the PEMBINA institute

Seismic Exploration

Environment & Energy in the North

A PRIMER

About the Pembina Institute

The Pembina Institute is an independent non-profit research, education and advocacy organization. It promotes environmental, social and economic sustainability through the development of practical solutions for businesses, governments, individuals and communities. The Pembina Institute provides policy research leadership on climate change, energy policy, green economics, renewable energy, and environmental governance, as well as extensive formal and public education programs. More information about the **Pembina Institute** is available at **www.pembina.org** or by contacting

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Contents

About the Primers

The Pembina Institute's Energy Watch program has developed a series of eight primers to help northern communities understand the potential environmental and, where applicable, human health impacts of oil and gas development. The primers also aim to help these communities effectively take part in managing these risks, ensuring that governments and oil and gas developers are using the best environmental practices available.

Each of the first six primers focuses on a different phase of oil and gas development.

There are four parts to each of these primers:

1. A basic description of the activities of that phase
2. The potential environmental and human health risks of that phase
3. The best practices available to reduce those risks
4. Opportunities for citizens to get involved in deciding how developers carry out the activity.

The following are the six phases of oil and gas development addressed by the primers:

Seismic Exploration — industry activities to create a picture or map of the geology below the Earth's surface to find oil and gas reserves.

Land Disposition — the actions companies need to take to get the rights to explore for and produce oil and gas reserves.

Exploration and Production Drilling — the activities companies perform to first locate oil and gas, then to find out the size and usability of an oil and gas reservoir, and finally to reach the oil and gas using intensive production drilling.

Well Site Operation — industry practices to remove oil and gas from underground reservoirs and transport them to the surface.

Oil and Gas Processing — actions companies take to process oil and gas to prepare it for sale.

Pipeline Construction and Operation — industry activity to set up pipelines that carry oil and gas from the place it comes out of the ground to the places where consumers will use it.

The last two primers focus specifically on citizens' rights around oil and gas development projects:

Citizens' Rights and Oil and Gas Development: Northwest Territories explains the rights that citizens have related to oil and gas development in the Northwest Territories.

Citizens' Rights and Oil and Gas Development: Yukon Territory explains the rights that citizens have related to oil and gas development in the Yukon Territory.

To produce these primers, the authors reviewed the limited oil and gas development already under way in Canada's North. They also researched the current issues and practices in Alberta, northeast British Columbia, and the Alaskan North Slope, where intensive oil and gas development is already occurring.

Introduction

Just as they were about twenty years ago, companies are once again actively exploring for oil and gas reserves in the frontier regions of the Northwest Territories and the Yukon Territory. If developers decide to develop these resources, they will have to build a large capacity (or large diameter) pipeline to export the oil and gas from the far North to other regions. Once developers make a final decision to build one or more pipelines, and once regulators approve the plans, oil and gas exploration and production activity in the North will quickly increase.

Developing the oil and gas resources of the North would offer the people living there many opportunities for economic development. But it is important that companies developing oil and gas reserves, and governments and other regulators overseeing the work, make sure they do not damage the cold, slow-growing and sensitive northern ecosystems. While there will be unavoidable environmental impacts because of oil and gas exploration, developers and regulators can reduce impacts with careful planning and by using the best available technologies and practices.

Since it is the people of the North who will experience the most direct impacts, it is important that they play a strong role in setting the terms and conditions of such development. When deciding on the actions they will take, industry and various levels of government need to be respectful of and consider the needs and wishes of Northern communities.

During the past few decades, the oil and gas industry has become more aware of the environmental impacts associated with its work. Technologies and practices have become much less environmentally damaging than they were in the past. And most, though not all, companies have responded to social and environmental concerns. Despite these improvements, there are still negative environmental impacts associated with oil and gas development and production. This is especially true in areas where the activity is intensive.

When the public shares their questions, concerns and expectations about this work — directly to companies, through the media, and through regulators that inspect the work and enforce regulations — this helps to uphold and improve industry performance. When the public is able to take part in effectively influencing decisions around oil and gas exploration, this pushes companies to higher levels of performance. When the public gives their input they tend to examine all companies equally; their participation ensures that all developers follow the best practices possible.

When companies involve local people and their concerns for the long-term health of their communities and environment they can build positive relationships, increase certainty and decrease conflicts around the project, and lower their investment risk.

This primer, ***Seismic Exploration***, focuses on industry activities to create a picture or map of the rock formations below the Earth's surface so that companies can find places where there are likely to be large quantities of oil and gas and the role of governments in setting and enforcing the rules to which industry must abide.

There are four sections in this primer:

- Part 1 provides a general description of seismic exploration
- Part 2 outlines the potential environmental impacts associated with seismic exploration
- Part 3 describes technologies and best practices that companies can use to reduce environmental risks
- Part 4 offers information on citizen rights and opportunities to influence decisions on seismic proposals.

What is Seismic Exploration?

Seismic exploration is a method used by the oil and gas industry to gather information about underground rock formations. It involves creating shock waves (low-frequency sound waves) that pass through deep underground rock formations, and then interpreting the waves that are reflected back to the Earth's surface. This helps to determine which formations may contain large quantities of oil or gas.

SEISMIC

Seismic *means "caused by an earthquake or earth vibration."*

There are four basic steps to seismic exploration:

- *creating access to the area to be explored*
- *creating seismic lines*
- *creating and recording seismic waves*
- *collecting equipment and moving on*

Creating access to the area to be explored

Depending on the location of the area to be explored seismic crews may need to build access roads, and set up temporary camps and helicopter landing pads to bring equipment and personnel into the area to conduct the seismic program.

Creating seismic lines

First, the seismic crew must survey the lines along which they will create and record the shock waves. They begin by deciding where they want to conduct the tests. Then they clear away obstacles along that line to make room for their equipment and vehicles. Areas where they have to remove trees or shrubs are called "cutlines." The amount of space between the lines depends on how deep into the Earth the company is trying to locate reserves. Lines are generally closer together for shallow targets and further apart for deeper targets. Typically these lines are between 100 and 1000 metres apart.

The width of the lines depends on the surveying methods crews use to survey the lines and the size and type of equipment they use for drilling the shot holes. In treed areas of Alberta companies have used bulldozers to create lines six to eight metres wide. Most lines today are about five metres wide and follow a meandering course. In environmentally sensitive areas companies may be required to use "enviro-drills" mounted on specially designed all terrain vehicles that only require two-metre-wide lines.[1]

Creating and recording seismic waves

When the seismic crew is ready to start recording, they then lay out a line of sensitive

1 Schneider, Richard. 2002. Alternative futures: Alberta's boreal forest at the crossroads. Edmonton: Federation of Alberta Naturalists.

CUTLINES

Cutlines are clear paths created by removing trees or shrubs.

SOUND WAVES

Creating sound waves, whether by detonating explosives or using vibroseis, and then recording them is referred to as "shooting" the seismic lines.

receivers called geophones to record the sound waves.

