

# **TARANAKI REGIONAL COUNCIL**

## **Offshore Seismic Data Acquisition Permitted Activity Review**

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# 1 Background

Currently, offshore seismic data acquisition [“seismic”] for petroleum prospecting within all areas of the Taranaki Coastal Marine Area [“CMA”] is denoted within its Regional Coastal Plan [“the Plan”] as a Permitted Activity, subject to some criteria. The criteria associated with the Rule are re-printed below:

## *General Rule G2.12*

- *Survey does not involve placement of explosives or does not otherwise directly involve disturbance of the foreshore or seabed;*
- *Survey is not conducted in an area that is used by marine wildlife for breeding purposes during the time that those animals are breeding.*

The Council is currently reviewing its Plan, and has sought advice on the veracity of its currently held position with regard to this Permitted Activity status in light of updated knowledge about the environmental effects of the activity, including in particular upon marine mammals and other sensitive marine wildlife.

This report outlines in basic terms what seismic surveying entails, a discussion of the current nation-wide “*Code of Conduct for Minimising Disturbance to Marine Mammals from Seismic Survey Operations*” [“The Code”], how offshore seismic is treated within other regional council jurisdictions, and makes recommendations as to its future treatment within the Plan.

The author’s experience and expertise in the offshore petroleum industry and its associated environmental effects are set out in Appendix 1 to this report.

