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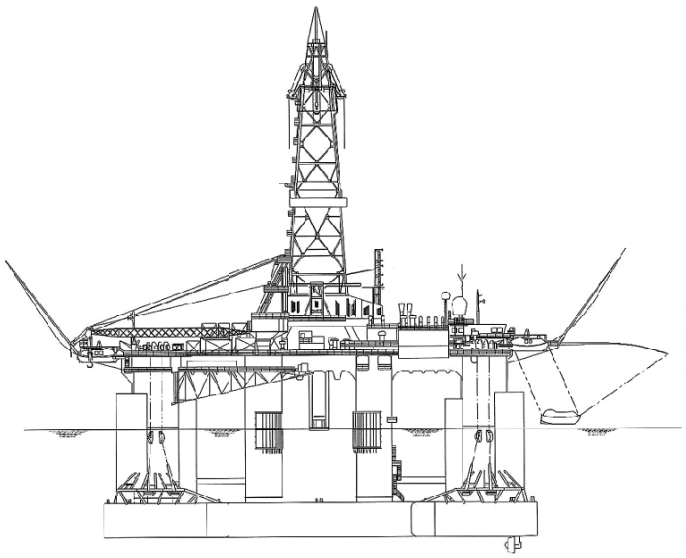
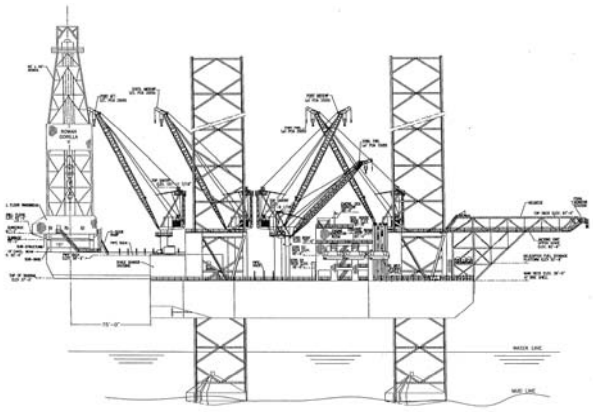
Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment Update





Husky Oil

Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area

Environmental Assessment Update

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1.0 Introduction

This document is an update to the Environmental Assessment (LGL 2005a) of the three-year (2005-2007) delineation/exploration drilling program in the Jeanne d'Arc Basin Area on behalf of Husky Energy. New and relevant data and information to the drilling program and to the environmental assessment of the drilling program are presented in this update. The focus of this update is the 2006 and beyond portions of the program. Responses to agency comments on the Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment (hereafter referred to as the Husky EA) (LGL 2005a) are also included in this update. Cross references to specific agency comments on the original EA are imbedded (in a text box) within the relevant sections and subsections. Full comments and Husky responses are contained in Appendix 1.

Husky Energy is proposing the addition of three more years to the original three-year (2005-2007) delineation/exploration drilling program involving several possible sites on the Grand Banks within the four exploration licenses (ELs) 1044 (Trepassey), 1045 (N. Amethyst), 1090 (Glenwood), and 1091 (Golconda), and the significant discovery areas (SDAs) White Rose and Trave (Figures 1.1 and 1.2). The drilling sites proposed for 2006 are all located within White Rose SDA (Figure 1.3), approximately 340 km southeast of St. John's. The water depth at each location is approximately 120 m. The proposed 2006 program will likely involve the drilling of four to six wells, and is scheduled to start in April 2006, depending on rig availability and regulatory approval. Geotechnical drilling, vertical seismic profiling (VSP) and geohazard surveying are also considered through to 2010 in this update.

EC Comment #1: Maximum number of potential wells (SEE APPENDIX 1)
EC Comment #2: Correct labeling on Figure 1.1

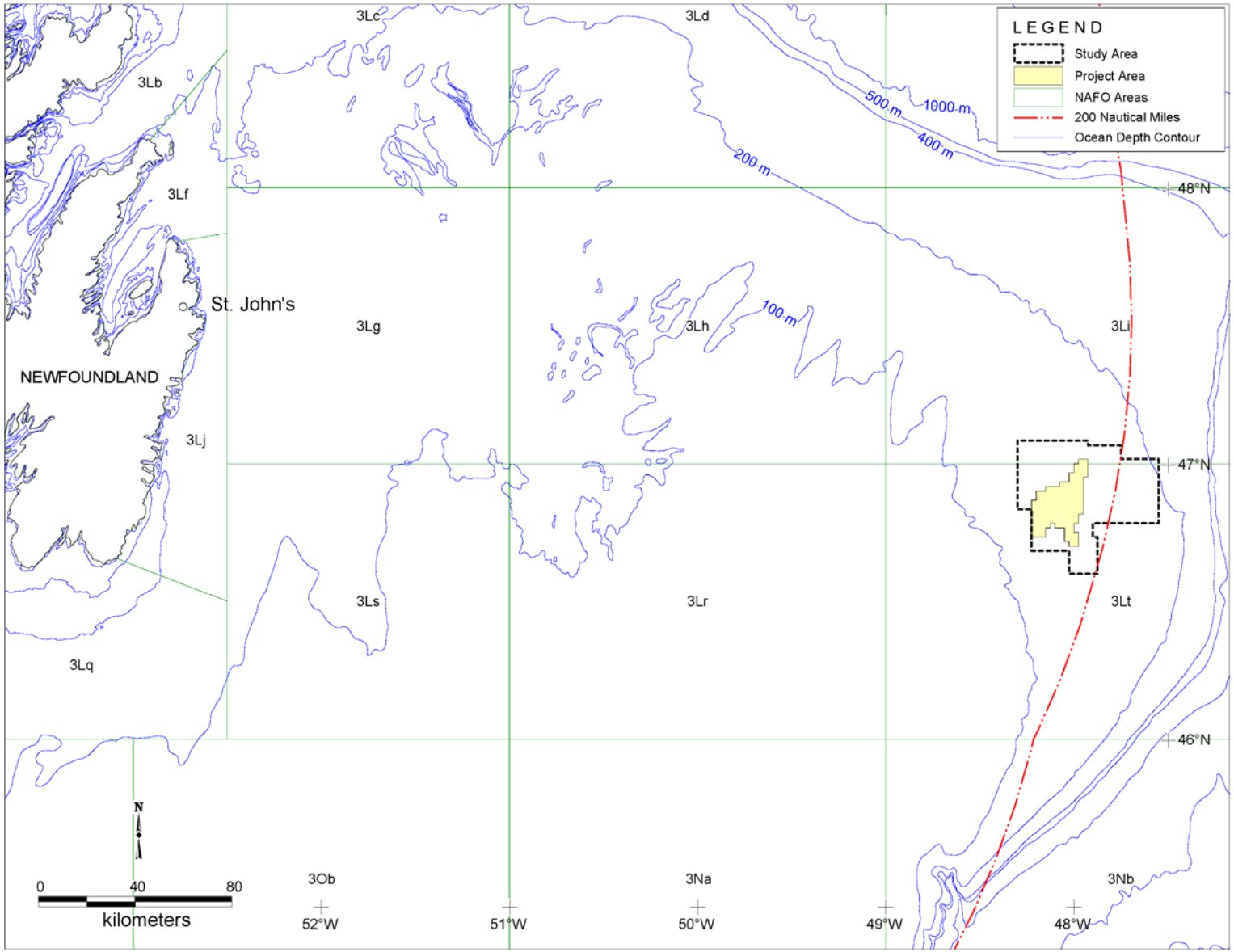

Figure 1.1. Locations of Project Area and Study Area.

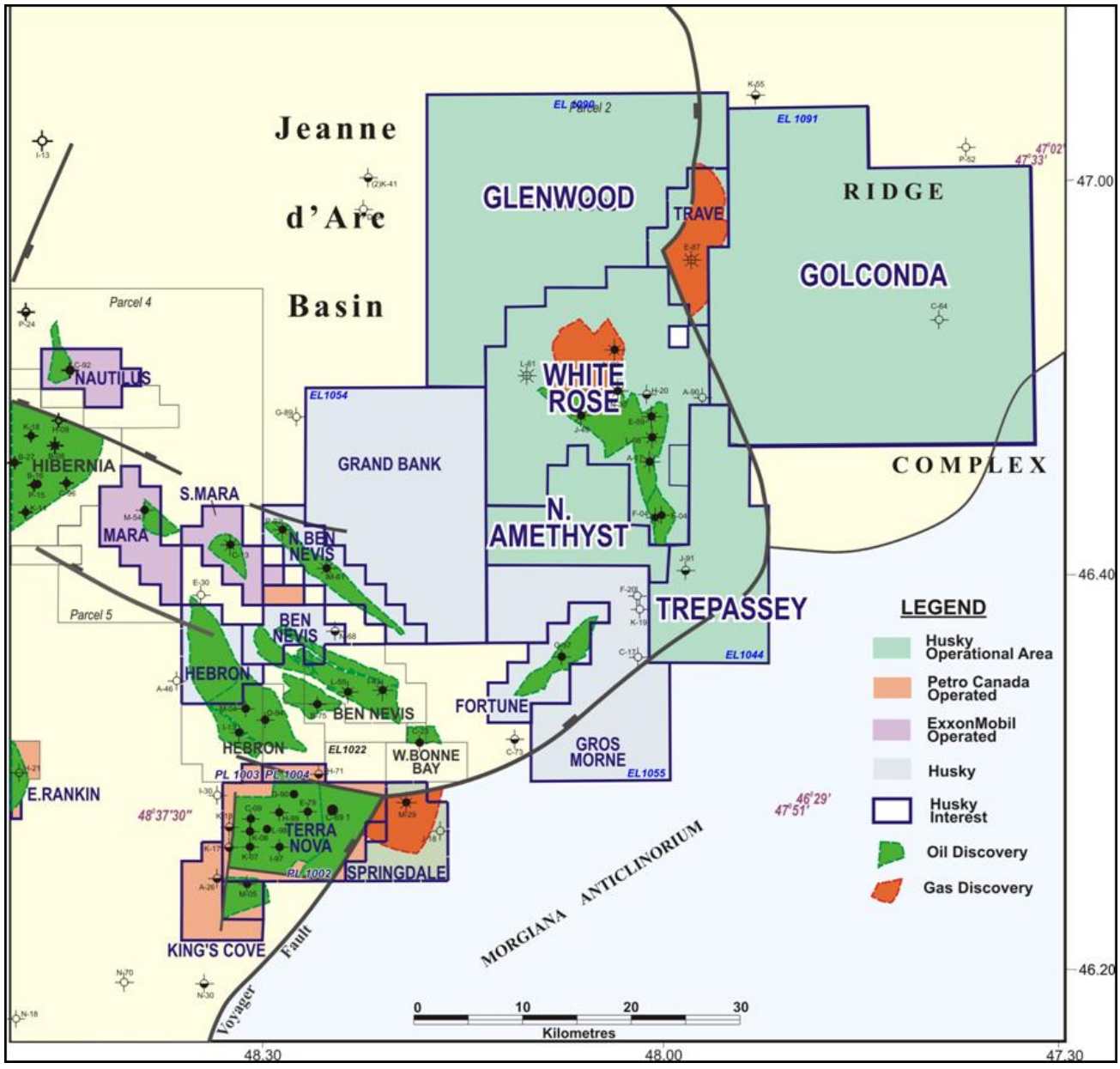

Figure 1.2. Husky ELs and SDAs that Comprise the Project and Study Areas.

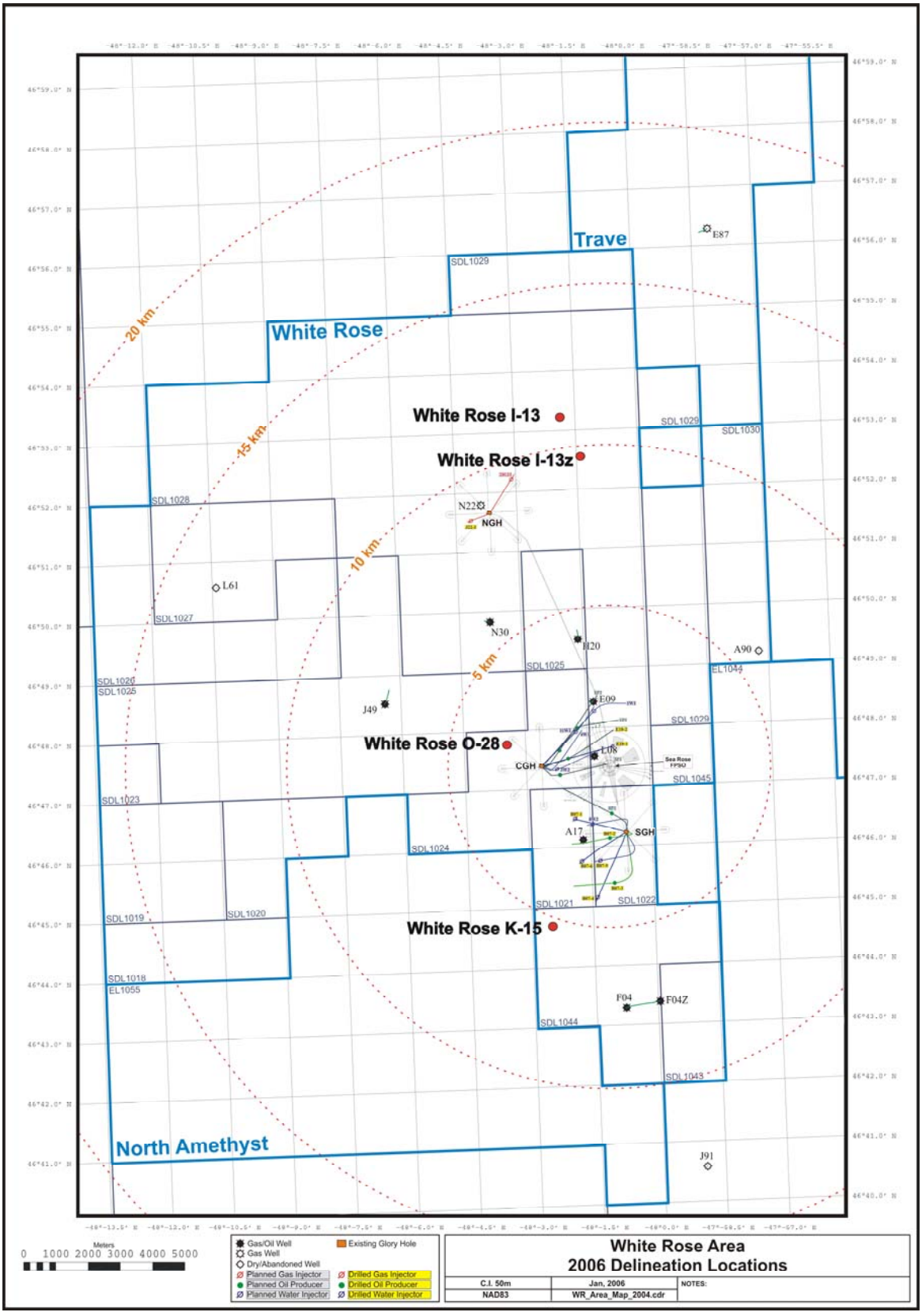

Figure 1.3. Locations of Four White Rose SDA Delineation Wells Proposed for 2006.

2.0 The Operator

Headquartered in Calgary, Alberta, Husky Energy (hereafter referred to as Husky) is a Canadian-based integrated energy company serving global customers, committed to maximizing returns to its shareholders in an ethical and socially responsible way, through the dedicated effort of its people. It is involved in:

- Exploration and development of crude oil and natural gas,
- Production, purchase, transportation, refining and marketing of crude oil, natural gas and natural gas liquids and sulfur, and
- Transportation and marketing of refined products.

The Operator is the management and operating company for the Operator's seven Significant Discovery Areas (SDAs) and nine Exploration Licenses, offshore Newfoundland. The White Rose field, the largest of the Operator's SDAs, is estimated to contain approximately 230 million barrels of recoverable reserves.

2.1. Operator Contacts

Operator Contacts concerning this application are:

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2.2. Operator Objectives

The long-term goals of the Operator are to:

- Execute a cost-effective program, while maintaining health, safety and environmental responsibilities and meeting all due diligence requirements;
- Minimize and phase capital expenditure;
- Re-establish and maintain cost-effective relationships with suppliers and contractors, creating long-term mutual benefits and a local infrastructure;
- Effectively conduct core business activities;
- Optimize synergy opportunities with other operators in the area; and
- Conduct operations with a moderate, cost effective, risk profile.

East Coast drilling operations are managed from the local offices of the Operator and supported using the established logistics infrastructure and resources in St. John's, Newfoundland.

3.0 Project Description

During 2006 to 2010, Husky plans to evaluate approximately fifteen oil and gas targets with a combination of vertical and deviated (twin) wells in Jeanne d'Arc Basin (Figures 3.1 and 3.2). These fifteen wells could be drilled anywhere within the defined Study Area. Only one of the two wells proposed for the 2005 portion of the program was drilled in 2005. Husky plans to drill four to six wells in 2006 (see Figure 1.3 for the locations of four potential wells). Geotechnical drilling, VSP and geohazard surveying will be conducted as required.

The Operator's drilling contractor will maintain a marine shore base in the St. John's area during the 2006-2010 drilling campaign. The re-supply of drilling equipment and materials will be performed from this location. The transport of personnel to and from St. John's and the Operating Area will be conducted mainly by helicopter, but in isolated situations, supply boats may be used. The Operating Area as defined in the Husky EA (LGL 2005a) encompasses all of the Operator's land holdings in offshore Newfoundland that are being considered in this program with the exception of contingency locations for safe standby locations for the jack up rig should weather conditions require. The general location(s) for these standby areas are described in this update. For the remainder of this document, the Operating Area will be known as the Study Area. No new shore-based facilities will be constructed for this operation.

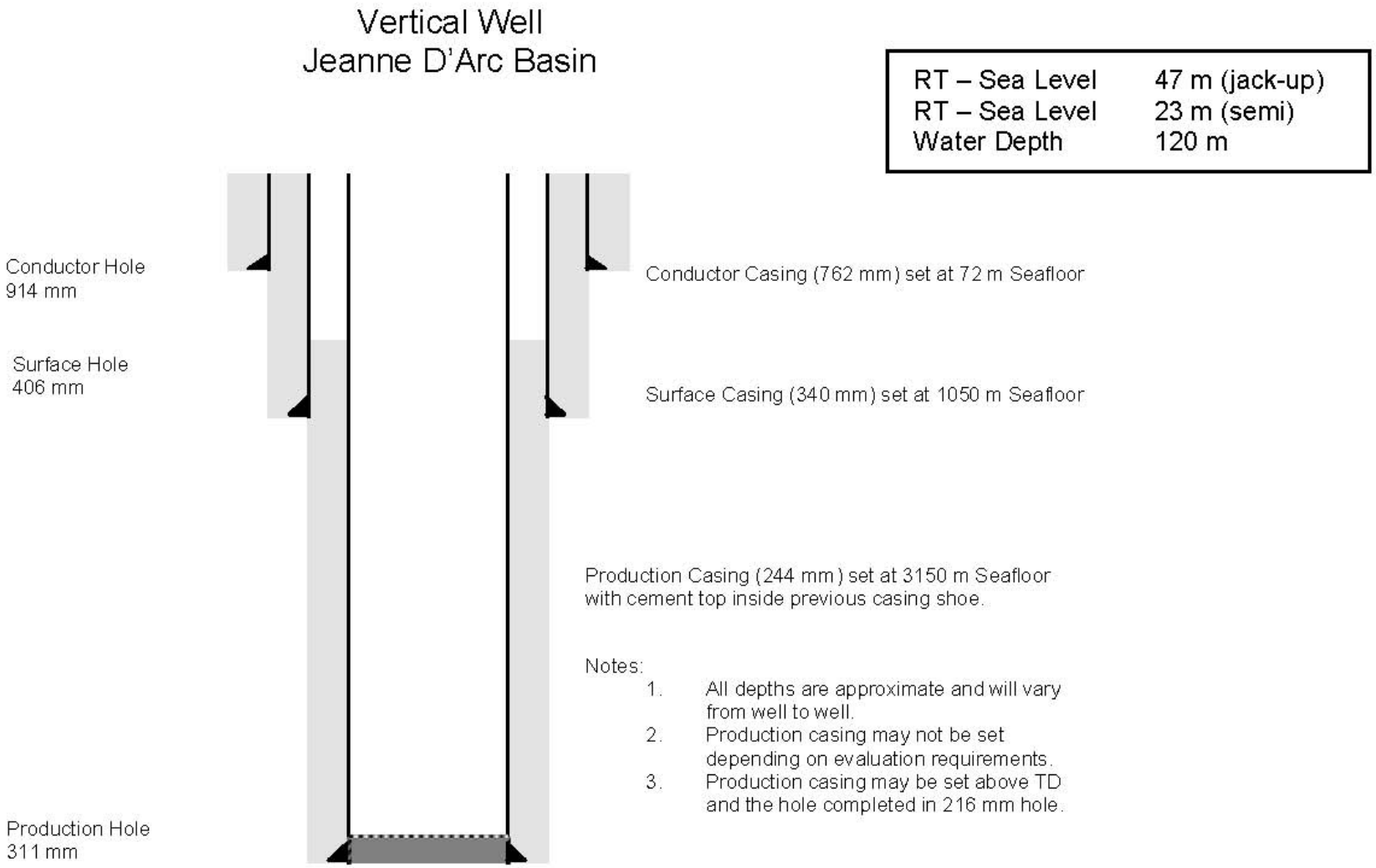
Consistent with the legislative requirements of the *Canada Newfoundland Atlantic Accord Implementation Acts*, Husky Energy is committed to enhancing the business opportunities for Canada and Newfoundland as outlined in the Company's Canada-Newfoundland and Labrador Benefits G/L outlined in the Benefits Plan. Consequently, Husky will utilize the services of Newfoundland and other Canadian companies and personnel wherever possible.

3.1. Name and Location of Proposed Project

The official name of the Project is the Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area. It is located on the northeastern Grand Banks (Figure 1.1). All proposed wells are within 40 km of previous exploratory drilling in the area and are encompassed within SDAs White Rose and Trave, and ELs 1044, 1045, 1090 and 1091 (Figures 1.2 and 1.3).

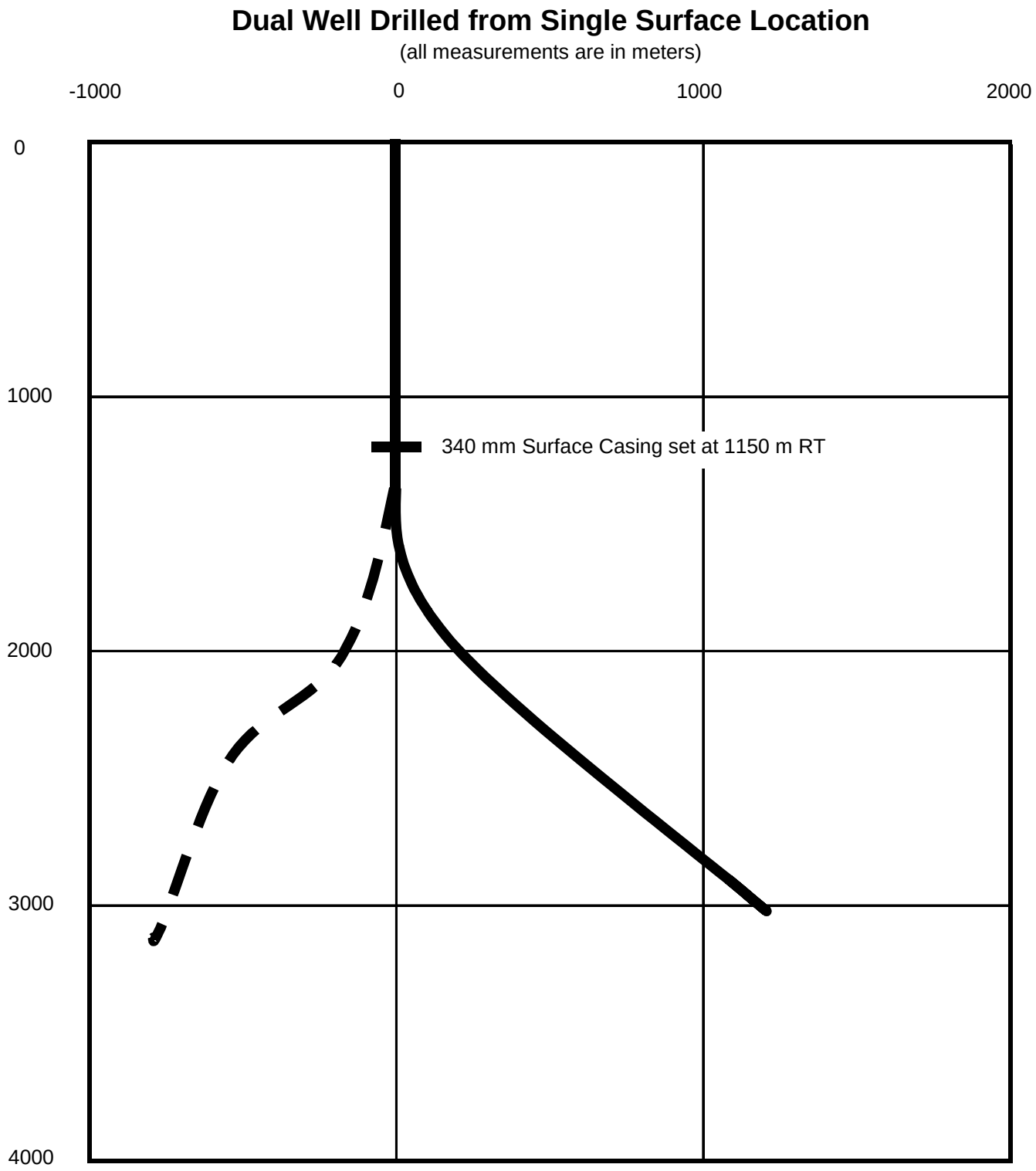
3.2. Alternatives to Project/Alternative Means within Project

The alternative to the Project is to not drill any wells in these locations but to seek oil and gas elsewhere in order to satisfy market demand. However, Husky has been awarded rights to explore in these areas through a regulated competitive bidding process and is now seeking to fulfill its regulatory commitments made as part of this process.



[Note: RT = rotary table]

Figure 3.1. Schematic of a Typical Straight (Vertical) Well Scenario (15 m RT-Sea Level for Drillship).



[Note: RT = rotary table]

Figure 3.2. Schematic of a Twin Well Scenario.

