



PROJECT REGISTRATION

IN ACCORDANCE WITH

THE NL ENVIRONMENTAL PROTECTION ACT

FOR THE

**BAY ST. GEORGE SEISMIC EXPLORATION
PROGRAM**

JUNE 14, 2010

1.0 Name of Undertaking
Bay St. George Seismic Project

2.0 Proponent

2.1 Name and Contact Information

Vulcan Minerals Inc.
333 Duckworth Street
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Principle contact person for purposes of Environmental Assessment

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2.2 Proponent Profile

Vulcan Minerals is an exploration company based in St. John's NL, which is primarily involved in exploring for oil and gas in western Newfoundland. Vulcan has carried out oil and gas exploration activities in the Bay St. George area, including seismic data acquisition and drilling since 1998. Vulcan has a well established record of operating in an environmentally responsible manner and in compliance with all applicable legislation.

3.0 The Undertaking

3.1 Nature of Undertaking:

The Undertaking involves the acquisition of reflection seismic data (aka "seismic") in the Bay St. George area. One hundred forty km of seismic data acquisition is proposed of which 114 km will be located "off-road" and 26 km will be located on existing trails. Seismic data is acquired by generating sound waves at the surface and recording the echoes that return from stratified layers in the subsurface. The sound waves may be generated by mechanical devices that shake the ground ("Vibroseis") or by exploding small dynamite charges in "shot holes". Vulcan has used the Vibroseis method when acquiring data on existing roads where the large trucks involved can be deployed. However, as the currently proposed seismic program is located predominantly "off-road" Vibroseis is not feasible. In this case Vulcan proposes to use small (2 kg) dynamite charges buried to a depth of 10 metres in drill-holes (aka "shot-holes"). This approach is not only more logistically feasible, but is more environmentally benign in that moving large vehicles off-road would require the cutting of wide trails and significant disturbance

to vegetation. By using dynamite as a source the cut-line must only be wide enough (2.75 m) to accommodate small drills specifically designed for seismic drilling – called *enviro drills*. Figure 3 is an example of a typical seismic drill. Vulcan carried out a similar seismic program in the Bay St. George area in 2007 whereby 57 km of seismic data were acquired.

It is worth noting that the detonation of dynamite charges in a seismic operation is significantly different than detonations in the more common type of blasting operation that is carried out in the construction industry. In seismic acquisition the idea is to generate sound waves that will travel downward into the ground – not to break rock. Normally when a seismic charge is detonated only a dull thud is noted at the surface.

3.2 Purpose of Undertaking

In order to acquire seismic data, Vulcan must obtain temporary access to the project area. As noted above seismic data are acquired to image the subsurface geology and thereby allow the optimization of drilling locations for oil and gas exploration. Vulcan Minerals has directly and indirectly caused the expenditure of approximately \$30 million in the Bay St. George area since first work began in 1998. Ten wells have been drilled, the most recent in 2009, which have shown promising potential for natural gas. With each well drilled new understanding of the geology is achieved. Petroleum exploration proceeds by gradual steps and improvements in understanding of local geology. In order to move to the next phase of exploration Vulcan desires to acquire additional seismic data to choose the next drilling locations.

3.3 Informing the Public

The first seismic programs onshore western Newfoundland were acquired in the late 1980s and early 1990s. Given that this was an entirely new activity to the area public information sessions were held in the Bay St. George – Port au Port area and in the Parsons Pond area, which were key areas of focus for petroleum exploration. On the same note, information sessions were also held for the first wells drilled in these areas to inform the public of the nature of petroleum drilling and associated activities. For later seismic programs and wells it was deemed sufficient to arrange meetings with community leaders and post notices in local newspapers to let people know that more work of the same nature was to take place. Along with these efforts any individual whose property is affected by the operations is consulted directly. Approval has been received from Corner Brook Pulp and Paper in areas where they maintain timber rights. In regard to this seismic program it is Vulcan's intent to publish notices in two local newspapers and to meet with community leaders in the area. Vulcan has established good relationships with the various development associations in the area and with contractors who will provide services to the seismic operation. As in previous projects in the area Vulcan will utilize local services to the maximum degree possible.

