Hebron

HEBRON PROJECT

Development Application Summary

September 2011

ExxonMobil Chevron Suncor Energy Statoil nalcor energy

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1 DEVELOPMENT PLAN

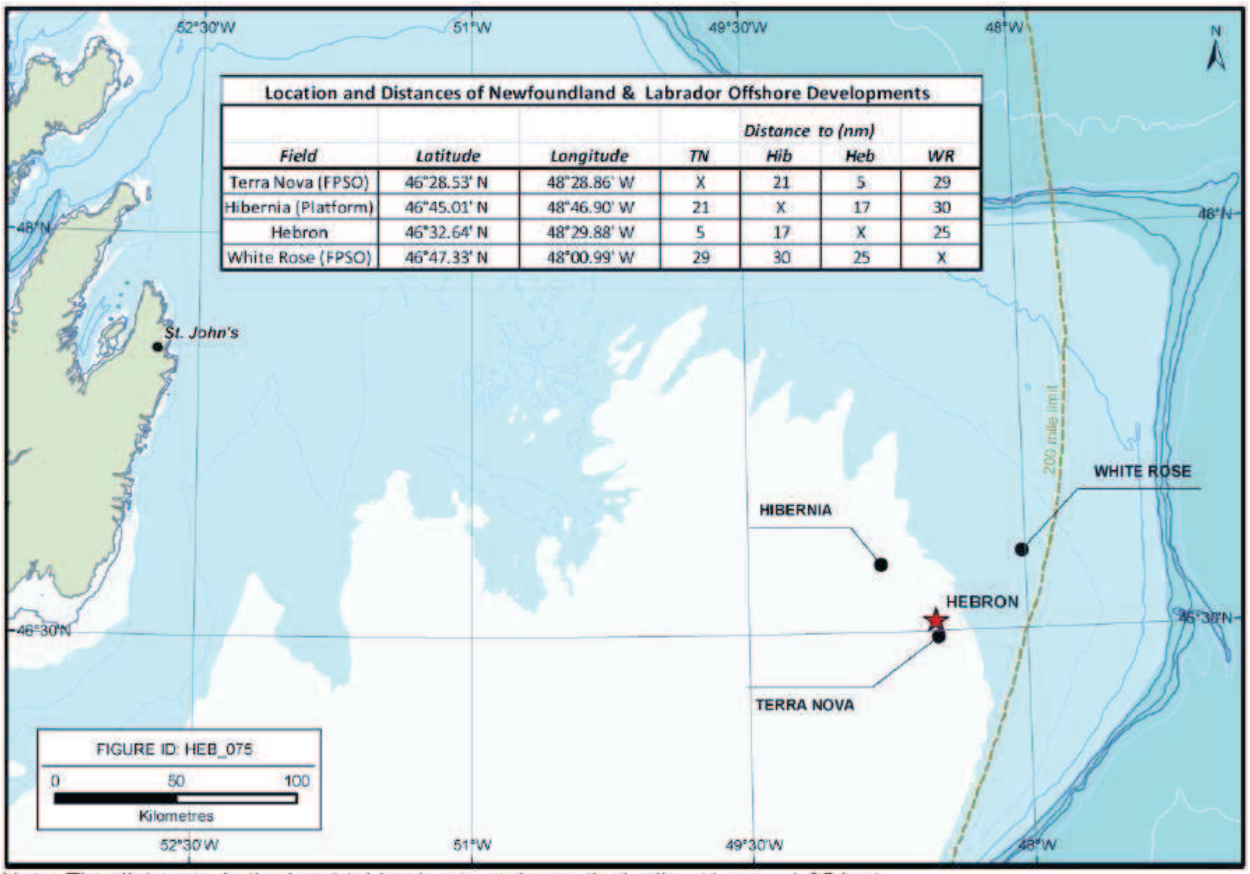
1.1 Introduction

ExxonMobil Canada Properties (EMCP), as Operator, on behalf of the Hebron Project proponents, ExxonMobil Canada Properties, Chevron Canada Limited, Petro-Canada Hebron Partnership through its managing partner Suncor Energy Inc., Statoil Canada Ltd. and Nalcor Energy – Oil and Gas Inc., is leading the development of the Hebron Project offshore Newfoundland and Labrador. The Hebron Project will be the fourth stand-alone development project on the Grand Banks and, considering the two tieback projects to the Hibernia and White Rose facilities, the sixth offshore petroleum project. The Hebron Project includes offshore surveys, engineering, procurement, fabrication, construction, installation, commissioning, development drilling, production, operations and maintenance and decommissioning of an offshore oil / gas production system and associated facilities.

1.2 Hebron Project Area

The Hebron Project Area is located in the Jeanne d'Arc Basin (centred at approximately 46°32.64344 min. N; 48°29.88379 min. W), 340 km offshore of St. John's, Newfoundland and Labrador, approximately 9 km north of Terra Nova, 32 km southeast of Hibernia, and 46 km southwest of White Rose (Figure 1.2-1). The water depth ranges from 88 to 102 m.

The Hebron Asset currently contains three discovered fields (the Hebron Field; the West Ben Nevis Field and the Ben Nevis Field) and incorporates four Significant Discovery Licences (SDLs) (SDL 1006, SDL 1007, SDL 1009 and SDL 1010) (Figure 1.2-2). These four SDLs contain the most likely extent of the oil for the delineated pools within the Hebron Asset. The Hebron Asset could be expanded if additional studies, seismic surveys, or exploration and / or delineation drilling proves that economically recoverable oil pool accumulations extend beyond the currently envisioned boundaries of the Hebron Asset.



Location and Distances of Newfoundland & Labrador Offshore Developments

Field	Latitude	Longitude	Distance to (nm) TN	Hib	Heb	WR
Terra Nova (FPSO)	46°28.53' N	48°28.86' W	X	21	5	29
Hibernia (Platform)	46°45.01' N	48°46.90' W	21	X	17	30
Hebron	46°32.64' N	48°29.88' W	5	17	X	25
White Rose (FPSO)	46°47.33' N	48°00.99' W	29	30	25	X

Note: The distances in the inset table above are in nautical miles (1 nm = 1.85 km)

Figure 1.2-1: Hebron Project Location

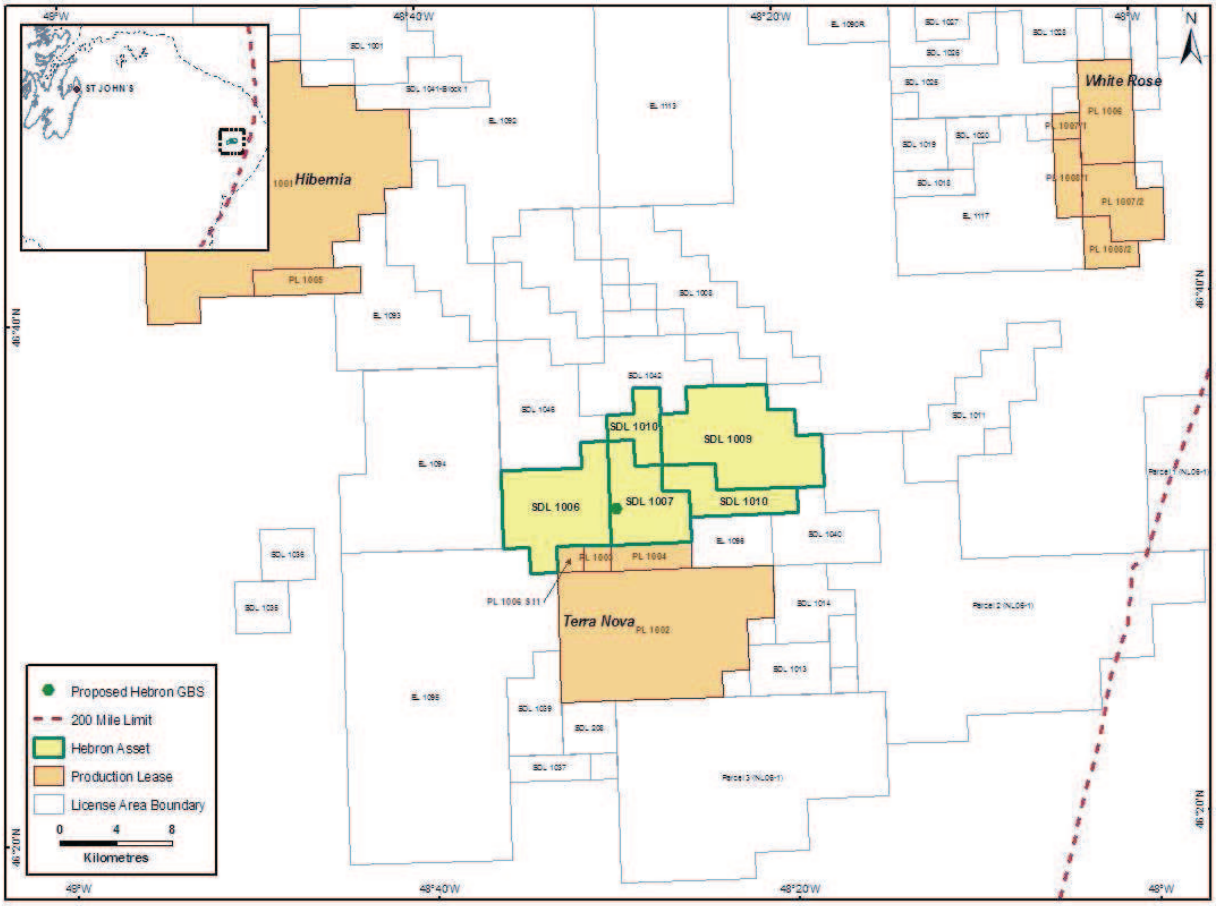


Figure 1.2-2: Significant Discovery Licences of the Hebron Asset

1.3 Project Proponents

The Hebron Project Proponents have varying participating interests in the four SDLs comprising the Hebron Asset. The Project owners and their respective shares in the Hebron Project are identified in Table 1.3-1.

Table 1.3-1: Owners' Participating Interest

Owners	Share (%)
ExxonMobil Canada Properties	36.0429
Chevron Canada Limited	26.6280
Petro-Canada Hebron Partnership	22.7289
Statoil Canada Ltd.	9.7002
Nalcor Energy – Oil and Gas Inc.	4.9000

1.4 Project Need and Justification

The Hebron Project will be a major contributor to the economic development of Newfoundland and Labrador, as well as to Canada. The Hebron Project will be Newfoundland and Labrador's fourth offshore oilfield development project. As such, it will build on and contribute to the multi-phase offshore petroleum industry in the province. In particular, the Project will provide substantial benefit through diversity programs, employment and training opportunities, business opportunities for the local service and supply community, and research and development opportunities, further expanding the province's industrial capabilities.

The Hebron Project's contribution to a sustainable economic development within the province is described in detail in the Socio-economic Impact Statement and the Canada-Newfoundland and Labrador Benefits Plan for the Project. In 2008, the Project Proponents and the province signed a Benefits Agreement. Through this Agreement, the Hebron Project has made significant commitments to the people and government of the province for engineering work, diversity programs, education and training, research and development, and construction and fabrication in the province.

The Project has committed to providing significant person-hours of work in Newfoundland and Labrador during the six-year design, fabrication and construction phase, including local project management, front-end engineering and design (FEED), detailed design and construction of the Gravity Base Structure (GBS), with additional employment during construction of Topsides modules.

During the operations phase there will be employment opportunities in areas such as logistics, engineering and technical support, drilling and production, marine support vessels (helicopters, supply vessels, tankers), catering, and similar onshore support. These opportunities during construction and operations will further develop the capabilities of Newfoundland and Labrador companies and individuals working on the project, and thereby enable local companies and individuals to develop capabilities to compete internationally on future opportunities.

Throughout its operations, the project will also contribute substantial revenues to the provincial government through corporate taxes and royalty payments. If approved, the Hebron Project will extend the life of the offshore oil and gas industry in Newfoundland and Labrador. It represents an important next step in the development of a sustainable offshore oil and gas industry in Newfoundland and Labrador.

1.5 The Hebron Asset

1.5.1 History

Oil was initially discovered in the Hebron Project Area in the Ben Nevis I-45 well in 1980. Test results showed uneconomic rates of oil in the Ben Nevis reservoir, and gas / condensate in the A Marker and Lower Hibernia reservoirs. The initial I-45 discovery was followed by two phases of delineation drilling. In the first phase of delineation drilling, the Hebron I-13 well was drilled in 1981 to evaluate the potential of the 'Hebron horst' fault block. The well was drilled to assess the structurally highest point of the fault block at the Hibernia and Jeanne d'Arc reservoirs, and tested oil in these reservoirs. The well also penetrated the Ben Nevis reservoir in the downthrown fault block to the south, and tested oil. The West Ben Nevis B-75 well was drilled in 1985 to evaluate the fault block between the I-45 and I-13 wells. This well tested oil in the Ben Nevis, A Marker, and Jeanne d'Arc reservoirs. The North Trinity H-71 was also drilled in 1985 to assess these reservoirs, but found no significant amounts of hydrocarbon. The hydrocarbon that was discovered in this first round of drilling was deemed uneconomic, for the time, due to either the poor oil quality or the poor reservoir quality.

A second phase of delineation drilling began in 1996 to test if there was an economic upside to the Hebron Project Area. The D-94 well was drilled to test the Ben Nevis reservoir on the 'Hebron horst' fault block in early 1999. The well encountered over 1 Billion barrels Stock Tank Original Oil In Place (STOOIP) and better reservoir and oil quality than observed in the I-13 well. The D-94 well encountered the same oil water contact as identified in the I-13 well, indicating that the I-13 fault block was in communication over geologic time with the D-94 fault block. The Ben Nevis L-55 well was drilled in 1999 to evaluate the potential for higher structure and better reservoir quality in the Ben Nevis reservoir of the Ben Nevis fault block. The well encountered higher structure than the I-45 well and a gas cap to the pool. The Hebron M-04 well was drilled in 2000 to investigate a seismic incised valley-fill feature at the top of the Jeanne d'Arc horizon (H sand), and to extend and gather data on the existing Ben Nevis, Hibernia, and Jeanne d'Arc reservoirs. The well tested oil in the Ben Nevis and Jeanne d'Arc H sand. The second phase of delineation drilling added significant recoverable resources to the Hebron Project Area and helped to resolve subsurface uncertainty.

1.5.2 Hebron Asset

The Hebron Asset is composed of four reservoir intervals organized into several normal fault-bounded fault blocks. The central horst block is the Hebron field, and the down-dropped fault blocks to the north-east are the West Ben Nevis and Ben Nevis fields. The down-dropped fault block to the south-west forms the Southwest Graben (Figure 1.5-1). The four stratigraphic units are the Late Jurassic Jeanne d'Arc formation, the Early Cretaceous Hibernia formation, the Early Cretaceous Avalon formation and Early Cretaceous Ben Nevis formation.

The four vertically stacked reservoirs and multiple fault blocks contribute to the complexity of the multiple hydrocarbon columns with different contacts at the Hebron Asset. To simplify communication, the Hebron Asset is currently divided into five major pools (although other hydrocarbon-bearing pools beyond these exist). The pools, shown in Figure 1.5-1, are defined in Table 1.5-1.

Table 1.5-1: Hebron Asset Hydrocarbon Pools

Field	Reservoir	Wells	Pool Identifier
Hebron Field	Ben Nevis Reservoir	Including the fault block penetrated by the D-94 and M-04 wells and the fault block penetrated by the I-13 well	Pool 1
Hebron Field	Hibernia Reservoir	Defined by the I-13 and M-04 wells	Pool 5
Hebron Field	Jeanne d'Arc Reservoir, including the isolated B, D, G, and H hydrocarbon-bearing sands	Defined by the I-13 and M-04 wells	Pool 4
West Ben Nevis Field	Ben Nevis Reservoir	Penetrated by the B-75 well	Pool 2
West Ben Nevis Field	Avalon Reservoir	Defined by the B-75 well	Pool 3
West Ben Nevis Field	Jeanne d'Arc Reservoir	Penetrated by the B-75 well	unassigned
Ben Nevis Field	Ben Nevis Reservoir	Defined by the L-55 and I-45 wells	Pool 3
Ben Nevis Field	Avalon and Hibernia Reservoirs	Penetrated by the I-45 well	unassigned

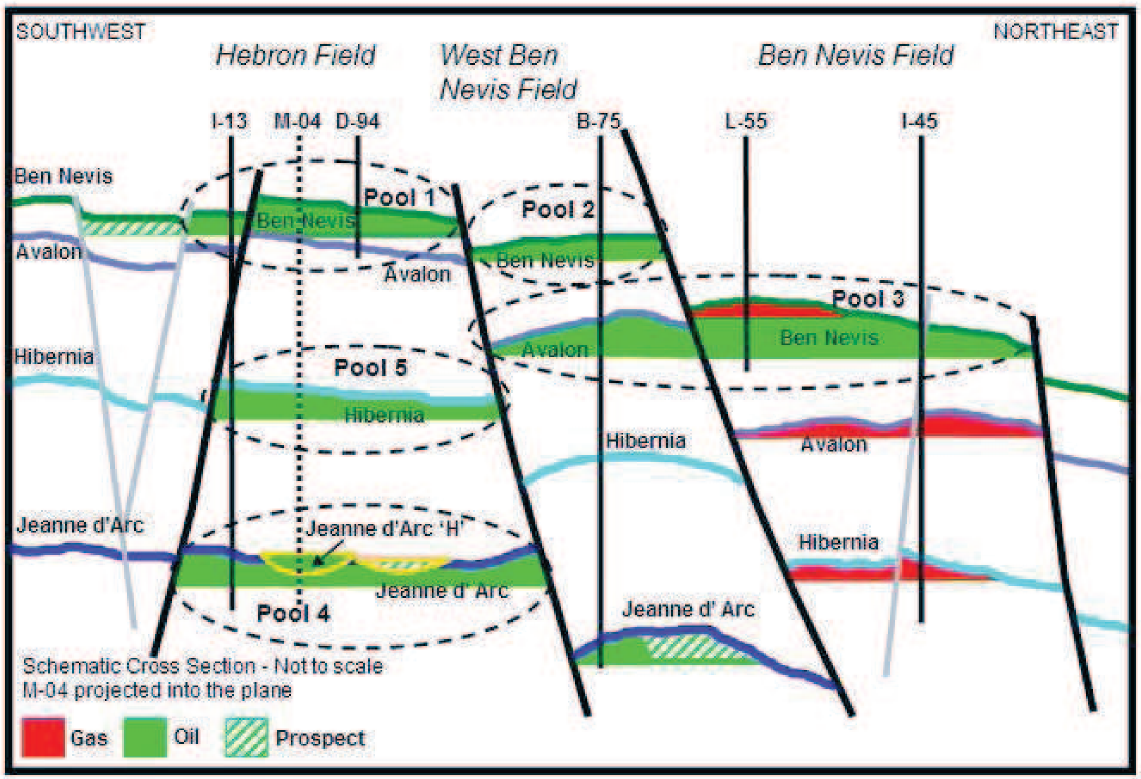


Figure 1.5-1: Schematic Cross-section across the Hebron Project Area

The Ben Nevis Reservoir within the Hebron Field (Pool 1) is the core of the Hebron Project, and is anticipated to produce approximately 80 percent of the Hebron Project's crude oil. However, the 20°API crude in this reservoir presents production challenges, as the viscosity can be 10 to 20 times higher than that of water.

The Jeanne d'Arc and Hibernia Reservoirs within the Hebron Field (Pools 4 and 5) and the Ben Nevis Reservoir of the West Ben Nevis and Ben Nevis Fields (Pools 2 and 3) are also significant resources within the Hebron Asset. Relative to the Hebron Ben Nevis Reservoir, the Jeanne d'Arc and Hibernia Reservoirs have higher oil quality but decreased reservoir quality consistent with deeper burial and cementation. The Jeanne d'Arc Formation has lower reservoir quality than the Jeanne d'Arc Formation of the Terra Nova Field, just as the Hibernia Formation at Hebron has lower reservoir quality than the Hibernia Formation of the Hibernia Field.

A depletion strategy for each of the reservoirs in the Hebron Project Area is discussed in Section 6. The depletion strategy balances economic value, risk mitigation and overall development flexibility to allow the reservoirs to be effectively managed over the life of the field. All reservoirs within the Hebron Asset are being evaluated with respect to risked production performance.

The initial development phase focuses on developing crude oil resources from the Ben Nevis, Hibernia and Jeanne d'Arc H and B Reservoirs within the Hebron Field. The Hebron Proponents have also assessed the Ben Nevis Reservoir within the Ben Nevis Field to an extent necessary to present a development plan for C-NLOPB review and approval.

Therefore, this Development Plan describes the plans to implement a platform development of the Hebron Field resources as well as a potential subsea tie-back development of the Ben Nevis Field resources.

Three concept options are currently being considered for the development of the Ben Nevis Reservoir within the Ben Nevis Field namely drilling of appraisal well(s) (Option 1), implementation of a production pilot (Option 2) or a subsea development (Option 3). The merits of each option are discussed in Section 6.5. Success with either Option 1 or 2 could lead to a development similar to Option 3. Forecasted cumulative oil recovery from these resources after 30 years of producing life ranges from 105 Mm^3 (660 MBO) to 168 Mm^3 (1055 MBO).

There are also ongoing evaluations to consider development of additional reservoirs in the Hebron Project Area, depending on the results of further drilling, production performance of the initial drill wells, studies, possible delineation wells, additional seismic data or some combination of these. In anticipation of potential expansion development, the GBS will be designed to include 52 well slots. To maximize resource development, slots may later be reclaimed for re-use. Expansion development could also occur from sub-sea tie back from drill centres. The platform will have space available for future installation of production facilities and J-tubes and / or risers to allow for such future expansion.

The formation gas produced in association with oil production will be used principally to meet the fuel requirements for the production and drilling facilities. During periods when the volume of produced formation gas exceeds operational requirements, the surplus gas will be injected into one of the Hebron area reservoirs for storage and/or pressure maintenance purposes. Later in field life, the gas production rate is expected to decrease in conjunction with a natural decline in oil production. If the level of gas production falls below the volumes required for platform operations, the gas previously stored may need to be withdrawn in order to provide fuel for platform operations. The gas management plan will take into account a number of considerations, including:

- Use of associated gas in applying artificial lift to oil producing wells
- Fuel requirements are expected to vary with time
- Down-time gas flaring (not continuous)
- Prospective subsurface location(s) for storing any temporary surplus of produced gas

- Potential need to withdraw gas that has previously been stored in order to provide fuel for platform operations
- Potential for using gas in any enhanced oil recovery method in the Hebron Project Area, should such a method be deemed technically and commercially viable
- Potential for future commercial gas production

1.6 Scope of the Project

The Hebron Project includes a combination of works and activities, onshore and offshore, necessary for the construction and operation of an offshore oil production system and associated facilities to allow the exploitation of the hydrocarbon resource accumulation.

