



# Deep Panuke

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## ABBREVIATIONS

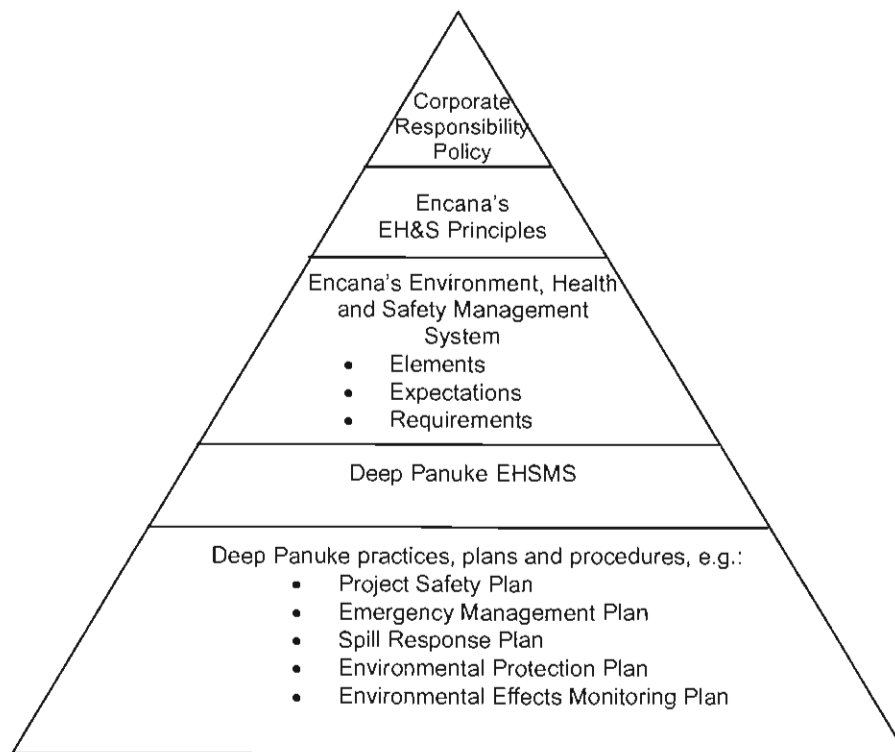
CEAA	Canadian Environmental Assessment Act
CNSOPB	Canada Nova Scotia Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSR	Comprehensive Study Report
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DND	Department of National Defense
EA	Environmental Assessment
EEMP	Environmental Effects Monitoring Plan
EFL	Electrical Flying Leads
EHSMS	Environment, Health and Safety Management System
EPP	Environmental Protection Plan
GEP	Gas Export Pipeline
HUC	Hook-up and Commissioning
IMO	International Maritime Organization
MARLANT	Maritime Forces Atlantic
MPA	Marine Protected Area
PFC	Production Field Centre
ROV	Remotely-Operated Vehicle
SSIV	Subsurface Isolation Valve
TDG	Transportation of Dangerous Goods
USBL	Ultra-Short Baseline
UTA	Umbilical Termination Assemblies
UXO	Unexploded Ordnance
WHMIS	Workplace Hazardous Materials Information System

## 1 BACKGROUND AND PROJECT DESCRIPTION

### 1.1 Regulatory and Management System Context

The Deep Panuke Project has been assessed in the Deep Panuke Environmental Assessment (EA) Report (Volume 4, 2006) under a *Canadian Environmental Assessment Act (CEAA)* Comprehensive Study process. The proposed program is part of the overall Deep Panuke scope of work.

As part of its environmental management system (see Figure 1.1, Encana's Environmental Management Framework), regulatory commitments (2006 EA Report), and conditions of approval (specifically Condition 25 and Condition 26 from the CNSOPB Decision Report and Condition 8 and Condition 13 from the National Energy Board (NEB) Certificate GC-111), Encana is obliged to implement environmental protection and monitoring measures to mitigate potential environmental effects from its activities. This Environmental Protection Plan/Environmental Effects Monitoring Plan (EPP/EEMP) focuses on Encana's proposed 2011 PFC installation and Deep Panuke field hook-up and commissioning (HUC) program.



**Figure 1.1 Deep Panuke EHS Management Framework**

## 1.2 Program Overview

The proposed 2011 PFC installation and Deep Panuke field HUC program will consist of several components which are described below. See Figure 1.2 for a location map and Figure 1.3 for a rendering of the PFC and subsea flowlines and umbilicals. See Figure 1.4 for subsea infrastructure near the PFC and Figure 1.5 for typical subsea infrastructure near a wellhead.

### 1.2.1 PFC Installation and HUC

The PFC installation and HUC program will be conducted by SBM and will consist of the following activities:

- debris and obstruction pre-survey of PFC site (with ROV) and installation of marker buoys, anchors and USBL transponders (see Section 1.3) with the installation vessel Skandi Skolten;
- PFC tow to field from Mulgrave, NS and installation at PFC site, including spudcan grouting and as-built ROV survey of the PFC; this phase will take approximately ten days and be conducted with the installation vessel Skandi Skolten, the Boa Barge 36, two support/standby vessels (the Atlantic Condor and the Ryan Leet) and four tugs (to be determined); and
- HUC of PFC systems, gas export pipeline (GEP), subsea systems and commissioning with buy-back gas until First Gas; with two support/standby vessels (the Atlantic Condor and the Ryan Leet); this will include pressure testing and dewatering of the GEP and flowlines.

The PFC installation and HUC program is tentatively scheduled to commence early July 2011 and could take up to approximately 180 days until First Gas.

### 1.2.2 Diving Program

The diving program will be conducted by Subsea 7 Canada Inc. (Subsea 7), formally known as Acergy Canada Inc., using the diving support vessel Acergy Discovery with saturation divers and will include the following activities:

- install subsurface isolation valve (SSIV) structure and umbilical (see Section 1.5);
- conduct acoustic metrology;
- install flowline/GEP spools and J-tube extension frame;
- install flange and flowline insulation covers;
- re-position and pull-in umbilicals and install umbilical termination assemblies (UTA), electrical flying leads (EFL) and support brackets (trees); and
- install on-bottom stability and dropped object protection (concrete mats and tunnels) on the GEP, flowlines and umbilicals; and scour protection (scour mats and sandbags) around the PFC South-West leg footing (see Section 1.4).

This diving program is tentatively scheduled to begin in early July 2010 and will take approximately 90 days.

This PFC installation and Deep Panuke field HUC program is very unlikely to have significant effects on the marine environment because of the low risk aspects of the proposed activities and the environmental protection measures described in the following sections.