3.4 Geographical Location

The project is located in the Bay St. George area. A topo map with regional inset shows the location of the proposed seismic lines in Figure 1. A Google Earth file which allows “zoom in” for more detail can be provided on request. Alternatively, “shape files” can be provided that allow the line locations to be imported into a Geographical Information System. The locations of the lines have been chosen with regard to maximizing geologic understanding of the area, while minimizing environmental impact. Wherever possible the lines follow hard ground and avoid bogs. In some areas crossing bogs was unavoidable and it is possible that these areas will not be accessible and may result in gaps in the seismic lines.

Figure 2 shows the line locations in relation to communities and buildings throughout the area. Seismic lines will cross into Heatherton and Robinsons, and will come close to houses on roads leading into Robinsons and Jeffries. These lines are expected to have essentially zero impact on these communities as the shot holes will not come within 180 metres of any building – in accordance with the provisions of the NL Exploration Survey Regulations (Draft June 25, 1997).

3.5 Physical Features of the Project

The project involves hand cutting narrow cut-lines (2.75 m width) throughout the project area as shown in Figure 1. Once the lines are cut low impact *enviro drills* will be used to drill 10 m deep shot-holes every 100 m along the lines (Figure 3). The shot-holes are about 9 cm in diameter. These drills have been designed specifically for the seismic industry. They are relatively light weight (as large drills are not needed for seismic shot holes) and run on wide tracks to minimize pressure on vegetation.

The Bay St. George area also includes many woods roads which will be incorporated into the project (as highlighted in yellow in Figure 1), as this is an area in which forestry harvesting has been carried out historically and currently by Corner Brook Pulp and Paper. The area was approved for oil and gas exploration through environmental screening processes in 1996 and 2003, prior to lands being offered in a competitive bidding process by the Department of Natural Resources. The Exploration Permits issued to Vulcan via this bidding process are shown in Figure 1.

3.6 Construction (Not Applicable)

3.7 Operations

Seismic lines have previously been acquired in the Bay St. George area before on existing roads / trails as well as off-road on cut-lines. The impacts of seismic exploration are well understood from similar operations in other jurisdictions (particularly Alberta in the Canadian context) as well as previous work in western Newfoundland, and mitigative measures are well established. The line cutting is anticipated to take approximately 6 weeks as it will be carried out by hand with chainsaws (12 – 16 persons) to minimize disturbance to soil and vegetation. Drilling will be carried out using 3 to 4 *enviro drills* and is expected to take about one month. Drilling operations may partially overlap with line cutting operations.

Shot-holes will be drilled to a depth of 10 metres and loaded with 2 kg of dynamite. Once the hole is drilled, the charge is loaded with an attached anchoring device (Figure 4), backfilled with a combination of drill cuttings and clay, and the detonator leads buried. Once the charge is placed in the bottom of the hole, the electric detonator is tested using a blasting galvanometer. Once detonator continuity is confirmed, the hole is back-filled using drill cuttings, clay, crushed stone or a combination thereof. Approximately four feet from the surface, a hole-plug is inserted into the hole. This plug acts as a tertiary anchor by helping in holding down the charge and containing the energy when the charge is detonated. The balance of the hole is then filled with additional drill cuttings or stone. Finally, the detonator leads are tied to the station marker and excess wire is buried to conceal the location of the charge. Vulcan will employ security personnel as needed to prevent tampering with shot-holes and to ensure public safety. The seismic contractor personnel will also meet with local community leaders and inform them of the seismic operations and the fact that explosives will be used. Signage will be placed at the entry points to seismic cut-lines indicating a seismic operation and the use of explosives. When a charge is about to be detonated the shooter will do a visual check in both directions to ensure that no one is approaching the shot-hole.

After lines have been cut and shot-holes drilled the recording crew will arrive. In a previous off-road seismic program it was found that travel by ATVs along the seismic lines was not feasible because of the roughness (very hummocky) of the lines. Therefore the recording equipment will be placed at appropriate locations along the cut-lines by helicopter (Figure 5) and “geophones” (microphones to pick up seismic signals) will be deployed by workers (“juggies”) who are also delivered to nearby landing areas (barrens) by helicopter. The buried charges will be detonated one at a time as the recording spread (about 5 km of geophones placed in clusters) is moved by hand and helicopter along the individual lines. Recording is expected to take about one month (weather permitting). Conditions that impact the pace of recording will be fog (helicopter can’t fly), rain (noise degrades data) and high winds (restricts helicopter activity and introduces noise from the movement of trees – aka “root noise”). All field operations occur during daylight hours.