Alternative means evaluated within the Project in the Husky EA (LGL 2005a) included the use of a semi-submersible vs. a jack-up. This update also includes the additional consideration of the use of a drillship. Within the oil and gas industry, all these rig types are all considered MODU or mobile offshore drilling units because they move under their own power and/or can be towed between locations. While there are some differences between rig types, their overall environmental "footprints" and emissions are similar. The rig types were selected because they provided the best of the following:

1. technological solution given environmental conditions likely to be encountered,
2. scheduling given availability of other suitable vessel types, and
3. economics compared to other qualified vessels.

The rigs will be selected through a competitive bidding process to maximize synergy with other projects. Another alternative within the Project is the use of vertical wells (i.e., one well per one hole) vs. dual side-track wells where there are two wells drilled per one hole (see Figure 3.2). Alternatives are discussed further in following sections.

EC Comment #3: Consideration of pollution prevention
EC Comment #4: Consideration of conservation

3.3. Personnel

The overall project will be managed by Husky's Vice President East Coast Operations located in St. John's. The Vice President East Coast Operations has the authority and responsibility to effectively manage the overall operational aspects of the project on an ongoing basis. Day-to-day drilling operations will be directed by the Husky Oil Drilling and Completions Manager. In addition, the shore-based drilling operations management team includes the Sr. Drilling Engineer, Senior Completions and Testing Engineer, Logistics Manager, Administration Manager, HSEQ Manager and the Public Affairs Manager. Offshore, the Management team consists of the Sr. Drilling Supervisor (Husky's offshore representative), the designated Offshore Installation Managers, and Supply Vessel Masters.

3.4. Mobile Offshore Drilling Units

Two types of MODU or moveable drilling rigs were assessed in the Husky EA (LGL 2005a): (1) semi-submersible, and (2) jack-up. The primary difference between the two types is that the semi-submersible floats and is anchored to the bottom with eight or more anchors whereas the jack-up sits on legs on the bottom. Drilling and abandonment procedures and emissions are similar. More details on the two types of MODU are available in the Husky EA (LGL 2005a). Drillships will also be evaluated in this update as an alternate means of drilling wells.

3.4.1. Drillship

Brief descriptions of two drillships are provided below.

The *Neptune Explorer* is a typical moored, ice classed, self-propelled drillship (Figure 3.3). Its length, beam, and maximum draft are 149.3 m, 23.8 m, and 7.5 m respectively. It typically operates in water depths ranging from 30 to 230 m, and is capable of drilling to a depth of 6,100 m.

The *Deepwater Millenium* is a Samsung/Reading & Bates designed dynamically positioned drillship capable of drilling in water depths up to 2,470 m (upgradable to 3,050 m). Its operating conditions include maximum wave heights of 15 m and maximum wind speeds of 75 knots. Its length, beam, and operating draft are 221 m, 42 m, and 13 m respectively.

Figure 3.3. Drillship *Neptune Explorer.*

3.5. Logistic Support

3.5.1. Marine Support Vessels

Anchor Handling Tug Supply (AHTS) and Supply/Standby vessels will be Canadian-flagged and Canadian-crewed and will be managed from the Contractor's office in St. John's, Newfoundland. Letters of Compliance for each chartered standby vessel will be in place prior to Work commencing.

3.5.2. Helicopter Support

Cougar Helicopters Inc. (CHI) have been contracted to provide helicopter support for the Project and will have a dedicated AS-332L Super Puma for Husky based in St. John's to service the Company's requirements. Cougar Helicopter Inc. will also provide all auxiliary flight services including First Response Equipment and technicians, alternate landing site at Long Pond complete with weather station, aviation fuel, helicopter passenger transportation suits and an aircraft maintenance and passenger loading terminal located at the St. John's Airport. Flight-following service will be contracted by Cougar Helicopters Inc. from Avflow Aviation Services.

3.5.3. Shorebase Facilities

The Project will be managed and operational decisions will continue to be made from Husky's existing Regional Office in St. John's at Suite 801, 235 Water Street. A. Harvey and Company Ltd. will provide dock facilities to support Project activity. The existing facilities are capable of servicing multiple operations with the existing infrastructure including office space, crane support, bulk storage and consumable (fuel, water) storage and delivery capability. The existing infrastructure and activity at the Harvey's facility enables the industry to optimize the utilization of supply vessels and other logistic assets. Warehouse facilities will be provided by Project contractors as required and will consist primarily of storage for tubular goods, and the equipment belonging to the drill rig which can be stored onshore.

Operation and co-ordination service of all aeronautical and marine voice and data communication services will be provided from a central facility (contract being finalized) in St. John's. The primary communications link between the drill rig and the Project Operations office in St. John's will be via a dedicated C-Band satellite service. Independent backup communications systems will be provided by high quality HF radio service, available through the coastal radio station. Details on communications systems are outlined in the East Coast Incident Coordination Plan (EC-M-99-X-PR-00003-Plan 001).

DFO Comment #1: Disposal of SBM and produced water

3.6. Information on Consultations

As part of the White Rose Development Plan Application which included an assessment of development activities such as well drilling, Husky conducted very extensive consultations with numerous organizations. These included federal agencies, particularly Fisheries and Oceans Canada and Environment Canada; provincial departments such as Environment and Labour, and Fisheries, Food and Aquaculture; municipal governments including St. John's, Clarenville and Marystown; special interest groups including the Natural History Society; and the general public at various locations. A detailed list of meetings, totaling well over 100 is contained in the report entitled "White Rose Oilfield Development Public Consultation Report" and summarized in the Comprehensive Study Report. The White Rose Development Plan Application also went through a series of Commission hearings that were open to the public.

In addition, Husky briefed the following parties on the nature of the Jeanne d'Arc Basin exploratory drilling project, including a description of proposed activities, locations and timing.

- Transport Canada (23 April 2002)
- C-NOPB (12 April 2002)
- Transport Canada, C-NOPB, Det Norse Veritas (7 May 2002)
- Environment Canada (May 2002)
- Fisheries & Oceans Canada (May 2002)

For the proposed 2006-2010 portion of the program, the following organizations were contacted by Canning and Pitt Associates, Inc. and Husky during the preparation of the EA update. The purpose of these consultations was to describe the planned 2006 program, to identify any new issues and concerns and to gather additional information relevant to the EA report update.

- Fisheries and Oceans
- Environment Canada
- Natural History Society
- One Ocean
- Fish, Food and Allied Workers Union
- Association of Seafood Producers
- Fishery Products International
- Groundfish Enterprise Allocation Council
- Clearwater Seafoods Limited Partnership
- Icewater Harvesting

Husky Energy and its consultants met with DFO managers, FPI managers and with representatives of One Ocean and the Fish, Food and Allied Workers Union (FFAWU). At each meeting, Husky Energy provided more details on the proposed 2006 drilling operations as well as maps showing the location of 2004 fish harvesting activities in each month of that year. (Meetings with Environment Canada managers and representatives of the Natural History Society have been scheduled for the week of 27 February.) Husky regularly initiates and is open to discussion with any of these organizations on an ongoing basis. Appendix 2 provides a list of agency and industry officials consulted to date.

None of the agencies, interest groups or fisheries industry officials contacted raised any major concerns or issues about the planned 2006 drilling activities. FPI representatives noted that their 2006 fish harvesting activities would not be in the vicinity of proposed drilling operations. Company vessels will be fishing yellowtail in 3Lr and 3Nc, both of which are well to the south of the Husky Study Area. The firm's turbot fishing activities to the north (in the Orphan Basin area) will be completed by April. FPI will be undertaking some industry surveys (northern shrimp, 3PS cod) in 2006, but none of these would be near the planned drilling operations. (The 3PS cod survey will likely take place in the period November-early December 2006, but the Unit 2 redfish survey will not be conducted this year.) The Association of Seafood Producers was invited to attend the FPI meeting but was unable to do so because of its busy schedule. However the Association's Executive Director indicated that his organization did not have any concerns or issues with the proposed drilling operations.

One Ocean and FFAWU representatives did not have any major concerns about the proposed drilling operations. Officials of both agencies indicated that it would be useful if the fisheries maps could indicate the Nova Scotia catch data separately from the Newfoundland data. They also noted that, for future consultations, they would like to receive the fisheries maps as soon as they are prepared for any EA report. There was also some discussion that these fisheries maps might need to be "ground-truthed" with relevant fishers. FFAWU biologists noted that the FFAWU and relevant fishers are involved in an industry survey for crab in various offshore harvesting locations. This 24 hour survey typically occurs in September.

As noted, meetings have been scheduled with managers of Environment Canada, and with representatives of the Natural History Society. To date, other fisheries industry managers contacted for these consultations have not yet responded.

3.7. Project Components/Structures/Activities

For some wells, the proposed drill rig will be a semi-submersible, which is typically moored using an eight point anchoring system (e.g., Stevin NK3 anchors). For other wells, the drill rig may be a jack-up which does not require anchors. A third option for rig-type is a drillship. Both moored and dynamically positioned drillships are available. Moored drillships have smaller operational windows than dynamically positioned ones which are capable of year-round operation. The rig will be supplied and

supported by two or three supply boats operating from Harvey's wharf in St. John's Harbour. The supply boats (anchor-handling) will have a range of 12-15,000 HP and be capable of storing and delivering drilling fluids and diesel fuel. On average there will be two supply boat trips per week between the base and the rig. Helicopter support may consist of about six trips per week ferrying personnel and light supplies and equipment.

The expected or typical conductor setting depth will be 215 m (measured depth from the rotary table or MD). The expected or typical surface casing depth will be up to about 1,200 m (MD) (see Figure 3.1). Final total well depths will range up to 3,550 m MD (Tables 3.1 and 3.2).

Well abandonment procedures will consist of the removal of any wellhead and associated equipment. Offshore wells are abandoned in two stages. During the first stage, the wellbore is isolated using mechanical and cement plugs in accordance with existing regulations. During the second stage the wellhead and any associated equipment items are removed from the seabed. Removal of the wellhead will routinely involve the use of mechanical cutters. In some circumstances, however, subsurface cutting using shaped charges may be required.

DFO Comment #2: Use of shaped charges for subsurface cutting

3.7.1. Project Phases

For the purposes of this update, the project is considered to consist of two phases: (1) drilling of delineation/exploration wells, inclusive of routine activities such as vertical seismic profiling (VSP), geohazard surveys, geotechnical drilling and testing, and (2) abandonment.

3.7.2. Project Scheduling

During 2006, drilling will commence in April and last about 40 days per well. Testing, if conducted, can be expected to take about 20 days per well. In general, the scheduling window for drilling will be between 1 April and 31 December in 2006 and year-round for 2007 to 2010. Execution and scheduling of subsequent wells will largely be dependent on exploration success encountered by the initial wells. All wells will be suspended or abandoned and the drilling program terminated by the end of 2010.

Table 3.1. Vertical Well Mud Scenarios.

	Unit	Casing Strings			Totals (1 Vertical Well)	Totals (10 Vertical Wells)	Notes
		Conductor	Surface	Main			
Hole Section	millimeters	914	406	311			1. RT to seafloor is assumed to be 143-m. This will vary depending on the MODU selected. Cuttings volumes are independent of this measurement. 2. Vertical wells can be drilled efficiently to total depth with WBM (water-based mud).
Mud System		Gel / Seawater	Gel / Seawater	WBM			
Depth (see Note 1)	meters RT	215	1200	3300			
Gauge Open Hole Volume	m^3	47.2	127.5	159.5			
Washout	%	50.0%	25.0%	10.0%			
Products							
Barite	MT (metric ton)	30	60	220	310	3100	
Bentonite (gel)	MT	20	70		90	900	
Biocide	L (litre)			400	400	4000	
Caustic Soda	kg			1125	1125	11250	
Corrosion Inhibitor	L			200	200	2000	
Defoamer	L	20	40	200	260	2600	
Drilling Detergent	L		100	300	400	4000	
Fluid Loss Reducer (Starch)	kg (kilogram)			1021	1021	10210	
Fluid Loss Reducer (PAC)	kg			1816	1816	18160	
Kelzan XCD (Viscosifier)	kg			3000	3000	30000	
Lime	kg	200	400		600	6000	
PEG (Glycol Inhibitor)	L			31200	31200	312000	
PHPA (Inhibitor)	kg			3632	3632	36320	
Potassium Chloride (Inhibitor)	kg			75000	75000	750000	
Oxygen Scavenger	L			1135	1135	11350	
SAPP	kg		454		454	4540	
Soda Ash	kg	200	375	1250	1825	18250	
Drilled Cuttings Weight	MT	184	414	456	1055	10549	
Cuttings Volume	m^3	71	159	175	406	4057	

Table 3.2. Deviated Twin Wells.

	Unit	Casing Strings				Totals (1 Twin Well)	Totals (5 Twin Wells)	Notes
		Conductor	Surface	Main	SideTrack			
Hole Section	millimeters	914	406	311	311			1. RT to seafloor is assumed to be 143-m. This will vary depending on the MODU selected. Cuttings volumes are independent of this measurement. 2. Deviated wells require SBM (synthetic based mud) in the 311-mm section for efficient drilling and reduced well bore rugosity. A smooth, in-gauge wellbore improves the quality of wireline logs.
Mud System		Gel / Seawater	Gel / Seawater	SBM	SBM			
Depth	meters RT	215	1150	3200	3550			
Gauge Open Hole Volume	m^3	47.2	121.0	155.7	182.3			
Washout	%	50.0%	25.0%	5.0%	5.0%			
Products								
Barite	MT (metric ton)	30	60	346	405	841	4205	
Bentonite	MT	20	70			90	450	
Calcium Chloride	kg			10865	12720	23585	117925	
Defoamer (WBM)	L (litre)	20	40			60	300	
Drilling Detergent	L		100			100	500	
Emulsifiers (Primary & Secondary)	L			2050	2400	4450	22250	
Fluid Loss Reducers (SBM - HTHP)	kg (kilogram)			2255	2640	4895	24475	
Kelzan XCD	kg			100	100	200	1000	
Lime	kg	200	400	1845	2160	4605	23025	
PureDrill IA-35 / IA-35LV	m^3			99	116	216	1079	
SAPP	kg		454			454	2270	
Soda Ash	kg	200	375			575	2875	
Viscosifier (SBM - Organophillic clay)	kg			2255	2640	4895	24475	
Wetting Agent (SBM)	L			1435	1680	3115	15575	
Drilled Cuttings Weight	MT	184	393	425	498	1500	7502	
Cuttings Volume	m^3	71	151	164	191	577	2886	

3.7.3. Site Plans

Four of the proposed well site locations for 2006 are presented in Figure 1.3. Conductor casing and abandoned well are shown in Figures 3.1 and 3.4, respectively. Note that a well head will only be left in place in the event of an unscheduled well suspension. Otherwise the well will be abandoned at least one meter below the sea floor as shown in Figure 3.4.

DFO Comment #3: Well site locations

3.7.4. Description of Waste Discharges and Air Emissions and Treatment

Waste discharges will include drill muds and cuttings, produced water, grey and black water, ballast water, bilge water, deck drainage, discharges from machinery spaces, cement, blowout preventer (BOP) fluid (not released when using a jack-up rig), and air emissions. All discharges will be in compliance with the Offshore Waste Treatment Guidelines (*OWTG*). Details are provided in the following sections.

EC Comment #5: Air emissions

3.7.5. Drilling Muds

It is planned that most of the wells will be drilled to depth using non-toxic water-based muds (WBM). However, some conditions or situations may be encountered that would potentially require the use of synthetic-based muds (SBM) and thus this assessment also considers SBM.

Components and additives typically differ somewhat by well, the specific conditions encountered in drilling, and by the depth and purpose for drilling. Typical formulations for water based drilling mud and the quantities likely to be used when drilling a vertical well hole for the surface and intermediate casings, and the conductor are provided in Tables 3.1 and 3.2.

The first part of the hole (i.e., the surface casing and conductor) is drilled without the riser in place and thus the drilling mud and associated cuttings are discharged directly to the marine environment. Approximately 230 m^3 of cuttings will be discharged per well during this stage of the drilling (see Table 3.1).

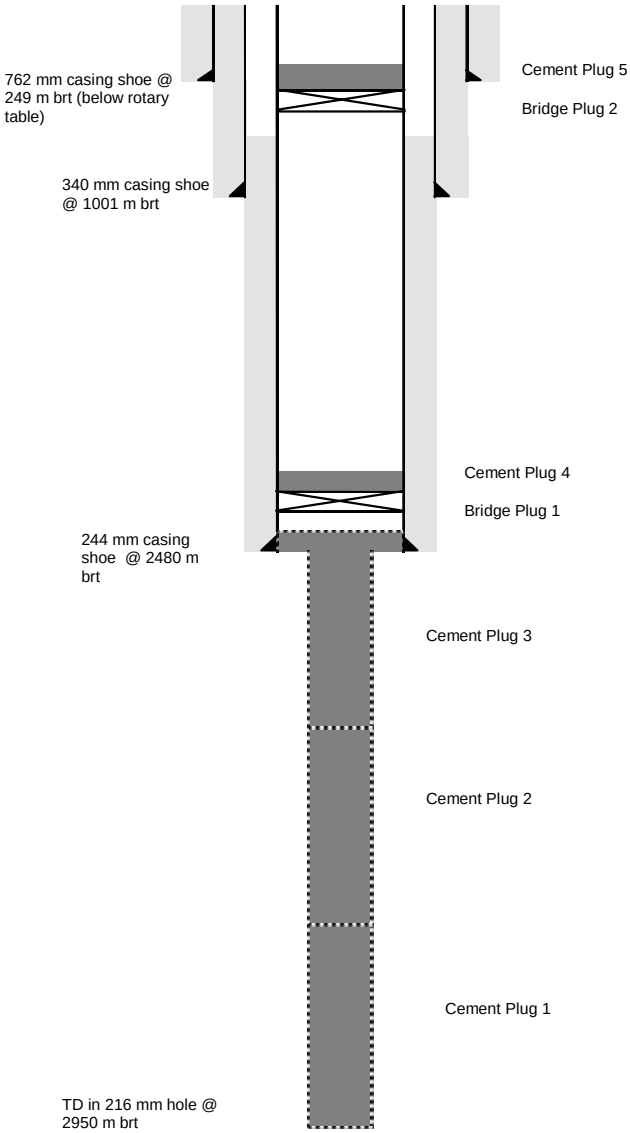


Figure 3.4. Schematic of a Typical Vertical Well Abandonment (Cape Race N-68) (well head and casings cut about 1 m below sea floor).

During the drilling of the hole for the intermediate casing, the riser and associated BOP are in place and mud is transported back to the rig. Cuttings are then removed from the drilling mud in successive separation stages through shakers, hydrocyclones, and centrifuges. After passing through the solids control system (Table 3.3), the cleaned cuttings are then discharged overboard through a cuttings shute. The recovered mud is then reconditioned and reused. Up to 175 m^3 of cleaned cuttings could be discharged during the installation of the intermediate casing (Table 3.1). If it becomes necessary to switch over to SBMs, then there would also be a bulk discharge of the WBM associated with this activity. All discharges of mud and cuttings will be in accordance with the C-NOPB *OWTG* – August 2002 Revision.

The deviated twin well approach uses less mud and results in lower total volumes of discharged cuttings than individual vertical wells [e.g., roughly 288 m^3 vs. 406 m^3 total cuttings per well] (see Tables 3.1 and 3.2).

As discussed previously, it is anticipated that SBM will not be required to drill any anticipated simple holes. If used, SBM will be recycled and reused or brought to shore for disposal when spent. Treatment equipment is contained in Table 3.3.

All drilling fluid and solid discharges will be in accordance with the *OWTG* and subject to approval by C-NLOPB.

DFO Comment #4: Fate of WBM upon well completion

Table 3.3. Mud/Cuttings Treatment System.

Equipment	Type	Characteristics
Shale Shaker	Thule VSM 300; Derrick Flowline Cleaner 2000; or equivalent	900 gpm design flowrate or more
Desilter	Swaco; Derrick; or equivalent	16 x 4 in cones or more Minimum flowrate 800 gpm
Centrifuges	HH5500; Brandt 3400; or equivalent	160 gpm or more

Note: Enhanced cuttings cleaning equivalent to the *GSF Grand Banks* or *Rowan Gorilla VI* for SBM only.

3.7.6. Produced Water

If hydrocarbons are present and testing is conducted then small amounts of produced water may be discharged by atomizing with hydrocarbons and flared. If the flare capacity is exceeded, then small amounts of treated produced water will be brought ashore for disposal. 'Treated' produced water refers to produced water that is heated in a tank to aid in the gravity separation prior to shipment to shore.

3.7.7. Grey/Black Water

The rig will accommodate about 85-120 personnel. It will discharge about 40 m^3 of grey water per day. Black water or sewage will be macerated to 6 mm particle size or less and discharged as per the *OWTG*. Estimated amounts of black water are up to 19 m^3 per day.

3.7.8. Machinery Space Discharges

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

3.7.9. Bilge Water

Bilge water will be treated to *OWTG* standards (15 mg/L or less).

3.7.10. Deck Drainage

Any deck drainage such as the rotary table floor and machinery spaces will undergo treatment as per *OWTG*.

3.7.11. Ballast Water

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

3.7.12. Cooling Water

Top drives and drawworks on rigs are cooled by pumping water through a set of heat exchangers; the water is then discharged overboard in accordance with *OWTG*. Other equipment is cooled through a closed loop system which may use chlorine as a biocide. Water from closed systems will be tested prior to discharge and will comply with the *OWTG*. Any proposals for alternate biocides will be submitted to C-NLOPB for consideration prior to use.

3.7.13. Garbage

All trash and garbage, including organic waste from galleys, will be containerized and transported to shore for disposal in approved landfills. Combustible waste such as oil rags and paint cans will be placed in hazardous materials containers for transport to shore. The rig will have a recycling program with an estimated total garbage-recycling rate of 5-10%.

3.7.14. Miscellaneous

When drilling with semi-submersibles and drillships, BOP test fluid (glycol/water) is released at intervals (typically three pressure and three function tests per 40-day drilling). About 1.0 m^3 is released per test (Husky 2000) of which less than 50% is glycol. There is no release of BOP test fluid when drilling with jack-ups.

Excess chemicals or chemicals in damaged containers will not be discharged into the sea but returned to shore on supply boat. Any spent or excess acids will be neutralized as approved by C-NLOPB and discharged. No other substances not discussed above or covered in the *OWTG* will be discharged without prior notification and approval of the C-NLOPB.

Additional information on discharges and treatment is contained in the environmental assessment sections.

3.7.15. Geotechnical Drilling

Geotechnical drilling is a regulatory requirement of the C-NLOPB intended to evaluate substrate and seabed conditions so that jack-up rig legs can be installed in the most secure manner. Soil sampling and *in situ* testing is carried out at regular intervals to a depth of approximately 30 m below the seabed. The sampling and testing program within each borehole would consist of downhole piezocone penetration testing (PCPT) and soil sampling. The geotechnical drilling would use water based drilling mud. Activities associated with the drilling of each borehole as well as an assessment of the effects of these activities on VECs are described and discussed in the Lewis Hill/White Rose Geotechnical Investigation Environmental Assessment (LGL 2005b). All of its technical aspects as considered are directly applicable to the study area and have been considered in this update and, hence, apply to the temporal and geographic scope of this assessment. The EA concluded that there would be *no significant residual effects* from the geotechnical drilling program.

3.7.16. Seismic Survey Equipment (Geohazard and VSP Surveys)

Geohazard/well site surveys and vertical seismic profiling (VSP) using an airgun array may be conducted as part of the drilling activities. The VSP is used to assist in further defining the actual location of the drill hole with respect to the petroleum resource. The array is similar to that employed by 2-D or 3-D seismic surveys but is typically smaller and deployed in a smaller area over a shorter time period (12 to 36 hours). Well site or geohazard surveys may also deploy a small array and sonar. They are used to identify and avoid unstable areas prior to drilling. The proposed geohazard surveys associated with the delineation/exploration drilling program have been assessed under separate cover (LGL and Canning & Pitt 2005). This geohazard assessment was only constrained in terms of its temporal application. All of its technical aspects as considered are directly applicable to the study area and have been considered in this update and, hence, apply to the temporal and geographic scope of this assessment.

DFO Comment #5: VSP/wellsite survey

3.7.17. Waste Management Plan

The waste streams will be managed according to the Husky Waste Management Plan. The purpose of the Husky Waste Management Plan is to provide guidance on effectively dealing with waste from the facility and avoiding environmental pollution. The Husky Waste Management Plan has been submitted to the C-NLOPB as part of the DPA requirements. Wherever possible, waste streams will be kept independent of one another so as not to create the additional problem of expensive decontamination or separation onshore.

3.7.18. Onsite Environmental/Ice Observers

An onsite Environmental Observer will also be on board the Drilling Unit to record and report 24-hour weather, oceanographic and ice parameters. During the potential ice infested water periods, two Environmental/Ice Observers will be stationed on the Drilling Unit to assist the Drilling Operations personnel in strategic and tactical planning along with the recording and reporting the weather and oceanographic duties. As part of these duties these personnel will also assist in vessel monitoring under the Project Collision Avoidance Procedures outlined in the East Coast Incident Coordination Plan.

The environmental observers will also conduct seabird and marine mammal observations on a daily basis in accordance with established protocols.

In addition, an Oceanographic Monitoring Program will again be conducted in accordance with the C-NLOPB *Guidelines Respecting Physical Environment Programs*. The program will be the same as previous ones and include the installation of new and/or operation existing of current meters and a wave-sensing device as required.

3.7.19. Project Site Information

3.7.19.1. Environmental Features

The Project has the potential to affect air, water, plankton, fish and fish habitat, fisheries, marine birds, marine mammals, and sea turtles through emissions and discharges, both routine and accidental. There are no known special or unique areas in the Study Area. A description of the physical and biological environment of the northeastern Grand Banks and potential Project interactions and effects was included in the Husky EA (LGL 2005a). A valued ecosystem component (VEC) approach was used in the EA. VECs in the area include fish, fish habitat, commercial fisheries, seabirds, marine mammals, sea turtles, and *SARA* species. Effects on VECs including cumulative effects (within the Project and with existing and planned projects) were also assessed in the Husky EA (LGL 2005a). Focus was on sensitive species, areas and times, including *Species at Risk Act* (*SARA*) species.

3.7.19.2. Other Users

Current and past uses of the area include marine shipping, oil and gas activity, defence-related ship traffic, and commercial fisheries. Hunting of murres, waterfowl, and seals has occurred for many years further inshore from the Study Area.

There are no major sources of contamination in the Study Area although there have been several accidental spills of SBM during drilling and hydrocarbons during production. There is a continuing problem on the Grand Banks and the approaches to the Gulf of St. Lawrence in general with oily discharges from disreputable ships. Previous disturbance of the seabed may have occurred from bottom trawling or dredging activity associated with commercial fisheries.

The closest protected bird areas are Cape St. Mary's and Witless Bay which are located about 350 and 310 km, respectively, to the west of the Study Area. The "Bonavista Cod Box," a fisheries protected area, is located approximately 200 km northwest of the Study Area. The closest urban centre is St. John's, located about 300 km to the west of the Study Area.

