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O/Ref: DM-CR-RE-09-0140/5512DM

September 15, 2009

Eric L. Theriault, P. Eng.
Advisor, Environmental Affairs
Canada – Nova Scotia Offshore Petroleum Board
6th Floor, TD Centre
1791 Barrington Street
Halifax, Nova Scotia B3J 3K9

Dear Mr. Theriault:

Re: Deep Panuke Offshore Gas Development
2009-2010 Drilling Environmental Protection Plan/Environmental Effects Monitoring Plan (EPP/EEMP)

Please find attached the 2009-2010 Drilling EPP/EEMP, DMEN-D00-RP-EH-90-0001-02U, which has been updated in response to your letter dated July 21, 2009. EnCana also offers the following response to your letter:

- **Field Monitoring Program**

A field monitoring program should be developed to confirm the drill waste dispersion modeling and analysis conducted in the 2006 Deep Panuke EA (Volume 4, Appendix D). This would provide verification of predicted impact levels. The drill cuttings monitoring program could be conducted through the use of a sampling program, along with ROV observations.

EnCana Response:

Drill waste dispersion modeling conducted for the 2006 Deep Panuke EA (Volume 4, Appendix D) predicted that coarse material from the seafloor release of water-based mud (WBM) cuttings would be deposited within a radius of 20 m from the hole, with thickness ranging from about 1 m in the centre to about 10 cm outwards. Dispersion of fine material was predicted to occur to a distance of about 150 m from the hole, with a maximum thickness of deposit at the centre being about 2 cm. Surface discharge of cuttings was predicted to result in a range of radius of 30 m to 400 m, depending on several variables. For a radius of 30 m, the maximum height of the mound could be about 2 m under the discharge pipe (within 30 m radius). If a radius of 400 m is realized, it was predicted that the maximum height of the mound would be about 2 cm with an area of deposition in excess of 1 cm extending to about 160 m (~8 ha).

Conditions at the well site have been previously characterized during geohazard, bathymetric and benthic habitat surveys. This data will provide the baseline (pre-drilling) data to help distinguish between any existing sediment deposits and discharges generated from the drilling program. Video and still camera imagery from these surveys can also be compared with post-drill ROV video camera imagery.

It should be noted that, based on the detailed drilling program being proposed for the E-70 well, a visible cuttings pile may not form due to the anticipated slow rate of release of muds/cuttings.

A Cuttings Pile Survey will be conducted by ROV video camera on completion of the drilling program to confirm EA prediction regarding cuttings dispersion. The ROV on the RGIII will conduct a visual survey and record the seabed images of the cuttings pile. The position of the cuttings pile will be determined using the ROV. A visual reference marker (such as a ruler attached to the ROV camera frame) will be used to help measure height of the cuttings pile.

A report will be prepared presenting the survey methods and results, describing the coarse material of the cuttings pile in reference to the background condition of the seabed. The report will include photographs and estimates of the dimensions of this cuttings pile.

Regular EEM benthic chemistry sampling (i.e. barium concentration) in the vicinity of the PFC during the production operations phase will likely provide the most precise measurement of drill waste dispersion.

The attached EPP/EEMP has been updated to including this monitoring program.

- **Flaring**

Section 5.2 Flaring from Well Cleaning and Testing. It is recommended that there be flare observation to ensure that an "efficient, smokeless burn" (p. 13) is happening during well testing and cleaning. In terms of methodology, it is recommended that flare observations be conducted by recording flare plume status (using a standard smoke chart) and concurrent weather conditions on the rig are recorded once a day.

In the event that observations detect a smoky flare, can the Expro's Emerald Burner be adjusted either during operation or between uses to increase the efficiency of the burn? If so, appropriate measures should be in place to increase the efficiency of the flare.

EnCana Response: It is extremely unlikely that flaring from the well cleaning and testing will produce a smoky flare.

As noted in Section 5.2, the Sea Emerald burner was extensively tested by a third-party environmental company in Norway, measuring smoke emissions using a "white sheet" fall-out test at varying distances from the actual burn and with various API oil (from heavy oil through to light condensate). The burner was given a rating of 99.9% efficiency in all cases.

Due to well design constraints, the completion fluids to be burned as a part of the well cleaning cannot be varied to any great degree which would impact the flaring operation. However, we will be burning a light condensate. At no time will the wells be produced directly to the burner from the separator; all condensate will be produced to pressurized holding tanks and at pre-determined levels, the tanks will be pumped to the burner. This promotes full control of the burn process by having a constant flow rate. There will be an air adjustment made at the burner head to ensure proper combustion between uses. There is no capability (or need) to add fuel gas to improve the efficiency of this burner.

EnCana will record the flare plume status (using a standard smoke chart) and concurrent weather conditions on the rig once a day. The attached EPP/EEMP has been updated to including this.

- **Well Blowout**

Section 7: Spill Response should include a discussion on the likelihood (see the 2006 EA (Volume 4, Appendix E1)), prevention and mitigation measures associated with a well blowout.

EnCana Response: Based on the Well Blowout and Spill Probability Assessment conducted for the Deep Panuke environmental assessment (SL Ross Environmental Research 2006), which assumed the drilling of five wells over a 12-month period, the chances of a well blowout during development drilling are predicted to be very small. The predicted probability of an extremely large oil spill (>24500 m^3) occurring from a drilling blowout was 0.013% over a 12-month drilling period or an average annual probability of one in 7,500 wells. The probability of a very large oil spill (>1600 m^3) occurring from a drilling blowout was predicted to be 0.027% over the same period with an annual probability of one in 3,700 wells. The probability of having a deep gas blowout (one that could involve sour gas) was predicted to be 0.12% chance per year (one-in-830), with virtually no chance of oil release.

It should be noted that this is a development drilling program where the geology and associated reservoirs are better defined than with exploration programs. This development drilling program includes completing four previously drilled wells (H-08, M-79A, D-41 and F-70) and drilling one new well. The new drill well, E-70, is a disposal well; its location was selected to avoid subsurface hazards and EnCana does not expect to encounter any hydrocarbons with the drilling of the E-70 well.

Given that the current plan is to drill one well and re-complete four others, it can be assumed that the probability of a blowout during drilling could be slightly less than previously predicted.

EnCana addresses blow out prevention using three primary methods:

- personnel training:
- operating procedures; and
- well design criteria.

Each position within EnCana's operating group has specified mandatory well control training requirements that meet or exceed all industry standards. Additional project specific training also occurs with rig personnel to ensure they are aware of and prepared for the specific challenges that may occur on the project. EnCana's unique approach ensures that all personnel are focused on well operations and primary well control prevention methods.

Operating procedures and well design are linked together to ensure the well is properly designed for well control. EnCana standards specify kick tolerance criteria, formation integrity and leakoff testing plus critical minimums for weight material, cement volumes and fluid inventories. These criteria are supported by mandatory well control operating procedures when a well is active which include continuous recording, monitoring and analysis of drilling parameters plus specific drilling and tripping procedures. A well understood and defined barrier policy is also used to ensure there are always two independently tested mechanical barriers in place to prevent loss of well control. If either barrier is lost all operations are suspended until the second barrier can be restored.

There are several physical safety measures in place to ensure no uncontrolled release of hydrocarbons occurs. The primary prevention mechanism within an offshore production or injection wellbore is the surface-controlled subsurface safety valve (SC-SSSV). The fail-close valve has a control line to surface that is constantly pressured to keep the valve open. In the case of an accident, the emergency shutdown procedure would have the valve close as soon as the hydraulic pressure is removed from the line. All reservoir fluids are contained below the SC-SSSV and subsea tree on top of the wellhead. This tree (series of fail-close surface valves) is connected to the tubing string within the wellbore that is used to transport the fluids to or from the reservoir.

The SC-SSSV is an integral part of the tubing string usually located at a depth below the seafloor. At the bottom of the tubing string, a production packer is placed between the tubing and casing to prevent migration of reservoir fluids in the annulus (space between the tubing and casing). This equipment provides a fit for purpose design conduit for the fluids to be removed from or injected into the reservoir. All pressure control valves within the well control system are redundant (i.e. there are two of each type of valves within the system).