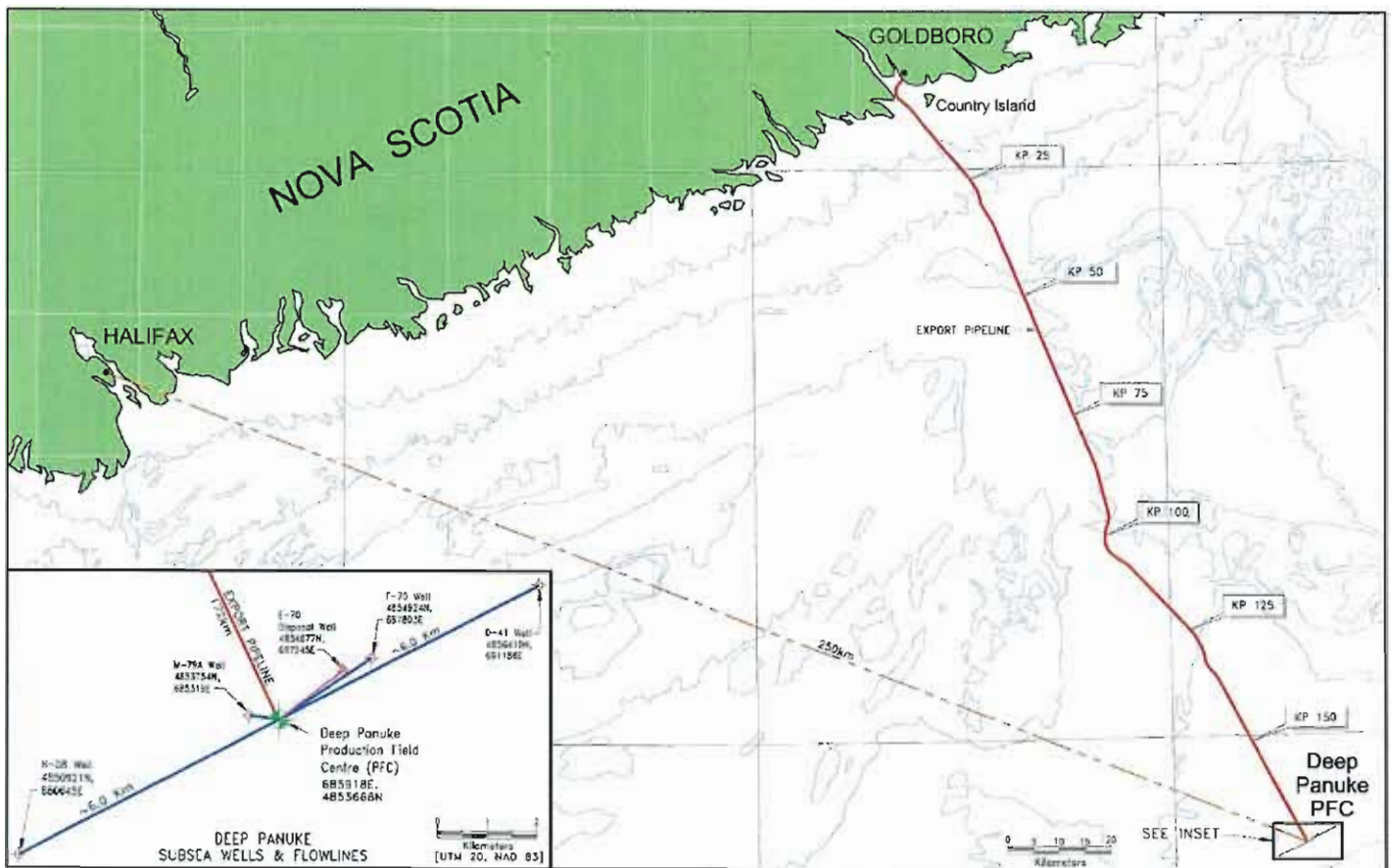


Figure 1.2 Deep Panuke Field Centre Layout

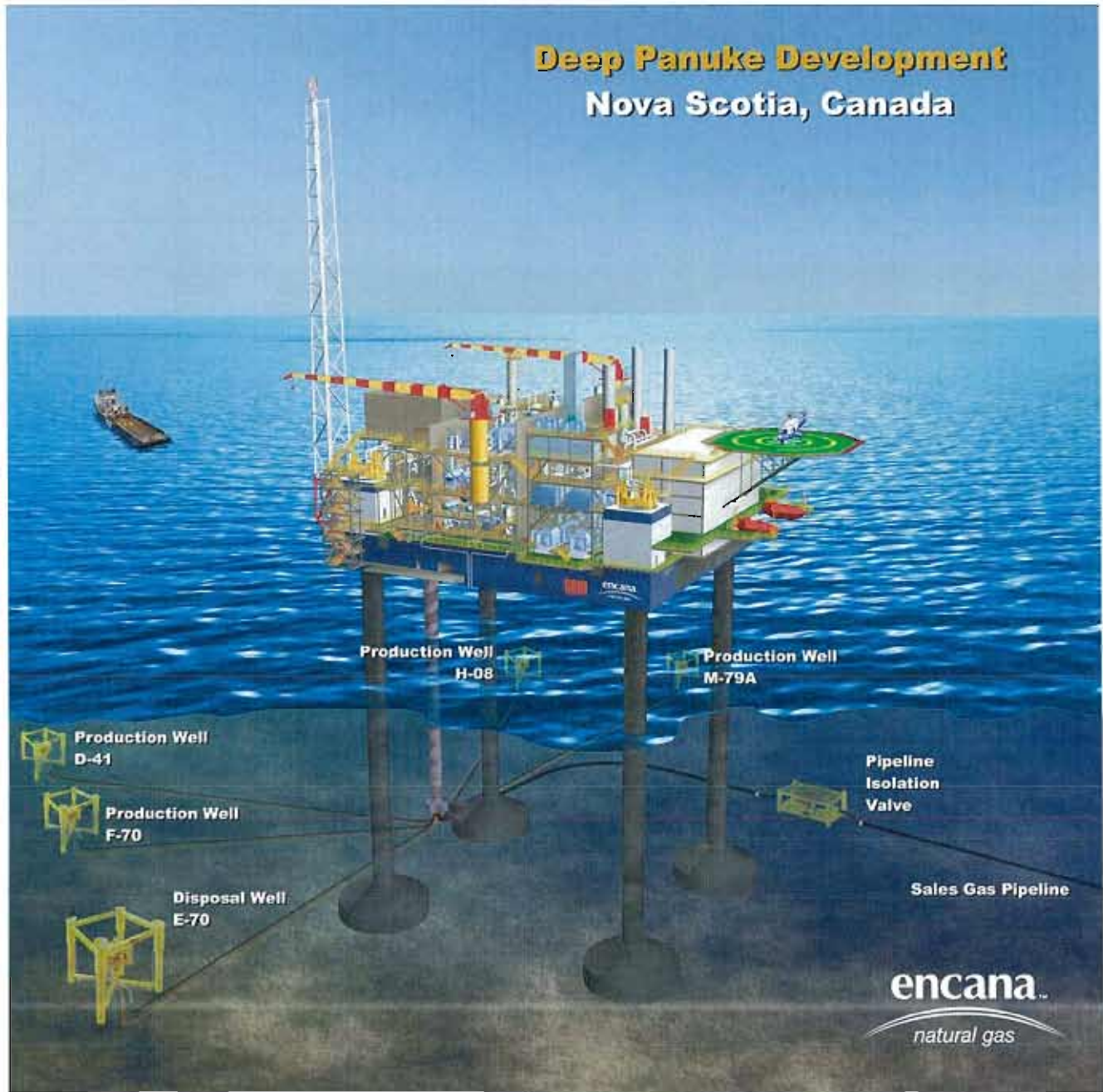


Figure 1.3 Deep Panuke Production Field Centre Rendering

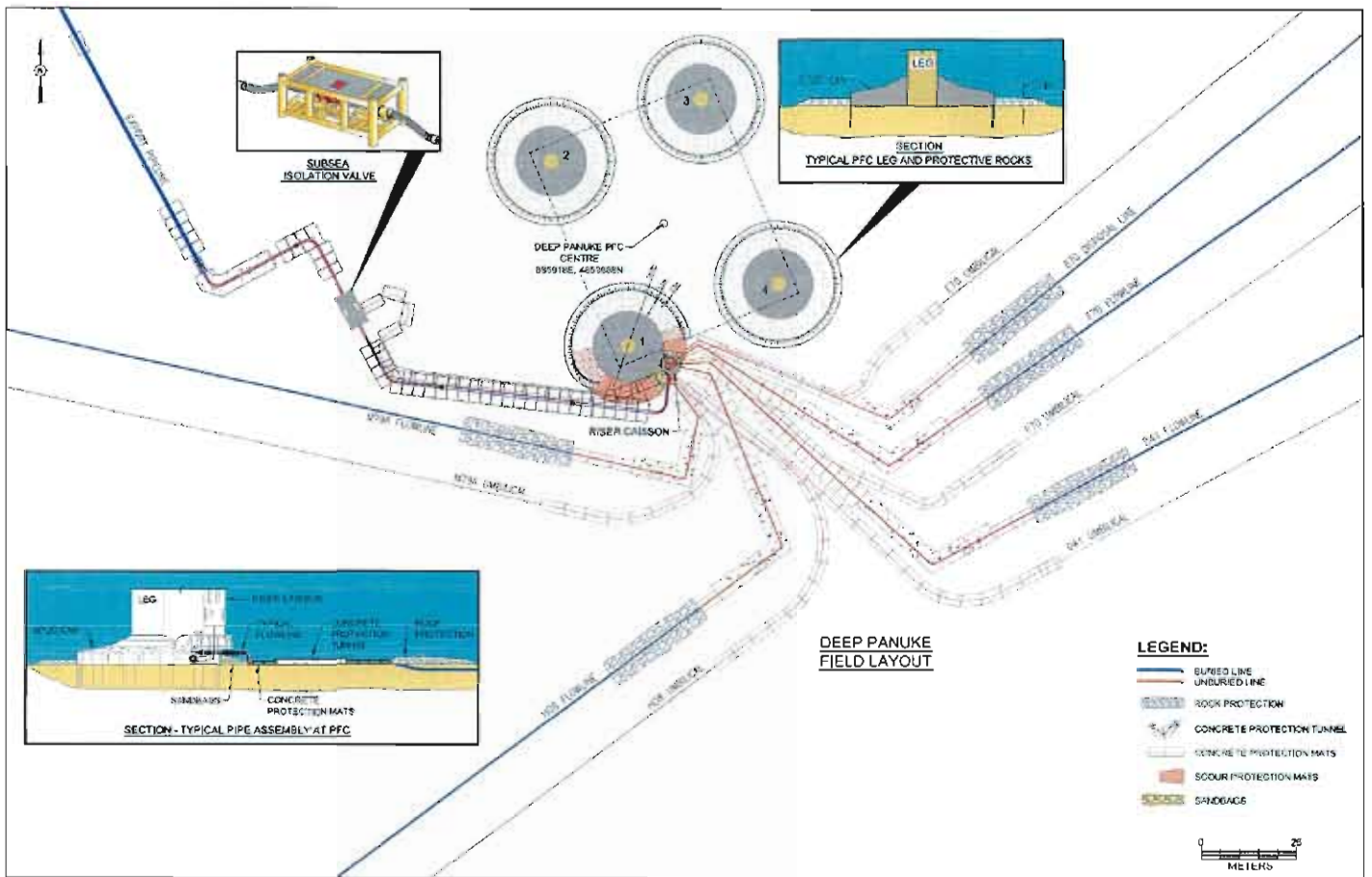


Figure 1.4 Subsea Infrastructure Near the PFC

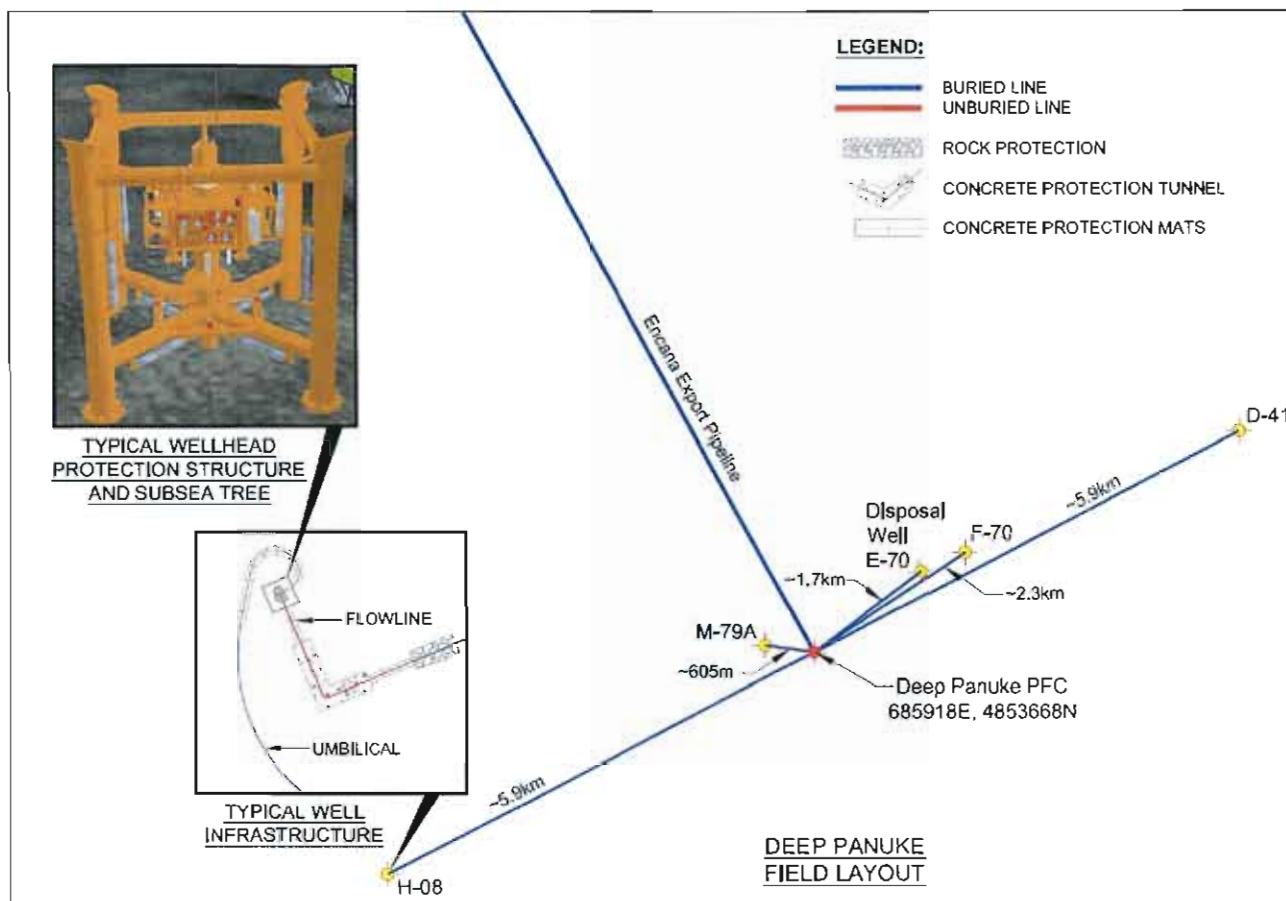


Figure 1.5 Subsea Infrastructure Near the Wellheads

### 1.3 Installation of Marker Buoys, Mooring Anchors and USBL Transponders for PFC Installation

Prior to the arrival of the PFC on site, the installation vessel, Skandi Skolten will install four marker buoys on the seabed at the southeast and southwest spudcan design locations to assist in the PFC positioning. The buoys will act as a visual reference for the ROV as the PFC approaches the final position.

In addition, two temporary moorings will be installed, pre-tensioned and buoyed-off in the field. These mooring lines will be used by the station keeping tugs during final positioning of the PFC. The moorings will use 12-tonne MK6 Stevpris anchors approximately 6 m long x 6 m wide (see Figure 1.6 and technical specifications at [http://www.vryhof.com/products/anchors/stevpris\\_mk6.html](http://www.vryhof.com/products/anchors/stevpris_mk6.html)) connected to a bottom chain laying on the seabed for 475 m maximum (see Figure 1.7).



Figure 1.6 Photo of MK6 Stevpris Anchor

Ultra-short baseline (USBL) transponders (underwater acoustic positioning system) will be placed on the PFC southeast and southwest spudcans and beside the nearest flowline/umbilical (M-79A flowline and E-70 umbilical) to supplement GPS positioning during PFC installation. The spudcan transponders will be installed in Mulgrave and the transponders for the flowline/umbilical lowered overboard by the Skandi Skolten crane.

The marker buoys, temporary moorings and transponders will be removed at the end of the PFC installation.

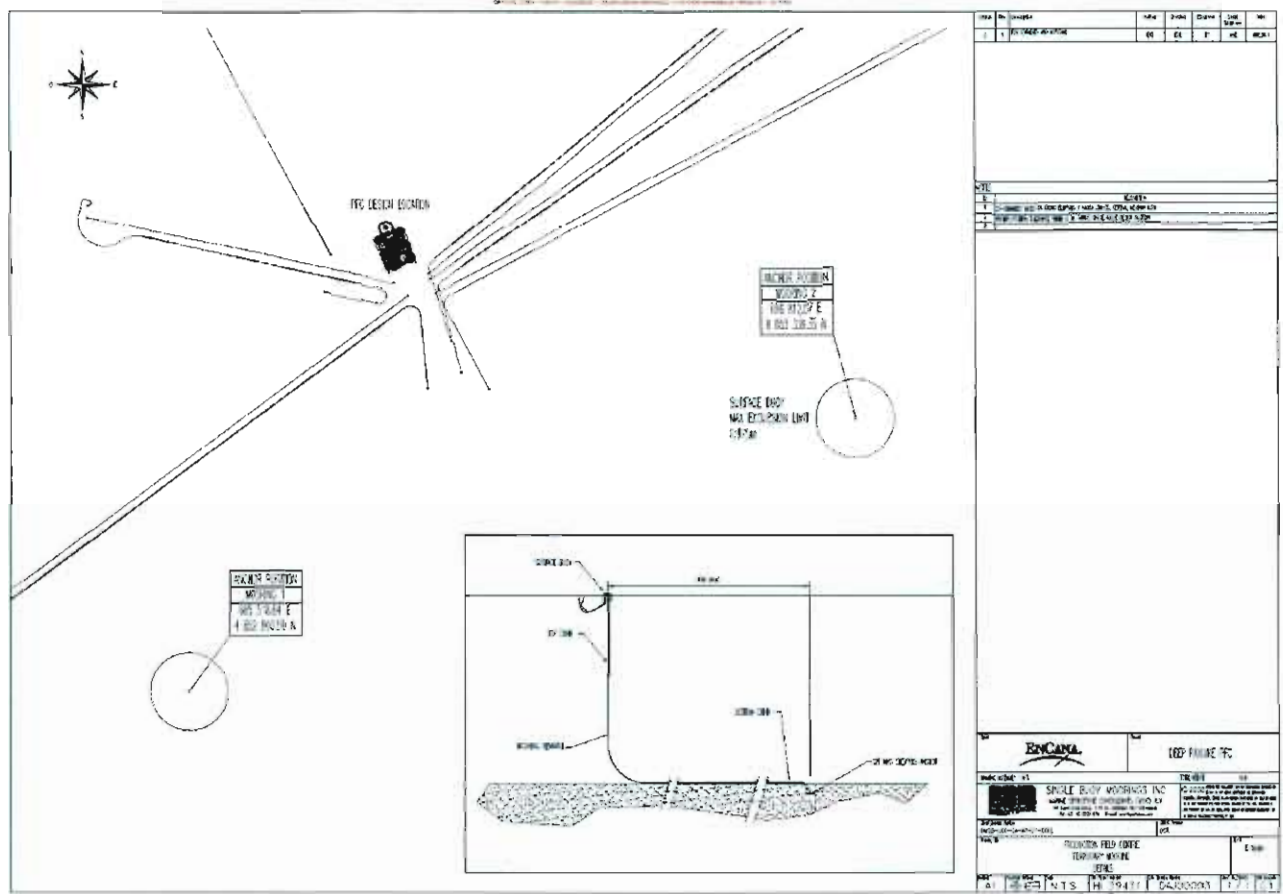


Figure 1.7 PFC Temporary Mooring Details

#### 1.4 On-bottom Stability, Dropped Object and Scour Protection Installed during Diving Program

The diving vessel Acergy Discovery will install on-bottom stability and dropped object protection (concrete mats and tunnels) on the GEP, flowlines and umbilicals; and scour protection (scour mats and sandbags) around the PFC South-West leg footing. A description of each of these protections is provided below.