1.6.1 Project Components

Project activities include:

- Construction of topside modules at a variety of fabrication locations and delivery to the Nalcor Energy - Bull Arm Fabrication facility in Bull Arm, Trinity Bay for integration
- Construction of a GBS and mating of topside modules with the GBS at the Nalcor Energy - Bull Arm Fabrication facility in Bull Arm, Trinity Bay
- Tow-out of platform to its offshore location
- Offshore site and clearance surveys, including geophysical, geological, geotechnical, and environmental (including iceberg surveys)
- Installation of the platform at its offshore location (may include site preparation activities such as clearance dredging, seafloor levelling, underbase grouting, offshore solid ballasting, and placement of rock scour protection on the seafloor)
- Platform hook-up and commissioning
- Operation, maintenance, modifications, decommissioning of the platform petroleum production facility
- Drilling operations from the platform, including well testing, well completions and workovers, wellsite / geohazard surveys
- Operation of one or more mobile offshore drilling units (MODUs) for subsea developments
- Construction, installation, maintenance, abandonment / decommissioning of one or more excavated drill centres and associated equipment for subsea developments; may include the disposal of dredged material at one or more offshore locations

- Construction (including trenching, excavation, covering and/or spoil deposition), installation, maintenance, protection, and abandonment / decommissioning of subsea flowlines, umbilicals and associated equipment (inclusive of water, gas and oil flowlines) tied back to the Hebron Platform
- Installation of additional production facilities on the Hebron Platform
- Construction, installation, operation, maintenance of an offshore loading system (OLS) (may include dredging activities, pile driving, installation and insulation of riser and OLS (rock dumping, concrete mattress pads, etc.)
- Tankering operations
- Supporting activities, including platform supply operations, helicopters, standby vessels, diving programs, remotely operated vehicle (ROV) surveys and operation of support craft associated with the above activities
- Seismic programs and other geotechnical and / or geophysical activities

1.6.2 Potential Expansion Activities

- Seismic programs and other geotechnical and/or geophysical activities
- Installation of additional production facilities on the Hebron Platform
- Operation of one or more mobile offshore drilling units (MODUs)
- Construction, installation, maintenance, abandonment / decommissioning of excavated drill centres and associated equipment within the Hebron Asset; may include the disposal of dredged material at one or more offshore locations
- Construction (including trenching, excavation, covering and / or spoil deposition), installation, maintenance, protection, and abandonment / decommissioning of subsea flowlines, umbilicals and associated equipment (inclusive of water, gas and oil flowlines) tied back to the Hebron Platform
- Supporting activities, including diving programs, ROV surveys and operation of support craft associated with the above activities

1.7 Overview of Approach to Project Management

EMCP will be the Operator of the Hebron Project. The Operator's authority, role, responsibility and reporting requirements are outlined in the Hebron, Ben Nevis and West Ben Nevis Unitization and Joint Operating Agreement (JOA). A management committee will establish overall Proponents' requirements and annual budgets. EMCP will review, on a regular basis, the development status with the Proponents who will provide advice and guidance per the JOA. EMCP will manage and direct all aspects of the development within the authority and approval parameters of the JOA.

The Hebron Project will use ExxonMobil's proven project management system that is utilized worldwide. The system has been developed with sound project management processes designed to ensure successful execution of major capital project developments. The structured activities included in the process are designed to assure that projects are conducted in a safe and environmentally responsible manner, deliver assets of appropriate quality, meet cost and schedule expectations, and achieve commercial success.

Hebron's project management approach will encompass:

- Commercial Development Business Planning
- Evaluation and Selection of Development Alternatives
- Final Scope Definition, Detailed Design of Selected Facility Development, Construction, Installation, and Operational Plan Development
- Execution of Fabrication, Construction, Installation, Hook Up, and Commissioning of Facilities
- Start-up and Operation of Facilities

The Hebron Project Team will employ a contracting philosophy to award work, in accordance with the Hebron Project Benefits Plan, to contractors whose experience and capability will minimize risk to project success, thereby optimizing execution certainty.

It should be noted that submission of this Development Plan is based on completion of our conceptual engineering studies, which were carried out to demonstrate the feasibility of the proposals contained in the application. As engineering studies progress, these concepts will be refined and revised.

1.8 Alternatives to the Proposed Project

1.8.1 Project Alternatives Evaluation and Screening Criteria

An extensive process was undertaken to review the alternative development concepts for the Hebron Project.

Economic analysis considering ranges for variety of input parameters including, but not limited to, facility costs, production profiles, and oil prices was used to assist the concept selection process.

Assessments were made regarding the robustness of various concepts under a particular scenario. In each case, the ability to mitigate a downside risk or take advantage of an upside opportunity was considered. Among the scenarios considered were:

- Downside reservoir performance
- Operability challenges
- Cost and schedule challenges
- Upside reservoir performance

A number of other decision criteria were considered for the Hebron Project, including:

- Safety and environmental performance
- Regulatory compliance
- Benefits to Canada / Newfoundland and Labrador
- Economic metrics (e.g., net present value, rate of return, profit to investment ratio)
- Mitigation of downside reservoir risk (including the use of phasing)
- Operability risk (e.g., wet vs. dry wellheads, artificial lift options, sand control vs. stand alone screens)
- Cost and schedule risk
- Technology application risk for the environment (e.g., disconnectable turret)
- Ability to capture upside potential
- Operating costs
- Capital exposure

The Hebron Project Team screened each development concept using criteria listed in Table 1.8-1 to narrow the options to four project alternatives, each of which is discussed in detail below.

Table 1.8-1: Selection Criteria for Alternatives Screening

	Criteria	Level 1	Level 2	Level 3
Evaluation Criteria	Technically feasible / practical	Comparative		
	Compliance with applicable regulatory requirements and Proponent's safety, health and environmental standards		Comparative	Comparative – some quantitative analysis
	Value creation (net present value, rate of return)		Deterministic	Fully risked
	Option value (opportunity for reservoir risk mitigation and upside value capture)		Comparative	Quantitative
	Canada-Newfoundland and Labrador Benefits	Comparative	Comparative	Quantitative
	Project schedule to first oil	Comparative	Comparative	Quantitative
Risks	Concept technology maturity and risk	Comparative	Comparative	Quantitative
	Reservoir uncertainity	Comparative	Comparative	Quantitative
	Capital exposure		Comparative	Quantitative
Inputs	Capex and Opex estimates		Class 1 ($\pm$50%)	Class 2 ($\pm$30%)
	System availability (uptime)	Comparative	Comparative	Quantitative
	Production profiles		Deterministic	Case specific
	Fiscal parameters		Deterministic	Quantitative

1.8.2 Alternative Means of Offshore Development

The selection of the preferred concept for development of the Hebron Project included consideration of environmental effects, safety, capital and operating cost, reliability, energy efficiency, constructability and schedule for construction. Four potential concepts were considered in detail:

- Subsea wells tied back to Hibernia Platform
- Floating Production, Storage and Offloading (FPSO) facility in combination with subsea wellheads (wet tree), manifolds, pipelines and risers
- FPSO in combination with wellhead gravity base structure (WHGBS)
- GBS (with or without pre-drill alternative)

1.8.2.1 Tie-back to Hibernia

In this concept (Figure 1.8-1), subsea wells would be drilled by a MODU over the life of the Hebron Project. Subsea equipment, including metering facilities, would be installed in two excavated drill centres, one for the Ben Nevis horizon wells and another for the Hibernia and Jeanne d'Arc wells. The produced fluids would be delivered to the Hibernia Platform (31.5 km to the north) from the excavated drill centres by two insulated, subsea, multi-phase, production lines using multiphase pumps (MPPs).

The production lines would have round-trip pigging capability. The power for the MPPs would be supplied by two independent power cables from the Hibernia Platform. Two umbilicals would control the subsea wells and isolation valves. Gas lift would be delivered from the Hibernia Platform to the subsea wells. Injection water would be supplied from the Hibernia Platform via a water injection line. All the flow lines, power cables and umbilicals would be installed in trenches to protect them from iceberg scour. Modifications to the separation, compression, power generation and water injection systems on the Hibernia Platform would be required.

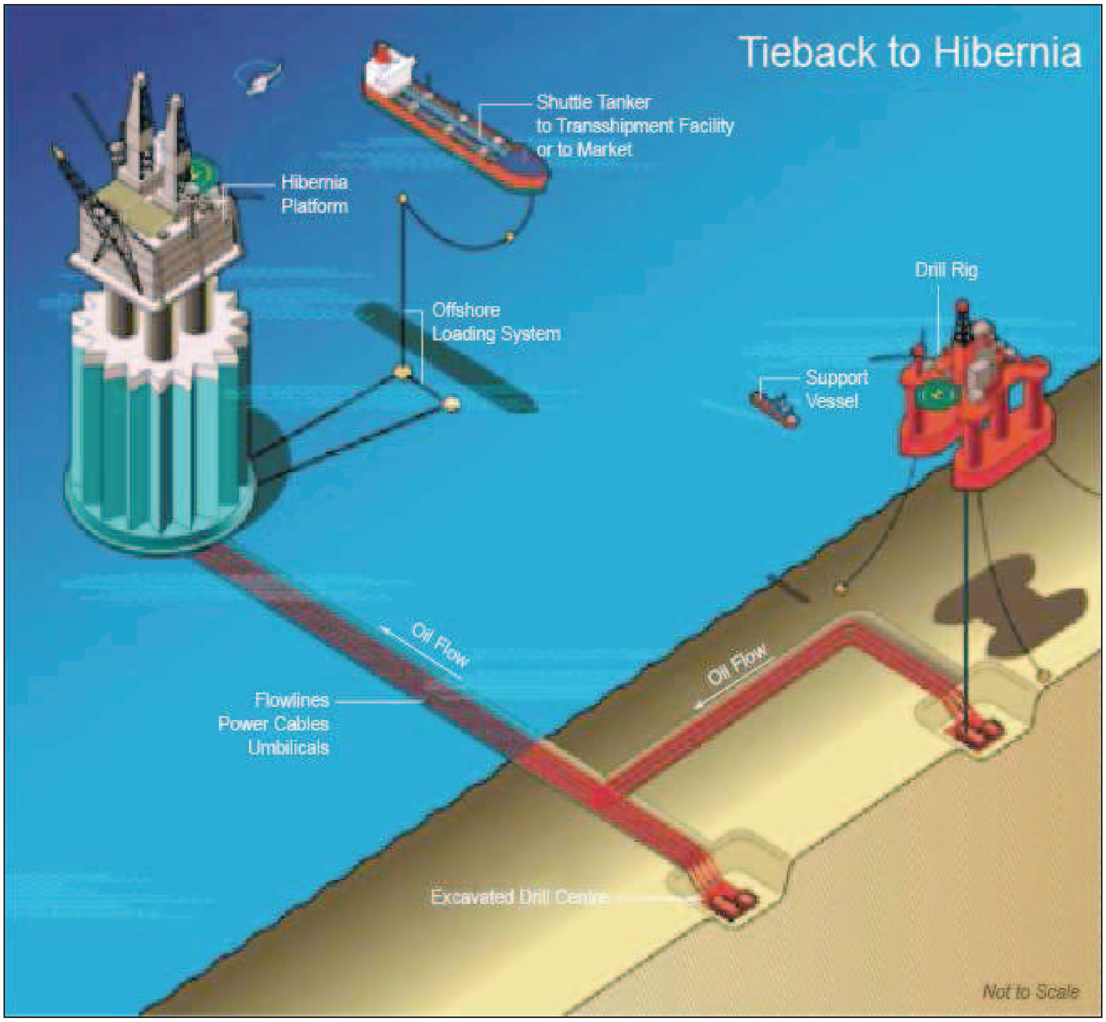


Figure 1.8-1: Tieback to Hibernia

1.8.2.2 FPSO with Subsea Wellheads

A FPSO with subsea satellite wells concept would entail subsea wells being drilled using a MODU (Figure 1.8-2). Subsea wells would be located in excavated drill centres to protect them from iceberg scour. Production fluids would be transferred to a FPSO via flowlines and flexible risers. The FPSO would be double-hulled and double-bottomed, with appropriate storage capacity for crude oil, thrusters (for heading control), and would house the oil treatment, gas compression, gas lift, water injection and utility equipment, including power generation. It would also include quarters to house operations and maintenance personnel. The FPSO would stay on station by means of an internal, disconnectable turret anchored to the sea floor. In the event of an encroaching iceberg or dense pack ice, the FPSO would be able to disconnect and depart from the field. Stabilized crude oil would be stored in the FPSO prior to tandem loading onto tankers for shipment to market or to the Newfoundland Transshipment Terminal.

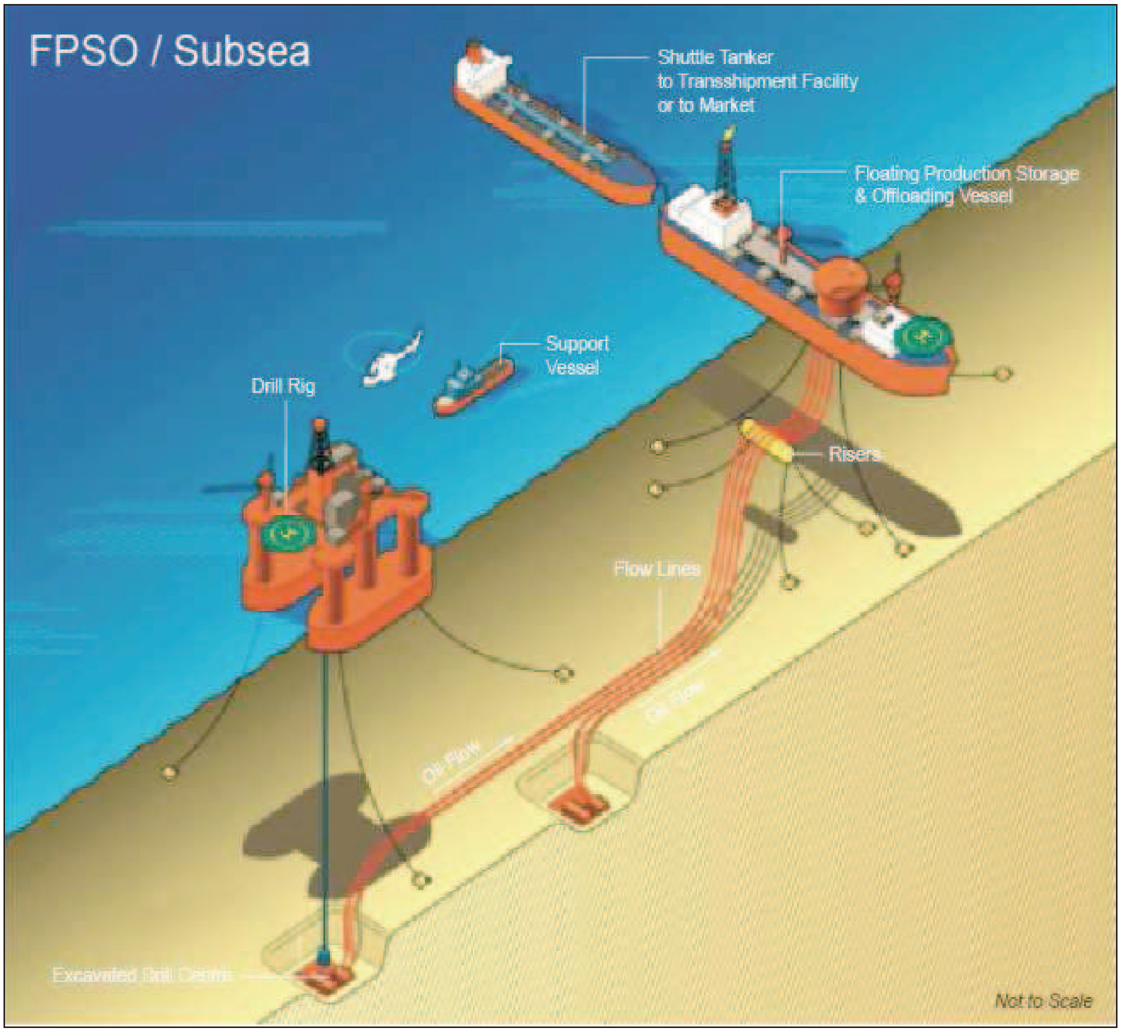


Figure 1.8-2: Floating Production, Storage and Offloading Facility and Subsea Infrastructure

1.8.2.3 FPSO with WHGBS

This concept requires wells to be drilled from a concrete mono-tower WHGBS using a MODU in a tender assist mode (Figure 1.8-3). All wells (producers and injectors) would be drilled from the WHGBS. The WHGBS would be constructed and installed approximately two years prior to FPSO completion to enable pre-drilling and, hence, improved production ramp-up.

The WHGBS would be configured with minimal topsides processing functionality to reduce the numbers of personnel on the structure. WHGBS process equipment would be limited to manifolding and well testing via multiphase meters. Utility systems, notably those involving rotating equipment, would be limited. Trenched pipelines, with riser base manifolding, would be used to tie the WHGBS to the FPSO. Injection water, gas lift and power to the WHGBS would be supplied by the FPSO. Oil export would be undertaken with tankers loading in tandem off the stern of the FPSO.

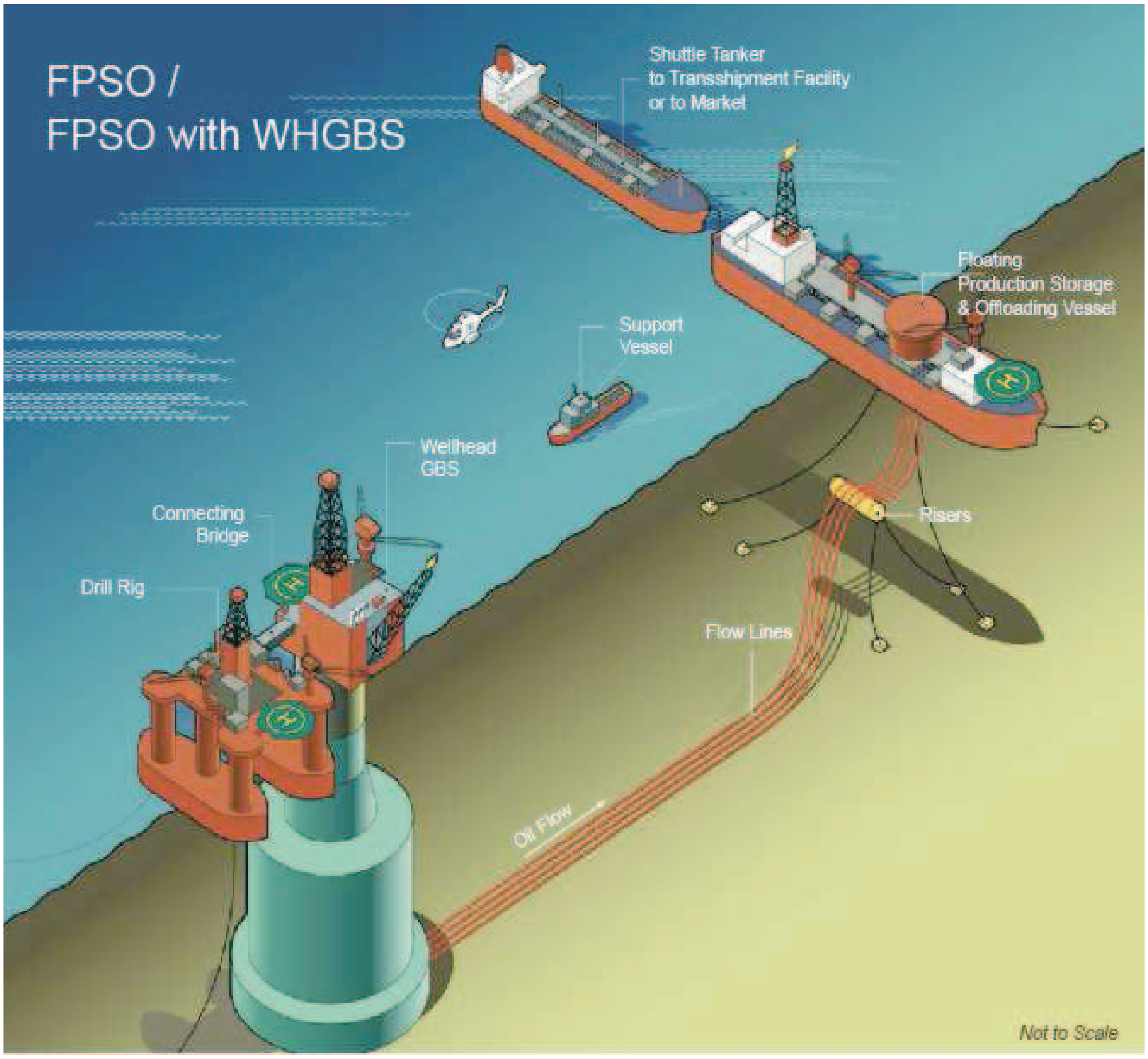


Figure 1.8-3: Floating Production, Storage and Offloading Facility with Wellhead Gravity Base Structure

1.8.2.4 Gravity Base Structure

The stand-alone GBS production facilities concept is similar to Hibernia and includes a concrete GBS with associated topsides (Figure 1.8-4). The GBS and topsides would be constructed separately and then mated at an inshore site prior to towing and installing the platform at the Hebron site.

All wells (producers and injectors) would be drilled by the platform rig. Treated oil would be stored in the platform prior to custody transfer metering and subsequent shipment. An OLS, complete with a looped pipeline and two separate loading points, would be installed to offload the oil onto tankers for transport.