The attached EPP/EEMP has been updated to including this information.

- **Editorial Suggestions**

- Page 7, last paragraph, refers to "non-intrusive aspects of the proposed activities" – a better term may be "low risk".

EnCana's Response: The term 'non-intrusive' has been replaced with the term 'low risk' in the attached EPP/EEMP.

- Page 10 states "No interations with fishing vessels are anticipated since drilling activities will take place within the Deep Panuke Safety Zone, and minimal fishing activity is expected in the Deep Panuke field centre area." - there should be no

fishing within the safety zone.

EnCana's Response: Agreed. The attached EPP/EEMP has been updated to reflect this.

- Page 12 & 13 refer to the Offshore Waste Treatment Guidelines. The EPP calls these Guidelines the "CNSOPB *Offshore Water Treatment Guidelines*".

EnCana's Response: Noted. The attached EPP/EEMP has been updated to reflect this.

- Page 12 states "…a water deluge system will also be installed in order to further protect the rig from head radiation." – should read "heat" radiation.

EnCana's Response: Noted. The attached EPP/EEMP has been updated to reflect this.

In addition, the EPP/EEMP also included general updates; all changes in the EPP/EEMP are tracked within the document.

Please do not hesitate to contact me at (902) 492-5437 should you have any questions.

Yours truly,
EnCana Corporation

David J. Riffe
EHS&Q Manager
Deep Panuke Project

/dfm

cc Keith Landra
Jayne Roma, EC
Kristian Curran, DFO
Peter Shankel, EnCana

Deep Panuke

02U	2009-08-13	Re-Issued for Use	D. Morykot	R. MacDonald	D. Riffe	P. Shankel
01U	2009-06-04	Issued for Use	M. Thillet	L. McLachlan	D. Riffe	P. Shankel
Rev	**Date**	**Reason for Issue**	**Prepared**	**Checked**	**Approved**	**Approved**

Title

2009-2010 Drilling Environmental Protection Plan/Environmental Effects Monitoring Plan

DM	EN	D00	RP	EH	90	0001		02U
Project	Originator	Location	Type	Disc	System	No.	Sheet	Rev

REVISION LIST	
REVISION	DESCRIPTION OF CHANGES
01U	Issued for Use
02U	Re-Issued for Use; general updates and updates based on regulators comments.

HOLDS AND INPUT STATUS		
HOLD No.	ACTION	REMARKS

TABLE OF CONTENTS

ABBREVIATIONS

CEAA	Canadian Environmental Assessment Act
CNSOPB	Canada Nova Scotia Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DND	Department of National Defense
EA	Environmental Assessment
EEMP	Environmental Effects Monitoring Plan
EHSMS	Environment, Health and Safety Management System
EPP	Environmental Protection Plan
IMO	International Maritime Organization
MARLANT	Maritime Forces Atlantic
MPA	Marine Protected Area
PCB	Polychlorinated Biphenyls
RG	Rowan Gorilla
ROV	Remotely-Operated Vehicle
SCBA	Self-Contained Breathing Apparatus
TDG	Transportation of Dangerous Goods
UXO	Unexploded Ordnance
WBM	Water-Based Mud

1 BACKGROUND

1.1 Regulatory and Management System Context

The proposed 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 drilling 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), 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 2009-2010 drilling program.

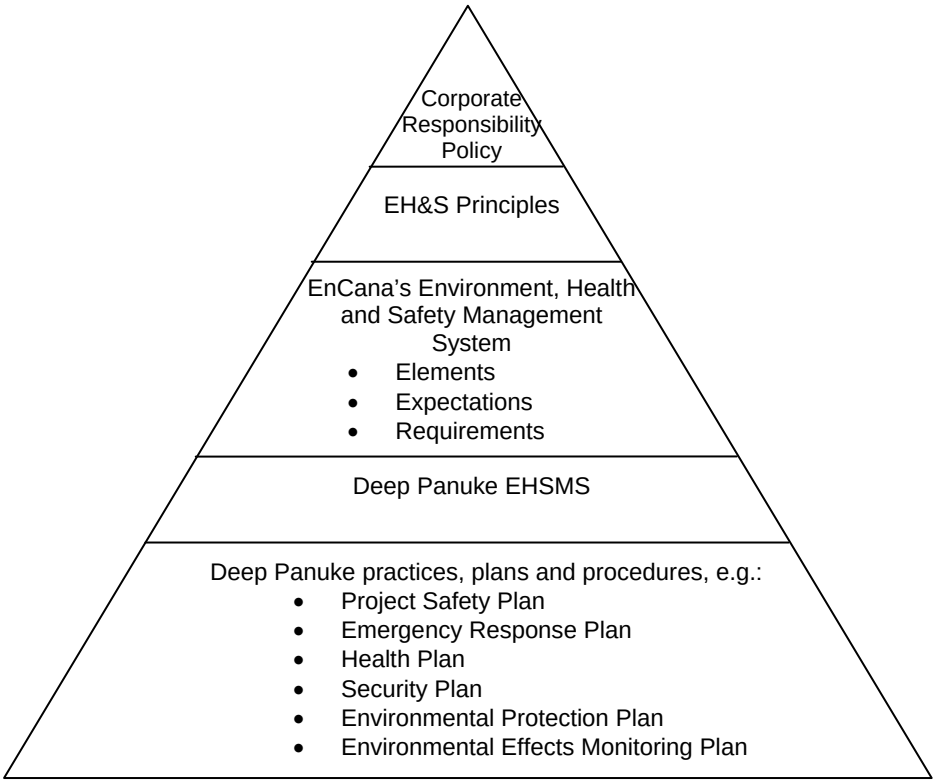


Figure 1.1 EnCana Environmental Management Framework

1.2 Program Overview

The proposed drilling program will be conducted by Rowan Companies Inc. with the jack-up drilling rig Rowan Gorilla III (RG III). The program will consist of re-entering four existing wells (H-08, M-79A, F-70 and D-41) and drilling one new acid gas injection well (E-70) (see Figure 1.2, Location Map).

Each well re-entry and completion is expected to take between 35-40 days and the new well is expecting to take 45 days to drill and complete.

The drilling program is scheduled to commence in late September/early October 2009, and will take approximately six months to complete offshore.

This drilling 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.

