DEEP PANUKE OFFSHORE GAS DEVELOPMENT

PROJECT SUMMARY

VOLUME 1

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PREFACE

This Project Summary is the first of five documents comprising a Development Plan Application (DPA) for approval of the Deep Panuke Offshore Gas Development. The documents comprising the DPA are as follows:

**Volume 1**  Project Summary  
**Volume 2**  Development Plan  
**Volume 3**  Canada-Nova Scotia Benefits Plan  
**Volume 4**  Environmental Assessment Report  
**Volume 5**  Socio-Economic Impact Statement

**Volume 1**, the Project Summary, summarizes the DPA and provides a description of the Project for a general review.

**Volume 2**, the Development Plan, describes the development strategy and includes details on subsurface interpretation, drilling, processing, facilities, and environmental and safety management for the Project.

**Volume 3**, the Canada-Nova Scotia Benefits Plan, describes the processes to promote Canada and Nova Scotia benefits associated with the Project.

**Volume 4**, the Environmental Assessment (EA) Report, describes the physical and biological environment in which the Project will operate, provides an assessment of the potential environmental and socio-economic effects of the Project, and identifies mitigation measures.

**Volume 5**, the Socio-Economic Impact Statement (SEIS) provides a summary of the existing socio-economic conditions and a summary of the potential impacts with the project.
# TABLE OF CONTENTS

PREFACE .................................................................................................................................................... i  
INTERPRETATION.................................................................................................................................. iii  

1 INTRODUCTION ....................................................................................................................... 1-1  
1.1 Purpose and Need for the Project..................................................................................... 1-3  
1.2 Project Schedule............................................................................................................... 1-4  
1.3 Regulatory Overview....................................................................................................... 1-4  

2 PROJECT DESCRIPTION.......................................................................................................... 2-1  
2.1 Subsurface........................................................................................................................ 2-1  
2.2 Project Components and Activities.................................................................................. 2-3  
2.2.1 Development Drilling .......................................................................................... 2-3  
2.2.2 Subsea Equipment................................................................................................ 2-3  
2.2.3 Mobile Offshore Processing Unit (MOPU) ......................................................... 2-5  
2.2.4 Offshore Pipeline ................................................................................................. 2-6  
2.2.5 Onshore Pipeline and Facilities ........................................................................... 2-6  
2.3 Decommissioning and Abandonment.............................................................................. 2-7  

3 PROJECT PRINCIPLES AND MANAGEMENT...................................................................... 3-1  
3.1 Project Principles ............................................................................................................. 3-1  
3.2 Project Management ........................................................................................................ 3-1  
3.3 Development Approach ................................................................................................... 3-3  
3.4 Canada-Nova Scotia Benefits Plan .................................................................................. 3-4  
3.5 Environmental, Health and Safety Management ............................................................. 3-6  
3.5.1 EHS Management Framework............................................................................. 3-6  
3.5.2 Safety Plan ........................................................................................................... 3-8  
3.5.3 Security Plan ........................................................................................................ 3-8  
3.5.4 Deep Panuke Emergency Management Plan ....................................................... 3-9  
3.5.5 Deep Panuke Environmental Protection Plan .................................................... 3-10  
3.5.6 Deep Panuke Environmental Effects Monitoring .............................................. 3-10  

4 ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT........................................... 4-1  
4.1 Malfunctions and Accidental Events ............................................................................... 4-2
4.2 Public Consultation and Aboriginal Communications .................................................... 4-3
4.3 Scope of the Assessment .............................................................................................. 4-3
4.4 Biophysical Assessment .............................................................................................. 4-4
4.5 Socio-Economic Assessment ....................................................................................... 4-5
4.6 Effects of the Environment on the Project ..................................................................... 4-7
4.7 Environmental Management Features and Commitments ........................................... 4-7
4.8 Conclusions.................................................................................................................... 4-8

5 ECONOMIC COMMITMENTS AND OPPORTUNITIES .................................................... 5-1
5.1 Commitments under Deep Panuke OSEA .................................................................... 5-1
  5.1.1 EnCana’s Commitments Regarding Nova Scotia Benefits ....................................... 5-1
5.2 Economic Opportunities .............................................................................................. 5-3
  5.2.1 Pre-Development Expenditure ............................................................................... 5-3
  5.2.2 Forecast Expenditures ............................................................................................ 5-4

6 CONCLUSION..................................................................................................................... 6-1

LIST OF TABLES

TABLE 2.1 Export Pipeline ............................................................................................... 2-6
TABLE 3.1 Deep Panuke Project Principles ....................................................................... 3-2
TABLE 4.1 Comparison of Approved 2002 CSR Project Basis and the Revised
  Project Basis .................................................................................................................. 4-1
TABLE 5.1 Development Phase Expenditures .................................................................... 5-4

LIST OF FIGURES

FIGURE 1.1 Deep Panuke Proposed Field Layout ............................................................... 1-2
FIGURE 1.2 Preliminary Master Schedule .......................................................................... 1-5
FIGURE 2.1 Proposed Field Rendering ............................................................................... 2-2
FIGURE 2.2 Deep Panuke Exploration and Delineation Wells ............................................ 2-4
FIGURE 3.1 Deep Panuke Project Elements ....................................................................... 3-3


INTERPRETATION

Unless the context otherwise requires,


“Accord Acts” means collectively the Accord Act and the Provincial Accord Act;

“bcf” means billion cubic feet;

“Benefits Plan” means the Canada-Nova Scotia Benefits Plan, which is DPA Volume 3, as contemplated by Section 45 of the Accord Act and the Provincial Accord Act;

“CEA” means Cumulative Effects Assessment;

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

“CNSOPB” means the Canada-Nova Scotia Offshore Petroleum Board established under the Accord Acts;

“CO₂” means carbon dioxide;

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

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

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

“EA” means Environmental Assessment;

“ECM” means environmental compliance monitoring;

“EEM” means environmental effects monitoring;

“EEMP” means environmental effects monitoring plan;

“EHS” means environment, health and safety;
“EIS” means environmental impact statement;

“EnCana” means EnCana Corporation and includes, according to the context, its predecessor companies on the East Coast of Canada prior to April 2002, including PanCanadian Petroleum Limited and PanCanadian Energy Corporation.

“EPP” means environmental protection plan;

“ESD” means emergency shut down;

“FEAC” means Federal Environmental Assessment Coordinator (representing the Canadian Environmental Assessment Agency);

“FEED” means front end engineering design;

“H2S” means hydrogen sulphide;

“IMT” means integrated management team;

“JRCC” means Joint Rescue Coordination Centre;

“km” means kilometer;

“KP” means kilometer point;

“m” means metre;

“M&NP” means Maritimes and Northeast Pipeline;

“Mean” means the statistical mean value of a probability distribution.

“MODU” means mobile offshore drilling unit;

“MOPU” means Mobile Offshore Production Unit;

“NEB” means the National Energy Board;

“NEB Act” means National Energy Board Act;
“OSEA” means offshore strategic energy agreement;

“POB” means persons on board;


“ppm” means measurement in parts per million

"P10" means value at the 10th Percentile;

"P50" means value at the 50th Percentile;

"P90" means value at the 90th Percentile;

“R&D” means research and development;

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

“ROV” means remotely operated vehicle

“SCM” means subsea control module;

“SOEP” means Sable Offshore Energy Project;

“VEC” means valued environmental component and includes biophysical and socio-economic components; and

“WBM” means water based mud.
1 INTRODUCTION

EnCana is an experienced East Coast offshore operator. In 1996, EnCana 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. EnCana’s exploration drilling resulted in the drilling of the PP-3C discovery well in late 1998. Further delineation drilling results led EnCana to file a DPA with the CNSOPB in March 2002 and conduct an EA in the form of a Comprehensive Study under CEAA. A CSR was submitted by EnCana 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 regulatory applications with the CNSOPB to allow further review and refinement of the Project.

Between 2003 and 2006, EnCana re-evaluated the reservoirs and facilities to determine the optimum project basis. EnCana is re-filing the DPA and the NEB applications for the Deep Panuke Project. The EA Report, conducted on the variations between the Project basis of the approved 2002 CSR and the current revised Project basis, is being filed under CEAA and as a component of the DPA and NEB application.

The Deep Panuke gas pool is located on the Scotian Shelf and encompasses natural gas located on, at the time of this filing, offshore licenses PL 2902 (Panuke), EL 2387 (Margaree), SDL 2255H (Deep Cohasset), PL 2901 (Cohasset), and EL 2360 (Lower Musquodoboit). Gas will be produced from the completion of four existing wells and one new production well feeding a central production facility sized for a peak sales gas throughput of $8.5 \times 10^6$ m$^3$/day [300 MMscfd], producing a Mean cumulative production total of $17.8 \times 10^9$ m$^3$ [632 bcf] over approximately 13 years. Figure 1.1 indicates the proposed field location for the Deep Panuke Project.

