Amendment to the Environmental Assessment of the EMGS East Canada CSEM Survey, 2014-2018

Prepared by

LGL LIMITED
environmental research associates

for

emgs

March 2015
LGL Project No. FA0046

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1.0 Introduction

This document is an Amendment to the Environmental Assessment (EA) (LGL 2014a) prepared for Electromagnetic Geoservices Canada Inc.'s (EMGS) 2014–2018 Controlled Source Electromagnetic (CSEM) survey program in offshore Newfoundland and Labrador waters (the Project). The official name of the Project is "East Canada CSEM Survey, 2014-2018". The C-NLOPB has determined that the Amendment is necessary to provide assessment of two changes to the Project details: (1) a scenario involving the concurrent use of two CSEM survey vessels; and (2) the extension of the annual temporal window of the Project from 30 November to 31 December.

These Project detail changes are considered to be outside the scope of the Project as presented in the EA (LGL 2014a), its Addendum (LGL 2014b), and its first Amendment (LGL 2014c). Note that the first Amendment was prepared to extend the temporal window in 2014 from 30 November to 31 December. This Amendment was approved by the C-NLOPB prior to EMGS CSEM activities in 2014.

1.1 The Operator: EMGS

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).

Electromagnetic Geoservices' North American offices are located in Vancouver, BC and Houston, TX. The company 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.

1.2 Contacts

Electromagnetic Geoservices' key contacts for the Project are listed below.

Executive Contact:

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Health, Environment and Safety Contact:

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2.0 Project Description

As indicated in the EMGS EA (LGL 2014a), it is anticipated that one or more CSEM programs will be conducted within the Project Area (Figure 2.1) during the 2015 to 2018 period.

2.1 Spatial and Temporal Boundaries

The spatial boundaries of the Project Area are indicated in Figure 2.1. The Study Area includes the Project Area plus a 20 km buffer around the Project Area to account for any potential effects such as sound, accidental spills, or electromagnetic emissions on marine animals that may occur outside the Project Area. The areal extents of the Study Area and Project Area are 325,617 km^2 and 276,438 km^2, respectively. The survey areas during any particular year will be much smaller than the Project Area. The corner coordinates for both the Project Area and the Study Area are provided in Table 2.1 of the EA (LGL 2014a).

The temporal boundaries of the Project, as defined in the EA (LGL 2014a), are 1 May to 30 November during 2014-2018. As indicated in Section 1.0, one objective of this Amendment is to extend the annual temporal window from 30 November to 31 December. The duration of a typical CSEM survey is estimated at 60 to 150 days in any given year.