The installation of the rock protection berms has already been assessed in the 2011 Rock Placement EPP/EEMP (DMEN-X00-RP-EH-90-0010).

##### 1.4.1 Concrete Protection Tunnels

Concrete protection tunnels will be placed for on-bottom stability and dropped object protection over both ends of each flowline (at the PFC and near the wellheads, see Figures 1.4 and 1.5, respectively) and over the GEP where the GEP is coming out of the trench near the PFC (see Figure 1.4). Figure 1.8 shows a typical cross section of a concrete protection tunnel and Figure 1.9 shows how individual units are assembled to form a tunnel. Table 1.1 shows the location and dimensions of the concrete tunnels. Each unit is 3 m long x 6 m wide x 1.2 m tall. A total of 100 concrete tunnel units will be installed for a total length of approximately 300 m.

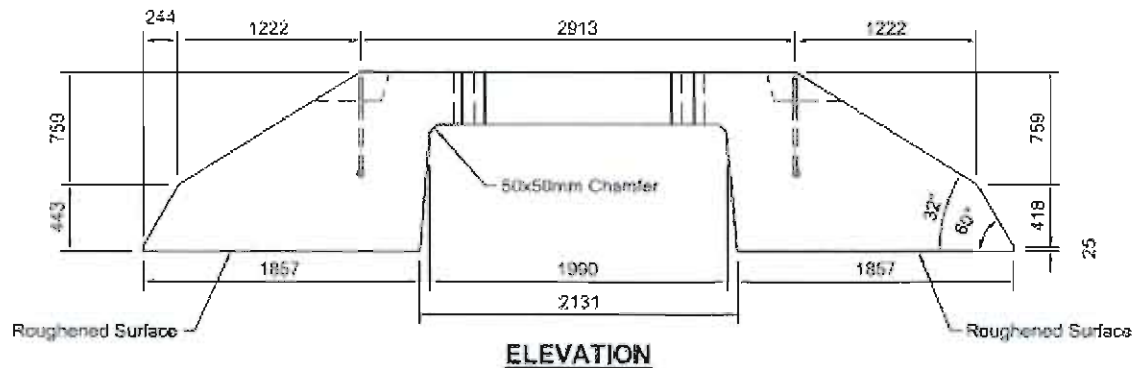


Figure 1.8 Cross-Section of Concrete Protection Tunnel



Figure 1.9 Photo of Concrete Protection Tunnel

Table 1.1 Concrete Tunnel Locations and Dimensions

Flowline / GEP	Number of Concrete Tunnel Units / Approx. Total Length of Tunnel		
	Near PFC	Near Wellhead	Total
H-08	14 / 42 m	8 / 24 m	22 / 66 m
M-79A	9 / 27 m	4 / 12 m	13 / 39 m
D-41	15 / 45 m	8 / 24 m	23 / 69 m
F-70	17 / 51 m	8 / 24 m	25 / 75 m
E-70	6 / 18 m	N/A	6 / 18 m
GEP	11 / 33 m	N/A	11 / 33 m
TOTAL			100 / 300 m

1.4.2 Concrete Protection Mats

Concrete protection mats will be installed for dropped object protection over both ends of each flowline and umbilical (at the PFC and near the wellheads, see Figures 1.4 and 1.5, respectively) and over the GEP near the PFC (see Figure 1.4). Figure 1.10 shows a drawing of a typical mattress deployed over a production flowline. The areas shaded in blue denote higher density concrete which is used to keep the edges of the mattress from overturning. Figure 1.11 shows a photo of a concrete protection mattress. The dimensions of a mattress are 3 m (width) x 6 m (length) x 0.3 m (height). The weight of a mattress is approximately 10 tonnes for mattresses on the flowlines and umbilicals and approximately 15 tonnes for mattresses on the GEP. Approximately 250 mattresses will be used in total.

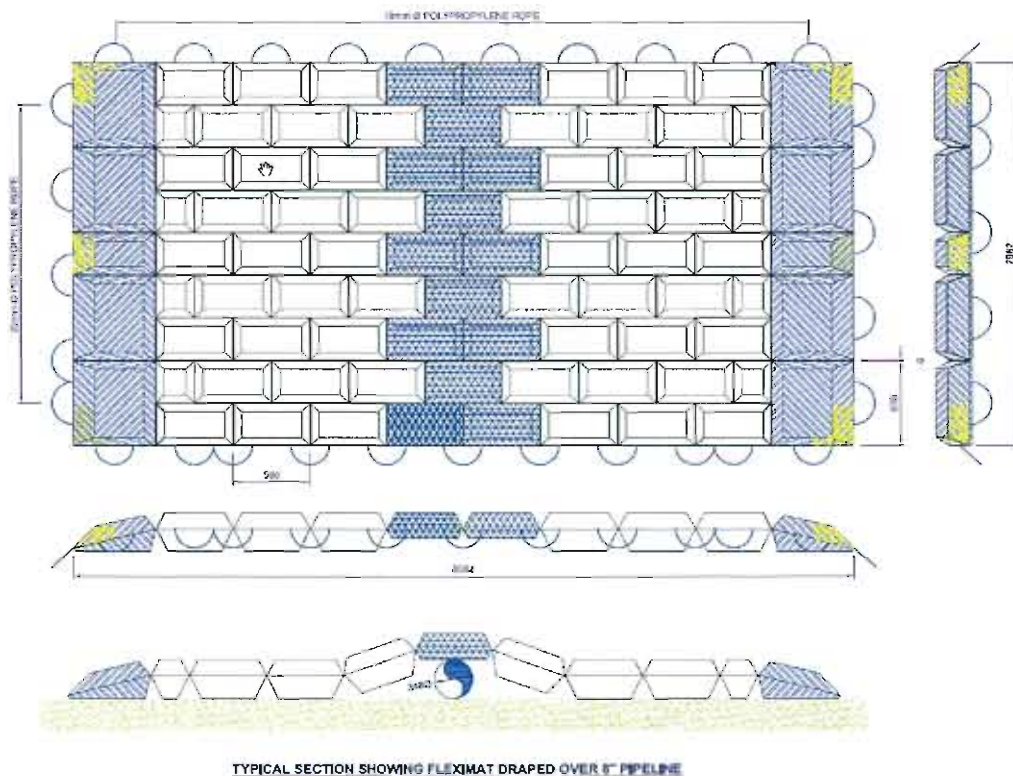


Figure 1.10 Drawing of Typical Concrete Protection Mattress (Production Flowline)

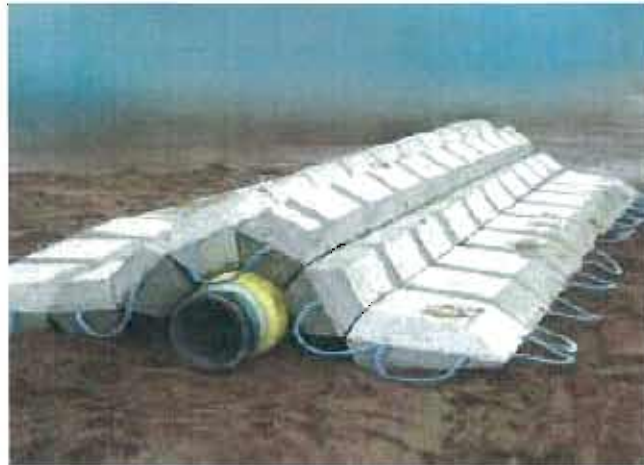


Figure 1.11 Photo of Concrete Protection Mattress

**1.4.3 Scour Mats**

Scour protection mats will be placed around the footing from the PFC South-West leg in the riser caisson area (see Figure 1.4). The scour protection mats will be similar to the concrete mats described in Section 1.4.2 except that the shape is wedge instead of rectangular and that there is geotextile underneath to prevent scour in-between the mattresses (see Figure 1.12). Geotextile is rolled out onto the seafloor and the edges of the mattresses are placed overtop of it to hold it down. A total of ten scour mattresses will be installed side by side around the leg footing.

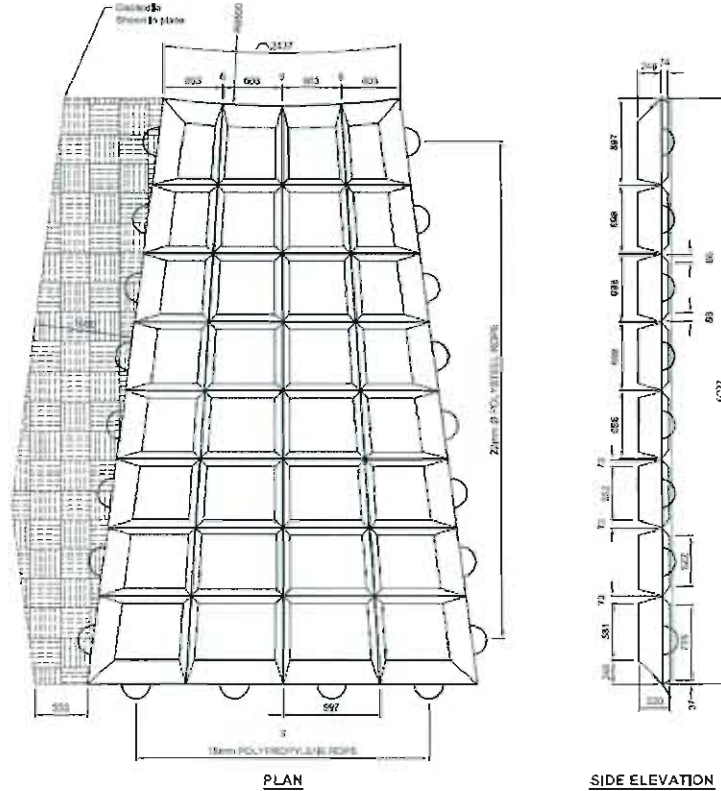


Figure 1.12 Drawing of Scour Protection Mattress

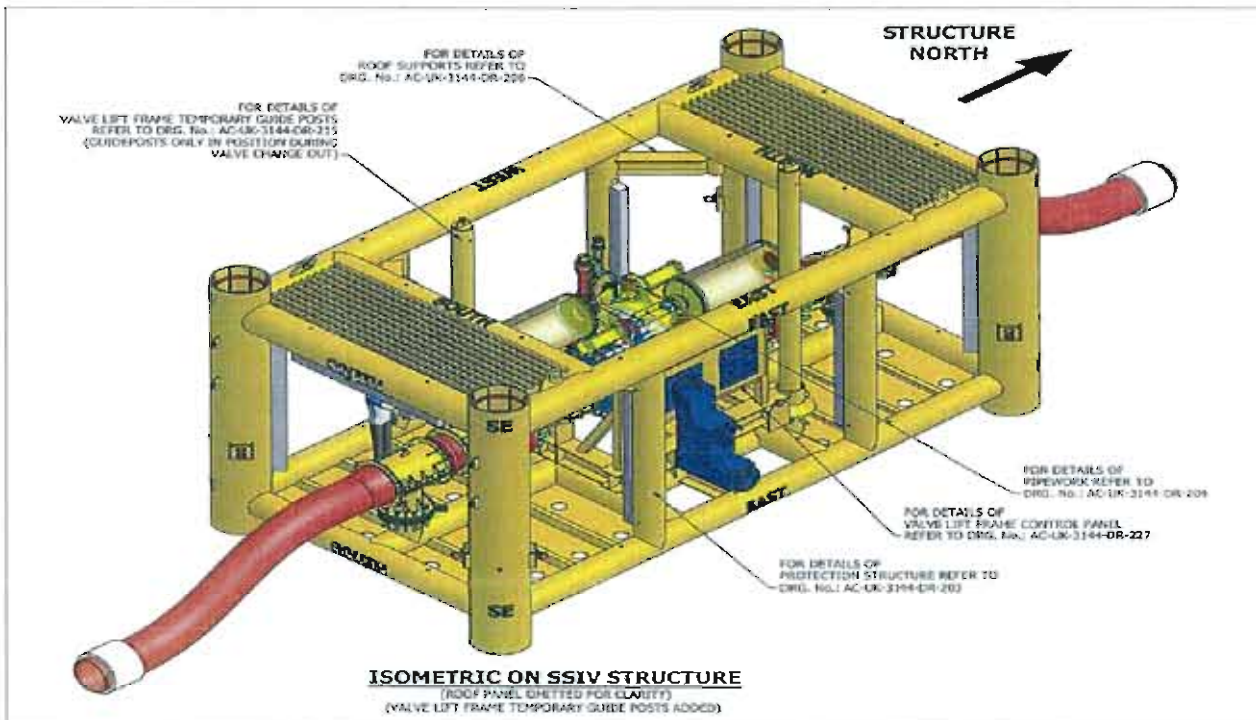
**1.4.4 Sandbags**

Sandbags will be installed for scour protection under the riser caisson at the PFC South-West leg (see Figure 1.4) where it would be too difficult to install scour mattresses (because of tight clearance area underneath the caisson).