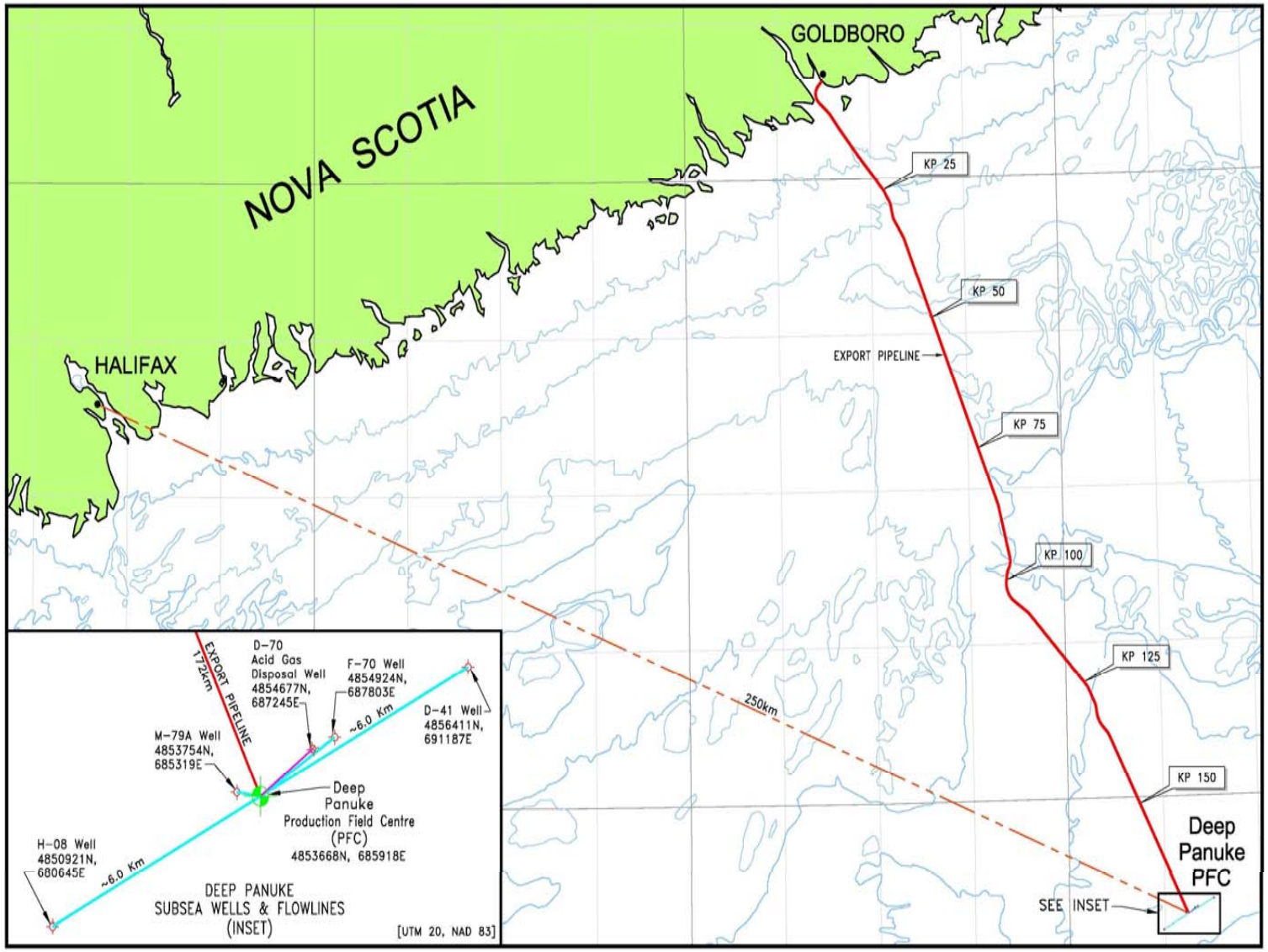


Figure 1.2 Drilling Program Location Map

2 SPECIAL AREAS

The drilling program will follow EnCana's Codes of Practice for Sable Island and the Gully Marine Protected Area (MPA), 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.

3 INTERACTION WITH FISHING ACTIVITY

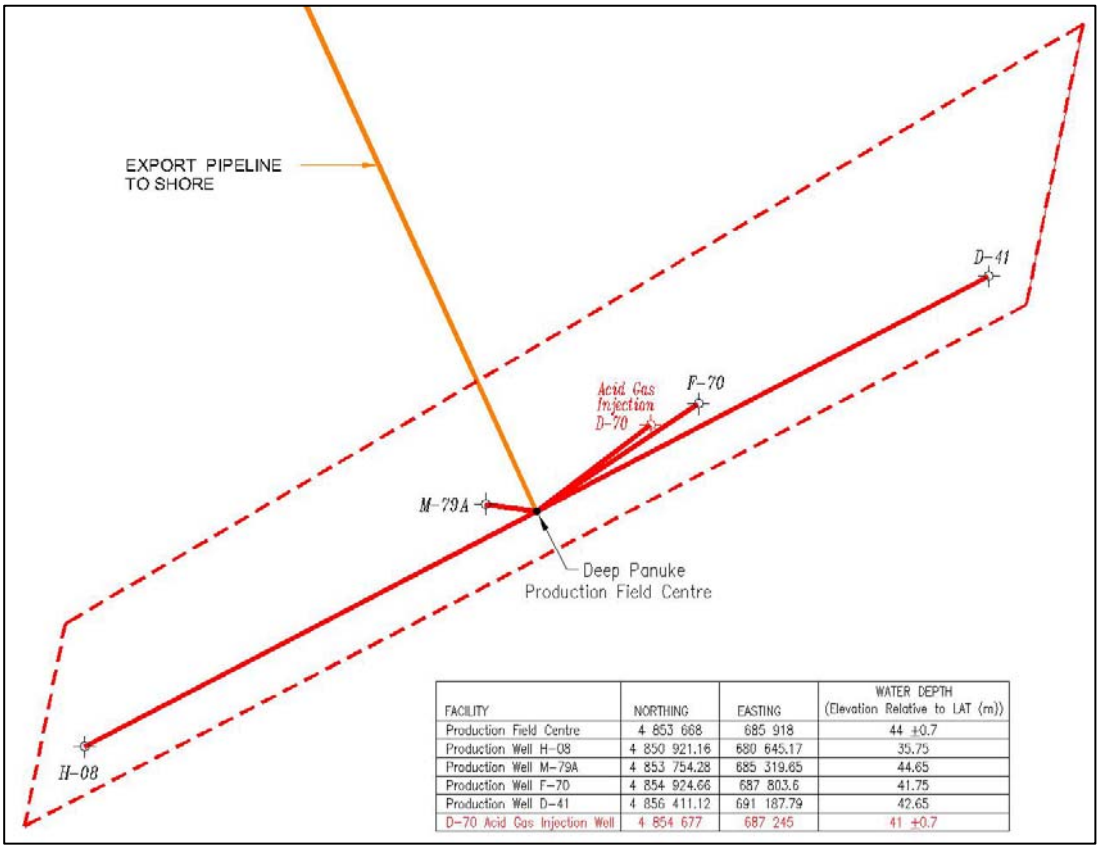
No fishing activity is expected in the Deep Panuke Safety Zone; therefore, no interactions with fishing vessels are anticipated since drilling activities will take place within this zone.

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 area 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)). In addition, as mentioned above, the program will take place within the Deep Panuke Safety Zone (see Figure 3.1), which has now been added to hydrographic charts.

A Notice to Shipping will be issued with regard to the drilling program.

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.

In addition, as per EnCana's commitment to place fisheries observers strategically on key construction vessels and as noted in the Fisheries Liaison Program, DMEN-X00-RP-EH-00-0011-02U, EnCana will have a Fisheries Observer in the field for at least 25% of the 6-month drilling program.



FACILITY	NORTHING	EASTING	WATER DEPTH (Elevation Relative to LAT (m))
Production Field Centre	4 853 668	685 918	44 ±0.7
Production Well H-08	4 850 921.16	680 645.17	35.75
Production Well M-79A	4 853 754.28	685 319.65	44.65
Production Well F-70	4 854 924.66	687 803.6	41.75
Production Well D-41	4 856 411.12	691 187.79	42.65
D-70 Acid Gas Injection Well	4 854 677	687 245	41 ±0.7

Figure 3.1 Deep Panuke Safety Zone

4 INTERACTION WITH MILITARY OPERATIONS

EnCana has received confirmation from DND in March 2009 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 drilling program.

5 WASTE AND DISCHARGES

Wastes and discharges (including air emissions) for the Deep Panuke drilling program were assessed in the in the 2006 Deep Panuke EA (Volume 4). Additional vessel and/or equipment-specific considerations and mitigation measures for this program are provided below.

5.1 Muds and Cuttings

Drill waste dispersion modeling and analysis of the Deep Panuke development drilling program was conducted in the 2006 Deep Panuke EA (Volume 4), see Section 8.3.4.1 and Appendix D. The proposed drilling program will operate within the parameters (estimated type and volumes of discharged muds, cuttings and completion fluid per well) used in the 2006 EA.

In particular, EnCana will use exclusively water-based mud (WBM) for this drilling program. The density of this drilling fluid will be adjusted by increasing the concentration of salt in the drilling fluid, not by using barite typically. The use of barite will be minimized and will only be used (1) in an emergency situation where mud would be required to "kill" the well or (2) in the preparation of high density slugs to pull the drill pipe out of the drill hole or just prior to running the 30" conductor. These "slugs" are small volumes of high density WBM used to make the fluid level in the drill pipe drop as the pipe is pulled out of the hole. EnCana will strictly manage the use of barite in these situations; the barite selected will have the lowest mercury content commercially available. Barite contains very low amounts of mercury in an insoluble form.