This Project Summary provides a summary of the DPA for the Deep Panuke Project. It outlines the following:

- development strategy;
- Project description;
- Project principles and management;
- environmental assessment methodologies;
- environmental effects of the Project; and
- socio-economic effects and benefits of the Project.
1.1 Purpose and Need for the Project

The Deep Panuke Project is designed to meet the significant and growing demand for natural gas and other forms of energy in markets in Canada and the United States. The proximity of the Deep Panuke discovery to existing infrastructure serving these growing energy markets is one of the foundations of the Project. The Project will provide further opportunity for Nova Scotians and other Canadians to participate in, and benefit from, the offshore oil and gas industry, contributing to the economies of Nova Scotia and Canada. Development of the Project will enable EnCana to exercise its rights under, and obtain economic benefits from, the licenses issued to it under the Accord Acts.

Each project, which contributes to the development of an industry, is unique - dealing with specific reservoir attributes, which will drive the development decisions necessary to make a particular project a success. Some projects will require extensive offshore facilities and some will require proportionally more infrastructure onshore. While each project that contributes to the development of an industry will have a different economic impact on the provincial and national economies, each project will add to available infrastructure, making it easier for other new projects to enter the industry. In the same way the Deep Panuke Project will benefit from, and take advantage of, the infrastructure built up as a result of the Cohasset Project, SOEP, and M&NP, developments which follow Deep Panuke can be expected to benefit from the infrastructure which will be put in place as a result of developing Deep Panuke. Infrastructure created by successive projects is not limited to physical infrastructure, such as platforms and pipe, but also extends to labour and intellectual infrastructure, including an increasingly capable workforce and supply community, a more developed research and development capability, and an improved knowledge base regarding the environmental effects of oil and gas projects offshore Nova Scotia.

As indicated above, the Deep Panuke Project will take advantage of existing infrastructure where possible. The availability of the existing M&NP infrastructure has facilitated the commercial development of the Deep Panuke Project despite its relatively small reservoir size. This lowering of the threshold reservoir size maintains the momentum of the emerging natural gas industry in Nova Scotia – allowing the optimization and expansion of existing infrastructure, diversification of the supply portfolio available to potential natural gas users in Nova Scotia, and the maintenance and further development of the valuable human resource capacity that was developed as a result of the Cohasset Project, SOEP and the M&NP Project. In the same fashion the Deep Panuke Project is expected to facilitate the development of further natural gas developments.
1.2 Project Schedule

The Project’s three main phases are the Development Phase, the Production Phase, and the Decommissioning Phase. The Development Phase consists of the following activities:

- definition – MOPU bid competition and regulatory application;
- engineering;
- procurement;
- well construction;
- facilities construction; and
- facilities commissioning.

The Project is currently in the MOPU bid competition and regulatory application phase.

The Production Phase will consist of gas production and processing and, as required, further drilling and well workovers.

Currently, the Development Phase is expected to continue until 2010. Following the commissioning of the Project facilities, the Project life of the Production Phase is expected to be in the range of 8 to 17.5 years with the mean case of approximately 13 years. It is important to note that the Project facilities have a design life of 25 years, with the exception of the topsides which have a design life of 20 years. With proper maintenance, Project facilities can be available to other projects including subsequent discoveries within the Panuke area.

Project timing may be adjusted to account for market conditions or other developments that may occur over the life of the Project and/or Project facilities.

Figure 1.2 provides a detailed breakdown of the Development Phase schedule for the Project.

1.3 Regulatory Overview

The Deep Panuke Project involves three separate regulatory processes and requires that four major approvals be issued. The three separate regulatory processes are as follows:

- Comprehensive Study Process (CEAA Process);
- Development Plan Application (DPA) Process (CNSOPB Process); and
The *CEAA* Process pertains to the environmental assessment of the Project. The CNSOPB Process pertains to the offshore aspects of development, including the offshore pipeline. The NEB Process pertains to the entire transmission pipeline from interconnect with the MOPU to interconnect with downstream facilities.

The major approvals that must be obtained through the three regulatory processes listed above are as follows:

- A determination by the Federal Minister of the Environment that the Project is unlikely to have significant adverse environmental effects (outcome of *CEAA* Process);
- CNSOPB approval of the Benefits Plan for the Project;
- CNSOPB approval of the Development Plan for the Project; and
- NEB approval of the pipeline application for the Project.
Proposed production installations and development drilling for offshore oil and gas are subject to EA under *CEAA*. The CNSOPB and NEB have a mandate for environmental protection and are RAs under *CEAA*. The Canadian Environmental Assessment Agency is the 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 under *CEAA*, (that is, RAs), or expert knowledge to declare their interest in the project. The expected RAs for this project and respective *CEAA* “triggers” include:

- CNSOPB (approval of a development plan, under Section 143(4)(a) and authorization under Section 142(1)(b) of the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* (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 *Canadian Environmental Protection Act*, 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
- National Energy Board (Certificate under Section 52 or Section 58 authorization 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 EIS as a condition of its approval process. The NEB requires an EA as a condition of its approval process. Based on pre-filing consultation with the regulators, EnCana’s *CEAA* EA Report (DPA Volume 4) will also form the EIS requirement of the regulatory applications with the CNSOPB and the EA of the NEB application.

In 2002, EnCana conducted an EA in the form of a comprehensive study under *CEAA*. 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 regulatory applications with the CNSOPB and the NEB to allow further review and refinement of the Project.

Between 2003 and 2006, EnCana re-evaluated the reservoir and facilities to determine the optimum Project basis. As part of pre-filing consultation with the regulators, the FEAC and expected RAs put
together a draft work plan for the Deep Panuke Project in order to guide the regulatory review process. The draft work plan indicated that the assessment would be a new comprehensive study, but that it would solely address the modifications between the Project basis of the approved 2002 CSR and the revised Project basis.

The NEB regulates international and interprovincial aspects of oil, gas and electric utility industries under the *NEB Act*. To determine whether a pipeline project should proceed, the Board must be satisfied that the proposed facilities are required by the present and future public convenience and necessity in the form of a Certificate Application filed by the proponent. The EA Report will also be included as a part of the NEB application.
2 PROJECT DESCRIPTION

The Project involves production and processing of gas offshore and transport, via subsea pipeline, of market-ready gas to Goldboro, Nova Scotia to an interconnection with the M&NP main transmission pipeline for further transport to markets in Canada and the northeast United States.

EnCana holds a majority working interest in and is the operator of Deep Panuke, which is located approximately 250 km southeast of Halifax, Nova Scotia, on the Scotian Shelf. The Project design consists of a jack-up MOPU in a water depth of approximately 44 m. The Project will initially include completing four previously drilled wells and drilling two new wells, one production well and one acid gas injection well. Up to three additional subsea production wells could be drilled; such wells would be drilled after production start-up and at least one full year of production. All wells will have horizontal trees and will be tied back individually to the MOPU with subsea flowlines and control umbilicals. See Figure 2.1 for the proposed field rendering for the Deep Panuke Project.

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 the M&NP Option);
- SOEP 660 mm [26-inch] subsea pipeline at a close point on the pipeline route to Goldboro (herein referred to as the SOEP Subsea Option).

The gas processing system will include inlet compression, separation, sweetening, dehydration, export compression and measurement. Deep Panuke is considered a sour gas reservoir with raw gas containing approximately 0.18% H₂S; therefore, gas sweetening equipment is required. Acid gas processing will be performed offshore through application of an amine unit to remove H₂S and some of the CO₂, 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. The production design sales gas throughput for the Project is 8.5 x 10⁶ m³/d [300 MMscfd].

2.1 Subsurface

The Deep Panuke pool will produce natural gas from a porous and permeable carbonate reservoir located about 3500 m below the seafloor in the area of the decommissioned Cohasset Project. The Deep Panuke gas pool was discovered by EnCana drilling in 1998, and additional drilling in 1999 and 2000 has confirmed the presence of a significant gas accumulation. A detailed geological and geophysical description of the reservoir is contained in the Development Plan (DPA Volume 2).
Figure 2.1 Proposed Field Rendering
Deep Panuke raw gas is lean \(i.e.,\) with low volumes of associated gas liquids) and contains low levels of \(\text{CO}_2\) (~3.5 %). The raw gas contains a small amount of hydrogen sulphide (\(\text{H}_2\text{S}\)) and is therefore referred to as “sour gas”. \(\text{H}_2\text{S}\) concentration in the raw gas is expected to be approximately 0.18 % or 1,800 ppm.

