study area at Goldboro. These include reported pre-European contact finds along the shores of Bettys Cove, a cemetery on the point known as Redhead, evidence of nineteenth and twentieth century mining activities and three ship wrecks in the vicinity of the nearshore pipeline.

Appendix 1 Deep Panuke Offshore Development – Location Map

