

Marine Seismic Surveying Multi-industry Workshop

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**CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS**

Canada's Oil and Natural Gas Producers

Overview

- **Who is CAPP**
- **What is a marine seismic survey and why they are conducted**
- **Seismic survey research**
- **Environmental protection and minimizing conflict during seismic surveys**
- **Education and outreach**

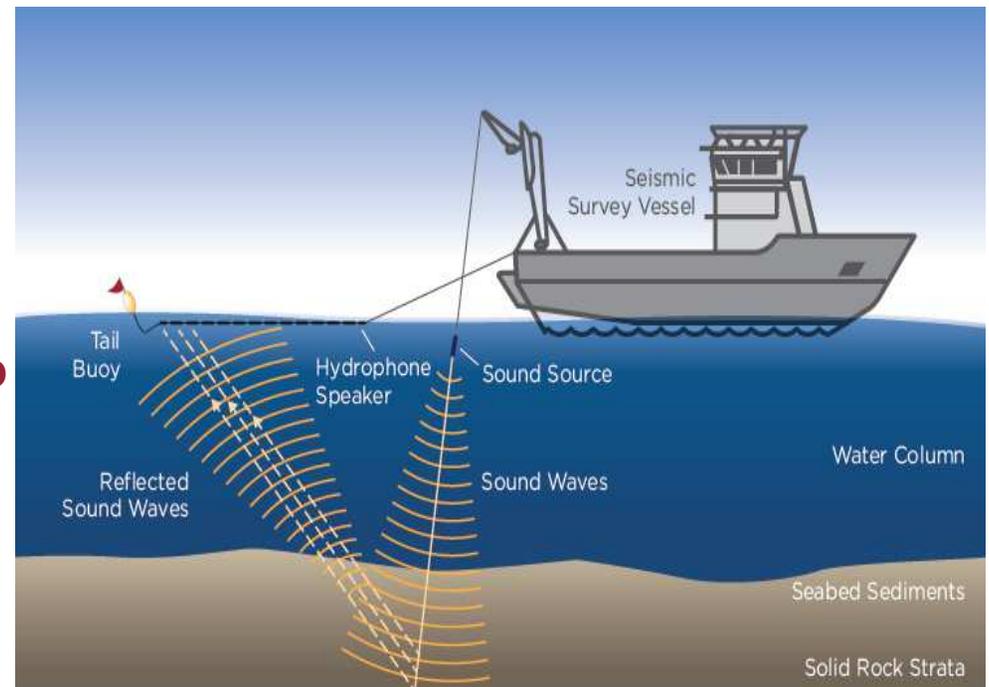


Canadian Association of Petroleum Producers (CAPP)

- **Represents Canadian upstream oil & gas sector (~ 100 member companies)**
- **Members explore for, develop and produce natural gas, natural gas liquids, crude oil, and oil sands throughout Canada**
- **Members produce about 90 per cent of Canada's natural gas and crude oil**
- **Key focus areas:**
 - Education
 - Communications & outreach
 - Policy & regulatory advocacy
 - Industry performance
- **Offices in St. John's, Ottawa, Calgary and Victoria**

What is a marine seismic survey?

- **Uses sound energy to map geological structures under the seabed**
- **Vessels tow devices that use compressed air to produce pulses of high energy, low frequency sound waves**
- **Travel through the water and into the rock layers beneath the seabed**
- **Sound waves can penetrate more than 6,000 metres below the sea floor**
- **Receivers (“hydrophones”) listen for and record the reflected sound waves**



