

Offshore Seismic Surveying



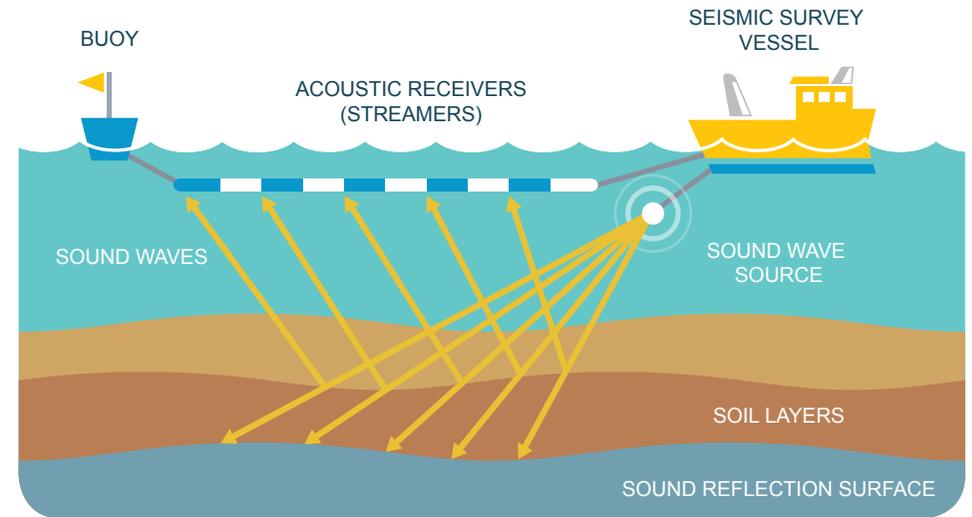
This information sheet explains how government agencies manage offshore seismic surveying activities in New Zealand.