The physical presence of the rig and supply boats affects navigable waters on the Grand Banks to a small degree. The Study Area is close to major North Atlantic shipping lanes and may receive ship traffic from fishing vessels, tankers, freighters, naval vessels, private yachts and others. The detailed physical characteristics of the waterway were provided in the Husky EA (LGL 2005a) in the section titled 'Physical Environment'.

4.0 Physical Environment

Chapter 4.0 of the Husky EA (LGL 2005a) remains relevant to this update. Agency comments on Chapter 4.0 of the EA are referred to in the appropriate sections and subsections indicated below. Any additional information, either 'response' related or otherwise, is provided in the corresponding sections and subsections.

4.1. Geochemical

Section 4.1 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #6: Sediment hydrocarbon concentrations found in EEM

4.2. Climate

Section 4.2 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #6: Dataset references
EC Comments #7-#11: Wind climate
EC Comment #12: Wave climate

4.3. Physical Oceanography

Section 4.3 of the Husky EA (LGL 2005a) remains relevant to this update.

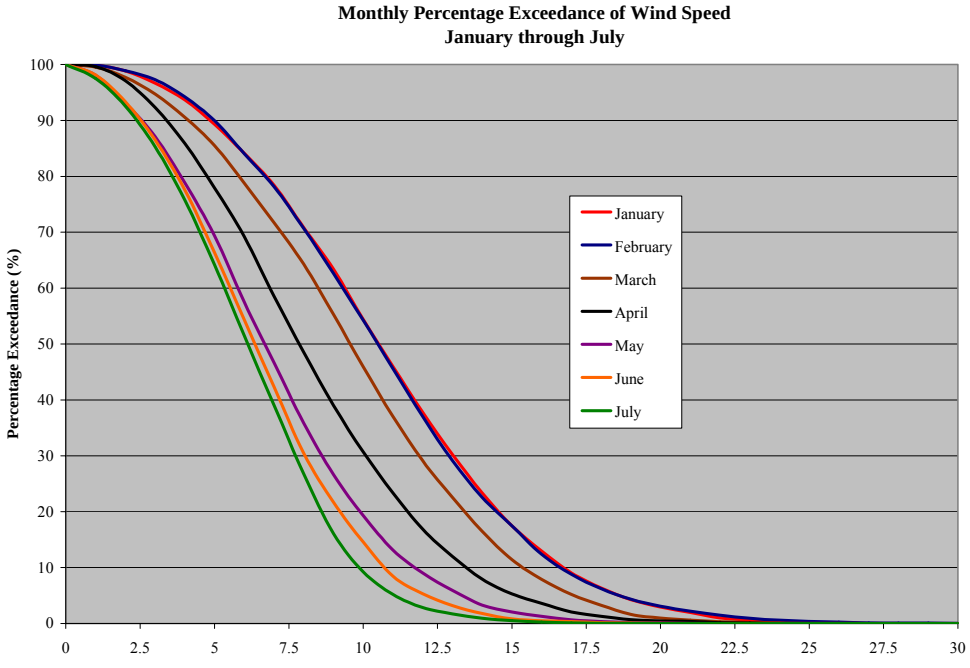
DFO Comment #7: Labrador Current water mass properties
DFO Comment #8: Water temperatures
DFO Comment #9: Collection of water property data
DFO Comments #10-#26: Currents

4.4. Extremes

Section 4.4 of the Husky EA (LGL 2005a) remains relevant to this update.

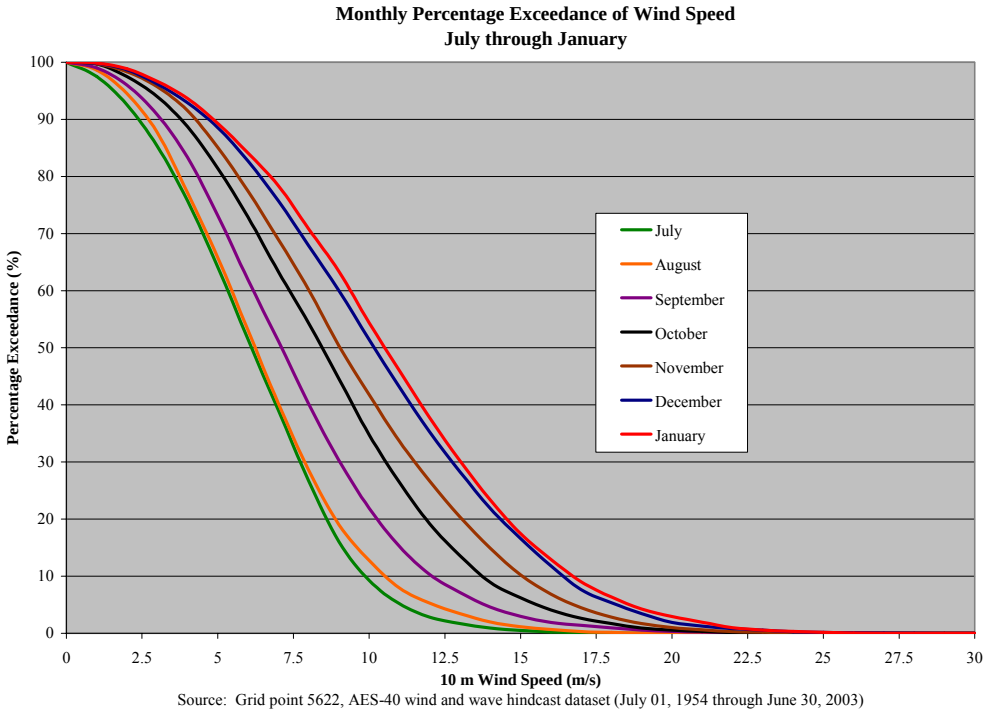
EC Comments #13-#20: Extremes

Part of Response to EC-11



Source: Grid point 5622, AES-40 wind and wave hindcast dataset (July 01, 1954 through June 30, 2003)

Figure 4.3 Monthly Percentage Exceedances of 10 m Wind Speed - January through July



Source: Grid point 5622, AES-40 wind and wave hindcast dataset (July 01, 1954 through June 30, 2003)

Figure 4.4 Monthly Percentage Exceedance of 10 m Wind Speed - July through January.

Part of Response to EC-17

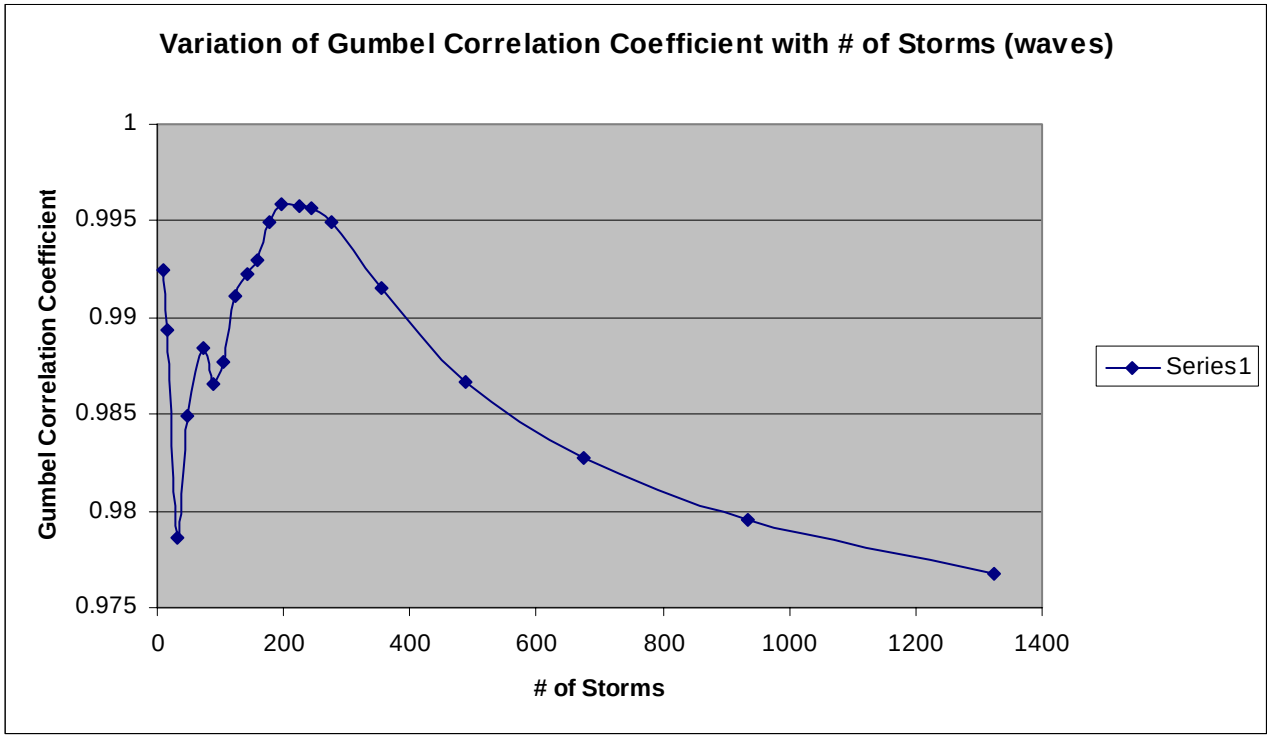


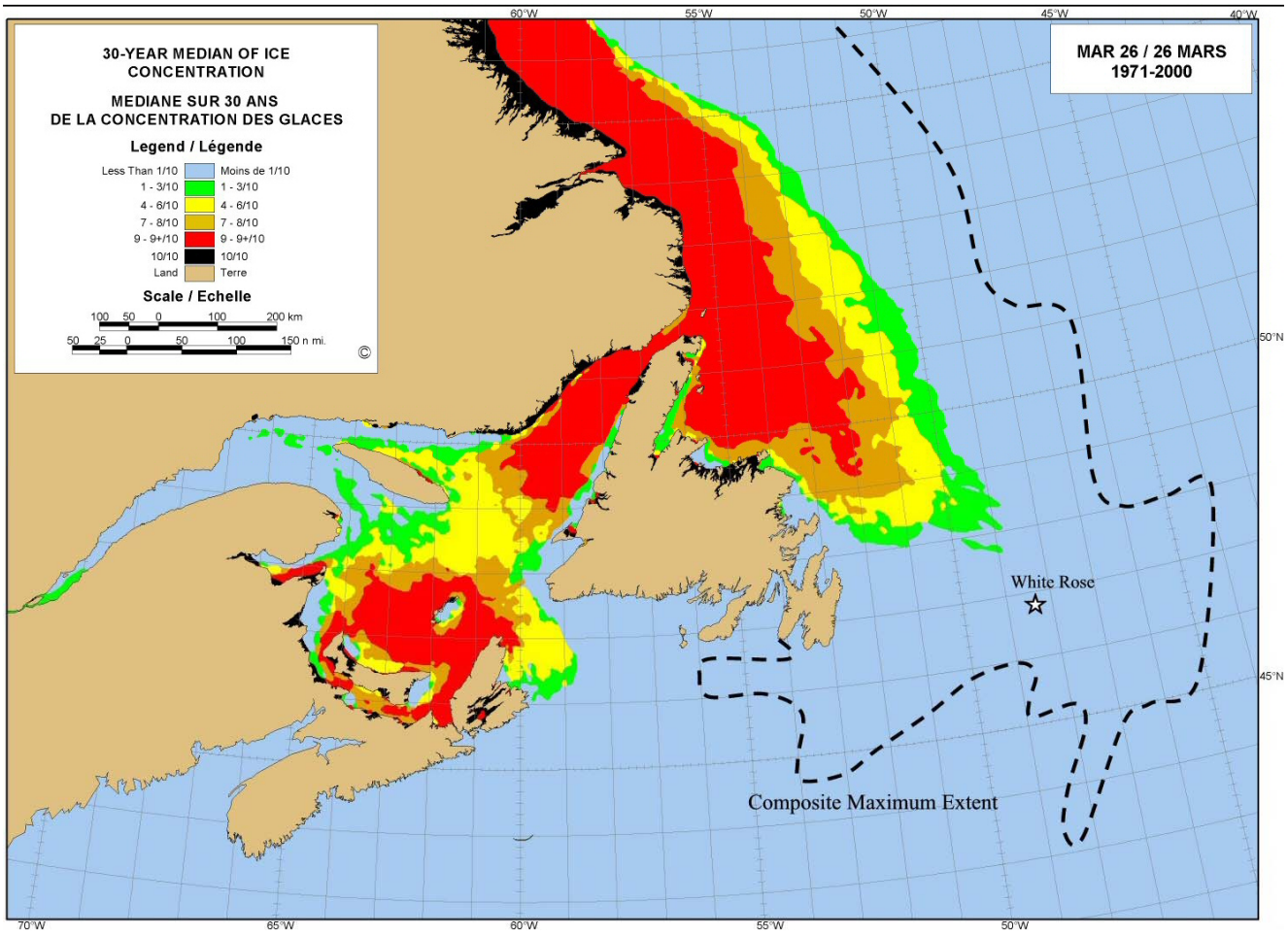
Figure 4.26 Correlation Coefficient for Significant Wave Height using a Gumbel Distribution.

4.5. Ice and Icebergs

Section 4.5 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #27: Remove references to seismic
DFO Comment #28: Consults with government oceanographers
EC Comments #21-#32: Ice and icebergs

Part of Response to EC-30



5.0 Biological Environment

Chapter 5.0 of the Husky EA (LGL 2005a) remains relevant to this update. Agency comments on Chapter 5.0 of the EA are referred to in the appropriate sections and subsections indicated below. Any additional information, either 'response' related or otherwise, is provided in the corresponding sections and subsections.

5.1. SARA Species

Section 5.1 of the Husky EA (LGL 2005a) remains relevant to this update.

Husky will apply adaptive management measures to deal with changes to Schedule 1 of *SARA*. Each year prior to commencement of the drilling season, Husky will consult with DFO and Environment Canada regarding any listing changes of Schedule 1 species, releases of Recovery Strategy Plans, and possible mitigative measures as they relate to Species at Risk.

DFO Comment #29: Porbeagle shark

5.2. Ecosystem

Section 5.2 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #30: Level of ecosystem description

5.3. Plankton

Section 5.3 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #31: Microzooplankton
DFO Comment #32: Dalley et al. 2001

5.4. Benthos

Section 5.4 of the Husky EA (LGL 2005a) remains relevant to this update.

5.5. Invertebrates and Fish

Section 5.5 of the Husky EA (LGL 2005a) remains relevant to this update.

5.6. Commercial Fisheries Update

The following updates the commercial fisheries component (Section 5.6) of the Husky Oil Exploratory Drilling Environmental Assessment (*Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment*, Husky Oil 2005). This update focuses on new information or changes since the original EA was completed.

5.6.1. Data Sources

This update is based on additional consultations (February 2006) and an analysis of 2005 DFO catch and effort data. The data, maps and analysis provided here complement those in the original EA document, extending the description of the fisheries for 2005 – 2006. The DFO catch and effort data utilized are from DFO Newfoundland and Labrador Region and DFO Maritimes Region. They were supplied in digital form by the Statistics Division (NL) and Commercial Data Division (Maritimes) in February 2006. (DFO Maritimes notes that a portion of the landings of northern shrimp, *Pandalus Borealis,* from the region are based on as yet unmatched hail data, so may not appear in the georeferenced data sets.)

5.6.2. Domestic Fisheries in 2005

The species harvested in and near the Project Area and Study Area in 2005 were very similar to those in 2004, the last year included in the 2005 EA. Table 5.1 shows the harvest from the Unit Areas that contain the project (3Lt and 3Li) for both years. As the data indicate, the harvest in these Unit Areas was mainly northern shrimp and snow crab (together, more than 99% by quantity in both years).

Table 5.1. Composition of the Domestic Harvest 2004 and 2005, UAs 3Lt and 3Li.

Species	Quantity (Tonnes)	% of Total
2004		
Atlantic cod	0.01	0.0%
Atlantic halibut	0.27	0.0%
Turbot (Greenland halibut)	0.37	0.0%
Northern shrimp	6,942.35	54.9%
Snow crab	5,704.73	45.1%
Total	12,647.73	100.0%
2005		
Atlantic cod	0.17	0.0%
Northern shrimp	8,117.53	59.6%
Snow crab	5,501.81	40.4%
Total	13,619.51	100.0%

Within the Study Area the recorded 2005 harvest was 100% snow crab, similar to previous years (2002-2004), though in 2005 there was no recorded catch in the Project Area (see Tables 5.2 and 5.3).

Table 5.2. Domestic Harvest by Species, Study Area, 2002-2005.

Species	Quantity (Tonnes)	% of Total
2002		
American plaice	0.03	0.0%
Northern shrimp	8.56	2.4%
Snow crab	353.88	97.6%
Total	362.47	100.0%
2003		
American plaice	0.32	0.0%
Snow crab	853.80	100.0%
Total	854.12	100.0%
2004		
Snow crab	771.07	100.0%
Total	771.07	100.0%
2005		
Snow crab	683.09	100.0%
Total	683.09	100.0%

Table 5.3. Domestic Harvest by Species, Project Area, 2002-2005.

Year	Species	Quantity (Tonnes)
2002	Snow crab	14.14
2003	American plaice	0.20
2004	Snow crab	13.85
2005	nil	0

5.6.2.1. Harvesting Locations

The distribution of fishing effort in 2005 was also very similar to 2004, as the following map indicates (Figure 5.1) as noted, there was no reported harvest within the Project Area (blue boundary) and little within the Study Area (green boundary) inside the 200 NMi limit.

Most of the domestic fish harvesting closest to the project (i.e. to the east, beyond 200 NMi), is concentrated between the 100 - 200 m contour.

Figures 5.2 and 5.3 show the recorded northern shrimp and snow crab domestic harvesting locations in 2005.

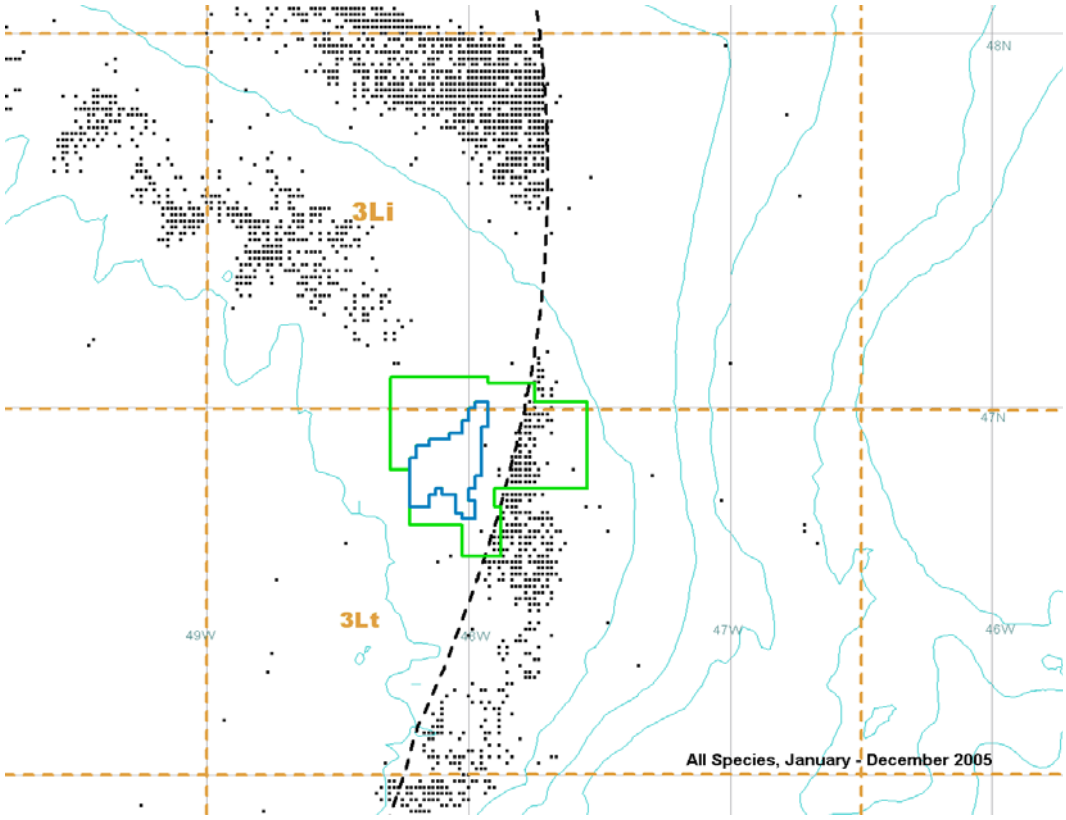


Figure 5.1. All Species Harvesting Locations 2005.

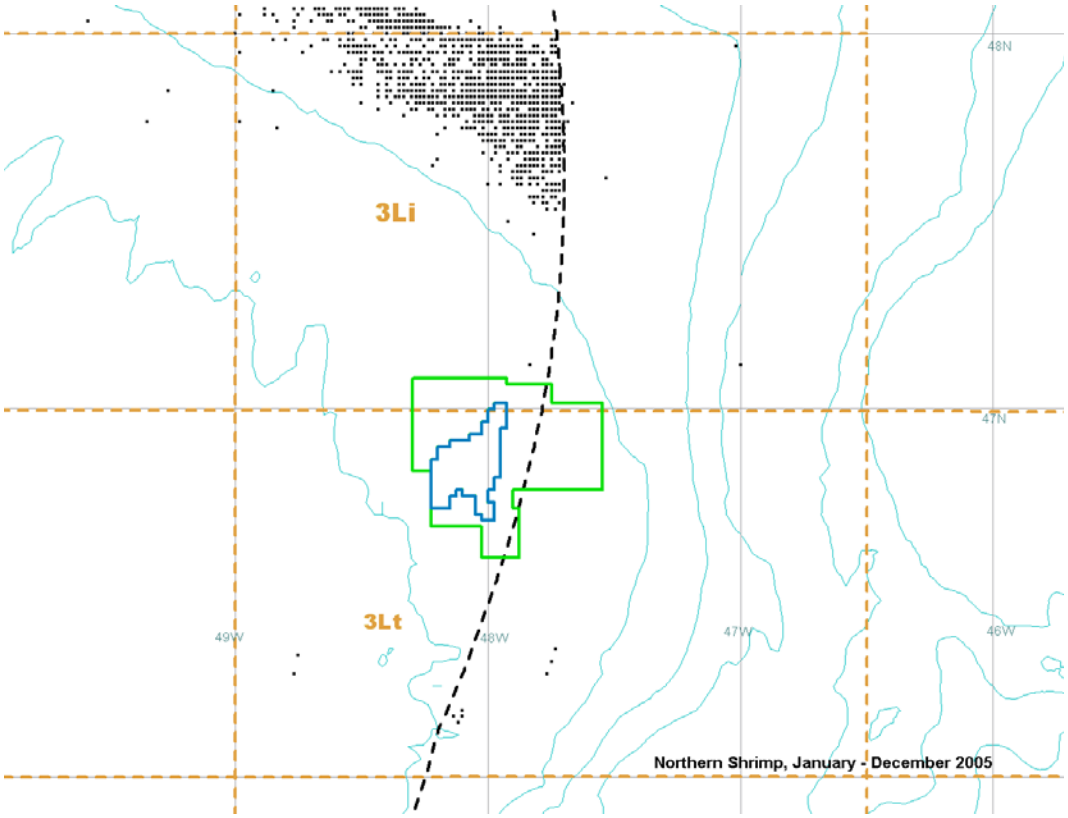


Figure 5.2. Northern Shrimp Harvesting Locations 2005.

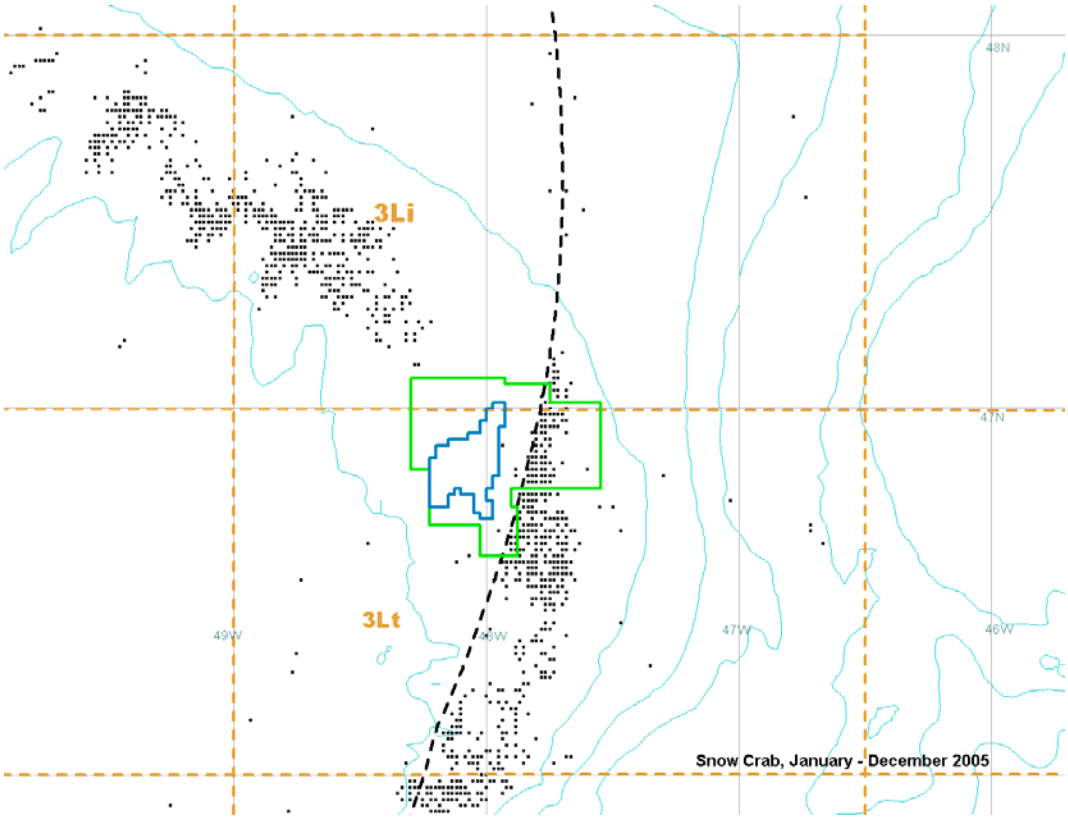


Figure 5.3. Snow Crab Harvesting Locations 2005.