WBM and associated cuttings will be disposed overboard as per the CNSOPB *Offshore Waste Treatment Guidelines.* In addition, all drilling and cement chemicals will be screened according to the CNSOPB *Offshore Chemical Selection Guidelines* prior to offshore discharge.

5.1.1 Cuttings Pile Survey

Drill waste dispersion modeling conducted for the 2006 Deep Panuke EA (Volume 4, Appendix D) predicted that coarse material from the seafloor release of water-based mud (WBM) cuttings would be deposited within a radius of 20 m from the hole, with thickness ranging from about 1 m in the centre to about 10 cm outwards. Dispersion of fine material was predicted to occur to a distance of about 150 m from the hole, with a maximum thickness of deposit at the centre being about 2 cm. Surface discharge of cuttings was predicted to result in a range of radius of 30 m to 400 m, depending on several variables. For a radius of 30 m, the maximum height of the mound could be about 2 m under the discharge pipe (within 30 m radius). If a radius of 400 m is realized, it was predicted that the maximum height of the mound would be about 2 cm with an area of deposition in excess of 1 cm extending to about 160 m (~8 ha).

Conditions at the well site have been previously characterized during geohazard, bathymetric and benthic habitat surveys. This data will provide the baseline (pre-drilling) data to help distinguish between any existing sediment deposits and discharges generated from the drilling program. Video and still camera imagery from these surveys can also be compared with post-drill ROV video camera imagery.

It should be noted that, based on the detailed drilling program being proposed for the E-70 well, a visible cuttings pile may not form due to the anticipated slow rate of release of muds/cuttings.

A Cuttings Pile Survey will be conducted by ROV video camera on completion of the drilling program to confirm EA prediction regarding cuttings dispersion. The ROV on the RGIII will conduct a visual survey and record the seabed images of the cuttings pile. The position of the cuttings pile will be determined using the ROV. A visual reference marker (such as a ruler attached to the ROV camera frame) will be used to help measure height of the cuttings pile.

A report will be prepared presenting the survey methods and results, describing the coarse material of the cuttings pile in reference to the background condition of the seabed. The report will include photographs and estimates of the dimensions of this cuttings pile.

Regular EEM benthic chemistry sampling (i.e. barium concentration) in the vicinity of the PFC during the production operations phase will likely provide the most precise measurement of drill waste dispersion.

5.2 Well Cleaning and Testing

The existing wells are currently suspended with a completion fluid which consists of primarily brine. EnCana will make best efforts to re-use this fluid. However, if the completion fluid meets the screening requirements of the CNSOPB *Offshore Chemical Selection Guidelines* for ocean discharge, it may be disposed overboard as per the CNSOPB *Offshore Waste Treatment Guidelines;* otherwise, it will be shipped to shore.

For the four re-entry wells, it will be necessary to flow the well to clean up and remove the remaining completion fluids from the reservoir. Each re-entry well will need to be cleaned-up for approximately 3 days. In addition, one well (D-41) will need to be cleaned up and tested, which will take approximately 7 days. Therefore flaring operations for well cleaning and testing should take a total of approximately 16 to 20 days, involving burning of mostly gas and a total of 175 m^3 of condensate for all four wells.

As mentioned above, air emissions resulting from short-term flaring of the production wells during well clean-up and completion was assessed in the 2006 Deep Panuke EA (Volume 4). Additional considerations on the flaring equipment selected for this program, as well as specific mitigation measures for the proposed well testing operations are provided below.

The selection of the flaring equipment for this drilling program took into account several considerations, as follows:

1) Capacity of the pumps in order to supply an uninterrupted and stable flow of oil/condensate to the burner head. The pump efficiency is important in order to supply a stable flow of condensate, as this makes for a more efficient burn and lowers the risk of fall out.
2) The Sea Emerald burner selected for this program has been extensively tested by a third-party environmental company in Norway, measuring smoke emissions using a “white sheet” fall-out test at varying distances from the actual burn using different rates, oil gravities, water cuts and temperatures. The burner was given a rating of 99.9% efficiency in all cases. The burner combines air and water with the oil to provide improved combustion performance producing an efficient, smokeless burn with minimal fallout of hydrocarbons.
3) The burner pilot system is critical due to the risk of fallout during start-up or slugging oil to the burner. The pilot needs to be stable in high winds and capable of sustaining an ignition source throughout the burn period.
4) The burner boom length was chosen based on heat radiation and noise concerns. The selected burner booms are 27.4 m (90 ft) long, which offers the rig protection from heat radiation and reduces the noise experienced on the rig during the flaring of high volume gas. In conjunction with the 27.4 m (90 ft) booms, a water deluge system will also be installed in order to further protect the rig from heat radiation.

It is extremely unlikely that flaring from the well cleaning and testing will produce a smoky flare. Due to well design constraints, the completion fluids to be burned as a part of the well cleaning cannot be varied to any great degree which would impact the flaring operation. At no time will the wells be produced directly to the burner from the separator; all condensate will be produced to pressurized holding tanks and at pre-determined levels, the tanks will be pumped to the burner.

This promotes full control of the burn process by having a constant flow rate. There will be an air adjustment made at the burner head to ensure proper combustion between uses. There is no capability (or need) to add fuel gas to improve the efficiency of this burner.

EnCana will record the flare plume status (using a standard smoke chart) and concurrent weather conditions on the rig once a day.

Appendix 2 provides the specifications of the flaring equipment selected for the well testing program, i.e. the transfer pumps, well test burners (including environmentally-friendly well testing considerations) and burner booms.

In addition, the following mitigation measures will be implemented during flaring activities:

- As mentioned above, the selected well testing contractor will use a very efficient burner, which, combined with the fact that the products burned will be gas and condensate, is expected to result in zero smoky emissions.
- During flaring activities, all marine vessels will be operating upwind of the burner in use, and all vessels in the area will remain at a safe distance from the rig (3 to 5 km). All vessels in the vicinity of the rig will be advised of flaring operations prior to start up and will also be advised of which burner will be used (port or starboard). If there is a wind change and the burner needs to be switched from one side to the other, the vessels will be advised to move location.
- All safety procedures associated with flaring will be outlined in the completion program and it should be noted that some 30-minute self-contained breathing apparatus (SCBA) sets will be located on the supply / stand-by vessel. The rig will be fully equipped with a Cascade Breathing air system and 30-minute SCBA sets.
- Flaring operations will be planned and adjusted according to weather conditions, which will be continuously monitored.
- In some extreme conditions, flaring operations will need to be suspended, such as high winds conditions where a pilot cannot be sustained or zero wind conditions where the SO_2 dissipation is insufficient.

5.3 Other Wastes and Discharges

There will be a small amount (approximately 20 litres) of hydraulic fluid released during the function testing of the wellhead trees, which will be installed during the drilling program. The selected fluid will be an environmentally friendly product that is non-toxic to aquatic organisms and will be screened for ocean discharge according to the CNSOPB *Offshore Chemical Selection Guidelines* prior to use.

Hazardous wastes 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 (e.g., sanitary and food wastes, oily bilge/ballast water). The drilling rig, RGIII, has an onboard water sewage plant in accordance with MARPOL regulations. The supply/standby vessels for this program, Maersk Challenger, Hebron Sea, and Ryan Leet, have an onboard water sewage plants in accordance with MARPOL regulations.

Further, the rig and 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 supply/standby vessels associated with this program, nor the jack-up rig, have onboard incinerators.

Any other wastes will be sorted and brought to shore for disposal according to the local regulatory regime of the shore base, including the Nova Scotia *Solid Waste - Resource Management Regulations*, and municipal requirements at the offloading location (Halifax).