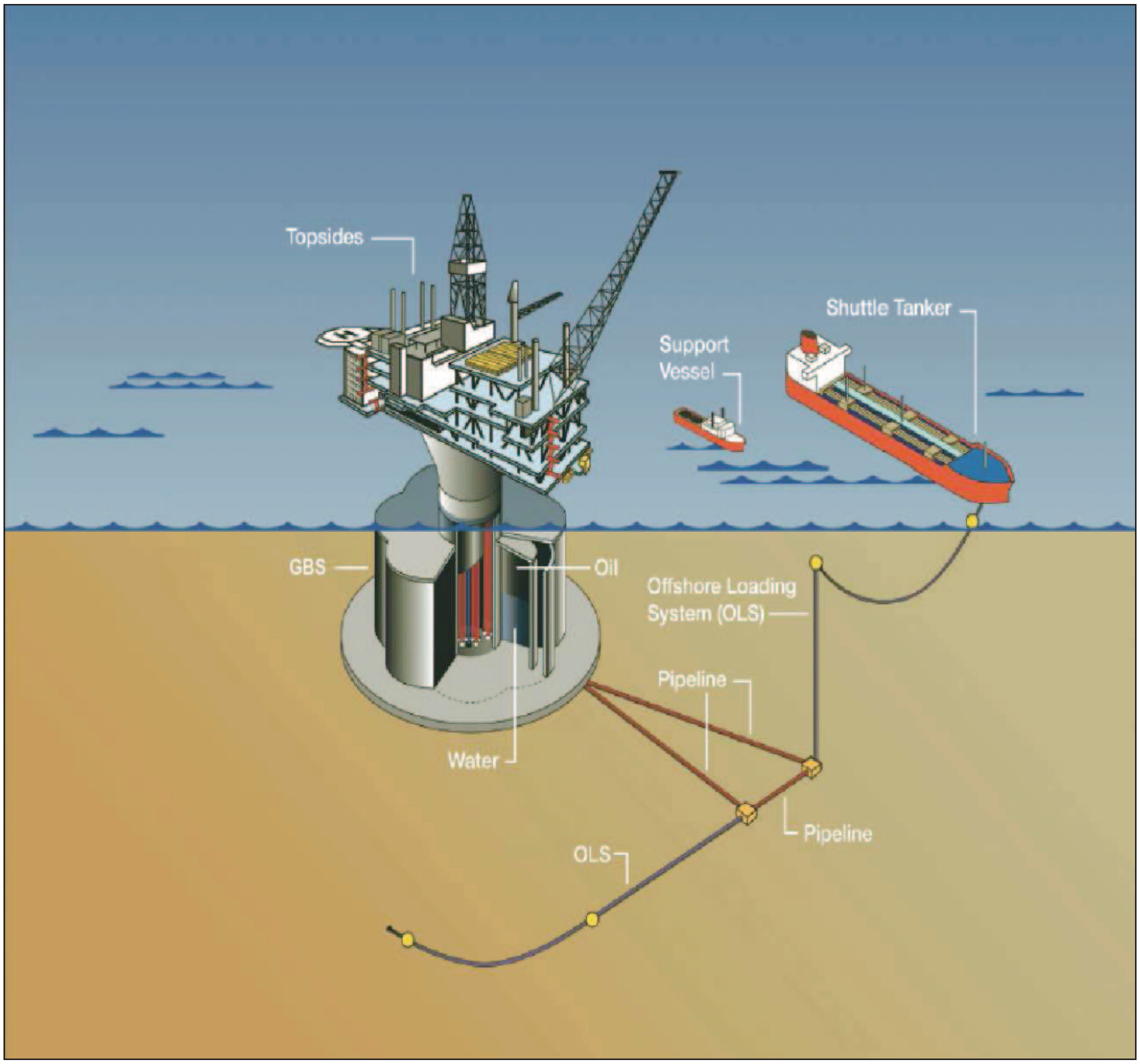


Figure 1.8-4: Stand-alone Gravity Base Structure Preliminary Development Layout

Pre-Drill Alternative

Within the stand-alone GBS option, consideration has been given to a pre-drill alternative, where some wells would be drilled prior to the arrival of the platform, through a pre-drill template.

With the pre-drill alternative, a MODU would be used to drill and partially complete the pre-start-up wells prior to the installation of the platform. However, an excavated drill centre would not be constructed for the pre-drill option; the platform cannot be installed over an excavated drill centre. Rather, the well heads would remain, unprotected, above the sea floor until the platform was installed over the wellhead. Drill cuttings, both water-based and non-aqueous fluid (NAF) based, would be processed and discharged overboard in accordance with the C-NLOPB guidelines.

Once the pre-drill has been completed, the platform is installed by floating the platform structure over the template, and lowering the platform to the seafloor. The pre-drilled wells would be connected to the platform topsides and then completed from the platform. The remaining wells would then be drilled by the platform rig in parallel with operations.

1.9 Preferred Concept: Hebron Project

The Project Proponents evaluated the alternative modes of development, including development drilling options, and determined that the preferred concept is to develop the Hebron Asset using a stand-alone concrete GBS (no pre-drill option) and topsides, and an OLS. It provides greater technical and economic certainty and there is greater environmental benefit than with the other options. A few of the key decision criteria are discussed in the following paragraphs.

Most of the crude oil in the Hebron Asset horizons is “heavy” and may therefore pose flow assurance challenges. To mitigate these flow assurance issues and enable easier wellbore access for remedial work the use of above-water wellheads (dry trees) is preferred for the Hebron development. A dry tree design would be used in this context for any concept where the valves at the top of the well (tree) are located above sea level, as is the case for the GBS concept. Conversely, wet trees refer to designs where the valves are located below sea level, as is the case with the FPSO / Subsea option. Dry tree technology can reduce well drilling and maintenance costs, and hence, improve the lifecycle economics of a heavy oil project such as Hebron.

Dry trees also provide an environmental benefit during drilling over wet trees. The GBS concepts include an injection well for the disposal of cuttings and NAF-based mud. Water-based mud will be discharged within GBS shaft, or overboard in accordance with applicable guidelines. In the other concepts with wet trees or pre-drilling, disposal of cuttings is either overboard into the sea or back to a landfill onshore.

The GBS no pre-drilling alternative was chosen relative to the pre-drill option based on:

- Concept refinement work has concluded that the pre-drilling plan is not viable for technical, operational and economic reasons
- The resultant concept has the highest execution confidence and the least economic and operational risk; this may enhance opportunities for an early start-up benefiting all stakeholders

The items listed above far outweigh the potential oil production acceleration benefit that pre-drilling can offer. From technical, execution, economic and environmental perspectives, the no pre-drill alternative provides significant advantages over the pre-drill concept.

The evaluation of the Hebron Project development options considered is summarized in Table 1.9-1.

Table 1.9-1: Summary of Analysis of Alternate Means of Carrying Out the Project Showing Determination of Risk

Alternative Considered	Technical Feasibility	Economic Feasibility	Environmental Effects
Tie-back to Hibernia			
FPSO			
FPSO with WHGBS			
Stand-alone GBS (with pre-drill)			
Stand-alone GBS (no pre-drill)			
Note: *High-red; Medium-yellow; Low-green*			

Neither FEED nor detailed design for the Topsides and GBS have been completed. However, the main criteria upon which the detailed design will be based are provided in Section 1.10.

1.10 Hebron Project Concept and Design

1.10.1 Hebron Project Facilities Concept

The GBS for the Hebron Project will be a post-tensioned reinforced concrete structure designed to withstand impacts from sea ice and icebergs, and the meteorological and oceanographic conditions at the Hebron Project Area. It will accommodate up to 52 well slots and be outfitted with J-tubes and / or risers for tie-ins to outlying subsea developments.

The GBS will be designed to store approximately 190,000 m^3 (1.2 Mbbl) of crude oil in multiple separate storage compartments. It will have a single main shaft supporting the topsides and will encompass all wells to be drilled from the platform. The GBS will be designed for an in-service life of 50 or more years. The Topsides facilities will include the following modules:

- Drilling Support Module (DSM)
- Derrick Equipment Set (DES)
- Flare boom
- Utilities and Processing Module (UPM)
- Living Quarters, including helideck and lifeboat stations

A schematic of a typical GBS and Topsides layout are provided in Figures 1.10-1 and 1.10-2, respectively.

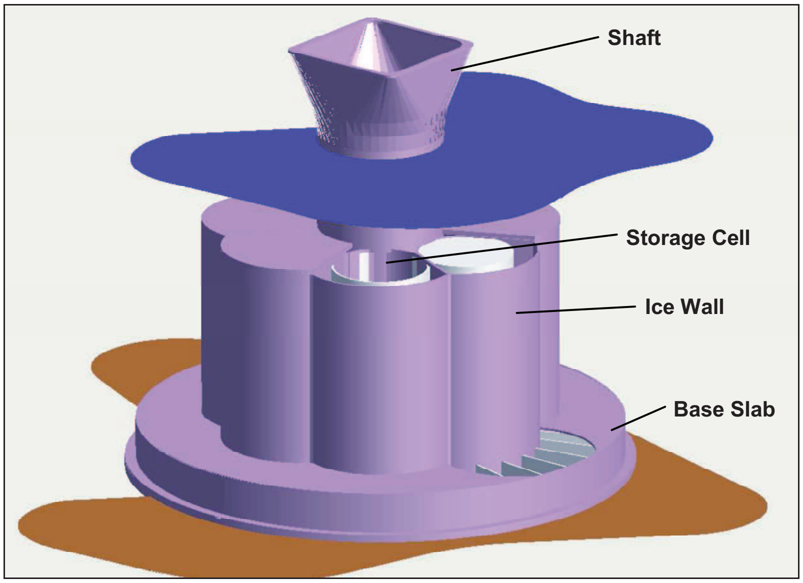


Figure 1.10-1: Schematic of Gravity Base Structure

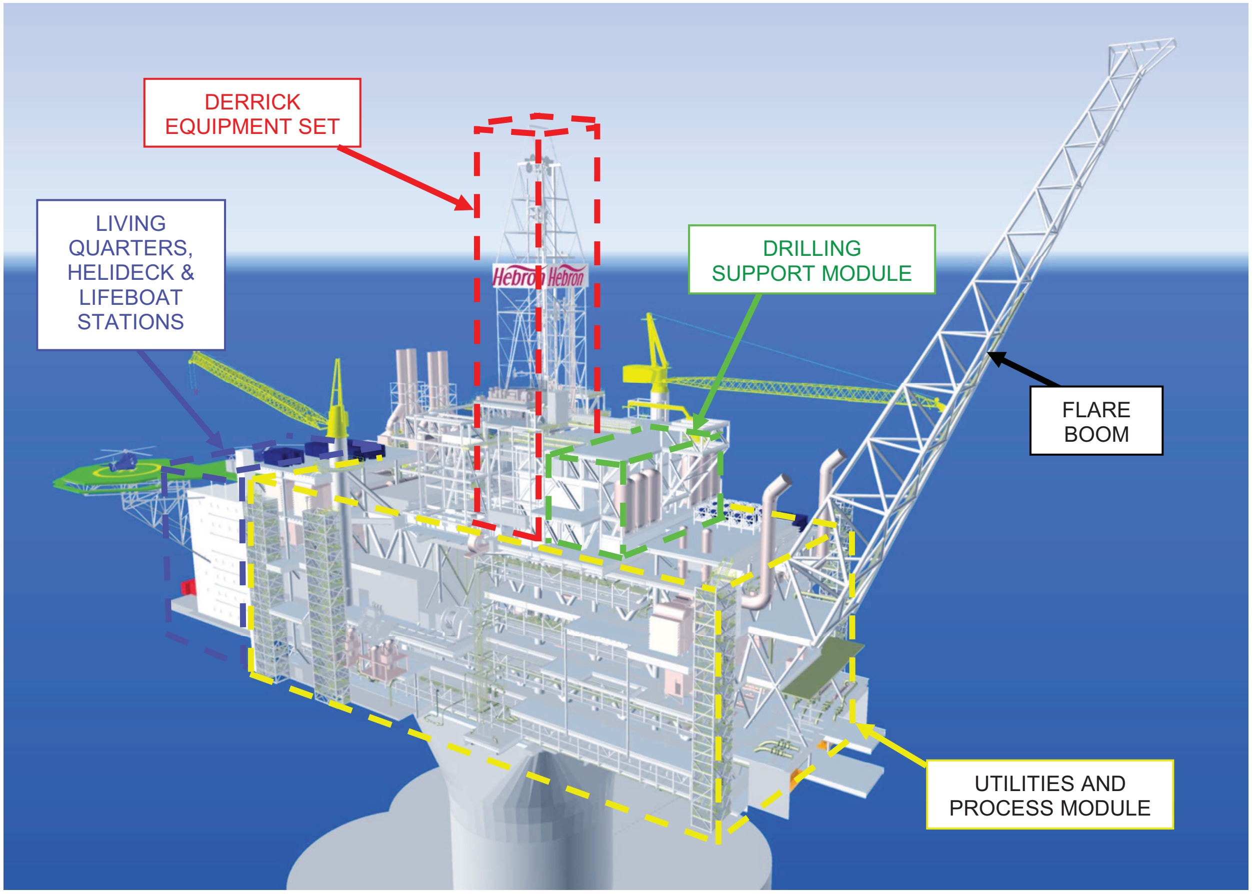


Figure 1.10-2: Schematic of Topsides

Production facilities will have the capacity to handle the requirements of drilling and production of crude oil, storage and export, gas management, water injection, and the management of produced water, for a production life of 30 or more years. Topsides facilities will be designed for a nominal design life of 30 years. Surveillance and maintenance programs will be implemented throughout the operation of the facility and the production life may be extended through refurbishment or replacement of select components as required.

The Hebron Project will include an OLS to offload crude oil onto tankers for transfer to the Newfoundland Transshipment Terminal or directly to market. The currently planned OLS system, as shown in Figure 1.8-4, consists of two main offshore pipelines running from the GBS to separate riser bases (Pipe Line End Manifolds, PLEMs) with an interconnecting offshore pipeline connecting the two PLEMs. The notional offloading rate of the system is 8,000 m^3/hr (50,300 bbl/hr).

The closed loop arrangement is planned to allow round-trip intelligent pigging and flushing operations through the pipelines and PLEMs if an iceberg threatens the loading facilities.

During loading, the riser will be connected to the dynamically-positioned, bow-loading shuttle tanker.

1.10.2 Hebron Project Design Criteria

An overview of the Hebron GBS and Topsides design criteria is provided in the following paragraphs. More details are provided in Section 8. The following design criteria are based on current estimated project requirements. However, during FEED and detailed design and engineering, some of these elements may be modified. The following description provides for ranges in design criteria to allow for any modifications to project design.

The Hebron production facilities will have the capacity to handle the predicted life-of-field production stream for 30 plus years. Based on the current initial development phase, it is expected the facility will be designed to accommodate an estimated production rate of 23,900 m^3/day of oil (150kbd). It is anticipated that, with de-bottlenecking and production optimization post-start-up, that the total capacity of the facility could potentially be raised to 28,600 m^3/day (180 kbd). The produced water system will be designed to process up to 55,000 m^3/day (350 kbd) of produced water and inject up to 74,000 m^3/day (470 kbd) of water. Gas handling of up to 8,500 km^3/day (300 MSCFD) will be required to accommodate gas re-injection and artificial lift gas.

An overview of the design basis for the Hebron Project is provided in Table 1.10-1. These design rates may change as the reservoir depletion strategy and initial development phase are finalized.

Table 1.10-1: Hebron Project Attributes

Project Component	Attribute
Platform Location	46°32.64344 min N; 48°29.88379 min. W
Life of Field	Greater than 30 years
Well Slots	Up to 52
Measured Well Depths	2,300 to 6,500 m measured depth
Topsides Design Basis Summary	
Preliminary Topsides Weight	30,000 to 44,000 tonnes
Crude Oil Production	23,900 to 28,600 m^3/d (approximately 150 to 180 kbd)
Water Production	31,800 to 55,000 m^3/d (approximately 200 to 350 kbd)
Water Injection	43,000 to 74,000 m^3/d (approximately 270 to 470 kbd)
Gas Handling (includes associated gas and gas-lift gas)	6,000 to 8,500 km^3/d (approximately 215 to 300 MSCFD)
GBS Notional Design Metrics	
Concrete GBS Structure	Reinforced concrete with post tensioning
Overall Height (seabed to top of central shaft)	Approximately 120 – 130 m (394 – 427 ft)
Foundation Diameter	122 to 133 m (400 to 436 ft)
Caisson Diameter	100 to 110 m (328 to 361 ft)
Shaft internal diameter	Approximately 33 m (108 ft)
GBS Dry Weight	300,000 to 340,000 tonnes
Solid Ballasting	50,000 to 100,000 tonnes
Concrete Volume	115,000 to 126,000 m^3 (150,300 to 164,700 cubic yards)
Reinforcing Steel	33,000 to 50,000 tonnes
Post Tensioning Steel	3,700 to 5,000 tonnes
Topsides Support during tow-out	Up to 44,500 tonnes
Base Storage	7 storage cells Approximately 190,000 m^3 (1.2 M bbl)
Life Expectancy of GBS	Approximately 50 years

Project Component	Attribute
Potential Field Expansion	J-tubes, risers, and unused well slots Future options may include use of additional platform drilling slots, reclamation of previously-utilized slots and / or sub-sea wells connected via tie-back to the GBS
Water Quality	
Produced Water Handling (OWTG limits)	≤ 30 mg/L 30-day average; ≤60 mg/L 24-hour average
Storage Displacement water (oil content – OWTG limits)	≤ 15 mg/L
Ballast / Bilge Water (oil content – OWTG limits)	≤ 15 mg/L
Deck (open) Drainage (oil content – OWTG limits)	≤ 15 mg/L
Well Treatment Fluids	≤ 30 mg/L; strongly acidic fluids should be treated with neutralizing agent to a pH of at least 5.0 prior to discharge
Cooling Water	As approved by the Chief Conservation Officer
Desalination Brine	No discharge limit
Fire Control Systems Test Water	No discharge limit
Monoethylene Glycol	As approved by the Chief Conservation Officer
Sewage and Food Waste	Macerated to ≤ 6 mm
Water-based Drill Solids	No discharge limit
NAF-based Solids	Re-injected where possible; if not, ≤ 6.9 g/100 g on wet solids
Offshore Loading System	
OLS Location	Approximately 2 km north-northeast of platform
Transfer Rate	Up to 8,000 m^3/h (50,312 bbls/hour)
Off-loading Line Length (each)	2 km (approximate) (6,560 ft)
Interconnecting Off-loading Line Length	1000 m (approximate) (3,280 ft)
Export vessels	Anticipated use of existing shuttle tankers

The design basis values presented in Table 1.10-1 are those listed at peak production; these are the limits expected when the facility is operating at peak production levels.

1.10.3 Gravity Base Structure Systems

The GBS will be designed to have permanent and temporary mechanical systems installed as follows:

- Up to 52 well slots and associated conductor guides and J-tubes and / or risers
- Two shale chutes
- Seven crude oil storage compartments, including associated booster pump(s) to lift the oil for offloading, and level monitoring equipment
- Seawater systems including storage displacement water, cooling water and firewater, will likely include:
  - A large-diameter caisson for return of seawater to the marine environment
  - Separate lift pumps to supply the firewater and seawater systems; firewater pumps will be segregated to ensure that no single point of failure can cause loss of firewater supply.
  - Storage displacement water from the crude oil storage compartments will pass through a buffer cell before horizontal discharge. The final temperature of the storage displacement water prior to its discharge will be approximately 30°C.
- Corrosion protection system to protect metal elements against corrosion and biological growth where seawater is present. The discharge from the hypochlorite system will be treated in accordance with the *Offshore Waste Treatment Guidelines* (OWTG) [National Energy Board (NEB) *et al.* 2002] (Note: the OWTG are currently being revised. While this development plan may refer to the 2002 OWTG, all operations will adhere to the most recent version of the guidelines).
- A separate sewage disposal line may route water from the sewage treatment unit to the marine environment. Merits of combined disposal will be addressed during detailed engineering design work. Sewage will be discharged overboard in accordance with the OWTG (NEB *et al.* 2002).
- Systems to minimize the occurrence of flammable gases and flammable or combustible liquids entering the shaft and allowance for removing any accumulations of gas
- Fire and gas detection system
- Control and monitoring systems including instrumentation to control crude oil levels, monitor corrosion systems and monitor foundation integrity

- Cooling system to ensure proper temperature maintenance of the GBS shaft over the life of the project
- Grounding / Earthing System including cables running through the GBS

1.10.4 Topsides Systems

The topsides will include all equipment required for the drilling, processing and power generation for the Hebron Project.

1.10.4.1 Drilling Facilities

Based on preliminary design work, drilling facilities on-board the GBS will consist of the following systems:

- Mechanical drilling systems, including drawworks and pipe handling
- Well control system consisting of a blow-out preventer (BOP) stack, complete with diverter assembly, hydraulic control system, kill and choke manifold, trip tank, atmospheric separator (de-gasser)
- Bulk material and storage system, including storage tanks and surge tanks for dry bulk materials
- Mud storage, mixing and high pressure system, including liquid storage tanks, mixing equipment, and mixing, transfer, pre-charge and high-pressure mud pumps
- Mud return and reconditioning system, including shaker distribution box, shale shakers, degassers, centrifuges, and associated tanks and pumps
- Onboard gravel pack equipment
- Cementing system, including a dual high-pressure pump unit, a batch mixing unit and a Liquid Additive System
- Driller's cabin containing drilling controls as well as monitoring capabilities for all drilling, pipe handling, mud handling and cement handling operations
- Cuttings re-injection system for NAF-based mud and cuttings. NAF-based mud and cuttings will be re-injected into the subsurface via a re-injection well. There will be no NAF-based cuttings treatment on the platform. The cuttings re-injection system will be designed with dual redundancy; there will be a minimum of two wells for re-injection. All water-based drill mud and cuttings will be discharged overboard, as per the OWTG (NEB *et al.* 2002). There will be two shale chutes for water-based cuttings discharge

1.10.4.2 Process Systems

The main function of the production facility will be to stabilize the produced crude by separating out the water and gas from the oil, sending the crude oil to storage, and treating and managing the separated gas and water and associated components such as sand. The following is a list of the main systems employed in the process and utilities during crude oil processing.

- Three-stage separation system
- Water injection system
- Gas compression
- Gas lift
- Gas injection
- Produced water treatment
- Vent and flare system
- Oily water treatment
- Chemical injection
- Seawater lift
- Power generation and distribution
- Fuel gas
- Process cooling
- Crude oil offloading and metering
- Potable and service water
- Fire suppression systems
- Escape, evacuation, and rescue facilities
- Jet fuel storage
- Diesel fuel storage
- Hydraulic power
- Heating, Ventilating and Air Conditioning (HVAC)

1.10.5 Subsea Production and Injection Systems

A full development option of Hebron Pool 3 is as a subsea tie-back to the Hebron GBS (Option 3). A conceptual design for the subsea production and injection system has been developed (Figure 1.10-3) and consists of the following elements:

- One or more subsea excavated drilling centres with production, water injection, and gas injection manifolds and trees, umbilical termination assemblies, subsea distribution units, control pods, jumpers and flying leads.