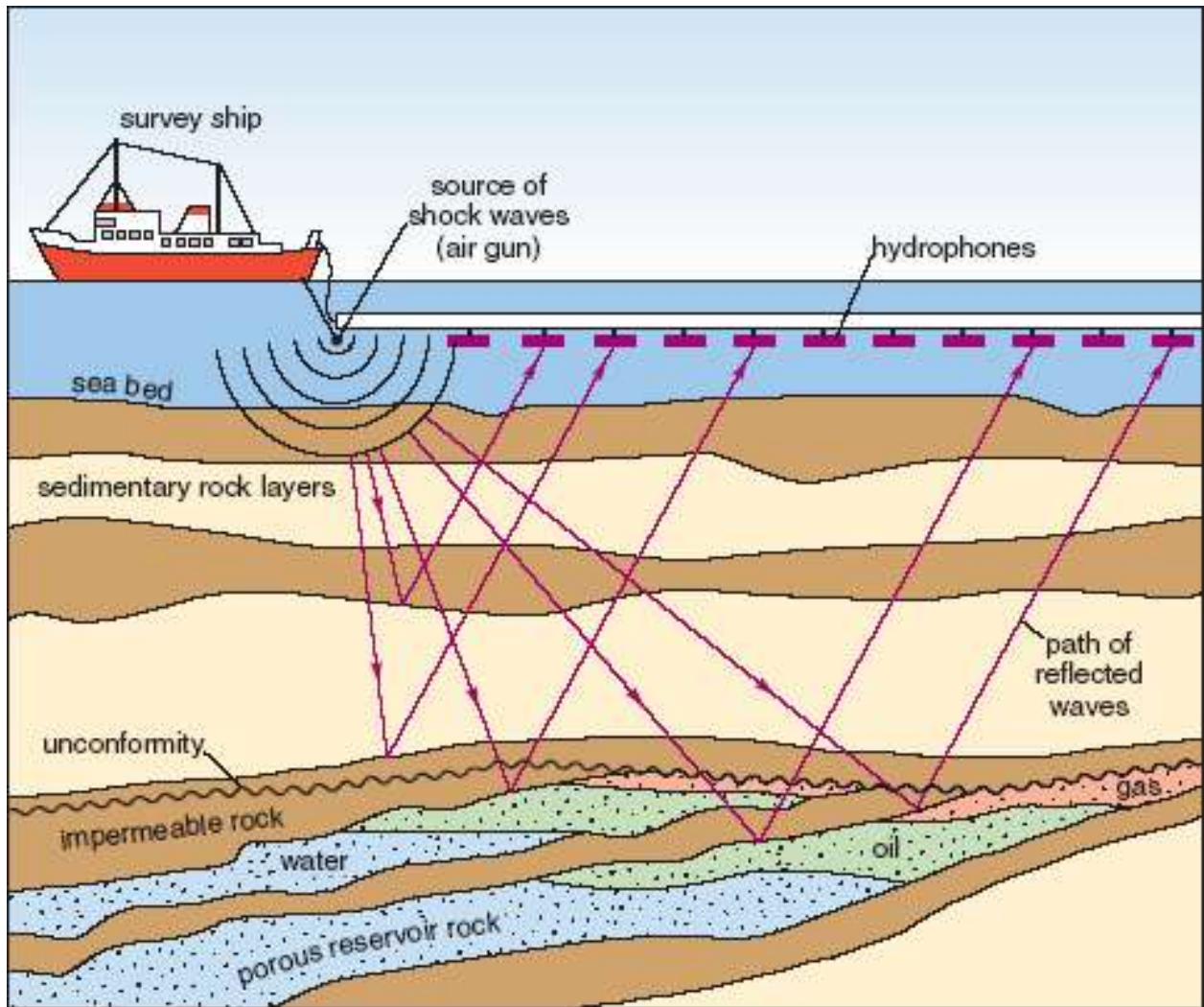
## 1.1 The basics of offshore seismic

Once the analysis of known geological information has been completed, seismic data acquisition surveys are then undertaken to further pin down the location and likelihood of a petroleum reservoir of potentially-economically recoverable size being present.

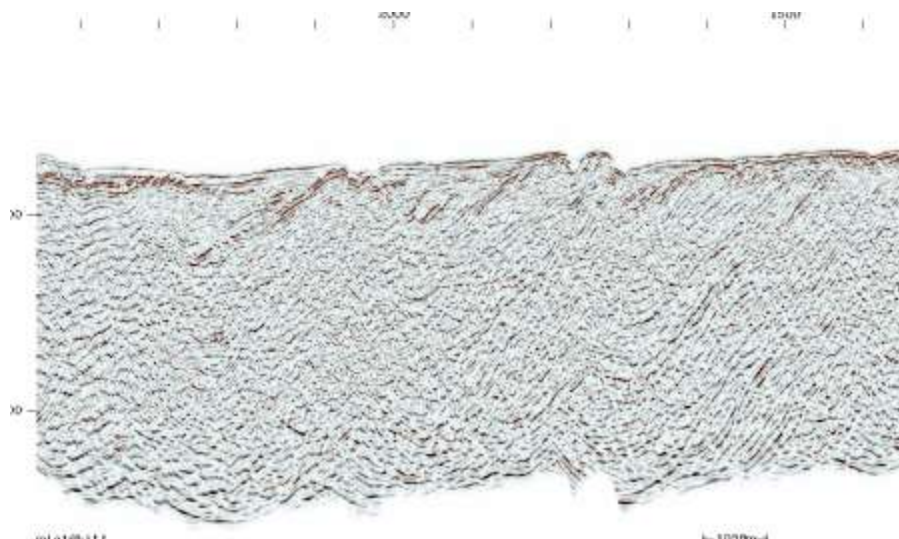
In essence, sound waves are directed downwards from an array of compressed air guns behind a vessel. These waves penetrate the underlying sub-strata and are reflected back. The time delays for the sound waves to return to the surface (recorded by hydrophones trailing behind the survey vessel) are then mapped and analysed, and show the types of strata and structures beneath the seabed. Historically the sound waves were generated by explosive charges, but this technology was abandoned many decades ago.

So in terms of the RMA there is a discharge of noise/energy and a temporary occupation of space. As a consequence, these activities must be authorised by either a rule in regional [coastal] plan, or by resource consent (refer sections 12 and 15 of the Act).