A geotechnical membrane will be installed on the seabed and divers will then place individual sandbags over it. The sandbags will then be linked together using a synthetic rope or similar to ensure they are one complete unit. Approximately 1600-2000 sandbags of 25 kg each will be needed.

**1.5 Subsurface Isolation Valve (SSIV) Structure and Umbilical**

At the GEP terminus and approximately 50 m from the PFC, a SSIV will be installed. This 24” ball valve is contained within a steel protection structure and will close to isolated the GEP from the PFC in the event of a post emergency shut down. The protection structure is supported by four driven steel piles and the valve is connected to the GEP and PFC via flanged spools. With overall dimensions of 9 m x 4.55 m x 4.5 m, the structure and valve have a total weight of 63 tonnes in air (see Figures 1.4 and 1.13).



**Figure 1.13 Drawing of SSIV**

The Acergy Discovery will also install the SSIV umbilical. The umbilical will be 222 m in length, 5” in diameter and contains three electrical cables and nine lines filled with hydraulic fluid HW443R (see cross-section in Figure 1.14).

The umbilical will be pressurized to 50 bars (725 psi) with the hydraulic fluid for storage and installation. This will prevent ingress of foreign particles and aid in maintaining the shape of the umbilical. This pressure will be maintained throughout the course of the installation.

The SSIV umbilical will not be buried but will instead be covered with concrete mattresses (see Figure 1.4). There will be no discharge of fluids associated with the SSIV umbilical installation.



Figure 1.14 Umbilical 5" Cross-Section

## 2 SPECIAL AREAS

The PFC installation and Deep Panuke field HUC program will follow Encana's Codes of Practice for Sable Island, the Gully Marine Protected Area (MPA) and Country Island, which include the following measures (see Appendix 1):

- no activities and no vessels and aircraft within 2 km (1 nautical mile) of Sable Island except in emergency situations, under an approved Environmental Monitoring Program or for special trips approved by the Canadian Coast Guard;
- no activities inside the Gully MPA, no vessels permitted within the Gully MPA, and aircraft flying at a height of at least 500 m above the Gully MPA; except for the purpose of safety or under an approved environmental monitoring program; and
- no flying over, disembarking or approaching within 2 km (1 nautical mile) of Country Island (which encompasses the Roseate tern designated critical habitat) except for the purpose of safety or an approved Environmental Monitoring Program.

### 3 INTERACTION WITH FISHING ACTIVITY

No interactions with fishing vessels are anticipated since all activities (with the exception of the rig tow) will take place within the Deep Panuke Safety Zone where no fishing activity is taking place (see Figure 3.1) and minimal fishing activity is expected along the export pipeline route during the rig tow.

Extensive consultation with the fishing industry was conducted as part of the Deep Panuke Environmental Assessment process and identified that the Deep Panuke field centre was an area of very low fishing activity, with no catches reported in this area between 2002 and 2005 (refer to the commercial fisheries catch and effort maps provided in Appendix J of the 2006 Deep Panuke EA Report (Volume 4)), even before the Deep Panuke Safety Zone was established.

Encana has contacted the following fisheries associations with regard to its planned Deep Panuke's 2011 offshore activities, including this PFC installation and Deep Panuke field HUC program:

- Nearshore Sea Urchin Fisherman;
- Area 24 Crab Fisherman's Association;
- Native Council (Mimej Seafood Inc.);
- Eastern Shore Fisherman's Protective Association (part of the larger Eastern Fisherman's Federation);
- Ocean Pride (Sea Cucumber Fishery);
- Grover Fisheries Ltd. (Sea Cucumber Fishery);
- Atlantic Herring Co-op Ltd.;
- Nova Scotia Sword Fishermen's Association;
- Clearwater Seafoods Limited;
- Seafood Producers Association of Nova Scotia; and
- Guysborough County Inshore Fishermen's Association.

In March 2011, these organizations were provided with an updated information package including a summary of activities, schedule and location information on Deep Panuke's planned 2011 offshore activities, including this program. They were then called directly to gather any feedback. No issues or concerns were raised by fishing groups representatives.

A Notice to Shipping will be issued with regard to the program (including for the deployment of the marker buoys, mooring anchors and flowline/umbilical transponders as described in Section 1.3).

In the unlikely event of an incident with a non-project vessel such as a fishing vessel or a spill, Encana will adhere to the CNSOPB *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity* and compensate and indemnify licensed participants in the fishing industry to the extent that the Deep Panuke Project may cause them damage or loss, including consequential damages during normal fishing operations.

As per Encana's Fisheries Liaison Program (DMEN-X00-RP-EH-00-0011-02U), a fisheries liaison observer will be onboard one of the tugs during the PFC tow to the field. As per Encana's Fisheries Liaison Program (DMEN-X00-RP-EH-00-0011-02U), there is no requirement to have a fisheries liaison observer during the diving program. However, Encana will have a Fisheries Observer onboard the Acergy Discovery for one rotation at the beginning of the program to conduct marine mammal and sea turtle observations during the pile driving activities (as per Section 7).

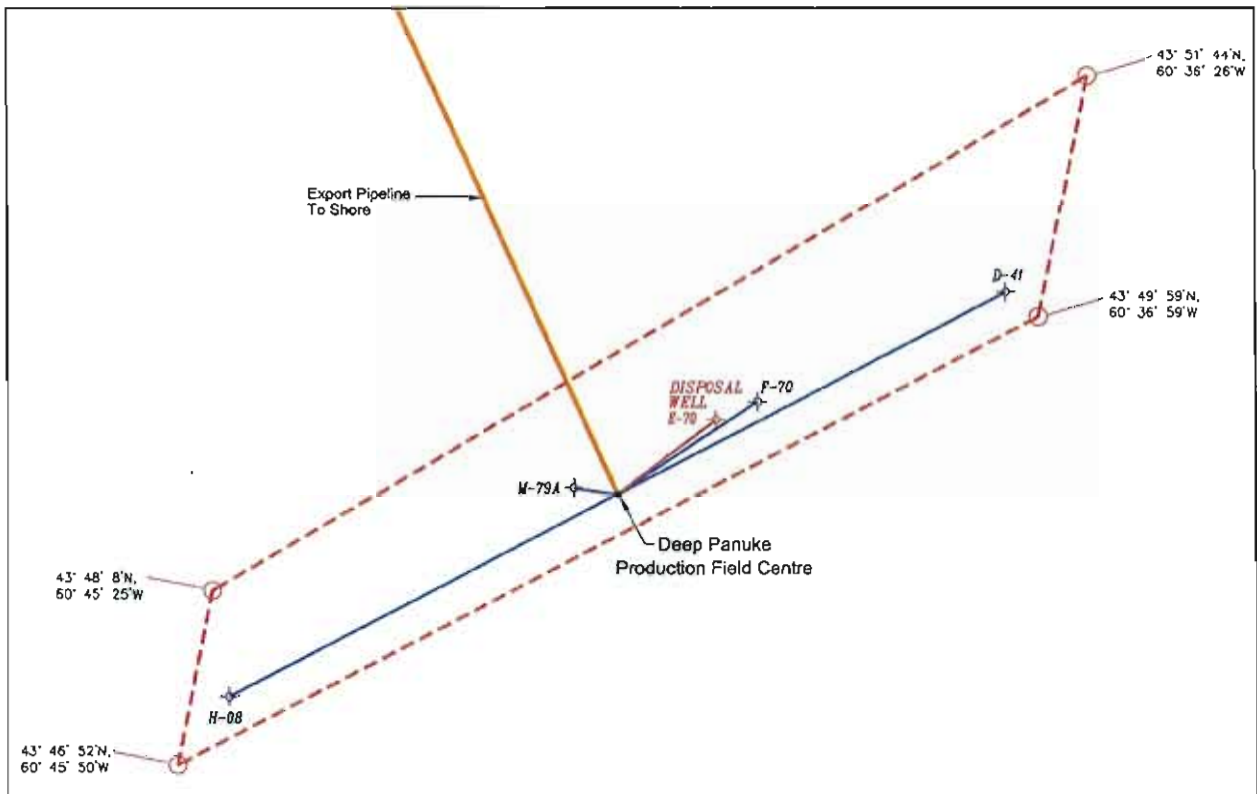


Figure 3.1 Deep Panuke Safety Zone

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#### 4 INTERACTION WITH MILITARY OPERATIONS

Encana has received confirmation from DND in February 2011 that there are no UXO (Unexploded Ordnance), chemical, biological, or radioactive material or operational issues or conflicts from the MARLANT perspective with the Deep Panuke Project, including this PFC installation and Deep Panuke field HUC program. Should any suspected UXOs be encountered during the course of the Deep Panuke operations, they will not be disturbed or manipulated. Encana will mark the location and immediately inform the Coast Guard.

## 5 IMPACT TO BENTHIC HABITAT

### 5.1 Temporary Moorings for PFC Installation

Temporary mooring anchors will be installed for PFC installation as described in Section 1.3.

Benthic studies conducted in the Deep Panuke field center area for the Deep Panuke environmental assessment process have shown that substrate and biota are homogeneous across this area. Substrate is primarily fine to medium well-sorted sand with ripples. Biota assemblages are sparsely distributed. The overall abundance and diversity of organisms in the Deep Panuke field center area is low, with sand dollars being the most common epibenthic species and no presence of sensitive habitats (e.g. corals).

This habitat is not expected to be significantly impacted by the use of the temporary moorings, which have a very small footprint compared to similar available habitat on Sable Island Bank, therefore no specific mitigation measures are necessary.

### 5.2 Subsea Dropped Object and Scour Protection

The diving support vessel Acergy Discovery will install dropped object protection (concrete mats and tunnels) on the GEP, flowlines and umbilicals; scour protection (scour mats and sandbags) around the PFC South-West leg footing as well as the SSIV and associated umbilical as described in Sections 1.4 and 1.5.

The potential impact from the physical presence of project infrastructure (including platforms, pipelines, protective mattresses and rocks) was assessed in the 2002 Deep Panuke Comprehensive Study Report (CSR). It was determined that while these structures would create a long-term alteration of benthic habitat, the areas would recolonize with local species within one to three years.

It was noted in particular that concrete mattresses and rocks used to stabilize the GEP would provide a hard stable substrate creating benthic habitat in what is otherwise a predominantly sandy mobile environment. These hard surfaces will be colonized by a variety of local marine flora and fauna creating a "reef" effect which is anticipated to have a minor positive effect on the benthic community in the project area (see Section 6.3.3.4 from the 2002 CSR for additional information on that reef effect).

It was also noted that concrete coating and the colonization from benthic organisms on the subsea pipeline would increase the roughness of the pipe surface, thereby further facilitating the capability of crustaceans to climb over the pipe. The same can be said of concrete mats and tunnels over the GEP, flowlines and umbilicals.

In the 2006 EA Report (see Section 8.3.4.2, Operation, Presence of Structures, Reef and Refuge Effects), it was determined that the proposed new design of the project would create a greater reef effect (and associated minor positive effect on the benthic community) because of the additional structures on the seafloor, including the flowlines and associated protective rocks and mattresses.

The concrete mats and tunnels, scour mats and sandbags will be free of hydrocarbon/chemical contamination. No additional protection measures are required during installation of these structures.

## 6 WASTES AND DISCHARGES

### 6.1 Program Vessels

Vessels involved in the PFC installation and Deep Panuke field HUC include the following:

- PFC tow and installation (approximately ten days): installation vessel Skandi Skolten, Boa Barge 36, two support/standby vessels (the Atlantic Condor and the Ryan Leet) and four tugs (to be determined);
- PFC HUC (approximately 180 days): two support/standby vessels (the Atlantic Condor and the Ryan Leet); and
- Diving program (approximately 90 days): diving support vessel Acergy Discovery.