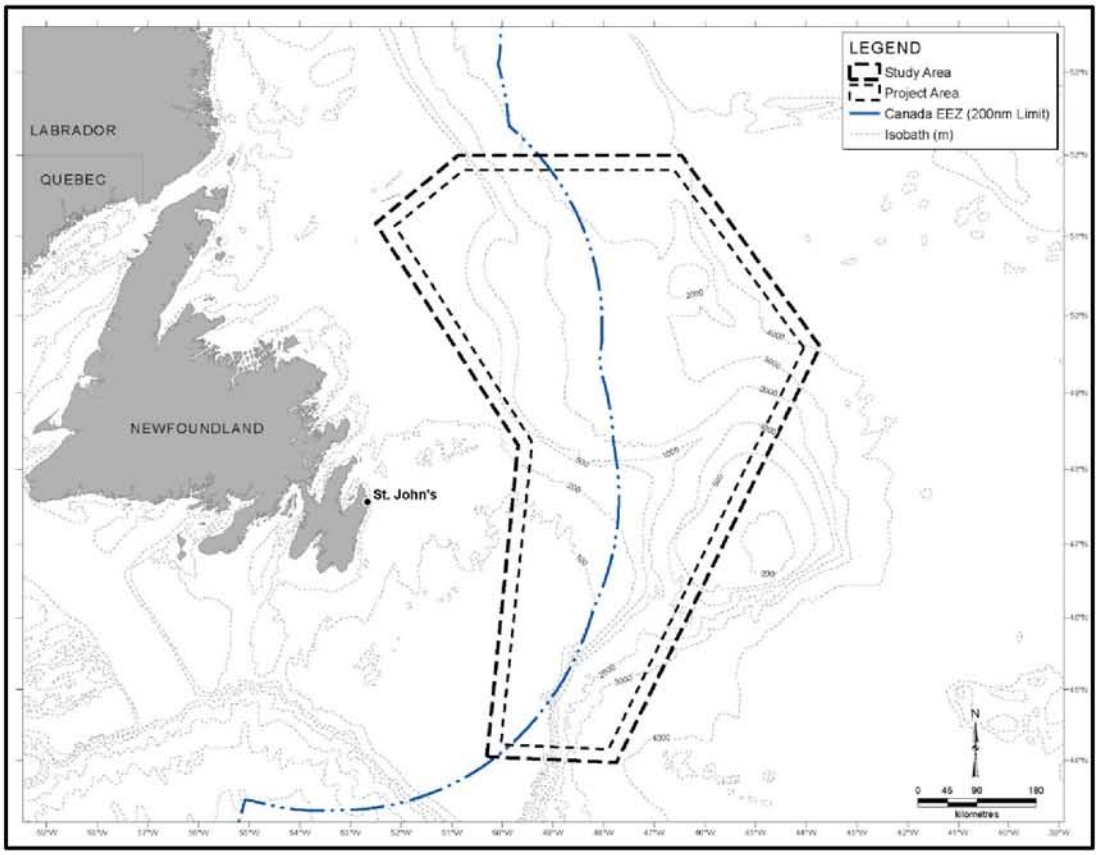

Figure 2.1 Locations of the Project Area and Study Area for CSEM Surveying in the Eastern Newfoundland Offshore Area, 2014-2018.

2.2 Project Overview

The CSEM survey will be conducted along pre-plotted lines, as per C-NLOPB *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012). Final survey location maps will be submitted to C-NLOPB four to six weeks prior to acquisition start-up in any one year.

During the survey, 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. The end product can increase drilling success since water has a different resistivity than the petroleum hydrocarbons.

EMGS proposes the possible operation of two CSEM vessels concurrently during the 2015-2018 period. There are two possible scenarios for the concurrent use of two CSEM vessels: (1) the two vessels work together on the same survey, one deploying and retrieving receivers and the other towing the electromagnetic source; and (2) the two vessels work independently of one another, each one deploying/retrieving its own receivers and towing its own electromagnetic source.

EMGS also proposes the extension of the annual temporal window from 30 November to 31 December for the four remaining years of the assessed project (i.e., 2015-2018).

All other Project Description details provided in the EMGS EA (LGL 2014a) and its Addendum (LGL 2014b) remain relevant to the 2015-2018 portion of the CSEM program.

The C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012) will be used as the basis for a marine mammal/sea turtle monitoring and mitigation program. In addition, the environmental observers (EOs) (potentially the marine mammal or seabird 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 each survey vessel to ensure implementation of communication procedures intended to minimize conflict with the commercial fishery. The FLO will also assist the EOs as demands may require.

Proposed mitigation procedures intended to minimize the potential effects of the Project activities associated with CSEM surveys are discussed in detail in Sections 5.5 and 6.0 of the EMGS EA (LGL 2014a) as well as in the associated Addendum (LGL 2014b). Table 2.1 summarizes the proposed primary mitigation measures for each anticipated potential effect.

Table 2.1 Summary of Mitigation Measures.

Potential Effects	Primary Mitigations
Interference with fishing vessels	• Conduct upfront planning to avoid high concentrations of fishing vessels • Request input from fishing captains through FFAW PIL regarding streamer deployment and testing plan • Utilize Single Point of Contact (SPOC) • Release advisories and communications • Employ FLO • Plan transit route to and between Survey Areas (if required)
Fishing gear damage	• Conduct upfront planning to avoid high concentrations of fishing gear • Utilize SPOC • Release advisories and communications • Employ FLO • Compensation • Plan transit route to and between Survey Areas (if required)
Interference with shipping	• Utilize SPOC • Release advisories and communications • Employ FLO
Interference with DFO/FFAW research vessels	• Maintain communications and scheduling
Temporary disturbance to Species at Risk	• Delay start-up if any *SARA* species are within 500 m • Ramp-up EM source • Shutdown EM source for endangered or threatened elasmobranchs, marine mammals and sea turtles • If required, use qualified observers to monitor for Ivory Gull, white shark, marine mammals and sea turtles during daylight EM operations.
Injury (mortality) to stranded seabirds	• Monitor vessel daily • Comply with conditions in CWS permit • Provide strandings report to CWS within one year (see CWS protocols Appendix B) • Minimize lighting if safe to do so
Exposure to hydrocarbons	• Adhere to International Convention for the Prevention of Pollution from Ships (MARPOL) • Utilize Spill Response Plan • Report oiled birds to CWS (see CWS protocols Appendix B)

3.0 Potential Effects of Project Activities on the Environment

The assessment of the potential effects of CSEM survey activities on marine biota presented in the EMGS EA (LGL 2014a) remains valid for the assessment of the potential effects of two CSEM vessels operating concurrently on marine biota. If the two vessels are working together on a single survey, then the increase in potential effects will be due to the added footprint and noise associated with the second vessel. If the two vessels are working independently of one another, then the increase in potential effects will be due to the added footprint and noise associated with the second vessel, as well as added footprint associated with a second set of receivers and added electromagnetic levels associated with the second source. The latter scenario will be characterized by the two vessels operating some distance apart in order to prevent one vessel's output signal from interfering with the other vessel's data collection. The scenario involving both vessels working together would be characterized by two vessels operating closer to one another. Both two-vessel scenarios would result in an increase in vessel lighting and, therefore, slightly higher potential for bird attraction. Both scenarios would also result in slightly higher potential for an accidental release of hydrocarbons.