3.8 Environmental Protection Measures

At all phases of the seismic program steps will be taken to mitigate environmental effects. Cut-lines will be “doglegged” at intersections with roads and trails to mask linear sight lines. Corduroy and cross-ditching will be applied where there is a risk of erosion. No fording of streams or rivers will occur except where properly reviewed and permitted by the Department of Fisheries and Oceans (DFO) and the Water Resources Division (WRD) of the NL Department of the Environment. Where small brooks are to be crossed by equipment, temporary bridges made of logs will be built and removed at the end of the program. At the end of the program all materials used in the program will be retrieved (pin flags etc) and brush will be placed across cut-lines at strategic locations to block access.

No significant waste material is anticipated to be produced by this project. Packaging from any consumables will be stored and disposed of at an approved disposal site in

accordance with relevant regulations. No temporary camps will be established as workers will be either from the local area or housed in local hotels.

Any development within 15 metres of a body of water (including streams, ponds, wetlands and the ocean) requires approval under Section 48 of the Water Resources Act. The seismic operation will comply with all terms and conditions of permits issued under this legislation. Fisheries and Oceans Canada also requires that the proponent complete a “*Request for Review under the Fish Habitat Protection Provisions of the Fisheries Act.*” Vulcan will apply for required permits under both Federal and Provincial legislation to receive appropriate permits and will comply with all terms and conditions there under.

There are a number of scheduled salmon rivers in the project area (Figure 6). Vulcan will comply with all WRD and DFO procedures in working near these rivers. No shot holes will be drilled within 33.7 metres of the rivers (as per DFO guidelines – Appendix A), and steps will be taken to minimize disturbance to vegetation. As noted above no fording will occur unless previously permitted by WRD and DFO.

During the program it is necessary to refuel the various vehicles being used in the project. Pickups are refueled at a local gas station and drills, ATVs and the helicopter are refueled from fuel trucks at “staging points” (usually where cut-lines intersect existing roads). These refueling points will be located on flat ground well clear of rivers, ponds and wetlands.

Vulcan is committed to ensuring that all contractors selected to carry out operations are highly experienced, as well as safety and environmentally conscious and responsible.

3.9 Resource Conflicts

No significant resource conflicts are anticipated. Figure 2 shows the locations of seismic lines in relation to communities in the area and buildings. All seismic drill holes will be set back at least 180 metres from any buildings, in accordance with the NL Exploration Survey Regulations. Permission for access will be obtained from all private land holders where seismic lines are proposed to cross onto their property.

Corner Brook Pulp and Paper (CBPP) holds timber rights in the area. Where timber is cut on CBPP licences Vulcan is required to compensate for the value of the timber. The seismic program has already been reviewed and approved by Corner Brook Pulp and Paper. Additionally, a cutting permit has been issued in accordance with the *Forest Fire Regulations under the Forestry Act*. A standard practice in seismic line cutting is to avoid cutting down larger trees. In this regard the seismic cut-lines will “weave” around larger trees to minimize impact. Trees cut along the lines will be trimmed and stacked at regular intervals for possible salvage.

Where portions of seismic lines cross agricultural properties the consent of owners will be required prior to entering these lands. Although no damage is anticipated it is possible that portions of fences may require temporary alteration to facilitate movement of drills. Any alteration to roadways, gates or fences will be rectified.

3.10 Wildlife

The NL Wildlife Division indicates that the program area contains habitats that are of interest from a botanical point of view. The proponent will meet with the Wildlife Division officials for advice on the specific areas of concern and steps needed to avoid harming any rare plants that may be present. The cutting crew will be advised of the particular environments of concern and educated on the particular plants to watch for, and thereby avoid disturbance of said plants. Occurrences of rare plants will be noted and reported to the Wildlife Division for future reference.

The Wildlife Division also advises that some of the lines fall within marten habitat and that clearing in these areas should be minimized. The proponent will ensure that cutting is kept to the very minimum in these areas and that extra remedial efforts are taken in regard to restricting access at the end of the program by restricting access points with brush.

There is also a concern that disturbance to river banks may have a negative impact on riparian systems. In this regard fording of rivers (if it occurs) will only take place at points and under conditions that have been previously approved by the Water Resources Division of the Department of the Environment and the federal Department of Fisheries and Oceans. When applying for permission to ford a river at a particular point the proponent must provide a physical description of the site including: channel width, type of flow, tides, water depth, substrate type and density, aquatic vegetation type and the presence of fish and other aquatic organisms. These factors are taken into account in the decision as to whether fording will be allowed. It is worth noting that the proposed project has much in common with activities that occur on a regular basis in forests throughout the Province. In this regard there are clear rules and procedures as to how these activities can proceed, which are rigorously applied to seismic and other projects.