- Production, water injection, gas injection, gas lift, and well stimulation pipelines and / or flowlines, and control umbilicals between the GBS and the subsea drilling centers.
- Pipeline risers and / or J-tubes pre-installed in the GBS
- Additional Topsides equipment necessary to support subsea development

Subsea facilities will include all equipment necessary for the safe, efficient operation and control of subsea wells, and transportation of production and injection fluids between the subsea wells, subsea manifolds, and GBS facilities. Specifics of the conceptual design may change as designs are finalized.

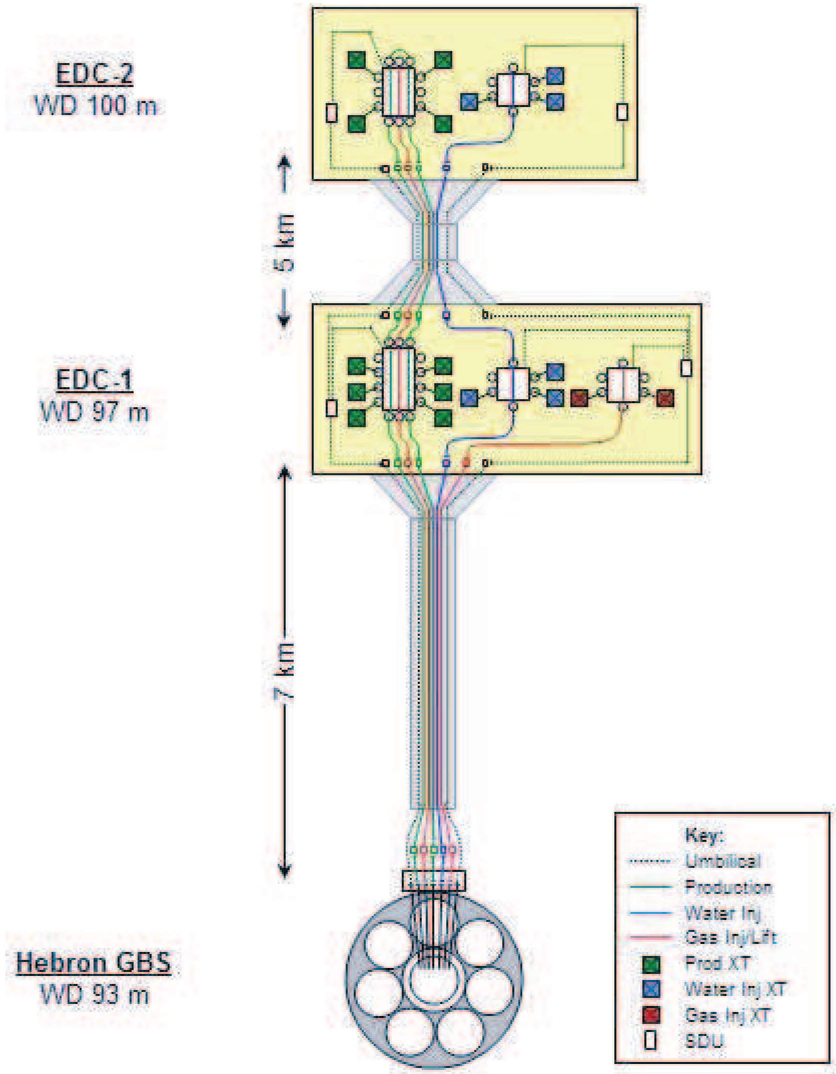
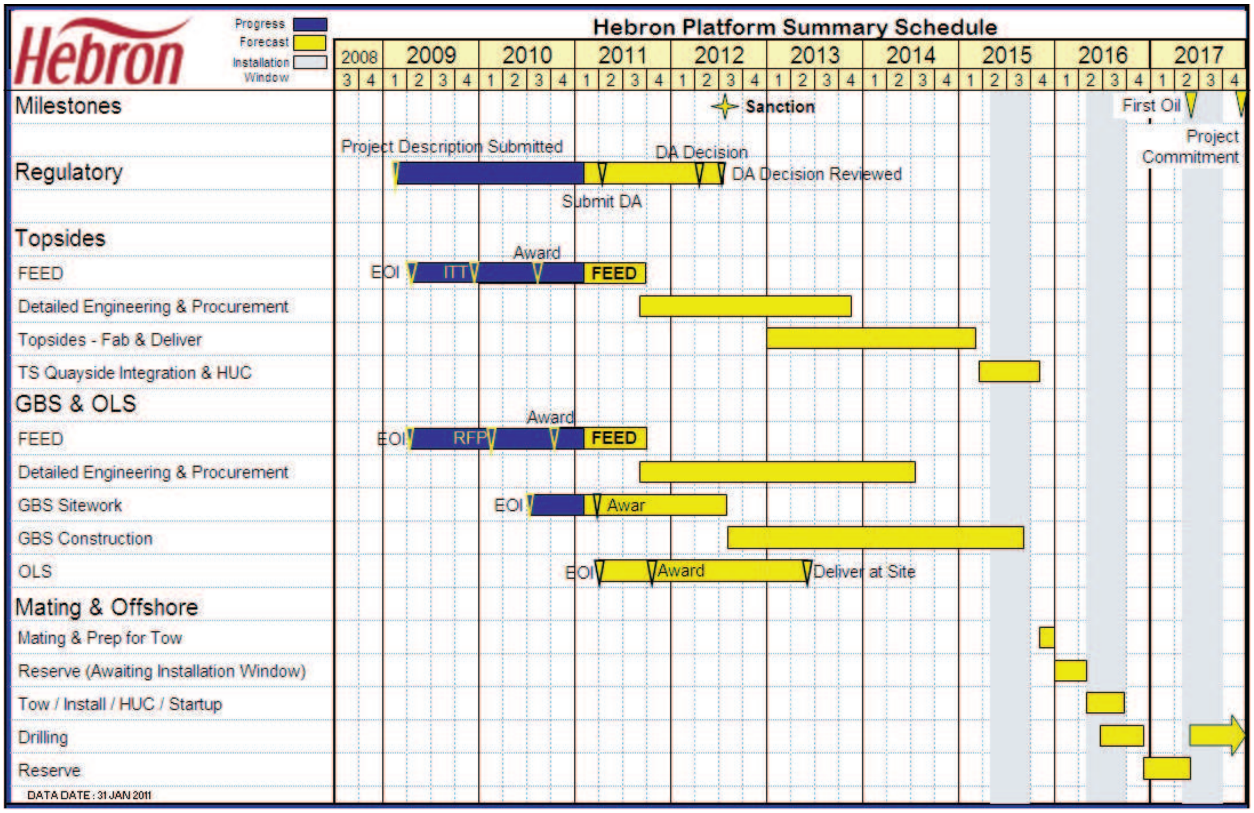


Figure 1.10-3: Pool 3 Full Development Option Subsea Concept Layout

1.11 Project Schedule

The overall project development schedule is shown in two parts as the duration and timing of the the Hebron Platform Development is more mature than the schedule for the Hebron Pool 3 Development. The Hebron Platform Development schedule is illustrated in Figure 1.11-1.



Notes:

** DA - Development Application includes Development Plan, Benefits Plan, EIS / SEIS and other supporting documents as determined by the C-NLOPB*

Figure 1.11-1: Hebron Platform Development Schedule

A preliminary Pool 3 subsea development (Option 3) schedule is illustrated in Figure 1.11-2. Specific duration and timing of the development is under evaluation with the earliest start-up date envisioned to be concurrent with the platform first oil date.

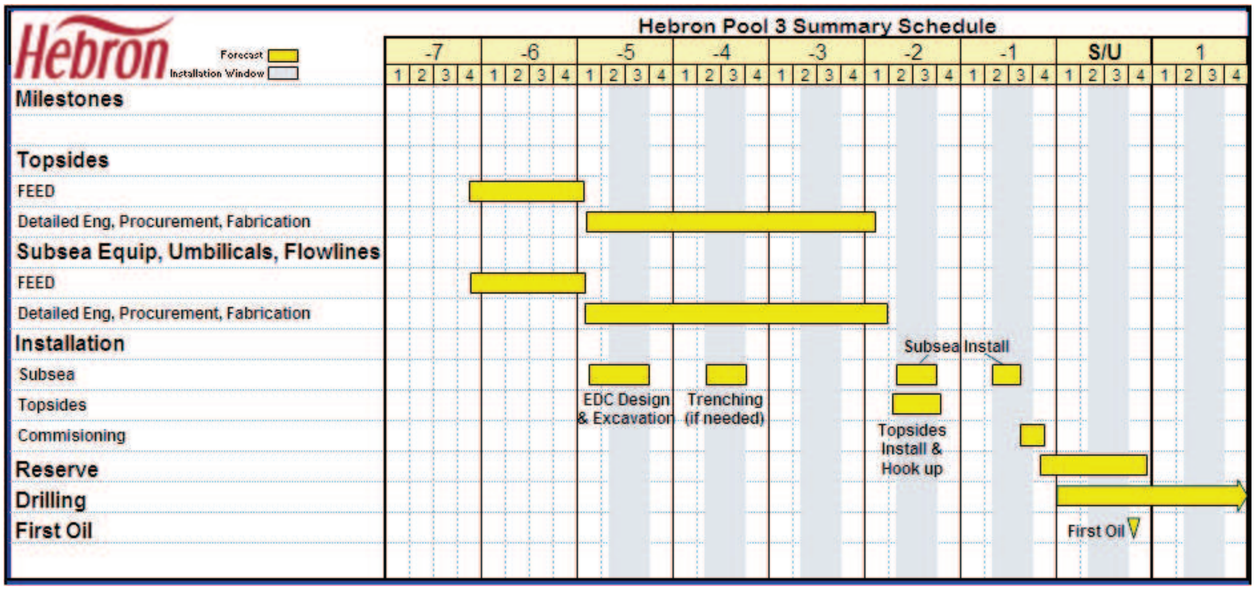


Figure 1.11-2: Hebron Pool 3 (Option 3) Development Schedule

1.12 Hebron Project: Construction and Installation

Construction of the Hebron facilities will maximize the use of existing technology and expertise. Safety, experience, quality, and commercial terms will be considered when selecting contractors.

The Hebron Project has four major construction scopes – the Topsides Integrated Deck, the GBS, the Export System / OLS, and the Pool 3 Subsea Development. The Topsides will employ a modular fabrication strategy with subsequent module integration, while the GBS will employ civil construction techniques along with installation of mechanical outfitting. After completing construction of these two scopes, they will be mated creating one integrated system. The Export System / OLS and the Pool 3 Subsea Development will be tied into the facility subsequent to platform installation at the offshore site.

The strategy for the GBS is to design the structure with thorough consideration of the construction process and input from construction planning. As the GBS will be floating for a significant portion of the construction and installation phase, the design must ensure stability of the structure at all times. Thus, the design is a function of the various construction stages.

The Bull Arm Site has been selected as the primary construction and integration site for the GBS and topsides modules. This location provides adjacent dry dock and deep water GBS construction sites as well as facilities to fabricate components and integrate the topsides modules.

When ready for mating with the GBS, the assembled Topsides will be loaded onto specialized barges and floated to the Deepwater Site using the barges in a catamaran configuration. Once the Topsides are in position over the GBS shaft, the GBS will be de-ballasted and will lift the Topsides off the barges.

After de-ballasting the GBS to ensure the necessary under keel clearance, the platform will be released from its moorings and towed to the field. The completed platform comprising the GBS and Topsides will be towed to the field (340 km offshore) and installed at site, most likely during an April to October weather window. Tow duration may be 10 to 14 days. The project plans to install the OLS during the same weather window.

Once at site the platform will be water ballasted. Once ballasted, grouting around the base of the platform may be required to increase uniformity in foundation bearing pressure and increase the platform stability *in situ*.

Once installed at the site, final hook up and commissioning activities of the Topsides and GBS facilities will be executed offshore. These include connection of the OLS to the platform.

The overall construction sequence for the Hebron Platform Development is shown in Figure 1.12-1 and described in more detail in Section 10 of the Development Plan.

Construction and installation activities for the Pool 3 Subsea Development will be generally similar to those used previously on the Grand Banks. Section 10 of the Development Plan describes these activities in more detail.

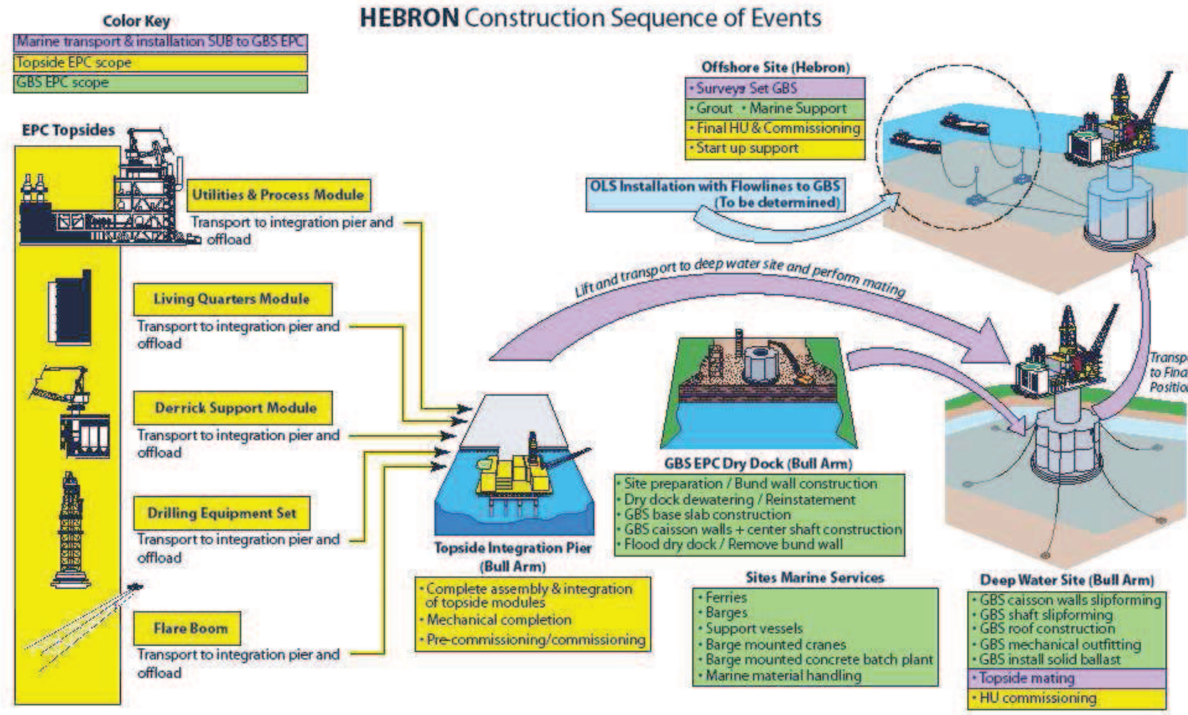


Figure 1.12-1: Hebron Construction Sequence

1.13 Hebron Project Operations

The Hebron Project operations, as described in Section 11 of the Development Plan, will be managed by EMCP as Operator, employing both Company and third-party services. The project will be managed and operational decisions will be made from offices in St. John's, Newfoundland and Labrador.

1.13.1 Operational Support

The onshore organization will include engineering, technical, SSH&E (safety, security, health and environment), logistics, financial and administrative personnel. Onshore support for docking, warehouse space, helicopter operations and product transshipment will be carried out at existing worksites in Newfoundland and Labrador. The Hebron Project will look to optimize existing operations at EMCP, through the sharing of resources and, contracted services, where feasible.

1.13.2 Logistics and Other Support

Four key areas of logistical support required during the operation and maintenance of the project are shorebase support, personnel movements, vessel support and iceberg management. Where practicable, the Operator will consider possible synergies with existing Grand Banks operators. The project will also be supported by Oil Spill Response personnel.

Shorebase Support: Marine shorebase and warehouse facilities using existing facilities in St. John’s and surrounding areas capable of providing project support activities will be used. Existing port facilities are capable of servicing multiple operations, including wharfage, office space, crane support, bulk storage, consumable (fuel, water) storage and delivery capability.

Personnel Movements: Helicopters will be the primary method to transfer personnel between St. John's and the offshore platform. Personnel may also be transferred using supply vessels, when required (*i.e.*, weather or other logistical delays). The Operator will consider and discuss possible shared services with other Grand Banks operators with a view to optimizing the fleet configurations of all operations and providing the safest and most efficient and effective service.

Vessel Support: Supply and stand-by vessels will be required to service the operational needs of the platform and drilling units in the Hebron Project Area. Supply vessels may also be required to conduct components of the environmental effects monitoring program and for oil spill response support, training and exercising. The Operator will consider and discuss possible synergies with other Grand Banks operators, where practicable, with a view to optimizing the fleet configurations of all operations and providing the safest and most efficient and effective service. As with current operations, vessels associated with the Hebron Project will operate within established shipping corridors between St. John’s and the offshore project area

Ice Management

The Grand Banks Ice Management Plan has been developed by existing operators and the Hebron Project is expected to participate in this program. Reliable systems for the detection, monitoring and management of icebergs and pack ice, including towing techniques, have been developed for the Grand Banks area.

Communications

Equipment and systems will be installed to provide industry accepted high standards of communications on the Hebron Platform itself and between Hebron, the onshore office and facilities, and other offshore installations, vessels and aircraft in the vicinity of the Hebron Platform.

The communications systems will include radio, telephone, telemetry, local area computer network, and other related equipment necessary to provide the high standard of reliable communication that is required for safe and efficient operations. The systems will comply with all regulatory requirements. Back-up systems will be used to provide the maximum continuous communications capability available in any reasonable environmental condition.

1.13.3 Shipping / Transportation

Crude oil from the Hebron Platform will be transported to the Newfoundland Transshipment Terminal or direct to market. Tankers will be in compliance with Canadian regulations and will use existing international shipping lanes and established shipping lanes.

1.14 Decommissioning and Abandonment

The Operator will decommission and abandon the Hebron production facility according to applicable regulatory requirements. The platform infrastructure will be decommissioned and the wells will be plugged and abandoned. The platform structure will be designed for removal at the end of its useful life. This is discussed further in Section 12 of the Development Plan.

1.15 Potential Expansion Development

Further development of resources is anticipated within the four Significant Discovery Licences, and / or on adjacent land that may be acquired by project proponents. These expansion developments may be produced from the platform or through tie-back using sub-sea systems similar to those described for the Pool 3 development.

1.16 Development and Operating Cost Data

1.16.1 Past Expenditures

Past expenditures associated with the Hebron Project are shown in Table 1.16-1.

These expenditures total $538.49 million, and were incurred between 1980 and 2010. Table 1.16-1 shows the costs for each well and the engineering and project team expenditures related to the pre-development of those wells.

The well costs were incurred under the fiscal years 1980-1981 through to 2000-2001. During this period, seven wells were drilled in the Hebron-Ben Nevis field.

The pre-development engineering studies and project team costs covered the fiscal years 1997-1998 through to 2005-2006 and 2008-2010.

Table 1.16-1: Past Expenditures (1980 to 2010)

Past Expenditures (1980 - 2010)	Total
Ben NevisI-45	29,667,505
Hebron I-13	48,205,376
Hebron D-94	34,421,746
Ben Nevis L-55	23,803,418
Hebron M-04	67,223,469
West Ben Nevis B-75	111,003,904
North Trinity H-71	58,622,900
Total Well Costs:	**372,948,318**
Pre-Development Engineering Studies and Project Team Costs	165,540,058
Total Costs (CAD):	**538,488,376**

1.16.2 Drilling Capital Estimate

The drilling cost estimates are based on mid-2009 price levels and include all applicable customs, duties, and sales taxes.

They are based on the following assumptions:

- Drilling and completion operations will take place as described in the Development Plan
- Drilling costs based on scoping level estimates for generic pool and well type
- Base rig rates and full rig spread rates are based on in-house data
- Estimate assumes a learning curve effect over time to reduce base activity times
- Non-production time assumed to be higher than average initially due to start-up and then decrease over time as lessons learned incorporated into project
- Supplier costs based on current East Coast cost environment
- The economic conditions prevailing world-wide in mid-2009 price levels will continue throughout the period of drilling and completion operations

1.16.3 Facilities Capital Estimate

1.16.3.1 Hebron Platform Development

The Hebron Platform Development cost estimates are based on mid-2009 price levels, and include all applicable customs, duties, and sales taxes. They are based on the following assumptions:

- The development will take place as described in this Development Plan

- There will be competition for the supply of all facilities, goods, and services on the project and contracts will be awarded in compliance with the Canada-Newfoundland Benefits Plan proposed for the project
- Current worldwide economic conditions will continue

The capital cost estimates are based on in-house cost studies and contractors' estimates. Contractors' estimates are developed from the following information:

- Preliminary facilities design
- Equipment sizes and weights
- Equipment-to-bulk-ratios and weights
- Fabrication work-hours per ton
- International wage rate surveys
- Vendor cost data
- Contractor cost data
- Fabrication and installation schedules
- Engineering and project management costs
- Marine operations costs

The capital cost estimates include costs for the following items:

- Topsides
  - Utilities and Process Module
  - Flare Boom
  - Living Quarters Module
  - Helideck
  - Lifeboat Stations
  - Drilling Rig Modules and Derrick
  - Gravel Pack Module
- Gravity Base Structure
- Offshore Loading System
- Pre-project costs
- Project management
- Contractor engineering and home office costs

- Quality assurance
- Infrastructure upgrades
- Site facility operations and Camp Costs
- Transportation and installation
- Completion and offshore hook-up
- Well drilling and completion
- Pre-start-up operations

A summary of the capital estimate is presented in Table 1.16-2 for the Hebron Platform Development.

1.16.3.2 Pool 3 Subsea Development

For the Pool 3 Subsea Development, ranges of capital cost estimates are included for the range of development concepts described in this development plan. These costs are based on in-house cost studies. The capital cost estimates include costs for the following items:

- Topsides Process Module
  - Pig launcher and receiver
  - Three phase separator
  - Fiscal metering
  - Gas injection compressor
  - Sea water treatment and water injection pumps
  - Chemical injection and storage
  - Utilities
- Subsea Excavated Drilling Centre(s) (EDC)
  - Production manifolds and pigging loop
  - water injection manifold(s)
  - gas injection manifold(s)
  - Subsea multi-phase and single phase meters
  - Pipelines and umbilicals to tie-back to GBS
- Project management
- Contractor engineering and home office costs
- Quality assurance

- Site facility operations and camp costs
- Transportation and installation
- Completion and offshore hook-up
- Well drilling and completion
- Pre-startup operations

The range of capital costs ($M CAD, Constant) for the Pool 3 subsea development is expected to be:

Topsides Module	$420 to $500 $M CAD
Subsea EDC(s)	$1050 to $1750 $M CAD
Drilling	$1430 to $2500 $M CAD
Total	$3000 to $5000 $M CAD

Table 1.16-3 presents the capital cost estimate for the full development of Pool 3 (Option 3).