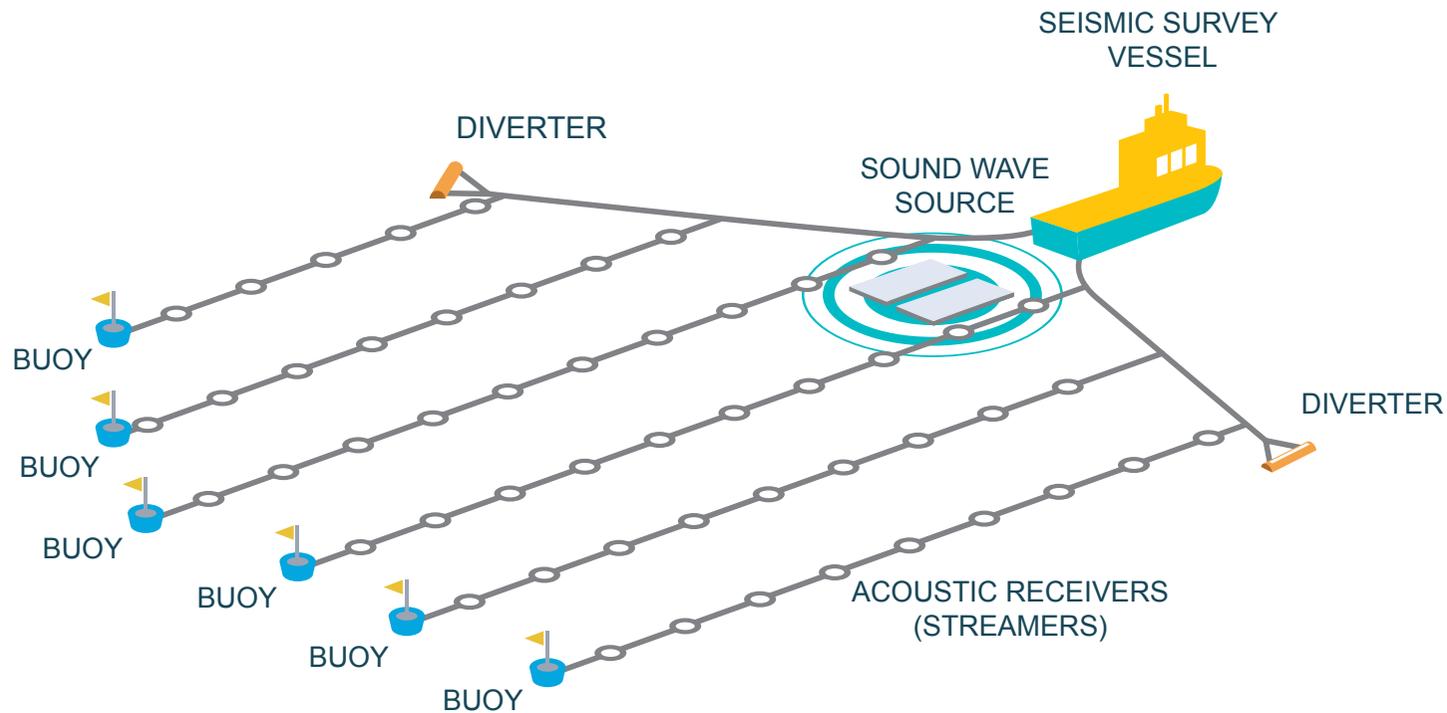
Introduction

Seismic surveying is a technique used to explore the layers of rock below the seabed for geologic features that indicate the presence of oil or gas. As the name suggests, seismic surveys use seismic pulses to create two or three dimensional images. Seismic waves are generated from a surveying vessel, travel down through the water and seabed and reflect back off the different layers of rock.

The reflected waves are then picked up by sensors called geophones which are towed in a streamer behind the vessel.

This streamer consists of long cables with geophones spaced evenly along it with a tail buoy at the end.





A single streamer is used for 2D seismic data and an array of streamers (between 4 and 24) is used when acquiring 3D seismic data.

Marine seismic vessels use a combination of air or water guns and other acoustic sources to create the pulse needed to take seismic readings. There are other methods as well including an acoustic source that produces a chirp frequency.

Creating a seismic pulse does not involve explosions or blasts of any kind. It is important that the pulses or chirps be emitted in rhythmic repetition as the vessel moves to collect accurate data.

Does seismic surveying affect marine mammals?

Seismic survey methods do have the potential to impact on marine mammals.

Depending on the strength of the pulses, marine seismic surveying can generate significant underwater sound.

Intense noise has the potential to affect a variety of marine life, including marine mammals, squid, fish, and zooplankton.

Responses could range from minor behavioural reactions such as reorienting or moving away from the noise through to more serious reactions.

Physical injury could potentially occur if an animal was very close to a source of intense sound.

Pulses are directed into the seabed and some of that sound is reflected into the broader marine environment.

The strength of the pulse is strongest close to the source and weakens rapidly with distance.

The marine environment is a naturally noisy place and activities that introduce additional noise – whether it is industry, marine tourism or recreation – contribute to that.

A variety of studies have been reported in scientific literature over the years, but there are none that have been conclusive on exactly how seismic surveying affects marine mammals. Impacts can vary greatly from case to case depending on the species, location, type of noise, and other factors.

Some animals and species have been reported as not reacting to seismic noise at all, others have been observed moving away from a vessel operating many kilometres away. Humpback whales have been observed moving rapidly away from the sound source, as well as moving rapidly toward it.

It's important to acknowledge that seismic surveying has not been directly linked to strandings or deaths. However naval sonar (a very different type of underwater sound not used by the oil industry) has been implicated in both and is often wrongly confused with seismic surveying in the media.

Regulation & protection

If an operator wants to search for petroleum or minerals using seismic surveying it will first need to obtain a prospecting or exploration permit from New Zealand Petroleum & Minerals (NZP&M).

NZP&M will assess the company's proposed work programme as well as the operator's technical and financial capability, and compliance history.

In the case of an exploration permit, NZP&M will also undertake a preliminary, high level assessment of an operator's capability and systems that are likely to be required to meet applicable health, safety and environmental legislation.

If granted, a prospecting permit can last up to four years and an exploration permit can last up to 15 years.

Under the Exclusive Economic Zone (EEZ) and Continental Shelf (Environmental Effects) Act 2013, administered by the Environmental Protection Authority (EPA), seismic surveying is treated as a 'permitted activity' on the condition that operators comply with the Department of Conservation's (DOC) Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations.

Operators who don't comply with the Code within the EEZ must obtain a marine consent from the Environmental Protection Authority instead.

Within the Territorial Sea (up to 12 nautical miles offshore) there is no regulatory requirement to comply with the Code but voluntary compliance is often adopted by operators.

The Petroleum Exploration & Production Association New Zealand (PEPANZ), a national body representing the major petroleum operators in New Zealand, endorses the Code as industry standard and all of their members have voluntarily agreed to comply with it regardless of regulatory obligation.

As part of the Code, an operator undertaking a seismic survey is also required to submit a Marine Mammal Impact Assessment (MMIA) to DOC.

The MMIA outlines any potential impacts on marine mammals in the survey area and how the operator intends to mitigate those impacts. The MMIA must be signed-off by DOC before the survey starts.



How does the Code of Conduct manage the impacts on marine mammals?



