

Project Description

2D/3D/4D Seismic Projects

(2013 – Remaining Life of Field)

Newfoundland Offshore Area

Hibernia Management and Development Company Ltd.

January 2013

1. PROJECT DESCRIPTION

The following project description pertains to seismic projects that may occur over the remaining life of the Hibernia oil and gas development project. Additionally, details specific to the planned 2013 4D seismic monitoring program are provided; such details may vary in subsequent seismic program years.

1.1 PROJECT PURPOSE

The purpose of a seismic survey is to acquire data to assess the presence of geological structures suitable for the containment and accumulation of hydrocarbons and to determine the hydrocarbon characteristics.

In 2013, the seismic project is intended to acquire high quality 4D monitor survey data. The 4-D imaging will be used to monitor fluid and pressure changes in the reservoirs and also aid in optimization of future development well locations. The 4D monitor seismic data will become part of the reservoir management plan.

1.2 PROJECT SCHEDULE

The first seismic project is intended to take place between May and December in 2013 and future programs may be conducted during that same time period for the remaining life of the Hibernia oil and gas production field. For the 2013 project, the intent is to commence data acquisition as a direct follow-on program to the 2013 Hebron Seismic Streamer Program. Depending upon the start date of the 2013 Hebron Seismic Streamer Program and weather and other factors, the program could commence as early as the beginning to mid July 2013 and conclude by the end of November.

1.3 2013 PROJECT DETAILS

Program	Area of Operations	Survey Type	Size	Bin Size
Hibernia 2013 Seismic Streamer Program	Offshore Newfoundland See Figure 1	4D Streamer Monitor	Approx. 702 km ²	6.25 meter inline 18.75 meter or 12.5 meter crossline

1.4 PROJECT LOCATION

The seismic project (or study) area is approximately 4035 km² in size and generally centered upon the Hibernia gravity based structured (GBS) (charted position 46 45.01N, 48 46.9W). It includes a 20 km turning area to accommodate ship turning, holding, and streamer deployment (see Table 1 and Figure 1 (red box)). The seismic project area is contained entirely inside the NAFO 3L (3Lt, 3Li, 3Lh, 3Lr) fish management zone and in an area generally referred to as the Jeanne d'Arc basin. The seismic area also includes

the area which is the focus of the 2013 project (Figure 1 green and blue boxes) and all future seismic projects.

Table 1. Seismic Project Area Outline (Red) Coordinates (WGS-84 UTM Zone 22 N)

Corner	Easting (m)	Northing (m)
NE	710844	5197280
SE	683660	5137689
SW	627615	5163253
NW	654800	5222847

The 2013 program is focused on an area approximately 702 km² in size with a survey line heading of 24.5° / 204.5° and with an average line length of approximately 18 kms. The 702 km² area and the 20km turning zone are defined by the coordinates in Tables 2 and 3 below:

Table 2. 2013 Seismic Project Area Outline (Green) Coordinates (WGS-84 UTM Zone 22 N)

Corner	Easting (m)	Northing (m)
NE	685436	5186840
SE	674233	5162273
SW	650576	5173061
NW	661779	5197628

Table 3. 2013 Project Area Turning Zone (Blue) Coordinates (WGS-84 UTM Zone 22 N)

Corner	Easting (m)	Northing (m)
NE	703983	5193769
SE	681162	5143726
SW	632029	5166132
NW	654850	5216175