3.11 Occupations

The project will proceed in 3 phases. The drilling and line cutting phases will likely overlap by 3 to 4 weeks.

<u>Employment</u>	<u>National Occupation Code</u>	<u>Estimated days</u>
Phase 1 – Line Cutting		
16 woodcutters	8616	42
1 supervisor	8222	42
3 surveyors	2154	10
Phase 2 – Drilling		
3 drillers	7372	30
3 drillers helpers	7612	30
1 drilling foreman	7219	30
1 licenced blaster	7372	30
1 security guard	6651	30

Phase 3 – Data Recording

28 “juggies” (to move geophones)	2212	28
4 truck drivers	7443	28
1 pilot	2271	28
1 seismic observer	2212	28
1 junior observer	2212	28
1 project supervisor	8222	28
1 licenced blaster	7372	28
1 security guard	6651	28

3.11 Project Related Documents

The seismic data acquisition industry is very well established in Alberta and as such there is a wealth of experience resident within the seismic companies established there. The Canadian Society of Geophysical Contractors (CAGC) has compiled a set of “best practices” which are based on a long history of western Canadian and international experience. The approved seismic bidders for this project are all based in Alberta and are members of the CAGC, and as such are well acquainted with the “best practices” which are summarized at this website.

<https://www.cagc.ca/index.html?DISPLAY=practices>

Although no additional related project documents form an essential part of this submission the information at the above website does provide some relevant background information on how the seismic industry operates. Vulcan will require the successful bidder to comply with applicable provisions said best practices which are broadly followed within the Canadian geophysical industry.

4.0 Approval of Undertaking

The main permits, approvals, licences required for this project are:

- Any required fording permits from Federal DFO and Provincial WRD
- A cutting permit from the Forestry Division of NL Dept. of Natural Resources
- A cutting permit from Corner Brook Pulp and Paper for any lines cut on their areas of timber rights
- A “Variance” under Section 441(1) of the Occupational Health and Safety Regulations
- An Exploration Licence under the NL Petroleum Regulations
- Approval by Minister of Environment under the Environmental Protection Act.

5.0 Schedule

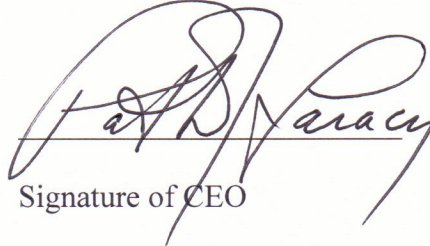
The project is to commence as soon as possible. If approval is received 45 days from the date of registration, the project would start in late July and take approximately 12 weeks to complete.

6.0 Funding

The project will be funded by the proponent (Vulcan Minerals Inc.) with its partner Investcan Energy Corporation (50%). Estimated cost is \$2.25 million.

June 14 / 10.

Date

A handwritten signature in black ink, appearing to read "Patrick J. Laracy", written over a horizontal line.

Signature of CEO

Patrick J. Laracy

Appendix A

Setback distances for confined explosives in relation to fish habitat. Source: DFO website: http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/water-eau/explosives-explosifs/pdf/explos_e.pdf

Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Table 2. Setback distance (m) from centre of detonation of a confined explosive to spawning habitat to achieve $13 \text{ mm} \cdot \text{sec}^{-1}$ guideline criteria for all types of substrate.

	Weight of Explosive Charge (kg)							
	0.5	1	5	10	25	50	100	
Setback distance (m)	10.7	15.1	33.7	47.8	75.5	106.7	150.9	