Hazardous wastes generated onboard these vessels during the PFC installation and HUC will be accumulated in suitable containers and placed in appropriate shipping containers for return to shore for disposal and collected by licensed waste haulers. Applicable codes and regulations for the handling, use, storage, transport and disposal of hazardous wastes will be followed, including Workplace Hazardous Materials Information System (WHMIS), the Nova Scotia *Dangerous Goods Management Regulations* and the *Transportation of Dangerous Goods (TDG) Act* and Regulations, as applicable.

In the event of an onboard spill, any used absorbent materials and any other oily wastes will be placed in sealed containers and returned to shore for treatment and disposal at an approved waste management facility.

The CNSOPB *Offshore Waste Treatment Guidelines* will be followed with respect to routine discharges onboard all vessels (e.g., sanitary and food wastes, oily bilge/ballast water). Food waste from the vessels will be reduced through maceration to a particle size of 6 mm or less prior to discharge; sewage will be treated via an approved sewage treatment plant compliant with MARPOL regulations; and bilge water will be discharged via the vessels oily water separators which alarm at 15 ppm.

All program vessels will comply with the *Ballast Water Control Land Management Regulations (2006)* under the *Canada Shipping Act*, including provisions to replace its ballast water before entering Canadian waters.

None of the vessel selected for this program at this point have onboard incinerators with the exception of the Acergy Discovery. If the incinerator is used, it will only be used to treat wastes that are non-recyclable; the unit will conform to MARPOL's specification MEPC76(40) for shipboard incinerators and its usage will conform with MARPOL 73/78/97 ANNEX VI Regulation 16 which provides specific guidance on personnel training and incinerator operations, notably the prohibition of shipboard incineration of waste materials containing PCBs, heavy metals, or similar contaminants. In addition, no waste containing chlorinated compounds will be incinerated. If any of the vessels still to be selected (one support/standby vessel and two tugs) have onboard incinerators, they will meet the same requirements. Environment Canada will be notified at the start of the diving program for purposes of the Sable Island Air Monitoring Program.

Any other wastes will be sorted and brought to shore for disposal according to the local regulatory regime of the shore base at Mulgrave, NS.

### 6.2 PFC during Installation and HUC Program

During PFC HUC, the PFC deck drainage handling system (including the deck drainage polisher) will be fully operational and deck drainage will be handled as per Section 8.4 of the

Production Environmental Protection and Compliance Monitoring Plan (EPCMP) (DMEN-X00-RP-EH-90-0002), with the exception that the on-line oil in water analyzer may be used for testing oil in deck drainage water prior to discharge until the PFC lab is fully operational (which will happen before produced water starts flowing to the platform).

Once the wells are brought on, produced water will be generated. The PFC produced water handling system will be fully operational and produced water will be handled as per Section 8.5 of the Production EPCMP (DMEN-X00-RP-EH-90-0002). In particular, the lab will be fully operational for testing oil in produced water.

The PFC seawater system will be fully operational and effluents (including testing for residual chlorine) will be handled as per Section 8.6 of the Production EPCMP (DMEN-X00-RP-EH-90-0002), with the exception that a different testing process (e.g. onshore lab) may be used to test for residual chlorine in seawater discharge until the PFC lab is fully operational (which will happen before produced water starts flowing to the platform).

The PFC sewage treatment unit is designed to an operational POB of approximately 75 persons maximum, therefore, it will not be used during HUC activities where POB may go up to 118. Instead, the system will be by-passed and grey/black water will be sent to the two grey/water black holding tanks and processed through the two macerator and pump units before being discharged overboard (as per the CNSOPB *Offshore Waste Treatment Guidelines*). Based on the Baltic Commission Figures, the estimated daily black and grey water output per person is 230 liters, i.e. for a POB of 118 this would amount to a total volume of black/grey water of 27.2 m<sup>3</sup>/day. The capacity of the two PFC grey/water black tanks (20 m<sup>3</sup> each) will be sufficient to contain the daily flow of black/grey water and the macerator and pump units will have sufficient capacity to process the effluent daily (each pump and macerator unit has a flow capacity of 5 m<sup>3</sup>/h; i.e. 240 m<sup>3</sup> per day between the two units). Therefore, the expected grey/water flow generated during the PFC HUC program will be well within the operational envelope of the grey/black water holding tanks and pump/macerator units working together.

There will be air emissions generated during the PFC HUC program as a result of the following activities:

- power generation;
- flaring for purging of export pipeline, process piping and vessels; and
- flaring after initial start-up, which may involve several days of flaring before the gas can be discharged to the export line.

Handling of PFC air emissions during HUC will be as Section 8.10 of per the Production EPCMP (DMEN-X00-RP-EH-90-0002). Environment Canada will be notified at the start of the PFC installation in the field centre area for purposes of the Sable Island Air Monitoring Program.

Other hazardous and non-hazardous wastes will be segregated and sent to shore for disposal as per Section 8.9 of the Production EPCMP (DMEN-X00-RP-EH-90-0002).

### 6.3 Discharge of Monoethylene Glycol from Commissioning of Umbilicals

Each of the four production well umbilicals includes two annulus monitoring lines and three chemical injection lines. The disposal well umbilical includes two annulus monitoring lines and two chemical injection lines. Each of these lines is filled with a preservation fluid consisting of a 50% monoethylene glycol (MEG) and 50% water. Prior to startup, this mixture must be displaced with methanol and will be routed through the topsides facility and discharged overboard via the discharge caisson. The estimated total amount of MEG to be discharged overboard during commissioning of the umbilicals is a maximum of 11 m<sup>3</sup>.

MEG has been screened and rated as “accepted for use and discharge” according to the *Offshore Chemical Selection Guidelines*. It has a PLONOR (Posing Little Or NO Risk to the environment) rating, which is the least hazardous category.

Discharges related to hydrotest of the flowlines and GEP have been assessed in the 2010 Flowline Installation EPP/EEMP, DMEN-U15-RP-EH-90-0001 and the 2009 Offshore Pipeline Installation EPP/EEMP, DMEN-P21-RP-EH-90-0002.

#### 6.4 Spudcan Grouting

During installation of the PFC, after spudcan penetration in the soil has been achieved, grouting of the remaining voids between footing bottom and seabed is needed to provide stability during the operational life of the PFC.

Each footing has a circumferential (outer) skirt which is equally subdivided into 6 separate skirt compartments. Each skirt compartment (4 footings x 6 = 24 in total) will be filled completely, one at a time (see Figure 6.1).

In order to ensure that the spud cans are correctly filled up, the grout injection will be deemed completed when 50% of the injected volume has poured out of the spud. The grouting outlets will be monitored by the RIV during grouting.

The grouting flow rate will be 250 litres per minute. The anticipated required grout volume is 1,200 m<sup>3</sup> (including the 50% overage volume). Grout will consist of a mix of Portland cement (CAS# 65997-15-1) and sodium silicate (CAS# 1344-09-8). Both products have been screened and rated as “accepted for use and discharge” according to the *Offshore Chemical Selection Guidelines*. They have a PLONOR (Posing Little Or NO Risk to the environment) rating, which is the least hazardous category.

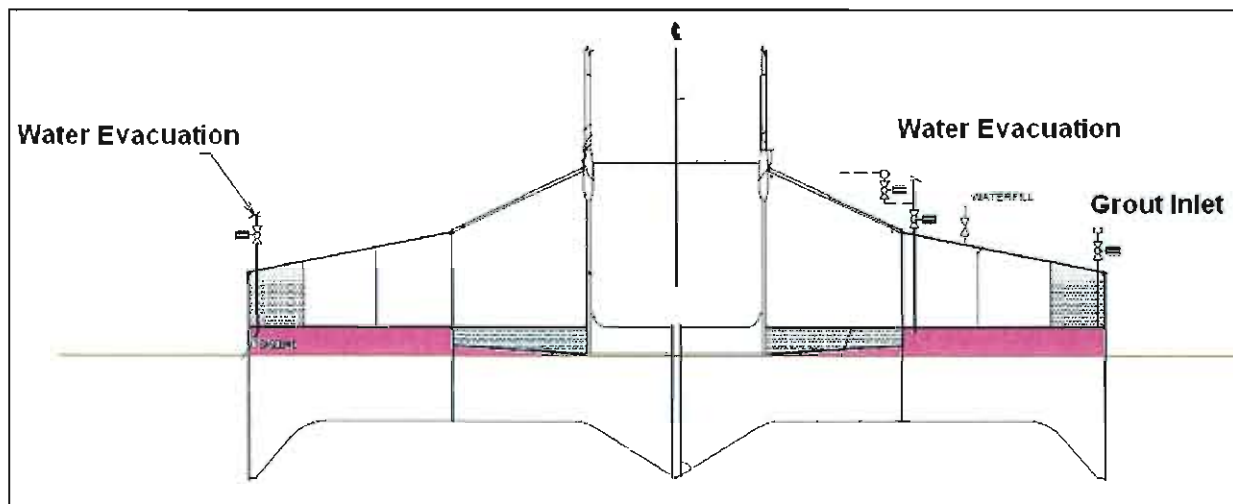


Figure 6.1 Spudcan Grouting

## 7 NOISE DISTURBANCE

### 7.1 Pile Driving

A total of four piles will be required for the installation of the SSIV protection structure (one in each corner) (see Section 1.5). Piles will be lowered through each corner of the SSIV protection structure and hammered into place with a hydrohammer S-200 (see Appendix 2).

The piles that will be used for the Deep Panuke SSIV are significantly smaller and their installation will generate significantly lower sound pressure levels than conventional platform piles. The table below provides a comparison between the Deep Panuke SSIV piles and typical platform piles such as those used for the initial 2002 Deep Panuke Project Basis Design (Table 2.3 of the 2006 Deep Panuke EA Report, Volume 4).

	Deep Panuke SSIV Piles	Conventional Platform Piles
Diameter	61 cm	210 cm
Penetration	19 m	68 m
Actual driving duration per pile	17 to 28 minutes	4-6 hours

**Figure 7.1 Pile Driving Characteristics**

The following mitigation measures will be implemented during pile driving associated with the installation of the SSIV:

- Visual monitoring of a 500-m safety zone around the pile driving source for 30 min before source start-up;
- Delay of start-up if a sea turtle or cetacean (i.e. a whale, dolphin or porpoise) is seen within the safety zone during the 30-min observation period, until the sea turtle or cetacean has not been observed within the safety zone for at least 30 min;
- Gradual ramp-up of sound source each time the source is started after an interruption of more than 30 min; and
- Immediate shut down of sound source if a designated endangered or threatened cetacean or sea turtle (i.e. Blue whale, Northern Bottlenose whale, Atlantic Right whale, or Leatherback turtle) is observed within the 500-m safety zone during activities.

Encana will have a trained marine mammal observer onboard who will conduct the safety zone monitoring during the pile driving operations.

This procedure is consistent with the DFO 2008 Statement of Canadian Practice, Mitigation of Seismic Noise in the Marine Environment. The safety zone radius of 500 m is also consistent with mitigation measures used for other pile driving programs, which involved more conventional piles of deeper penetration generating higher sound pressure levels than the Deep Panuke SSIV piles.

The program will take place in early July before the peak occurrence of migratory whales and turtles (such as the endangered Leatherback turtle). Endangered whales are not expected to be found in the deep Panuke area (the Northern Right whale is found in the western area of the Scotian Shelf and the Blue whale and Northern Bottlenose whale are expected to inhabit deeper waters than the project area).

## 7.2 USBL System

As described in Section 1.3, an ultra-short baseline (USBL) underwater acoustic positioning system will be used during the PFC installation. This acoustic equipment (which is similar in nature to echo sounder and sonar equipment commonly used by fishing vessels) can be considered as non-intrusive in the marine environment and is not expected to have any significant environmental impact for the following reasons:

- the acoustic activity will very localized (at the PFC location);
- the acoustic activity will be of short duration (intermittently over the 10-day installation program);
- generated noise will be of low pressure (below the CEAA seismic screening trigger level of 275.79 kPa or 229 dB re 1  $\mu$ Pa @1m) and of high frequency (greater than 1000 Hz, as opposed to seismic surveys which use predominantly low frequency (10-300 Hz) noise which propagates farther), and will therefore attenuate over a short time and distance; and
- endangered whales such as the Blue whale, Northern Right whale and the Northern Bottlenose whale are not expected to be in the Project area.

## 8 STRANDED BIRD PROTOCOL

The protocol developed by Williams and Chardine (1999) for storm petrels (Appendix 3) will be implemented for any stranded bird species on the program's vessel.

A Seabird Salvage Permit has been obtained from Canadian Wildlife Service (CWS) to cover all Deep Panuke 2011 offshore activities. A report of birds "salvaged" onboard the program's vessel (and other offshore vessels/platforms used for Deep Panuke 2011 activities) will be submitted to CWS and to the CNSOPB before the end of January 2012.