The resource estimate provides a probabilistic estimate of recoverable gas using accepted statistical modelling methods for available reservoir information. Recoverable sales gas resources are estimated to be within a range of \(11.0 \times 10^9 \text{ m}^3\) [390 bcf] to \(25.1 \times 10^9 \text{ m}^3\) [892 bcf] with a Mean of \(17.8 \times 10^9 \text{ m}^3\) [632 bcf].

### 2.2 Project Components and Activities

The primary infrastructure for the Project is the central offshore processing facility, known as the MOPU. The MOPU will be located in a central location to accept production from the surrounding subsea producing wells. A subsea pipeline will be used to transport sweet natural gas to shore via one of the two options (M&NP Option or SOEP Subsea Option). The final location of the MOPU or the “field centre” will be determined during detailed design; however, the present tentative location is positioned at coordinates of Northing 4853668 and Easting 685918 (ZONE 20 NAD 83).

#### 2.2.1 Development Drilling

Since the discovery of the Deep Panuke gas reservoir in 1998, several delineation wells have been drilled. There are four delineation wells that have been suspended for potential future re-entry with the remaining wells abandoned. EnCana plans to complete the Panuke H-08, M-79A, Margaree F-70 and MarCoh D-41 wells, drill two new wells, including one production well (Panuke H-99) and one acid gas injection well (Margaree D-70), and complete all wells as subsea tiebacks. Once production is established at Deep Panuke, up to three additional production wells may be drilled. Figure 2.2 shows the relative locations of the existing wells.

#### 2.2.2 Subsea Equipment

The Project’s subsea system will include all equipment from the wellhead to the connection of the flowlines at the riser on the MOPU, including the riser section. This will include the following:

- horizontal production trees;
- protection structures;
- flowlines;
- umbilicals; and
- control systems.
Figure 2.2 Deep Panuke Exploration and Delineation Wells

The production trees, with connections for production and service lines, will be optimized for productivity and ease of access for downhole interventions. Production trees will be designed to allow chemical injection into the production stream both downstream of the upper master valve and below the tree in the wellbore.

The subsea wells will be protected by dedicated protection structures against dropped objects, dragging anchors, and fishing gear. The protection structure is to be designed to allow adequate access to the wells for all planned diver and ROV intervention tasks. These tubular, lattice protection structures will be designed to be trawlable even though they will likely be located within the facilities safety zone.

Each production well will be tied back to the MOPU platform with its own dedicated infield subsea flowline. The initial production flowlines are expected to be 200 mm [8 inches] in diameter and range from 1 to 6 km in length. The acid gas injection flowline is expected to be 75 mm [3 inches] in diameter and approximately 1.7 km in length. The flowlines will be trenched their entire length.

Subsea umbilicals are required for each of the production wells and the acid gas injection well. Each well will have its own dedicated umbilical controlled from the MOPU, which will be laid beside the well flowline and will be trenched and buried along its entire length.
The control system for the subsea wells will be capable of controlling, monitoring, and supplying chemicals to the subsea wells. The subsea well control system will comprise the tree mounted subsea control module (SCM) and the associated topsides equipment. The subsea control system will provide redundant power, signal, high-pressure hydraulic, and low-pressure hydraulic supplies to the tree-mounted SCM.

### 2.2.3 Mobile Offshore Processing Unit (MOPU)

The primary infrastructure for the Project is the central offshore processing facility, known as the MOPU. The MOPU will be located in a central location to accept production from the surrounding subsea producing wells. The MOPU will include all the required processing equipment for separation and processing to allow product to be shipped to market. The sales gas production capacity is $8.5 \times 10^6$ m$^3$/d [300 MMscfd], with a turn down to $1.1 \times 10^6$ m$^3$/d [40 MMscfd] to allow for reduced production as the field declines over time. The facility will not be designed for expansion of production capacity; however, it will have the capability to connect up to eight subsea production wells at one time.

The MOPU will also provide all necessary utility systems to support the process and non-process functions as well as craneage, accommodations, helideck, and a central control room. The MOPU will allow for a minimum continuous POB complement of 68 persons to sustain year round production. The normal steady state POB complement is expected to be approximately 30 persons; however, it could also be larger should the design be a standard MODU accommodations design to allow for easier conversion back to MODU operations in the future.

The MOPU will likely comprise a newly built unit. The MOPU has the following two main components:

- a floating hull structure with jack-up legs, which provides a “dry” deck and ancillaries to support the processing equipment; and
- a topsides production facility which contains all the necessary production and processing equipment necessary to produce the field.

The MOPU will be a leased facility, with a lease arrangement to accommodate the Deep Panuke Project. When the production at Deep Panuke is complete, it will be disconnected, jacked down, and demobilized. It could be refitted/reused at a new location for another project or refitted as a drilling unit.

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**Deep Panuke Volume 1 (Project Summary) • November 2006**
2.2.4 Offshore 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) to an interconnection with M&NP; or
- SOEP 660 mm [26 inch] pipeline tie-in (SOEP Subsea Option) at a close point on the pipeline route.

The Deep Panuke export pipeline will have a sales gas capacity of $8.5 \times 10^6 \text{ m}^3/\text{d}$ [300 MMscfd] at mean environmental conditions. The proposed routes of the export pipeline will minimize its footprint by using existing pipeline corridors where practical. The pipeline details for both options are presented in Table 2.1.

<table>
<thead>
<tr>
<th>Table 2.1 Export Pipeline</th>
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<tbody>
<tr>
<td>Pipeline diameter [mm (inch)]</td>
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<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>M&amp;NP Option</td>
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<tr>
<td>SOEP Subsea Option</td>
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</tbody>
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2.2.5 Onshore Pipeline and Facilities

Onshore facilities are required for the M&NP Option only. In this option, EnCana’s onshore facility will consist of a pipeline and the physical components necessary for interconnection of EnCana’s pipeline with M&NP’s facility. EnCana’s pipeline will tie into the M&NP transmission pipeline at Goldboro, Nova Scotia, downstream of the SOEP gas processing plant. The onshore portion of the pipeline will be approximately 2 to 4 km in length depending upon the final routing selected.

The onshore facility will include a pig receiver facility and a safety/emergency shutdown valve system. The onshore facility will interface with the M&NP owned facility which will include custody transfer meters, the final section of pipeline, and tie-in to the existing 760 mm [30 inch] M&NP pipeline. Additionally, the area of the facility is estimated to be 60 m x 45 m and will be enclosed by a security fence. A new access road to the metering station may be required.

For the SOEP Subsea Option, no new onshore facility will be required since the export gas and condensate will be processed by the existing SOEP onshore gas plant (Goldboro) and liquid facilities (Point Tupper).
2.3 Decommissioning and Abandonment

The Mean production life of the Project is anticipated to be approximately 13 years; however, the resource forecasts show a probable field life ranging from 8 years to 17.5 years. The actual field life will be predicted with greater certainty after production commences. The topsides will be designed for a life of 20 years and structures will be designed for a life of 25 years. The decommissioning and abandonment of these facilities will be performed in accordance with the regulatory requirements applicable at the time such activities are undertaken.

It is anticipated that decommissioning of the MOPU will essentially be a reverse of the installation process. The processing equipment will be systematically shutdown, flushed, and cleaned. The MOPU will then be disconnected from the subsea infrastructure, jacked down, and removed from the site. It is expected that the MOPU will be reused following decommissioning but this will be evaluated on an economic basis at the time of decommissioning.

Wells will be abandoned in compliance with applicable drilling regulations and according to standard industry practices. Subsea equipment, such as wellhead trees and manifolds, will be purged, rendered safe, and recovered. Trenched flowlines and umbilicals will be flushed and left in situ below the seafloor. All other subsea facilities above the seafloor, including protection structures, will be purged and decommissioned in accordance with applicable regulations at the time.

The offshore export pipeline will be abandoned “in place” after it is flushed and filled with seawater. For the M&NP Option, with the exception of the onshore pipeline, the onshore facility will be removed and utilized land restored in accordance with applicable regulations. The buried onshore pipeline will be flushed, capped, and abandoned in place. The onshore pipeline RoW will be re-vegetated and allowed to return to its natural state. Any above ground structures associated with the onshore pipeline will be removed.
3 PROJECT PRINCIPLES AND MANAGEMENT

3.1 Project Principles

Project success depends upon Project economics, the quality of output, and the efficiency of operation in a very competitive world energy market. In particular, the basic principle for the development and operation of the Deep Panuke Project is that it must be internationally competitive as it operates in a dynamic, market-driven environment.

Along with Project economics, other important principles, such as safety and environmental performance, also guide the Project’s development team.

Also crucial to the success of the Project are open and ethical business practices. Open and ethical business practices include working to the highest professional standards, placing top priority on safety and quality and ensuring that staff, employees and contractors are treated in a fair and equitable manner. The Deep Panuke Project Management Principles are more particularly described in the Canada-Nova Scotia Benefits Plan (DPA Volume 3).