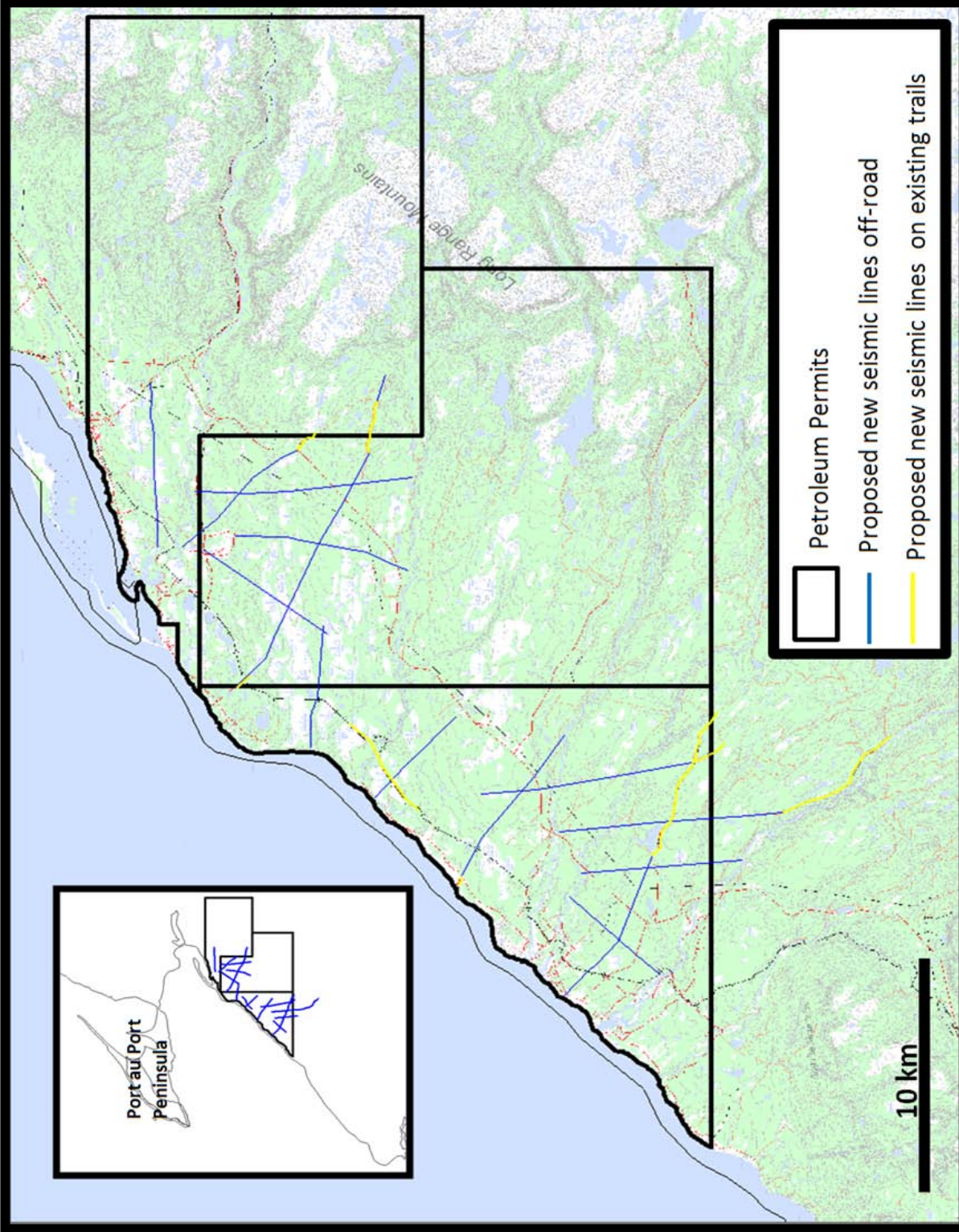


Figure 1

Proposed seismic program on topo map. Inset for regional reference.