On land a seismic wave is created in two ways:

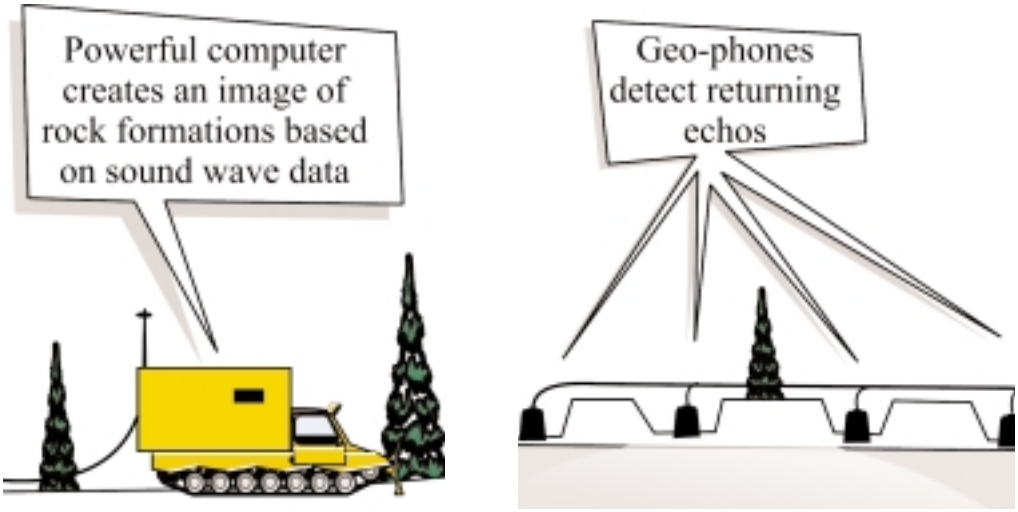
- Explosives are placed in holes that are drilled into the ground and then detonated
- A surface vibrator mounted on a truck vibrates heavy plates on the ground

When explosives are used, the team drills holes into the ground six to 20 metres deep until they find a layer of material beneath the surface that is hard and dense enough to carry the sound wave. Workers typically look for a layer of wet shale or mud, as it transmits seismic waves better than sand or silt. They drill the holes about 20 to 120 metres apart. Called "shot holes," the workers put the explosive charge at the bottom of these holes.

On flat terrain, workers may use truck-mounted surface vibrators instead of underground explosive charges. Creating seismic waves this way is called "vibroseis." In vibroseis, one to four large trucks lower and then vibrate a heavy plate on hard surfaces to create seismic waves.

Workers use drills to create holes. They put explosives into the holes to make seismic waves.

SOURCE: LORRNEL CONSULTANTS AND COMMAND EQUIPMENT CREDIT DAVE MUSSELL



SOURCE: PEMBINA INSTITUTE

CREDIT: DAVE MUSSELL

The seismic waves travel into the Earth, bounce off the subsurface formations, and then return to the surface. The geophones located along the seismic line detect the waves, record them as data, and send the data to a computer. The time it takes for the waves to go from the energy source — the detonated explosive or vibrating plate — down to the subsurface rock formations and then back up to the geophones on the surface indicates the depth and type of the rock formations.

A basic seismic program uses one "receiver line" of geophones that are connected together by a cable and produces a two-dimensional image of the subsurface. When a company decides that it wants more detailed subsurface maps of the area it will carry out more intensive three-dimensional (3D) seismic. This involves using multiple shot lines that are arranged perpendicular to multiple receiver lines of geophones to create a three-dimensional map of the subsurface.

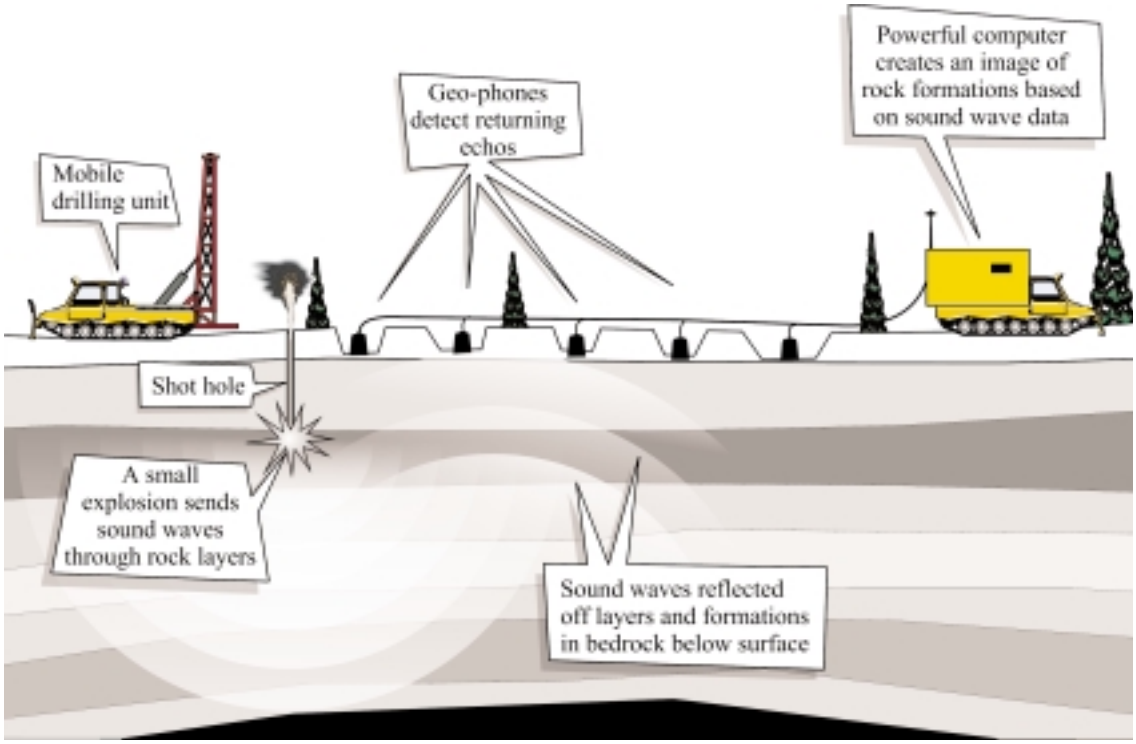
Collecting equipment and moving on

When shooting of the seismic line is complete, workers collect the geophones. Then they check the shot holes to ensure that the explosion did not cause water, mud or rocks to be blown out of the hole. For shot holes that did "blow out," the workers fill them in again. They then move on to the next seismic line.

When the seismic program is complete the seismic crew dismantles its camp facility and removes vehicles and equipment from the area.

REPEAT AREA

Over time, competing companies, or the same company using different methods or technology, may repeat seismic exploration in the same area several times.



Schematic of Seismic Exploration.

SOURCE: PEMBINA INSTITUTE

CREDIT: DAVE MUSSELL

Environmental Impacts

Canada's north is a diverse landscape. It contains seven distinct ecological areas:

Arctic Cordillera Ecozone	mountains, rock, ice and glaciers, few plants and animals
Northern Arctic Ecozone	barren plains, permafrost, some rock, seabirds and muskox
Southern Arctic Ecozone	shrubs, meadows, lakes, large mammals
Taiga Cordillera Ecozone	mountains, arctic shrubs and flowers, wetlands, valleys, waterfalls, canyons, rivers, wide range of mammals
Taiga Plains Ecozone	low-lying plains, large rivers, rich diversity of plants, birds and mammals
Taiga Shield Ecozone	coniferous forest, bedrock, lakes, wetlands, meeting of the boreal and arctic zones
Boreal Cordillera Ecozone	mountains and valleys separated by wide lowlands

Since each area in the North is unique, oil and gas development will impact each area differently. The nature and extent of environmental impacts will depend upon the regional ecosystem type, local terrain characteristics, the presence or absence of tree cover and permafrost, and the type of soil.