Upon termination of the wells, a final ROV survey of the wellsites will be conducted and any remaining debris, such as dropped objects, on the seafloor will be removed.

6 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 drilling rig or support vessels.

A Seabird Salvage Permit has been obtained from Canadian Wildlife Service (CWS) (covering all Deep Panuke 2009 offshore activities) and a report of birds “salvaged” onboard the rig/vessels (and other offshore vessels/platforms used for Deep Panuke 2009 activities) will be submitted to CWS and to the CNSOPB within 30 days of the permit’s expiry date (January 2010).

EnCana will immediately notify the Canadian Coast Guard Operations Center if a dead bird is found during the program to confirm the course of action. In case of a mass stranding (more than five birds in a 24-hr episode), or a stranded oiled bird (see section 7.5.3 for oiled birds), the CNSOPB will also be contacted. In addition, Andrew Boyne at CWS can be contacted for seabird-related advice. Dead birds will be identified, recorded and disposed of at sea unless they are oiled (see section 7.5.3 for oiled birds). Figure 7.1 provides a summary flowchart of bird handling procedures for the program.

7 SPILL RESPONSE

7.1 Well Blowout

Based on the Well Blowout and Spill Probability Assessment conducted for the Deep Panuke environmental assessment (SL Ross Environmental Research 2006), which assumed the drilling of five wells over a 12-month period, the chances of a well blowout during development drilling are predicted to be very small. The predicted probability of an extremely large oil spill (>24500 m^3) occurring from a drilling blowout was 0.013% over a 12-month drilling period or an average annual probability of one in 7,500 wells. The probability of a very large oil spill (>1600 m^3) occurring from a drilling blowout was predicted to be 0.027% over the same period with an annual probability of one in 3,700 wells. The probability of having a deep gas blowout (one that could involve sour gas) was predicted to be 0.12% chance per year (one-in-830), with virtually no chance of oil release.

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Each position within EnCana's operating group has specified mandatory well control training requirements that meet or exceed all industry standards. Additional project specific training also occurs with rig personnel to ensure they are aware of and prepared for the specific challenges that may occur on the project. EnCana’s unique approach ensures that all personnel are focused on well operations and primary well control prevention methods.

Operating procedures and well design are linked together to ensure the well is properly designed for well control. EnCana standards specify kick tolerance criteria, formation integrity and leakoff testing plus critical minimums for weight material, cement volumes and fluid inventories. These criteria are supported by mandatory well control operating procedures when a well is active which include continuous recording, monitoring and analysis of drilling parameters plus specific drilling and tripping procedures. A well understood and defined barrier policy is also used to ensure there are always two independently tested mechanical barriers in place to prevent loss of well control. If either barrier is lost all operations are suspended until the second barrier can be restored.

There are several physical safety measures in place to ensure no uncontrolled release of hydrocarbons occurs. The primary prevention mechanism within an offshore production or injection wellbore is the surface-controlled subsurface safety valve (SC-SSSV). The fail-close valve has a control line to surface that is constantly pressured to keep the valve open. In the case of an accident, the emergency shutdown procedure would have the valve close as soon as the hydraulic pressure is removed from the line. All reservoir fluids are contained below the SC-SSSV and subsea tree on top of the wellhead. This tree (series of fail-close surface valves) is connected to the tubing string within the wellbore that is used to transport the fluids to or from the reservoir.

The SC-SSSV is an integral part of the tubing string usually located at a depth below the seafloor. At the bottom of the tubing string, a production packer is placed between the tubing and casing to prevent migration of reservoir fluids in the annulus (space between the tubing and casing). This equipment provides a fit for purpose design conduit for the fluids to be removed from or injected into the reservoir. All pressure control valves within the well control system are redundant (i.e. there are two of each type of valves within the system).

7.2 Spill Risk

The likelihood of an accidental spill into the marine environment during the program is low because the rig and support vessels will comply with IMO standards and implement good housekeeping practices. Furthermore, a spill response plan will be in place to minimize the possible consequences of a malfunction or accident (refer to Sections 7.2 to 7.7 below).

The drilling program will include the deployment of an ROV to assist with drilling operations, such as rig move inspections, wellsite intervention capability, etc.. However, the risk of potential impact from hydraulic fuel spills from ROV cables is expected to be minimal due to the small duration of ROV activity (approximately 200-250 hours) and the fact that the ROV will use a hydraulic fluid (Ocean-Rite AW Hydraulic Oil 22) that is non-toxic to aquatic organisms and will inherently biodegrade in water under aerobic conditions.

7.3 Spill Response Logistics and Equipment

The vessels involve in the drilling program will include the following:

- Drill Rig: RGIII
- Standby Vessel #1: Maersk Challenger
- Standby Vessel #2: Hebron Sea
- Supply/Tow Vessel: Ryan Leet
- Helicopter: Sikorsky S-92

There will be regular vessel (3-4 trips/week) and helicopter (3-5 trips/week) trips between the drill rig and Halifax during the program.

The drill rig, as well as each program vessel, will have a standard spill response kit capable of containing and cleaning up a small spill onboard the rig/vessel.

7.4 Spill Monitoring

As per EnCana's Spill Response Plan approved by and on file with the CNSOPB, the Canadian Coast Guard and DFO, 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.

7.5 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^3 (10-barrel) and 16 m^3 (100-barrel) diesel spill scenarios at the Deep Panuke PFC location. A 1.6 m^3 (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^3 (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 condensate 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).

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.

7.6 Spill EPP for Marine Birds

Figure 7.2 provides a summary flowchart of the proposed environmental protection plan (EPP) for the program in the event of a spill.

7.6.1 Bird Monitoring

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

Marine bird species-at-risk are not expected to occur in the program area. The only marine bird species listed by COSEWIC as endangered or threatened offshore Nova Scotia is the endangered Roseate tern nesting on Sable Island between May and July, approximately 40 km away from the closest location of the project site.

7.6.2 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.

7.6.3 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 7.1) 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 rig or vessels during the program because of good housekeeping procedures. If a live oiled bird were found onboard the rig or vessels during the program, the protocol developed by Williams and Chardine (1999) for storm petrels (Appendix 3) would be implemented. If the bird died or if any dead oiled birds were found onboard the rig or vessels, the bird would be frozen and shipped to the CWS office in Dartmouth for confirmation of origin of the oil contamination, if logistics permits (CWS will be contacted beforehand). If shipping to shore were not possible, the bird would be disposed at sea.

EnCana will immediately notify the CNSOPB and the Canadian Coast Guard Operations Center if an oiled bird (dead or live) is identified during the program and will confirm the course of action with them. In addition, Andrew Boyne at CWS can be contacted for seabird-related advice.

Beached bird surveys on Sable Island would only be implemented in the event of a catastrophic spill in which a large number of birds were expected to be oiled and oiled birds were expected to arrive on the island. As indicated in Section 7.4, such an occurrence is deemed to be highly unlikely based on spill dispersion modeling.

Figure 7.1 provides a summary flowchart of oiled bird handling procedures for the program.