The principles that will guide EnCana in the development of the Deep Panuke Project are described in Table 3.1.

3.2 Project Management

EnCana has set out a number of operating principles for the Deep Panuke Project. These operating principles are designed to ensure employee and public safety, make the Project economically viable, ensure operations are conducted to the highest business standards, and facilitate the highest possible Canada-Nova Scotia benefits. The Project will place a premium on safety above all other operating principles.

EnCana is a longstanding Canadian company that has been operating offshore Nova Scotia since 1996. EnCana has an excellent record of local procurement and employment practices across Canada, and intends to continue these practices on this Project.
<table>
<thead>
<tr>
<th><strong>Table 3.1</strong> Deep Panuke Project Principles</th>
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<tbody>
<tr>
<td><strong>GUIDING PRINCIPLE</strong></td>
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<tr>
<td>The Project operates in a dynamic, market-driven environment and must be internationally competitive.</td>
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<tr>
<td><strong>ENVIRONMENT, HEALTH &amp; SAFETY</strong></td>
</tr>
<tr>
<td>The Project is fully committed to protecting the health and safety of all individuals affected by their work, as well as the environment in which they live and operate. Specifically, the Project will be guided by the following principles, which outline EnCana’s Environmental, Health, and Safety (EHS) commitments under EnCana’s Corporate Responsibility Policy.</td>
</tr>
<tr>
<td>• We protect the health and safety of all individuals affected by our activities;</td>
</tr>
<tr>
<td>• We provide a safe and healthy working environment and expect our workforce to comply with the health and safety practices established for their protection;</td>
</tr>
<tr>
<td>• We safeguard the environment and contribute to the well being of the communities in which we live and operate;</td>
</tr>
<tr>
<td>• We maintain EnCana’s commitment to clear, honest and respectful dialogue with stakeholders;</td>
</tr>
<tr>
<td>• We strive to make efficient use of resources, minimize our environment footprint, and conserve habitat diversity and the plant and animal populations that may be affected by our operations;</td>
</tr>
<tr>
<td>• We strive to reduce our emissions intensity and increase our energy efficiency;</td>
</tr>
<tr>
<td>• We integrate Environment, Health and Safety Best Practices, EnCana’s EH&amp;S Management System, into all parts of our business;</td>
</tr>
<tr>
<td>• We comply with applicable laws, regulations, and industry standards;</td>
</tr>
<tr>
<td>• We identify, assess and manage EH&amp;S risks throughout our business;</td>
</tr>
<tr>
<td>• We ensure each employee, contractor and third-party service provider understands their EH&amp;S responsibilities, is trained to meet them, and is monitored for compliance; and</td>
</tr>
<tr>
<td>• We establish EH&amp;S objectives, regularly measure our progress, and strive to continually improve our EH&amp;S performance.</td>
</tr>
<tr>
<td><strong>DEVELOPMENT PRINCIPLES</strong></td>
</tr>
<tr>
<td>• The Project will be competitive with other investment opportunities available to EnCana.</td>
</tr>
<tr>
<td>• Our Project will serve natural gas customers on a competitive basis, on reasonable terms and conditions.</td>
</tr>
<tr>
<td><strong>CANADA-NOVA SCOTIA BENEFITS</strong></td>
</tr>
<tr>
<td>The Project will provide full and fair opportunity for Nova Scotians and Canadians to participate in the supply of goods and services to the Project on a “best value” basis.</td>
</tr>
<tr>
<td>• Goods and services will be procured through competitive tender.</td>
</tr>
<tr>
<td>• The bidding process will be open and fair.</td>
</tr>
<tr>
<td>• Best value is a blend of total cost, quality, technical suitability, reliability, delivery and assurance of supply, while at the same time meeting or exceeding safety and environmental standards.</td>
</tr>
<tr>
<td>• We will encourage the development of long-term industrial support for the Project in Nova Scotia and Canada through consultation and communication.</td>
</tr>
<tr>
<td><strong>PROJECT MANAGEMENT</strong></td>
</tr>
<tr>
<td>Safety and quality are the fundamental values that define the Project’s Management Philosophy.</td>
</tr>
<tr>
<td>• The Project’s management structure will operate to ensure quality and safety, while maintaining cost control and schedule requirements.</td>
</tr>
<tr>
<td>• The Project will fully comply with all appropriate regulatory standards and industry codes.</td>
</tr>
<tr>
<td>New technology will be embraced where an analysis indicates that such use is prudent and does not create undue risk for the Project.</td>
</tr>
</tbody>
</table>
3.3 Development Approach

The Deep Panuke Project has been refined based on the advice of various disciplines. Building upon the best efforts of the multi-disciplinary team assembled to develop the Deep Panuke Project, the development approach provides flexibility so as to allow the Project to respond to the challenges of an offshore development.

The Deep Panuke Project contracting strategy proposes an IMT providing various levels of support and expertise to effectively manage all internal and external stakeholder interfaces with a focus on effective change management, risk mitigation, and timely delivery of the Project within established cost parameters as per Figure 3.1.

![Figure 3.1 Deep Panuke Project Elements](image-url)
The organization will be designed to integrate five major contract elements of the development, as follows:

1. drilling and completions;
2. subsea flowlines, umbilicals and structures;
3. export pipeline;
4. provision of a leased MOPU; and
5. ready for operations (RFO) support and long term logistics and operations.

Where possible, key personnel from within the major contractors and supplier organizations will be incorporated into the IMT to enhance communication, interface management and alignment.

EnCana will not consider full sanction to the Project until the conclusion of the bid competition phase and after regulatory approvals are received.

During the concept development and FEED stages, several potential development alternatives were analyzed. As a result of this analysis, the production and transportation systems described in the Development Plan (DPA Volume 2) are the most technically and economically feasible means of developing the Project in a safe and environmentally responsible manner. The evaluation of development alternatives is also described in the Development Plan (DPA Volume 2).

### 3.4 Canada-Nova Scotia Benefits Plan

The Deep Panuke Canada-Nova Scotia Benefits Plan (DPA Volume 3) describes various processes and procedures to address the requirements for Canada-Nova Scotia benefits as described in Section 45 of the Accord Act.

The Benefits Plan reflects EnCana’s commitment to the principles and processes by which it will strive to enhance opportunities for Nova Scotians and Canadians through the development and operations phases of the Project. The Benefits Plan will remain an important element of EnCana's overall strategy for Deep Panuke, and through appropriate consultation and reporting, EnCana will demonstrate that the policies and principles of the Benefits Plan (DPA Volume 3) are applied in practice.

EnCana has operated its East Coast operations from its Halifax office since 1996. The Deep Panuke Project Management Team will be continue to be based in Halifax for the duration of the Development Phase of the Project, with an operations team located in Nova Scotia during the production operations phase. There will be appropriate levels of decision-making resident in Nova Scotia for all functional areas required for the execution of the Project.
EnCana is fully committed to employing a competitive, open, and fair recruitment process, with full and fair opportunity for Nova Scotians and all Canadians, and with first consideration to qualified Nova Scotians. Foreign workers will be hired only when specialized knowledge or experience is required and when qualified Canadian workers are not available.

EnCana is committed to providing training opportunities to Nova Scotians and Canadians as required for the work program, and will continue to work with educational and training institutions and with the provincial government to identify skills gaps and to promote and support training and development within Atlantic Canada. First consideration will be given to Nova Scotians in training and employment in the work program.

EnCana will require its contractors to adhere to this Benefits Plan, and any collective agreement entered into by EnCana will contain similar provisions.

Since establishing a presence on the East Coast of Canada in 1996, EnCana has demonstrated its commitment to the initiation and support of education, training, and applied R&D associated with East Coast offshore petroleum activities. EnCana will continue to work with Nova Scotia-based institutions that have the capacity and capability to develop education and training programs and conduct required R&D in relation to petroleum resource activities in the offshore area. Programs will be developed in consultation with the Province of Nova Scotia to support these initiatives.

EnCana has agreed with the Province of Nova Scotia to establish funds, administered by the Province, for the purpose of R&D, education and training, disadvantaged groups and such other benefits expenditures related to R&D, education and training and disadvantaged groups as may be required in an approved Benefits Plan. The formula for funding is based on 0.5% of gross revenues generated by the Deep Panuke Project. Under the Deep Panuke OSEA, the Province has agreed that any expenditures paid by EnCana pursuant to conditions imposed by the CNSOPB on the approval of the Benefits Plan, and accepted by the CNSOPB as an expenditure with respect to Section 45 of the Accord Act shall be deemed to be, and credited as, amounts paid to the Province with respect to these funds. More specific details regarding the funds are contained in Clause 3, “EnCana’s Commitments Regarding Nova Scotia Benefits” of the OSEA, as well as in Appendix C of the Benefits Plan (DPA Volume 3) which provides an excerpt of the commitments from the OSEA signed on June 22, 2006.