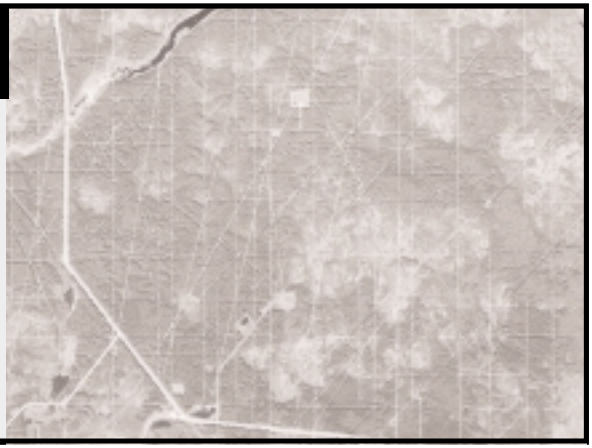
This section identifies potential environmental disturbances that may result from seismic exploration. Some impacts are common to all areas; others are particular to an area that may be sensitive in some way. For example, in tundra areas of the North that have few trees or are treeless, such as parts of the Mackenzie Delta, the concerns will be different than in heavily treed areas.

Disturbance of the Land Surface

Developing cutlines, access roads, camps, and airstrips or helicopter pads used to conduct seismic exploration disturbs the surface of the land. When workers create seismic lines, roads and other clearings this leaves breaks or separations in ecosystems. Vehicles used in seismic exploration can compact the soil or damage the vegetative mat. If crews disturb the soil or remove the vegetative cover, this can cause the permafrost to melt in the summer,

CUMULATIVE IMPACTS = FRAGMENTED FOREST

Over the life of a oil and gas producing area, the combination of repeated seismic surveys and land disturbances associated with drilling wells, operating well sites and constructing and operating pipelines can result in cumulative impacts.



Cumulative Impacts of Seismic.

SOURCE: ALBERTA SUSTAINABLE RESOURCES DEVELOPMENT

thus disrupting over the long term the structure of the soil and the plants that would normally grow there.

As different companies compete and collect seismic data for the same geographical area, this can lead to repeated disturbances. The same companies may also re-explore an area, sometimes with an increased density of seismic lines, to get more definitive information. This compounds environmental impacts and delays recovery of disturbed areas.

Aerial view of cutlines in Northern Yukon, 2001.

SOURCE: NIKI WILSON

Permafrost

In polar environments, the extent of surface disturbance depends on the type of soil and whether the soil is permafrost (a permanently frozen layer of soil underlying the "active layer" on top that melts and re-freezes each year). Permafrost soils are easily damaged. They are very sensitive to changes in temperature.

Human activities, including the operation of large equipment, can result in dramatic reshaping of the land through rutting of roads, "melt-outs" and subsidence (settling of the land). Disturbing, compressing or removing any surface material and vegetation can result in increased soil temperatures in summer months. This can seriously damage the permafrost.

Wildlife

Areas where there are a lot of cutlines and access roads are known to impact wildlife and wildlife movement. For example, although woodland caribou often cross cutlines to access adjoining habitat, they will generally avoid being within 250 metres of these lines.[2] Wolves will use cutlines to quickly access an area, thus increasing predation on certain animals. Cleared areas have created more habitat for moose. The presence of larger moose populations may decrease habitat available to other animals, attract predators to the area and thereby upset the ecological balance.[3] Seismic activity may generally affect the size of wildlife populations, the location of herds, and their traditional migratory paths.

Vegetation

In addition to wildlife, trees and other plants are affected by land disturbance caused by seismic exploration. When vegetation in arctic regions is damaged or removed it takes a long time to grow back. This is because the growing season is short and in these areas soils don't produce a lot of nutrients to sustain the plants. Compared to more southern parts of Canada, northern Canadian forests take more time to recover from surface disturbances like cutlines and shot holes.

ARCTIC CARIBOU

Surface disturbances can impact wildlife, especially at key stages in their life cycle.

SOURCE: CPAWS YUKON CHAPTER

Arctic caribou usually travel in large herds. Because there typically isn't any forest to protect them, they won't be impacted by the linear disturbances caused by seismic activity in a forest. But, without the forest as a barrier, they may be more sensitive to disturbances they can see and hear. As a result, arctic caribou may potentially show stress-related responses, including not resting, not paying attention to predators, not eating, losing weight, and having calves that are low in birth weight. Responses of caribou to seismic activity will likely depend on the duration, intensity and extent of the development.

To learn more about the impacts of oil and gas exploration on arctic caribou, see the companion publications entitled "Resources and Contacts".

2 Dyer, Simon. 1999. Movement and distribution of woodland caribou in response to industrial development in northeastern Alberta. Master of Sciene Thesis. Edmonton: University of Alberta. Also available online at http://www.deer.rr.ualberta.ca/caribou/SD_MSc.pdf .

3 Wyne, Bob. 2002. Boreal Caribou Research Program: Alberta's boreal caribou and oil and gas development. Paper presented at CPAWS Oil and Gas Workshop, May 26, in Edmonton, Alberta.

Damage to Soil and Water

Seismic exploration can cause damage to both soil and water quality, as outlined in detail below.

Fuels

Fuels and oils can leak from vehicles and fuel storage areas. Workers may accidentally spill fuels and oil when refuelling their equipment. Unless these spills are captured or cleaned up immediately, the present hydrocarbon compounds can leach into and contaminate both soil and water.

Soil Erosion

When vegetation is removed from the land, or when permafrost is damaged, this can lead to soil erosion. Soil that would have been held in place by trees and other vegetation is now steadily worn away from the surface by rain, snow and wind and deposited as sediment into lakes, rivers and streams.

Sedimentation

When crews remove vegetation from the land, or when their equipment damages permafrost, this can lead to soil erosion. Soil that would have been held in place by trees and other vegetation is now steadily worn away from the surface by rain, snow and wind and deposited as sediment into lakes, rivers and streams. This is called sedimentation.

Sedimentation can cause serious damage to surface water bodies. It can cover critical aquatic habitat for fish and insects. Nutrients in the sediment, such as phosphorous and nitrogen, can increase nutrient levels in the water. Sediment can also raise water levels and block the flow of water, leading to flooding and habitat damage.

Fish Kills

In onshore areas where there is a lot of surface water (such as lakes) crews sometimes drill shot holes directly into the bottom of the water body to a set depth below the lake bed.[4] This activity occurs in the winter when the surface of the lake is frozen. Fish may be killed or injured by shock waves if the charge is detonated too close to the bottom of the lake bed surface. If crews detonate shot hole explosive charges too close to the bank of a water body, the shock waves can also kill or injure fish. Shock waves travel easily through water and can damage the swim bladders of the fish. Vibrations from the detonation of explosives may also damage incubating eggs. To try to prevent fish kills due to seismic shock waves, the government regulates the distances companies must maintain between charges and fish habitat, and also the size of charges they can use.[5]

Groundwater Contamination

In non-permafrost areas the vibrations caused by the detonation of charges in shot holes can

4 In February 2003, the Department of Fisheries and Oceans issued a directive stating: "explosives should not be used to conduct seismic exploration in the areas of water bodies not frozen to the bottom in the NWT."

