PROJECT DESCRIPTION

EAST CANADA CSEM SURVEY
2014-2018

Prepared by

LGL LIMITED
environmental research associates

Prepared for

emgs

11 December 2013
Project No. SA1248

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NON-EXCLUSIVE CSEM SURVEY 2014-2018

Prepared by

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1.0 INTRODUCTION

Electromagnetic Geoservices Canada, Inc. (EMGS) has prepared this Project Description (PD) for a proposed non-exclusive controlled source electromagnetic (CSEM) project for offshore Newfoundland waters. It is the first step in the Canada-Newfoundland and Labrador Offshore Petroleum Board's (C-NLOPB) environmental assessment (EA) process. This PD combined with the technical and scoping advice received from the C-NLOPB, other federal agencies, and stakeholders consulted by the Proponent will guide the preparation of an environmental assessment (EA).

The Project is proposed for the eastern offshore of Newfoundland for 2014-2018. The first phase of the Project has a tentative start of May 1, 2014, and pending on EMGS' client commitments may last until the weather window closes around November 30 (although a shorter "typical" campaign of 2-4 months is more likely). CSEM is a useful tool at all phases of the exploration process, but is most commonly applied immediately prior to drilling as a "drill or drop" test. Drill or drop surveys are acquired mainly where seismic data is already acquired prior to the exploration drilling. The EM data is then used to further reduce uncertainty and influence the decision of whether a prospect should be drilled, or dropped from the portfolio. The resulting CSEM data enable oil companies to de-risk potential hydrocarbon reservoir prior to drilling and ultimately increase exploration success by reducing the amount of dry offshore wells and thereby reducing the overall environmental footprint of drilling programs.

This Project would be the fourth CSEM campaign offshore Newfoundland. The previous three projects were all operated by ExxonMobil and acquired by EMGS. All three projects underwent the EA process, were delivered on time without environmental or safety incidents, and achieved their objectives.

1.1 Relevant Legislation and Regulatory Approvals

The *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) came into force on 6 July 2012. The "Regulations Designating Physical Activities" lists physical activities which fall under the *Act*. Marine CSEM surveys are not included on the list and therefore do not require an EA under CEAA 2012. However, an Authorization to Conduct a Geophysical Program will be required from the C-NLOPB. The C-NLOPB is mandated in this matter by the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act*. Authorizations for the kinds of activities described in this PD will be issued under the *Atlantic Accord Implementation Act* at the discretion of the C-NLOPB. One of the specific guidelines issued by the C-NLOPB, the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012) are directly relevant to the proposed undertaking.

Other legislation that is relevant to the environmental aspects of this project includes:

- *Species at Risk Act* (*SARA*)
- *Oceans Act*
- *Fisheries Act*
- *Navigable Waters Protection Act*
- *Canada Shipping Act*
- *Migratory Birds Convention Act*

1.2 The Operator

EMGS is the global market leader in the CSEM industry with more than 650 surveys conducted worldwide since the company was founded in 2002. The company's primary business is focused towards the use of resistivity data as a direct hydrocarbon indicator (DHI). EMGS has conducted all of the CSEM surveys to date in Newfoundland and Labrador waters, and acquired the 2006, 2007 and 2009 CSEM data in the Orphan Basin for ExxonMobil.

EMGS currently operates a fleet of four dedicated 3D electromagnetic survey vessels; the M/V *Atlantic Guardian*, M/V *EM Leader*, S/V *BOA Galatea* and S/V *BOA Thalassa*, with extensive experience across the world's mature and frontier offshore basins.

1.3 Canada-Newfoundland and Labrador Benefits

EMGS is cognizant of the requirements of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act*. EMGS is committed to providing maximum benefits associated with East Coast operations to Canadians, and in particular, to Newfoundland and Labrador individuals and companies where they are commercially competitive in accordance with EMGS' requirements.