The extension of the annual temporal window from 30 November to 31 December will also not reduce the validity of the assessment results presented in the EMGS EA (LGL 2014a). As already indicated, the purpose of the first Amendment (LGL 2014c) was to extend the 2014 temporal window to 31 December. The same conclusions drawn in that first Amendment regarding extension of the annual temporal window also apply to this Amendment.

The relevant assessment tables in the EMGS EA (LGL 2014a) are indicated in Table 3.1.

Table 3.1 Relevant Tables and Sections in the EA Applicable to Assessment of the Potential Effects of Two CSEM Vessels Operating Concurrently on each VEC.

VEC	Interactions Tables	Assessment Tables	Significance
Fish and Fish Habitat	Table 5.2	Table 5.3	Section 5.7.5
Fisheries	Table 5.2	Table 5.3	Section 5.7.6
Seabird	Table 5.2	Table 5.3	Section 5.7.7
Marine Mammals and Sea Turtles	Table 5.2	Table 5.3	Sections 5.7.8 and 5.7.9
Species at Risk	Table 5.2	Table 5.3	Section 5.7.10
Sensitive Areas	Table 5.2	Table 5.3	Section 5.7.11

3.1 Residual Effects Assessment Summary

All predictions made in the EMGS EA of the Southern Grand Banks Seismic Program (LGL 2014a) relating to the 'significance' of the residual effects of Project activities on the various VECs remain the same for the residual effects of two CSEM vessels operating concurrently and extension of the annual temporal window on the various VECs.

A summary of the Project's residual effects on the environment are shown in Table 3.2. All activities associated with EMGS operating two survey vessels concurrently during CSEM surveying and the extension of the annual temporal window to 31 December are predicted to have *no significant* effects on any of the VECs.

Table 3.2 Significance of Potential Residual Environmental Effects on VECs of Operating Two Survey Vessels Concurrently during CSEM Surveys and the Extension of the Annual Temporal Window to 31 December.

All Valued Ecosystem Components (VECs)				
Project Activity	**Significance Rating**	**Level of Confidence**	**Likelihood [a]**	
	Significance of Predicted Residual Effects		**Probability Occurrence**	**Scientific Certainty**
CSEM Source	NS	3	-	-
Underwater Sound				
• Receiver Deployment	NS	3	-	-
• Receiver Retrieval	NS	3	-	-
• Streamer Towing	NS	3	-	-
Seabed Disturbance				
• Receiver Deployment	NS	2-3	-	-
• Receiver Retrieval	NS	2-3	-	-
Light Attraction	NS	3	-	-
Physical Presence				
• Survey Vessels/Gear	NS	3	-	-
• Supply Vessel	NS	3	-	-
Sanitary/Domestic Wastes	NS	2-3	-	-
Accidental Spills	NS	2-3	-	-

Key:

Residual environmental Effect Rating:
S = Significant Negative Environmental Effect
NS = Not-significant Negative Environmental Effect
P = Positive Environmental Effect

Significance is defined as a medium or high magnitude (2 or 3 rating) and duration greater than 1 year (3 or greater rating) and geographic extent >100 km^2 (4 or greater rating).

Level of Confidence: based on professional judgment:
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

Probability of Occurrence: based on professional judgment:
1 = Low Probability of Occurrence
2 = Medium Probability of Occurrence
3 = High Probability of Occurrence

Scientific Certainty: based on scientific information and statistical analysis or professional judgment:
1 = Low Level of Confidence
2 = Medium Level of Confidence
3 = High Level of Confidence

[a] Considered only in the case where 'significant negative effect' is predicted.

3.2 Cumulative Effects

EMGS's EA of the Southern Grand Banks Seismic Program (LGL 2014a) assessed cumulative effects within the Project and thus, the residual effects described in preceding sections include any potential cumulative effects from the EMGS geophysical program activities in the Project Area. The EA also assessed cumulative effects from other non-Project activities that are either occurring or are planned for the Regional Area. These activities include:

- fisheries (commercial and research);
- marine transportation; and
- other oil and gas activities.

As indicated in Section 5.10 of the EMGS EA (LGL 2014a), it seems likely that while some animals may undergo disturbance from multiple user activities within the project Area, the current scientific prediction is that the resultant residual effects will be *not significant*.

The EA prediction that between-project cumulative effects will be *not significant* remains valid for this Amendment.

4.0 Literature Cited

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

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