Encana will immediately notify CWS if a dead bird or an oiled bird is found during the program. Any oiled bird will immediately be reported to the Canadian Coast Guard Operations Center. In case of a mass stranding (more than five dead birds in a 24-hr episode), or an oiled bird (see section 9.5.3 for oiled birds), the CNSOPB will also be contacted. Dead birds will be identified, recorded and disposed of at sea unless they are oiled (see section 9.5.3 for oiled birds). Please see Figure 9.1 for a detailed flowchart of bird handling procedures for the program.

## 9 SPILL RESPONSE

### 9.1 Spill Risk

The likelihood of an accidental spill into the marine environment from the program's vessels is low because the program's vessels will comply with IMO standards and will have no specific onboard spill sources other than their own internal fuel tanks. The likelihood of a spill to the marine environment from the PFC during the program is also low because of the PFC spill protection measures outlined in the Production EPCMP (DMEN-X00-RP-EH-90-0002).

The PFC installation and HUC program will include the deployment of two ROVs (for the debris and construction survey prior to PFC arrival, installation of USBL transponders, monitoring of grouting, as-built survey of the PFC after installation, etc). However, the risk of potential impact from ROV hydraulic fuel spills is expected to be minimal due to typically very small volumes of such spills and the fact that the ROV hydraulic fluid used (Shell Tellus Oil 22) is expected to be practically non-toxic to aquatic organisms.

The diving program will include the deployment of equipment using hydraulic fluid such as an ROV to assist with visual surveys of the construction area, underwater bolt tensioning equipment and piling spread equipment. However, the risk of potential impact from hydraulic fuel spills from this equipment is expected to be minimal due to the typically very small volumes of such spills and the fact that the hydraulic fluids used for this program are practically non toxic to aquatic organisms (Tellus T32, ROV and piling spread fluid) or inherently biodegradable (Castrol Aero HF585B, bolt tensioning/nut splitting equipment).

As described in Section 1.5, the SSIV umbilical will be pressurized to 50 bars (725 psi) with hydraulic fluid for storage and installation. The umbilical will contain approximately 0.37 m<sup>3</sup> of HW443R hydraulic fluid. There is no planned release of this fluid during umbilical installation. The risk of potential impact from a spill of umbilical fluid during the installation program is very low because umbilical failure is very unlikely and the hydraulic oil used (Oceanic HW443R) has low toxicity, is biodegradable and does not bioaccumulate. The risk of spill of umbilical fluids from the production and injection well umbilicals was assessed in the 2011 Umbilical Installation EPP/EEMP (DMEN-U15-RP-EH-90-0003).

A spill response plan is in place to minimize the possible consequences of a malfunction or accident (refer to Sections 9.2 to 9.7 below).

### 9.2 Spill Response Logistics and Equipment

The program's vessels will be available for spill monitoring and response if required. There will be regular helicopter flights to the PFC during the HUC program and to the Acergy Discovery during the diving program.

All program's vessels will have standard spill response kits capable of containing and cleaning up a small spill onboard the vessel. Spill response kits onboard the PFC will be available as described in Section 12.3.1 of the Production EPCMP (DMEN-X00-RP-EH-90-0002).

### 9.3 Spill Monitoring

As per Encana's Deep Panuke Offshore Spill Response Plan (DMEN-X00-PR-EH-00-0008), in the unlikely event of a spill, Encana will conduct the following monitoring until the slick dissipates:

- estimate spill volume;
- estimate oil type; and
- visually assess the slick until it has disappeared by natural dispersion and evaporation.

#### 9.4 Enhance Natural Dispersion

Spill modeling can be used to investigate the fate of a 'worst case' spill event – a diesel spill from a simultaneous rupture of the vessel hull and fuel tank, a very unlikely event for this program. Furthermore, diesel is a light oil which is highly evaporative and dispersive in the marine environment.

Spill dispersion modeling carried out for the 2006 Deep Panuke EA (Volume 4) gave the following results for 1.6 m<sup>3</sup> (10-barrel) and 16 m<sup>3</sup> (100-barrel) diesel spill scenarios at the Deep Panuke PFC location. A 1.6 m<sup>3</sup> (10-barrel) batch spill will persist as a slick for about 13 hours and travel about 12 km prior to the complete loss of the surface oil. The maximum dispersed oil concentration for this spill will be about 2 ppmw and this will drop to 0.1 ppmw within about 16 hours. A 16 m<sup>3</sup> (100-barrel) batch spill of diesel will persist as a slick for about 19 hours and travel about 18 km prior to the complete loss of the surface oil. The maximum dispersed oil concentration for this spill will be about 4 ppmw and this will drop to 0.1 ppmw within about 43 hours. The dispersed oil cloud will travel about 54 km and have a maximum width of about 4 km. Prevailing water currents would take the dispersed oil cloud in a southwest direction away from Sable Island (located approximately 48 km from Deep Panuke). Therefore, no diesel is predicted to reach the nearest landfall which is Sable Island (critical habitat for endangered Roseate terns). Any diesel spill will also not likely reach the Haddock Box since most spill scenarios result in a dispersed oil cloud traveling significantly less than the 49 km distance from the production field to the Haddock Box (for further details refer to Encana's Reply Evidence for the Deep Panuke Project dated February 26, 2007).

Any batch spill of diesel in the nearshore area would be expected to follow a similar pattern, i.e. short persistence on the water because of rapid dispersion and evaporation of the oil.

Based on the limited persistence of diesel on the sea surface, it is unlikely that a containment and/or recovery effort at sea or the use of chemical dispersants would be warranted. The most appropriate response would be to enhance natural dispersion processes by running vessels through the slick.

#### 9.5 Spill EPP for Marine Birds

Figure 9.2 provides a summary flowchart of the proposed environmental protection plan (EPP) for the program in the event of a spill.

##### 9.5.1 Bird Monitoring

In the unlikely event of a spill, any observations of spill and marine bird interactions will be reported to Encana immediately.

The only marine bird species listed by COSEWIC as endangered or threatened offshore Nova Scotia is the SARA-listed endangered Roseate tern nesting on Sable Island between May and July, approximately 40 km away from the closest location of the project site. In the nearshore area, the PFC tow to field will come within approximately 3.7 km from Country Island, which is a designated critical habitat for the endangered Roseate tern.

##### 9.5.2 Bird Dispersal

In the unlikely event of a spill, Encana will attempt to keep birds away from the slick area by hazing from the vessels, if logistical conditions permit. This effort will focus on dispersing

congregations of birds. Potential hazing means include the vessels themselves, and the use of sound makers (e.g. vessel horns). No specific permit is required from Environment Canada for bird hazing.

### **9.5.3 Oiled Birds Handling**

It is very unlikely that an oiled bird will be found at sea during the program because of the low risk of oil spill during the program (see section 9.1) and the difficulty to identify oiled birds in the water (small dark spot on dark water). In the very unlikely event that an oiled bird were found at sea during the program, Encana would not attempt to recover it because of safety concerns associated with an overboard recovery operation and the unlikelihood to save a live oiled bird if it can be recovered (onshore rehabilitation can cause distress to marine birds with no guarantee of successful re-entry into the breeding population, especially in Canada where waters are generally cold and the species generally affected do not respond well to cleaning).

It is also very unlikely that an oiled bird will be found onboard the vessel during the program because of the absence of specific spill sources on deck and of good housekeeping procedures. If an oiled bird were found onboard the vessel during the program, Environment Canada's protocol for collecting oiled birds would be implemented (see Appendix 4). While this protocol was developed primarily for beached oiled birds, it provides applicable direction to handle live or dead oiled birds encountered in the offshore. Oiled birds will be shipped to the CWS office in Dartmouth as soon as logistics permits (CWS will be contacted beforehand).

Encana will immediately notify the CNSOPB, the Canadian Coast Guard Operations Center and CWS if an oiled bird (dead or live) is identified during the program and will confirm the course of action with them.

Beached bird surveys on Sable Island would only be implemented in the event of a spill approaching or reaching the island. As indicated in Section 9.4, such an occurrence is deemed to be highly unlikely based on spill dispersion modeling.

## **9.6 Spill EPP for Marine Mammals**

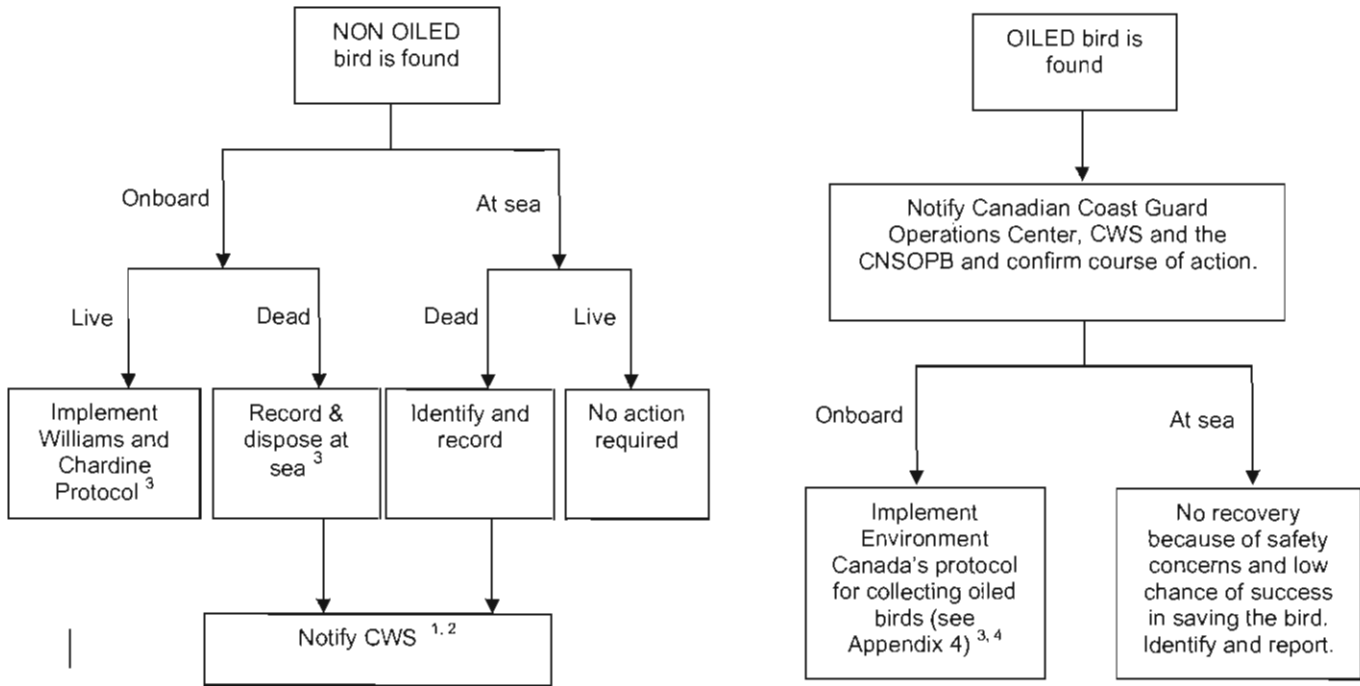
Marine mammals have body coverings, unlike those of birds, that are relatively unaffected by oiling. Hair seals for example are often observed with apparently untroublesome patches of heavy oil; light oils such as diesel are likely to evaporate and wash off more readily. Spills of light oil are likely to impair breathing in ways that would tend to repel animals from the area before they are adversely affected.

In the unlikely event of a spill, any observations of spill and marine mammal interactions will be reported immediately to Encana. Wildlife observations and any related action will be included in the spill incident report submitted to CNSOPB (see Figure 9.2).

## **9.7 Spill EPP for Sable Island**

Dispersion modeling carried out for the Deep Panuke EA (Volume 4) shows that 10-barrel and 100-barrel spills of diesel are unlikely to occur during program activities or reach Sable Island due to prevailing currents away from the island – even with winds blowing directly towards the island (see Section 9.4).

While very unlikely, Encana will conduct beached bird surveys on Sable Island should a spill approach or reach Sable Island, to assist in determining the impact of the spill.



<sup>1</sup> If during non business hours or if during business hours and CWS has not responded within 2 hours of being contacted via cell phone and email, AND in case of 10 dead birds or more in a 24-hr episode, then notify Canadian Coast Guard Operations Center

<sup>2</sup> Also notify the CNSOPB in case of mass stranding (more than five dead birds in a 24-hr episode)

<sup>3</sup> Birds handled during the program will be included in Encana's yearly Seabirds Salvage Permit report submitted to Environment Canada under the Migratory Bird Act and to the CNSOPB (before January 31 from the following year).

<sup>4</sup> Oiled birds will be shipped to Canadian Wildlife Service, Environment Canada, 45 Alderney Drive, 16th Floor, Dartmouth, N.S. B2Y 2N6. CWS will be contacted beforehand.