EMGS will manage the operations for the CSEM surveys from St. John's, Newfoundland and Labrador. EMGS supports the principle that first consideration be given to personnel, support and other services that can be provided within Newfoundland and Labrador, and to goods manufactured in Newfoundland and Labrador, where such goods and services can be delivered at a high level of health, safety and environmental performance, and be competitive in terms of quality and cost. Contractors and subcontractors working for EMGS in Newfoundland and Labrador must also apply these principles in their operations.

A Canadian Benefit plan will be submitted in accordance with the C-NLOPB Guidelines.

1.4 EMGS Contacts

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2.0 PROJECT DESCRIPTION

The official name of the Project is the East Canada CSEM Survey, 2014-2018. EMGS is proposing to conduct one or more CSEM programs between 2014 and 2018, starting as early as May 2014, anywhere within its proposed Project Area (Figure 1). The timing of the surveys is subject to EMGS's client priorities and circumstances, weather conditions, contractor availability and regulatory approvals.

2.1 Spatial and Temporal Boundaries

The Study Area is composed of the Project Area plus a 20 km "buffer" around the Project Area to account vessel turning activities (see Figure 1). The areas of the Study Area and Project Area are 325,617 km^2 and 276,438 km^2, respectively. The survey areas for any particular area will likely be much smaller than these. At least half of the Study Area and Project Area is located outside of Canada's Exclusive Economic Zone (EEZ) (200 nm limit).

The "corner" coordinates (decimal degrees, WGS84 projection) of the Study and Project areas are shown in Table 1 below.

Table 1. Study and Project Area Corner Coordinates.

Study Area WGS_84_UTM_zone_22N		Project Area WGS_84_UTM_zone_22N	
X	Y	X	Y
394841	5668769	421339	5664471
508865	5760934	515986	5740974
550072	5761167	550185	5741167
604328	5762006	604637	5742008
692338	5764656	692940	5744665
766994	5768012	767892	5748032
811141	5770618	802400	5750067
1025379	5520121	1002245	5516398
760880	4873807	747571	4894089
555667	4878082	577454	4897633
597198	5352639	617778	5357632
394841	5668769	421339	5664471