5.6.2.2. Timing and Seasonality

The seasonal distribution of the harvest was also similar within the two areas, as Figure 5.4 and the maps following (Figure 5.5 to Figure 5.10) indicate. The harvest occurred between May and August in 2005, as in other years, but its peak month (July) occurred later that year than in most other recent years (May June). This was likely owing to the delayed start of the snow crab fishery in 2005. The 3Lex and 3L200 snow crab fisheries closed officially on 31 July 2005, though some of the harvest was not landed until the beginning of August (http://www.nfl.dfo-mpo.gc.ca/publications/ reports_rapports/Crab_2005.htm).

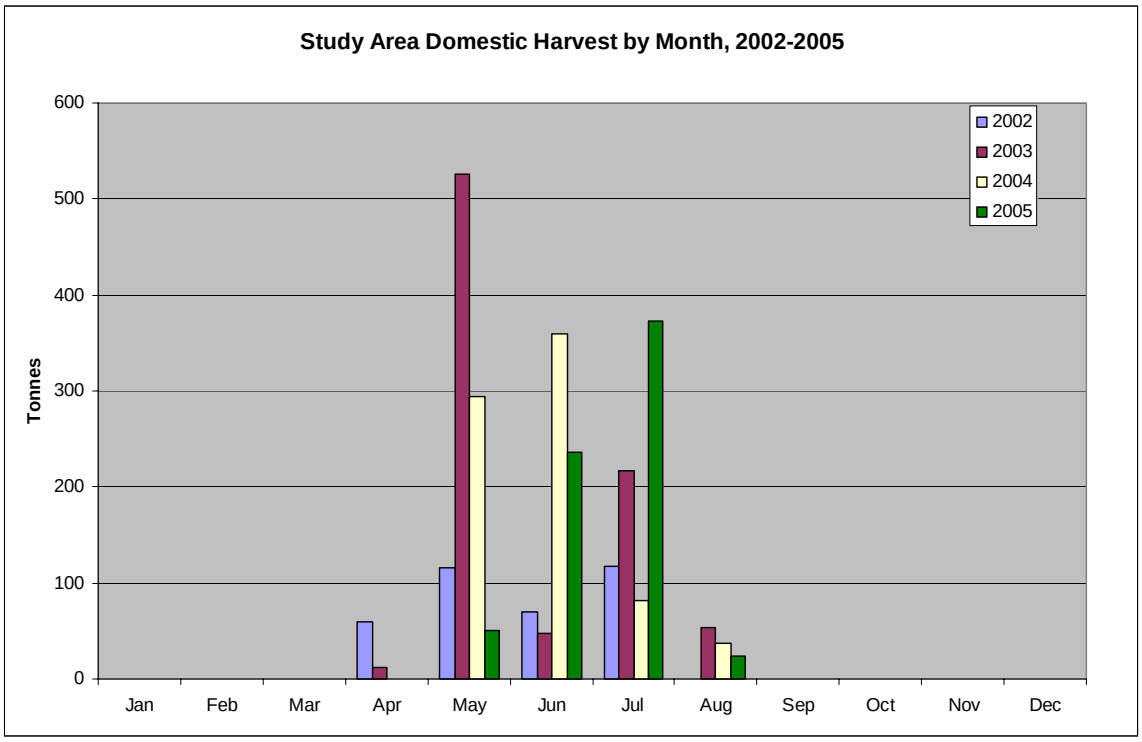


Figure 5.4. Study Area Domestic Harvest by Month, All Species, 2002-2005.

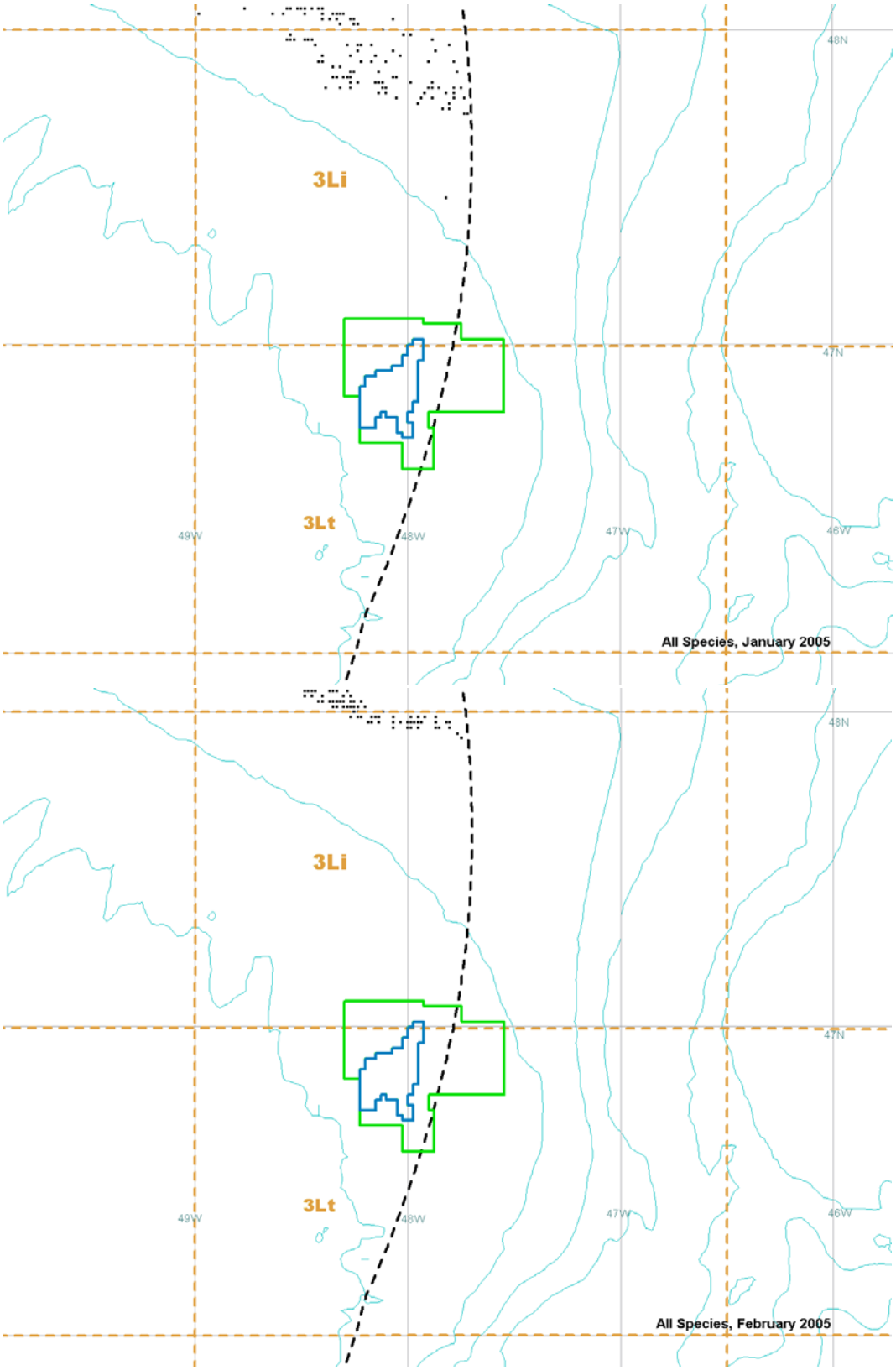


Figure 5.5. Domestic Harvesting Locations, All Species, January – February 2005.

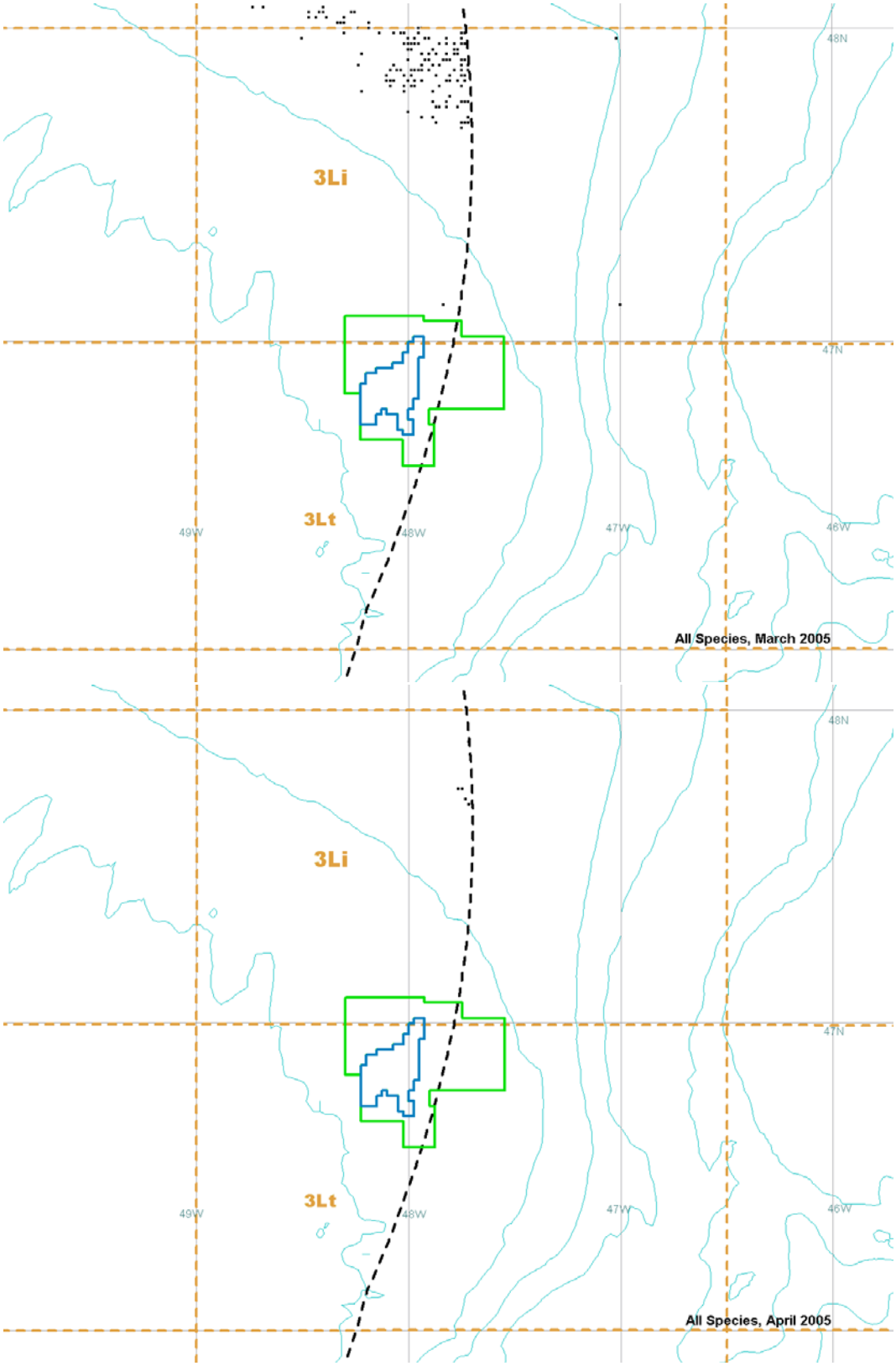


Figure 5.6. Domestic Harvesting Locations, All Species, March – April 2005.

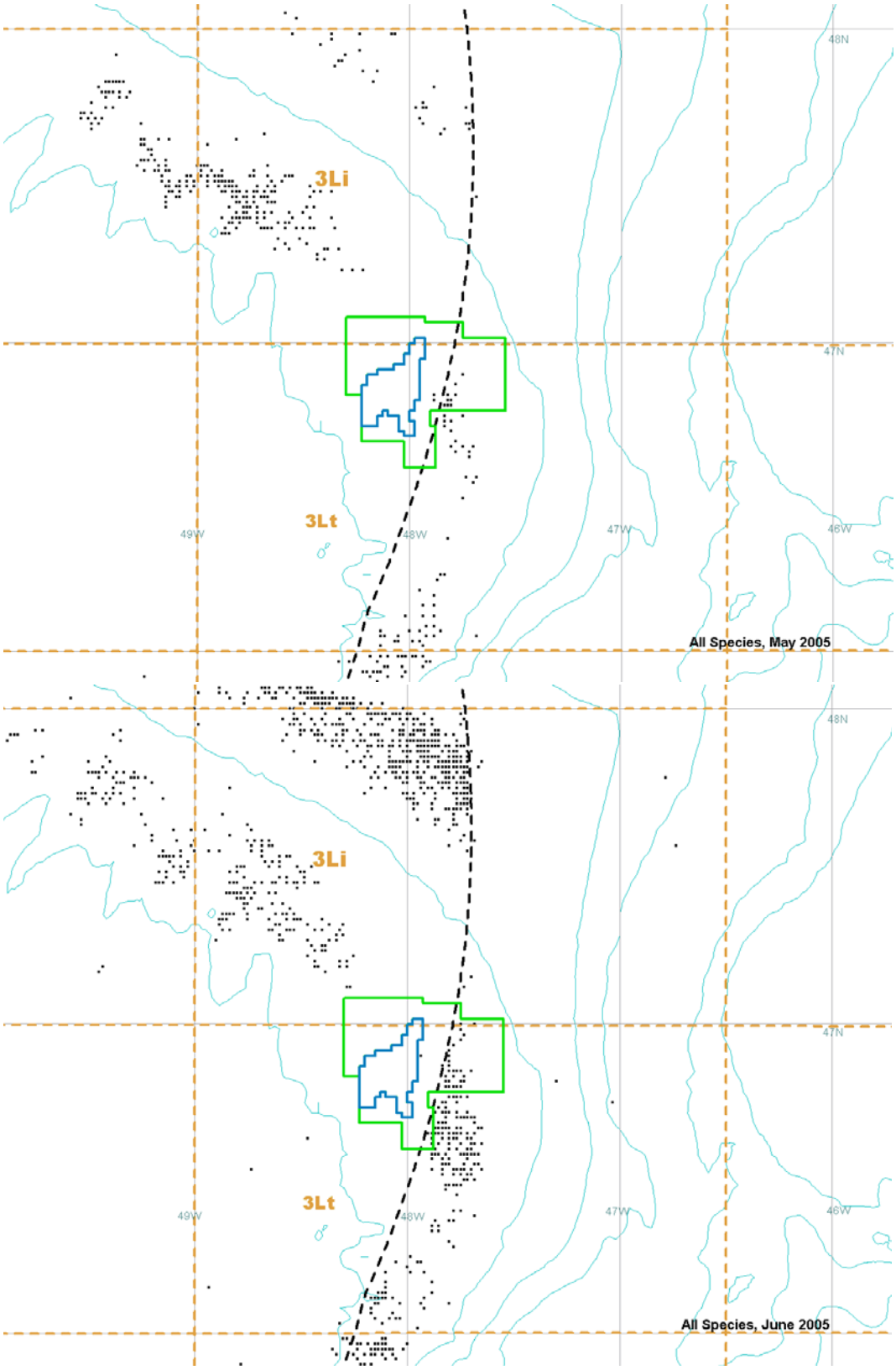


Figure 5.7. Domestic Harvesting Locations, All Species, May – June 2005.

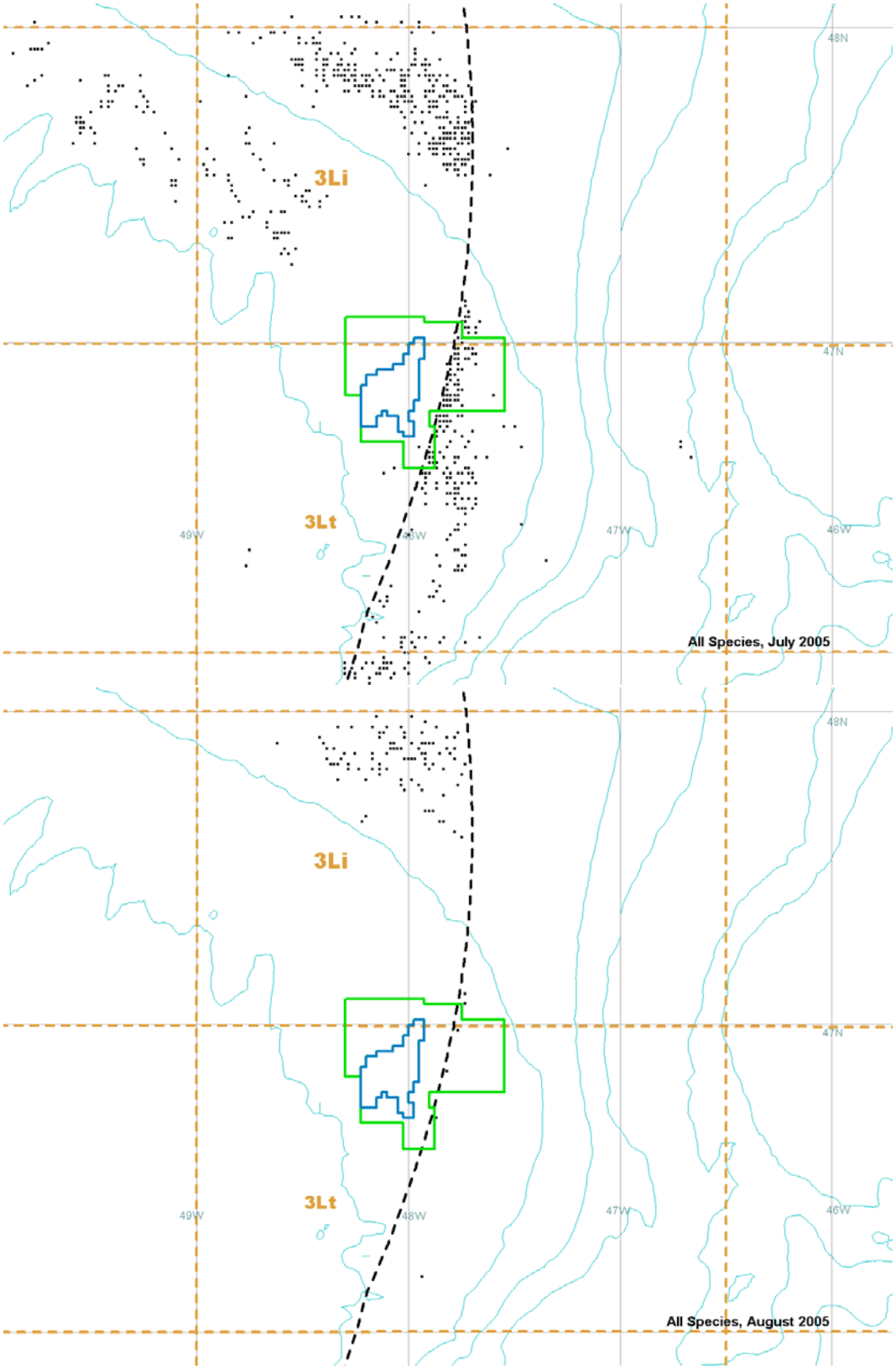


Figure 5.8. Domestic Harvesting Locations, All Species, July – August 2005.

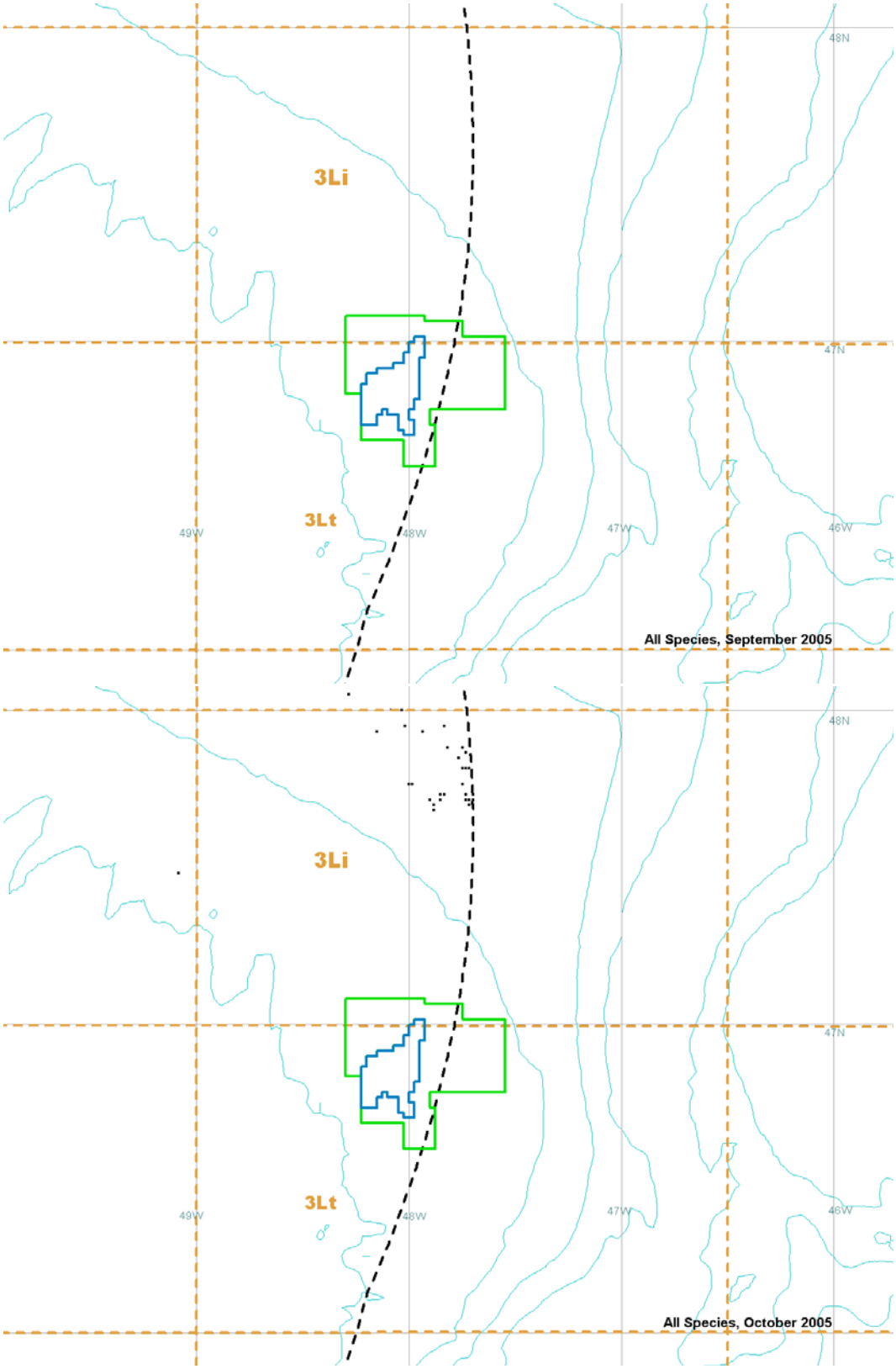


Figure 5.9. Domestic Harvesting Locations, All Species, September – October 2005.

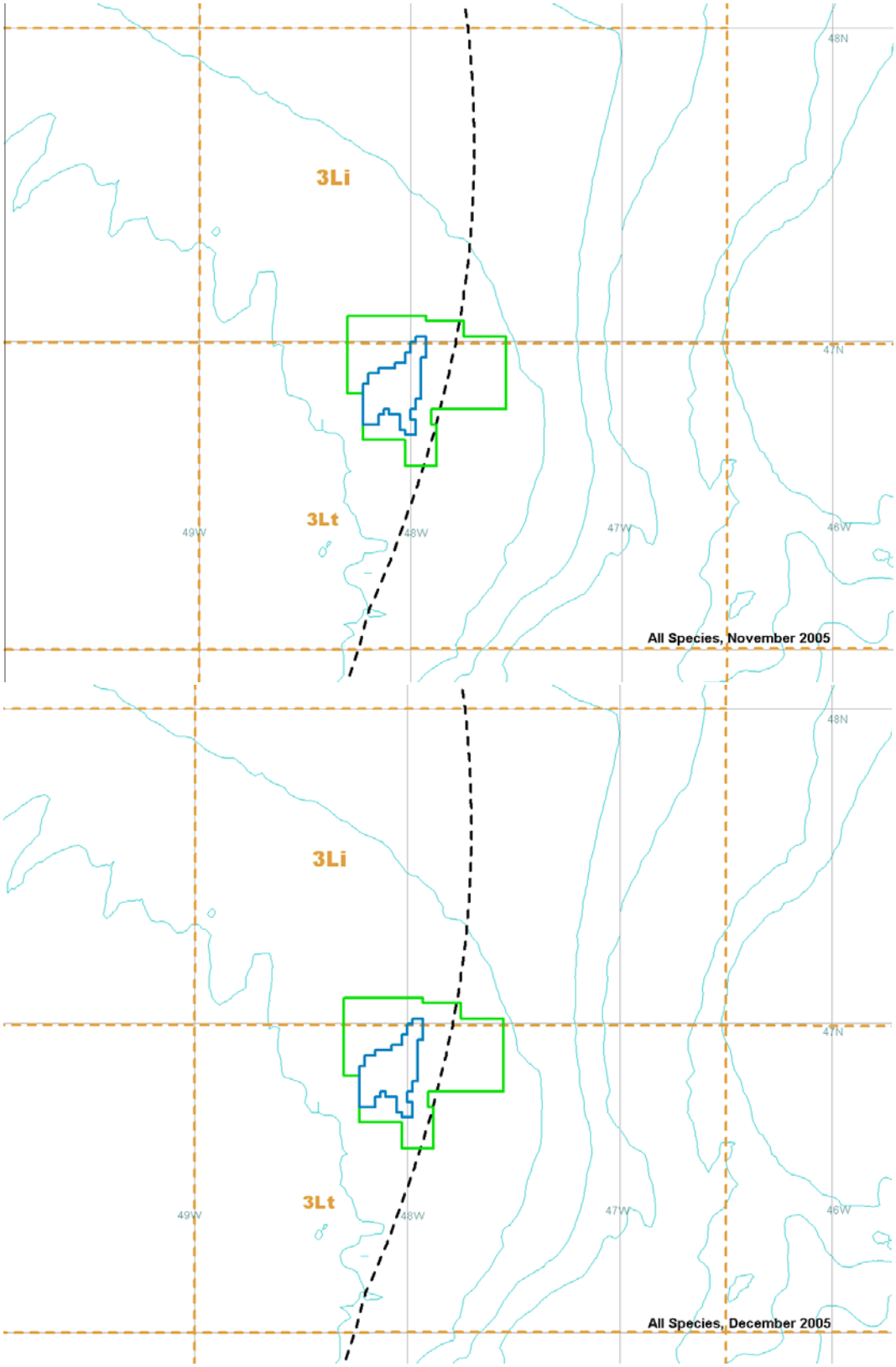


Figure 5.10. Domestic Harvesting Locations, All Species, November – December 2005.

5.6.3. 2006 Fisheries

No significant changes are expected in the Study Area or Project Area domestic fisheries in 2006.