5 Wright, D.G. and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Canadian Technical Report of Fisheries and Aquatic Sciences 2107. Ottawa: Minister of Public Works and Government Services.

also damage nearby groundwater wells. If workers do not properly fill the shot holes, they can become a pathway for surface contaminants to make their way into the groundwater.

Water Crossings

Roads and cutlines that cross or come too close to the edges of water bodies can damage vegetation and soil on the banks of watercourses. Both permanent and temporary stream crossings can become barriers to fish, preventing them from travelling up- or downstream if not properly designed and maintained.

Snow or ice crossings that are not properly removed before spring could become impassable barriers to fish movement. In addition, bank and bed erosion can occur when the spring waters are forced to flow around the blocked watercourse.[6]

Pristine Riparian.

SOURCE: CPAWS YUKON CHAPTER

6 Cott, Pete and Peter Moore. 2002. Working near water: Considerations for fish and fish habitat. Appendix 3: Protocol for temporary winter access water crossings for oil and gas activities in the Northwest Territories. Inuvik, Northwest Territories: Department of Fisheries and Oceans.

To cross streams and creeks, companies often install concrete or steel drainage pipes, called "culverts," instead of bridges. Culverts can pose barriers to fish, preventing them from travelling upstream. On the downstream side, water flowing through the culvert may erode the streambed, causing depressions and making a small waterfall too large for fish to jump over. If the culvert is too narrow, the force of the water flowing through the culvert can be too strong for fish to move through while trying to travel upstream.

Other Environmental Impacts

Solid Waste

Seismic exploration also results in the generation of solid wastes. This includes survey stakes, wire, plastic, paper, containers, fuels and other vehicle-related wastes, as well as food and human waste that must be collected and disposed. Companies are normally not permitted to bury solid waste on-site, but burning waste may be allowed. Burning mixed solid waste at low temperatures can create emissions of air toxics. Improperly managed food and human waste can attract wildlife.

Disruption of Other Activities

Disruption of wildlife or increased access may impact individuals carrying out subsistence and commercial hunting and trapping. In treed areas such as southern parts of the Yukon and Northwest Territories, the clearing associated with seismic exploration may result in a loss of commercial timber.

Wildlife Disturbance

Ground and air traffic noise can greatly disturb wildlife. Sometimes it can cause them to leave an area completely, forcing them into areas of poorer habitat, or, in the case of large carnivores, forcing them into areas already inhabited by larger members of the same species.

Increased Access

Opening previously inaccessible areas often increases access for hunting, fishing and other recreational pastimes. This can increase pressure on wildlife and set back restoration efforts.

Using the Best Practices Available

Oil and gas exploration involves activities that will result in some environmental damage. Regulators and developers can minimize any disruption of the environment by using "best practices and technologies available — the most environmentally effective standards, practices and technologies that have been proven to minimize environmental damage.

Overall, best practices aim to ensure community sustainability. When companies use best practices they take a "triple bottom line" approach, considering the economic, environmental, and social impacts on the community of any action they take. In each of these areas, regulators and developers design best practices to minimize damage to the community's well-being and to increase its viability. This document focuses primarily on environmental best practices.

In oil and gas development there are three types of best practices:

- those that apply to the principles of how the work is planned and carried out
- those that refer to the practices and standards used in the field
- those that have to do with the equipment that is used.

With seismic exploration, most of the best practices refer to choices that industry should make before they start clearing lines and drilling shot holes. Compared to the past, companies plan more carefully, use smaller equipment, and use low-impact survey and clearing techniques. All of these practices, together with accessing areas only in winter, serve to reduce surface impacts of seismic exploration.

At this stage of oil and gas exploration, regulators can also use best practices to protect ecologically significant areas and to preserve the overall ecological health of an area over the long term.

SEISMIC DATA-SHARING REQUIREMENTS

When competing companies share seismic information they don't need to conduct the same exploration over and over. This reduces environmental impacts. Some sharing and re-selling of seismic data is already occurring between companies. However, there is still a lot of competition between companies that results in additional seismic impacts. A system that provided access to third-party companies who would collect seismic data for the purpose of selling it to multiple companies, or a system that encouraged or even required companies to share data could reduce surface impacts associated with seismic data collection.

ENVIRONMENTAL IMPACT ASSESSMENT

Companies should carry out environmental impact assessments (EIAs) to find out what the short- and long-term impacts will be of this and future seismic exploration projects. These assessments can help companies decide on ways to improve their projects and lessen environmental damage.

Companies can also use this information to set limits on the work they will do to keep environmental impacts to a minimum. Companies must consider the impacts that will result from their immediate project, as well as those of other projects that they or other companies may conduct in the same area over time.

It is important for governments to complete land-use planning before exploration starts and before they give oil and gas rights to any company. This planning will ensure that governments can exclude from oil and gas development any areas of ecological, cultural or historical significance.

Considering cumulative impacts of future developments when making current regulatory decisions, and carrying out proactive land use planning before oil and gas development is approved are examples of best practices that regulators can adopt.

Best practices that are used during seismic exploration are designed to:

- minimize linear disturbance and habitat fragmentation
- minimize soil compaction and erosion
- prevent damage to riparian areas
- avoid soil and water quality impacts
- minimize direct and indirect wildlife disturbance and mortality.

The particular suite of practices and measures adopted for a specific seismic project should reflect local circumstances. Not all of the best practices or measures listed below are appropriate in all cases.

Planning

Aerial photos of the area to be surveyed can help crews design the program in a way that minimizes environmental impacts and maximizes the use of existing cutlines, trails, roads, clearings and other areas that are free from trees and large scrub.

Before using large equipment to clear vegetation and create seismic lines, seismic crews can scout the area by helicopter and cut a line by hand to assess and mark the access route for ground equipment. This way the team can identify potential problem areas before work on the lines begins.

At daily meetings before beginning work, supervisors can remind workers that it is important not to damage the vegetative mat covering the ground surface, especially in permafrost areas. In permafrost areas, surface vegetation protects the land and keeps it

frozen. If this vegetation is damaged and the ground is exposed, the ground may begin to melt, thus upsetting the ecology of the area.

If workers accidentally damage the surface in permafrost areas, they should repair it immediately and cover exposed soil with branches or other vegetation if necessary. If the surface is disturbed in areas prone to surface drainage or erosion, workers should similarly move quickly to control the damage and minimize the impact. To reduce the possibility of damaging the surface, companies should clearly mark all access points before moving any equipment.

Whenever they can, workers should avoid placing shot holes near or underneath a water body to prevent the risk of killing or injuring fish.

Gathering Baseline Data

Gathering good baseline data is critical for companies to assess the extent of cumulative linear disturbance impacts on wildlife. As seismic exploration represents the first of a series of linear disturbance impacts that will occur in the cycle of oil and gas exploration and development, the seismic team should collect baseline information before extensive seismic work starts.

Winter Access Only

To minimize surface impacts, companies should consider conducting all seismic exploration in the winter months when the ground is fully frozen. On permafrost soils, on land with a high water table, and in other sensitive areas, companies should transport equipment, clear lines and drill only when the ground is frozen. They should stop all work before spring. If they use a fully heli-portable operation, companies can carry out low-impact activity such as data collection during the summer months. Companies should use off-road vehicles only during the winter months.