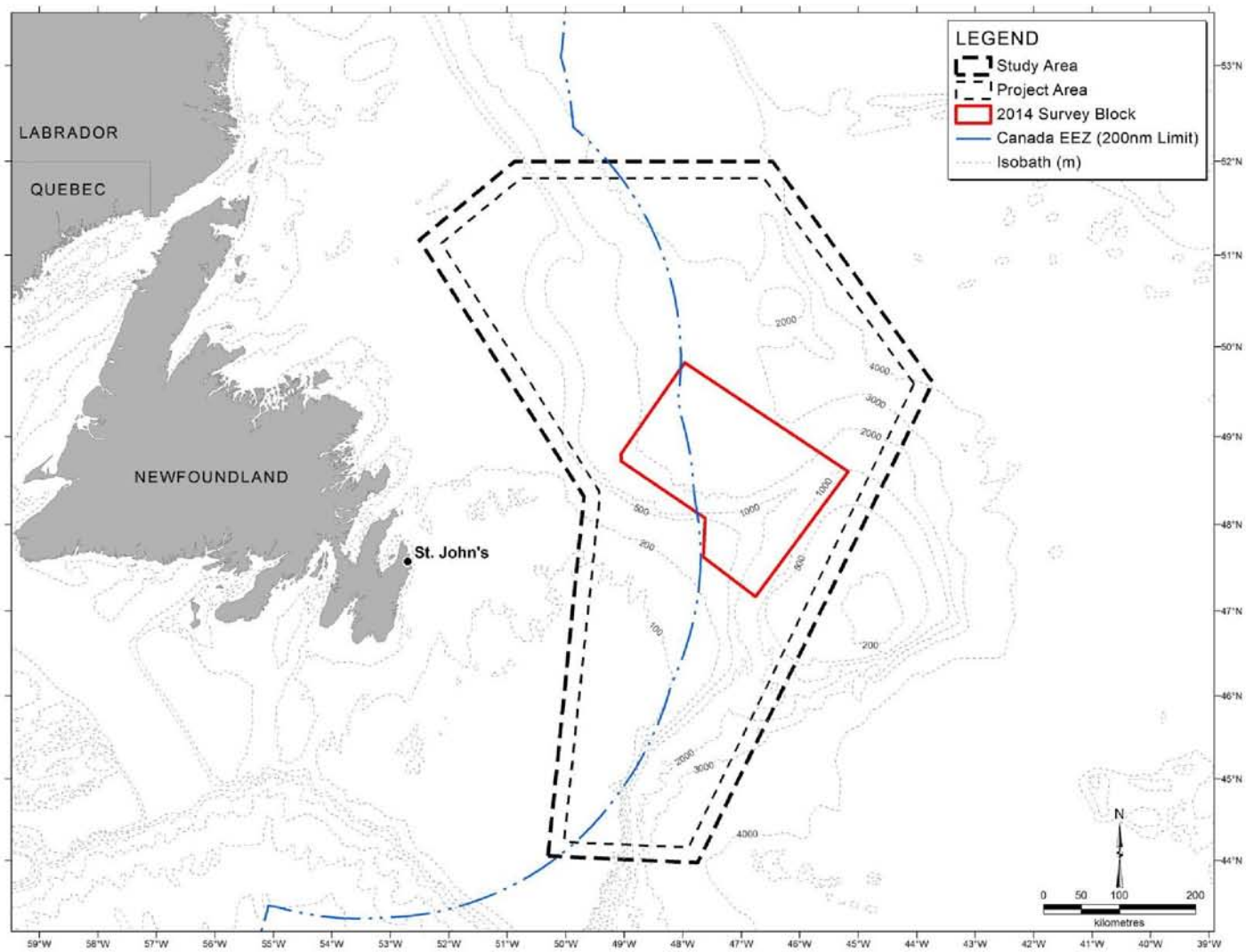

Figure 1. Study and Project Areas for the Proposed Non-exclusive CSEM Survey, 2014-2018.

The temporal boundaries of the proposed Project are between 1 May and 30 November, from 2014-2018. The duration of a seismic survey is estimated at 60 to 150 days in a given year.

2.2 Project Overview

The Study and Project areas for the five year period are indicated in Figure 1. The corner coordinates of these areas are listed in Table 1. The CSEM survey will be conducted along pre-plotted lines, as per C-NLOPB guidelines for Geophysical Programs.

An array of receivers will be deployed on the seabed commonly 1-3 km apart. An electromagnetic source is then deployed and towed behind the survey vessel, roughly 30 m above the seabed. The electromagnetic signal propagates through the subsurface and is recorded by receivers sitting on the sea bed. By modeling, integrating and interpreting these recordings, subsurface resistivity can be inferred.

Final survey location maps will be submitted to CNLOPB 4-6 weeks prior to acquisition start-up.

The C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012) will be used as the basis for a marine mammal monitoring and mitigation program, if required. In addition, the environmental observers (potentially the marine mammal observers, if required) will conduct a monitoring and release program for seabirds which may strand on board Project vessels. A Fisheries Liaison Officer (FLO) provided by the Fish, Food and Allied Workers (FFAW) will be on board the survey vessel to ensure implementation of communication procedures intended to minimize conflict with the commercial fishery.

2.2.1 Objectives and Rationale

CSEM methods produce valuable resistivity information used to assess the type of fluids in a reservoir. The existence of a subsurface resistor co-located with a prospective structure identified on a seismic image can significantly increase the probability of success when the prospect is drilled. Quantitative interpretation of resistivity data can further reduce commercial risk for the oil company by assessing the scale (and thus commerciality) of the oil and reserves in place.

2.2.2 Project Scheduling

The seismic surveys may occur between 1 May and 30 November of any given year from 2014 to 2018. The estimated duration of the proposed 2014 survey could be as long as 120-150 days.