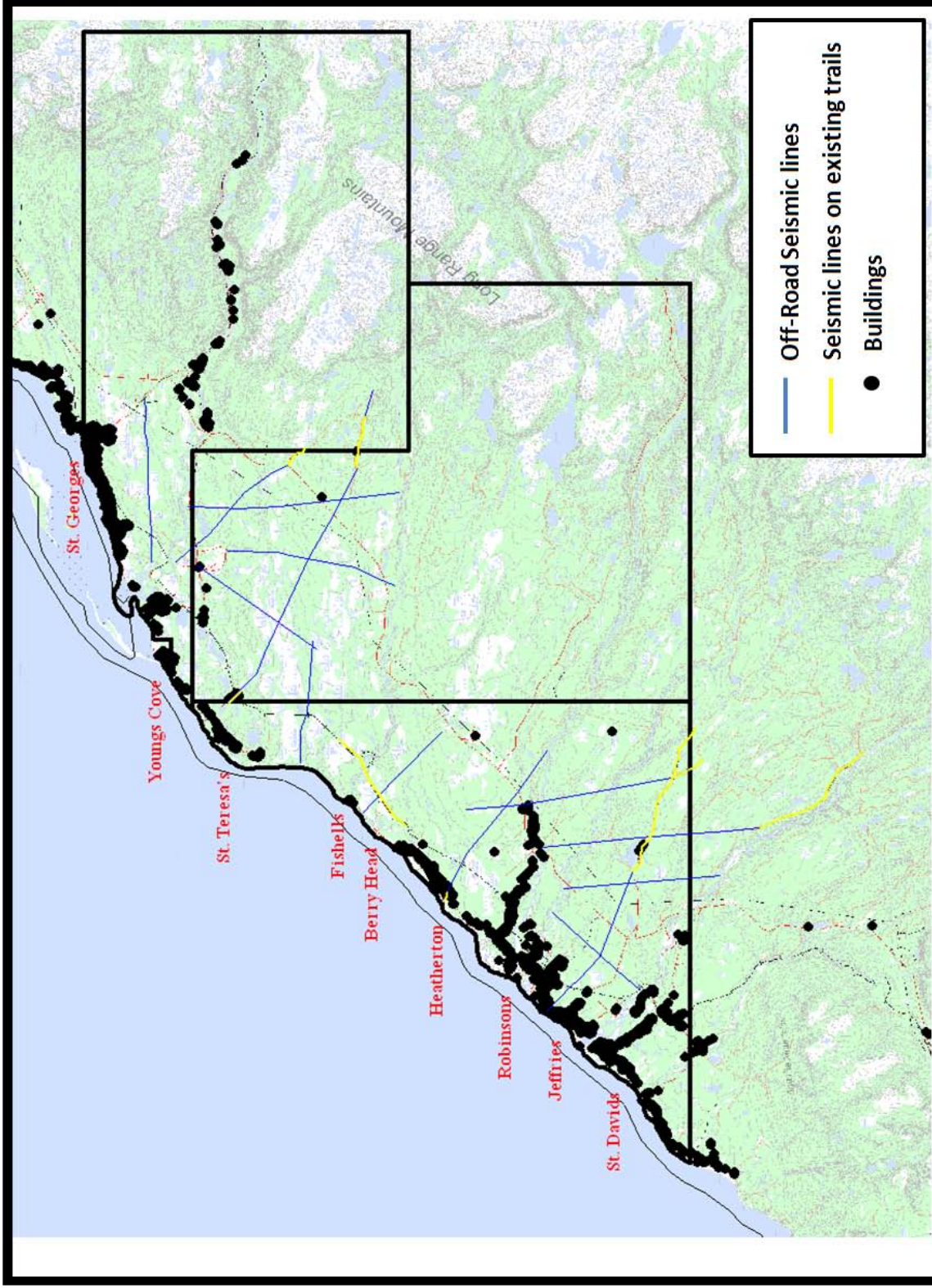


Figure 2

Topo map showing location of buildings and communities with respect to proposed seismic lines.



Figure 3
Low impact seismic drill.