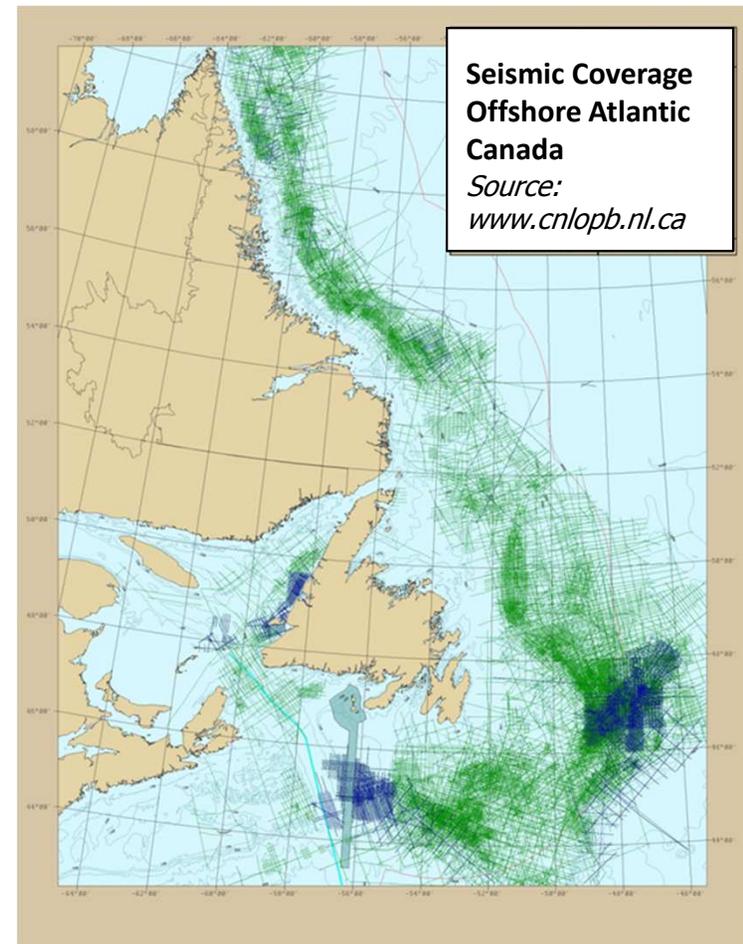
What is a marine seismic survey (cont'd)

- **Types of seismic surveys:**

- **Two dimensional (2D):** Uses one sound source and one set of receivers
- **Three dimensional (3D):** Uses multiple synchronized sound sources and hydrophones to provide more detailed information about an area
- **Four dimensional (4D):** Uses multiple synchronized sound sources and hydrophones with the added dimension of time (i.e.: a 3D survey is conducted multiple times over the same location at different periods to compare data)
- **Geohazard or well site survey:** Uses one sound source and one set of receivers towed over a small area prior to drilling to check for possible hazards
- **Vertical Seismic Profiles:** Hydrophones are lowered into a drilled well and sound is produced at the surface to give a detailed view of the geology near the well bore

Why are seismic surveys conducted?

- **Seismic surveys provide information on the depth, position and shape of underground geological formations that may contain oil or gas**
- **Data is processed to improve the quality and filter out background “noise”**
- **End result is a detailed picture of the structures and rock formations in the survey area**
- **Geophysicists look for specific features that could indicate whether oil or gas might be present:**
 - Sedimentary basins
 - Faults
 - Ancient reefs or buried former beaches



Why are seismic surveys conducted? (cont'd)

- **Seismic surveys help companies decide whether:**
 - The available information is sufficient to justify drilling an exploratory well
 - Additional surveys are needed to better define the structures before drilling
 - The features present are not attractive enough to warrant further interest
- **Survey results do not show definitively whether oil or gas are present**