2.2.3 Site Plans

Survey design planning for 2014 is still in progress and will depend upon client seismic results; thus detailed survey lines are not yet available. These details will be submitted to the Board 4-6 weeks in advance of the survey. The 2014 survey site will be located within the 41,000 km^2 block (shown in Figure 1). Survey line length and orientation is to be determined. Grid and survey line spacing will range from about 1-3 km. Water depths in the Project Area range from about <100 m to >4,000 m (Figure 1).

Much of the CSEM program will occur beyond Canada's Exclusive Economic Zone (EEZ).

2.2.4 Personnel

A typical survey vessel can accommodate approximately 35-50 personnel. Personnel on a survey vessel include ship's officers and marine crew as well as technical and scientific personnel. The survey vessel may also have a FLO and MMOs on board. All project personnel will have all of the required certifications as specified by the relevant Canadian legislation and the C-NLOPB.

2.2.5 Survey Vessel

The survey will be conducted using one of EMGS' four exploration vessels which can hold up to 200 receivers. These vessels are not significantly different that offshore supply vessels typically used on the east coast and similar to the vessel used previously in Orphan Basin. The vessel will have an onboard technical crew from EMGS in addition to a maritime crew employed by the ship-owner. Total crew is 35-50 persons on five week rotations.

2.2.6 CSEM Source

The source system is designed to meet state of the art CSEM requirements with respect to performance, physical dimensions and safety when handling the equipment.

The CSEM source system consists of a: power supply and control unit at the topside transmitter mounted on towed subsea-frame (tow fish) horizontal electric dipole connected to the tow fish.

The topside unit is controlling the power to generate the predefined EM pulse at the electric dipole. The power is transformed to high voltage/low current and transferred via umbilical to the subsea system. At the subsea system the power is transformed back to low voltage/high current. A trailing electric dipole (antenna) is connected to the subsea signal source. This antenna is fed with a periodic current. The waveform, amplitude and periodic time can be defined and changed at the topside operator station.

A separate power supply feeds the instrumentation on the tow fish.

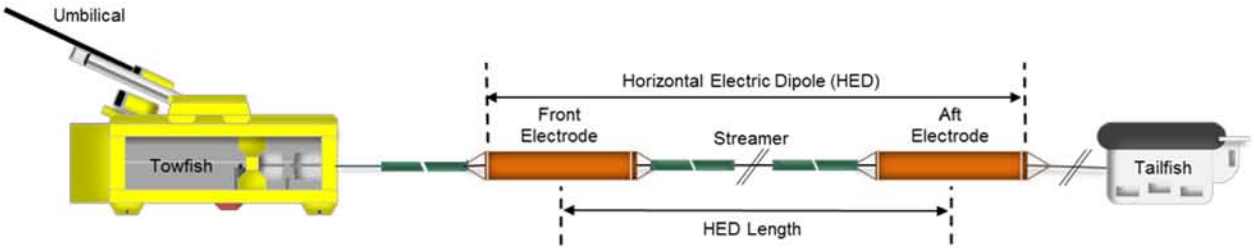

Figure 2. Schematic Drawing of the CSEM Source.

Figure 2 shows the general schematic of the subsea configuration. The electric dipole (antenna) is neutrally balanced for in-line towing operation. A tail fish is designed to stretch the antenna system. Tow fish and tail fish are carrying additional survey and navigation equipment.

2.2.7 CSEM Receivers

CSEM receiver nodes are placed on the seabed in a grid pattern. The node consists mainly of antenna, receiver, positioning transponder, release system, buoyancy, and an environmentally benign anchor. Sonardyne Programmable Generic Transponders (PGT) are used on both the Receivers and the Towed source in order to position them in the water. The PGT also can release the receiver from the anchor by primary or secondary release. Primary release is an electric motor which releases the wire from the PGT. The secondary release uses a burn wire in case the primary fails to release. Buoyancy is provided in order to bring the receivers back to the surface after the anchor release. The system consists of five glass spheres enclosed in high quality yellow plastic. The PGT is also used to position the receivers on the seabed using the shipboard Sonardyne or Kongsberg Ultra Short Base Line (USBL) system. It works by sending an acoustic interrogation signal to the PGT which in turn sends a reply signal enabling its precise position to be calculated.