Figure 9.1 Bird Handling Flowchart

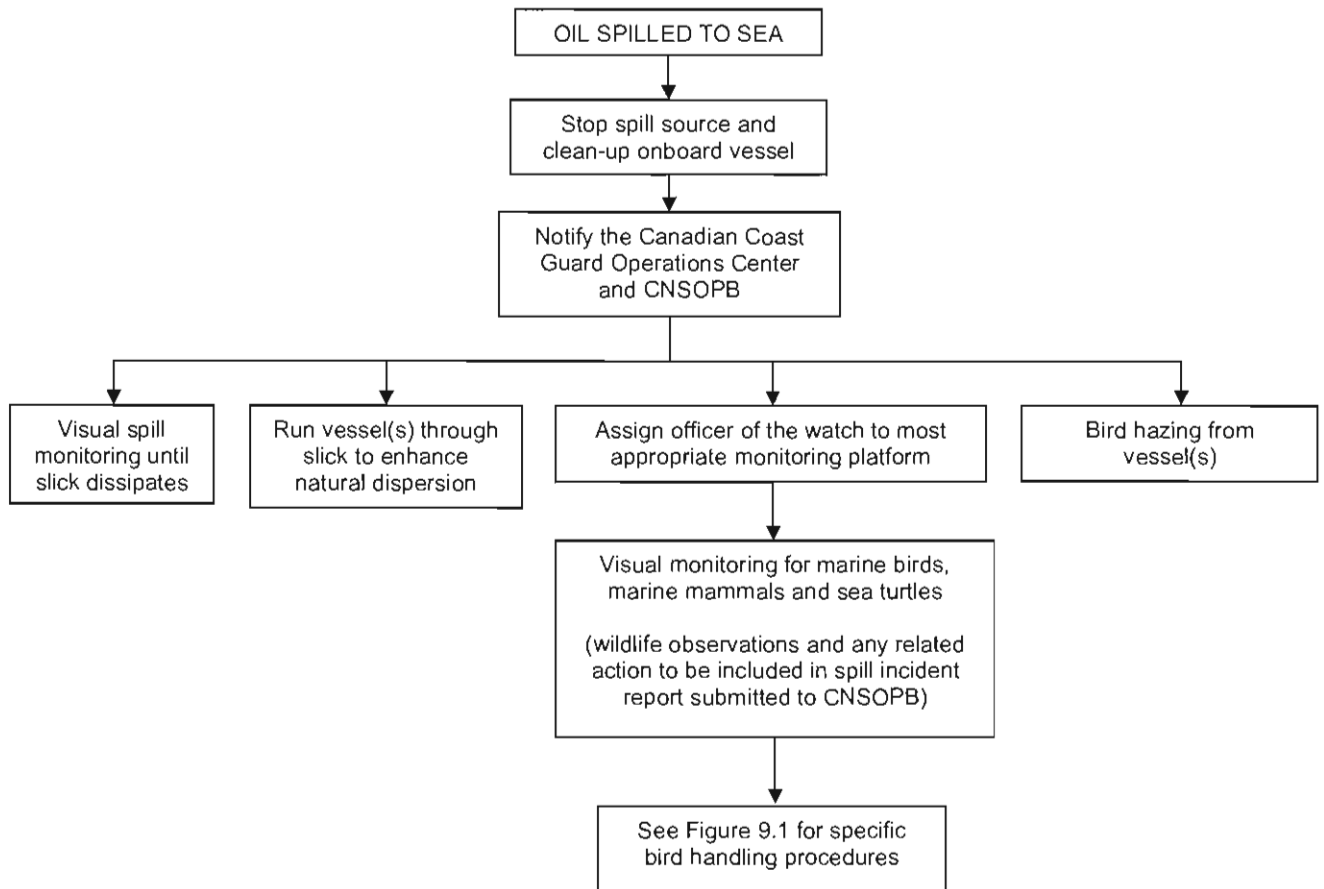
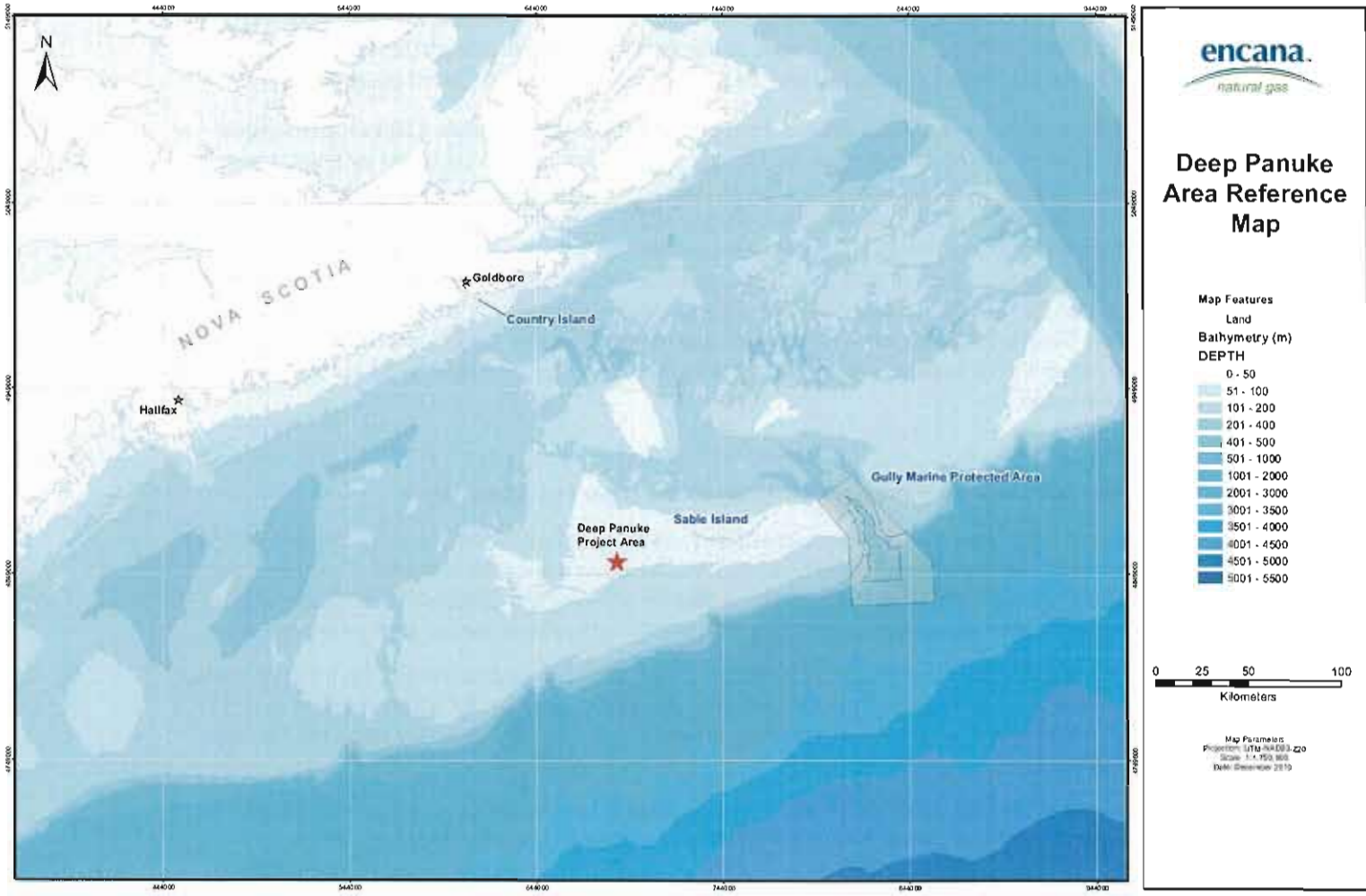


Figure 9.2 Spill EPP Flowchart

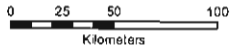
**APPENDIX 1 CODES OF PRACTICE FOR SABLE ISLAND AND THE GULLY MPA AND  
COUNTRY ISLAND**



## Deep Panuke Area Reference Map

### Map Features

- Land
- Bathymetry (m)
- DEPTH
- 0 - 50
- 51 - 100
- 101 - 200
- 201 - 400
- 401 - 500
- 501 - 1000
- 1001 - 2000
- 2001 - 3000
- 3001 - 3500
- 3501 - 4000
- 4001 - 4500
- 4501 - 5000
- 5001 - 5500



Map Parameters  
 Projection: UTM 18Q UTM Zone 18Q  
 Scale: 1:750,000  
 Datum: Canadian 1983

# code of practice for Sable Island

Encana has developed, as part of its environmental protection planning, a code of practice to protect the uniqueness and integrity of Sable Island (see area reference map). This code is not a regulatory requirement and is indicative of Encana's environmental stewardship philosophy and corporate policies:

Sable Island is approximately 41 kilometres (km) (25 miles) in length and is located 290 km (157 nautical miles) southeast of Halifax. The island is composed of sand and is the only emergent portion of the Sable Island Bank. It supports a fragile ecosystem consisting of diverse flora and fauna; the best known components being the feral horses, seal populations, the rare Ipswich (Savannah) sparrow (*Passerculus sandwichensis princeps*) and the endangered Roseate tern (*Sterna dougallii*).

Sable Island access and activities are currently administered by the Canadian Coast Guard pursuant to the Sable Island Regulations under the Canada Shipping Act. It is also protected by Environment Canada's Migratory Bird Sanctuary Regulations under the Migratory Birds Convention Act. Nesting tern colonies on the island have also been designated by Environment Canada as critical habitat for Roseate terns under the Species at Risk Act. In May 2010 the governments of Canada and Nova Scotia announced that they will take the necessary steps to designate Sable Island as a national park under the Canada National Parks Act. Encana is represented on the Sable Island Stakeholder Advisory Committee chaired by the federal Department of Fisheries and Oceans (DFO). The Sable Island Green Horse Society website ([www.greenhorsesociety.com](http://www.greenhorsesociety.com)) contains additional information on Sable Island.

## As part of its environmental stewardship with respect to Sable Island:

- Encana will not conduct activities within 2km (one nautical mile) of Sable Island. All Encana activities on Sable Island must receive approval from Encana senior management and the Canadian Coast Guard and will comply with all applicable guidelines including the Canadian Coast Guard Visitors Guide to Sable Island [www.ccg-gcc.gc.ca/fo/00039/docs/SableIslandVisitorsGuide-eng.pdf](http://www.ccg-gcc.gc.ca/fo/00039/docs/SableIslandVisitorsGuide-eng.pdf).
- Encana vessels and aircraft are not permitted within 2km (one nautical mile) of the Island. However, this restriction does not apply in the case of an emergency situation, for access required as part of an approved environmental monitoring program or for special trips approved by the Canadian Coast Guard.
- Encana will include discussion of this code of practice in its environmental awareness training program for its personnel. Encana intends this code to be a living document and will review and update it as required. This code of practice is also publicly available on the Encana website [www.encana.com/contractor/expectationspractices](http://www.encana.com/contractor/expectationspractices).

# code of practice for the Gully Marine Protected Area

Encana has developed, as part of its environmental protection planning, a code of practice to protect the uniqueness and integrity of the Gully Marine Protected Area (MPA) (see area reference map). This code is not a regulatory requirement and is indicative of Encana's environmental stewardship philosophy and corporate policies.

The Gully is a large submarine canyon approximately 40 kilometres (km) (21.6 nautical miles) east of Sable Island on the edge of the Scotian Shelf. It is unique among canyons of the Eastern Canadian margin because of its depth, steep slopes and extension back into the continental shelf. The Gully contains a rich diversity of marine habitats and species, including deep-sea corals and the endangered northern bottlenose whale (*Hyperoodon ampullatus*). The area is nationally and globally acknowledged as an important and exceptional marine habitat.

The Gully has been designated by the Federal Department of Fisheries and Oceans (DFO) as an MPA under the Oceans Act in 2004, and comprises an area of 2,364 square km (913 square miles). The MPA regulations prohibit the disturbance, damage, destruction or removal of any living marine organism or habitat within the Gully. The MPA contains three management zones, each providing varying levels of protection based on conservation objectives and ecological sensitivities. The regulations also control human activities in areas around the Gully that could cause harmful effects within the MPA boundary. Encana is represented on the Gully Advisory Committee chaired by DFO.

## As part of its environmental stewardship with respect to the Gully MPA:

- Encana will not conduct activities inside the Gully MPA. In addition, no vessels are permitted within the Gully MPA and aircraft in regular transit to and from any vessels, drilling units, or facilities are restricted to flying at a height of at least 500 metres (1640 feet). These restrictions apply unless it is required for purposes of safety or safe operation of a vessel/aircraft or as part of an approved environmental monitoring program.
- Encana will include discussion of this code of practice in its environmental awareness training program for its personnel. Encana intends this code to be a living document and will review and update it as required. This code of practice is also publicly available on the Encana website [www.encana.com/contractor/expectationspractices](http://www.encana.com/contractor/expectationspractices).

# code of practice for Country Island

Encana has developed, as part of its environmental protection planning, a code of practice to protect the uniqueness and integrity of the Roseate tern colony of Country Island (see area reference map). While the focus is on Country Island, the code will also serve to protect nearby seabird colonies. This code is not a regulatory requirement and is indicative of Encana's environmental stewardship philosophy and corporate policies.