To protect sensitive soils, before they begin working crews should ensure that seasonal

Arctic landscape with old seismic line

SOURCE: NIKI WILSON

PINGOS

Pingos are round, ice-cored hills that are formed because of water and ice pressures in permafrost terrain. Typically found in the Mackenzie Delta, pingos are sensitive to surface disturbance. For this reason the Inuvialuit Land Administration has adopted a minimum setback restriction that prohibits operation of machinery, vehicles and equipment within 150 metres of these landforms.

Iceroad.

SOURCE: WAYNE SAWCHUK

frost is at least 30.5 centimetres (12 inches) deep, and snow cover must be at least 10 centimetres deep (in the Alaska North Slope the snow must be at least 15 centimetres (6 inches) deep).[7]

Low Ground Compaction Techniques

To avoid compaction impacts to soil and ground vegetation companies should use low-ground-pressure equipment. Examples include tracked or balloon-tire vehicles such as Nodwells, Chieftains, and Rolligons. Companies can use "mushroom shoes" on their snowplows to raise the blade high enough off the ground to avoid damage to permafrost or vegetation.[8]

Companies should use conventional "wheeled" vehicles and other high-ground-pressure vehicles only on well-compacted ice roads or on highways. They should remove them well before spring break-up.

Low-Impact Survey Techniques

When mapping positions for shot holes and geophones, workers traditionally survey an area using conventional line-of-sight techniques. This technique requires crews to remove a lot of vegetation to create long straight lines of sight along which they can see for a distance.

As an alternative, companies can use survey techniques that have less impact, such as those that use a Global Positioning System (GPS). A worker holding a portable GPS unit can download specific geographic coordinates from newer Earth-orbiting satellites to within about two metres.

8 This practice may not be practical in areas where there is large woody debris and tree stumps, as the mushroom shoes can be easily damaged or torn away.

CAMPS

When conducting seismic exploration, crews often set up camps near to where they work during the project. Camps typically consist of numerous buildings that are taken into an area on skids. These camps can create negative environmental impacts, including damage to the land surface.

Environmental damage from camps can be minimized. Putting ice pads underneath the camp units in permafrost areas can prevent thawing of the vegetation mat. Companies can put each camp unit onto separate skids so that smaller equipment can be used to move the camp. This will reduce high ground pressure damage caused by large equipment.[9]

Crews using this technology can walk around sensitive areas and large trees to mark geographically labelled locations for shot holes and receiver lines, thereby reducing the impact of cutlines and avoiding the need for cutting on receiver lines.

Companies can also use GPS technology to survey lines and shot hole drill sites from the air using helicopters. This reduces the need for cutlines and minimizes disturbance of the land surface. Helicopters can also be used for moving equipment and workers, decreasing the need for access roads and large cleared areas in which to set up camps and store equipment during the seismic work.

A seismic hole that 's been drilled by a heliseismic drill.

SOURCE: NIKI WILSON CREDIT: GEOFF SKINNER

Low-Impact Clearing Techniques

Using smaller seismic exploration equipment means that cutlines don't have to be as wide as when larger equipment is used. Cutlines that are two metres wide are wide enough for the smallest low-impact drilling equipment. Most cutlines today are less than five metres wide.

9 Jorgenson, Janet and Philip Martin. 1997. Effects of winter seismic exploration on tundra vegetation and soils. In NPR-A symposium proceedings. Anchorage: US Fish and Wildlife Service.

A small mulcher can be used to create meandering source lines less than 2 metres wide.

SOURCE: LORRNEL CONSULTANTS AND COMMAND EQUIPMENT

Small seismic shot hole drills can operate on narrow source lines.

SOURCE: LORRNEL CONSULTANTS AND COMMAND EQUIPMENT

Crews once used large bulldozers to clear wide cut lines. Pushing trees over rips out their roots and exposes the soil; this can lead to the melting of permafrost soils. Workers can avoid this by using hand tools or tree mulchers that grind the above-ground part of the tree into chips and deposit the chips on the ground.[10]

Using heli-portable drills also reduces the need to clear vegetation. Using helicopters, crews then do not need to build vehicle access routes. Ground crews only need to clear helicopter landing sites for safety purposes, the drill site itself and a narrow path so that workers can get access to the drill site.

Low-impact drills (also called "enviro-drills") mounted on specially designed all-terrain vehicles minimize impacts in sensitive terrain. They can be used on cut lines as narrow as two metres wide.[11]

HELICOPTERS

Although using helicopters minimizes surface impacts, it may increase disruption of wildlife. Helicopters should not be used during crucial periods in the life cycles of wildlife, such as mating and migration. As well, in the far North companies cannot use helicopters during the darkest months of the year for safety reasons.

In open areas, using vibroseis mechanical equipment instead of explosive charges completely eliminates the need to drill holes. However, conventional vibroseis equipment requires wide access lines and therefore may not be best for vegetated areas.

In sensitive areas, including steep terrain, densely treed areas, and areas within 30 metres

12 Oil and Natural Gas Industry Foundation Paper. 1998. Background information on the ability of the industry to contribute to greenhouse gas emission reductions. Paper prepared for the National Climate Change Secretariat.

A hand-cut, low-impact seismic line, two metres wide.

SOURCE: LORRNEL CONSULTANTS AND COMMAND EQUIPMENT

A mechanically cut, high-impact seismic line, six metres wide.

SOURCE: LORRNEL CONSULTANTS AND COMMAND EQUIPMENT

of any stream or water-body crossing, seismic crews should clear land by hand only. Hand clearing following a path of least resistance that avoids trees and sensitive vegetation can reduce the width of the cutline to about 1.5 metres.[12]

When clearing land for seismic activity, especially in upland areas, companies can minimize negative impacts on surface water bodies by ensuring that

- Seismic lines are more than 30 metres away from any water body. This will reduce the possibility of soil erosion and sedimentation.
- Seismic cutlines are more than 30 metres away from the edge of steep terrain.

Of course, in areas such as the Mackenzie River Delta, where most activity occurs below the high water mark, these types of measures do not apply.

Cutting branches off trees and shrubs — called "limbing" — instead of removing the vegetation completely, can also reduce surface impacts.

When working in naturally cleared or previously cleared areas, companies should use low-impact techniques that are suitable for uncleared areas to make sure these areas do not become further degraded and to increase the chances that the area can be regenerated.

Whenever possible, frozen water bodies should be used for locating camps and helicopter landing areas. This reduces the need for more clearing.

12 Oil and Natural Gas Industry Foundation Paper. 1998. Background information on the ability of the industry to contribute to greenhouse gas emission reductions. Paper prepared for the National Climate Change Secretariat.

Cutting trees is preferable to pushing trees over as it prevents soil exposure which can lead to permafrost thaws and or erosion.

Unintended surface disturbance can significantly damage the permafrost. When working in these senstive areas, seismic crews should immediately repair any damage to the land surface.

Low-Impact Water Crossings

Crossings of water bodies should be avoided if possible to avoid damage to important water edge habitat and the sensitive soil and vegetation on the banks of water bodies. To reduce damage caused by crossing water bodies, crews should pre-select those that have very shallow banks and that they can approach at a straight 90-degree angle to the stream.

Ideally, work should take place only while surface water is frozen and crews should use clean ice or snow to construct the crossing. Snow making equipment can be used to create snow that is completely free of soil or debris. Workers should not compact snow cover or remove snow from fish-bearing water bodies except at ice-road crossings.