During the consultation update, FPI representatives noted that their 2006 fish harvesting activities would not be in the vicinity of proposed drilling operations (meeting, February 2006). Company vessels will be fishing yellowtail in 3Lr and 3Nc, both of which are well to the south of the Husky area. The firm's turbot fishing activities to the north (in the Orphan Basin area) will be completed by April. FPI will be undertaking some industry surveys (northern shrimp, 3PS cod) in 2006, but none of these will be near the planned drilling operations.

5.6.4. DFO Science and Industry Surveys

As in past years, fisheries science surveys will occur in NAFO Division 3L in 2006. At this point in the planning cycle (February 2006), the schedule is still being finalized, but DFO notes that there are no major changes planned for the multi-species surveys in 2006, compared to 2005, though there may be one or two new surveys of short duration during the summer (B. Brodie, pers. comm. February 2006).

The 2005 schedule (Table 5.4, below, provided by B. Brodie February 2006) is slightly revised from Table 5.8 of the 2005 EA as it reflects some in-season adjustments. Coverage of specific areas/times are usually decided 2-4 weeks ahead of the surveys and other adjustments are often necessary for operational considerations during the surveys.

During recent consultations (February 2006), FFAWU biologists noted that the FFAWU and relevant fishers are involved in an industry survey for crab in various offshore harvesting locations. This relatively short (24 hour) survey takes place in September.

Communications will need to be maintained with DFO and the fishing industry about their surveys as the project moves forward.

Table 5.4. DFO Science Survey Schedule (Final) Eastern Grand Banks 2005.

Ship/Scientist	Survey and Area	Start Date	End Date	Days
Teleost				
Brodie	Multi-species 2J 3KLMNO	01-Oct-05	14-Oct-05	14
	Multi-species 2J 3KLMNO	15-Oct-05	28-Oct-05	14
	Multi-species 2J 3KLMNO	29-Oct-05	10-Nov-05	13
	Multi-species 2J 3KLMNO	12-Nov-05	25-Nov-05	14
	Multi-species 2J 3KLMNO	26-Nov-05	09-Dec-05	14
	Multi-species 2J 3KLMNO	10-Dec-05	20-Dec-05	11
Templeman				
Brodie	Multi-species 3LNO	14-May-05	27-May-05	14
		28-May-05	10-Jun-05	14
		11-Jun-05	30-Jun-05	20
Brodie	Multi-species - Grand Banks	01-Oct-05	14-Oct-05	14
	Multi-species - Grand Banks	15-Oct-05	28-Oct-05	14
	Multi-species - Grand Banks	29-Oct-05	10-Nov-05	13
	Multi-species - Grand Banks	12-Nov-05	25-Nov-05	14
		26-Nov-05	09-Dec-05	14
		10-Dec-05	20-Dec-05	11
Needler				
Brodie	Multi-species	10-Oct-05	10-Nov-05	32
Brodie	Multi-species	11-Nov-05	19-Nov-05	9
Shamook				
Taylor	Crab Trapping/Trawling 3-3L	10-May-05	23-May-05	14

DFO Comments #34-#36: Commercial fisheries

5.7. Marine Birds

Section 5.7 of the Husky EA (LGL 2005a) remains relevant to this update.

Part of Response to Comment EC-59

Table EC-33. Number of Pairs of Seabirds Nesting at Important Bird Sites (IBA) in Eastern Newfoundland.

Species	Wadham Islands	Funk Island	Cape Freels and Cabot Island	Baccalieu Island	Witless Bay Islands	Cape St. Mary's	Middle Lawn Island	Corbin Island	Green Island
Procellariidae									
Northern Fulmar	-	13[a]	-	20[a]	40[a,f]	Present[a]	-	-	-
Manx Shearwater	-	-	-	-	-	-	100[a]	-	-
Hydrobatidae									
Leach's Storm-Petrel	1,038[d]	-	250[a]	3,336,000[a]	621,651[a,f]	-	26,313[a]	100,000[a]	72,000[a]
Sulidae									
Northern Gannet		9,837[b]		1,712[b]	-	6,726[b]	-	-	-
Laridae									
Herring Gull	-	500[a]	-	Present[a]	4,638[a,e]	Present[a]	20[a]	5,000[a]	-
Great Black-backed Gull	Present[d]	100[a]	-	Present[l]	166[a,e]	Present[a]	6[a]	25[a]	-
Black-legged Kittiwake	-	810[a]	-	12,975[a]	23,606[a,f]	10,000[a]	-	50[a]	-
Arctic and Common Terns	376[a]	-	250[a]	-	-	-	-	-	-
Alcidae									
Common Murre	-	412,524[c]	2,600[a]	4,000[a]	83,001[a,f]	10,000[a]	-	-	-
Thick-billed Murre		250[a]	-	181[a]	600[a]	1,000[a]	-	-	-
Razorbill	273[d]	200[a]	25[a]	100[a]	676[a,f]	100[a]	-	-	-
Black Guillemot	25[a]	1[a]	-	100[a]	20+[a]	Present[a]	-	-	-
Atlantic Puffin	6,190[d]	2,000[a]	20[a]	30,000[a]	272,729[a,f,g]	-	-	-	-
TOTALS	**7,902**	**426,235**	**3,145**	**3,385,088**	**1,007,107**	**27,826**	**26,413**	**105,075**	**72,000**

Sources:
[a] Cairns et al. (1989)
[b] Chardine (2000)
[c] Chardine et al. (2003)
[d] Robertson and Elliot (2002)
[e] Robertson et al. (2001) *in* Robertson et al (2004)
[f] Robertson et al. (2004)
[g] Robway et al. (2003) *in* Robertson et al. (2004)
[h] Stenhouse et al. (2000) *in* Robertson et al. (2004)

EC Comment #33: Reference update
EC Comment #34: Ivory Gulls

5.8. Marine Mammals and Sea Turtles

Section 5.8 of the Husky EA (LGL 2005a) remains relevant to this update.

Since the preparation of the Husky EA (LGL 2005a), the primary source of new information available is the marine mammal monitoring results of the Husky 3D seismic program conducted in October and November 2005 (Lang et al. in prep). Two biologists (and fisheries liaison officer) were aboard the seismic ship, the M/V *Western Neptune*, throughout the seismic program which occurred from 3 October to 6 November 2005. The seismic program was conducted primarily in EL 1067. A summary of the results are provided below. However, these results should be considered preliminary given that the monitoring report is in preparation.

Given the endangered status of blue whales (*Balaenoptera musculus*), an update of the information for this species provided for in LGL (2005a) is also provided here. There is no new information available since the preparation of LGL (2005a) to suggest that other marine mammals considered endangered by COSEWIC (North Atlantic right whale (*Eubalaena glacialis*), northern bottlenose whale (*Hyperoodon ampullatus*)—Scotian Shelf population) are likely to occur in the Study Area.

Summary of Seismic Monitoring Results (Fall 2005)

The marine mammal observers conducted approximately 371 hours of observation along 2859 km trackline from the *Western Neptune* during 3 October to 6 November 2005. Table 5.5 summarizes the marine mammal sightings. A total of 170 marine mammal sightings were made, totaling 530 individuals. Most observations were made north of the Project Area as the seismic ship conducted its surveys primarily in EL1067, with the vessel making turns in EL 1066 and 1089 (Fig. 5.11). Other marine mammals sightings were made when the seismic ship was in transit or sailing away from the seismic area to avoid bad weather.

Baleen whales or mysticetes were the most numerous marine mammal observed during late fall near the Project Area. There were 59 confirmed sightings (totaling 79 individuals) of humpback whales (*Megaptera novaeangliae*), which accounted for about 70% of all baleen whale sightings identified to the species level. Humpbacks were sighted in water depths averaging 97 m (Table 5.5). There were 16 sightings (22 individuals) of fin whales (*Balaenoptera physalus*) and nine sightings (totaling nine individuals) of minke whales (*Balaenoptera acutorostrata*).

Relatively few dolphins (23 sightings) were sighted from the *Western Neptune* (Table 5.5). Near the Project Area, in EL 1089, there were two sightings of Atlantic white-sided dolphins, one sighting of white-beaked dolphins, and one sighting of common dolphins (Fig. 5.11). A group of six killer whales was sighted northwest of the Project Area in NAFO area 3Ld (Fig. 5.11). There was one sighting of a beaked whale species (potentially a Sowerby's beaked whale) made in EL1067, NW of the Project Area (Fig. 5.11). Two harbour porpoises were observed in EL 1089 in a water depth of 165 m. Long-finned pilot whales (two sightings) were observed north of the Project Area, in slope waters averaging 637 m.

Table 5.5. Summary of marine mammal sightings made from the MV *Western Neptune* during Husky's seismic monitoring program in Wildrose during October and November 2005.

Species	No. of Marine Mammals		Avg. Water Depth (m)
	Sightings	Individuals	
Mysticetes			
Fin whale	16	22	106
Humpback whale	59	79	97
Minke whale	9	9	120
Unidentified	48	61	106
Total	*132*	*171*	
Odontocetes			
Long-finned pilot whale	2	16	637
Atlantic white-sided dolphin	6	128	317
Common dolphin	4	61	126
White-beaked dolphin	2	23	151
Killer Whale	1	6	na
Unidentified dolphin	8	107	114
Unidentified beaked whale	1	1	128
Harbour porpoise	1	2	165
Total	*25*	*344*	
Unidentified Whale	13	15	124
GRAND TOTAL	***170***	***530***	121

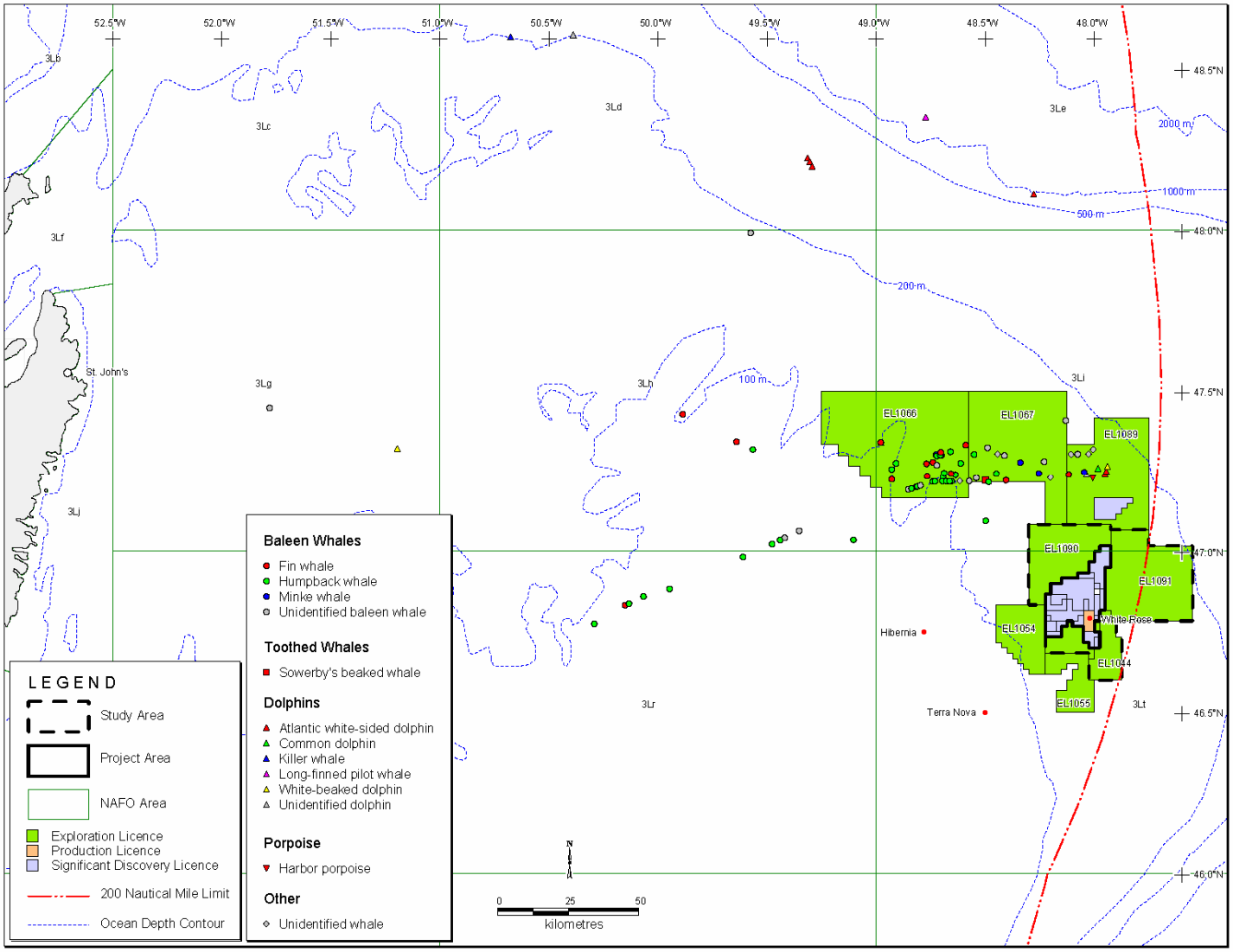


Figure 5.11. Marine mammal sightings made from the MV *Western Neptune* during Husky's seismic monitoring program in Wildrose during October and November 2005.

Blue Whale—Additional Information

The blue whale is a cosmopolitan species with separate populations (and subspecies) in the North Atlantic (*B.m. musculus*), North Pacific (*B.m. brevicauda*), and Southern Hemisphere (*B.m. intermedia*). The global population is thought to range from 5000-12,000 individuals but a recent and reliable estimate is not available. Blue whale abundance in the North Atlantic is currently thought to range from 600 to 1500 individuals, although more reliable and wide ranging surveys are required for better estimates (Sears and Calambokis 2002). Blue whales concentrate in areas with large seasonal concentrations of euphausiids, its main prey (Yochem and Leatherwood 1985). Little is known about the distribution and abundance of blue whales in the northwest Atlantic—especially the waters off eastern Newfoundland. One area of blue whale concentration is the Gulf of St. Lawrence where 350 individuals have been catalogued photographically (Sears 2002).

There is insufficient data to determine population trends of the blue whale in the northwest Atlantic. The blue whale is considered endangered by COSEWIC (COSEWIC 2002) and is listed as such on Schedule 1 of the *SARA*. Accordingly, a Recovery Strategy is being developed under *SARA* and is likely due for release in the near future (J. Lawson, DFO, pers. comm.) On a global level, the IUCN—World Conservation Union, also considers the blue whale endangered (www.redlist.org). The original population was reduced due to whaling and now their biggest threats are thought to be from ship strikes, disturbance from increasing whale watching tours, entanglement in fishing gear, and pollution (Sears and Calambokidis 2002).

Blue whales have a coastal and pelagic distribution and they are known to frequent areas of the Gulf of St. Lawrence, the lower Estuary part of the St. Lawrence, and to a lesser extent the west and southwest coasts of Newfoundland. Most sighting effort and sightings of blue whales have been made along the Quebec North Shore from the Mingan and Anticosti islands region, off the Gaspé Peninsula, and west into the St. Lawrence Estuary to the Saguenay River (Sears and Calambokidis 2002). Little survey effort has been expended in other regions of the Gulf or elsewhere in the northwest Atlantic, especially outside of the summer period. Information on the distribution of blue whales in winter is lacking. Some blue whales become entrapped by ice (during heavy ice years) near the southwest coast of Newfoundland (Stenson et al. 2003). Records of entrapped blue whales date back to 1868 and 41 individual blue whales (23 entrapment events) have been recorded since then. All entrapments with available date information occurred during March and April and based on morphometric analyses most whales were adults and one whale was a pregnant female (Stenson et al. 2003). There have been no confirmed sightings of blue whales in or near the Husky Project Area (see Fig. 5.12) based upon available data provided by DFO. The closest sighting was made in June 1993, approximately 260 and 250 km south of the Husky Project Area and Study Area, respectively. Most sightings of blue whales in Newfoundland have occurred near the coast, which likely is related to the lack of dedicated marine mammal surveys in offshore waters.

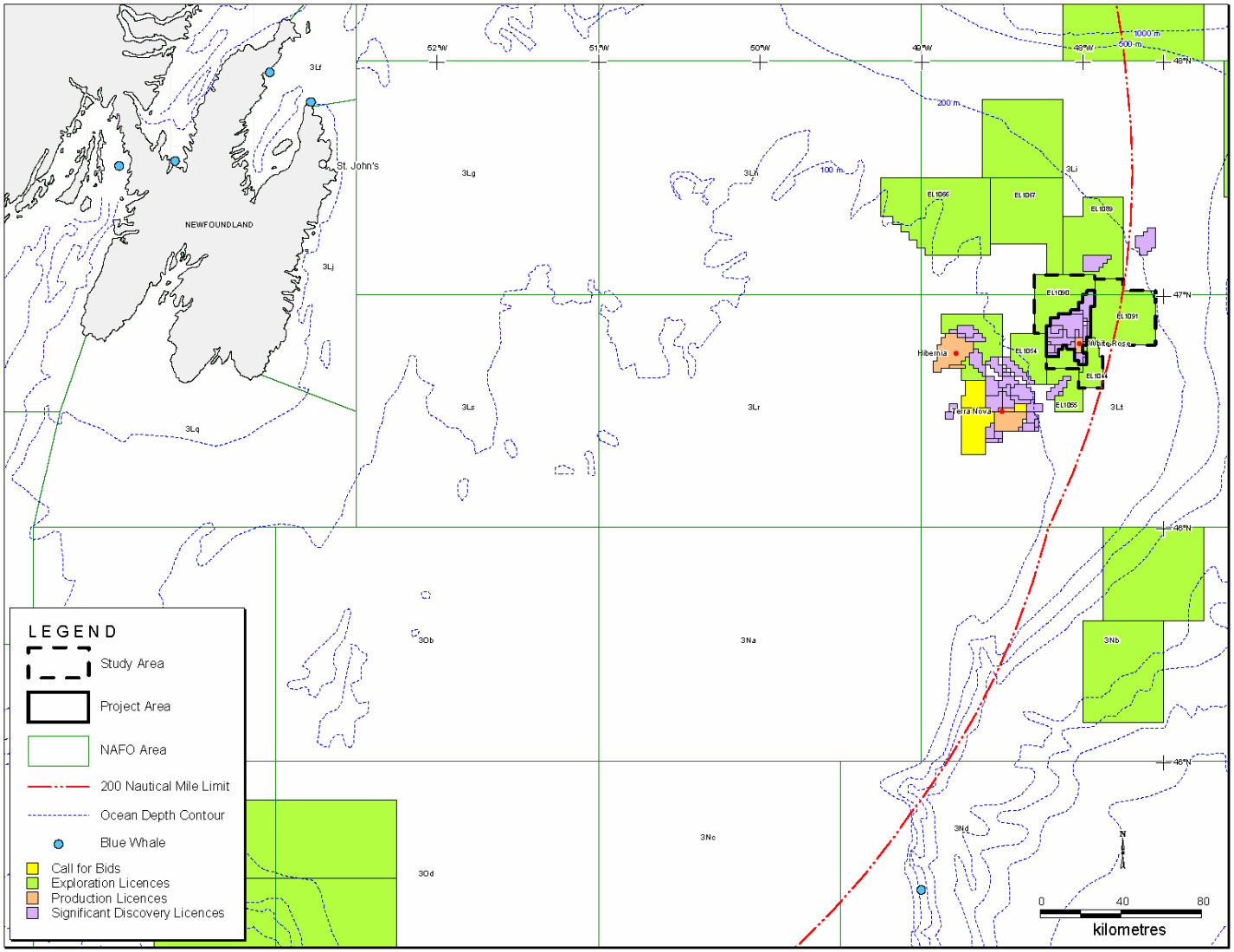


Figure 5.12. Location of blue whale sightings made in and near the Grand Banks relative to Husky's Project and Study Area (data provided by DFO).

In the Northern Hemisphere, blue whales mate and calve from late fall to mid-winter and become sexually mature at the ages of 5-15 (Yochem and Leatherwood 1985). Blue whales are thought to live for 70-80 years and potentially longer (Yochem and Leatherwood 1985).

Blue whales feed almost exclusively on euphausiids (krill) such as *Thysanoessa raschii* and *Meganyctiphanes norvegica* (Yochem and Leatherwood 1985). Blue whales also feed on copepods (e.g., *Temora longicornis*) and some fish species (Kawamura 1980; Reeves et al. 1998). Areas where blue whales are known to occur correspond to areas where their prey aggregate in great abundance (Simard and Lavoie 1999).

Sea Turtles

No sea turtles were sighted during monitoring from the *Western Neptune* in October and November 2005 (Lang et al. in prep.). October and November are not the best times of the year to sight sea turtles in the area. Relevant and up-to-date information on the endangered leatherback turtle is reviewed in LGL (2005a). A draft of the "National Recovery Strategy for the Leatherback turtle (*Dermochelys coriacea*) in Atlantic Canadian waters" has been prepared but was not available on government web sites during preparation of this EA.

6.0 Effects Assessment

Chapter 6.0 of the Husky EA (LGL 2005a) remains relevant to this update. Agency comments on Chapter 6.0 of the EA are referred to in the appropriate sections and subsections indicated below. Any additional information, either 'response' related or otherwise, is provided in the corresponding sections and subsections.

6.1. Assessment Methodology

The assessment methodology described in Section 6.1 of the Husky EA (LGL 2005a) remains relevant to the re-evaluation of the potential effects of Husky's delineation/exploration drilling program in this update.

6.1.1. Scoping

Sub-section 6.1.1 of the Husky EA (LGL 2005a) remains relevant to this update.

6.1.2. Valued Ecosystem Components (VECs)

Sub-section 6.1.2 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #35: Other Issues-Air quality

6.1.3. Boundaries

Sub-section 6.1.3 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #37-#39

6.1.4. Effects Assessment Procedures

Sub-section 6.1.4 of the Husky EA (LGL 2005a) remains relevant to this update.

6.1.5. Identification and Evaluation of Effects

Sub-section 6.1.5 of the Husky EA (LGL 2005a) remains relevant to this update.

6.1.6. Classifying Anticipated Environmental Effects

Sub-section 6.1.6 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #36: Classifying anticipated environmental effects
EC Comment #37: Evaluation criteria

6.1.7. Migration

Sub-section 6.1.7 of the Husky EA (LGL 2005a) remains relevant to this update.

6.1.8. Application of Evaluation Criteria for Assessing Environmental Effects

Sub-section 6.1.8 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #40

6.1.9. Cumulative Effects

Sub-section 6.1.9 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #38: Cumulative effects
EC Comment #39: Cumulative effects

6.1.10. Integrated Residual Environmental Effects

Sub-section 6.1.10 of the Husky EA (LGL 2005a) remains relevant to this update.

6.1.11. Significance Rating

Sub-section 6.1.11 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #40: Significance rating

6.2. Effects of the Environment on the Project

Section 6.2 of the Husky EA (LGL 2005a) remains relevant to this update.

Husky intends to designate fall back positions for the jack-up rig if necessitated by weather. These positions are likely to be approximately 30-35 km southwest of the Project Area, inside the 100 m isobath. If it becomes necessary that the jack-up rig be moved to a fall back position, the only notable activities that would occur at the site would be the drilling of geotechnical bore holes from the rig to ensure bottom stability and, hence, safety and subsequent placement of the leg spudcans on the seafloor, and the discharge of grey/black water.

Activities associated with geotechnical drilling are described and discussed in the Lewis Hill/White Rose Geotechnical Investigation Environmental Assessment (LGL 2005b) and summarized in sub-section 3.7.7 of this update. Potential effects of these activities are also assessed in the same document. Discharge of grey/black water is discussed and assessed in the Husky EA (LGL 2005a) as well as in sub-section 3.7.15 of this update. The EAs concluded that there would be *no significant residual effects* from any of the activities associated with the movement of the jack-up and its temporary placement at the fall back position.

EC Comment #41: Ice accretion
EC Comment #42: Wind and waves

6.3. Routine Project Activities-Potential Zones of Influence

Section 6.3 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #43: Well plugging techniques
EC Comment #44: Flaring-Table 6.1
EC Comment #45: Flaring

6.3.1. Drill Mud and Cuttings

Sub-section 6.3.1 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #41-#44

6.4. Effects of Routine Activities

Section 6.4 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.1. Plankton

Sub-section 6.4.1 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #45

6.4.2. Benthos

Sub-section 6.4.2 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.3. Effects on Fish and Fish Habitat

Sub-section 6.4.3 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #46-#48
EC Comment #58: Chlorination levels
EC Comment #59: Marine birds-cumulative effects
EC Comment #60: Marine birds-cumulative effects
EC Comment #61: Marine birds-cumulative effects
EC Comment #62: Marine birds-monitoring and follow-up

6.4.4. Presence of Structures

Sub-section 6.4.4 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #49-#50

6.4.5. Discharge of Drilling Muds and Cuttings

Sub-section 6.4.5 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #51-#56

6.4.6. Discharge of Other Fluids and Solids

Sub-section 6.4.6 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #57

6.4.7. Garbage and Other Waste

Sub-section 6.4.7 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #46: Chemical selection and use

6.4.8. Small Spills

Sub-section 6.4.8 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.9. Ballast Water

Sub-section 6.4.9 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.10. Bilge Water

Sub-section 6.4.10 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.11. Produced Fluids

Sub-section 6.4.1 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.12. Atmospheric Emissions

Sub-section 6.4.12 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comments #47-#56

6.4.13. Effects of Ships and Boats

Sub-section 6.4.13 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.14. Effects of Helicopters

Sub-section 6.4.14 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.15. Effects of Sound

Sub-section 6.4.15 of the Husky EA (LGL 2005a) remains relevant to this update.

6.4.16 Effects on Fisheries

Sub-section 6.4.16 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #58-#59

6.4.17 Effects on Marine Birds

Sub-section 6.4.17 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comment #57-#62

6.4.18 Effects on Marine Mammals and Sea Turtles

Sub-section 6.4.18 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #60-#62

7.0 Accidental Events

Chapter 7.0 of the Husky EA (LGL 2005a) remains relevant to this update. Agency comments on Chapter 7.0 of the EA are referred to in the appropriate sections and subsections indicated below. Any additional information, either 'response' related or otherwise, is provided in the corresponding sections and subsections.

EC Comment #63: SBM spill

7.1. Probability of Accidental Events

Section 7.1 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.1. General Oil Pollution Record of the Offshore E&P Industry

Sub-section 7.1.1 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.2. Sources of Information

Sub-section 7.1.2 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.3. Categories of Spill Size

Sub-section 7.1.3 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.4. Extremely Large, Very Large and Large Spills

Sub-section 7.1.4 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.5. Blowouts Involving Gas Only or Small Discharges of Oil

Sub-section 7.1.5 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comments #64-#65

7.1.6. Smaller Platform Spills

Sub-section 7.1.6 of the Husky EA (LGL 2005a) remains relevant to this update.