EnCana is committed to providing Canadian companies with full and fair opportunity to participate in the provision of goods and services on an internationally competitive basis, with first consideration to Nova Scotian residents and companies where competitive on a best value basis. EnCana defines best value as a blend of total cost, quality, technical suitability, reliability, delivery and assurance of supply while at the same time meeting or exceeding safety and the environmental standards.
3.5 Environmental, Health and Safety Management

3.5.1 EHS Management Framework

EnCana’s EHS management framework for Deep Panuke includes the following components:

- EnCana’s Corporate Responsibility Policy
- EnCana EHS Best Practice Management System

EnCana’s Corporate Responsibility Policy defines its commitment to EHS and provides the foundation for its management. The Corporate Responsibility Policy builds on the base of EnCana’s Constitution, translating shared principles and values into actionable commitments in eight key performance areas, including EHS. The Corporate Responsibility Policy commits all employees to conducting EnCana business ethically, legally, and in a manner that is fiscally, environmentally, and socially responsible. It provides the overarching values and policy framework for EHS performance. EnCana’s Corporate Responsibility Policy is as follows:

*EnCana believes our reputation is critical to the creation of long-term value for our shareholders. We also recognize that success on the bottom line is reinforced by our behavior beyond the bottom line. Protecting and enhancing our reputation and social license to operate is a significant element of sustained financial success and requires us to define and commit to Corporate Responsibility as an organization-wide standard.*

*In alignment with the values and principles embodied in EnCana’s Constitution, this Corporate Responsibility Policy commits us to conducting our business ethically, legally, and in a manner that is fiscally, environmentally, and socially responsible, while delivering sustainable value and strong financial performance. It illustrates our Constitution in action and demonstrates its impact on decision-making. EnCana aspires to be a leader in Corporate Responsibility and will implement changes as required to reflect leading Corporate Responsibility practices.*

*This policy applies to any activity undertaken by or on behalf of EnCana, anywhere in the world, associated with the finding, production, transmission, and storage of our products, including decommissioning of facilities, marketing, and other business and administrative functions.*

The Corporate Responsibility Policy is built around eight pillars of commitment that reflect existing and emerging benchmarks of corporate responsibility as follows:
1. leadership commitment;
2. sustainable value creation;
3. governance and business practice;
4. human rights;
5. labour practices;
6. environment, health and safety;
7. stakeholder engagement; and
8. socio-economic and community development.

The EnCana EHS Best Practice Management System is a corporate-wide standard for systematically achieving a desired level of EHS performance and serves as the overall framework for safety and environmental management. Specifically, it provides for a structured approach to be taken with respect to the identification, evaluation and management of hazardous conditions or practices that could potentially harm people or result in environmental damage. It comprises a set of ten inter-linked elements, which address important business practices that enable the company to achieve its intentions outlined in the Corporate Responsibility policy. These elements are stated below:

1. leadership;
2. managing risk;
3. emergency preparedness and response;
4. assuring competency;
5. conducting our business responsibly;
6. ensuring contractor and supplier performance;
7. managing incidents;
8. documentation management;
9. reporting EHS performance; and
10. evaluating system effectiveness.

The Deep Panuke EHS Management System Guidance Manual will provide guidance to the Project team, including contractors, in implementing the requirements of the corporate-wide EHS Best Practices Management System. The Deep Panuke EHS Management System will be used as a means of documenting and demonstrating compliance with required hazard prevention, control and mitigation measures, and regulatory requirements.
3.5.2 Safety Plan

The Project Safety Plan will specify the resources and measures needed to plan, schedule, control and monitor implementation of the day to day safety-critical work activities. This plan will incorporate risk prevention and mitigation measures identified in formal risk assessment and safety engineering studies undertaken during the design phase. Major contractors will be required to develop Safety Plans for their installations and activities and those plans will be incorporated by reference in the Project Safety Plan. EnCana will suggest a standard for the content and format of such Safety Plans, to ensure uniformity as well as to optimize the interfacing between the various plans.

The Project Safety Plan must meet the expectations of EnCana’s EHS management system.

The Project Safety Plan will be succeeded by an Operations Safety Plan that documents all the hazards and effects associated with the facility and the corresponding control measures. These control measures will be translated into operations procedures, maintenance procedures, and emergency response systems.

Management of hazards during the operational phase will focus on procedural and administrative aspects. Hazard management techniques such as an effective permit to work system, job hazard analysis, EHS performance monitoring system, and contingency planning, will be implemented to address operations-specific hazards.

Production operations manuals, drilling operations manuals, and other manuals required for safe operations will be developed for routine activities. Formal maintenance management systems will be established to ensure safe and environmentally-sound operations of the production facilities.

Where operations involve simultaneous drilling, diving, or construction activities, procedures will be developed jointly with the contractors involved to ensure that these activities are conducted in a safe and coordinated manner. In these cases, the major contractors involved will be required to have or develop site-specific Safety Plans (e.g. Drilling Safety Plan, Diving Safety Plan), that meet EnCana’s requirements.

3.5.3 Security Plan

Security threats and incidents will be managed under the Deep Panuke Emergency Management Plan. An Offshore Facility Security Plan conforming to API RP 70 Security for Offshore Oil and Gas Operations will be developed and implemented for the MOPU and drilling rigs. EnCana will ensure that Transport Canada-approved Security Plans complying with the Marine Transportation Security Regulations are developed and implemented at contracted or subcontracted vessels and the supply base. For foreign-flagged or contracted vessels, the requirements of the International Ship and Port Facility
Security Code (ISPS Code) and SOLAS Amendments 2002 will be met to the extent applicable for operation in Canadian waters.

3.5.4 Deep Panuke Emergency Management Plan

The DPEMP will outline the measures to effectively prepare for and respond to foreseeable emergency situations involving operations, equipment and products. The DPEMP will cover the following three broad areas of emergency management responsibility:

- provision of logistical, consultative advice and support to the field Incident Commander. Incident Commander is an incident command system terminology for the “person in charge” of on-scene response, for example, the Offshore Installation Manager, Vessel Master, or Helicopter Pilot;
- assessment of short and long term risks and impact of the emergency, and co-ordination of regulatory liaison, media communications and relative response; and
- appropriate notification of and communication with the EnCana Crisis Management Team.

The DPEMP will address or include the following:

- plan administration;
- incident command organization, roles and responsibilities;
- notification and communication protocol;
- emergency response actions based on incident severity classification;
- risk assessment criteria for developing incident action plans;
- emergency response procedures for serious injury/death, including medical evacuation, loss of well or process control, fire/explosion, overdue/lost craft, collision avoidance, diving emergency, spill incident, severe weather, and security incident/threat of criminal activity;
- Joint Rescue Coordination Centre (JRCC) liaison;
- support resources;
- media, next-of-kin and relative response procedures;
- business restoration/resumption planning;
- training requirements;
- supporting documentation including manuals, forms, checklists and information appendices, and
- auditing and continuous evaluation.
3.5.5 Deep Panuke Environmental Protection Plan

EnCana will implement environmental protection measures, which will be documented in an EPP, to mitigate potential environmental effects from its activities. The EPP for the Deep Panuke Project will be developed during the detailed engineering phase of the Project in consultation with regulators and key stakeholders. It will be developed to ensure the implementation of EnCana’s environmental commitments and will be consistent with the requirements of the CNSOPB’s regulations and guidelines. The EPP will be updated as required over the life of the Project.

The EPP will include environmental protection procedures for general activities common to all phases in the Project lifecycle. The EPP will cover the various Project phases/activities/procedures to provide clear and specific instruction and guidance to employees and contractors during these short term, but critical, phases of Project development. The EPP will cover practices, such as spill response, waste and chemical management; activities associated with onshore and offshore construction and decommissioning and compensation for fishing and aquaculture vessel and gear damage. Corporate environmental Codes of Practice for special areas such as Sable Island, the Gully Marine Protected Area and Country Island, will also be included in the EPP. The strategy and overall approach to spill response will be dealt with in the DPEMP.

An important aspect of the EPP is ECM, which ensures compliance with all regulatory requirements and self-imposed environmental commitments. EnCana will use ECM to monitor performance standards developed for the Project. Specifically, ECM will involve monitoring for conformance with the discharge limits identified in the Offshore Waste Treatment Guidelines and targets and commitments set by EnCana in the EA Report (DPA Volume 4).

3.5.6 Deep Panuke Environmental Effects Monitoring

As part of its commitment to adaptive ecosystem management, EnCana will implement an environmental effects monitoring plan for the lifecycle of the Project. The EEMP will take into account the following:

- environmental effects predictions in the approved 2002 CSR and the 2006 EA Report and the resulting CSR;
- findings of the EEM program;
- mitigation measures for various effects, and
- issues that may arise regarding environmental sustainability.