7.7 Spill EPP for Marine Mammals

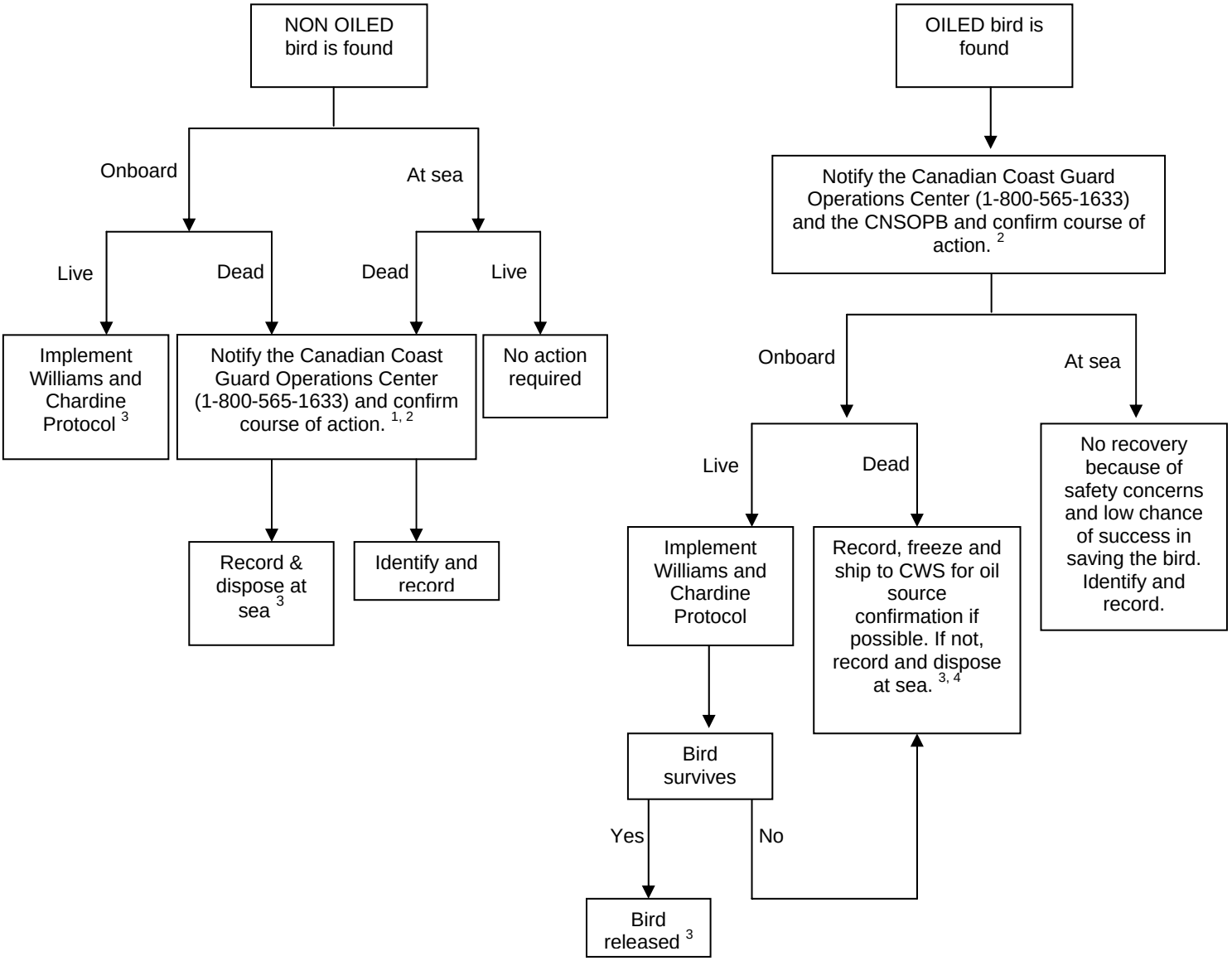
Marine mammals have body coverings, unlike those of birds, that are relatively unaffected by oiling. Hair seals for example are often observed with apparently untroublesome patches of heavy oil; light oils such as diesel are likely to evaporate and wash off more readily. Spills of light oil are likely 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 7.1).

7.8 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 7.4).

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.



[1] Also notify the CNSOPB in case of mass stranding (more than five birds in a 24-hr episode)

[2] In addition, Andrew Boyne at CWS can be contacted for seabird-related advice

[3] 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 the end of January 2010.

[4] 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 7.1 Bird Handling Flowchart

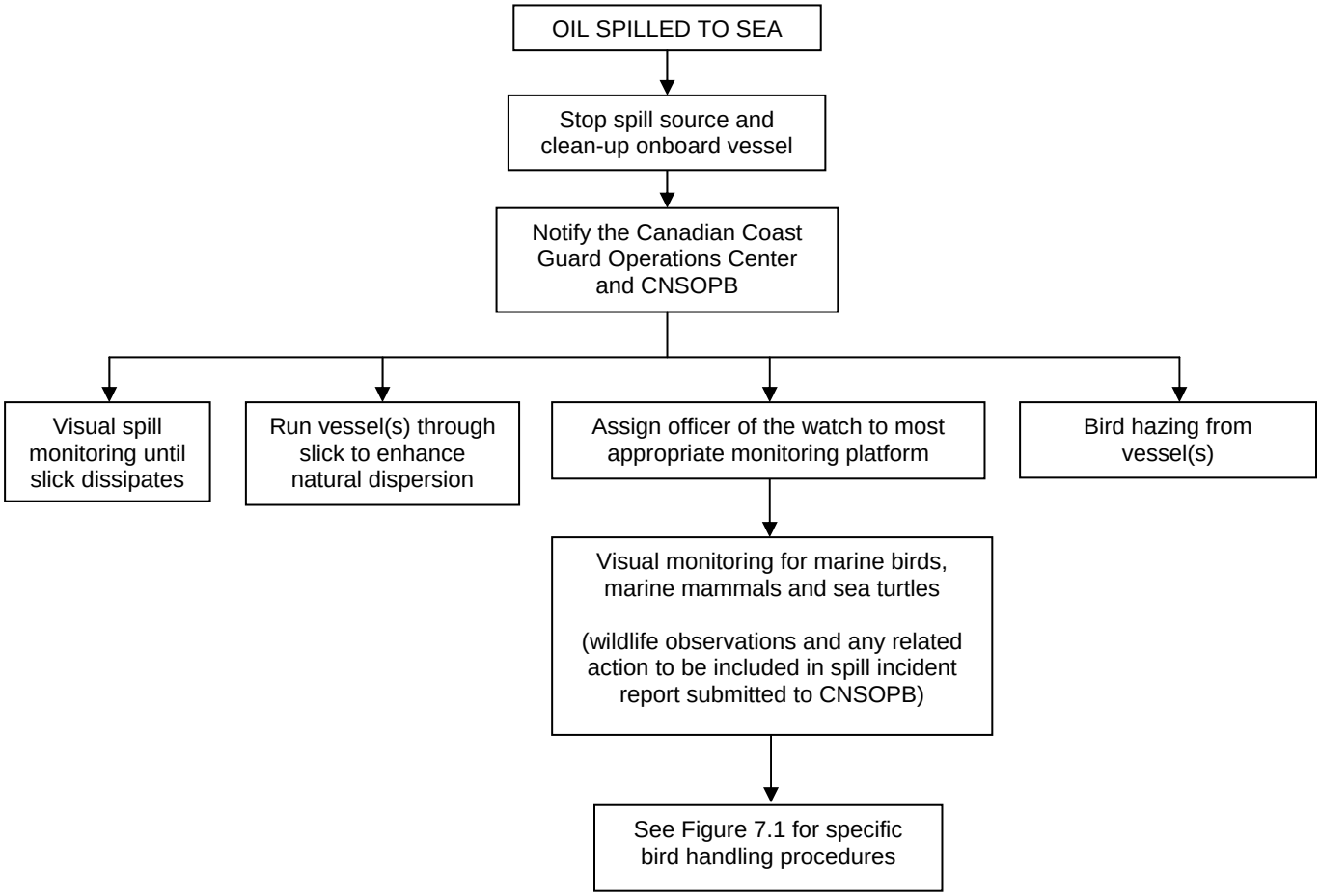


Figure 7.2 Spill EPP Flowchart

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

ENCANA CODE OF PRACTICE FOR SABLE ISLAND

A. OVERVIEW

EnCana has developed, as part of its environmental protection planning, a Code of Practice to protect the uniqueness and integrity of Sable Island (see attached map). This Code of Practice is intended to protect the sensitive environment of Sable Island and its Valued Environmental Components. This Code is not a regulatory requirement and is indicative of EnCana's environmental stewardship philosophy and corporate policies. This Code of Practice applies to all EnCana activities.