1.16.4 Operating Cost Estimates

The annual operating cost estimates are based on mid-2009 price levels, and include all applicable customs, duties, and sales taxes. EMCP has drawn on its extensive global operating experience and has taken into consideration the operation experience of other operators of similar facilities in order to develop the following items:

- Facility operating costs (personnel related costs, process related costs such as fuel and chemicals, communication, etc.)
- Well workovers
- Variable production
- Scheduled downtime
- Support logistics (transportation, catering, services, onshore warehouse, etc.)
- Administration (onshore support, training, etc.)

The operating costs are based on the following assumptions:

- The reservoir parameters will be as described in this Development Plan

- EMCP will operate the development in accordance with a typical co-venture agreement and will adhere to the management approach and development scenario as set out in this Development Plan
- The economic conditions prevailing world-wide in mid-2009 will continue throughout the period of operation
- Operating costs for the Pool 3 Subsea Development are expected to increase total operating expenses by 1% to 3%. This increase has not been included in the operating expense estimate since the timing of the development has yet to be determined.

A summary of the operating estimates are presented in Table 1.16-2:

Table 1.16-2: Hebron Platform Development Capital and Operating Estimates

Year	Capital Costs ($M CAD))						Operating Costs ($MCAD)
	Pre-Production				Drilling	Total	
	Proj. Admin.	Topsides	GBS	OLS			
2010	68	12	13	0		93	1
2011	174	394	240	0		807	9
2012	244	704	291	12		1252	11
2013	216	698	391	36		1340	14
2014	290	643	444	107		1484	20
2015	327	409	234	69		1039	36
2016	256		175	0	82	513	65
2017					222	222	157
2018					236	236	147
2019					242	242	148
2020					242	242	174
2021					242	242	159
2022					218	218	159
2023					189	189	159
2024					215	215	179
2025							159
2026							161
2027							164
2028							187
2029							176
2030							196
2031							194
2032							210
2033							190
2034							188
2035							186
2036							202
2037							182
2038							181
2039							179
2040							197
2041							180
2042							180
2043							180
2044							187
2045							176
2046							592
TOTAL	$ 1,575	$ 2,861	$ 1,788	$ 224	$ 1,887	$ 8,334	$ 5,883

Notes:
Operating Costs exclude crude transportation costs.
The final year Operating costs include $430 MM for adandonment of the facility and wells.

Table 1.16-3: Pool 3 Subsea Development Capital Estimate

Year	Capital Costs ($M CAD, Constant)				
	Proj. Admin.	Topsides	SURF	Drilling	Total
-7	25		10		35
-6	35	80	310		425
-5	40	85	280		405
-4	40	85	180		305
-3	35	85	125		245
-2	40	80	70	15	205
-1	35	50	40	85	210
S/U				350	350
1				350	350
2				350	350
3				350	350
4				280	280
Total	250	465	1,015	1,780	3,510

Notes:
Lowside estimate is -20%
Highside estimate is +40%

1.17 Safety Analysis and Commitment

This section documents how the Hebron Project has integrated safety into the design of the proposed development. It includes how safety is integrated into the both the design of structures, facilities and equipment and the management systems, policies, procedures, planning processes and personnel selection, training and management that will be used during all phases of the Hebron Project.

1.17.1 Concept Safety Analysis and Target Levels of Safety

According to Section 43 of the Newfoundland Offshore Petroleum Installations Regulations, an operator is required to submit to the Chief Safety Officer a Concept Safety Analysis of an installation that considers all components and activities associated with each phase in the life of the production installation. The Concept Safety Analysis must include a determination of the frequency of occurrence and potential consequences of potential accidents identified, and details of safety measures designed to protect personnel and the environment from such accidents.

The report, therefore, identifies major hazards associated with the Hebron facility, taking into account the basic design concepts, layout and intended operations, and assesses the risks to personnel and the environment resulting from these hazards.

The Concept Safety Analysis, conducted by RMRI (Canada), is included in Part II of the Development Application. The following paragraphs provide a description of its contents and summarize the findings of the study.

Section 2 provides an outline description of the Hebron project and Section 3 describes the key safety design features and systems proposed for the prevention, detection and control of potential major hazards. Sections 6 to 10 present the basis of the assessment of risk to personnel due to the identified major hazards (listed in Section 5). Section 11 presents the results of the assessment, and compares them to the Target Levels of Safety set for the Project (Section 4). Section 12 details sensitivity studies that have been performed.

The Concept Safety Analysis identifies and assesses quantitatively the following Major Hazards associated with all phases of the proposed development of the Hebron Asset:

- Loss of hydrocarbon containment (resulting in fire, explosion or toxic gas release)
- Blowout (resulting in fire, explosion or toxic gas release)
- Iceberg Collision
- Ship collision
- Helicopter transportation
- Seismic activity

Dropped object events are also considered. The risk arising from such events is, however, not quantified in the Concept Safety Analysis. This is because sufficiently detailed information on lifting activities is not available at this stage and because it is assumed that appropriate procedures will be put in place to reduce this risk where possible. Dropped Object Studies will be carried out during front-end engineering design (FEED) and / or detailed design and mitigations recommended as needed.

Occupational accidents are considered in the assessment, but the risk from such accidents is not quantified. Whilst it is clearly necessary to recognize occupational hazards, and to reduce the frequency and mitigate the consequences of such events, it is not, in general, appropriate to assess these hazards using quantitative analysis techniques. Fatal Accident Rates for occupational accidents are generally derived from historical accident data. Measures will be put in place for the monitoring, control and mitigation of occupational hazards and accidental events.

The selection of clear design goals aimed at protecting personnel and the environment is fundamental to the design of offshore facilities. With this view in mind, the Hebron Project will use design goals known as Target Levels of Safety that are specified with regard to risk to personnel and risk to the environment.

TLS provide a benchmark against which the results of the quantitative analysis can be assessed. Tolerability of risk to personnel is generally judged based on three risk ‘regions’, the boundaries of which are defined by the TLS:

- An upper region (intolerable region), which defines risk levels that are unacceptable, so that further mitigation measures must be taken to make the risk tolerable
- A lower region (broadly acceptable or ‘negligible’ region), which defines risk levels that are generally tolerable and there is no need for consideration of further mitigation measures
- Between these upper and lower regions, an intermediate region where the risk may be tolerable but continuous efforts to reduce risk should be undertaken

The Hebron Project is currently at the concept design stage. There are, therefore, significant uncertainties in some of the risk assessment data used in this assessment, which mean that the risk values predicted are indicative only. Where uncertainties exist in the risk analysis, conservative assumptions (that is, assumptions that over-estimate the risk, rather than under-estimate the risk) are made.

The Concept Safety Analysis found that the largest contributors to risk to personnel on the Hebron Platform are:

- Helicopter transportation (accounting for approximately 38% of overall platform risk during drilling and production phase, and approximately 54% in the post-drilling phase)
- Blowout events resulting in evacuation fatalities (approximately 38% of overall platform risk during drilling and production phase, and approximately 12% in the post-drilling phase)
- Process loss of containment event resulting in immediate fatalities (approximately 16% of overall platform risk during drilling and production phase, and approximately 30% in the post-drilling phase)

A review of the adequacy of potential risk reduction measures to prevent, mitigate and safeguard against these main risk contributors should be undertaken at the detailed design stage, in order to ensure that risks are adequately addressed.

The risk from blowout decreases significantly in the post-drilling phase, as the blowout risk associated with drilling activities is greater than that associated with well activities carried out on production wells. The risk from process loss of containment increases slightly in the post-drilling phase as it is dependent on the number of wells in production and it is assumed that the maximum number of wells will be in production once drilling is complete.

Comparison of the predicted risks with the Hebron TLS concludes that they are below the intolerable region and within the intermediate region defined by the criteria. Additional risk reduction studies and activities will be undertaken during engineering to ensure that risks are adequately identified and addressed such that risk is minimized in the final design.

Risks associated with H_2S are not accounted for in these preliminary results. However, initial evaluation of these risks suggests they will be very low (if not negligible) and are likely to have little if any impact on the overall results presented in the tables above. Risks associated with production from Pool 3 are not accounted for in these preliminary results. Initial evaluation of these risks suggests the total project average IRPA during drilling and production will be no greater than 1.5×10^{-4}, and the total project average IRPA during production only will be no greater than 1.2×10^{-4}.

It is however concluded that there are no significant areas for concern that could prevent demonstration that risks have been reduced. Further studies will, however, be required at detailed design stage, to confirm or refine the assumptions that have been made in this Concept Safety Analysis and to reflect the design of the installation as it is developed by EMCP.

1.17.2 Risk Assessment Plan

The Risk Assessment Plan for the Hebron Project is described in the Project Risk Assessment Plan (PRAP) document (CAHE-ED-FPRSK-00-000-0001). The PRAP addresses risk assessments that are aimed specifically at the design and construction phases, including installation, commissioning, and start-up. The PRAP also addresses loss prevention studies that will be done during the project to support risk assessment and hazard and operability studies (HAZOPS). The early plan lists the pre-identified project-specific risk activities (both formal risk assessments and loss prevention studies) in addition to ExxonMobil template-recommended studies, workshops, philosophies, and risk assessments. The PRAP will be updated as the project progresses and the need for additional studies is discovered.

The Risk Assessment Plan is converted to the Hebron Project Risk Management Plan by the addition of scopes, responsibilities, and definition of the method by which action items will be documented, tracked, and closed.

Risk Management includes EMCP's contractors and subcontractors planning, conducting, evaluation, and follow-up of formal risk assessments, including HAZOPS.

The risk management objectives are:

- Risks related to project execution and operations are identified by a structured approach to risk identification

- Risk assessments are planned and conducted in advance of appropriate project milestones or activities to allow timely management of risk
- Appropriate personnel are included in risk assessments to verify risks are correctly identified and assessed
- Results of risk assessments and the associated risk reduction measures are evaluated by appropriate levels of management and are documented, executed, and followed-up to completion to reduce risks to an acceptable level consistent with project objectives
- Risks and associated resolutions are documented for hand-over to Operations

1.17.3 Quality Assurance and Quality Control

The Hebron Project will require specific quality assurance systems across the whole Hebron development. This will be applicable to all major contractors and suppliers in the conduct of their activities associated with the Hebron Project. As well, Hebron Project will ensure that the conduct of all project tasks, and the quality of installation, are in accordance with applicable C-NLOPB offshore regulations.

Before going into production operation, the Hebron Project will issue a Declaration of Fitness to C-NLOPB after which a Certificates of Fitness (COF) will be issued. An independent certifying agency has been selected to act as the Certifying Authority for the project. The Certifying Authority will monitor the project throughout its development and to confirm that the complete installation has been designed, constructed and installed in compliance with regulations. Pursuant to the requirements of the COF Regulations under the Atlantic Accord Acts, a scope of work for the Certifying Authority will be developed by the Certifying Authority in consultation with EMCP, and submitted to the C-NLOPB for approval. ExxonMobil has developed Global Practices which are company standards and are used to illustrate the minimum acceptable requirements for delivery of product.

EMCP will also be implementing ExxonMobil's global management Operations Integrity Management System (OIMS) to ensure compliance to company requirements.

The relationship between Hebron Project and its major contractors, particularly in the case of the installation, needs to be seamless. A key element in achieving that seamless relationship is the demonstrated compatibility of the OIMS and Global Practices with Contractor(s) management systems. This will be monitored through implementation of various surveillance programs that cover Quality, Procurement, Engineering and Construction.

The Hebron Project requires that its major contractors document how their project quality management systems will be implemented across the project.

These programs will at a minimum meet ExxonMobil requirements, and where gaps are identified, contractors will be asked to rectify in order to achieve complete consistency with regard to project quality expectations.

The Hebron Project will conduct regular structured audits against the contractor's activities.

1.17.4 Training Plan

The Hebron Project Training Plan describes plans for ensuring the training and qualifications of all personnel to be employed in association with the proposed development. The plan will comply with the ExxonMobil global best practice on training personnel as well as the Atlantic Canada Offshore Petroleum Industry Standard Practice for the Training and Qualifications of Personnel (CAPP, 2008). It will discuss the following topics:

- Onshore organizational structure
- Offshore organizational structure
- Personnel selection and competency verification
- Personnel training, training documentation and record keeping
- Operating and maintenance procedures and practices
- Safety and emergency preparedness / response training
- Training methodologies
- Management training and qualifications

1.17.5 Safety Management System and Safety Plan

The ExxonMobil Safety Management System is fully integrated within OIMS which addresses the overall Operations Integrity Management and planning implementation activities for the Hebron Project and its contractors.

The Safety Management System will be used by the Operator during all phases of the Hebron Project from engineering design and construction phases through to drilling and completions, and producing operations to eliminate or reduce risks to personnel, the environment, and the asset through a systematic, continuous improvement process. The Hebron Safety Management plan will focus on preventing and minimizing accidental losses, based on the following continuous improvement process:

- Policies, organizations, roles and responsibilities
- Planning
- Implementation and operation
- Checking and corrective action

- Management review

EMCP will implement safety, security and health policies and procedures for the Hebron development that will meet or exceed all statutory requirements, ensure the safety of all personnel, provide a healthy work and living environment, and support the goal that "*Nobody Gets Hurt*".

As part of EMCP's application for an Operations Authorization, EMCP will prepare and implement a Project Safety Plan covering all platform drilling and producing operations. The Plan will be prepared in accordance with the requirements of the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and the C-NLOPB's *Other Requirements Respecting Occupational Health and Safety.*

The Project Safety Plan will follow the approach outlined in the C-NOLPB's *Safety Plan Guidelines* and discuss the following:

- Safety management policies and procedures
- Facilities and equipment
- Operations and maintenance procedures
- Training and qualifications
- Command structure
- Contingency planning

To minimize the risk to employees of occupational injuries or illnesses, operational characteristics and conditions will be monitored. Modifications will be made to address exposure to excessive noise, heat, radiation, vibration, ventilation issues and ergonomic considerations. Programs will be developed to engage personnel and promote occupational hygiene, enhance the well-being of personnel, and prevent incidents.

Safety will be an important design criterion. HAZOPS will continue to be essential activities at key stages of design. The purpose of a HAZOPS is to identify a potentially hazard, assess the possible consequences and determine the most appropriate mitigating action.

Fire and gas monitoring procedures are of key importance as this system will be the primary process hazard detection system and will have a direct interface with the emergency shutdown system and active protection systems.

Safety procedures training will be provided to every employee to ensure complete awareness and understanding of these procedures. Records will be maintained on the training undertaken by each employee.

1.17.6 Security Plan

The main objective with respect to security for all aspects of the Hebron Project is to provide security for project personnel, assets, facilities, and business information at job sites during construction and execution. A full project security management plan will be developed outlining all necessary focus areas with respect to security of the project, its offices, construction sites, and the platform. Ongoing threat assessments are being completed to understand requirements needed to meet threat escalation necessities and procedures for all project sites and travel routes. Safeguards and security qualitative risk assessments will be conducted, along with security design and planning review procedures to enhance our knowledge of the required security parameters that must be considered.

Additionally, the Hebron Project will work with regulatory bodies to implement the requirements of the Marine Transportation Security Regulations administered by Transport Canada and the C-NLOPB's other requirements respecting offshore security. Pursuant to these requirements, the Hebron Project will undertake a Facility Security Assessment and prepare and implement a Facility Security Plan.

2 BENEFITS PLAN

This Hebron Project Canada-Newfoundland and Labrador Benefits Plan (the “Plan”) has been prepared in response to the requirements of the Canada-Newfoundland Atlantic Accord Implementation Act and the Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act. The Plan also addresses the requirements of the Benefits Agreement reached between ExxonMobil Canada Properties (EMCP), the Hebron co-venturers and the Government of Newfoundland and Labrador. While the above regulatory and contractual requirements have shaped the Benefits Plan, its content is also driven by ExxonMobil’s conviction that making the most of energy resources goes beyond their production. It is an ExxonMobil objective to develop industry and labour capacity, and create and deliver sustainable benefits to host jurisdictions down to the community level. Participation in the further development of diverse supply, service, labour, education, training and research and development (R&D) capacity and capabilities in the Province of Newfoundland and Labrador (“Province”), close to Hebron and other ExxonMobil assets in Eastern Canada, facilitates local operations, and EMCP and its employees have a vested interest in the development of the communities where they live and work.

The Benefits Plan covers the construction and operations phases of the Project, which is currently estimated to have a total duration of over 30 years. Accordingly, the Plan is a high-level document, addressing the above-noted requirements over the entire life of Hebron by describing approaches and mechanisms that have the flexibility to respond to change. However, the Plan also includes information on current industrial and labour requirement estimates for the Project, for both its construction and operations phases. The Plan also includes information on the current industrial and labour capacity, and near-term examples of initiatives to demonstrate commitment and translate high-level strategy into action.

Industrial benefits considerations have been important in Newfoundland and Labrador since the late 1970s. Since that time, the petroleum industry has built on its early exploration, moving on to development and production activity. This has been accompanied by the development of a provincial offshore petroleum industry, with growth in the scale and scope of activity, its importance to the provincial economy and treasury, and industry-relevant infrastructure and education, training and R&D facilities and capabilities. This has also seen growth in the local labour force and supply community, and their participation in the global oil industry.

This Benefits Plan builds on, and has been developed with the goal of further advancing, the development of the industry in the Province, so that Hebron delivers long-term value to shareholders and to Newfoundlanders, Labradorians and other Canadians. This includes contributing to the Province reputation as being a source of supply, service, construction, fabrication, labour, education, training and R&D capabilities and expertise that are globally competitive in terms of safety performance, price, quality and delivery.

2.1 Approach to Benefits

EMCP has established the following Benefits Principles which underlie this Plan and will govern all of its benefits-related activities:

- Meeting local benefits commitments while maintaining the highest levels of safety, environmental performance, efficiency and integrity of our operations
- Selecting contractors and suppliers that will work diligently with us to deliver benefits to the people of the Province
- Promoting the development of local skills and industry capability that leaves a lasting legacy for the communities in which we operate and for the Province
- Delivering execution certainty so that Hebron delivers best-in-class return on investment to stakeholders, including the Province of Newfoundland and Labrador
- Working collaboratively with industry, government, academic and training institutions, community and other stakeholder groups for the effective delivery of benefits

EMCP will seek to implement these Principles through its Hebron construction and operations phase activities. In doing so, it will draw on and further develop a benefits culture within its organization and Hebron contracting companies. As with the development of a safety culture, this will see benefits considerations being inherent to business processes and practices, rather than a separate consideration.

In seeking to leave a lasting legacy, the focus will be on delivering sustainable industrial benefits that can be leveraged for local, national and export purposes. This includes providing training and employment experience that will deliver value for Hebron and are also transferable to other industries, projects and markets.

Such benefits are sustainable because they not only deliver value for Hebron but also help the Province be seen as a source of supply, service, construction, fabrication, labour, education, training and R&D capabilities and expertise that are globally competitive in terms of safety performance, price, quality and delivery. This also requires that Hebron maintain the highest levels of safety, efficiency (including through synergies with other projects and operators) and integrity and deliver execution certainty. This will assist the Province in attracting investment in future local projects and in competing for work on projects elsewhere in Canada and internationally.

EMCP will endeavour to be innovative in identifying sustainable benefits initiatives. Examples of initiatives under current consideration include:

- Further developing local expertise and practice in relation to the delivery of sustainable employment, business and other economic development
- Providing information and access to opportunities for workers and companies throughout Newfoundland and Labrador

2.2 Policies, Guidelines and Procedures

EMCP's Hebron benefits policies, guidelines and procedures are discussed under the following headings: Project Management, Supplier Development, Procurement and Contracting, Education and Training, Research and Development, and Diversity. A summary of initiatives is included at the end of each section and in Appendix D.

2.3 Project Management

EMCP will use the same project management approach for Hebron as ExxonMobil uses on all its projects. This approach is driven by a concern for:

- Safety, health and environmental performance
- Disciplined project management systems
- The application of innovative technology
- The promotion of local content and capabilities
- Community support and involvement
- Meeting our regulatory, contractual and other commitments

Hebron project management will be driven by a highly capable and motivated team, supported by ExxonMobil's world-class management systems. The management team will both exemplify and promote a benefits culture, and exhibit relentless discipline in implementing the Project, the Benefits Plan and its Benefits Principles, and ensuring it meets all regulatory and contractual requirements.

A Project office was opened in St. John's in 2009 and has the appropriate levels of decision-making to manage Hebron. Having decision-making and key management personnel in St. John's will assist in focusing on benefits matters and creating an in-depth understanding of local capabilities. A Hebron Benefits Team will be responsible for overall management of benefits, with an emphasis on the coordination of benefits between EMCP and its contractors and suppliers.

Project benefits goals will be achieved through the successful development, selection and monitoring of Hebron contractors and suppliers, which will have a similar level of obligation to the benefits commitments as does EMCP. Success in working with contractors and suppliers will be facilitated by the commercial terms of key contracts, allowing EMCP to influence strategy.

2.4 Supplier Development

Supplier development will be facilitated by EMCP's benefits culture and by cooperation and collaboration with the Province's oil and gas industry supply community, particularly through NOIA. Consistent with the Benefits Plan principle of collaboration, EMCP is committed to establishing an open dialogue with the supply community, using such initiatives as:

- A Project website that provides timely communication of Project opportunities
- Supplier information sessions and workshops, and participation in industry conferences and workshops
- Site visits to assess local infrastructure and to review prospective contractors and suppliers' operating procedures and capabilities
- Co-locating key contractor procurement personnel in St. John's to facilitate opportunities for Newfoundland and Labrador companies to participate in bidding for sub-contracts, material and equipment purchasing
- Managing and coordinating all procurement from the St. John's FEED / EPC offices, including procurement executed in FEED / EPC offices outside of Newfoundland and Labrador
- Facilitating the participation of companies owned and operated by members of designated groups

2.5 Procurement and Contracting

EMCP will seek to ensure that companies in the Province and other parts of Canada have a full and fair opportunity to compete for Hebron work, and that first consideration is given to goods manufactured in, and services provided from within, the Province where they are competitive in terms of fair market price, quality and delivery.

EMCP views the procurement process and associated responsibilities as extending from the development of the procurement strategy, through the sourcing process, contract initiation and implementation and performance management, to contract close-out or renewal. Benefits, including diversity, will be an important consideration at each stage. EMCP will maintain a regular liaison with the C-NLOPB, and fulfill all reporting requirements, in order to make sure that its procurement activities address the requirements of the regulations.