Workers should look at drain channels to make sure there is no debris blocking them. The team should return any surface drainage to its original condition and fully open up or at least "V-notch" — cut a V-shaped opening in the middle of the water channel — all snow fills to avoid ice damming during spring break-up.

Riparian areas are the green zones along streams and rivers and around lakes, streams and bogs. They act as natural filters to keep water clean. They regulate water levels, making it available for drinking and also preventing flooding. Riparian areas provide important habitat for wildlife. Seismic crews should always try to decrease the width of cutlines at stream crossings to preserve riparian habitat.

Crews should not change the banks of a waterway, except at approved water crossings. When crossing water bodies, approaches should be close to straight-on or perpendicular to the stream to reduce damage to the bank. If snow ramps or bridges are built to protect the bank, they should not contain any oil or debris and should be removed immediately after use or before spring.

In non-permafrost areas where people rely on groundwater for drinking water, workers should collect baseline groundwater quality data before they start any seismic exploration.[13] This can help to resolve concerns about water quality that arise after oil and gas development starts in an area. Collecting data may include drilling test wells as well as testing existing water wells (for both quality and quantity) and surface water near the proposed work site.

13 Groundwater use for domestic purposes is rare in the North at the present time.

Maintenance and Follow Up

Proper Fuel Management

In upland areas crews must keep fuels and other materials a safe distance away from water bodies and above high water zones:

- Fuel and other materials should be stored on stable ground more than 100 metres above the normal high-water mark of any water body. Workers should not refuel equipment within the active floodplain of any water body. Of course, in areas such as the Mackenzie River Delta, where most activity occurs below the high water mark, these types of measures do not apply.
- Companies can use double-walled tanks to store fuels in order to provide secondary containment in the case of a leak.
- At fixed camps, workers should construct "berms" of mounded soil or clay or low walls of concrete or other materials that surround fuel-supply sites to contain fuel to the area around the base of the tank in the case of a serious leak or spill.

Site Supervisor at Western Geco's Eagle Plains Seismic Operation 2001.

SOURCE: NIKI WILSON

Crews should use oil drip pans on major equipment such as generators, trucks and other vehicles to avoid impacts associated with ongoing small leaks and spills. Workers can also limit soil impacts by refuelling and servicing equipment in dedicated areas that are equipped with spill capture and containment devices.

Companies should develop fuel spill contingency plans for fuel storage and refuelling sites. To minimize environmental impacts and hazards to workers, all crews should be aware of what to do in the event of a spill.

Inspection and Repair of Shot Holes

It is important for workers to visually inspect shot holes after the charge is detonated to make sure that water, mud or rocks and cuttings from a shot hole stay in the hole and to repair any damaged holes. Any surface soil or organic material that was moved during

drilling should be returned to its original location.

Drill cuttings are rock fragments that come out of a hole when it is drilled. Workers should ensure that all drill cuttings are returned to the shot holes and that these holes are completely filled in. Shot holes can also be packed with bentonite clay or concrete.[14] Completely filling the holes prevents pathways from forming for surface water to flow into the holes and from there into groundwater, thus contaminating it. It also stops groundwater in one area from flowing into another area.

Grizzly Bear.

SOURCE: CPAWS YUKON CHAPTER

If a drilled shot hole does release water to the surface (commonly called a "flowing hole"), drilling should stop. Workers should plug the hole to keep the water where it was originally.[15]

Restoration Work

Seismic teams can minimize negative environmental impacts by making sure that all solid waste is collected, treated if necessary, and removed from the area. Domestic wastewater and sewage should also be treated and the solid fraction transported out of the area.

As waste is created, it should be cleaned up and removed as quickly as possible to limit the possibility that it will be later overlooked and left behind. Typical waste created by seismic work includes packaging, wires, cables, geophones, batteries, lineboxes, survey ribbon, and flagging.

Clearing cut-lines can result in windrows — long, narrow rows of vegetation, debris, and

14 The Alberta Environmental Protection and Enhancement Act's current Exploration Regulation states in Section 38(1) and (2) that shot holes must be abandoned to prevent flow of surface water to an aquifer and to prevent movement of water from one formation to another. However, current guidelines only require that a plastic plug be installed in the top portion of the hole and that it then be covered with drill cuttings.

15 Alberta Environmental Protection Exploration Regulation. 1998. Section 37. Available online at http://www.qp.gov.ab.ca/Documents/REGS/1998_214.CFM (accessed June 23, 2003).

soil. Windrows can create barriers to wildlife movement and fire hazards. Where there is not a need for use of felled trees as fuel, crews can avoid creating windrows replacing cut material on the lines after the seismic operation is complete. Replacing cut material, commonly called "re-blocking," reduces unintended access to the area and reduces potential for erosion. In permafrost areas replaced cut material provides shade and insulation for the soil.

NO-BLAME INCIDENT REPORTING POLICIES

Companies should consider creating a "no-blame" policy to encourage workers to report incidents and to prevent the cover-up of impacts and accidents. Under this system it is important to follow up on incidents by educating employees on how to avoid or minimize impacts. Daily safety and environment meetings serve to reinforce proper procedures as well as alert employees to particular hazards, provide information on wildlife spotted in the area, and offer guidance on ways to avoid environmentally sensitive areas. Employee performance recognition, awards and other forms of positive reinforcement for good behaviour are also important.

Revegetation — replacing plant material that was removed with new seeds or seedlings — can help the area return more quickly to a natural state. Workers should plant only those seeds and seedlings that are native to the specific area. It is often better to leave the cutline as is than to plant non-native grass or seed mixes. Non-native species often take over, squeezing out native species and spreading into previously undisturbed areas.

Selectively planting trees to limit access points to explored areas — a practice called "plugging" — helps control unauthorized access by hunters and recreational users.

Companies can follow these practices to ensure reclamation and restoration success:

- Promote natural degradation by ensuring all trees that are cut are laying flat on the ground.
- Promote revegetation by preventing erosion, replacing materials that have been cut to form the seismic line, and reseeding using regionally specific native seed mixes.
- Check areas over time to ensure that restoration efforts have been successful and to decide if more work is needed.

Minimal Disruption of Wildlife

Disruption of wildlife is another environmental impact that can be minimized. Timing seismic activity to avoid disturbing wildlife during crucial periods in their life cycles — such as mating and migration — can minimize wildlife disruption. Minimizing activity in the spring and summer in general will help to avoid wildlife disruption, as well as potential damage to surface soils and aquatic environments.

The seismic team can avoid or minimize wildlife disturbance by following effective corporate policies, such as the following:

- Provide wildlife awareness, wildlife avoidance, and garbage control education to all contractors and employees before beginning work.
- Institute a "no harassment, feeding, hunting, trapping or fishing" policy for all workers.
- Where fitting, ban firearms for all workers.
- Limit the use of all-terrain vehicles for personal or recreational purposes.
- Watch and limit access to trails, roads, and cutlines created by the project.

On-Site Environmental and Wildlife Monitors

Qualified personnel should be on site to supervise seismic work in environmentally sensitive areas. The qualifications workers need will depend on the area and may include local knowledge, extensive experience and/or training in conservation, biology, botany, soil science, hydrology and other areas.