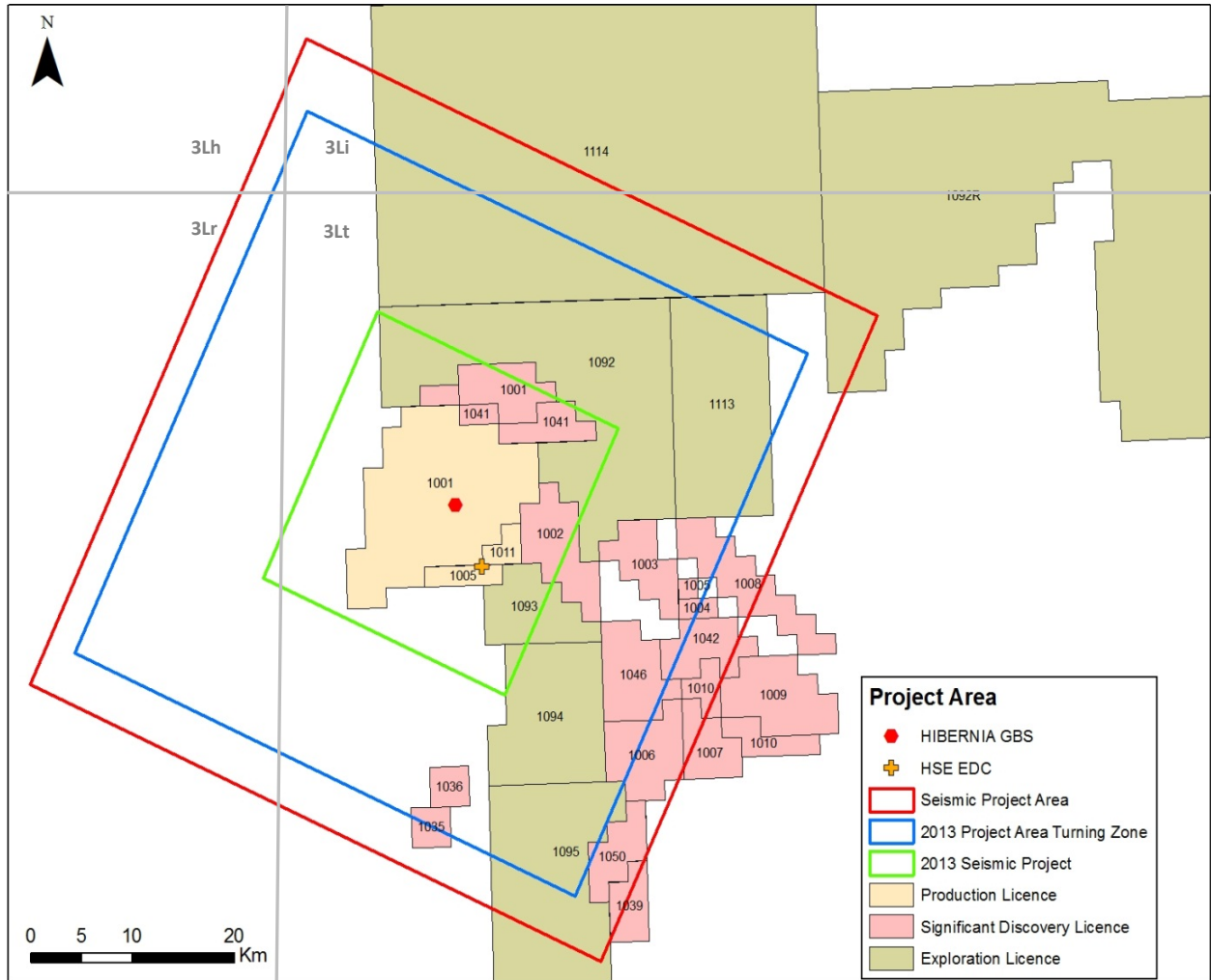


Figure 1: Project Area

1.5 PROJECT OVERVIEW

The proponent proposes, over the remaining life of the Hibernia field, to conduct marine geophysical programs within an approximate 4035 km² area which is generally centered on the Hibernia GBS location (Figure 1 – Seismic Area). The 2013 program will consist of approximately 702 km² area for the completion of a high quality 4D monitor seismic survey (Figure 1 – 2013 Seismic Project).

The proposed survey season is May through December and could include 2D, 3D and 4D programs. Traditional streamer technology will be used in 2013 however other programs could include use of ocean bottom cables (OBC). An OBC consists of a string of sensors (ex. hydrophones, geophones, accelerometers) temporarily placed on the seabed to record seismic signals similar to sensors embedded in towed streamers. The exact dates of the 2013 Hibernia 4D survey will depend upon the weather conditions and the completion date of a prior program over the Hebron field. It is expected that the vessel will be available sometime in July 2013. If the survey cannot commence or be completed in 2013, it may be completed in subsequent years.

The seismic survey vessel used during the program will be typical state of the art and approved for operation in Canadian waters. In 2013 the vessel will tow a dual sound source and up to twelve seismic streamers of an approximate length of six kilometers.

1.6 ENVIRONMENTAL RISK MANAGEMENT

Guidance provided in the C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012) will be used as the basis for the management and mitigation of environmental risks associated with the project. These guidelines recommend that operators implement the mitigations listed in the Fisheries and Oceans Canada *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*.

This Statement recommends the use of a marine mammal observer (MMO) to continuously observe, for a minimum of 30 minutes, a 500 m safety zone (centered on the air source array) prior to start up and to ramp-up the array gradually over a 20 minute period beginning with the activation of a single source element. Further, it recommends the ramp-up to be delayed if a cetacean, sea turtle or *Species at Risk Act* (SARA) listed (Schedule 1) marine mammal is detected within the safety zone. In addition, the air source array will be shut down any time a marine mammal or sea turtle listed as endangered or threatened on Schedule 1 of the SARA is observed in the safety zone.

A Canadian Wildlife Service permit will also be obtained to enable the MMO to salvage and release seabirds which may strand on the seismic vessel. A seabird salvage log will be maintained to record all seabird interactions as per the permit conditions.