The following figure schematically shows how a survey is carried out. The “streamers” bearing the hydrophones can be over a nautical mile in length, and there can be eight or more streamers towed behind the survey vessel.



The following diagram shows an example of the final output from a seismic survey – the “strata” in the figure are related to the times taken for the sound waves to bounce from underlying strata and return to the hydrophones on the water surface, and are then analysed to produce a “map” of the strata, and the location and extent of any potential petroleum reservoirs. An example of a seismic plot is shown below:



## 1.2 The regulation of offshore seismic – national

Historically, offshore seismic has been blamed overseas for the injury to or deaths of marine mammals and other marine life, and as a consequence an operator wishing to undertake such surveys often runs a gauntlet of environmental “activism” and objection.

There are no documented cases in NZ of marine mammals being killed or injured due to a seismic survey, with innumerable surveys having been undertaken around the coast and within the EEZ over the past fifty years. Internationally, there are a few publications implying a link between petroleum exploration and marine mammal injury/death: one where an animal near a seismic boat appeared to be injured and dying, but wasn't examined by post-mortem, and an IWC report suggesting a link between a multi-beam survey (not seismic) and a mass stranding in Madagascar (<https://iwc.int/2008-mass-stranding-in-madagascar>). On the contrary, there are multiple publications detailing links between military sonar and marine mammal strandings, which is now more or less accepted proof in the science community. Sonar, in particular when used for military purposes, operates in the sound ranges that many marine mammals use for echolocation and communication, whereas the sound frequencies used for seismic data acquisition are in the main outside of those ranges.

The caveat to the above however is that nobody in New Zealand has looked for acoustic damage in deaths of marine mammals until very recently, so there is very little chance that there would be documented cases. Internationally, others have looked, but there are no cases in the scientific literature of a direct link. In the last couple of years the Department of Conservation [“the Department”] has facilitated full necropsies of animals which strand nearby to where seismic surveys have been carried out, but no direct link between the seismic survey and the stranding has been established (see section 2 below).

It is noted however in the accompanying Reference Document to the Code (sections 2.2 and 2.3) that there have been no empirical studies proving that seismic data acquisition has minimal or no impacts on marine mammals, and as a consequence the Department believes that it needs to continue to manage the activity in a precautionary manner [see below - Dave Lundquist, *pers. comm.*].

Therefore despite the lack of any observed direct connection between seismic operations and marine mammal injury or deaths, the offshore petroleum industry world-wide has nevertheless developed, as a precautionary measure, various guidelines and codes for the protection of marine mammals, in general denoted as a “seismic code of practice”. As noted above, New Zealand has such a Code, developed by the Department in conjunction with the petroleum industry. The Code, along with its supporting technical document, can be found at the following web site:

<http://www.doc.govt.nz/conservation/marine-and-coastal/seismic-surveys-code-of-conduct/code-of-conduct-for-minimising-acoustic-disturbance-to-marine-mammals-from-seismic-survey-operations/>

It should be noted that whilst the prime aim of the Code is for the protection of marine mammals, “.....proponents are strongly encouraged to adopt whatever means are available to avoid or mitigate negative effects on other key species (such as turtles, penguins and seabirds) or key habitats identified in the planning stage as being potentially impacted” [section 3.2 of the Code].

The Code sets out "requirements" for, *inter alia*:

- advising the Department of the intention to undertake a seismic survey, and preparing Marine Mammal Impact Assessment report. To quote the Code – *"While there is no formal approval process resulting in a 'consent', in each case the Director-General will determine whether the MMIA is sufficient for the purposes of the Code."* The purpose of the MMIA is noted as leading to *".....the development of an appropriate marine mammal mitigation plan for use by observers and crew to guide operations."*
- having on board at all times during a survey marine mammal observers (see below). All observers are required to be sufficiently trained to the requisite degree (to the Department's satisfaction), and section 4.1 of the Code stipulates requirements for other aspects of operational monitoring;
- once the survey commences, pre-start-up observations for marine mammals, both visual but also, at night and at times of reduced visibility, an underwater listening technique called passive acoustic monitoring ["PAM"] used to detect marine mammals by their vocalisations;
- a "soft-start" procedure for commencing seismic, namely starting off using only one or two air guns before ramping up to the full array, to prevent alarming any marine mammals in the immediate area by a full start-up, and allowing them to move away from the guns;
- maintaining marine mammal observations throughout the survey, both visual but also PAM at night and at times of reduced visibility;
- once in full operation, what to do if marine mammals are observed within a certain distance, including shut-down of operations;
- reverting to a soft-start status during any turning manoeuvre between seismic lines; and
- providing a comprehensive report to the Department of all marine mammal observations during the survey, also noting any associated interactions, incidents, and mitigation measures. Amongst other things, such reports add substantially to our knowledge of the occurrence, number, and habits of marine mammals around New Zealand.

Whether or not all of the Code's "requirements" are to be followed depends upon the nature and scale of the seismic survey – there are three levels of activity depending upon the volume/intensity of the sound source. As noted in the Code however:

*Level 1 surveys (>427 cubic inches) primarily include large-scale geophysical investigations that would routinely be employed in oil and gas exploration activities with dedicated marine seismic survey vessels, but may also apply to other studies using high-power acoustic sources. This level features the most stringent requirements for marine mammal protection, and is the main focus of the Code.*

The lower classifications of surveys relate to scientific investigations/research (Level 2) subject of less stringent requirements, and lesser activities again described as being *"all other small scale seismic survey technologies, and are considered to be of such low impact and risk—with nominal noise levels lower than commercial shipping—that they are not subject to the provisions of the Code."*

The New Zealand Code is currently voluntary, with one exception – within the waters of the EEZ and Continental Shelf, seismic data acquisition is a Permitted Activity under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 and its associated Permitted Activity Regulations (2013), but only on the proviso that the Code must be adhered to.



The Department advises [Dave Lundquist, *pers.com.*] that in the next couple of months it will be commencing another review of the Code. There is also the possibility that the Minister of Conservation might *in future* make adherence to the Code mandatory under the Marine Mammals Protection Act ["MMPA"], so that management of all offshore seismic surveying is consistent across all NZ waters, including within the CMA. At this stage however this is not on the Minister's immediate agenda [Tania Wrightson, Minister's Office, *pers.comm.*]

All petroleum exploration companies operating in New Zealand waters have agreed to abide by the Code including in areas where it is currently voluntary, bar one, Greymouth Petroleum. These operators have signed up to the Code as a voluntary commitment, and so would be expected to follow its provisions regardless of whether it becomes a regulatory requirement (national or regional).

Finally, it has been observed overseas, both in "the wild" but also in experimental settings, that some fish species can be startled by sudden noise in certain frequency ranges, and dart downwards and away from the noise source. This is a temporary effect only. Again however, the soft-start regime for offshore seismic has been noted to sufficiently warn fish of the impending increase in noise level and frequency of discharge such that they move away from the immediate area until the noise ceases.

### **1.3 The regulation of offshore seismic – regional**

From the regional perspective, for seismic surveys within the CMA, most regional coastal plans are silent on provisions for the activity, one would suspect because, until recently, no offshore seismic surveys have been proposed for their respective CMAs and hence, at the time of writing the current plans, crystal ball gazing did not extend to that activity. As a consequence, seismic surveys fall within the default categorisation of discretionary or, in some cases, restricted discretionary activities.

Two other (than Taranaki) councils, Tasman and Horizons, currently allow offshore seismic as a Permitted Activity, although not specifically as such noted in Tasman ("short-term noise" is permitted), whilst Horizons does specify seismic and requires compliance with the Code.