Specific programs to address these issues will be developed in consultation with the regulatory authorities having jurisdiction in such matters.
An EA on the Deep Panuke Project in the form of a Comprehensive Study under CEAA in 2002 concluded that the Deep Panuke Project was not likely to have significant adverse effects on the environment. The resulting CSR received Ministerial approval in December 2002.

Between 2003 and 2006, EnCana re-evaluated the reservoir and facilities to determine the optimum Project basis. As part of pre-filing consultation with the regulators, the FEAC and expected RAs put together a draft work plan for the Deep Panuke Project in order to guide the regulatory review process. The draft work plan indicated that the assessment would be a new comprehensive study, but that it would solely address the modifications between the Project basis of the approved 2002 CSR and the revised Project basis. The major modifications between the revised Project basis and the Project basis for the approved 2002 CSR include:

- production design capacity of $8.5 \times 10^6 \text{ m}^3/\text{d} \ [300 \text{ MMscf/d}]$ versus $11.3 \times 10^6 \text{ m}^3/\text{d} \ [400 \text{ MMscf/d}]$;
- subsea wellheads with subsea tie-backs versus platform wells;
- single integrated installation (MOPU) versus three fixed platforms;
- revised field centre location;
- additional export (multi-phase) pipeline option (SOEP Subsea Option); and
- greater produced water discharge rate.

Table 4.1 provides a more detailed comparison between the Project basis for the approved 2002 CSR and the revised Project basis.

<table>
<thead>
<tr>
<th>Table 4.1</th>
<th>Comparison of Approved 2002 CSR Project Basis and the Revised Project Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Item</td>
<td>Base Case (Approved 2002 CSR)</td>
</tr>
<tr>
<td>Well Count and Configuration</td>
<td>• Maximum of 8 – platform wells • 5-6 new drilled production wells: H08, PI1B, M79A, PP3C and 1-2 future wells • 1-2 new drilled injection wells</td>
</tr>
<tr>
<td>Project Life</td>
<td>Expected Mean case: 11.5 years</td>
</tr>
</tbody>
</table>
### Table 4.1 Comparison of Approved 2002 CSR Project Basis and the Revised Project Basis

<table>
<thead>
<tr>
<th>Project Item</th>
<th>Base Case (Approved 2002 CSR)</th>
<th>M&amp;NP Option</th>
<th>SOEP Subsea Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Centre</td>
<td>Base Case</td>
<td>Relocated 3.6 km NNE</td>
<td></td>
</tr>
<tr>
<td>Base Structure</td>
<td>Three fixed platforms including: • production platform • utilities/quarters platform • wellhead platform</td>
<td>• 1 MOPU integrated facility</td>
<td></td>
</tr>
<tr>
<td>Discharge of muds/cuttings for new wells</td>
<td>• Drilled from field centre • WBM/cuttings overboard • SBM/cuttings skipped and shipped or injected</td>
<td>• Drilled from individual well locations • WBM/cuttings overboard No SBM</td>
<td></td>
</tr>
<tr>
<td>Delivery point</td>
<td>• M&amp;NP tie-in onshore, adjacent to SOEP • gas plant</td>
<td></td>
<td>• SOEP subsea tie-in • SOEP 660 mm [26 inch] pipeline</td>
</tr>
<tr>
<td>Export pipeline</td>
<td>• 610 mm [24 inch], • 176 km • Single phase trenched ~ 50% of route</td>
<td>• 560 mm [22 inch], • 176 km • Single phase, trenched ~ 50% of route</td>
<td>• 510 mm [20 inch], • 15 km • Multi-phase trenched 100% of route</td>
</tr>
<tr>
<td>Export gas</td>
<td>• 11.3 x 10^6 m^3/day [400 MMscfd] • Sales quality</td>
<td>• 8.5 x 10^6 m^3/day [300 MMscfd] • Sales quality</td>
<td>• 8.5 x 10^6 m^3/day [300 MMscfd] • sweet and dehydrated</td>
</tr>
<tr>
<td>Export condensate</td>
<td>N/A</td>
<td></td>
<td>• Maximum 220 m^3/day • Sweet and stabilized, commingled with gas</td>
</tr>
<tr>
<td>Condensate use</td>
<td>Fuel, surplus injected</td>
<td></td>
<td>Sales product</td>
</tr>
<tr>
<td>Produced water</td>
<td>• Maximum 1,100 to 1,600 m^3/day [7,000 to 10,000 bpd] • Discharged overboard</td>
<td>• Maximum 6,400 m^3/day [40,000 bpd] • Discharged overboard</td>
<td></td>
</tr>
<tr>
<td>Acid gas</td>
<td>• Dedicated injection well • ~180 x 10^3 m^3/day [6 MMscfd]</td>
<td>• Dedicated injection well • ~130 x 10^3 m^3/day [4.5 MMscfd]</td>
<td></td>
</tr>
</tbody>
</table>

### 4.1 Malfunctions and Accidental Events

EnCana has reviewed the various potential malfunctions and accidental events that may occur during the Project and has updated spill probability analysis, spill behaviour modelling and air quality modelling based on the new Project design and location. Spill probability remains low, with the highest frequency for smaller, platform spills (less than 1 bbl). The probability of a spill from a flowline or export pipeline is estimated to be 0.03% chance per year for spills between 1,000 and 10,000 barrels. In general, the spill behaviour modelling results present potential impact zones similar to or smaller than those identified in the approved 2002 CSR. EnCana has incorporated design features and procedures to virtually eliminate or minimize the risk of major releases. EnCana will also develop and implement safety, spill response and contingency plans to reduce adverse environmental effects in the unlikely event of such incidents.
4.2 Public Consultation and Aboriginal Communications

An extensive consultation process for the originally proposed Project was carried out between 2000 and 2002 as part of the environmental assessment process leading to the Ministerial approval of the CSR in 2002. In 2006, EnCana initiated a public consultation program for the currently proposed Project to seek public and stakeholder input to the current environmental assessment and Project planning process. Discussions with Aboriginal groups have been initiated with respect to the currently proposed Project and to highlight the findings and conclusions of the EA Report. Issues identified through these processes have been tracked for consideration in Project planning and the preparation of the EA Report. EnCana will continue to communicate proactively with interested stakeholders and will provide supplementary information as part of this ongoing public consultation process. EnCana remains committed to communication around public and stakeholder concerns and the development of mutually constructive relationships.

4.3 Scope of the Assessment

The scope of the environmental assessment was defined based on differences between the Project basis for the approved 2002 CSR and the revised Project basis. As such, the EA Report focussed on Project modifications and regulatory, biophysical, and socio-economic updates since the approved 2002 CSR. These modifications and updates were identified through a review of the Proposed Project Options, regulatory and stakeholder consultation, background research, and professional judgment of the Study Team. The final scope of the assessment was provided by the relevant regulatory authorities in November 2006 following a period of public comment.

Biophysical VECs selected for the approved 2002 CSR remained valid and were reselected for this EA Report. The socio-economic VECs selected for this EA Report were updated from the approved 2002 CSR and focused on social and economic components most likely to be affected by the proposed Project options.

Since the scope of this EA Report was limited to modifications and updates from the approved 2002 CSR, potential interactions which had been assessed previously did not require reassessment. Likewise, where a Project modification was predicted to result in a lower effect than that previously assessed (e.g., smaller footprint, less emissions), in general, the effects analysis presented in the approved 2002 CSR was referenced and no further analysis was required.

Based on this scoping exercise, the following VECs were selected:
Biophysical VECs
- Air Quality
- Marine Water Quality
- Marine Benthos
- Marine Fish
- Marine Mammals and Turtles
- Marine Related Birds
- Sable Island
- Onshore Environment

Socio-economic VECs
- Land Use
- Economy
- Commercial Fisheries and Aquaculture
- Other Ocean Users

The scoping for the CEA also focused on Project modifications and regulatory, biophysical and socio-economic updates since the approved 2002 CSR. The activities considered in the CEA reconsidered those activities that have changed since 2002 such that the cumulative effects would differ from that originally predicted, or interact cumulatively with the revised Project options, resulting in different cumulative effects than originally predicted for the approved 2002 CSR.

4.4 Biophysical Assessment

In general, effects on biophysical VECs were predicted to be similar to or less than, those presented in the approved 2002 CSR. As was the case in the approved 2002 CSR, the only predicted significant adverse effect is the effect on air quality in the unlikely event of a well blowout or piping rupture resulting in the release of acid gas. Such an event could have health and safety consequences for platform workers and passengers on vessels downwind. Design prevention measures, rendering such an event extremely unlikely, and emergency response contingency planning will further reduce the likelihood that workers or others would be seriously affected by emissions. Air quality modelling for accidental events indicates that exposure levels to receptors on Sable Island remain not significant and have decreased from that originally predicted in the approved 2002 CSR. Spill modelling indicates that accidental releases of hydrocarbon from the Project will dissipate quickly without widespread effects and would not reach Sable Island.