Internationally, many jurisdictions have frameworks to manage offshore seismic activities and mitigate potential impacts to acceptable levels.

New Zealand established its own guidelines in 2006 to provide effective, practical mitigation

measures for minimising acoustic disturbance of marine mammals during seismic surveys.

It was reviewed and updated to reflect developments in international best practice in 2012 and 2013.

The Code applies to any operator planning to undertake a marine seismic survey using an acoustic source. This includes the oil and gas exploration industry, scientific geophysical research, seabed minerals prospecting and cable-laying.

The objectives of the Code are to:

- minimise disturbance to marine mammals from seismic survey activities;
- minimise noise in the marine environment arising from seismic survey activities;
- contribute to the body of scientific knowledge on the physical and behavioural impacts of seismic surveys on marine mammals through improved, standardised observation and reporting;
- provide for the conduct of seismic surveys in New Zealand continental waters in an environmentally responsible and sustainable manner; and,
- build effective working relationships between government, industry and research stakeholders.

To minimise disturbance to marine mammals, the Code requires independent, qualified Marine Mammal Observers and Passive Acoustic Monitors on board the seismic vessel at all times. These observers must have completed a DOC-approved course and demonstrated a satisfactory understanding of seismic operations and their responsibilities under the Code.

While on board, observers continually monitor a set of ‘mitigation zones’ within a radius of 1-1.5km around the sound source for signs of marine mammals.

If any mammals are sighted within the mitigation zones, the observers will stop the seismic pulses immediately.

Observers also ensure that mitigation actions are taken as specified in the operator’s MMIA.

The size of the mitigation zone varies depending on the power of the acoustic source used.



Recommendations from a panel of international experts put the level of sound likely to result in injury to a marine mammal at 186 decibels.

The panel put the level of sound likely to result in a significant behavioural response at 171 decibels.

During the MMIA process, the operator must conduct sound transmission modelling associated with their activities, and if sound levels are predicted to exceed these levels within the mitigation zones, the area of the zones may be expanded as appropriate.

The Code splits seismic surveying into three levels:



Level 1

1

- the highest power surveys.

Level 2

2

- less powerful surveys like those conducted by NIWA and GNS Science.

Level 3

3

- all other small-scale seismic surveys, generally used for research. Level 3 seismic surveying is not covered by the provisions of the Code.



Petroleum exploration generally falls under Level 1.

A Level 1 survey must have at least two independent Marine Mammal Observers and two Passive Acoustic Monitors on board at all times.

Observers must carry out 30 to 120 minutes of pre-start observation within the mitigation zones specified in the MMIA before operations can begin, in order to give observers time to identify any marine mammals within the mitigation zone.

Some surveys are required to have larger mitigation zones based on what is discovered during the MMIA process. Level 1 surveys use 'soft starts' which sees the seismic pulses begin at a low level and slowly increase to full power over the course of 20 to 40 minutes.

The Passive Acoustic Monitors perform 24-hour monitoring for marine mammals using underwater audio receiving equipment that can detect vocalising whales and dolphins.

Acoustic monitoring can be used to estimate direction and distance from the mammal as well as identify the species.

Passive Acoustic Monitors also have the authority to stop the seismic pulses immediately if marine mammals are detected within the mitigation zone.

Other protections for marine mammals

New Zealand currently has six marine mammal sanctuaries, five of which have their own mandatory seismic surveying regulations.

Operators surveying in these areas must comply with these regulations and DOC can specify additional measures to minimise risk to marine mammals in these areas.



Marine Mammal Sanctuaries



Seismic vessels and non-interference zones

Amendments to the Crown Minerals Act 1991 in 2013 saw offences introduced for damaging or interfering with structures or ships being used offshore in prospecting, exploration and mining activities or related operations as well as incursions into specified non-interference zones.

The Chief Executive of the Ministry of Business, Innovation and Employment may now, at his discretion, create specified non-interference zones for up to three months.

These zones can extend up to 500m from the edge of the relevant structure, ship or towed seismic streamer.

Non-interference zones are as much for the safety of others out on the sea as they are for the operating vessel.

Seismic vessels may be in the order of 100 metres long and 30 metres wide and can be towing several streamers up to 12 kilometres behind it.

The ship and streamers make it very difficult for the vessels to turn. They are also unable to stop or change course abruptly so other vessels need to listen carefully to navigational warnings to maintain a safe distance.

Similarly, becoming entangled in a seismic vessel's streamer can present very serious safety risks for all parties.

Streamers are often submerged and not easily visible to other vessels. The cables towing this equipment are under considerable tension and could cause significant injury or loss of life if broken or run into.



New Zealand Government