2.6 Employment and Training

EMCP will employ a long term, comprehensive human resources planning process in addressing its employment and training requirements. This will include the following considerations:

- Supply and Demand Analysis
- Communication and Consultation
- Skills Development
- Recruitment and Selection Processes
- Career Development and Competency Assessment

The above are designed to provide Newfoundlanders and Labradorians with first consideration for employment opportunities available with the Hebron Project.

2.7 Research and Development

In order to pursue the identification, implementation and completion of successful and effective R&D, including education and training, initiatives, EMCP will establish:

- A process for identifying and raising awareness of potential R&D projects, and give priority to undertaking R&D in the Province, where effective and competitive
- A process for the submission and review of R&D proposals
- Priority areas supporting its overall R&D strategy

2.8 Diversity

Valuing diversity is a business imperative for ExxonMobil and provides an opportunity to access an expanded labour force and supplier pool. The Hebron Diversity Plan describes how EMCP will encourage women, Aboriginal peoples, visible minorities, and persons with disabilities to participate in the Hebron Project.

2.9 Capacity Assessment

This section describes Hebron procurement and labour requirements and provides a capacity assessment for the construction and operations phases.

2.10 Consultation, Monitoring and Reporting

Benefits Plan consultation focused on Newfoundland and Labrador, and more specifically on those regions most likely to have involvement with Hebron. However, EMCP engaged with groups representing other parts of Canada. EMCP sees continued stakeholder consultation and collaboration as key to delivering benefits over the life of the Project.

The consultation involved a mixture of topic-specific and multi-topic events. In addition, EMCP representatives participated in a wide range of conferences, seminars, luncheons and other public events, and various formal and informal meetings, with benefits being a common topic or consideration.

The main benefits messages heard were very positive. Participant groups indicated that they represent a strong and experienced base of benefits and economic development-related expertise and capacity, and are willing and able to collaborate with EMCP in the delivery of Hebron benefits. It was generally recognized that sustainable economic development will only result if the Project, and the companies and individuals working on it, are competitive. Stakeholders also made clear that the interest in 'local' benefits operates at a range of different geographic scales, including the communities hosting or adjacent to Project activities.

Monitoring is a key element in EMCP's management process, providing information that is used to further refine and develop Project benefits processes, policies, guidelines and initiatives so as to ensure they are appropriate and effective throughout the life of the Project. Monitoring and reporting of procurement decisions, employment levels and expenditures are also required to demonstrate to the C-NLOPB that the principles of the Benefits Plan are being followed and its commitments are being met. This includes the monitoring of activities by both EMCP and its contractors and suppliers.

EMCP's approach to monitoring and reporting is based on the Benefits Plan Guidelines, taking into account the Hebron Benefits Agreement requirements, the current practices of the operators of existing projects in the Newfoundland and Labrador offshore, the current benefits context and priorities in the Province, and ExxonMobil practice and experience in other jurisdictions.

3 SOCIO-ECONOMIC IMPACT STATEMENT AND SUSTAINABLE DEVELOPMENT REPORT

ExxonMobil Canada Properties (EMCP) is the operator of the Hebron Project, an offshore oilfield located in the Jeanne d'Arc Basin 340 km offshore of St. John's, Newfoundland and Labrador in the North Atlantic Ocean. The Hebron production facilities will be installed at the offshore production location 9km north of the Terra Nova oil field and 32 km southeast of the Hibernia offshore production platform, with start-up of operations no later than the end of 2017.

The Hebron oilfield will be produced from a concrete Gravity Base Structure (GBS) supporting the Topsides which holds the platform's drilling, drilling support, process and utilities and living quarters modules. The GBS will be constructed at Bull Arm, Trinity Bay, NL, as will some of the Topsides components. Other parts of the Topsides will be constructed elsewhere in the Province or internationally. All of the Topsides modules will be assembled and integrated at Bull Arm before being installed on the GBS. Once complete, the entire structure will be towed to the offshore site.

Management of the petroleum resources in the Newfoundland and Labrador Offshore Area is the responsibility of the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). As part of the Hebron Project Development Application (DA), a Socio-economic Impact Statement and Sustainable Development report (SEIS) is required. The SEIS is designed to meet the requirements for the socio-economic impact assessment of the Project and to describe its contribution to sustainable development in the Province.

The SEIS adopts the socio-economic assessment approach used in previous offshore petroleum projects in the Province, giving particular attention to those socio-economic issues identified as being of greatest interest and building on the experience gained from other Newfoundland and Labrador offshore projects.

The geographic scope of the socio-economic assessment is primarily provincial, with the Isthmus of Avalon, Marystown and St. John's areas examined in greater detail as areas most likely to experience direct effects from the Project.

The temporal scope of the Project is thirty plus years, from the initial development phase, through installation and operations, decommissioning and abandonment. The main socio-economic effects are expected to be associated with the approximately seven to eight year design, fabrication and construction, installation and commissioning phase, and the long-term production and operations activities.

The assessment began with a review of literature and information from previous offshore oil developments, an analysis of experience from previous projects, and an issues scoping process, which included stakeholder and public consultations.

These inputs helped determine the selection of the Valued Environmental Components (VECs) that form the focus for the assessment. The VECs identified represent three main socio-economic issue areas: business and employment; community social infrastructure and services; and community physical infrastructure and services. Where appropriate the VECs are subdivided into a number of components. For example, health and education are considered as separate components of the community social infrastructure and services VEC. The Report also provides an analysis of the contribution of the Project to sustainable development in the Province.

For each VEC or VEC component the existing socio-economic conditions and potential socio-economic interactions between the VEC and the Project are described. The socio-economic effects of the Project are then analyzed, taking into consideration any mitigative measures to address potential adverse Project effects as well as measures to create or enhance potential beneficial effects. The results are then summarized as an integrated set of residual environmental effects. Recommendations for monitoring and follow-up for each VEC are then offered.

The assessment of the socio-economic effects of the Hebron Project indicates that it will have a range of positive consequences for Newfoundland and Labrador and its citizens, families and communities. Any potential adverse effects are minor and non-significant and will be addressed through ongoing and constructive engagement with communities and other stakeholders.

The main positive effects relate to its effect on the economy. Hebron will create large amounts of business and employment in the Province during all phases of activity. This will, in turn, create spin-off business and employment, as well as create new revenues for government through personal, business and property taxes.

Municipal governments will also benefit through increased user pay for the use of recreational and other infrastructure and services. The governments of Newfoundland and Labrador and Canada will also benefit from increased tax and/or royalty revenues.

The Project Co-venturers are also committed to contributing to enhanced Research and Development and Educational and Training activities as well as supporting gender equity and diversity in all aspects of the workplace. These effects are discussed in greater detail in the Hebron Project Benefits Plan.

The SEIS also examines the social effects of Hebron on local residents, families and communities. The SEIS considers the potential effects of the Hebron Project on education, health, recreation and security in terms of police and fire response. The assessment also considers community physical infrastructure and services in terms of ports and airports, industrial and commercial land, and housing.

Experience from previous offshore petroleum projects in Newfoundland and Labrador has shown that a project such as Hebron will bring changes, but these changes are generally acceptable and positive, and where they are not, they are manageable or can be mitigated satisfactorily. EMCP will maintain ongoing, active engagement and communication with Project stakeholders to ensure that key effects are addressed and managed.

Hebron will be Newfoundland and Labrador's fourth stand-alone offshore oilfield development project. As such, it will build on, and further contribute to, the development of a multi-phase offshore petroleum industry in Newfoundland and Labrador providing both local and export opportunities.

Hebron will be 'another' petroleum industry project, rather than a 'first' for the Province. It will use existing industrial and commercial facilities and infrastructure and is unlikely to present any significant new challenges for local residents, businesses or institutions. At the same time experience with past projects allows for a realistic interpretation of the potential outcomes of this project.

The Hebron Benefits Plan builds on, and has been developed with the goal of further advancing, the development of the industry in the Province so that the Project delivers long-term value to shareholders and to Newfoundlanders, Labradorians and Canadians. This includes contributing to the Province being seen as a source of supply, service, construction, fabrication, labour, education, training and research and development capabilities and expertise that are globally competitive in terms of safety, performance, price, quality and delivery.

The Hebron Project will contribute to community and economic sustainability within the Province and, to a lesser extent, Canada. Four underlying commitments for the Project are the cornerstones that will help to achieve this. These are commitments to:

- Achieving the highest levels of safety, health, environment and security performance throughout all phases of the Project
- Meeting commitments under the Atlantic Accord Acts and Benefits Agreement signed with the Province in 2008
- Delivering execution certainty and world-class execution
- Building sustainable relationships with the community.

4 ENVIRONMENTAL COMPREHENSIVE STUDY REPORT

4.1 Project Environmental Assessment Areas

Activities associated with the Hebron Project will occur in two distinct phases and project environmental assessment (EA) areas: the nearshore construction area at Bull Arm, Trinity Bay, for the GBS construction, Topsides assembly, installation and commissioning; and the offshore area on the Grand Banks, where the completed Hebron Platform will be installed and production of crude oil will occur.

4.1.1 Nearshore Project EA Area

The GBS will be constructed at the Bull Arm fabrication facility, an existing facility owned by Nalcor Energy-Bull Arm Fabrication, with capabilities for steel and concrete construction, outfitting, fabrication, installation, at-shore hook-up and commissioning. The dry dock site for GBS construction is situated at the Bull Arm Facility in Great Mosquito Cove (Figure 4.1-1).

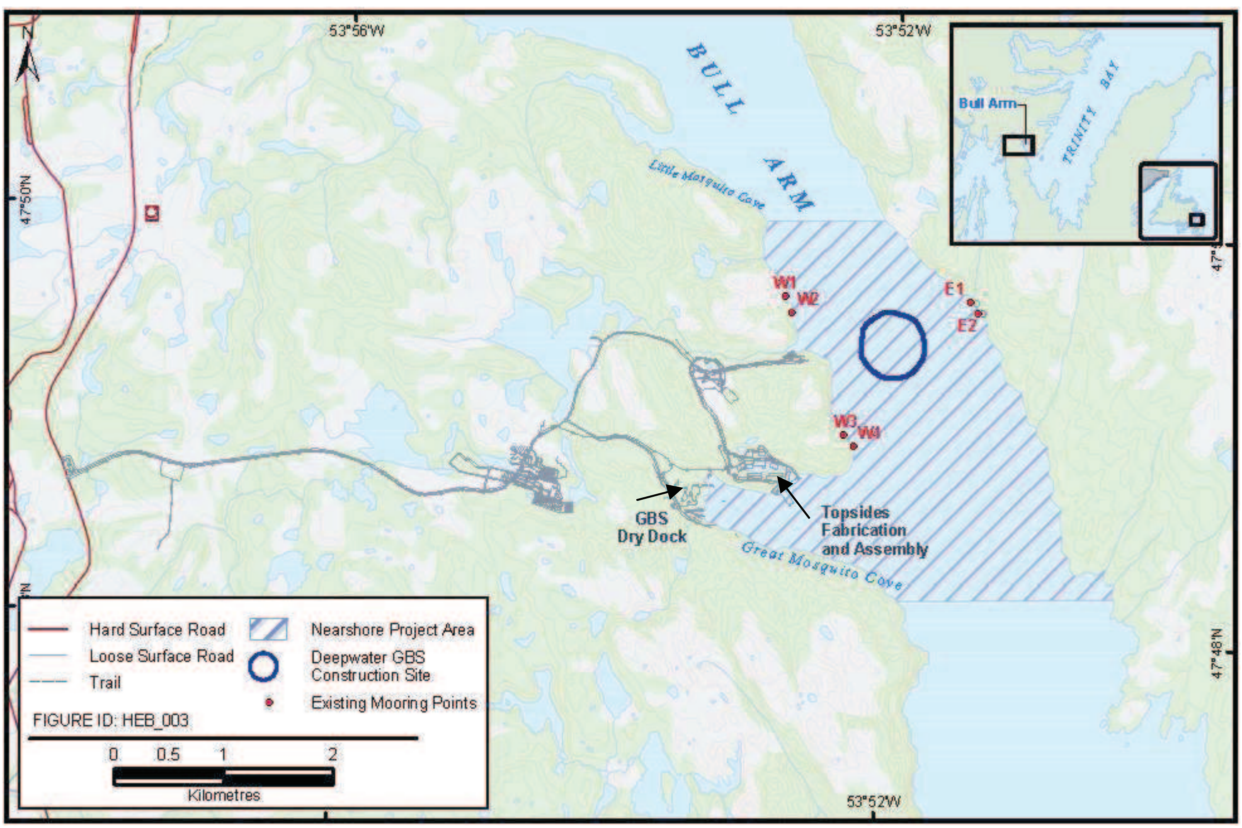


Figure 4.1-1: Nearshore Project EA Area

The current concept is to construct a rock-fill dike (or bund wall) with a centre impermeable core comprised of a cement slurry across the cove to form the wall of the basin; the dry dock and immediate channel for towing the GBS out of Great Mosquito Cove may have to be enlarged. The pier in Back Cove, which is the site of the ferry terminal to transport workers to the GBS in the deepwater site, may require upgrading. After completion of the GBS base slab and lower caisson, the partially constructed GBS will be floated out of the dry dock and towed to the deepwater site in Bull Arm itself, where it will be moored during final construction of the GBS. The requirement for additional moorings will be determined at the FEED stage. If additional moorings are required at the deepwater site, they will be constructed on land. Selected Topsides components will be fabricated at the Bull Arm fabrication facility; others will be fabricated offsite and will be transported to the Bull Arm fabrication facility for assembly. Following assembly and hook-up at the Topsides pier, the Topsides will be towed out to the deepwater site and mated with the GBS to form the Hebron Platform.

4.1.2 Offshore Project EA Area

Once completed, the Hebron Platform will be towed offshore and installed at the Hebron Field (Figure 4.1-2). Offshore activities may include: site and clearance surveys; platform commissioning and production operations; drilling of up to 52 wells from the Hebron Platform; construction, installation and operation of the OLS and tankers; and supporting activities including remotely-operated vehicle (ROV) surveys; and operation of support craft (*e.g.*, various vessels, and helicopters).

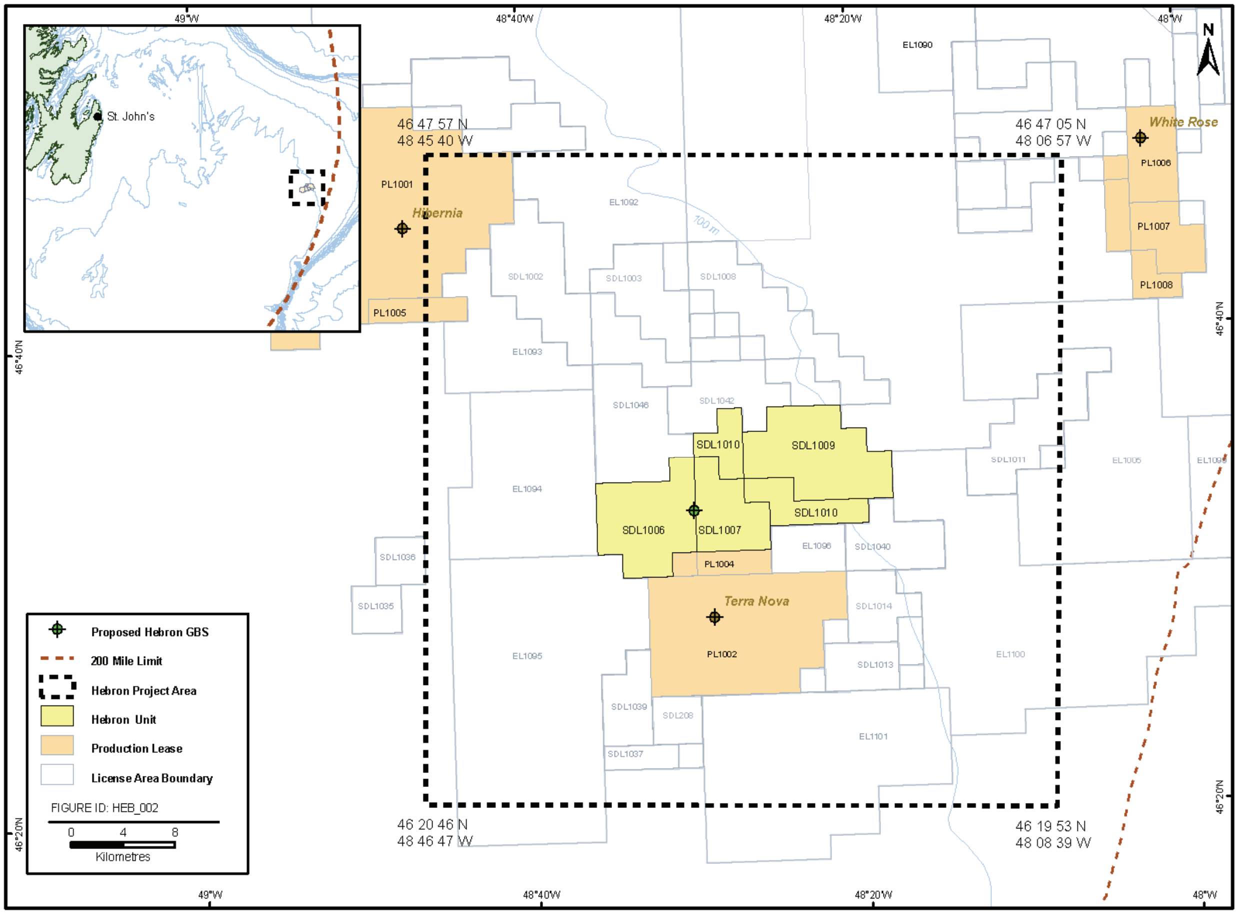


Figure 4.1-2: Hebron Offshore Project EA Area

Potential future developments, as part of the Hebron Project, include construction and installation of one or more excavated drill centres and subsea infrastructure, flowline installation and tieback to the Hebron Platform, as well as drilling activities by mobile offshore drilling units (MODUs). Potential modification of the Hebron Platform may also be required as well as the associated activities of environmental, geophysical and / or geotechnical surveys and support from vessels and helicopters.

4.2 Environmental Management

EMCP, as operator of the Hebron Project, maintains a strong commitment to health, safety and environmental stewardship. The company conducts its business activities with a progressive approach and is committed to monitoring and continually improving its performance. Central to this commitment is a corporate Safety, Health, Environment and Security (SHE&S) management system within the overall Operations Integrity Management System (OIMS).

A Project-specific Environmental Management Plan will be developed for the Hebron Project based on detailed information and assessment of the Project.

It will be supported by topic-specific plans such as a Waste Management Plan, Oil Spill Response Plan and Community Liaison Plan.

During construction, EMCP will implement an Environmental Protection Plan (EPP) for all activities at the Bull Arm Site. This EPP will be developed in consultation with regulators and area residents, in particular the commercial fish harvesters. The EPP will be approved by the Newfoundland and Labrador Department of Environment and Conservation and will be available to the public through the Department.

Offshore production activities are regulated pursuant to the Canada-Newfoundland Atlantic Accord Implementation Act (S.C. 1987, c.3) and the Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act (R.S.N.L. 1990, c. C-2) (Atlantic Accord Acts) and regulations prescribed thereunder and any guidelines provided by the C-NLOPB (e.g., Offshore Waste Treatment Guidelines (OWTG) (National Energy Board (NEB) et al. 2010). The Hebron Project will develop and implement an EPP as per regulations issued under the Accord Acts.

ExxonMobil has a mature Operations Integrity Management System (OIMS) that emphasizes relentless attention to Safety and Environmental Protection, and is designed to minimize and mitigate accidental events from occurring. EMCP's emergency response philosophy is to minimize the impact of an emergency on people, environment and the corporation. Prior to commencement of drilling and production operations, EMCP will develop contingency plans that will serve as the guidelines for the company's response to an emergency at the Hebron Project. Contingency plans will be developed to address emergencies that will be identified in operations-specific hazard and risk analyses. The plans will outline the necessary procedures, personnel, equipment and logistics support required to respond to an emergency incident in a safe, prompt, and coordinated manner. The plans will be distributed to designated personnel who will be responsible for emergency response actions. The content of the plans will contain sufficient detail to enable personnel to respond in a coordinated and effective manner.

4.3 Environmental Assessment

4.3.1 Regulatory Context

Under the federal *Canadian Environmental Assessment Act*, the Hebron Project requires environmental assessment at a comprehensive study-level of assessment. The C-NLOPB and other federal Responsible Authorities have set out the required scope of this environmental assessment in a Scoping Document released in June 2009 (C-NLOPB *et al.* 2009). This Comprehensive Study Report (CSR) meets these requirements, as well as meeting the requirements of the C-NLOPB *Development Plan Guidelines* (C-NLOPB 2006).

4.3.2 Consultation

EMCP recognizes the importance of communications with federal, provincial and municipal regulatory agencies, stakeholders and the public and accordingly, has conducted an extensive public and stakeholder consultation program associated with the Project. The program focused primarily on the geographic regions most likely to be affected by the Project, including the Isthmus region of the Island (Marystown, Clarenville and St. John's). However, a wider audience was reached through a number of meetings in other communities such as Corner Brook.

Meetings were held with environmental interest groups in the St. John's area. Most participants indicated a level of familiarity with the offshore petroleum industry and the environmental assessment process and acknowledged that many of the issues raised in previous assessments of offshore projects had been addressed by industry. Nonetheless, there is continuing concern regarding ongoing potential for an oil spill from a platform or tanker, as well as the incidence of sheens around platforms as a result of platform discharges (even when treated to regulated levels). These groups are interested in accessing raw data from monitoring programs, in addition to the environmental effects monitoring (EEM) program reports that are released to the public by the C-NLOPB.

Consultation has also been initiated with commercial fish harvesters (both those using the Bull Arm area and the offshore area), the Fish, Food and Allied Workers Union (FFAW) and One Ocean. In Bull Arm, the concerns are around potential interference with fishing activities during platform construction. Offshore commercial fishers are concerned at the increasing level of offshore oil and gas activity as it affects their travel routes to and from fishing grounds and, to some extent, the placement and security of fishing gear. One Ocean, the fishing industry / offshore petroleum industry liaison organization, is addressing these concerns through efforts of a working group.

4.3.3 Assessment Methodology

The scope of the Project includes a combination of works and activities that will take place in both the nearshore (construction) and offshore (operations) environments. The potential environmental effects of each Project phase have been evaluated for each of the selected Valued Ecosystem Components (VECs). VECs are those components of the environment that are valued socially, economically, culturally and / or scientifically and are of interest when considering the potential environmental effects of the Project.