Sable Island is approximately 41km in length and is located 290km 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 administered by the Canadian Coast Guard on behalf of the Government of Canada, pursuant to the Sable Island Regulations of the Canada Shipping Act. It is also protected under Environment Canada regulations, specifically the Migratory Birds Convention Act. EnCana is represented on the Sable Island Stakeholder Advisory Committee chaired by DFO. The Sable Island Green Horse Society website (http://www.greenhorsesociety.com) contains additional information on Sable Island.

B. DETAILS

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

EnCana will not conduct activities within 2 km (1 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 2005 Sable Island Visitors Manual.

EnCana vessels and aircraft are not permitted within 2 km (1 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 and provide orientation for its visitors to the Island. EnCana intends that this Code is a 'living document' and will review and update it as required. The Code of Practice will also be publicly available on the EnCana Corporation web site (www.encana.com).

EnCana Corporation

David L. Kopperson
Vice President
Offshore East Coast of Canada

ENCANA CODE OF PRACTICE FOR THE GULLY MPA

A. OVERVIEW

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 attached map). This Code is not a regulatory requirement and is indicative of EnCana's environmental stewardship philosophy and corporate policies. This Code of Practice applies to all EnCana activities.

The Gully is a large submarine canyon approximately 40 km 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. It is thought to be an area of high productivity and important marine mammal habitat. Fifteen species of whales and dolphins have been identified in the area and eight of them are commonly found there. The deepest part of the Gully supports a resident population of approximately 163 endangered Northern Bottlenose whales (*Hyperoodon ampullatus*). The Gully also contains the highest known density of corals in Atlantic Canada with a dozen species identified to date.

The Gully has been designated by the Federal Department of Fisheries and Oceans as a MPA under the Oceans Act in 2004, and comprises an area of 2,364 km^2. EnCana is represented on the Gully Advisory Committee chaired by DFO.

B. DETAILS

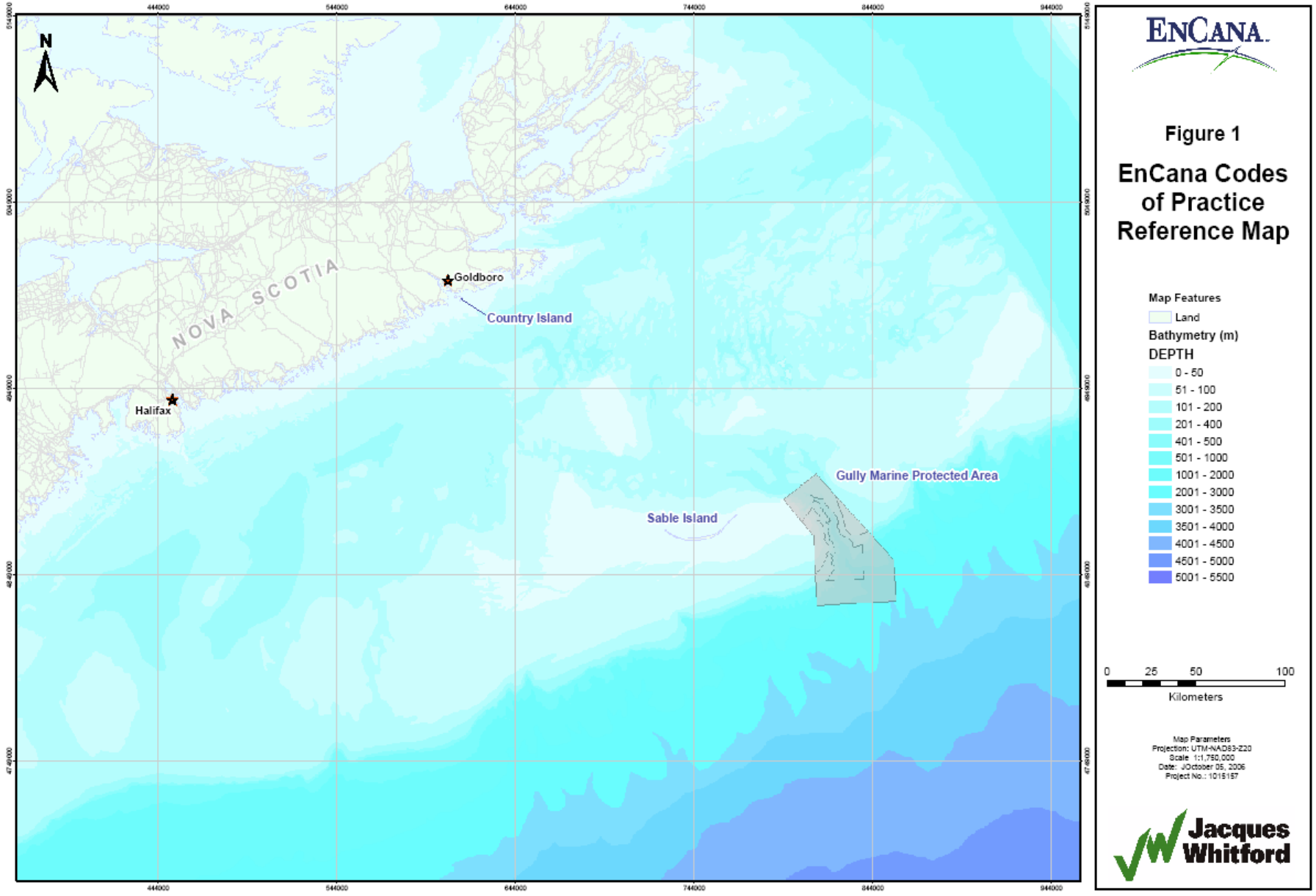
As part of its environmental stewardship with respect to the Gully MPA:

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 m. 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 employees and contractors. EnCana intends that this Code is a 'living document' and will review and update it as required. The Code of Practice will also be publicly available on the EnCana Corporation web site (www.encana.com).

EnCana Corporation

David L. Kopperson
Vice President
Offshore East Coast of Canada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Sable Island
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ENCANA
Figure 1
EnCana Codes of Practice 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
0 25 50 100
Kilometers
Map Parameters
Projection: UTM-NAD83-Z20
Scale 1:1,750,000
Date: dOctober 05, 2006
Project No.: 1015157
Jacques Whitford

APPENDIX 2 WELL TEST FLARING EQUIPMENT SPECIFICATIONS (TRANSFER PUMPS, BURNERS AND BOOMS)

Centrifugal Transfer Pumps

Description

Transfer pumps are used to transfer crude oil from the test tanks to a pipeline, storage tank or to crude oil burners for disposal by combustion. Transfer pumps may be driven electrically, by diesel or gas engines. Electric drivers are preferred in offshore applications when ample electrical supply is available. Pump packages are supplied with Class I Div I electric motors with rated explosion proof starter boxes and electrical components.

The pumps are horizontal, end suction centrifugal pumps with mechanical seals. They can supply the oil at a higher atomization pressure to the burner when the well is not capable of ensuring optimized combustion. They are also used to pump out the storage tanks after meter factors have been performed or when function testing burners with diesel.

The units are usually controlled manually during well testing operations, but can be set up for automatic control using high/low level switches in the stock tanks if required.

Transfer pumps are ideal for transferring oil or water under high corrosive conditions.

Features and Benefits

- Can use either an electric, diesel or gas driver for maximum flexibility
- Are on an oilfield skid
- Use mechanical pump seals (highly reliable)

Operation

Centrifugal pumps deliver a constant pressure without the pulsations that occur with piston type pumps. Centrifugal pumps will not overpressure the system if the line becomes blocked by an obstruction. The motor is protected by circuit breakers should the pump start to cavitate or run dry.