Modelling studies of produced water discharges and drill wastes were updated to reflect Project modifications. Despite the greater volumes of produced water discharges, modelling has shown that
these discharges are not expected to result in significant adverse effects on marine water quality or marine organisms. Project modifications will result in lower total WBM and cuttings discharges spread over a larger area (i.e., disposed at well sites, not a single platform location). Dispersion modelling of these discharges reveals an increased initial dispersion of drilling wastes, resulting in smaller cutting piles.

New Project related effects not considered in the approved 2002 CSR include potential effects on wetlands and freshwater habitat as a result of onshore components for the M&NP Option. EnCana is currently in discussions with landowners to finalize the routing of the onshore pipeline (and location of associated facilities). Through these discussions, EnCana will make every reasonable effort to minimize interactions with wetlands or any other sensitive onshore environmental features. Analysis of potential effects of the Project on the onshore environment assumed that EnCana may be unable to avoid wetlands and watercourse crossings. Mitigation and follow-up to minimize adverse effects on these features have been included and there are not predicted to be any significant residual adverse effects.

The biophysical CEA focussed largely on potential cumulative effects with the proposed Keltic Petrochemical Inc. petrochemical facility and LNG project (Keltic/Maple Project), which are planned to begin construction in the Goldboro Industrial Park in 2007. Spatial and temporal overlap between the Keltic/Maple Project and the Deep Panuke Project could result in cumulative effects on the nearshore and onshore environment. However, due to mitigation and monitoring/follow-up proposed by both proponents (EnCana and Keltic/Maple), these effects are not likely to be significant.

4.5 Socio-Economic Assessment


The Deep Panuke Project is not likely to have significant adverse socio-economic effects. The Project will bring positive socio-economic benefits to the Province of Nova Scotia and represents an important step in the further development of the offshore oil and gas industry in Atlantic Canada. The Project is predicted to result in employment, business, and training opportunities, and contribute to economic stability and growth within the Province of Nova Scotia and for all Canadians. By bringing a second offshore natural gas field into production, the Project strengthens and diversifies the supply of natural gas in the Province and other domestic markets in Canada.

EnCana and the Province of Nova Scotia have worked collaboratively to agree to commitments for potential development of Deep Panuke with respect to Nova Scotian opportunities and other issues
including royalty treatment and funding of research and development, education and training, and programs for disadvantaged groups. These commitments were documented in the OSEA signed on June 22, 2006. The Project will contribute positively to local and provincial employment, incomes and gross economic output. During the Deep Panuke Project, EnCana has committed to certain levels of economic activity within Nova Scotia. EnCana will continue to provide manufacturers, consultants, contractors, and service companies in Nova Scotia and other parts of Canada with a full and fair opportunity to participate on a competitive basis in the supply of goods and services required for the Project.

Positive effects are predicted for land use and economy as the Project will be consistent with designated use in the Goldboro Industrial Park and will contribute to economic development.

In the unlikely event of a pipeline rupture and fire associated with the onshore or landfall portion of EnCana’s pipeline (M&NP Option), there is potential to cause a significant adverse effect on land use if the Keltic/Maple facilities become involved causing large scale fire and/or release of dangerous materials. A detailed quantitative risk analysis considering potential risk synergies between the nearshore/onshore components of the Project with the proposed Keltic/Maple Project will be undertaken during detailed route design in conjunction with further Keltic/Maple Project planning and design. Compliance with all applicable design codes and standards will ensure that cumulative risks of hazard to land use and inhabitants between the two projects are extremely low.

The offshore pipeline route options will interact with an experimental sea cucumber fishery (M&NP Option only) and quahog fishery. Current plans are that quahogs will be harvested prior to construction, thereby limiting the potential for effects on this fishery. The potential effects on the sea cucumber fishery, if the fishery is indeed developed, are expected to be limited due the small area of overlap with Project activities and the low density of sea cucumbers.

Effects on marine navigation are predicted to be not significant given implementation of appropriate mitigation, including effective communication with other ocean users. The issuance of Notices to Mariners during installation activities and the charting of all Project infrastructure and safety zones will decrease the likelihood of interaction between vessels and Project components. No significant adverse effects are predicted on socio-economic VECs.

Similar to the biophysical CEA, the socio-economic CEA focused largely on potential cumulative effects with the Keltic/Maple Project. The environmental assessment for the Keltic/Maple Project predicted significant economic benefits and significant demands on the local transportation infrastructure as a result of project development. There is predicted to be a positive cumulative effect on the economy as a result of the two projects. The cumulative contribution of EnCana’s onshore construction activities (M&NP Option) and the Keltic/Maple Project to adverse effects on transportation infrastructure will be relatively small and mitigated. Proponents of the Keltic/Maple Project have also
committed to working with local authorities to help mitigate transportation effects to non-significant levels.

The socio-economic CEA also considered cumulative effects associated with subsea infrastructure and safety zones on commercial fisheries. The proposed safety zone for the Deep Panuke Project is not located within a heavily fished area. In summary, significant adverse cumulative socioeconomic effects are not considered likely.

4.6 Effects of the Environment on the Project

As predicted in the approved 2002 CSR, effects of the environment on the Project are not considered to be significant. Project facilities will be designed and installed based on the appropriate environmental design criteria to ensure the safety and integrity of these facilities during severe environmental conditions. Monitoring and/or contingency planning will also serve to minimize adverse effects.

4.7 Environmental Management Features and Commitments

EnCana will honour all commitments made in the approved 2002 CSR except where a commitment is no longer valid due to Project design modifications or other updates. In addition, the EA Report (DPA Volume 4) identifies new commitments to minimize adverse effects that could occur as a result of these design modifications. Section 11 of the EA Report (DPA Volume 4) summarizes these revised and new commitments. The following is a list of key environmental management features of the Project and other commitments made by EnCana to minimize adverse environmental effects of the Project:

- injection of waste acid gas into a suitable geological structure which will reduce potential atmospheric emissions of greenhouse gases (by 18%) and sulphur compounds (>99%) during routine operations;
- an internal design target (25 mg/L) for oil in produced water which is lower than the regulatory limit (30 mg/L, 30-day rolling weighted average);
- in addition to a hydrocyclone, use of a dedicated full-time polishing unit (organophillic clay type) and stripping tower to reduce hydrocarbons (and potentially other chemicals) and H₂S respectively in produced water prior to discharge;
- co-operation with the Fisheries and Oceans Centre for Offshore Oil and Gas Environmental Research on investigating fate and effects of produced water discharges from the MOPU;
- in addition to a separator tank, use of a dedicated full-time polishing unit (organophillic clay type) to reduce hydrocarbons (and potentially other chemicals) in deck drainage prior to discharge;
- use of water-based muds only;
- recovery of waste heat during offshore operations;
• use of surplus condensate for offshore power generation (M&NP Option);
• use of an existing pipeline corridor (M&NP Option) or pipeline (SOEP Option) for transporting gas to shore;
• design (protective concrete coating) and/or installation (burial) of pipelines/flowlines to minimize interactions with fishing activities;
• Project configuration and planned mitigation to avoid harmful alteration of fish habitat as defined under the *Fisheries Act* and disposal at sea as defined under the *Canadian Environmental Protection Act*;
• no nearshore pipeline construction during lobster fishing season (April 19 to June 20) which also covers the period when the endangered Roseate Tern typically prospects for nests and lays eggs on nearby Country Island (May 1 to June 20);
• routing of the onshore pipeline to minimize interactions with sensitive environmental locations such as wetlands and major stream crossings where possible; and
• adherence to corporate Codes of Practice for Sable Island, Country Island and the Gully Marine Protected Area.

4.8 Conclusions

In conclusion, the Deep Panuke Project is not likely to have significant adverse effects on the environment. The Project will contribute positively to the Canadian and Nova Scotia economies by establishing a viable facility and operation. The Project will reduce adverse environmental effects to acceptable levels through the use of technically and economically feasible design and mitigation measures.
5 ECONOMIC COMMITMENTS AND OPPORTUNITIES

5.1 Commitments under Deep Panuke OSEA

In its Energy Strategy, released in 2001, the Province of Nova Scotia identified its desire to enter into voluntary OSEAs with developers of offshore projects, prior to the full regulatory process, that describe expectations and obligations of both parties with respect to the development. In particular, the OSEA would deal with specific industrial and employment benefits commitments and processes.