7.1.7. Summary of Blowout and Spill Frequencies

Sub-section 7.1.7 of the Husky EA (LGL 2005a) remains relevant to this update.

7.2. Oil Spill Behaviour and Fate

Section 7.2 of the Husky EA (LGL 2005a) remains relevant to this update.

7.2.1. Oil Characteristics

Sub-section 7.2.1 of the Husky EA (LGL 2005a) remains relevant to this update.

7.2.2. Selection of Oil Spill Scenarios

Sub-section 7.2.2 of the Husky EA (LGL 2005a) remains relevant to this update.

7.2.3. Blowout/Spill Scenarios

Sub-section 7.2.3 of the Husky EA (LGL 2005a) remains relevant to this update.

7.2.4. Modelling and Description of Selected Oil Spill Scenarios

Sub-section 7.2.4 of the Husky EA (LGL 2005a) remains relevant to this update.

7.3. Spill Trajectories

Section 7.3 of the Husky EA (LGL 2005a) remains relevant to this update.

7.3.1. Hibernia and Terra Nova Analyses

Sub-section 7.3.1 of the Husky EA (LGL 2005a) remains relevant to this update.

7.3.2. White Rose Spill Trajectories

Sub-section 7.3.2 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #63-#64

7.3.3. White Rose Spill Areas and Concentrations of Dispersed Oil

Sub-section 7.3.3 of the Husky EA (LGL 2005a) remains relevant to this update.

7.3.4. Effects of Pack Ice on Oil Spills

Sub-section 7.3.4 of the Husky EA (LGL 2005a) remains relevant to this update.

7.4. Estimation of Potential Cleanup Effectiveness

Section 7.4 of the Husky EA (LGL 2005a) remains relevant to this update.

7.4.1. Best-Practicable Containment/Recovery System

Sub-section 7.4.1 of the Husky EA (LGL 2005a) remains relevant to this update.

7.4.2. F_{TRP}: Fraction of Time that Recovery is Possible

Sub-section 7.4.2 of the Husky EA (LGL 2005a) remains relevant to this update.

7.5. Alternatives to Containment and Recovery

Section 7.5 of the Husky EA (LGL 2005a) remains relevant to this update.

7.6. Spill Response

Section 7.6 of the Husky EA (LGL 2005a) remains relevant to this update.

7.7. Potential Effects of Accidental Spills

Section 7.7 of the Husky EA (LGL 2005a) remains relevant to this update.

7.7.1. Effects on Fish and Fish Habitat

Sub-section 7.7.1 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comments #65-#66

7.7.2. Effects on Commercial Fisheries

Sub-section 7.7.2 of the Husky EA (LGL 2005a) remains relevant to this update.

7.7.3. Effects on Marine Birds

Sub-section 7.7.3 of the Husky EA (LGL 2005a) remains relevant to this update.

EC Comments #66-#69: Effects on marine birds

7.7.4. Effects on Marine Mammals

Sub-section 7.7.4 of the Husky EA (LGL 2005a) remains relevant to this update.

DFO Comment #67

7.7.5. Effects on Species at Risk

Sub-section 7.7.5 of the Husky EA (LGL 2005a) remains relevant to this update.

8.0 Residual Effects of the Project

The predicted residual environmental effects of the Husky delineation/exploration drilling program and possible accidental events on fish and fish habitat, and the fishery are assessed as negative, but *not significant*.

The residual environmental effects of delineation/exploration drilling on marine birds are assessed to be negative, but *not significant*. The residual environmental effect of an accidental event such as a significant oil spill on marine birds, although unlikely, is assessed to be negative and *significant*. The overall effect of the Project on marine birds is assessed as *not significant*.

The residual effects of routine delineation/exploration drilling and an accidental event on marine mammals and sea turtles are assessed to be negative, but *not significant*, excluding major accidents.

In summary, after mitigation measures have been implemented, the overall predicted effects of the proposed Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin on the biophysical environment and the fishery are assessed as *not significant*. The only exceptions are the potential effects of a large offshore oil spill on marine birds and on the marketability of offshore commercial fish. However, the likelihood of such an event is, as discussed previously, very low. In the event of an accidental blowout with release of oil, in calm conditions, some mitigation may be possible through oil spill response measures. Also, in the case of fishery losses directly attributable to the exploration program, actual loss would be mitigated through compensation. The capacity of renewable resources to meet present and future needs is not likely to be significantly affected by the proposed project.

9.0 Cumulative Effects of the Project

Projects and activities considered in the cumulative effects assessment included:

- Drilling program within-project cumulative impacts. For the most part, and unless otherwise indicated, within-project cumulative effects are fully integrated within this assessment;
- Hibernia, Terra Nova, and White Rose (existing offshore oil developments);
- Other offshore oil exploration activity (seismic surveys and exploratory drilling). In 2006, Grand Banks activity could include multiple seismic surveys, delineation/exploration drilling, and glory hole excavation. The Labrador Shelf may also see some exploration activity because there has been recent seismic survey activity there.
- Commercial fisheries;
- Marine transportation (tankers, cargo ships, supply vessels, naval vessels, fishing vessel transits, etc.); and
- Hunting activities (marine birds and seals).

The Canadian Association of Petroleum Producers (CAPP) had predicted that there would be between one and four drill rigs per year operating on the Grand Banks between 2000 and 2010 (CAPP 1999). CAPP's scenario for a moderate level of activity predicts two rigs drilling exploration, delineation and production wells on the Grand Banks each year over the ten-year period. It is reasonable to assume that there will be at least two exploratory drilling programs on the Grand Banks in 2006. Any cumulative effects on the Grand Banks ecosystem from routine exploratory drilling outside the proposed drilling area will probably not overlap in time and space and thus, will be additive but not multiplicative. This level of activity will not change the effects predictions when viewed on a cumulative basis unless significant oil spills or blowouts occur.

A potential scenario for cumulative effects from drill mud and cuttings discharge would be if the material settles on the bottom, smothers benthic communities partially or completely, and effects are persistent over time. This scenario is subject to numerous variables such as type of mud, weather conditions, water depth and velocity, discharge depth, species involved, biological and biodegradation activity, and many others. In order to obtain some order of magnitude of the area of seabed potentially affected by the Husky delineation/exploration drilling program during the 2006-2008 period, one can quickly calculate from the number of wells and "predicted areas covered" a very rough approximation of the total affected area.

Using 500 m as the radius of the biological 'zone of influence' (ZOI) (potential smothering due to a minimum of 1 cm thickness of deposited drill cuttings and mud) (as defined in the Husky EA), the area of each well ZOI is approximately 0.785 km^2 or 78.5 hectares. If one considers a maximum of 15 delineation/exploration wells in this program, the total ZOI area is approximately 1,178 hectares. Based on data available from the C-NLOPB website, the areas of the Project and Study Areas are 45,890 hectares and 214,501 hectares, respectively. The calculated total ZOI area represents 2.6 % of the

Project Area and 0.5% of the Study Area. There could potentially be some overlap of adjacent ZOIs but it is not possible to confirm this without known positions of all fifteen potential wells. However, any overlap would be minimal. Thus, it is clear that even if a 1 cm layer is persistent over time, likely a worst case assumption because it will be broken up and dispersed over time by bottom currents and biological activity, the proposed exploration wells in Jeanne d'Arc Basin would add a very small cumulative effect to the total. The Husky EA (LGL 2005a), and many others, has assumed that the effects from one well will be largely dissipated after one year. Duration of effects and time to recovery are important considerations under *CEAA*. Thus, any cumulative effect from delineation/exploration drilling in Jeanne d'Arc Basin is predicted to be additive, low magnitude, small geographic extent (<1 km^2 per well), and thus *not significant*.

Given that the likelihood of an oil well blowout or a significant oil spill occurring at the delineation/exploratory drilling sites is extremely low (Section 7.1), it is highly unlikely that simultaneous accidental events would concurrently occur at a drilling site, Hibernia, Terra Nova or White Rose.

10.0 Acknowledgements

Bob Buchanan, Bruce Mactavish and Val Moulton of LGL Limited provided updates and responses to comments associated with their respective sections. Oceans, under Judith Bobbitt, and Pip Rudkin of PAL provided updates and responses to comments associated with their respective sections on the Physical Environment. Strat Canning of Canning and Pitt Inc., St. John's, coordinated consultations and provided the report on them. Robb Pitt and Garry Kirby of Canning and Pitt Inc., St. John's, provided the update section on the commercial fisheries.

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Appendix 1. Agency Comments and Responses

DFO Comments on Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment

COMMENT ID	COMMENT	RESPONSE
	PROJECT DESCRIPTION	
DFO-1	Section 3.5.3, page 14: Onshore facilities should address disposal of SBM and produced water if brought ashore (Section 6.4.11).	Produced water will only occur if hydrocarbons are discovered and testing occurs. Husky's first preference will be to burn it through the flare. If this is not feasible, it will be brought ashore and handled by a certified third party waste handler. Used SBM will be brought ashore and processed for subsequent re-use. Again, any associated waste products associated with this component will be handled by a certified third party.
DFO-2	Page 18: Well abandonment procedures may include using shaped charges for subsurface cutting. This procedure should be clarified.	Husky's preferred approach is to use mechanical means to sever the well head. If this is not feasible, then an explosive technique, standard to the industry and subject to C-NLOPB approval, using small shaped charges placed below the mudline. Mitigations to protect marine life would be ensuring that no marine mammals or sea turtles are in the safety zone prior to setting off the charge. Should the use of shaped charges be required, Husky will consult with DFO and C-NLOPB with regard to regulatory requirements.
DFO-3	Page 18: The document indicates that well site locations for 2005 are presented in Figure 1.3, however, the figure indicates 4 possible sites whereas the 2005 program is supposed to include up to two wells. The locations of the wells planned for 2005 should be specified.	So noted.
DFO-4	Page 20: The fate of the WBM upon well completion has not been specified. It is therefore assumed that there is a bulk discharge at sea. This should be stated in the document.	There would be a bulk discharge of WBM which is standard procedure and in conformity with the *OWTG*. The OWTG state that operators should take steps to minimize or avoid this kind of discharge. WBMs would be collected only if there was excessive hydrocarbon contamination.
DFO-5	Section 3.7 (Project Components/Structures/Activities), page 15+: A typical VSP sound source should be described as well as its sound propagation characteristics. Further, the terms 'VSP' and 'wellsite survey' are interchanged in the assessment. If it is the proponent's intention to undertake geophysical work (other than VSP), it should be clearly stated and described in the project description.	The reviewer is referred to Section 6.4.18.1.7 Effects of Sound for additional detail on VSP. The term VSP in the document refers to vertical seismic profiling which is a limited scale, short term use of a 3-D array, which conducted during drilling. Well site surveys refer to surveys of the seabed to locate shallow geohazards prior to drilling. These surveys are also very limited in geographic extent and are short term, and typically use a variety of gear such as echosounders and side scan sonar. In the case of a jack-up rig installation, bore holes may be required to better ascertain seabed stability.

	PHYSICAL ENVIRONMENT	
DFO-6	Section 4.1.2.2, page 27: The document indicates that the Husky EEM program is detecting hydrocarbons in sediment samples near the northern and southern well centers with the maximum concentrations at about 300 m in 2004. More detail should be provided regarding the exact location of the maximum (i.e., in a predominant direction or entire circumference). In addition, similar information respecting the Terra Nova and Hibernia development projects should also be provided.	The maximum hydrocarbon concentrations found in sediments collected during the 2004 EEM occurred in sediments collected to the southwest of both the Northern and Southern drill centers. The report arising from the 2005 EEM program will be submitted in the first quarter of 2006 and will provide information relevant to this issue. We do not have access to the Terra Nova and Hibernia EEM data.
DFO-7	Section 4.3.1: Two definitions of the properties of the Labrador Current water mass are quoted from the scientific literature: -0.28°C (potential temperature)/33.33 psu (Hinrichsen and Tomczak) and +1 to +2°C/32-33.5 psu (inshore branch), +3 to +4°C/34-35 psu (offshore branch (Lazier). However, the report does not properly present this information. For example: Lazier reports a range for T and S whereas Hinrichsen and Tomczak does not; plus the Hinrichsen and Tomczak value is an average of observations collected outside the area of interest.	The report does not state that Lazier (1982) gives a range of properties for temperature and salinity. When it is stated that Hinrichsen and Tomczak (1993) gives a general value, the value is an average. Location is irrelevant in a discussion of the properties of a water mass.
DFO-8	Section 4.3.1: The temperature of waters over the shelf is limited by the freezing point of cold water (origin of quoted limit of -1.84°C). The upper limit of 0°C for the cold intermediate layer is arbitrary as it is the freezing point of pure water.	The statement is that the temperature of the Cold Intermediate Layer in summer ranges from 0°C to –1.84°C. In this context, 0°C has nothing to do with the freezing point of fresh water. Salt water can have a temperature of 0°C.
DFO-9	Section 4.3.1: It should be recognized that the majority of the water property data for the region has been collected by DFO-NL; MEDS is only a data repository.	We acknowledged that the data we use came from the BIO database and was collected by the Bedford Institute of Oceanography and the Department of Fisheries and Oceans (DFO) as well as others. It is standard practice to quote the source of data so that the results can be repeated. A CTD data base may have data from a large number of sources. The names of the data collectors are not provided with the data. It is all government controlled data.
DFO-10	Section 4.3.2 (Currents), page 48+: This section should be revisited in light of the following comments: The document suggests that the properties of Labrador Current water over the shelf are determined by meteorological wind forcing the solar heat exchange. Ice formation and melt as well as advection should also be considered (see Lazier and Wright 1993).	The statement is that the properties are primarily determined by meteorological wind forcing and solar heat exchange. Solar heat exchange does not include ice formation. Since advection means movement of water and the paragraph talks about currents, the comment is not fully understood.

DFO-11	Section 4.3.2: Figure 4.15 is said to illustrate 'intensified flow' near the Study Area. However, the Study Area is south of the area presented in the figure.	The 'intensified flow' shown in Figure 4.15 is along the Slope. The discussion is about surface currents to the northeast of the Newfoundland Shelf. This is close enough to the Study Area to be mentioned in the report because this general circulation pattern could indirectly impact upon the oceanography at the drilling sites.
DFO-12	Section 4.3.2, page 51: The statement 'In this area, factors other than wind and tides play a dominant role' should be explained.	This statement is explained in the remainder of the paragraph.
DFO-13	Section 4.3.2: 'Subsurface' is a misleading term to refer to the 'near surface' as all depths are considered subsurface.	So noted.
DFO-14	Section 4.3.2: The statement 'the currents are in all directions showing a rotation (sic) tidal circulation' is not appropriate for the discussion of Figure 4.22.	So noted.
DFO-15	Section 4.3.2: The document suggests that the extreme currents observed occurred during the tropical storm season. However, this was not qualified to establish that the quoted extremes were wind-forced.	Facts rather than suggestions were stated in this section.
DFO-16	Section 4.3.2: The importance of meandering of the offshore branch of the Labrador Current as it affects the Study Area should be discussed.	See response to DFO-12.
DFO-17	The following comments refer to the speed histograms, directional rose lots and progressive vector diagrams. Section 4.3.2, page (70): The length of the tidal ellipse major axis does not describe the magnitude of the tidal flow as asserted.	The paragraph is discussing the M_2 tidal constituent. The major axis does represent the magnitude of the M_2 tidal flow. The M_2 tidal constituent is the semi-diurnal and the dominant tidal constituent in the Study Area.
DFO-18	Section 4.3.2: The ADCP data should be used to describe the vertical current structure.	So noted.
DFO-19	Section 4.3.2: The rose-histogram plots should provide current meter depth and deployment dates.	The information requested is in a table with the other relevant information on the data sets. The plots have been grouped into subsurface (I guess should be called near-surface), mid-depth, and near bottom for simplicity.
DFO-20	Section 4.3.2: Table 4.1.3 should provide bottom depth and record duration in days.	This information is included in the table showing location and sampling periods of current data.
DFO-21	Section 4.3.2: The significant variability in the directional roses for all three depth ranges should be discussed in the text.	There is not enough data to discuss the significance of the variability. The document is merely reporting on an observed variability. This phenomena is left to be studied in the future when more information becomes available.

DFO-22	Section 4.3.2: Composite progressive vector diagrams (one for each depth range) should be provided.	It is our belief that one should never combine data from different locations and different times in a progressive vector diagram.
DFO-23	Section 4.3.2: The near surface tidal ellipses for WR I-08 and WR A-90 seem to be inaccurate (i.e., disagreement between mid-depth and near-bottom results at the same locations).	The near-surface currents were measured at approximately 20 m below the surface. This is in a different water mass than the meters at mid-depth and near-bottom. One can expect the tidal ellipses to be a different shape. If there is a dominant flow in one direction or the record length is short, it is sometimes impossible to completely resolve the tidal constituents. One has to interpret the results of the tidal ellipses in conjunction with the other data products.
DFO-24	Section 4.3.2: A horizontal section of currents observed across the Grand Bank and into deep water should be provided (ship mounted ADCP are routinely produced at NWAFC).	This information can be included in the report if DFO will make this information available. Note that knowing the general structure of the currents will not have any impact on exploration drilling.
DFO-25	Section 4.3.2: Current variance should be partitioned by timescale to the extent permitted by record length.	A spectral analysis on all these current records is beyond the scope of an EA. If a spectral analysis on all the current records is required, it can easily be done. One must bear in mind that identifying the energy frequencies in the data will have no impact on exploration drilling.
DFO-26	Section 4.3.2: In general, and in consideration of the above, the description and analysis of currents observed in the Study Area should provide [1] a detailed description of the 3-dimensional distribution of currents in the Study Area and how these vary on tidal, weather band (7-10 days), seasonal, and yearly timescales, [2] statistical summaries including means and variances, [3] a partition of observed variances into the different time scales, [4] a detailed description of the vertical profile of currents and the degree to which currents are vertically correlated by time scale, and [5] the correlation of currents separated horizontally.	A cross-correlation analysis of currents in the temporal and spatial domain is a major research task. It is beyond the scope of an Environmental Impact Statement, and well beyond the scope of an EA.
DFO-27	Section 4.5 (Ice and Icebergs): References to seismic should be rectified as they are assumed to be typos.	So noted.
DFO-28	Consultations with oceanographers at the DFO-NL (NWAFC) or DFO-NS (BIO) were not cited.	They were not cited because no specific consultations took place. Data is routinely extracted from DFO maintained databases.
	BIOLOGICAL ENVIRONMENT	
DFO-29	Section 5.1 (SARA Species), page 97: The fact that porbeagle shark is being considered for SARA listing should be acknowledged.	The porbeagle shark (*Lamna nasus*) is now under consideration for addition to Schedule 1 of SARA (http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=810).

DFO-30	Section 5.2 (Ecosystem), page 98+: The description of the marine ecosystem of the Study Area is overly simplistic and should be improved. There is a multitude of unutilized information and data available (i.e., Hibernia baseline studies) regarding the biophysical environment (including foodweb and foodweb dynamics) of the Grand Banks and the Northwest Atlantic. A comprehensive description of the Grand Banks ecosystem with consideration of ecosystem components should be provided. Further, the sweeping statement (page 98) 'The proposed exploration/delineation drilling program has no potential to cause effects at the ecosystem level and thus the discussion in the following sections is limited to only those key parts of the ecosystem that could be affected, albeit in very minor ways' is inappropriate prior to the effects assessment. Plus 'ecosystem level' should be defined.	The general description of the marine ecosystem of the Study Area followed the scoping document provided by the C-NLOPB. The 'sweeping statement' on page 98 can be considered removed from the document. Husky would be pleased to discuss with relevant DFO scientific staff an approach to wards characterizing the structure and function of the Grand Banks ecosystem that would lend itself to the context of environmental assessment.
DFO-31	Section 5.3.2, page 100: The reference to Husky (2000) for microzooplankton grazing on the Southeast Shoal is inaccurate and should be revisited. Microzooplankton and crustacean zooplankton should be clearly distinguished.	Paranjape (1990) in Husky (2000) reported the results of field experiments on microzooplankton herbivory conducted on the Grand Banks near the Southeast Shoal in 1984. Results indicated that microzooplankton grazed on whatever appropriately sized food was dominant in the water, and suggested that the microzooplankton could potentially contribute to the determination of species composition of phytoplankton communities. Microzooplankton are defined as phagotrophic organisms (i.e., those that feed by ingestion) that are less than 200 µm in length. The copepod-dominated crustacean zooplankton referred to in association with Dalley et al. (2001) are considerably larger.
DFO-32	Section 5.4, page 102: The discussion of Dalley et al. 2001 should provide the locations of the surveys undertaken.	The surveys discussed in Dalley et al. (2001) were conducted on the Newfoundland Shelf and Grand Banks. Parts of the surveys overlapped with the Study and Project Areas.
DFO-33	Section 5.5.5, page 111: Table 5.2; Considering the nature of the proposed project (i.e., benthic discharge of cuttings/muds), the depth distribution of wolffish eggs/larvae is important and should be included in the table.	Addition to Table 5.2 is completed.
DFO-34	Section 5.6.5, page 117: It is stated in the document that most of the domestic fish harvesting in the general area of the project is concentrated between the 100 and 1,000 m contour, while from the maps it appears that 100-200 m contour is more appropriate.	The author was including the catches indicated between the 200 m and 1,000 m isobaths in the northern part of NAFO Unit Area 3Li. However, it is noted that most of the catches nearest the Study and Project Areas were made at depths ranging between 100 and 200 m.
DFO-35	Section 5.6.6, page 119: The document indicates that the snow crab fishery within the Project Area is generally finished by the end of June. It should also be stated that the fisheries in the Study Area are likely to continue through August.	Figures 5.10 to 5.15 indicate that most of the domestic commercial harvesting in the vicinity of the Study and Project Areas during 2004 occurred between May and August.

DFO-36	Section 5.6.7 (Principal Species Fisheries): Because American plaice has been fished in the Project Area, this species should be addressed in this section and included in the assessment.	Catches from the American plaice stock that occurs in the Study Area were generally in the range of 40 000 to 50 000 tons per year throughout the 1970s and 1980s, before declining to low levels in the early 1990s. There has been no directed fishing on this stock since 1993.
	EFFECTS ASSESSMENT	
DFO-37	Section 6.1.3.1 (Temporal), page 169: It is understood that Year 1 (2005) of the multi-year delineation/exploration program is the focus of the assessment as EA updates are expected for subsequent years. However, as indicated in the project description, there may be up to a total of ten wells in the program which is to continue until 2007. The cumulative effects assessment should consider the entire program as well as other exploration activities within the Jeanne d'Arc Basin.	Using 500 m as the radius of the biological ZOI (potential smothering due to a minimum of 1 cm thickness of deposited cuttings and mud), the area of each well ZOI is approximately 0.785 km^2 or 78.5 hectares. It is generally accepted that the biological ZOI rarely extends beyond 500 m from an exploratory well (Buchanan et al. 2003; Hurley and Ellis 2004) If one considers a maximum of 15 delineation/exploration wells in this program, the total ZOI area is approximately 1,178 hectares. Based on data available from the C-NLOPB website, the areas of the Project and Study Areas are 45,890 hectares and 214,501 hectares, respectively. The calculated total ZOI area represents 2.6 % of the Project Area and 0.5% of the Study Area. There could potentially be some overlap of adjacent ZOIs but it is not possible to confirm this without known positions of all fifteen potential wells. It should be noted that the cumulative effects of multiple wells over multiple years is not an exercise in simple addition. This EA, and many others, have assumed that the effects form one well will be largely dissipated after one year. Duration of effects and time to recovery are important considerations under *CEAA*.
DFO-38	Section 6.1.3.2.2, page 170: It is stated that 'there are many affected areas or geographic extents defined in this EA', however this is not always the case nor are they clearly defined. VEC (and VEC components) affected areas/geographic extents should be provided where appropriate (i.e., discussion of magnitude evaluation criteria).	It should be noted that the magnitude ratings are ratings that place effects into perspective and not necessarily "hard" or precise measureable numbers. The ratings have been used in numerous east coast EAs, and while not perfect, appear to work reasonably well in satisfying CEAA requirements in a wide variety of situations.
DFO-39	For the purposes of assessing the effects of drilling the Study Area as defined in Figure 1.1 (p. 2) is appropriate. This is the official "Study Area". A Regional Area was defined for consistency with other previous EAs and to allow for the discussion of regional aspects on a very large scale.	For the purposes of assessing the effects of drilling the Study Area as defined in Figure 1.1 (p. 2) is appropriate. This is the official "Study Area". A Regional Area was defined for consistency with other previous EAs and to allow for the discussion of regional aspects on a very large scale.
DFO-40	Section 6.1.8, page 172: Application of Evaluation Criteria, under the definition of 'Magnitude', the definition of 'negligible' and 'low' overlap. For example, a 5% decline in abundance in the immediate vicinity of the array could be both 'negligible' and 'low' simultaneously.	So noted.