A number of regional coastal plans are currently under review, or reviews are about to be commenced, and in the light of recent offshore petroleum interest in several regions, appropriate provisions for the activity are likely to be promulgated. Several councils interviewed advised that seismic surveys would be, subject to due process, classified as a Permitted Activity as long as the Code's requirements were adhered to.

## **2 Review of Recent Survey Reports**

Since the original Code was promulgated in 2006, the Department has received numerous marine mammal observer reports.

These reports show that whilst there have been interactions between marine mammals and the surveys at times, in the main mammals approaching within the relevant "exclusion zone" thereby requiring shut-down of the guns (and fur seals would appear to be a major component of such reports), there has been no instance of death of, injury to, or measureable/significant behaviour change observed or recorded in marine mammals during surveys. The regular attraction of fur seals and dolphins at times to the survey vessel, and sharks reacting to the sound and water disturbance associated with the

hydrophones being towed behind the survey vessel (and biting through the streamers) has been frequently noted, with no observed injury to these species.

Refer to section 1.2 above.

### **3 Conclusions & Recommendations**

In summary of the above, and in light of the comprehensiveness of the current Code (albeit not mandatory for the CMA), it is apparent that there is little if anything that the Council could require, in terms of preventing significant environmental effects (aka marine mammal and other species' injury and possibly death) that would warrant a level of control and monitoring within its Regional Coastal Plan over and above the current Permitted Activity status.

Should Council wish to ensure the levels of protection for marine mammals and other sensitive wildlife as set out in the Code, it could require, by way of an additional condition within the Plan, that adherence to the Code is mandatory. Indeed one or more regional councils are considering such a move. Would this however impose upon Council more time and costs, in particular in terms of the requirement to monitor adherence to any such a condition? Indeed this question has been raised by one other Council looking at the option (West Coast). The answer is "no" – it would be a simple matter for the Council to interrogate both the proponent of the seismic survey, and the Department, as to whether or not the Code is being followed. It is suggested that no further monitoring by Council would be needed in order to satisfy the requirement for monitoring of any regulatory provision, including a rule in a Plan.

It is also more than apparent from operator behaviour over at least the past six or so years that every seismic survey bar one has been undertaken pursuant to the Code, as if it were mandatory, and there is no reason to surmise that this situation would ever change.

As a consequence, it is recommended that the Council retain the current Permitted Activity status for marine seismic surveys with its CMA, subject to the existing conditions but with the addition that adherence to the Code is mandatory. For the purposes of ensuring compliance with the Code, the Council should require the operators of seismic surveys to forward to it the mandatory reports which are currently sent to the Department of Conservation.

The following is suggested as appropriate wording for the Rule:

*Seismic surveys of the coastal marine area for the purpose of petroleum prospecting –*

- 1. The survey does not involve the use of explosives;*
- 2. The survey does not directly involve the physical disturbance of the foreshore or seabed;*
- 3. The survey is undertaken in accordance with the most recent version of the Department of Conservation's "Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations";*
- 4. The Operators is to inform the Council when the survey is to begin, and the duration of the survey;*
- 5. The Operator is to provide the Council with a Marine Mammal Observer report at the completion of the survey; and*

6. *The survey is not conducted in an area that is used by marine wildlife for breeding purposes during the time that breeding is occurring.*

### **3.1 A comment about the West Coast North Island marine mammal sanctuary**

One concern that could potentially be raised with regard to the Council deciding to retain the Permitted Activity status for offshore seismic is that of Maui's dolphin – a denoted Species of Concern within the Code.