EnCana and the Province have worked collaboratively to agree to commitments for the potential development of Deep Panuke with respect to Nova Scotian opportunities and other issues including royalty treatment and funding of R&D, education and training, and programs for disadvantaged groups. The OSEA sets out the commitments and obligations agreed to by the Province and EnCana to facilitate the development of the Deep Panuke Project. The OSEA was signed on June 22, 2006.

5.1.1 EnCana’s Commitments Regarding Nova Scotia Benefits

Section 3 of the OSEA outlines EnCana’s commitments to Nova Scotia Benefits, including its commitment to the statutory obligations in Section 45 of the Accord Act describing full and fair opportunity and first consideration for Nova Scotians, and recognition of the right of the Province to be principal beneficiary of the Nova Scotia offshore as set out in Section 1 of the Canada-Nova Scotia Offshore Petroleum Resources Accord. In addition to establishing processes to provide full and fair opportunities for Nova Scotians and first consideration where competitive, the OSEA describes additional commitments by EnCana to provide specific industrial and employment opportunities for Nova Scotians, with minimum commitments for person hours of work in Nova Scotia as well as person hours of work for individuals defined as Nova Scotians.

Section 3 from the OSEA is included as Appendix C of the Benefits Plan (DPA Volume 3).

5.1.1.1 Person Hour Commitments

The total commitment to the opportunities described in Section 3 of the OSEA is one million three hundred and fifty thousand (1,350,000) Person Hours, which will include not less than eight hundred and fifty thousand (850,000) Nova Scotia Person Hours. Person Hours and Nova Scotia Person Hours are also defined in Section 3 of the OSEA.
5.1.1.2 Engineering, Procurement and Management Activities

EnCana is committed to providing not less than six hundred and twenty-three thousand (623,000) Person Hours on Engineering, Procurement and Management Activities, as outlined in the activities below:

- EnCana Management Team – Engineering;
- EnCana Management Team - Project Management/Procurement;
- Design & Procurement - Subsea Protection Structures;
- Design & Procurement - Landfall tie-in to M&NP;
- Design & Procurement telecommunications equipment;
- Design & Procurement - PIMMS (Process/Production Monitoring System);
- Design - metering systems for sales, production, test, and discharge;
- Procurement - 560 mm [22 inch] diameter export line to shore;
- Geotechnical survey technical support;
- Environmental Engineering;
- Regulatory & Certifying Authority engineering;
- Preparation of Detailed Safety Case;
- Design & Procurement - Drilling & Completions; and
- Placement of 10 Nova Scotians in technical professions within the successful contractor’s offices or facilities in the key areas of engineering, project controls, IT/IS, Planning, QA/QC, Cost Control, or Change Management.

5.1.1.3 Offshore Supply Vessels

The Deep Panuke Project will require the service of two offshore supply vessels, leased on a multi-year charter, with options to renew. EnCana has agreed that construction of one of these vessels will be completed in Nova Scotia. The construction of such vessel shall comprise not less than three hundred and sixty thousand (360,000) Person Hours.

5.1.1.4 Subsea Protection Structures

EnCana agrees to perform design, procurement, and fabrication activities with respect to subsea trawl over protection structures for the subsea well locations on the Deep Panuke Project which shall comprise not less than thirty thousand (30,000) Person Hours.
5.1.1.5 Export Pipeline

Receiving, handling, double jointing, coating and shipping activities with respect to a 560 mm [22 inch] export line will occur in Nova Scotia and shall comprise not less than thirty-seven thousand (37,000) Person Hours.

5.1.1.6 Accommodations Unit

The design, procurement and fabrication activities with respect to accommodations unit(s) for the MOPU will be undertaken in Nova Scotia with not less than two hundred and eighty thousand (280,000) Person Hours.

5.1.1.7 Flare

EnCana agrees to perform design, procurement and fabrication activities for a flare unit for the MOPU in Nova Scotia, which shall comprise not less than twenty thousand (20,000) Person Hours.

5.1.1.8 Alternative Initiatives

In the event that it is not practicable to undertake any of the commitments shown in Sections 4.2.1 to 4.2.7, Section 3.5 of the OSEA provides EnCana with the right to substitute alternative initiatives of equivalent value based on Person Hours, subject to agreement of the Province.

5.1.1.9 Onshore Drilling Rig Program

EnCana will commit financial and human resources to facilitate the development of the capability of an onshore drilling rig manufacturing operation in Nova Scotia, to enhance the capability and capacity of the supplier and fabrication community in Nova Scotia. EnCana will work with the Province of Nova Scotia, industry groups and suppliers to support the establishment of the drilling rig operation through the contribution of up to $1 million per rig for each of the first five rigs manufactured.

5.2 Economic Opportunities

5.2.1 Pre-Development Expenditure

Total Pre-Development expenditures for the Deep Panuke Project were approximately $430 million (Canadian) from 1998 to the end of the third quarter of 2006. This figure includes costs for the successful Panuke PP3-C discovery well, five successful delineation wells, two unsuccessful wells,
project management, engineering, studies, geophysical acquisition and interpretation, and subsurface evaluation.

5.2.2 Forecast Expenditures

Forecast expenditures shown in Table 7.1 for the Project are estimated in 2006 Canadian dollars. The forecast is estimated to be accurate at a +/- 25% level at this stage of project definition, and will become more accurate as further engineering design, procurement and contracting activities, and commercial and leasing alternatives are developed.

5.2.2.1 Development Phase Expenditures

Estimates for the development phase include costs incurred by EnCana, as operator of the Project, from the fourth quarter 2006 to first gas production, scheduled to occur in the fourth quarter 2010. The costs shown in Table 5.1 are for the M&NP option, and exclude any costs associated with the MOPU, which will be included as operating costs payable during the production life of the Project.

<table>
<thead>
<tr>
<th>Table 5.1 Development Phase Expenditures</th>
<th>C$ Millions 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnCana Project Management &amp; Engineering</td>
<td>115</td>
</tr>
<tr>
<td>Subsea Cost</td>
<td>135</td>
</tr>
<tr>
<td>Export Pipeline Cost</td>
<td>200</td>
</tr>
<tr>
<td>Drilling and Completions Cost</td>
<td>160</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>610</td>
</tr>
<tr>
<td>Contingency</td>
<td>90</td>
</tr>
<tr>
<td><strong>Total Cost to First Gas</strong></td>
<td><strong>700</strong></td>
</tr>
</tbody>
</table>

The SOEP Subsea Option would see a reduction in the cost of the export pipeline during the Development Phase. However, there would be an increase in operating costs for tariffs changed as result of using the SOEP pipeline. At this time, these costs are not defined.

5.2.2.2 Production Operations Phase Expenditures

During the production life of the field, the expenditures will be required for production operations, logistics, onshore support, well interventions, ongoing capital improvements, as well as for the field centre lease and operations services contract. There is significant variability in the potential operations cost forecast for Deep Panuke, primarily because of the impact of the field centre lease, which will constitute the single largest component of operating costs. The annual field centre lease cost will depend on the actual cost of the MOPU, lease terms, duration of amortization, and other factors.
Annual operating costs, including the field centre (MOPU) lease, are estimated at $150 million per year, +/-25%.

As well, depending on the performance of the reservoir, up to three additional production wells could be drilled after production start-up. The Mean and P50 production profile require one additional well drilled after start-up, while the P10 production profile requires three additional wells. The estimated cost of drilling, completing, and tying back to the future subsea production wells is approximately $120 million for one well in the P50 and Mean cases and $260 million for three wells in the P10 case.
CONCLUSION

The Project involves production and processing of gas offshore and transport, via subsea pipeline, of market-ready gas to an interconnection with the M&NP main transmission pipeline in Goldboro, Nova Scotia, for further transport to markets in Canada and the northeast United States.

EnCana is committed to protecting the health and safety of all individuals as well as the environment in which it operates. Therefore, the design of the Project facilities is based on high standards for environmental protection and public and personnel health and safety. The facilities will also be designed, constructed, and installed in accordance with all applicable industry standards, regulations and guidelines.

The Deep Panuke Project is not likely to have significant adverse environmental or socio-economic impacts. The Project will bring positive socio-economic benefits to the Province of Nova Scotia and represents an important step in the further development of the offshore oil and gas industry in Atlantic Canada. Indeed the Project is predicted to result in employment, business, and training opportunities, and contribute to economic stability and growth in each of the study areas identified within the Province of Nova Scotia. The Project, by bringing a second offshore natural gas field into production, strengthens and diversifies the supply of natural gas in the province and Canadian markets.

The results of the economic opportunities and impacts analysis conducted for the Project indicates that the Project will have a positive impact on the economies of the Province of Nova Scotia and Canada.

The Project is designed to meet the significant and growing demand for natural gas and other forms of energy in markets in Canada and the United States. The proximity of the Deep Panuke discovery to existing infrastructure serving these growing energy markets is one of the foundations of the Project.