DFO-41	Section 6.3.1 (Drill Muds and Cuttings), page 177+: The biological zone of influence (ZOI) should be clearly defined.	The biological zone of influence is defined as the area around a well site where drill muds and cuttings accumulate up to a thickness of 1 cm. Evidence suggests that an area defined by a 500 m radius most often includes the zone of influence. Using the 500 m radius, the area of the biological ZOI is calculated to be 0.785 km^2, likely more than the actual area with up to 1 cm of drill cutting and mud. Drill cuttings and mud would not disperse evenly out from the well site.
DFO-42	Section 6.3.1 (Drill Muds and Cuttings), page 177+: The document states that the effects of exploratory drilling are well known, and that the primary concern is drill muds and cuttings (page 177). While it is agreed that drill muds and cuttings are the primary concern there remains high scientific uncertainty with respect to the persistence of physical and chemical states of mud and cuttings discharges (and associated biological effects) and dispersion on the Grand Banks. There also remains considerable scientific uncertainty regarding the implications of elevated body burdens for higher population, community or ecosystem level parameters (page 184).	So noted.
DFO-43	Section 6.3.1 (Drill Muds and Cuttings), page 177+: The White Rose EA/model predicted *a worst-case scenario of less then 1 km^2 around each well with a depth sufficient to result in smothering* (page 180) and the *biological 'zone of influence' (ZOI) confined within approximately 500 m of the drilling area* (page 177). The document indicates that the 2004 White Rose EEM program found elevated hydrocarbon and barium concentrations in the sediment extended to 5-8 km from the source and fines within 1 km of the source (page 178 and 197). It suggests that the monitoring data from other operators indicate the area of smothering to be less then predicted (page 180). The results of the White Rose EEM and other development programs monitoring programs should be presented in terms of ZOI for biological effects and smothering for comparison purposes.	In the 2004 Husky EEM (Husky 2005), few project-related biological effects were suggested with respect to benthic invertebrates and American plaice. Preliminary review of the results of the draft 2005 EEM (Husky 2006) again did not suggest much in terms of project-related biological effects although evidence of effects on benthic invertebrate communities was slightly stronger than in 2004. Polychaete and amphipod abundances were typically lower at stations closer to the well centres. However, these results only imply project-related effects. American plaice and snow crab collected near the development area were similar to those collected at Reference Areas in terms of morphometrics, metal and hydrocarbon body burden, taint and general health. As stated in the Husky EA (LGL 2005a), it is best to define the biological ZOI as the area around the well site where drill cuttings and mud deposition results in layers at least 1 cm thick. This amount of deposition would likely result in a smothering effect on the less mobile fauna. A 500 m distance from a well more than accounts for a biological ZOI.
DFO-44	Section 6.3.1 (Drill Muds and Cuttings), page 177+: Further to the above, while the White Rose development drilling was deemed to create no significant effect on fish and fish habitat, the monitoring program was designed to determine the extent and duration of effects on benthic animals and should be fully considered in the assessment of the current program.	See response to DFO-43

DFO-45	Section 6.4.1 (Plankton), page 183: It should be clearly stated that no produced waters will be released to the marine environment as indicated in Section 6.4.11 (Produced Fluids). In addition, further clarification is needed regarding the statement (page 184) 'the relatively high natural mortality of plankton' (i.e., density related, critical times/life stages, etc.).	Produced water will only occur if hydrocarbons are discovered and testing occurs. Husky's first preference will be to burn it through the flare. If this is not feasible, it will be brought ashore and handled by a certified third party waste handler. The statement on p. 184 refers to some of the difficulties of conducting laboratory toxicity studies on plankton and should be considered deleted.
DFO-46	Section 6.4.3, page 185: 'All effects assessment has been done in a conservative manner by evaluating the most sensitive species or groups and their most sensitive life stages when there is potential for effects'. It is unclear if the fish and fish habitat VEC effects assessment was based primarily on Atlantic cod or if other important species (i.e., snow crab) are included. Similar 'representative' species have not been identified for the commercial fishery, marine birds or marine mammals VECs. The relative importance of cod in the assessment of this VEC should be specified (see also Section 6.1.2.1, page 167).	Atlantic cod was selected as the representative fish/invert species in the effects assessment of routine drilling activities and accidental events on the fish/fish habitat VEC. This species has been studied more than other marine fish and invertebrates, particularly in Newfoundland, so it is a valid selection as the representative species.
DFO-47	Section 6.4.3, page 187, Table 6.6: Subsea structures should include and consider jack-up spud cans in the disruption of benthos.	So noted. As listed on p. 11, a spud can has an area of 243.1 m^2 at the base of the rig. Any effects of this are contained within the rig effects zone for cuttings discharge and the safety zone and will be not significant.
DFO-48	Section 6.4.3, page 191, Table 6.9: The geographic extent of contamination related to drilling muds/cuttings is likely greater than the geographic extent given (<1km^2).	Some tracer "metals" (e.g., barium) have been located farther than 1 km from a drilling rig. The geochemistry of marine sediments is highly complex and levels of metals are dependent upon many variables such as particle size, organic content, redox potential, site specific background levels, drill mud composition, cuttings make up, and many other factors. Also, the area affected by levels that appear elevated above background can have very complex shapes (e.g., many narrow branching tendrils). The overall area affected by elevated levels is likely <1 km^2 or possibly more but the main relevant point is that many studies support the conclusion that effects on biota are confined to within 500 m of the rig.
DFO-49	Section 6.4.4 (Presence of Structures), page 194: The discussion regarding the seabed components omit the fact that a jack-up rig may result in 729.3 m^2 (3 spud cans @ 243.1 m^2) of benthic habitat being altered/unavailable due to the placement of spud cans at each drill site. This is an important omission that must be rectified.	This area is contained within the rig-affected area of <1 km^2 and thus the inclusion does not change any of the conclusions of the EA.

DFO-50	Section 6.4.4, page 194: The potential for fish 'tainting' is not addressed nor the unavailability or changed nature of the benthos (i.e., food chain) in the vicinity of the drill rig. These are important considerations in discussions regarding safety zone fish refuge or reef effects. In relation to this, the statement to the effect that closed area will offer protection that may be offset by 'perception of negative effects on the health of biota in the immediate area' is not appropriate as benthic contamination and health effects may be more than perception.	Fish taint has been a large part of EEM programs on the Grand Banks over 10 years. To the best of our knowledge, there have been no reported cases of the tainting of fish resources. Furthermore, we are aware of no reports form other parts of the world such as the North Sea or the Gulf of Mexico where fish have become tainted by drill platforms. The reviewer is correct in stating that benthic food of fish will be affected, albeit in a very small area, by the change in bottom substrate. However, this will be offset by an increase in epifaunal food resources growing on the rig and being sloughed off the rig. This phenomenon is a characteristic of rigs (i.e., the "reef effect") and is well documented in the scientific literature.
DFO-51	Section 6.4.4 (Discharge of Drilling Muds and Cuttings) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: The document states, *the total quantity of mud and cuttings that would be deposited on the seabed would be on the order of 230 m^3 per well. This will cover an area of the seabed of about 0.8 km^2* (radius 500 m*) to a thickness of one centimeter or greater* (page 181 and page 196). The discussion of drilling discharges cumulative effects (page 199) indicated that *the cuttings discharge modeling for the Husky White Rose and Lewis Hill projects predicted deposition of cuttings (10-mm layer or greater) out to about a radius of 200 m from a rig for White Rose and 250 m from a rig at Lewis Hill resulting in about 0.1 to 0.2 km^2 of seabed could be affected by each well.* This confuses the above statement and for the purposes of this EA the smothering area is assumed to be 0. 8 km^2 with ZOI radius of 500 m for each well. The discussion of drilling discharges cumulative effects should include within project predictions including 10 wells in study area in 3 years. Based upon this "worst case scenario' (10 wells at 0.8 km^2 each), 8 km^2 of benthic habitat could be affected by drill cuttings/muds. The cuttings deposition related to the development projects in the area as well as any other predicted exploration drilling in the Basin for the next 3 years should be included in the cumulative effects assessment of drill cuttings/mud.	See response to Comment DFO-37. It should be noted that the cumulative effects of multiple wells over multiple years is not an exercise in simple addition. This EA, and many others, have assumed that the effects form one well will be largely dissipated after one year. Duration of effects and time to recovery are important considerations under *CEAA*.
DFO-52	Section 6.4.4 (Presence of Structures) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: In which case SBM are used more then anticipated, a taint and hydrocarbon accumulation testing program may be recommended to ensure that fisheries resource (i.e., American plaice, Snow crab) quality is maintained.	Fish taint has been a large part of EEM programs on the Grand Banks over 10 years. To the best of our knowledge, there have been no reported cases of the tainting of fish resources. Furthermore, we are aware of no reports form other parts of the world such as the North Sea or the Gulf of Mexico where fish have become tainted by drill platforms.

DFO-53	Section 6.4.4 (Presence of Structures) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: The statements to the effect that exploratory drilling for one well would be well below the worst case scenario used for the White Rose EA may not be justified as the White Rose model predicted an area of less then 1 km^2 for each well. These values are not that different.	It should be noted that the cumulative effects of multiple wells over multiple years is not an exercise in simple addition. This EA, and many others, have assumed that the effects form one well will be large dissipated after one year. Duration of effects and time to recovery are important considerations under *CEAA*. See response to Comment DFO-37.
DFO-54	Section 6.4.4 (Presence of Structures) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: The specific chemical formulation of drilling muds should be provided.	The formulations have already been provided for the C-NLOPB.
DFO-55	Section 6.4.4 (Presence of Structures) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: The area of seabed covered as a result of installation of the conductor and surface well is not provided. The expected radius of the cuttings 'pile' related to the installation of the conductor and surface well section should be provided.	The expected radius of the cuttings 'pile' related to the installation of the conductor and surface well is < $10m^2$.
DFO-56	Section 6.4.4 (Presence of Structures) and Section 6.4.5 (Discharge of Drilling Muds and Cuttings), Page 196+: Page 197: As presented, the results of the Lorax (2002) study are unclear. The Mar. - Aug. simulation results are said to be similar to the Mar. – Apr. simulation. however, Mar. – Aug. indicates most material being deposited within 250 m radius with maximum mean thickness less then 1 cm within a very small radius of the well. The Mar. – Apr. showed coarse material within a radius of 250 m with maximum thickness of ~ 1 cm within a 25 m radius. The results of this study should be clarified.	We are unclear as to the intent of this comment We suggest that the results of the 2004 and 2005 EEM programs might be relevant here.
DFO-57	Section 6.4.6, page 200: The potential discharge of approximately 33 t (26.4 m^3) of excess cement to the marine environment should be further discussed in relation to potential benthic impacts and combination with other project activities (smothering, cuttings, jack-up footprint, etc.).	The cement will smother a small area of infaunal benthos and create a small area of habitat for epifaunal benthos. Epifaunal benthos is more productive than infaunal benthos. In any event, the key point is that any effects from cement will be well within the other areas of rig effects.
DFO-58	Section 6.4.1.6 (Effects Assessment on Commercial Fisheries), page 210, Table 6.13: It is not clear if alteration of benthic prey composition and availability is included in the effects assessment of drilling muds/cuttings.	This was included in the consideration of the fish habitat
DFO-59	Section 6.4.16.2, page 218: Coordination between offshore oil and gas operators and a DFO liaison has proved to successfully mitigate the potential for overlap between offshore oil and gas activities and DFO research surveys. DFO-NL Region requests that the operator notify the department of wellsite locations once they are known.	So noted.

DFO-60	Section 6.4.18.1.7, page 240: The possibility of ship strikes should be included in the discussion regarding supply vessels.	Ship strikes of marine mammals do not appear to be a problem on the Grand Banks as there have been few reported cases (J. Lawson, research scientist, DFO, pers. comm.). To our knowledge this has only happened once with respect to Husky operations as reported on the Husky White Rose public website when there was evidence of a collision with a marine mammal. The primary problem species on the East Coast of Canada in this regard appears to be the North Atlantic right whale which typically does not occur on the Grand Banks.
DFO-61	Section 6.4.18.1.9, page 243: It is predicted that given the distance between the project and other activities (distance not specified), any effects of exploratory drilling will be additive not synergistic. While the within project and between existing projects significance is presented, the significance of other exploration activities (Husky seismic and wellsite, Petro Canada and HMDC wells sites, etc.) within the Basin is not. This should be determined.	The response to Comment DFO-37 explains the quantitative approach to the within project cumulative effects of drill cuttings and mud deposition on the bottom as a result of drilling. Cumulative effects that include activities outside of this specific project are dealt with in a more qualitative way in the text of the update.
DFO-62	Section 6.4.18.2, page 245, Table 6.20: The subsea structures category should consider placement of a jack-up on benthos. It is not clear what is meant by *effects on health (N)* under drilling mud/cuttings (limited benthos food, contamination, etc.) and it is unclear why the potential effects of cement is different then mud/cuttings (contamination vs. effects on health).	The potential adverse effect of both drill mud/cuttings and cement should be the same.
	ACCIDENTAL SPILLS	
DFO-63	Section 7.3.2, page 271: Spill trajectory figures should be presented in the document rather then the reader being referred to another document (i.e., there is discussion re figure details but the actual figures are not provided). Similarly, the discussion re accidental release and the harp seal pupping/breeding (whelping) front (page 305) should be more specific re distances and figures provided for both.	Providing the citation to a document where data are referenced is a common practice. To include the modeling results from the White Rose EIS in the present EA would be redundant. The White Rose EIS is publicly available (see Husky Energy's website: www.huskyenergy.ca). As indicated in the EA, it is unlikely that oil will reach the Front where harp seals congregate to give birth and breed, especially considering that oil accidentally released in Jeanne d'Arc Basin will under almost all modeled spill scenarios move primarily to the east (with reduced probability of movement to the southeast and northeast) away from the Front. In average years, the ice edge extends no nearer than several hundred kilometers to the north of Jeanne d'Arc Basin and then for only several months of the year. In years of heaviest ice, pack ice extends southwards as far as the Jeanne d'Arc Basin but only for a few weeks. Seals are less common on deteriorating southern extremities of the ice edge than they are farther north at the Front where pupping and breeding typically occur. Few seals are expected to be exposed to oil from an accidental release at Jeanne d'Arc Basin.
DFO-64	Spill trajectory work undertaken for White Rose (and Hibernia and Terra Nova) is heavily relied upon, however, there are other models of the ocean circulation of the Northwest Atlantic and Grand Banks available (i.e., Charles Tang (DFO-NS, BIO), Guoqi Han (DFO-NL, NWAFC), and up in coming Fraser Davidson (DFO-NL, NWAFC) NOOFS model).	So noted.

DFO-65	Section 7.7.1 (Effects on Fish and Fish Habitat): The possible formation and effects of 'tar balls' should be included in the discussion.	So noted.
DFO-66	Section 7.7.1.1.2 (Eggs and Larvae), page 282+: Due to the importance of currents to the drift patterns of eggs and larvae, a brief discussion of the predominant currents and expected transport of fish eggs larvae should be provided.	As the Husky EA states in Section 4.3.2, water currents on the shelf edge in the vicinity of the Study Area can be generated by several different mechanisms, including wind, tides, meandering and eddy formation in the Labrador Current, and the propagation of continental shelf waves generated upstream by distant storms. The currents in the Study Area are extremely variable and complicated. The EA analyzed data from moored current meters proximate to the Study Area for the period 1984-2002 to assess the characteristics of marine currents in the immediate vicinity of the Study Area. Rose plots were presented to show at a glance the most probable direction the current would follow. The rose plots clearly demonstrate the spatial and temporal variability associated with currents in the Study Area. Lack of understanding of the local currents make a discussion on fish eggs and larvae in the area difficult at best.
DFO-67	Section 7.7.4, page 299: The effects of the heavy Grand Banks oil in terms of external oiling (i.e. thermoregulation), ingestion, inhalation and fouling of baleen should be discussed.	These potential effects were discussed in Section 7.7.4 of the Husky EA (LGL 2005a).

EC Comments on Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area Environmental Assessment

COMMENT ID	COMMENT	RESPONSE
EC-1	Additional Comments The maximum number of wells that could be drilled as part of proposed activities (i.e., 10) should be clearly stated in the *Introduction*, as well as in the *Executive Summary*.	So noted
EC-2	The labeling of latitude lines on the right side of *Figure 1.1: Locations of Project Area and Study Area* seems incorrect (i.e., 47W and 48W?).	So noted
EC-3	Consideration of Pollution Prevention (Alternative Means of Carrying out the Project): The *Offshore Waste Treatment Guidelines* (NEB et al., 2002) place an onus on operators to review and implement pollution prevention measures that minimize waste generation and discharge. Consideration of pollution prevention measures has important implications for the nature and extent of environmental impacts from offshore activities. Nonetheless, the discussion of pollution prevention opportunities is limited in the EA. Similarly, consideration of alternative means of carrying out the project is essentially restricted to a brief paragraph on rig type and a sentence on the use of vertical wells (p. 10). Examples of pollution prevention opportunities which could be considered in revisions to the EA include the following: • opportunities to recover water-based mud as opposed to a bulk release at the end of the well; • alternative means of managing synthetic-based muds such as measures that reduce drilling mud volumes, reduce or substitute the toxic constituents of drilling muds, and other means of managing the resulting waste (e.g., re-injection of cuttings, transport to shore) recognizing that technology is being developed to remove oil from cuttings); • substitute drilling additives; and; • options related to the length and/or diameter of the surface-hole section.	The Project will use equipment and procedures that are more or less standard across many jurisdictions. Modern drilling practices have evolved to include many mitigations as standard procedure. These are detailed in Husky's various management plans for waste management and emergency response. At present, the bulk release of essentially non-toxic WBM is not an unusual practice on the Grand Banks and acceptable under the *OWTG* when recovery and shipping to shore is not practicable. Husky is constantly assessing the available SBM selections and cuttings treatment methods. It should be noted that any drilling additives that are discharged offshore are vetted under the *Offshore Chemical Selection Guidelines*. Waste SBM is brought to shore to be recycled and reused. There are no realistic options related to the hole characteristics. These are determined by the drilling manager based upon safety and availability concerns. Husky constantly reviews its operations to seek safe and cost effective ways to reduce discharges associated with it drilling programs. Husky's East Coast drilling team has developed and implemented a total fluids management plan aimed at managing its drilling fluids. This plan involves reusing and recycling drill muds and their weighing constituents and where ever possible re using those constituents (i.e., barite and bentonite). A recent example of discharge reduction was the use of a guar gum viscosifier for drilling top holes that allows us to eliminate the use of 100,000 kg of barite and 60,000 kg of bentonite that would otherwise have been discharged to the ocean during drilling top hole prior to placing casing.
EC-4	Conservation should be recognized as another alternative to the project. (p. 7)	Conservation is a policy alternative, not a project alternative.

EC-5	Air Emissions In general, there is little consideration of air emissions and the associated environmental effects. There is no consideration of how air emissions from the proposed drilling program could interact with emissions from other multiple projects in the study area and beyond. The EA does not estimate emissions from proposed activities, with the exception of evaporation rates for blowouts. While some qualitative discussion of emissions from flaring during well testing has been provided, the potential to reduce these or other emissions has not been considered. Overall, the potential for effects on air quality is dismissed in the EA as negligible, but no data on background contaminant levels or expected emissions are provided to substantiate this claim. The following comments are offered to help the CNLOPB direct the proponent in preparing a substantive accounting of air emissions, and a reasonable assessment of potential environmental effects and necessary mitigation and follow-up monitoring measures: • Emissions from other activities in the region should be recognized in the EA (p. 23). It is recommended that emissions data from other projects be provided, wherever possible (e.g., National Pollutant Release Inventory data from White Rose/Hibernia). The discussion of emissions should recognize the project's contribution to regional emissions and to cumulative effects.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
	PHYSICAL ENVIRONMENT	
EC-6	Climate Section 4.2 of the EA references the two datasets – COADS and AES40. o The reference to COADS should be changed to ICOADS (International Comprehensive Ocean Atmosphere Data Set). o References should be given for both datasets. o The reanalysis winds used in the AES40 dataset are referred to as NCAR/NCEP global reanalysis wind fields. This is usually written as NCEP-NCAR.	The marine weather and sea state observations were purchased from the Meteorological Service of Canada. The data used in the report was extracted from the Comprehensive Ocean-Atmosphere Data Set (COADS) and not the International Comprehensive Ocean – Atmosphere Data Set (ICOADS). The reference should remain unchanged. Both forms of the name appear to be incorrect. The web site refers to the reanalysis winds as the NCEP/NCAR Reanalysis Project. This is consistent with the label on the data disc.
EC-7	Wind Climate *Section 4.2.1: Wind Climatology* should be labelled as "Wind and Wave Climatology", as it also refers to wave climate.	Should be the "Wind and Wave Climatology".

EC-8	The EA states that the wind climatology for the AES40 grid points is for a wind 10 metres above the surface. It should also indicate that the winds are a 1-hour mean value.	This is a valid comment. The description should have stated that the winds were 1-hour mean values.
EC-9	In text discussing *Table 4.2*, it should be clarified that "maximum wind" refers to the maximum 1-hour sustained wind, rather than a gust value. In addition, the factor to convert a maximum 1-hour sustained wind value to a maximum 10-minute sustained wind value should be provided. A typical factor is 1.06 (note: this is the value used in *Section 4.4*). In general, most land and marine observations are provided for an averaging interval of 10 minutes or less.	This is a valid comment. The wind speeds are all for 1-hour mean values. The values for "maximum wind" would represent 1-hour sustained wind.
EC-10	Values in *Table 4.3: Percentage Occurrence of Wind Speed by Direction for all Months and All Year* are given to the nearest 100^{th} (m/s) (i.e., to two significant figures). It is recommended that values in the table be presented with three significant figures, as there are several occurrences of "0.00", which would be non-zero values if presented to the nearest 1000^{th} (m/s). Equivalent changes are recommended for Tables 4.4, 4.7, and 4.9 (i.e., sufficient digits should be presented to show at least one non-zero digit for each value).	No changes should be made. The software output is to 2 significant figures. The occurrences of "0.00" are actually zero values.
EC-11	The text describing Figures 4.3 and 4.4 defines gale force winds as those "between 34 to less than 48 knots (17.5 m/s – 24.7 m/s)" and storm force wind as those at 48 knots (24.7 m/s) or more. While the definitions are correct, it is misleading to present the definitions in conjunction with one-hour mean wind values in the figures. The gale and storm force wind thresholds of 34 and 48 knots (17.5 and 24.7 m/s) apply to 10-minute mean winds at 10 metres, not one-hour mean winds at 10 metres. Gale and storm force winds would occur more frequently than indicated in the tables and figures. If a conversion factor of 1.06 is employed, then the one-hour mean, 10 metre wind thresholds for gale and storm force winds would be 32 and 45 knots, respectively (16.5 and 23.3 m/s).	Remove the sentence on page 32 "Gale and storm force windspeed limits are also shown on the plots". The next sentence should read "Winds are classified as gale force between 34 to less than 48 knots (17.5 m/s – 24.7 m/s) and storm force when the wind speed is 48 knots (24.7 m/s) or more for 10-minute averaged winds. The data in Figure 4.3 and 4.4 are hourly mean values.
EC-12	Wave Climate In describing the spectral peak wave period statistics (based on AES40 model output), the EA should note that 3-G wave models, such as that used in AES40, have a slight low bias in peak period, compared to measurements (Section 4.2.1.2).	The last paragraph on page 34 could be extended to read: Since the spectral peak periods are hindcast values, they may be slightly low biased because Cardone et al. (1995) found a mean negative error of about 0.4 seconds in peak periods between hindcast and measured values from a study carried out off the U.S East Coast. Cardone et al. (2002) attributed the low bias to being a characteristic of 3-G wave models.

EC-13	Extremes The word "extreme" should be replaced with "extremal" in the title *Wind and Wave Extreme Analysis* (p. 78).	The title should be changed to "Wind and Wave Extreme Value Analysis" or "Wind and Wave Extremal Analysis".
EC-14	The reference to NCEP-CSAR should be corrected to read NCEP-NCAR (p. 78).	Should be NCEP/NCAR.
EC-15	The sentence "The hindcast wind fields closely resembled the waves measured at offshore buoys and observations from offshore platforms, thus validating the data set" (p. 78) appears to be missing a phrase. Was this meant to read "The hindcast wind fields gave modelled waves that closely resembled the waves measured at offshore buoys and observations from offshore platforms, thus validating the data set"?	The phrase should be changed to read as suggested by the reviewer: "The hindcast wind fields gave modelled waves that closely resembled the waves measured at offshore buoys and observations from offshore platforms, thus validating the data set."
EC-16	The EA correctly describes the differences between 1-hour, 10-minute, and 1-minute mean winds (*Section 4.4.1.1 Extreme Value Estimates for Winds from a Gumbel Distribution*). The EA should provide references for the conversion factors used. When referring to 100-year-, 10-year-, 1-year wind speeds, the phrase "return period" should be repeated each time, to avoid confusion with the averaging interval. The sentence summarizing the different return period extreme winds should specify that the values refer to the 1-hour sustained winds. The discussion should also state that these winds are at a 10 metre measurement height, and winds would be higher at the level of platform topsides. It is recommended that typical adjustment factors using a logarithmic profile and heights appropriate for the two types of rigs be provided, along with corresponding extreme wind speeds at those heights. The title for *Table 4.17: Extreme Wind Estimates for Return Periods of 1, 10, 25, 50 and 100 Year* could also include the phrase "for Winds Corresponding to Different Measurement Averaging Periods, at 10 m Height"	The reference for the conversion factors is "U.S. Geological Survey, (1979). It is not common usage to use the phrase "return period" each time when referring to a 100-year wave, etc. Section 4.4.1.1 does state that the wind speeds are 1-hour mean values. The previous section states that the winds are for 10-metre reference level. It could be stated that the winds would be higher at the level of platform topsides. However that information is well understood by the client. A logarithmic profile to adjust from 10-metres to a greater height depends on the condition of neutral stability. Neutral stability rarely occurs on the Grand Banks. Plus, during the stage of maximum wind speeds during a storm, the atmosphere is highly unstable. The method suggested by the reviewer is not scientifically valid. The common adjustment method is to use a stability dependent wind speed adjustment model in the surface boundary layer. The model depends on knowing the difference in sea temperature and air temperature at a known height. This information is not included in the AES-40 data base. Table 4.17 could be re-labelled to include more information.
EC-17	Figure 4.26 appears to be mislabeled (p. 79). The caption states "Correlation Coefficient for Significant Wave Height Using a Gumbel Distribution"; however, the title of the figure states "Variation of 100-Year Extreme Waves with # of Storms". The y-axis shows 100-year extremes (m), while the x-axis is shows the number of storms. The text referring to Figure 4.26 in Section 4.4.1 is also inconsistent with the title, as it states that Figure 4.26 is a plot of the correlation coefficient versus the number of storms.	We appreciate the comment that the wrong plot from a variety of analysis plots was accidentally inserted. The correct plot is attached. **

EC-18	The text inadequately describes *Figure 4.27: Distribution Fits for Wind Data using the 245 Storms* - it should describe the three distributions showed in the figure (i.e., Gumbel, Borgman, and Weibull).	Section 4.4.1.states that the Gumbel Distribution was chosen rather than the Borgman or Weibull because it had the best distribution fit to the data. Figure 4.2.7 shows the higher correlation coefficient for Gumbel. The other two distribution fits are included for reference only.
EC-19	The description of how the maximum wave heights are determined is not clear (Table 4.18). A typical ratio such as 1.8 of maximum individual wave height to significant wave height is often used to estimate the maximum wave height. However, it is not clear whether this ratio was used in the EA.	Section 4.4.1.2 could include the following section: "The maximum individual wave heights were calculated from wave spectrum by Oceanweather's software. The OSMOSIS software user manual states that the method involves evaluation of the Borgman (1973) integral. $$\Pr(H \le h) = \exp \int_{t_a}^{t_b} \log\left[1 - e^{h^2/a^2(t)}\right] \frac{dt}{T(t)}$$ where H is the largest wave height; a^2 is the mean square height taken as a function of time, t; t_a and t_b are the beginning and end times of the storm; and T(t) is the wave period, taken here as the significant wave period. This integral is based on a Rayleigh distribution function. Oceanweather's program uses a variant of this equation to calculate maximum individual wave height and has the following form $$\Pr\{H > h\} = \exp\left[-1.08311\left(\frac{h^2}{8M_0}\right)^{1.063}\right] \text{ (Forristal)}$$ $$; T = \frac{M_0}{M_1}$$ Where M_0 and M_1 are the first and second spectral moments of the total spectrum.
EC-20	Previous EAs for the Jeanne d'Arc Basin have provided various values of 100 year return period significant wave heights. It would be helpful to describe in revisions to the EA some of the earlier values (in conjunction with associated references) and discuss reasons for differences between the earlier- and current EAs.	The study has higher wind and wave extreme values than previously calculated for White Rose. The higher values are the result of the extended data base which includes the two unusually severe storms which occurred during the Winter of 2003. Previous work took place before 2003.