VECs for this assessment reflect the issues raised by stakeholders, while providing a focus for the assessment so that effects can be meaningfully evaluated. The VECs include Air Quality, Fish and Fish Habitat, Commercial

Fisheries, Marine Birds, Marine Mammals and Sea Turtles, Marine Species at Risk, Species at Risk (SAR), and Sensitive or Special Areas.

The purpose of the environmental assessment is to determine whether the Project is likely to result in a significant adverse residual environmental effect on the environment, as considered through the VECs. The criteria considered in the assessment include geographic extent, magnitude, duration, frequency and reversibility, as well as ecological or social context and the level of certainty in making the assessment of environmental effect. The environmental assessment of each VEC incorporates consideration of mitigation measures, accidental events and cumulative environmental effects.

4.4 The Project Environment

4.4.1 The Nearshore Study Area

The Nalcor Energy-Bull Arm Fabrication site is located at Bull Arm, a steep-sided narrow arm near the bottom of Trinity Bay. Trinity Bay is a large bay on the northeastern coast of Newfoundland with a length of approximately 100 km, orientated towards the northeast. Most of the shoreline is rocky and treed to the high tide mark before dropping off into relatively deep water. The tidal zone is mostly narrow and rocky. The shoreline is affected by landfast and pack ice. Eastern Newfoundland coastal areas are dominated by the southward flowing inner branch of the Labrador Current. The Nearshore Study Area is illustrated in Figure 4.4-1.

The east coast of Newfoundland experiences predominately southwest to west air flow throughout the year. However, local topography has a large influence on the wind direction and speed experienced within Bull Arm, Trinity Bay. Low pressure systems crossing the area are more intense during the winter months. As a result, mean wind speeds tend to peak during winter. Nearshore air temperatures are coldest in January and February, and warmest in August.

In Bull Arm, the following species of finfish are commonly found and commercially fished: cod (a COSEWIC-assessed at-risk species), capelin, herring and mackerel. Greenland halibut may be present in deeper water (200 to 300 m) outside Bull Arm. Other species include wolffish (a *Species at Risk Act* (SARA)-listed at-risk species), eelpout, lumpfish, skate and cunners. Great Mosquito Cove and “The Brood” in Bellevue are locally known as a spawning ground for herring. Shellfish that occur in the area include sea scallop, snow crab, lobster and squid. Capelin, mackerel, herring, crab and lobster have generated over 90 percent of all fishing income from species caught in Trinity Bay. Cod, sea urchin, squid and lumpfish make up most of the remaining portion of their annual earnings.

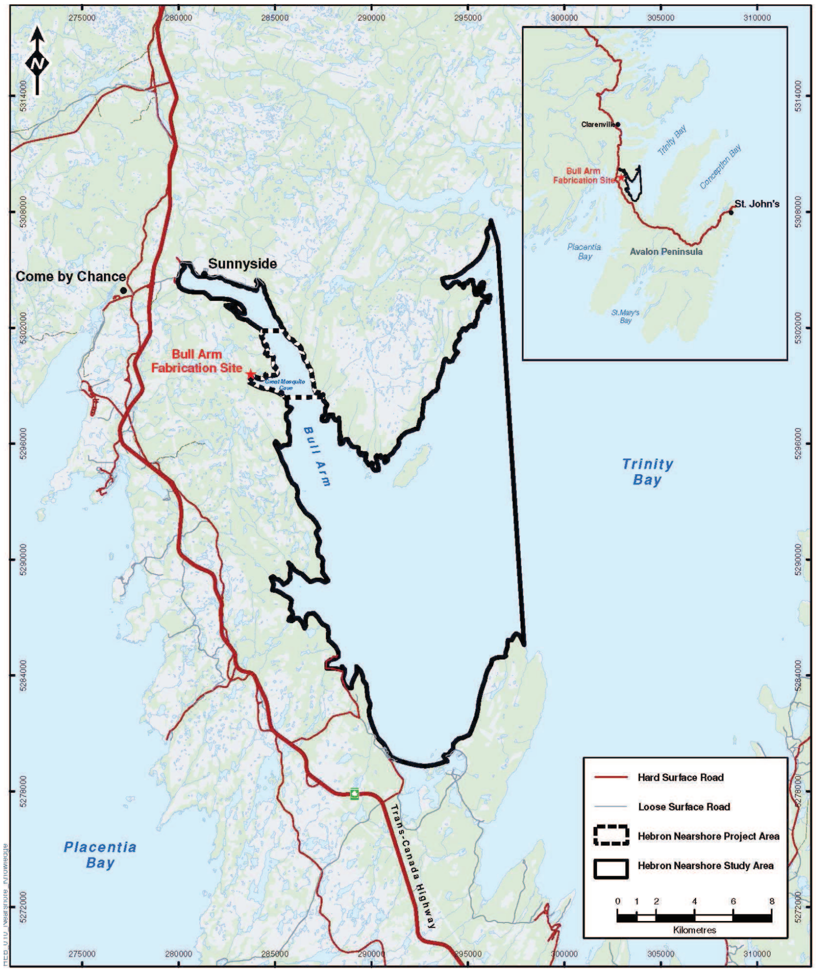


Figure 4.4-1: Nearshore Study Area

Habitat for shorebirds (Charadriiformes), such as shoreline deposits of fine sediments and tidal flats, is limited in the Nearshore Study Area. Bellevue Beach, located at the southern boundary of the Nearshore Study Area, is an important habitat for marine birds, including the Red Knot (a COSEWIC-assessed at-risk species). A strong tidal current flowing over a mud flat at the south end of Bellevue Beach creates a rich marine habitat. Gulls, terns, shorebirds and Ospreys are common here in season. There is a nesting colony of gulls and terns on Bellevue Island, 0.5 km from the tidal flats. Approximately 15 species of migrating shorebirds occur regularly on the Bellevue Beach tidal flats during south-bound migration.

A total of 21 marine mammals, including five baleen whales (mysticetes), 12 toothed whales (odontocetes), and four true seals (phocids), are known to occur in the Nearshore Study Area. Four species may be rare visitors in the Study Area: the beluga whale (a SARA-listed at-risk species); North Atlantic right whale (a SARA-listed at-risk species); ringed seal; and bearded seal.

Seals occur year-round in waters off Newfoundland and Labrador, including populations of grey, harp and hooded seals.

There are potentially a number of at-risk species (either assessed by COSEWIC or listed on SARA) that may occur in the Nearshore Study Area. Wolffish species are the marine fish SAR most likely to occur in the Hebron Nearshore Study Area. Bird SAR that could occur in the Hebron Nearshore Project EA Area are the Red Knot (a shore bird) and Ivory Gull (a marine bird). The marine mammal SAR that is likely to occur in the Hebron Nearshore Study Area is the fin whale; blue whale may occur in small numbers. The sea turtle species at-risk likely to occur in the Nearshore Study Area are the leatherback and loggerhead sea turtles. Sensitive or Special Areas include capelin beaches (*e.g.*, Bellevue Beach) and eelgrass beds (used by juvenile Atlantic cod, among others).

4.4.2 Offshore Study Area

The Hebron Platform will be situated within the Jeanne d'Arc Basin, one of the major sedimentary basins within the eastern Canadian offshore. The Grand Banks form a series of shallow outer banks separated from the Newfoundland coast by irregular inner shelf basins (Avalon and St. Pierre Channels). Water depth in the area ranges from 88 to 102 m. The Grand Banks has an overall area of 100,000 km^2. The Hebron Platform will be situated on the northeast margin of the Grand Banks, within approximately 98 m water depth. The Offshore Study Area is illustrated in Figure 4.4-2.

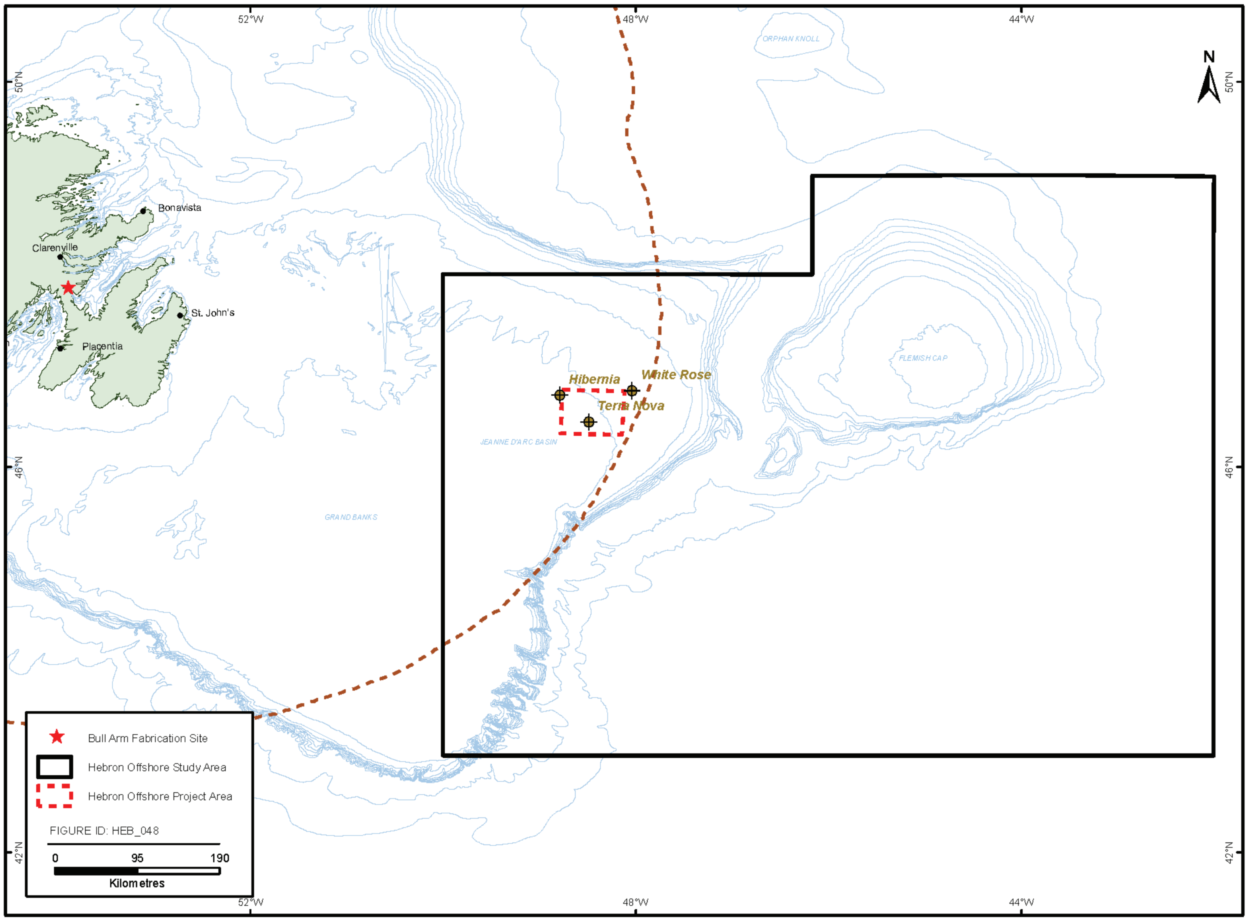


Figure 4.4-2: Offshore Study Area

The climate of the Grand Banks is dynamic and influenced by maritime, Arctic and tropical air masses. The area typically has cold and dry winters (with respect to humidity) and cool and moist summers. Weather systems are often intense, and include a wide range of precipitation types, particularly in fall and winter. In winter, spring and fall, the dominant winds in the area are westerly and in summer, southwesterly. Air temperatures in the vicinity of the Hebron Platform are generally lower in summer and higher in winter compared to St. John's because of the oceanic environment. February is the coldest month and August is the warmest month both onshore and offshore.

The Grand Banks region is the wettest in eastern Canada, with over 1,000 mm of precipitation per year. The occurrence of precipitation is highest in January and lowest in July. Rainfall is most likely in autumn, with moderate to heavy rainfall occurring most frequently from September to January. Snow is most likely to occur in January through March. Moderate to heavy snowfall is most likely to occur in January and February. Fog frequently occurs in the vicinity of the Hebron Platform, with the foggiest period occurring between

May and July. In July, the foggiest month, visibility is often reduced to less than 1 km. The highest waves occur from December to February.

Snow crab, shrimp and Iceland scallop occur on the Grand Banks in the vicinity of the Hebron Platform. Other species occurring in the area include sand lance, capelin, mailed sculpin, sea urchin, sand dollar, soft-shelled clams, toad crab and sea stars. Historically, the most abundant species in the vicinity of the Hebron Platform were American plaice (a COSEWIC-assessed at-risk species) and cod, but these species are also widely distributed throughout the Grand Banks. The dominant commercial fish in the vicinity of the Hebron Platform include snow crab, shrimp, American plaice and Iceland scallop.

The Grand Banks provides important habitat for millions of marine birds. Over 60 species have been reported. Approximately 19 of these species are pelagic and could occur in the Offshore Project EA Area. In the spring and summer, the most common species include the Northern Fulmar, Shearwaters, Storm-petrels, Jaegers, Black-legged Kittiwake, Gulls, Skuas and Dovekies.

Several species of whales may be found on the Grand Banks, including humpback, minke, sei, Atlantic pilot, sperm and northern bottlenose. Many species are mostly summer residents, transients, or both. There are only a few permanent residents, including the Atlantic pilot whale. There is one not-at-risk species of sea turtle known to occur near the Hebron Platform, the Kemp's ridley.

There are potentially a number of at-risk species (either assessed by COSEWIC or listed on SARA) that may occur in the Offshore Study Area. Schedule 1 SARA species known to occur in the Offshore Study Area include Atlantic wolffish, northern wolffish, spotted wolffish, Ivory Gull, blue whale, fin whale and leatherback sea turtle. The North Atlantic right whale, a Schedule 1 listed species, is not considered likely to occur in the Offshore Project EA Area. Some of the COSEWIC-assessed at-risk species include Atlantic cod, Atlantic plaice, redfish and loggerhead sea turtle.

Offshore Sensitive or Special Areas include those designated by the Northwest Atlantic Fisheries Organization, specifically the Southeast Shoal Vulnerable Marine Ecosystem and various canyon areas and seamount and knoll vulnerable marine ecosystems . In addition, the following Ecologically and Biologically Significant Areas, as identified by Fisheries and Oceans Canada (DFO), occur within the Offshore Study Area: Northeast Shelf and Slope; Virgin Rocks (immediately adjacent to the Offshore Study Area); Lily Canyon-Carson Canyon; and Southeast Shoal and Tail of the Banks.

4.5 Key Findings of the Assessment

4.5.1 Air Quality

To assess potential effects on air quality in the nearshore and offshore environments, an emissions inventory and modeling were used. The emissions inventory was used to predict the annual emissions released and the dispersion modeling was used to estimate the maximum ground-level concentrations.

Typical air emissions from Project activities include carbon monoxide, nitrous oxides, total suspended particulate, volatile organic compounds and greenhouse gases (GHGs).

4.5.1.1 Nearshore

The air emissions associated with blasting, grinding, welding and concrete production include total suspended particulate. However, such emissions will be temporary in nature and are considered to be localized, such as welding, or relatively minor in quantity and environmental effect. Vessels will emit carbon monoxide, nitrous oxides, total suspended particulate, volatile organic compounds and GHGs. However, these emissions are small in quantity, temporary and localized. They will be mitigated by reducing the amount of time the vessels are in idle mode, connecting to electrical power whenever possible, and other mitigation measures.

4.5.1.2 Offshore

The air dispersion modeling shows that the emissions produced from the Hebron Project alone, as well as in conjunction with emissions from existing platforms, would generally meet air quality criteria (*i.e.*, the stipulated National Ambient Air Quality objectives) in the short-term, the long-term, and in near-field and far-field locations. Fugitive emissions from operational sources (*e.g.*, leaking valves, pump seals, compressor seals, flanges / connectors, and pressure relief valves) may occur during operation of the Platform and have been considered quantitatively in this assessment. Mitigation measures include maintenance and inspection programs to repair equipment and machinery.

4.5.1.3 Findings

By implementing appropriate mitigation measures, the environmental effects on Air Quality during the construction and operations phases of the Project, including accidental events and cumulative environmental effects, is determined to be not significant. With respect to GHG, the magnitude is ranked as medium for both the construction and operations phases; however, the predicted emissions are consistent with those currently being reported for other similar facilities in the Newfoundland offshore and are rated as not significant. In the unlikely event of a large-scale accident or malfunction, the Project's GHG emissions will be temporarily increased. The percent contribution of GHGs from the Hebron Project to the overall national total is small in magnitude.

4.5.2 Fish and Fish Habitat

4.5.2.1 Nearshore

In the Nearshore Project EA Area, changes in fish habitat will occur in Bull Arm during construction of the bund wall and dry dock and if dredging and/or ocean disposal is required. In accordance with the DFO policy of no net loss of fish habitat, a habitat compensation program will be developed in conjunction with DFO to compensate for any loss of fish habitat. As its preferred option for HADD compensation, EMCP is proposing to enhance fish habitat in Bull Arm by re-locating bund wall material to featureless sedimentary areas of the sea floor, which currently have low commercial fish productivity.

Increased levels of suspended EA sediments and underwater noise can also be expected within the Nearshore Project EA Area. Mitigation measures will include the use of settlement basins and/or containment areas for concrete washwater. EMCP will also investigate the use of washed-rock for bund wall construction, as well as the use of silt and bubble curtains. While some fish egg and larval mortality may occur as a result of in-water blasting, any in-water blasting will adhere to DFO's *Guidelines for Use of Explosives in Canadian Fisheries Waters* to reduce the chance of injury to fish. Some mortality of benthic species is expected as a result of infilling for the bund wall, dry dock construction, dredging, and spoils disposal (if required), but these benthic invertebrates are ubiquitous throughout the area and will re-colonize within a few years of construction.

4.5.2.2 Offshore

In the Offshore Project EA Area, access to the substrate in the footprint of the Hebron Platform and OLS and its flowlines may be lost to fish and shellfish. If excavated drill centres are constructed as part of the Hebron Project, fish habitat will be affected. For this associated affect on fish habitat, fish habitat compensation may be required. Seismic activities associated with the Project will adhere to the *Statement of Canadian Practice on Mitigation of Seismic Noise in the Marine Environment* as appended to the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011).

Discharges from Project operations will be managed under an EPP and will adhere to the OWTG (NEB *et al.* 2010). During operations at the Hebron

Platform, water-based cuttings will be discharged overboard from the Hebron Platform and synthetic-based cuttings will be reinjected into the formation. If a MODU is used, both water-based and synthetic-based cuttings would be discharged overboard in accordance with the OWTG (NEB *et al.* 2010). The discharge of drill cuttings released on the Grand Banks have been monitored through various EEM programs and scientific studies, confirming that no significant environmental effect on the marine environment from discharged mud or cuttings occurred for these projects.

The feasibility of produced water re-injection is being investigated. If re-injection is not feasible, produced water, meeting the requirements of the OWTG (NEB *et al.* 2010), will be discharged from the Hebron Platform along with cooling water. Any associated effects are expected to be undetectable at a distance greater than 500 m from the Hebron Platform. Within 500 m, survival, growth and fertilization success of some species can be affected.

4.5.2.3 Findings

Based on the nature of the effects, planned mitigation, including fish habitat compensation, and knowledge gained from other offshore projects, no significant adverse residual environmental effects are predicted as a result of any of the Project phases. The cumulative environmental effects are also predicted to be not significant.

An accidental event is considered adverse but not significant and not likely to occur. Natural recruitment is expected to re-establish the population to its original level and avoidance of the area is expected to be temporary should an accidental event occur.

4.5.3 Commercial Fisheries

4.5.3.1 Nearshore

Establishment of marine construction safety zones at the Great Mosquito Cove site and later at the deepwater site in Bull Arm will create a temporary loss of access to fishing grounds (Figure 4.5-1) and possibly interfere with vessel transit. EMCP will establish an overall Project agreement with commercial fishers using the Bull Arm area that addresses safe operations and compensation.

Marine traffic associated with Project construction will use designated routes. EMCP will consult with the area fish harvesters to discuss and agree on an appropriate Vessel Traffic Management Plan for the safe and efficient operation of Project marine traffic and fishing vessel operations in the Nearshore Project EA Area. Communications will be maintained directly at sea by Project vessels via marine radio to facilitate information exchange with fisheries participants. Relevant information about marine operations occurring outside the Safety Zones will also be publicized, when appropriate, using established communications mechanisms, such as Notices to Shipping (Continuous Marine Broadcast and NavTex) and CBC Radio's (Newfoundland and Labrador) Fisheries Broadcast.

EMCP will also discuss the timing of underwater blasting operations and other activities that will create loud underwater noise. Activities will be planned to avoid finfish harvesting times to the extent possible.

EMCP will work with fishers active in the area and time period affected by platform tow-out from Bull Arm and through Trinity Bay to the offshore location to ensure safety and minimize disturbance.

4.5.3.1 Offshore

As part of the planning for offshore operations, EMCP will establish ongoing consultations and communications with relevant area fishers as well as with FFAW and One Ocean. EMCP will also have in place a fishing gear compensation program to cover loss of or damage to fishing gear, as well as catch lost as a result of contact with a Project vessel.

Any survey activity associated with the Project will follow guidance provided in the C-NLOPB’s *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011) for minimizing effects on commercial fish harvesting.

Considering the relatively low level of fish harvesting in the Offshore Project EA Area (Figure 4.5-2), and the type of fisheries in recent decades, few gear conflicts or catchability effects are likely to occur during operations. EMCP will maintain effective liaison with the offshore fishing industry and will meet as necessary during the operations and maintenance phase to continue communications with relevant area fishers and to help mitigate all aspects of potential fisheries effects.