Each receiver is mounted with a compacted sand anchor, typically about 920 mm x 810 mm x 102mm in size, in order to provide negative buoyancy during deployment, and to provide stability during seabed recording. The anchor remains at the seabed after release and recovery of the receiver. The anchor contains no components harmful to the marine environment. All ingredients are found in natural gravel, limestone and/or seawater and do not contain any organic admixtures.

2.2.8 Logistics/Support

Support Vessels

Depending upon the final logistic plan, a supply vessel may be required to facilitate technician changes and for re-supply.

Helicopters

The survey vessel will be equipped with a helicopter deck and helicopters are often used for crew changes and light re-supply. It is not known at this time whether helicopters will be used for crew changes during the proposed survey program(s). Once the final extents of the CSEM programs are determined, the necessity for and feasibility of helicopter support for crew changes will be determined.

Shore Base, Support and Staging

Logistics such as crew changes and re-supply will be coordinated in St. John's. No new shore base facilities will be established as part of the Project.

2.2.9 Waste Management

Waste management will be consistent with industry best practices in offshore Newfoundland and Labrador.

2.2.10 Air Emissions

Air emissions will be those associated with standard operations for marine vessels, including the CSEM vessel and any potential picket and/or supply vessel.

2.2.11 Accidental Events

In the unlikely event of the accidental release of hydrocarbons during the Project, the measures outlined in EMGS' oil spill response plan will be implemented. The oil spill response plan will be filed with the C-NLOPB. In addition, EMGS will have an emergency response plan in place.

2.3 Mitigation and Monitoring

Project mitigations will be detailed in the EA and will be based on C-NLOPB guidelines and any other appropriate regulatory guidelines.

3.0 ENVIRONMENTAL ASSESSMENT

The environmental assessment will closely follow previous assessments of CSEM programs for offshore Newfoundland and Labrador. The primary concerns are the effects of electromagnetic signals and towed gear on marine fauna and fisheries.

3.1 Physical and Biological Environment

Portions of the physical and biological environments in and immediately adjacent to the Study Area have been described in a number of recently approved and ongoing EAs. These have included seismic, drilling and development EAs. A description of the physical and biological environments will be provided in the EA for this Project. Background information will be provided for anticipated Valued Environmental Components (VECs)—fish and fish habitat, fisheries, marine birds, marine mammals, sea turtles, Species at Risk and sensitive areas.

3.2 Effects of the Environment on the Project

A discussion of expected effects of the physical environment on the Project, based partially on information from previous EAs will be provided in the EA for this Project.

3.3 Effects of the Project on VECs

The effects of Project activities, most notably the electromagnetic signals from the CSEM source, on VECs will be assessed in detail. Information on the known effects of electromagnetic emissions on marine fauna, as well as other Project activities, will be reviewed, and used to predict residual effects on VECs. Mitigation and monitoring procedures will be included in the EA and will consider input received by stakeholders during consultations.

Accidental events (such as an unplanned hydrocarbon release) associated with Project activities will also be assessed in the EA. It will also include an analysis of cumulative environmental effects.

3.4 Consultations

During the course of the assessment, EMGS will consult with stakeholders with an interest in the Project. Those consulted and the results of those consultations will be compiled in the EA.

In order to assist in scoping the effects assessment and mitigation plan, and to aid in addressing any issues of concern, EMGS will undertake a consultation program with the interested parties, which may include, but are not limited to:

- Fisheries and Oceans Canada (DFO);
- Environment Canada;
- ONE OCEAN;
- FFAW;
- Study Area fishers;
- Nature Newfoundland and Labrador (formerly the Natural History Society);
- Various fish processors; and
- Other Newfoundland and Labrador fisheries industry stakeholders as identified.

4.0 REFERENCES

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2012. Geophysical, Geological, Environmental and Geotechnical Program Guidelines, January 2012. 51 p.