Specifications

Motor	Type: 315M-2C 145kW (195 HP) Ex-Code: EExde IIC T4 440 volt, 3 Phase, 60 Hz, 225A, 3570 RPM
Starter	CAT6-250-EI-XC-FB1-B400E137-L11-SPL Rating: 200HP, 460V,3-Phase, 60 Hz NEMA7, 9, 4 UL & CSA Class 1, Div 1&2, Group B, C & D
Controls	On/Off Switch, External Reset NEMA 7/9 Enclosure, Separate Field Termination
Centrifugal Pump	Sunflo P-3000 Centrifugal pump 6750 Output RPM; Maximum Housing Pressure, 1000 psi (6895 kPa)
Maximum Temperature °F (°C)	-20(-29) Ambient, to 250 F (121) Maximum, Fluid Temperature
Pump Inlet (in.)	4″ 600# RF Flange
Pump Outlet (in.)	3″ 600# RF Flange
Performance (each)	With Water: 10,000 bbl/d @ 400 psi
Service	H_2S*
Skid Length in. (mm)	98.4 (2500)
Skid Width in. (mm)	48 (1200)
Skid Height in. (mm)	67 (1700)
Skid Weight lb (kg)	5,060 (2300) each

* Meets requirements of NACE MR-01-75

Well Test Burner

Introduction

Achieving stoichiometric combustion in an open-flame or flare-type burner is very difficult due to unknown and/or constantly changing variables, such as flow rate, flowing pressure, hydrocarbon content, composition, and environmental conditions. The fallout of unburned oil and dense smoke clouds may be significantly reduced or eliminated during well testing operations by using improved burner technology.

Expro's Sea Emerald Burner uses an internal air-mix atomizer that provides superior atomization for a well test burner.

The Combustion Process

Liquid fuel spray combustion is actually the hydrocarbon vapour around the droplet burning. Combustion occurs as the hydrocarbon vapour mixes with air and is exposed to an ignition source. Droplet vaporization is a function of the initial droplet size, fluid properties, and heat of combustion.

Environmentally Friendly Well Testing

Environmentally friendly well testing is dependent upon proper well test designs and the proper operation of the disposal equipment. Good burner performance is a function of the burner design and operating conditions.

The production of small hydrocarbon droplets (atomization) that vaporize quickly eliminates raw oil falling out of the flame. High burner nozzle exit velocities, which also improve atomization, and the use of multiple tips, which discharge in a unique array, improve flame turbulence and air ingestion, effectively eliminating smoke over a wide oil flow rate range.

Expro's Well Test Burner

A three head burner assembly has a rated capacity of 12,000 BOPD. The oil pressure at this rate is 190 psi with 38°API crude at 60ºF. Other rated capacities are obtained by using other multiples of the burner head. The head oil and air inlets are conveniently located in a vertical line to simplify header construction and allow flexible positioning. The low oil pressure requirement allows more opportunities to flow directly from the separator with live crude at its highest temperature. High-pressure pumps with their increased maintenance and operation requirements are not necessary. Working with lower pressures means lower fluid velocities and less chance for erosion. Larger oil passages make plugging less likely.

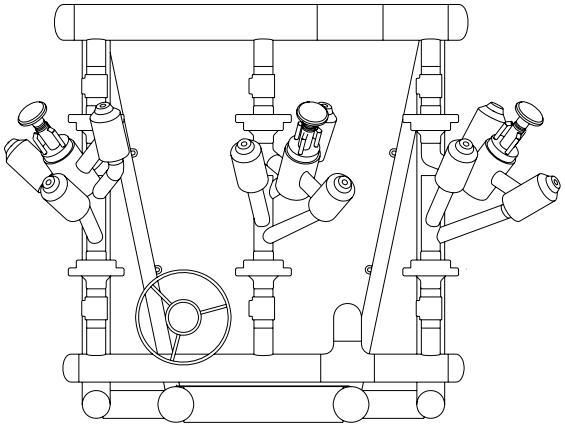
The burner performs best at low oil rates per nozzle. This makes startup quick and clean. It simplifies operation since all the nozzles for which there is an adequate air supply will be open. The operating sequence for the burner is, light pilots, start the air then flow oil.

Expro's burners combine air and water with the oil to produce an efficient, smokeless burn with minimal fallout of hydrocarbons. These burners can be mounted on burner booms for offshore operations or on tripods for land operations. Each burner is equipped with a stable, windproof igniter pilot. An optional remote spark ignition system is also available.

Well Test Burner

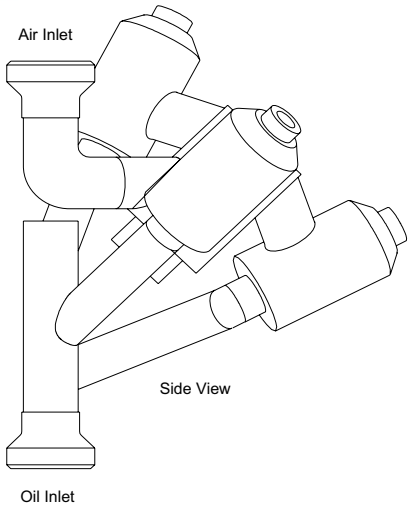
Features

- Improved Combustion Performance
- Wide Turndown Ratio
- Compact
- Lightweight
- Modular
- Serviceable
- Simple Operation
- Stable Pilot and Igniter System
- Clean Startup
- Low Oil Pressure Requirement



Specifications

Oil	Nom. Flow Rate 12000 BOPD
Working Pressure	9928 kPa (1440 psi)
Test Pressure	14.9 MPa (2160 psi)
Oil Inlet Size	76.2 mm (3 in)
Air	Nom. Flow Rate 4500 scf/min
Working Pressure	689 kPa (100 psi)
Test Pressure	1034 kPa (150 psi)
Air Inlet	101.6mm (4 in)
Dimensions	Height 1.22m (4 ft) Deep 0.6m (2 ft). Width 1.5m (5 ft)
Weight(est.)	261 kg (575 lb)
Service	H2S



Burner Booms

Description

Booms extend the Sea Emerald crude oil burner and gas flare a set distance from the structure of an offshore rig. The boom length selected will allow the produced hydrocarbons to burn safely when used in conjunction with a suitable water curtain system. The boom is a portable U-shaped truss assembly built in 30 ft sections. The kingpost attaches to the rig structure and is braced with three back struts. Vertical suspension cables and horizontal windstay cables support the boom, so a rig crane is not needed for support. The length of the boom depends on the anticipated flow rates. By using a boom, operators can avoid exposing the rig structure, equipment and personnel to excessive radiation levels from the combustion process. The U-shaped configuration helps provide added security for personnel using the boom.

Features and Benefits

- The boom is modular and available in 60-, 90-, 120-ft lengths.
- It is lightweight, which reduces the crane capacity requirement and simplifies installation.
- A boom attachment point at the kingpost easily accepts the boom into a U-shaped slot, which reduces and simplifies installation time.
- Integral air, water, and vent lines reduce weight and piping congestion.
- A protected walkway provides added safety.

Operation

Booms are usually installed on either side of an offshore rig. The well-test piping typically includes a manifold to divert flow to the downwind side for safe operation. In addition to the oil and gas lines, there are water, air, vent, and pilot gas lines.

Specifications

Boom Length	27.4m (90ft.)
Boom Weight	5221Kg (11.511lb.)
Design Load 1000-lb Burner	• 100-mph Wind • 1-G Vertical Load • ½-G Transverse Load
Oil	3″ Sch 80 – 1440 psi
Gas Flare	6″ Sch 80 - 1980 psi
Vent	4″ Sch 80 – To Atmosphere
Water	3″ Sch 80 – 525 psi
Spare	3″ Sch 80 – To Atmosphere
Air	3″ Sch 80 – 150 psi
Gas Relief	6″ Sch 80 – 1980 psi

*Meets requirements of NACE MR-01-75

NOTE: Other sizes, configurations, and pressure ratings are available to meet most applications. These ratings are guidelines only. For more information, consult your local Halliburton representative.

In the past we have had 90 ft burner booms manufactured locally from COLD TEMPERATURE rated materials. These booms were modified to accept 6″ gas flare and relief lines, 4″ oil and air line and then certified by DnV. Previous booms were designed with windstay cables and

sheaves to allow +15% movement during flaring for optimal performance in varying wind conditions. This type of boom has been installed and used with excellent results on the Henry Goodrich since Jan 2000 and on Exxon Mobil in Oct. 2003.

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*).

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 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 odour 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.