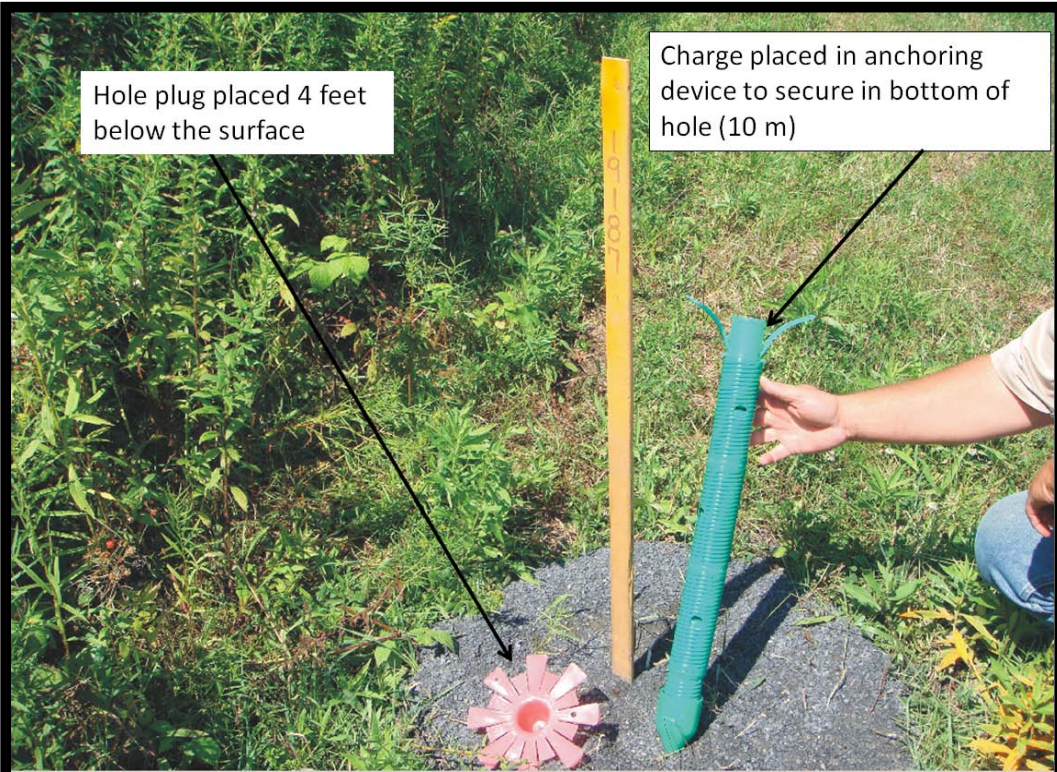


Figure 4
Seismic Shot Hole with safety devices to secure the charge in the ground.



Figure 5
Helicopter being used to move geophones.

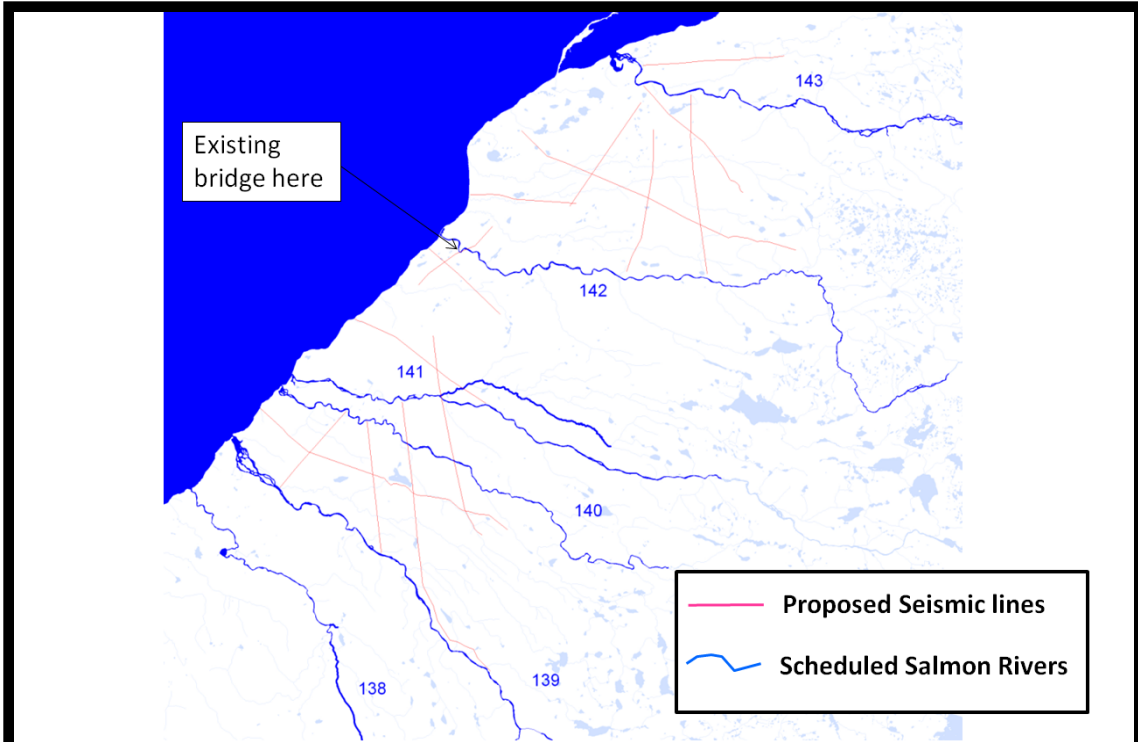


Figure 6
Seismic lines in relation to scheduled salmon rivers. Source for salmon river map is DFO website:
http://www.nfl.dfo-mpo.gc.ca/folios/00090/docs/anglersguide_guidedepêcheur_map_carte-eng.pdf