Section 3.2 of the Code notes however that:

*"Under normal circumstances marine seismic surveys will not be planned in any sensitive, ecologically important areas or during key biological periods where Species of Concern are likely to be breeding, calving, resting, feeding or migrating, or where risks are particularly evident such as in confined waters (for example, embayments or channels). However, where conducting surveys in such areas and seasons is demonstrated to the satisfaction of the Director-General to be necessary and unavoidable, further measures<sup>2</sup> may be required to minimise potential impacts. In these instances, proponents will seek advice from the Director-General to develop and agree on mitigation strategies for implementation. This should lead to the development of an appropriate marine mammal mitigation plan for use by observers and crew to guide operations."*

Further, section 3.6 of the Code stipulates that:

*"No person may carry out a marine seismic survey within a Marine Mammal Sanctuary (MMS) unless he or she has, at the earliest opportunity but not less than three months before commencing the survey:*

- *Notified the Director-General in writing of his or her intention to carry it out*
- *Submitted a written environmental impact assessment, and subsequently*
- *Agreed to comply with any additional conditions, such as increasing the mitigation zones or number of qualified observers required, imposed by the Director-General for operating in a MMS."* [my underlining]

As a consequence, with specific regard to Taranaki and the West Coast North Island marine mammal sanctuary, which was specifically established to protect these critically-endangered dolphins, any potential issues are sufficiently covered off within the Code and the Department's management of the regime such that the Council need not impose further conditions and restraints.

**Dr Mike Patrick**

**May 2015**

# **APPENDIX 1**

A Brief Summary of The Author's Experience in the Petroleum  
Industry

Dr Patrick has spent thirty five years involved with the oil and gas exploration and production industry in New Zealand, as follows:

#### As a regulator

Seven years (1981-88) at the former Taranaki Catchment Commission & Regional Water Board, now the Regional Council. During this time onshore exploration and development was "in full swing", requiring of environmental consents (then called water rights). There were also several offshore developments at the time, including the installation of rock protection of the Maui pipelines. Lead the various teams involved with undertaking background and project-specific environmental investigations, consenting, and monitoring of the industry.

Four years at the former Maritime Safety Authority, now Maritime NZ (1996-99), as manager of the development and maintenance of the National Marine Oil Spill Response Strategy and associated National Contingency Plan, and was responsible for approving regional marine oil spill contingency plans. Also lead the MSA team involved in approval of offshore petroleum drilling and developments pursuant to the relevant environmental provisions of the Maritime Transport Act and associated Marine Protection Rules, many of which he was involved in drafting. This included the first FPSO in New Zealand (Maui B). He represented New Zealand at the International Oil Pollution Compensation Fund in London. More generally, also approved marine dumping permits in the EEZ, in the main involving the dumping of fish waste, dredge spoil and derelict vessels. Also prepared the initial NZ Guidelines for Sea Disposal of Waste (1999), which set out the requirements for obtaining a marine dumping permit within the MTA regime, including sampling and testing protocols and methodologies pre-dumping and for later monitoring.

#### As an industry representative

Seven years (2000-2006), the Executive Officer and sole employee of the Petroleum Exploration and Production Association of NZ, during which time he was deeply involved in any and all developments, legislative and otherwise, that affected the industry, including representing the offshore industry in the development of the original Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations. Also the representative of the offshore industry in the Oil Pollution Advisory Committee, a statutory advisory body to Maritime NZ.

#### As a consultant

Sixteen years as an environmental consultant to the industry (1988-1995; 2006-present), in particular in the offshore sector, including obtaining resource and marine consents, preparing marine mammal impact assessments, auditing operations and facilities against the relevant environmental standards (many internal to the client), and providing environmental-related advice subject of legislative regimes other than the RMA or EEZ & CS Act (Marine Mammals Protection Act, Wildlife Act, Biosecurity Act, the HaSNO Act *et al*). This included representing the offshore industry players in the development of the Exclusive Economic Zone & Continental Shelf (Environmental Effects) Act 2012. Joined PEPANZ as a member during this time, and assisted them with all environmental-related activities, including review of the original seismic Code, and development of further iterations.

Also undertook considerable work in the CDEM arena, in particular reviewing and auditing systems, structures and arrangements against legislative requirements and international best practice, and is therefore very familiar with all aspects of emergency management, prevention & response including under the HSE Act and Regulations.