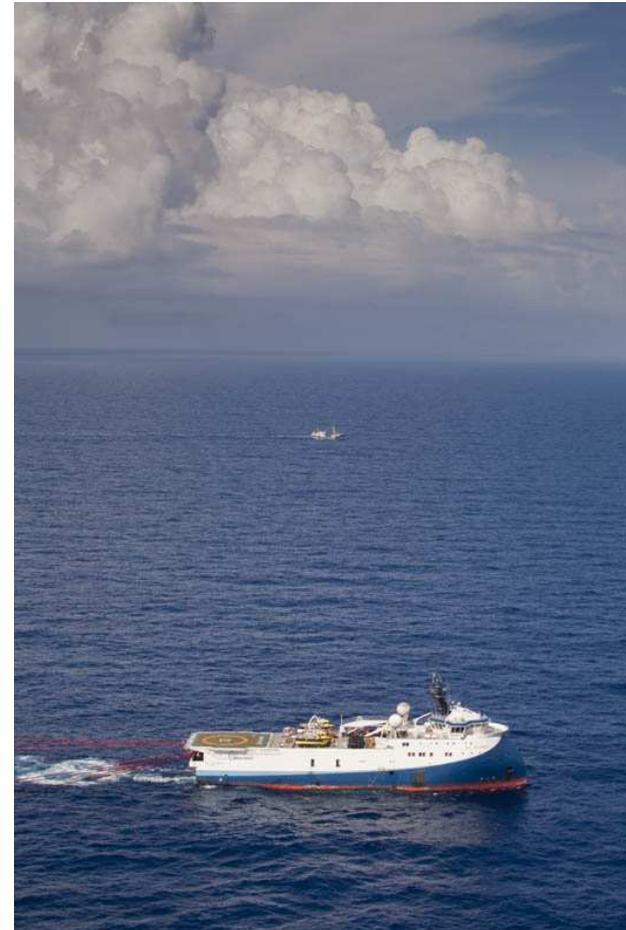


Photo courtesy of Schlumberger

Seismic Vessels

- **Seismic vessels travel at approx. 5 knots during a seismic survey**
- **Survey pattern is pre-determined**
- **Vessel tows one or two sound sources to generate sound waves and one or several long cables or “streamers” each containing hundreds of evenly-spaced hydrophones**
 - Each streamer can be up to 12 kilometres long
 - Streamers are towed 6 - 15 metres below the water surface
- **Position of the vessel and equipment must be carefully controlled using advanced navigation and acoustic systems**



Photo courtesy of Shell Canada

Seismic Surveys Research

- **Substantial research has been conducted to determine whether seismic surveys have an impact on ocean life:**
 - Current research indicates there is minimal risk of mortality in marine mammals, fish and invertebrates when the sound energy of seismic surveys is released into the water column. Additional research is ongoing.
 - Marine mammals, depending on species and proximity, can experience temporary changes to hearing thresholds and in some extreme cases of unmitigated exposure, these effects can be permanent
 - Laboratory research conducted in NL has shown no mortality among invertebrates (crab, shrimp scallop etc.) but has shown some physiological responses
 - Governments, academia and industry continue to invest in research related to seismic impacts to further broaden the body of knowledge
- **Carefully designed mitigation measures are applied to seismic surveys to minimize risk to marine life**

Seismic Surveys - Environmental Protection

- **Comprehensive Environmental Assessments (EAs) are completed prior to conducting surveys which must be approved by regulators**
- **Seismic vessels and their operators are guided by the *Statement of Canadian Practice with Respect to Mitigation of Seismic Sound in the Marine Environment***
 - Outlines mitigation measures that must be considered in the planning of seismic surveys
 - Examples:
 - Soft start
 - Exclusion zones
 - Visual monitoring
 - PAM

Minimizing Conflicts



Photos courtesy of Schlumberger

- **Seismic surveys in the NL offshore must be scheduled during optimal weather conditions (June to September) because:**
 - Surveys cannot take place if waves are higher than 3 metres
 - Rough seas affect quality of data
- **June to September is also peak fishing season**
- **Effective communication and coordination between petroleum and fishing industries is critical**

Minimizing Conflicts (cont'd)

- **Fishing industry advised of marine seismic survey activity through direct communication, notices to fishers via local media and notices to mariners**
- **A single point of contact is appointed by the operator that fishers can go to for precise information about geographic location**
- **A fisheries liaison officer (FLO) may be required on board the seismic vessel - the FLO communicates directly with fishing vessels in the field**
- ***One Ocean* was created as a communication & liaison organization between fishing and petroleum industries**
- **Compensation programs in place for damage to fishing vessels or gear**

Education and Outreach

- **CAPP has been working to ensure key information related to marine seismic surveys is available publicly**
 - Atlantic Canada Offshore Website: www.atlanticcanadaoffshore.ca
 - New Brochure: Marine Seismic Surveys: The Search For Oil and Natural Gas Offshore
 - Video outlining the role of the Fisheries Liaison Officer: <http://atlanticcanadaoffshore.ca/working-with-the-fishing-industry/>
 - International Research: www.soundandmarinelife.org
- **Effective communication and information sharing is key**



Photos courtesy of Schlumberger



More information available at:
www.AtlanticCanadaOffshore.ca
www.oneocean.ca