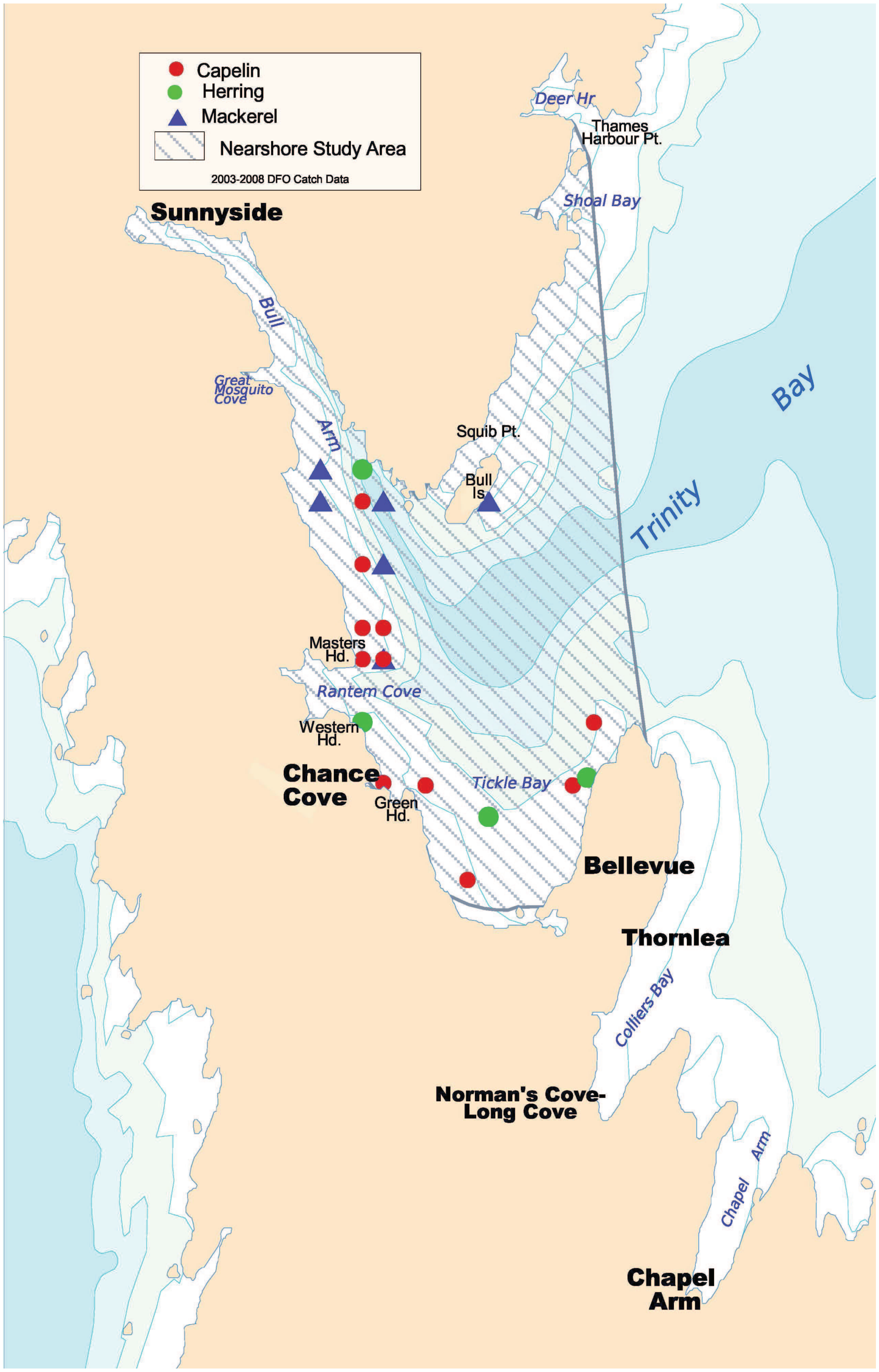
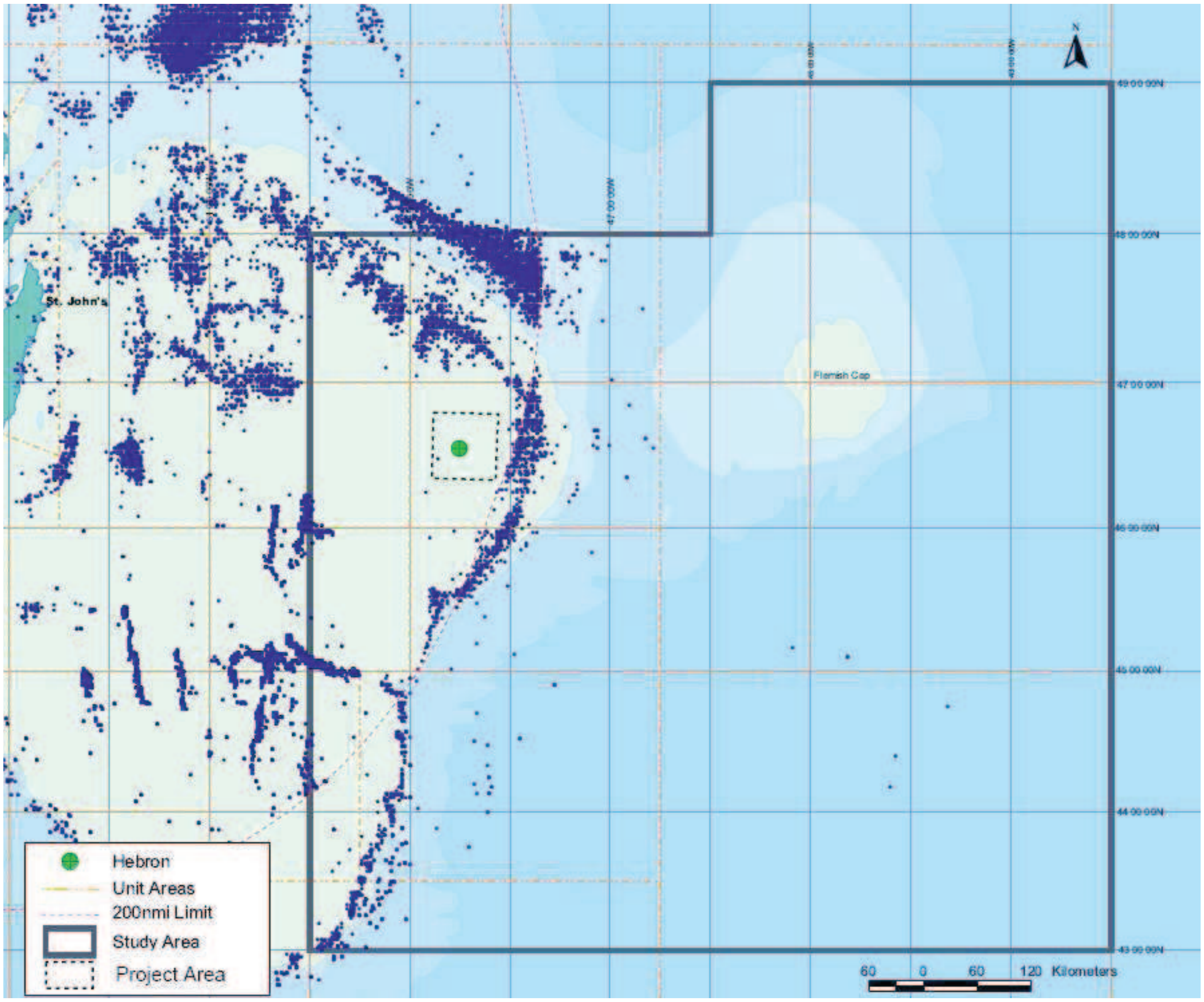


Figure 4.5-1: Nearshore Study Area Harvesting Locations for Key Pelagic Species, 2006 to 2008



Note; initial data for 2009, received in 2010, indicate that fishing activities in 2009 (in terms of quantities and harvesting locations) were consistent with those in recent years (*i.e.*, 2004 to 2008).

Figure 4.5-2: Domestic Harvesting Locations, 2008

4.5.3.2 Findings

With the proposed mitigation measures in place, the predicted residual environmental effects from all Project phases are not significant. An accidental spill could temporarily limit access to fishing grounds, cause damage to fishing gear or result in a negative effect on the marketability of fish products. A fishing gear compensation program and fisheries compensation plan will be developed.

With regard to offshore activities and potential interactions with commercial fishers, EMCP is committed to work with the One Ocean Working Group, relevant offshore fishers, FFAW representatives and other agencies to ensure good relations, cooperation and partnering between all offshore marine user groups.

4.5.4 Marine Birds

4.5.4.1 Nearshore

There are no nesting or feeding concentrations of marine birds expected to occur in the Nearshore Project EA Area. If in-water blasting is required, an observer will monitor for diving marine birds occurring within a specified safety zone of the blast location and protocols will be developed to reduce potential effects on marine birds. Blasts will be delayed until birds move outside the designated safety zone. Disturbance to birds in the area will be short-term and bird behaviour will likely return to normal shortly after the completion of these activities (if disturbed at all).

4.5.4.2 Offshore

In offshore Newfoundland waters, marine birds, primarily Leach's Storm-Petrels, are often attracted to lights and may become disoriented or injured by flying directly into the source of light or associated infrastructure. Structures and vessels that remain lit overnight will be searched for stranded birds in the morning. Recovered birds will be handled with care and released according to established protocols.

Gas flaring at night may also attract birds; however, the heat and noise generated by the flare may deter marine birds from the immediate area under most night-time conditions. While there is no known mitigation, flaring is expected to have minimal effect on marine bird populations over the duration of the Project. EMCP is committed to undertaking a research program that, when designed, would provide scientifically defensible information regarding seabird attraction to offshore facilities.

Shearwaters, Northern Fulmars and gulls are the species most likely to be attracted to the Hebron Platform and may rest on the water nearby. During Project operation and maintenance, produced water will be discharged below the thermocline whenever possible to minimize the occurrence of sheens that may be associated with this discharge.

During any seismic surveys, the approach of the seismic vessel would likely flush the birds from the area prior to being exposed to any airgun sounds or occurring in close proximity to operating airguns. For birds that do remain in the immediate area, seismic activity could result in hearing impairment to marine birds spending considerable amounts of time below the surface of the water and if in close proximity to airgun pulses; for example, alcids that secure food by diving and swimming under the water. Other offshore construction activities may cause temporary and localized disturbance of marine birds. These activities are not expected to occur near any known nesting colonies, so they should not affect that portion of marine bird life cycles. It is expected that bird behaviour would likely return to normal shortly after the completion of these activities (if disturbed at all).

4.5.4.3 Findings

With the planned mitigation in place, all phases of the Project are predicted to have no significant adverse residual environmental effects on Marine Birds. Cumulative environmental effects are also predicted to be not significant.

Should an accidental oil spill occur, marine birds are the biota most at risk. Reported effects vary with species, type of oil, weather conditions, time of year, and duration of the spill. Exposure to oil causes several physiological effects and / or thermal and buoyancy deficiencies that may lead to death. Although significant at the individual level, the residual environmental effects are predicted to be reversible at the population level. Nevertheless, these effects are predicted to be significant, although unlikely to occur. Mitigation for accidental events will include an oil spill response plan. ExxonMobil's philosophy is focused on prevention using safety and risk management systems, management of change procedures, and global standards. There will be an emphasis on accident prevention at all phases of the Project. These procedures will minimize the potential mortality from such accidental events.

4.5.5 Marine Mammals and Sea Turtles

4.5.5.1 Nearshore

During construction, in-water blasting without proper mitigation has the most potential to cause physical effects in marine mammals. If in-water blasting is required, a blast impact assessment will be undertaken to determine appropriate marine mammal and sea turtle exclusion zones. These zones will be monitored by a trained observer prior to and during in-water blasting operations in the marine environment, and in-water blasting operations will be temporarily suspended or halted if a marine mammal or sea turtle is sighted within or about to enter the zone. Activities will not resume until the animal(s) has left the zone or it has not been re-sighted for 30 minutes.

4.5.5.2 Offshore

In the offshore, the primary construction activity with potential to interact with marine mammals is seismic surveys. While there is uncertainty about the potential for survey sounds to cause either auditory impairment or other non-auditory physical effects in marine mammals or sea turtles, mitigation measures will follow those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011).There is limited potential for direct mortality of marine mammals or sea turtles as a result of collisions with vessels associated with any of the Project phases. Project activities involving vessel traffic will avoid spatial and temporal concentrations of marine mammals and sea turtles whenever possible, and vessels will maintain a steady speed and course in order to avoid potentially fatal collisions. Speed will be minimized whenever possible and vessels will deviate from their course to avoid concentrations of marine mammals and sea turtles in their path.

4.5.5.3 Findings

Given that Project activities are localized, and with the application of mitigation measures, it is predicted that the adverse residual environmental effects on Marine Mammals and Sea Turtles are not significant.

In the unlikely case of an accidental event, marine mammals and sea turtles are not considered to be at high risk from the environmental effects of oil exposure. For marine mammals and sea turtles, it is probable that only small proportions of populations are at risk at any one time (in either the nearshore or offshore).

Underwater sound associated with Project activities will likely have the greatest potential cumulative environmental effect on marine mammals and sea turtles, particularly cetaceans. Most species will be able to hear sounds, if they are close enough, and will be able to avoid them if they so choose. Mitigation measures associated with seismic surveys are designed to reduce potential effects to marine mammals or sea turtles. Individual mammals travelling near one or more of the offshore developments or in proximity to other offshore exploration activities may be subject to cumulative environmental effects. However, these environmental effects would most likely be limited to behavioural effects (*i.e.*, localized avoidance).

4.5.6 Species at Risk

For the purposes of this environmental assessment, Species at Risk (SAR) refers to those species of marine fish, mammals, birds and reptiles listed federally under the SARA, and / or assessed as at-risk by COSEWIC, which could potentially occur in either the Hebron Nearshore or Offshore Study Areas. The environmental assessment includes the associated habitats that these species rely upon, as protected under SARA.

Potential interactions between the Project and SAR are similar to those described above for non-listed species. The key differences between listed SAR and non-listed species are abundance and spatial and temporal presence. SAR are typically less abundant and are more widely dispersed in the marine environment, making it less likely that Project activities will interact with SAR and their respective habitats.

4.5.6.1 Marine Fish Species at Risk

4.5.6.1.1 Nearshore

The marine fish SAR most likely to occur in the Hebron Nearshore Study Area are described above under the Fish and Fish Habitat setting. For these species, habitat in the Nearshore Project EA Area has not been identified as critical habitat. For marine fish SAR, the pelagic eggs and larvae of finfish may be more susceptible to Project activities than the adult stage. Fish SAR are not known to spawn within the Hebron Nearshore Project EA Area. The mitigation measures described above for all Project activities for Fish and Fish Habitat are considered applicable to marine fish SAR.

4.5.6.1.2 Offshore

The marine fish SAR likely to occur in the Hebron Offshore Study Area are described above under the Fish and Fish Habitat setting. The Hebron Offshore Project EA Area has not been identified as critical habitat for any of these species.

The potential environmental effects for SAR associated with Project activities, as well as mitigation measures and management strategies, are similar to those presented for non-listed marine fish species.

4.5.6.1.3 Findings

The residual adverse environmental effects on marine fish SAR for all Project phases, including cumulative environmental effects, are predicted to be not significant. Due to the reversibility and limited duration of an accidental event, potential environmental effects of a spill on marine fish SAR and fish habitat are also considered adverse but not significant and not likely to occur. Natural recruitment is expected to re-establish the population to its original level and avoidance of the area is expected to be temporary should an accidental event occur.

4.5.6.2 Marine Mammal and Sea Turtle Species at Risk

4.5.6.2.1 Nearshore

The marine mammal and sea turtle SAR most likely to occur in the Hebron Nearshore Study Area are described above in the Marine Mammal and Sea Turtle setting. The issues of concern with respect to environmental effects for marine mammal and sea turtle SAR, as well as mitigation measures and management strategies, are similar to those presented for marine mammal and sea turtle species considered not at-risk. In-water blasting, if required, has the most potential to cause physical effects in marine mammals, and the mitigation described above for not at-risk species is considered appropriate for SAR species.

4.5.6.2.2 Offshore

The marine mammal and sea turtle SAR most likely to occur in the Hebron Offshore Study Area are described above in the Marine Mammal and Sea Turtle setting. The key Project activity with the potential to result in injury or mortality of marine mammal and sea turtle SAR is the operation of vessels. Project activities involving vessel traffic will avoid spatial and temporal concentrations of marine mammals and sea turtles, including SAR, whenever possible, and vessels will maintain a steady speed and course in order to avoid potentially fatal collisions with the VEC. Vessels will reduce speed whenever possible and deviate their course to avoid marine animals.

During seismic programs, mitigation measures outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011) will be followed to reduce environmental effects on marine mammals and sea turtles, including SAR.

4.5.6.2.3 Findings

The adverse residual environmental effects for all Project phases including cumulative environmental effects and accidental events are predicted to be not significant.

4.5.6.3 Bird Species at Risk

4.5.6.3.1 Nearshore

The bird SAR most likely to occur in the Hebron Nearshore Study Area are described above in the Marine Birds setting. Many of the issues of concern with respect to environmental effects for bird SAR, as well as mitigation measures and management strategies, are similar to those presented for bird species considered not at risk. The most likely interaction with bird SAR is noise associated with Project activities.

4.5.6.3.2 Offshore

The only bird SAR likely to occur in the Offshore Project EA Area is the Ivory Gull. It has a circumpolar breeding distribution and is associated with pack ice throughout the year. As such, individuals may occasionally reach the northern part of the Offshore Study Area in late winter or early spring when sea ice reaches its maximum southern extremity. The potential environmental effects and Project mitigation measures would be as described for species considered not at risk.

4.5.6.3.3 Findings

The potential adverse residual environmental effects from all Project phases on marine bird SAR including cumulative environmental effects are predicted to be not significant. The potential effects associated with accidental events are similar to those described above for non-SAR Marine Birds.

4.5.7 Sensitive or Special Areas

4.5.7.1 Nearshore

In the Nearshore Study Area, Sensitive or Special Areas include capelin beaches (*e.g.*, Bellevue Beach) and eelgrass beds. There is considerable distance between the Bull Arm Site and the nearest areas of eelgrass and capelin spawning beach and this limits the potential interaction with routine Project activities. Therefore, the only potential interaction is associated with an accidental event.

4.5.7.2 Offshore

As with the Nearshore Study Area, the distance between the Project and the Sensitive or Special Areas limits the potential interaction with routine Project activities. Therefore, the only potential interaction is associated with an accidental event.

4.5.7.3 Findings

For all Sensitive or Special Areas, the physical distance of these areas from the Project EA Areas limits the potential for interaction with routine Project activities. Therefore, the assessment focused on accidental events.

In the Nearshore Study Area, in the unlikely event of an accidental event where hydrocarbons reached eelgrass beds, the ability for eelgrass beds to function as a nursery and feeding area for juvenile fish may be affected. With regard to capelin beaches, there is potential for hydrocarbons to sink into the beach sediments and become buried. In this unlikely scenario, hydrocarbon contamination can persist for years, continuing to affect sensitive life stages of eggs and larvae and, therefore, the productivity. Using a precautionary approach, it is concluded that there is potential for a significant adverse residual environmental effect to the Sensitive or Special Areas in the Nearshore Study Area. However, the likelihood of a significant adverse residual environmental effect occurring is considered low.

Offshore, the effects of a spill on the biota that may be using these areas were assessed in their respective VECs and determined to be not significant. Therefore, the adverse residual environmental effect of accidental event on the Sensitive or Special Areas identified in the Offshore Study Area was determined to be not significant.

4.6 Effects of the Environment on the Project

Hebron Project design and planning will benefit from the years of physical data collection in the general area of the offshore Project location, as well as the experience gained during comparable construction and fabrication activities at Bull Arm for the Hibernia GBS Platform in the early 1990s.

Several aspects of the physical environment affect Project design, construction / fabrication activities and operations in the Nearshore and Offshore Study Areas including: water depth and seabed profile (bathymetry); wind, waves and currents; tsunamis; tides, water levels, and storm surge; temperature; sea ice and icebergs; geohazards and climate change.

Mitigation measures to be applied to minimize the effects of the environment on the Project include (but are not limited to) the following:

- Engineering design will adhere to national standards and codes
- Site-specific weather and oceanographic data will be collected
- An ice management plan will be implemented

4.7 Follow-Up and Monitoring

EMCP will include EEM programs for the nearshore and offshore Project activities as a part of its overall Environmental Management System.

EMCP will implement a nearshore EEM program to verify impact predictions in the marine environment in Bull Arm. The details of the nearshore EEM program will be developed in consultation with regulatory agencies and key stakeholders. If in-water blasting is required, a monitoring and observation program will be implemented in the Nearshore Project EA Area.

In the Offshore Project EA Area, an EEM program for production operations will be developed and will build on the experience of the three offshore oil and gas production EEM programs. Marine birds and mammal data will be collected opportunistically during drilling operations from MODUs and from supply vessels where space is available. Weather and sea ice conditions will be recorded as part of the oceanographic monitoring program.

EMCP is committed to a fish habitat compensation follow-up monitoring program for fish habitat compensation in the Nearshore and Offshore Project EA Areas.

4.8 Summary and Conclusions

The Hebron Project will benefit from the experience of the existing production projects offshore Newfoundland, with respect to many key items including reducing resource conflicts with commercial fishers, development of effective monitoring programs, and effective emergency response planning. Standard mitigation measures will reduce the potential for adverse environmental effects from most routine construction and operation activities. EMCP will comply with legislative requirements and adhere to guidelines and / or codes of practice that have been specifically developed to address environmental protection practices in the Newfoundland and Labrador Offshore Area.

A summary of the residual environmental effects assessment for each of the identified VECs is provided in Table 4.8-1.

The only potential for significant residual adverse environmental effects as a result of the Hebron Project is in association with an accidental event. In such an unlikely event, significant adverse environmental effects have been predicted for Marine Birds, Bird SAR, and the Sensitive or Special Areas located in the nearshore environment. Emphasis on both pollution prevention and effective response planning will further reduce the potential for these unlikely significant environmental effects to occur.

Table 4.8-1: Significant (S) and Not Significant (NS) Residual Environmental Effects on Valued Ecosystem Components

VEC	Significance of Residual Environmental Effect					
	Construction / Installation	Operation and Maintenance	Decommissioning and Abandonment	Accidents, Malfunctions and Unplanned Events	Project Overall	Cumulative Environmental Effects
Air Quality	NS	NS	NS	NS	NS	NS
Fish and Fish Habitat	NS	NS	NS	NS	NS	NS
Commercial Fisheries	NS	NS	NS	NS	NS	NS
Marine Birds	NS	NS	NS	S	NS	NS
Marine Mammals and Sea Turtles	NS	NS	NS	NS	NS	NS
Species at Risk: Marine Fish	NS	NS	NS	NS	NS	NS
Species at Risk: Marine Mammals and Sea Turtles	NS	NS	NS	NS	NS	NS
Species at Risk: Marine Birds	NS	NS	NS	S	NS	NS
Sensitive or Special Areas	NS	NS	NS	S	NS	NS

EMCP's commitment is to plan and execute the Hebron Project as an environmentally responsible development and one that successfully balances environmental and economic needs. The Hebron Project will be designed, built and operated within the ExxonMobil policy of environmental responsibility, summarized as *Protect Tomorrow.Today.*