Country Island is a 19 hectare (ha) island, located approximately eight kilometres (km) (five miles or 4.3 nautical miles) offshore from Goldboro, Nova Scotia (45°06'N, 61°32'W). The island hosts a sizeable breeding colony of Common and Arctic terns and has provided a nesting opportunity for the endangered Roseate tern (*Sterna dougallii*) for many years. The Roseate is the tern species most at risk in northeastern North America. There are about 4,000 pairs in the northeastern United States and 120 – 150 pairs in Atlantic Canada, mostly in one or two colonies, including approximately 53 pairs on the Country Island complex.

Country Island has been identified as critical habitat for the Roseate tern by Environment Canada in the Recovery Strategy for the Roseate tern in Canada (2006) under the Species at Risk Act. This designation includes the entire terrestrial habitat of the island as well as aquatic habitat extending 200 metres (656 feet) seaward from the mean high tide line.

## As part of its environmental stewardship with respect to Country Island:

- Encana will not fly over, disembark or approach within 2km (one nautical mile) of Country Island (which encompasses the Roseate tern designated critical habitat) unless it is required for purposes of safety or safe operation of a vessel or aircraft or as part of an approved environmental monitoring program.
- Encana will include discussion of this code of practice in its environmental awareness training program for its personnel. Encana intends this code to be a living document and will review and update it as required. This code of practice is also publicly available on the Encana website [www.encana.com/contractor/expectationspractices](http://www.encana.com/contractor/expectationspractices).

**APPENDIX 2 PILE DRIVING S-200 HAMMER TECHNICAL SPECIFICATIONS**



| **APPENDIX 3 WILLIAMS AND CHARDINE PROTOCOL**

**The Leach's Storm-Petrel:  
General information and handling instructions**

Urban Williams (Petro-Canada)  
&  
John Chardine (Canadian Wildlife Service)

The Grand Banks is an area that is frequented by large numbers of seabirds, representing a variety of species. Large populations are found in this area in both summer and winter, and come from the Arctic, northern Europe, and the south Atlantic, as well as from colonies along the Newfoundland Coast. One of the species found in the area of the Terra Nova Field is the Leach's Storm-Petrel (*Oceanodroma leucorhoa*).



Photo : Gilles Chapdelaine

**The Bird:**

Leach's Storm-Petrels are small seabirds, not much bigger than a Robin. They have relatively long wings and are excellent fliers. Leach's Storm-Petrels are dark brown in colour and show a conspicuous white patch at the base of the tail. In the hand, you can easily notice a small tube at the top of their bill, and you will also notice that the birds have a peculiar, not unpleasant smell (although some Newfoundlanders call these birds "Stink Birds"). Storm-Petrels are easy prey for gulls and other predators, and so to protect themselves from predation, Leach's Storm-Petrels are only active at night when on land at the breeding colonies.

**Nesting Habitat:**

Leach's Storm-Petrels are distributed widely in the northern hemisphere, however, their major centres of distribution are Alaska and Newfoundland. The bird breeds on offshore islands, often in colonies numbering tens or hundreds of thousands of pairs, even millions at one colony in Newfoundland. The nest is a chamber, sometimes lined with a some grass, located at the end of a narrow tunnel dug in the topsoil.. Depending on the colony, burrows may be under conifer or raspberry thickets or open grassland.

**Reproduction:**

In Newfoundland, Leach's Storm-Petrels lay their single egg in May and June. The egg is incubated by both parents alternately, sometimes for stretches exceeding 48 hours. The egg is incubated for 41-42 days, which is a long time for such a small egg. The peak hatching period is in the last half of July. The young petrel remains in the tunnel for about 63-70 days. Once breeding is over in late-August or early September, the birds disperse from the colonies and migrate to their wintering grounds in the Atlantic. September is the most important period for migration of Storm-Petrels to the offshore areas such as near the Terra Nova field.

**Populations:**

Canada alone supports more than 5 million pairs of Leach's Storm-Petrels. Most of them are found in Newfoundland. The Leach's Storm-Petrel colony located on Baccalieu Island is the largest known colony of this species.

Nesting sites for Leach's Storm-Petrels are found along the southeast coast of Newfoundland. These are - i) Witless Bay Islands (780,00 nesting pairs), ii) Iron Island (10,000 nesting pairs), iii) Corbin Island (100,000 nesting pairs), iv) Middle Lawn Island (26,000 nesting pairs), v) Baccalieu Island (3,336,000 nesting pairs), vi) Green Island (72,000 nesting pairs), and vii) St. Pierre Grand Columbier (100,000 nesting pairs).

**Feeding Habits:**

Leach's Storm-Petrels feed at the sea surface, seizing prey in flight. Prey usually consists of myctophid fish and amphipods. The chick is fed planktonic crustaceans, drops of stomach oil from the adult bird, and small fish taken far out at sea. Storm-Petrels feed far out from the colony and it would be reasonable to assume that birds nesting in eastern Newfoundland can be found feeding around the Terra Nova site.

**The Problem:**

As identified in the C-NOPB Decision 97-02, seabirds such as Leach's Storm-Petrels are attracted to lights on offshore platforms and vessels. Experience has shown that Storm-Petrels may be confused by lights from ships and oil rigs, particularly on foggy nights, and will crash into lighted areas such as decks and portholes. Fortunately, this type of accident does not often result in mortality, however, once on deck the bird will sometimes seek a dark corner in which to hide, and can become fouled with oil or other contaminants on deck.

**Period of Concern:**

Leach's Storm-Petrels are in the Terra Nova area from about May until October and birds could be attracted to lights at any time throughout this period. The period of greatest risk of attraction to lights on vessels appears to be at the end of the breeding season when adults and newly fledged chicks are dispersing from the colonies and migrating to their offshore wintering grounds. September is the most important period for migration of storm-petrels to the offshore areas. Past experience suggests that any foggy night in September could be problematic and may result in hundreds or even thousands of birds colliding with the vessel.

**The Mitigation:**

On nights when storm-petrels are colliding with the vessel, the following steps should be taken to ensure that as many birds as possible are safely returned to their natural habitat.

- All decks of the vessel should be patrolled as often as is needed to ensure that birds are picked up and boxed (see below) as soon as possible after they have collided with the vessel. After collision, birds will often "freeze" below lights on deck or seek dark areas underneath machinery and the like.
- Birds should be collected by hand and gently placed in small cardboard boxes. Care should be taken not to overcrowd the birds and a maximum of 10-15 birds should be placed in each box, depending upon its size. The birds are very easy to pick up as they are poor walkers and will not fly up off the deck so long as the area is well-lit. They will make a squealing sound as they are picked up- this is of no concern and is a natural reaction to be handled (the birds probably think they have been captured to be eaten!).
- When the birds are placed in the box the cover should be put in place and the birds left to recover in a dark, cool, quiet place for about 5-10 minutes. The birds initially will be quite active in the box but will soon settle down.
- Following the recovery period, the box containing the birds should be brought to the bow of the boat or to some other area of the vessel that has minimal (if any) lighting. The cover should be opened and each bird individually removed by hand. The release is usually accomplished by letting the bird drop over the side of the vessel. There is no need to throw the bird up in the air at release time. If the birds are released at a well-lit part of the vessel they usually fly back towards the vessel and collide again.
- If any of the birds are wet when they are captured (i.e. they drop into water on the deck) then they should be placed in a cardboard box and let dry. Once the bird is dry it can be released as per the previous instruction. Also, temporarily injured birds should be left for longer to recover in the cardboard box before release.
- Any birds contaminated with oil should be kept in a separate box and not mixed with clean birds. Contact Canadian Wildlife Service at (709) 772-5585 in NL or (902) 426-1900 in NS for instructions on how to deal with contaminated birds.
- In the event that some birds are captured near dawn and are not fully recovered before daylight, they should be kept until the next night for release. Storm-Petrels should not be

released in daylight as at this time they are very vulnerable to predation by gulls. Birds should be kept in the cardboard box in a cool, quiet place for the day, and do not need to be fed.

- Someone should be given the responsibility of maintaining a tally of birds that have been captured and released, and those that were found dead on deck. These notes should be kept with other information about the conditions on the night of the incident (moonlight, fog, weather), date, time, etc). THIS IS A VERY IMPORTANT PART OF THE EXERCISE AS IT IS THE ONLY WAY WE CAN LEARN MORE ABOUT THESE EVENTS.

### **Handling Instructions:**

- Leach's Storm-Petrels are small, gentle birds and should be handled with care at all times.
- It is recommended that the person handling the birds should wear thin rubber gloves or clean, cotton work gloves. The purpose of the gloves is to protect both the Storm-Petrel and the worker.
- As mentioned Storm-Petrel's have a strong odor that will stick to the handler's hands. Washing with soap and water will remove most of the smell.
- Handling Leach's Storm-Petrels does not pose a health hazard to the worker, however some birds may have parasites on their feathers, such as feather lice. These parasites do not present any risk to humans, however, as a precaution we recommend wearing cotton work gloves or thin rubber gloves while handling birds and washing of hands afterwards.

### **Wilson's Storm Petrels:**

A relative of the Leach's Storm-Petrel is the Wilson's Storm-Petrel. They breed in the south Atlantic and Antarctica and migrate north in our spring to spend the summer in Newfoundland waters. This species is very numerous on the Grand Banks in the summer, and shares the same nocturnal habits as the Leach's Storm-Petrel. Thus it is possible that Wilson's Storm-Petrels may also be attracted to the lights of a vessel at night. The two species are very similar and should be handled in the same way as described above for our Leach's Storm-Petrel.

### **Permits:**

A permit to handle storm-petrels issued by the Canadian Wildlife Service will be held on board the vessel to cover personnel involved in bird collision incidents.

**APPENDIX 4 ENVIRONMENT CANADA'S PROTOCOL FOR COLLECTING OILED BIRDS**

# PROTOCOL FOR COLLECTING BIRDS DURING AN OIL SPILL RESPONSE



***Anyone collecting migratory birds must be a nominee on an existing federal salvage permit***



## Collection of dead birds

- 1) Every time a beach is swept, select two oiled birds to be retained as possible evidence, preferably from different parts of the beach. For each of these two birds:
  - Individually wrap the bird in aluminum foil,
  - Place the wrapped bird in its own evidence bag,
  - Completely fill out a chain of custody form,
  - Write on the bag the date and location, and record that bird was found dead, and
  - Place evidence bag in a secure place until retrieved by appropriate Environment Canada personnel.
  
- 2) To avoid oil cross-contamination, it is vital that:
  - Clean gloves are used prior to handling each bird, and
  - Birds are wrapped in foil as soon as they are found.
  
- 3) Place each remaining bird found on the beach in its own generic plastic bag, and:
  - Write on the bag the date and location, and record that the bird was found dead,
  - Record on the bag whether the bird was OILED or NOT OILED, and
  - Treat bird parts the same as whole birds.
  
- 4) If it is not feasible to individually bag all birds found on the beach:
  - Put remaining oiled birds in one or more large bags,
  - Put remaining un-oiled birds in separate large bag(s) from oiled birds,
  - Write on each bag the date and location, and record that birds were found dead,
  - Record on the bags contain OILED or NOT OILED birds, and
  - Keep birds from different beaches in separate bags.
  
- 5) Make arrangements to retrieve all oiled and un-oiled birds with:
  - CWS personnel if oiled wildlife rehabilitation response is NOT in place, or
  - Wildlife rehabilitator if oiled wildlife rehabilitation response is in place.



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## Collection of live birds



### A. If oiled wildlife response is NOT in place:

1. If you are permitted to humanely euthanize the oiled bird, do so following the standard protocol and:
  - Individually wrap two euthanized birds in aluminum foil,
  - Place the wrapped bird in its own evidence bag,
  - Completely fill out a chain of custody form,
  - Write on the bag the date and location, and record that bird was found alive, and
  - Place evidence bag in a secure place until retrieved by appropriate Environment Canada personnel.
2. Record and bag remainder of euthanized oiled birds as outlined in points 3, 4 and 5 on reverse side of this form.
3. If you are not permitted to euthanize oiled birds, do not feel comfortable doing so, or have found a bird listed under COSEWIC (e.g., Roseate Tern, Ivory Gull):
  - Place the oiled bird in a cardboard box,
  - Label box with date and location where bird was recovered, and
  - Place in warm, quiet area until handed over to CWS personnel for euthanisation or rehabilitation.

### B. If oiled wildlife response is in place:

1. Place the oiled bird in a cardboard box,
2. Label box with date and location where bird was recovered, and
3. Place in warm, quiet area until handed over to wildlife rehabilitator for rehabilitation or euthanisation.

### Important information when catching and placing birds in box:

- Handle birds with gloves, preferably disposable ones, and
- Lid and walls of box must have sufficient holes to allow proper ventilation.



Place only one murre, seaduck, or other large bird per box



Two dovekies may be placed together in box if both are only slightly oiled (i.e., <25% of body covered)