To mitigate risks to fishers and fishing gear, a fisheries liaison officer (FLO) will be utilized to assess risks prior to departure; to recommend mitigations while at sea; and to communicate directly with fishers as needed. Meetings will also be held with the fishing industry to share details of the project; to assess the likelihood of fishing activity in the area; and to address any concerns or issues identified.

Table 4. Known Seismic Survey Parameters

General Information	
Operating Company:	Hibernia Management & Development Company Ltd. (HMDC) and ExxonMobil Canada Properties Ltd., a partnership (EMCP)
Vessel Name(s):	TBD
Location:	Hibernia field – see Figure 1 and Table 1
Type of Survey:	2013 4D Monitor Survey (subsequent years 2D, 3D, 4D, OBC)
Area	Seismic project area = 4035 km ² . 2013 Project Area = 702 km ² (may vary in subsequent years).
Average line length (including 3 km run-out):	2013 4D program 18 km (may vary in subsequent years)
Line direction:	24.5° / 204.5° (may vary in subsequent years)
Source Parameters	
Source type	Bolt, Soderia G or sleeve (steerable source preferred)
Number of sources	2 (flip-flop)
Shot to shot interval	18.75 m (37.5 m per source)
Total volume per source	3000-6000 cu inch
Source operating pressure	2000 psi (may vary in subsequent years)
Source depth	6 m +/- 0.5 meters tolerance (TBC)
Output	Up to 120 bar-meter peak to peak
Streamer Parameters	
Streamer type	Digital 24 bit (solid or gel-filled streamers required)
Number of active streamers	2013 4D program 12 streamers (on 8 streamer pre-plot) (may vary in subsequent years)
Streamer separation	50 or 75 meters
Active streamer length (each nominal)	4500 or 6000 meters
Steerable streamer device (REQUIRED)	DigiFin, Qfin, eBird, Nautilus or equivalent
Streamer depth	7-24 m +/- 1.0 m tolerance (TBC)
Minimum line run-in distance	1.5 x active streamer length (unobstructed areas)

1.7 PROJECT COMPONENTS

The components of a seismic survey include a seismic vessel; the towed seismic air source array; the towed receiver (hydrophone) array; a picket vessel; a logistics supply vessel; helicopter; and a shorebase.

1.7.1 Seismic Vessel

Vessel specifics will be provided in subsequent document submissions once the contractors are selected. The selected ship will be a fully equipped, modern vessel suited to the environment and task.

1.7.2 2013 4-D Program Seismic Source Towed Array

The proposed 4-D survey sound source will consist of two air source arrays, with sufficient volume to output up to 120 bar-meters peak to peak. The air source will operate at a towed depth of approximately 6 meters. The air sources will be operated with compressed air at a pressure of approximately 2000 psi. While towing the survey lines, the two air source arrays are discharged alternately, one each 18.75 meters down the line or approximately every 6 seconds. Detailed specifications of the air source array will be provided once the contractor is selected. Seismic air source array specifications may vary in subsequent years.

1.7.3 2013 4-D Program Streamer

The 4-D seismic survey will use 12 towed streamers with a length of 4,500 or 6,000 m and deployed at a depth of approximately 7-24 meters. The streamers will be separated by 50 or 75 meters. The streamers will be solid or gel-filled to minimize the environmental impact in the case of breaks or tears. Detailed streamer equipment specifications will be provided once the contractor is selected. Streamer configurations may vary in subsequent years.

1.7.4 Logistics / Support

Details of logistical operations to support the project will largely depend on the particular seismic acquisition company. The seismic vessel will use shorebase facilities in St. John's, NL for initial clearance into Canadian waters and exit from Canadian waters at the end of the survey. Resupply of the seismic vessel during the survey will be accomplished with a chartered supply vessel from the Port of St. John's.

A standby or picket vessel will be used to scout ahead for hazards and for interacting and communicating with other users of the area about the survey and associated trailing gear, and assist in working with fishers in the area (if any). The standby vessel will also provide a means for towing the seismic vessel in the case of a loss of propulsion. This will avoid a major loss of equipment and potential environmental damage.

Due to varying weather conditions, the contractor will likely use a supply vessel for crew changes rather than a helicopter. However, it is possible the seismic vessel may use a helicopter for crew changes. Helicopters can also be used in case of medical and other emergencies and for minor re-supply.

The seismic contractor will use existing shorebase facilities in St. John's whenever necessary and a shore based representative or contact person will be located in St. John's for the duration of the project.

1.7.5 Personnel

Typically, a large seismic vessel can accommodate 40 to 65 personnel. The crew is made up of seismic crew (technical and scientific personnel from the seismic contractor) and maritime crew (ship's officers and marine crew from the vessel owner/operator).

Additionally, there will be a FLO and MMO as well as Client Representatives on-board. All on-board personnel will have the required certifications specified by Canadian legislation and the C-NLOPB.