Companies should hire local environmental and wildlife monitors to oversee and carry out environmental mitigation measures, track wildlife migration patterns, and assess potential wildlife conflicts in the project area. This representative should also take part in the public consultation and the early planning of the operation. Planning can allow companies to route the project around known nesting and den areas, which they can later check during field operations.

Before starting seismic work, the environmental and wildlife monitors could find out, by viewing overhead using a helicopter, the relative densities of caribou and their distribution in the area. They could then postpone the project if large numbers of caribou are staying in a portion of the project area. Monitors should be in place before the seismic work begins. They can stop active ground operations if they or the seismic crew meet wildlife taking refuge in the area where work is occurring (e.g., moose grouping near a food source in response to cold weather).

Area of Concern	Best Practice
PLANNING	
Multiple companies entering the same area to collect data	• Share seismic data to avoid multiple entries into the same sensitive area to collect the same data.
Cumulative land disturbance impacts	• Reuse existing seismic lines and other disturbances. • Use low-impact techniques on previously disturbed lines.
Inadequate cumulative analysis	• Carry out environmental impact assessments and use the information to design mitigation measures. • Set aside protected areas before granting sub-surface rights to oil and gas.
Year-round access	• Conduct seismic work on frozen, snow-packed ground. Don't explore during spring. Ensure there is no off-road traffic outside of winter months. Use only low-impact activities in summer months, with heli-portable operation. Keep seismic activity as short as possible to minimize overall impact.
Travel over frozen ground	• Protect sensitive soils by ensuring that vehicle movement occurs on frozen ground on well-packed snow. • Use low-ground-pressure vehicles.
Damage to sensitive ecosystems	• Avoid pingos, sensitive eskers, and water bodies. • Take aerial photos of the area so crews can design the program in a manner that minimizes environmental impacts and maximizes the use of existing cutlines, trails, roads, clearings and other areas that are free from trees and large scrub. • Scout lines by helicopter. • Cut lines by hand to assess and mark the route before moving in large equipment to clear vegetation and create seismic lines.

Area of Concern	Best Practice
GROUND COMPACTION	
Equipment damage to vegetation	• Equip blades on snowplows with mushroom shoes or runners to lift blades, thus avoiding damage to vegetation and permafrost.
Damage to vegetative mat	• Cut trees rather than pushing them over to prevent soil exposure, erosion and/or permafrost thaws. • Educate workers on the importance of avoiding and repairing damage to the vegetative mat.
Large equipment (>D5) used to skid camp trains of equipment into an area	• Use smaller cats (D3–D4) and haul individual camp units instead of one large multiple unit train.
Large clearings created for camps	• Maximize the use of existing cut areas, burn areas, trails and cutlines for camps and turnarounds. • Use low-impact techniques in previously disturbed areas to minimize further degradation.
CLEARING OF TREES	
Use of line-of-sight survey	• Maximize use of GPS survey techniques instead of long line-of-sight survey techniques. • Use heli-portable survey techniques.
Wide cutlines, six to eight metres wide, using large equipment to push down trees	• Create narrow cutlines, one-and-a-half to two metres wide. Maximum width of lines should five metres. • Cut branches off trees rather than removing trees. This is called "limbing." • Cut trees by hand or use tree mulchers that grind the aboveground part of the tree into chips and deposit the chips on the ground.

Area of Concern	Best Practice
CLEARING OF TREES	
Bush and trees cleared for airstrips	• Use frozen bodies of water for airstrips. Avoid clearing bush.
Use of large drilling units for seismic shots	• Use small drilling units mounted on low-ground-pressure ATVs or tracked vehicles. • Use heli-portable drilling units. • Use vibroseis equipment where clearing is not needed and in other open areas. Avoid use of vibroseis equipment in treed areas because of the large rights-of-way needed.
Creation of windrows	• Avoid creating windrows to minimize impact on wildlife movement and fire hazards.
WATER CROSSINGS	
Improperly built water crossings	• Build water crossings at right angles to streams. Remove or V-notch snow and ice when finished to avoid ice damming in spring. • Use snow-making equipment to create snow that is completely free of debris and soil. • Narrow stream crossings to minimize damage to riparian areas.
Surface water impacts	• Keep at least a 30-metre buffer between all seismic lines and water bodies. • Keep at least a 30-metre buffer between steep terrain and drainage areas. • Store all fuel at least 100 metres from normal high-water mark. • Use double-walled tanks to store fuel. • Berm all fuel supplies. Use oil drip pans on major equipment. • Educate workers on fuel contingency plans.

Area of Concern	Best Practice
MAINTENANCE & FOLLOW UP	
Flowing holes and blown-out shot holes not repaired	• Ensure shot holes have not blown out. • Plug all flowing holes immediately with bentonite clay and report to regulatory bodies.
Piling of drill cutting	• Place all drill cuttings down shot hole if possible. • Spread excess drill cuttings thinly.
Creation of waste at camps	• Gather, treat, and ship out solid waste.
Lack of long-term recording	• Check reclamation success.
Fuel spills	• Store fuel and refuel vehicles more than 100 metres above the normal high-water mark where possible. • Use double-walled tanks to store fuel. • Use berms around tanks to contain leaks and spills. • Develop spill contingency plans.
DISRUPTION OF WILDLIFE	
Wildlife disturbance	• Institute policies against hunting, trapping, carrying firearms and fishing for all workers. • Prohibit ATVs for personal use at camp and worksites. • Educate workers in wildlife awareness, wildlife avoidance and garbage control. • Limit access to trails, roads and cutlines. • Avoid wildlife nesting, mating and migratory areas. • Plan to stop work as new information about impacts to wildlife using the area becomes available. • Hire a wildlife and environment monitor.

Citizens' Rights

If you are concerned about a seismic exploration project and think that you may want to take part in the regulatory approval process, this section gives you information and advice on how to go about it.

It explains how you can get information and summarizes the key issues associated with seismic exploration. It also gives advice on how to have a say in the decision-making process for a seismic exploration project.

To conduct seismic exploration, companies have to get a permit or licence from the government that will allow them to do the work. The way companies get these rights and permits/licences varies between the NWT and the Yukon, and from region to region within each territory. The rules about public consultation and public intervention opportunities can also vary. You can find more details about the laws and procedures for each region of the Northwest Territories and Yukon Territory by looking at two documents that are part of this series of primers on oil and gas entitled Citizens' Rights and Oil and Gas Development: Northwest Territories and Citizens' Rights and Oil and Gas Development Yukon Territory respectively.

Here are some steps to follow if you wish to review and comment on a proposed seismic project.

Find out about Proposed Projects

The first thing you need to do is make sure you know what proposals there are for companies to conduct seismic projects.

Companies send copies of seismic proposals and licence applications to government agencies, Aboriginal Nations or Groups, and interested parties. Companies may also arrange for copies to be available for public viewing at government offices.

You can register yourself as an "interested party" by contacting the primary government agency responsible for oil and gas development in your region. You will receive notice of new seismic exploration proposals and information about timelines for public comment on the regulatory approvals process.

Another way to get information about a proposed seismic project is to contact the company directly and ask for a copy of the detailed proposal or licence application.

A company planning to conduct seismic operations (the proponent) usually has to give public notice of their plans before they receive regulatory approval. Notice requirements vary from region to region. Sometimes companies will post notices in local newspapers or other media to announce proposed projects; other times you may have to be more active to ensure you are aware of new proposals.