EC-21	*Ice and Icebergs* While the description of sea ice and icebergs is the same as that presented in the EA for the "Northern Jeanne D'Arc Basin Seismic Program", EC's comments on the earlier document have not been addressed and are therefore reiterated here. In addition, several further comments are offered for consideration in revising the discussion of ice and icebergs. The project is located at the entrance of an iceberg alley and the presence of icebergs should thus be the principal consideration. Ice islands have been observed in the project area in recent years. The EA addresses the above points and it generally demonstrates a good knowledge of the sea ice and iceberg situation in the project area.	Husky Energy has a deep understanding of the ice environment around the White Rose location, having collected extensive data over the past 20 years and commissioned numerous studies into ice distributions. Husky, in conjunction with other offshore oil and gas operators, has in place an approved Ice Management Plan and an Ice Forecasting process that govern its operations during the ice season.
EC-22	The EA provides detailed information on sea ice and icebergs in the project area. In some cases, exact numbers have not been verified, but there is agreement with the general concepts.	Husky Energy has a deep understanding of the ice environment around the White Rose location, having collected extensive data over the past 20 years and commissioned numerous studies into ice distributions. Husky, in conjunction with other offshore oil and gas operators, has in place an approved Ice Management Plan and an Ice Forecasting process that govern its operations during the ice season.
EC-23	Tables in *Section 4.5: Ice and Icebergs* report on both "maximums" and "extremes". Typically, the term "maximum" is used to refer to a specific year, while the term "extreme" represents the absolute maximum over all years. It is not clear how these terms have been defined in the EA.	The context in which maximum and extreme are used in this report are as follows: Maximums refer to the largest measured or documented events while the term extreme is applied to either the upper range of a category or the largest calculated event possible. For example: floe size a small floe has a range of 20-100m while the maximum observed or measured may 40m we assume the extreme would be 100m.
EC-24	*Section 4.5.1.3: Sea Ice Floe Size* refers to "AES composite ice chart data for 1964 to 1998". This should be changed to the Meteorological Service of Canada's or to the Canadian Ice Service's regional ice chart data. Should the period read 1968 to 1998?	*Section 4.5.1.3: Sea Ice Floe Size* refers to "AES composite ice chart data for 1964 to 1998". To be changed to: Canadian Ice Service's regional ice chart data. In this case we used a dataset that extended from 1964.
EC-25	The EA reads "… the number of icebergs reaching the Grand Banks each year varied from a low of zero in 1966 to a high of 2,202 in 1984, with the average over the last ten years being around 900 icebergs" (p. 92). What is the "last ten year" period (e.g., 1991-2000)? The last 10 years of International Ice Patrol data (1995-2004) shows an average of about 750 icebergs per year. 900 icebergs is the mean between 1994 and 2003.	Data on the mean number of icebergs is derived from the PAL dataset. There are several discrepancies between these two data sets that are documented in database descriptions. As the PAL data was collected primarily for the offshore oil and gas industry it is thought that those data more accurately reflect the actual conditions on the grand Banks.

EC-26	What is meant by "two blocks of data" as referenced in *Section 4.5.2.1: Iceberg Distribution* (p. 92)?	A block is considered to be an area defined by one degree of Latitude by one degree of longitude. Because the White Rose field is located very close to the northern boarder of the 46:00N – 47:00N block we considered iceberg distributions in that and adjacent block of 47:00N- 48:00N.
EC-27	The EA states that the average yearly number of sighted icebergs is 88. While this number has not been verified, a larger portion of the 900 icebergs crossing 48N would be expected to pass through the area.	The number of icebergs crossing 48N refers to those sighted along the entire line. Many of those icebergs are located in areas that do not funnel down into the White Rose area. The number of 88, reflects the total number of sightings that were made within the area of White Rose.
EC-28	The EA refers first to PAL data from a period of 1989 to 2004 (p. 93), and then to the same data as being from a period of 1989 to 2001 (*Figure 4.31*). Data references should be consistent.	The figure reference at the bottom of the graphic will be changed to state: *Source:* PAL Iceberg Sighting Database 1989 – 2004.
EC-29	It is noted that table legends in the EA still refer to the Seismic Operations Area from the previous EA. Legends should be edited to reflect the proposed drilling project area.	So noted
EC-30	*Figure 4.30: Mean and Composite Maximum Sea Ice Distribution* is from an older Canadian Ice Service preliminary product, which uses data from 1968 to 1998. Official atlas products are now available for the period of 1971 to 2000 and can be accessed from the following website www.ice.ec.gc.ca/App/WsvPageDsp.cfm?ID=11705&LnId=20&Lang=eng.	Figure replaced. See replacement figure at end of comments.
EC-31	The EA states that ice islands are rare events and "because of their very large size detection is not an issue" (p. 94). It is noted that it is the management aspect of ice islands that can be an issue.	There are presently several initiatives underway to address the management of Ice Islands, these include early detection, tracking, and management techniques. This program is documented in the 2004, Integrated Ice Management Initiative undertaken by C-Core. Results of that program are waiting on suitable target Ice Islands for verification.
EC-32	The EA references a 1988 study conducted by Seaconsult (p. 95). While the reviewer was not familiar with the details of this study, it is unclear to which area the statement the "mean drift of less than 0.4 m/s regardless of water depth" applies. The White Rose project lies in deeper water closer to the iceberg alley, which is the source of the faster water currents in the area. Although the extreme speed is quoted, one wonders if the mean speed stated in the study truly reflects those in the White Rose area.	The 1,370 measured iceberg drift speeds over the 200 ice season showed no significant difference in drift speed of icebergs in the area of White Rose when compared to those around the Terra Nova or Hibernia fields. These data seem to confirm previous studies including the 1988 Seaconsult.

EC-33	Section 5.7 *Migratory Birds* In general, the report accurately describes migratory bird resources present on the Grand Banks throughout the year. Some of the information on seabird breeding population sizes provided is slightly out of date, so a list of updated references is provided below. However, the general size and relative importance of these colonies has not changed greatly, so the wording of the text is generally appropriate.	Refer to Table EC-33 for updated information.
EC-34	Section 5.7.3. – Ivory Gulls There has been quite a lot of interest in recent years on the status of Ivory Gull. Populations in the eastern Canadian Arctic have apparently declined (Gilchrist and Mallory 2005), and a revised status report has been sent to COSEWIC. The Canadian population size could be as low as 500 breeding individuals. The world population is also thought to be less than the 35,000 quoted in Haney and MacDonald 1995). Quoted from the revised Status Report "The global population of Ivory Gulls has been estimated at around 14,000 breeding pairs (Volkov & de Korte 1996). However, this figure incorrectly included 2,400 *pairs* estimated to be breeding in Canada in the 1980s, when the original estimate was in fact 2,400 *individuals* (1,200 pairs; Thomas & MacDonald 1987). This global estimate also admittedly included a likely over-optimistic estimate for the Russian population (~10,000 pairs; Volkov & de Korte 1996)."	References noted. Gilchrist and Mallory (2005) quote a revised global population of <14, 000 breeding pairs of Ivory Gulls. 2002 and 2003 surveys of historic breeding sites in the Canadian Arctic showed an 80% decline in the numbers of nesting Ivory Gulls. Changes to the breeding environment have been insignificant. Causes for the decline are likely related to factors occurring during migration or on wintering grounds. Ivory Gull is currently listed as a Species of Special Concern on Schedule 1 of SARA. COSEWIC will be re-evaluating the status of Ivory Gull in May 2006.
EC-35	*Section 6.1.2.8: Other Issues* states that air quality "may affect water quality and animal and human health, albeit in very minor ways" (p. 169). A discussion of these possible effects should be provided in the EA in conjunction with the rationale for why these effects would be considered minor (e.g., limited exposure? lack of receptors?).	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.

EC-36	As described in the EA, criteria for determining the negative environmental effects of project activities outlined in Canadian Environmental Assessment Agency guidance include (1) negative effects on human health and well-being and (2) discharge of persistent and/or toxic chemicals (p. 171). The discharge of air pollutants could contribute to the occurrence of either of these interactions, especially if hazardous air pollutants are emitted. It is therefore recommended that all discharges of hazardous air pollutants that could result from project activities be documented and assessed (e.g., hazardous air pollutants could occur as a result of the incomplete combustion of hydrocarbons). A consideration of the persistence of hazardous air pollutants in the environment and their ability to bioaccumulate in living organisms will be important to the analysis.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-37	The EA defines a "low" impact as one affecting between one and 10 percent of individuals in an affected area (p. 172). Although this definition has been used in previous EAs, it is worth noting that numerous individuals could potentially be impacted by a project and it would constitute only a "low" effect. In this case, definitions may not accurately describe the corresponding magnitude of impact.	It should be noted that the ratings in the assessment tables are relative ratings only and not truly quantitative. Also, the magnitude ratings are also based on a geographic factor as well as a percent factor (see p. 172).
EC-38	The EA compares the proposed project to the multi-well White Rose development, stating that proposed activities would have comparatively smaller impacts given that they involve only a single well (e.g., p. 198). It should be clear throughout the EA that proposed activities do not involve a single well, but rather could involve the drilling of up to 10 wells. While the project remains smaller than the White Rose development, it is important that the actual magnitude of project activities be assessed.	So noted
EC-39	The EA states that re-injection is not possible for a single exploration well using existing drilling units on East Coast (p. 177). Again, it should be clear that from the EA that this is a multi-well project, proposed in an area already subject to considerable petroleum activities.	So noted, however, Husky put considerable effort into the feasibility, costs and benefits of reinjection and similar mitigations for drill cuttings discharges over the course of the White Rose Comprehensive Study. The results of this work, which did not support reinjection or other mitigations, were accepted at that time and nothing has changed in the interim that would suggest that this issue needs to be re-evaluated in this context.
EC-40	The EA defines a significant effect as an impact with "a high magnitude or medium magnitude for a duration of greater than one year and over a geographic extent greater than 100 km^2" (p. 174) (i.e., at least 10 percent of individuals in an area greater than 100 km^2 must be impacted by the project). It is noted that by application of this definition, many individuals could be impacted by a project and the impact would still be deemed to be "insignificant".	Yes, but the magnitude definitions are quite conservative given their geographic extent factors as well. These definitions, or equivalent versions, have been used in many previous east coast EAs.

EC-41	Effects of the Environment on the Project The EA does not describe the effect of ice accretion on operations. Ice accretion can occur on helicopters, vessels and structures, as a result of freezing spray and freezing precipitation, and should be considered in revisions to the EA.	Freezing precipitation in the Newfoundland and Labrador area is most likely to occur from March to April (Petro-Canada 1996). Accumulations of ice on structures may be due to precipitation, condensation or sea spray and are highly related to air temperature, wind speed, diameter of surfaces, and other factors. Icing conditions in on the nose of the Grand Banks may not be as severe a closer inshore but in any event, the Husky will manage risk through forecasting, close monitoring of conditions, and adherence to documented and proven safety procedures. Ice accumulations (superstructure icing) may cause delays while operations are slowed or suspended and ice accumulation is avoided or removed. Any delays are not anticipated to be significant.
EC-42	Wind and Waves Considerable effort has gone into describing wind and wave climate (including extremes) in the EA. The authors have gone beyond the available AES40 extremal analysis of the top 50 events to include the top 245 storms. They have provided an extremal analysis of wind speed for 1-hour, 10-minute and 1-minute means (Table 4.17), and conducted a detailed analysis of the joint frequency distributions of extreme significant wave height and peak wave period. Nonetheless, there is no indication in the EA of how these extreme wind and wave conditions might affect the drill rigs under consideration, or of how this information might be used to mitigate the potential for effects (i.e., the EA states that extreme events would affect the project, but it does not say how this could occur). Similarly, there is no discussion of the probability of spills or other accidents that could be caused by extreme winds, waves, or currents. It is recommended that revisions to the EA provide additional rationale in concluding that the effects of the environment on the Project are expected to be *not significant*.	Additional information is contained in the Application to Drill a Well (ADW) and Husky's management plans for safety and emergency response.
EC-43	It is recommended that information on well plugging techniques be provided in the EA. In addition, the report could describe how the integrity of well plugs will be monitored.	Well plugging techniques are described in the ADW and are subject to C-NLOPB approval in that context.
EC-44	The EA should clarify how long each flaring episode during well testing could last (p. 176). What is the expected emission rate per day from flaring and what would be the maximum amount of emissions produced? What is the expected composition of the flare based on previous operations in the area?	These circumstances vary from well test to well test. Well testing is only undertaken at need or at the requirement of the C-NLOPB and is best managed by flaring only when needed and only to the extent needed to determine well flow parameters.

EC-45	Although the EA states that flaring activities will be kept to a minimum; it should also be clarified whether flaring equipment is designed to minimize emissions.	Flaring from well tests is indeed minimized and is a necessary safety function. The primary environmental focus during these tests is to prevent or minimize the loss of hydrocarbons to the ocean and equipment and procedures are optimized for that objective.
EC-46	*Chemical Selection and Use* The EA states that an offshore chemical management system will be in place (p. 202) and that chemicals will be screened according to Offshore Chemical Guidelines (NEB *et al*., 1999), but provides no further information on the matter. *Offshore Waste Treatment Guidelines* state that "a chemical substances that "passes" (the chemical selection) process is not necessarily automatically accepted for discharge" (p. 3). In addition, *Offshore Waste Treatment Guidelines* also require "operators to evaluate chemical substances used in their operations to ensure that those used are the most environmentally appropriate" (p. 3). Given the need to understand and communicate the environmental risks associated with the project, and how those risks will be managed, it is recommended that the EA include a description of the types of chemicals that could be employed during various project implementation phases (e.g., drilling, well testing, well completion). How will the proponent demonstrate that the most environmentally appropriate chemicals have been selected? Identification of chemicals by common name and Chemical Abstracts Service (CAS) number would allow EC to fulfill its role as an expert federal authority. With this information in hand, EC will be in a position to help the CNLOPB in the assessment of environmental effects that could result from chemical releases and help the CNLOPB ensure that appropriate mitigation and follow-up measures related to protection of the environment are identified and put in place.	All chemicals that may discharged offshore are screened using the *Offshore Chemical Selection Guidelines* (NEB et al. 1999). This screening is a rigorous procedure consisting of 13 steps whereby each chemical is evaluated for its performance, cost, efficacy, applicability of other legislation, guidelines, or international agreements, hazards to humans, potential for tainting fish tissue, toxicity, discharge quantity, and hazard to the environment. The purpose of the process is to ensure that chemicals with the least hazard to the environment are selected. The screening must be documented and is subject to audit by the regulators. As stated in the original environmental assessment Husky screens it drilling chemicals that are discharged to the environment in accordance with established guidelines developed by the offshore petroleum boards in consultation with other federal agencies and the industry. Records of this selection process are maintained and routinely audited by the C-NLOPB. In addition, the whole mud systems employed (e.g. SBM or Water based mud systems) are subjected to toxicity testing in accordance with the Offshore Waste Treatment Guidelines that incorporates testing protocols developed by Environment Canada. The chemical screening process takes into account information and experience from comparable screening processes in the North Sea and elsewhere in the world and specifically recognizes the requirements of Canadian environmental legislation.
EC-47	Revisions to the EA should identify expected air emissions (e.g., CO_2, CH_4, PM, SO_2, VOCs, PAHs) from project activities (i.e., 10 wells) in conjunction with their sources (e.g., flaring, on-board power generation, transportation, fugitive emissions). Emission estimates should use specific emission factors and referenced data, or be calculated from emissions from similar projects, where available. Professional judgment may be used where data are insufficient.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.

EC-48	Depending on the quantity of estimated emissions, the use of numerical dispersion models to predict ambient air quality changes from project emissions may be warranted. Comparisons to baseline levels for the region and to national and provincial ambient air quality objectives for specific pollutants should be provided in revisions to the EA, where possible.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-49	Revisions to the EA should describe the potential for hydrogen sulphide to be included as a constituent of the gas stream.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-50	It is recommended that revisions to the EA describe how best practices will be implemented so as to minimize emissions (e.g., an inspection program could reduce fugitive emissions from seals and valves). If such measures are not considered to be appropriate for the project, an explanation should be provided.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-51	The statement that the "effects of atmospheric emissions will be negligible" should be supported by quantified emissions estimates (p. 204).	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-52	One approach to addressing the uncertainty associated with emissions estimates (i.e., of 30 to 40 percent) would be to provide a high and low range of estimated emissions.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-53	The EA states that emissions from engine exhaust will be approximately 5 x 10^6 m^3/d. These emissions should be further characterized in terms of specific pollutants.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.
EC-54	From the information provided in the EA, it is assumed that there will be no incineration as part of project activities. If incineration is proposed, waste separation procedures, the incineration system, associated emissions and any measures that will used to reduce these emissions should be described in revisions the EA, along with a justification of why on-board incineration should be permitted.	There will be no incineration carried out onboard of Husky's drilling rigs.
EC-55	The EA should include a discussion of potential emissions resulting from malfunctions and accidental events in conjunction with estimated duration times.	We acknowledge the comment and stand by the original evaluation of effects as being non-significant, especially as there are no VECs which would be receptors.

EC-56	Greenhouse Gas Release An accounting of greenhouse gas (GHG) releases from project activities is absent from the EA. At a minimum, revisions to the EA should provide an inventory of GHG emissions, in equivalent amounts of carbon dioxide, along with a discussion of measures that have been considered and/or are proposed to reduce or monitor GHG emissions. It would also be desirable to include a discussion of emissions in the context of the proponent's operations and of its Voluntary Challenge and Registry (VCR) commitment, if any. If possible, a comparison of the above information with an estimate of the total contribution from the province of Newfoundland and Labrador, as well as that of the industry sector in Canada should be provided. It is recommended that a discussion of implications for Canada's commitments related to the Kyoto Protocol be provided. Guidance on the assessing the effects of GHG emissions on the environment can be found in the document entitled, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003).	Husky provides green house gas emissions estimates (CO2e) estimates for its drilling operations to the C-NLOPB in accordance with the Offshore Waste Treatment Guidelines. Flaring, which occurs only occasionally during well testing, is accounted for in these estimates.
EC-57	Section 6.4.17 Cumulative Effects Summary – Marine Birds Page 224. I would suspect that birds could be attracted to lights from one area in the oil production area to another. Especially given the intensity of the light (especially the flare) and the fact that birds have superior vision and a better line of sight (from being in the air) than we do.	This is speculative. The distance from which a seabird (Leach's Storm-Petrel) is drawn in to a light is unknown.
EC-58	*Chlorine* The EA states that cooling water will be chlorinated to a level of one or two mg/L of chlorine and discharged at temperatures of approximately 30 degree Celsius above ambient (p. 225). Chlorinated wastewater effluent through once-use coolant systems is listed as a toxic substance under the *Canadian Environmental Protection Act* (CEPA) 1999. It is recommended that the EA include a discussion of alternatives to chlorine use and whether these are feasible for the proposed project. If chlorine is to be employed, the proponent should indicate which chlorine product has been selected for use and consider the potential for the dechlorination of cooling water prior to discharge. The Pest Management Regulatory Agency should be contacted with respect to the applicability of the *Pest Control Products Act* and use of chlorine in any non-closed-loop cooling water systems.	Husky is aware of the status of chlorinated waste water effluents pursuant to CEPA. The purpose of chlorination of the cooling water streams on drill rigs is to prevent or control biofouling. Treatment of these low volume cooling water streams is not a practical or cost effective option in light of the negligible risk posed to the environment in question. For its more significant, high volume cooling water streams such as that on its production platform Husky aims to maintain its chlorine discharge levels at 0.5 ppm or less in accordance with Environment Canada's working guidance on this subject.

EC-59	Section 6.4.17 Cumulative Effects Summary – Marine Birds Page 227. On what basis is the 2 km buffer around seabird colonies is derived?	By law of the Government of Newfoundland and Labrador, a buffer zone is established around every Seabird Ecological Reserve. The width of these buffers varies between Reserves and by vessel size. That is, small open boats may not be able to operate within 100 m of some Reserve while large vessels such as tankers and supply vessels would have to stay kms away from the Reserve. The 2 km buffer mentioned in the Husky EA would not necessarily apply to all Seabird Ecological Reserves.
EC-60	Section 6.4.17 Cumulative Effects Summary – Marine Birds Page 228 and elsewhere. Chronic oil pollution. This section should be updated with recent published literature, namely.	References noted.
EC-61	Section 6.4.17.11 Cumulative Effects 95% of murres killed can be better referenced as Elliot (1991) Gaston and Elliot (1991) and Tuck (1961) describe the Newfoundland murre hunt in general, and would be better references than G. Robertson, pers. comm.). See also Wiese et al. 2004, for cumulative impacts on murres.	References noted. Elliot, R.D.; Collins, B.T.; Hayakawwa, E.G.; Métras, L. 1991. The harvest of murres in Newfoundland from 1977-78 to 1987-88. Pages 36-44 *in* Gaston, A.J. Elliot, R.D. (eds.), Studies of high-latitude seabirds. 2. Conservation biology of Thick-billed Murres in the Northwest Atlantic. Canadian Wildlife Service. Paper No. 69
EC-62	Section 6.4.17.12. Monitoring and Follow up Some more development of this section would be worthwhile. Although useful information has been collected, problems have been identified with the current fixed platform observation schemes used on the Grand Banks (Baillie et al. 2005). An acknowledgement that this report is aware of these issues and efforts will be made to resolve them would be suitable. The ESRF funded report from LGL on monitoring protocols and guidelines from CWS are available to assist with improving the survey program. CWS has developed a pelagic seabird monitoring protocol that we are recommending for all offshore drilling programs. Two versions of the protocol and a blank data sheet were previously provided under separate cover. One version of the protocol is for individuals that have experience doing seabird surveys. These protocols are a work in progress and we would appreciate feedback from the observers using them in the field. A guide sheet to the pelagic seabirds of Atlantic Canada is available through CWS in Mount Pearl.	Husky will continue to conduct a regular seabird monitoring program. In addition, Husky will continue to review monitoring protocols through consultation with DFO and CWS, as well as through consideration of Ballie et al. (2005) and Moulton and Mactavish (2004).

	A report of the seabird monitoring program, together with any recommended changes, is to be submitted to CWS upon completion of the drilling program. A statement on how observers will be vetted and trained would also be appropriate.	
EC-63	Malfunctions and Accidental Events It is noted that the potential for a spill of synthetic-based drilling muds has not been considered in the EA, although this type of spill has recently occurred in Atlantic Canada.	The potential effects of virtually all sizes and types of hydrocarbon spills are accounted for within the "worst case" scenario approach used in the EA.
EC-64	The EA states that gas blowouts that do not involve a discharge of liquid petroleum are generally believed to be innocuous to the marine environment (p. 253). A reference should be provided to substantiate this claim.	This statement is within the context of the behaviour of a blowout involving gas only compared one involving oil. For example, the gas will rapidly rise to the surface and evaporate. There will be effects on plankton that may get entrained in the plume. A blowout involving oil would be worse because it may form a slick and persist on the surface. Assessments of gas blowouts off Nova Scotia are contained in MacLaren Plansearch (1995), Thomson et al. (2000), JWEL (2002), and others.
EC-65	The EA provides statistics on spills from 1972 to 2000, but appears to calculate probability using the number of wells from 1972 to 2002 (p. 253). This discrepancy should be corrected.	So noted
EC-66	Section 7.7.3. Effects on Marine Birds Table 7.27 indicates that the predicted residual effects of an accidental oil spill or blowout will have significant adverse effects on marine birds. The magnitude of these effects are predicted to range from negligible to high due to high spatial and temporal variation in the distribution of birds in the project area and because the density and distribution data for seabirds are limited. In consideration of the above, as with previous assessments, it is appropriate to design an effects monitoring program to be implemented in the event of a spill or blow out. The purpose of this program will be to determine the actual magnitude of the spill in terms of seabird mortalities. The program design should be appended to the oil spill contingency plan and criteria for implementation made specific in the plan itself.	A Spill EEM procedure is on file with the C-NLOPB as a stand alone document.

EC-67	Section 7.7.3.4. Update this section with material in Wiese and Ryan (2003), some conclusions have changed since Wiese and Ryan (1999) and this paper should be used.	Chronic marine oil pollution has been a problem for seabirds on the Grand Banks for decades. Beached beach surveys conducted between 1984 and 1999 indicate that chronic oil pollution along the southeast coast of Newfoundland is among the highest in the world (Wiese and Ryan 2003). Most of the oil found on the feathers of seabirds washed up on beaches has been heavy fuel oil mixed with lubricants, the same mixture usually found in bilges of large vessels. This indicates the source of the waste oil is from vessels crossing the Grand Banks on the Great Circle Route between Europe and North America.
EC-68	Page 294. The standard technique to enhance common eider nesting habitat is to place nest shelters in appropriate breeding habitat. This technique is well used by Ducks Unlimited.	So noted.
EC-69	From the Canadian Wildlife Service perspective, reduction in hunting should not be considered a viable option to reduce impacts on murre populations after a major oiling incident, but rather as a last-ditch and desperate measure to conserve murre populations in the event of a catastrophic impact. Other options, such as re-introductions to abandoned sites, and habitat conservation and protection of breeding areas, would be preferred mitigative options in the case of impacts on these populations.	Agreed.

Appendix 2. Persons Consulted

The following agencies and persons were consulted about Husky Energy's planned 2006 delineation drilling activities.

Environment Canada (Environmental Protection Branch)

Glenn Troke, EA Co-ordinator

Fisheries and Oceans

James Meade, Senior Regional Habitat Biologist
Sigrid Kuehnemund, Senior Regional Habitat Biologist
Fraser Davidson, Research Biologist, Biological and Physical Oceanographic Section
Bill Brodie

Natural History Society

Dr. Len Zedel, MUN

One Ocean

Maureen Murphy, Research Assistant

Fish, Food and Allied Workers Union (FFAWU)

Sherry Glynn, Fisheries Biologist
Keith Sullivan, Fisheries Biologist

Association of Seafood Producers

Derek Butler, Executive Director

Fishery Products International

Derek Fudge, Manager, Fleet Administration and Scheduling
William Savory, FPI Offshore Captain

Icewater Harvesting

Michael O'Connor, Fish Harvesting Consultant

Nova Scotia

Christine Penney, Director of Corporate Affairs, Clearwater Seafood's Limited Partnership

Groundfish Enterprise Allocation Council (Ottawa)

Bruce Chapman, Executive Director