Learn about Public Consultation Rules

Next, you need to find out the rules for public consultation in your area.

Contact the primary government agency or co-management board responsible for oil and gas development in your region and get answers to the following questions:

- ❑ What does the company have to do to give notice of their proposed project? Who do they have to consult? What form does the consultation have to take (meetings, open houses, etc.)?
- ❑ What does the company have to do with the public comments they receive?
- ❑ What is the deadline for public comments?
- ❑ To what government agency approving bodies and co-management groups does the company have to send public comments?
- ❑ What do government agencies do with the public comments and concerns they receive?
- ❑ What happens if the public objects to or wants conditions attached to the seismic project?
- ❑ What is the process for deciding whether and how the project will proceed?
- ❑ Is it possible to call for a public hearing, if needed?
- ❑ How can the public find out whether the government has approved a seismic project?
- ❑ How can the public get a copy of a seismic approval?
- ❑ Can the public appeal an approval? If so, how?

Review the Seismic Application

Once you've received a copy of a company's proposal for exploration, and have learned about the rules for public consultation, you'll next want to review the project application.

When you review the application you may find that you are satisfied with the information presented or you may have questions or concerns about the project.

If you have questions or concerns, make of list of these and call a meeting with the company and/or proper government agency to discuss them (see box on page 37: *How to Negotiate with Companies*).

If you can't resolve your concerns about the project directly with the company or government agency you may wish to call for a public hearing (see section on page 36: *Participate in Decision Making*) if such a legal avenue is available.

Key questions to ask when reviewing a seismic application:

- ❑ Has the company assessed sensitive ecosystems within the project area?
- ❑ How will seismic crews access the area? Will the access created be temporary or permanent?
- ❑ How will they manage and reclaim access routes?
- ❑ What methods will companies use to survey the area?
- ❑ Will they use 2D exploration, or 3D exploration requiring multiple receiver lines?
- ❑ Will the company use shot holes or vibroseis for the energy source, or both?
- ❑ What is the total linear extent of the program?
- ❑ What is the width of the seismic lines?
- ❑ How much clearing will they need?
- ❑ What vegetation clearing techniques will they use?
- ❑ Will the company erect a camp for the project? For what time frame? Where will they locate the camp?
- ❑ In what season will the project occur?
- ❑ What vehicles will the company use to clear lines and transport equipment and personnel?
- ❑ Will they have to cross water bodies? How will they do this? Where will the water crossings be located?
- ❑ How will crews protect the soil and vegetative mat?
- ❑ What erosion mitigation measures will they use?
- ❑ What permafrost protection measures will they use?
- ❑ What reclamation practices will they use and will they monitor reclamation success over time?
- ❑ What are the shot hole setback distances from groundwater wells and surface water bodies?
- ❑ Will the company have a wildlife and environment monitor?
- ❑ What wildlife disturbance avoidance measures will they use? Does the company have policies to ensure workers know how to minimize impacts on wildlife?
- ❑ Are the waste management practices acceptable?
- ❑ Have they assessed the socioeconomic benefits (e.g., employment of local residents) and impacts?
- ❑ Have they identified ways they will mitigate possible effects on other land uses such as trap lines, as well as on areas of cultural significance?

Participate in Decision Making

If you meet with the company and government agencies directly and find you can't resolve your concerns about the project, you may wish to call for a public hearing.

Public hearings are meetings held to get comments from the general public, businesses, special interest groups, and local officials about proposed regulations, permits, or other changes that could affect the public.

You'll need to find out the rules for holding public hearings in your region, whether such a legal avenue is available for commenting on seismic projects and what the terms are. You can find more details about public participation in regulatory decision making in Citizens' Rights and Oil and Gas Development: Northwest Territories and Citizens' Rights and Oil and Gas Development Yukon Territory. These guides include government agency contacts that you can call to get more information about how governments conduct hearings and the specific rules for members of the public to call for and participate in hearings.

You'll want to find out the following:

- ❑ When are the deadlines for letters calling for hearings and for written and oral submissions?
- ❑ Who has intervener status — that is, the legal right to call for a hearing?
- ❑ Is there funding available for interveners to hire experts, including lawyers?
- ❑ What are the hearing procedures?

HOW TO NEGOTIATE WITH COMPANIES

Most companies have experience dealing directly with members of the public who have questions and concerns about oil and gas projects. They usually welcome opportunities to meet with interested parties, to provide information and to try to resolve issues outside of formal regulatory decision-making forums.

When involved in discussions with a company, make sure you

- ❑ *Get everything in writing. If you have an oral agreement or telephone conversation with a company representative, ask him or her to confirm it in writing and to send copies to the proper government agencies.*
- ❑ *Ask the company to explain anything you do not understand. If some of the written information the company has provided is ambiguous, ask for clarification in writing.*
- ❑ *Tell the company any concerns you have about the project. Suggest ways they could change the project to address your concerns. Be persistent if the company does not adequately resolve your concerns right away.*
- ❑ *Don't make a deal with the company wherein they only agree to deal with your issues of concern if you agree to not take part in a hearing. Sometimes it is not possible for you and the company to resolve all of the issues. But, if a public hearing is held, it will be shorter and more focused if you have resolved as many of the issues as possible. A shorter, more focused hearing is to the benefit of all parties involved.*
- ❑ *Recognize that some "give and take" may be necessary. For successful negotiation, both parties must be able to reach their final objectives and be willing to agree with the other.*
- ❑ *Negotiations can take a long time. Often members need a lot of time to both review and write documents. Therefore, it is important to research opportunities for intervener funding. It may be reasonable to ask the company for funding to make sure that members of the public can be more effectively engaged in the consultation.*

WORKING WITH THE MEDIA

Using the media to raise public awareness about an issue is not always appropriate. Under some circumstances, however, it can be an important tool:

- ❑ *It can make other members of the public aware of the proposed project and your concerns. This can help build support for your activities and increase your chances of success in negotiating with the company.*
- ❑ *It can encourage a company to negotiate. Many companies worry about their public image and would like to avoid negative publicity. Real or potential media attention on an issue may be an incentive for a company to try to resolve issues.*
- ❑ *It may ensure the government agencies are aware of and involved in your issue.*

Media include:

- ❑ *local, regional and national newspapers*
- ❑ *local and regional radio stations*
- ❑ *community and regional television stations*

If you have a message to get out, sending out a news release can be helpful. It does not have to be long, but you need to consider the following:

- ❑ *Decide on your main message and state this clearly in the first sentence.*
- ❑ *Include a brief outline of your key concerns and the outcome you want.*
- ❑ *Include one or more contact names and numbers.*
- ❑ *Put a short title at the top of the release — something eye-catching. Put the date at the top as well.*
- ❑ *Keep the release short — less than a page. You may want to include quotes and position statements.*
- ❑ *Consider including a separate "backgrounder piece." A backgrounder gives only factual information on the subject, rather than opinions.*
- ❑ *Make sure you are aware of the deadline for making submissions to the media.*
- ❑ *When your news release is ready, you should fax or deliver it to your local and regional newspapers, radio and television stations. Follow up with phone calls to select media contacts.*
- ❑ *Send a copy of your news release to both the company and the proper government agency. This will allow them to be better prepared to respond to the media if they know in advance what you are saying.*

For More Information

For information on government agencies, industry associations, and further reading on this issue, please consult the companion publication entitled: **Resources and Contacts.**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