

## **Observer Training Courses – Model Curriculum**

### **1 Background**

It is expected that two separate courses would be developed depending on whether candidates were seeking to become Marine Mammal Observers (MMO) or Passive Acoustic Monitoring (PAM) operators. These would feature common areas for both categories of observer as well as more detailed requirements for each discipline. However, since the two roles are complimentary it is important that any person acting in a particular observational capacity (either MMO or PAM) should have an understanding of the basic concepts of each others' disciplines. Therefore, the MMO course needs to include a theoretical module with key introductory information about PAM operation, and vice-versa. Candidates seeking to qualify as both MMO and PAM operators would not need to repeat common modules – indeed, training providers may opt to develop integrated courses that provide full instruction in each discipline.

It is anticipated that the time requirements for these courses could be of the order of two weeks. Courses must include relevant practical instruction in field conditions, with formal assessment of competency through examination, and may potentially be conducted anywhere in the world providing relevant standards are met.

Where appropriate, theoretical subject matter could be taught, and potentially even assessed, online or by other remote learning in advance of the practical components. This could facilitate more convenient, cost-effective and timely educational processes.

For experienced observers, it may only be necessary to demonstrate competence through the examination process. This could be enhanced by development of an intensive workshop of comparatively limited duration (1-3 days), completed immediately prior to examination.

#### **1.1 Tuition Staff**

It is important that those responsible for delivery of training have relevant qualifications, background and experience in relation to the components they are teaching.

This is particularly relevant for subjects related to observer duties and performance. Those engaged to provide training in these areas should be able to demonstrate significant offshore experience, as lead MMO/PAM Operator or equivalent.

#### **1.2 Training Objectives**

The objective of these observer training courses is to ensure that trained observers can meet the standards articulated in the Code when they are engaged in their respective professional capacities on marine seismic surveys. The relevant standards are as follows.

## **2 Observer Standards in the Code**

Those successfully completing observer training courses and passing the assessment process are expected to be able to perform to the following standards as a minimum.

### **2.1 MMO Standards**

The standards for being considered a trained marine mammal observer include demonstrating proficiency in the following areas as minimum requirements:

- Understanding mitigation and reporting requirements under the Code
- Measuring distance, true speed and direction of travel of marine mammals and vessel movement
- Navigation (eg true vs magnetic north, course vs heading)
- Plotting positions of marine mammals in relation to vessel and acoustic source
- Detection and identification of NZ marine mammal species, and behaviour/activity assessment
- Understanding relevant aspects of seismic survey operations

While engaged in observation duties onboard seismic survey vessels, qualified marine mammal observers are expected to be able to use the following tools effectively:

- Reticle binoculars and/or sextant for medium to long range (>500m) distance determinations
- Measuring sticks (in addition to sextant or reticle binoculars) for short range distance determinations
- Angle boards and compass for bearing determinations from vessel
- GPS to record vessel co-ordinates accurately and download track logs

### **2.2 PAM Operator Standards**

The standards for being considered a trained PAM operator include demonstrating proficiency in the following areas as minimum requirements:

- Understanding mitigation and reporting requirements under the Code
- Optimised deployment, and configuration of PAM equipment to ensure effective detections of cetaceans for mitigation purposes
- Detection and identification of vocalising species or cetacean groups
- Measuring distance and bearing of vocalising cetaceans while accounting for vessel movement
- Navigation (eg true vs magnetic north, course vs heading)
- Plotting positions of cetaceans in relation to vessel and acoustic source
- Understanding relevant aspects of seismic survey operations

### **3 Subject Area Headings and Content**

Training courses should enable prospective MMO and PAM operators to demonstrate competence in the following areas (not appearing here in any particular order) according to the standards articulated in the Code, as a minimum.

#### **3.1 NZ Law & Requirements of the Code**

1. Marine Mammal Protection Act 1978
2. Marine Mammal Sanctuaries
3. Primary objectives of the Code:
  - 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
4. Key features of the Code:
  - Recognition of three levels of surveys depending on scale and potential effects determined according to the notified operational capacity of the acoustic source array;
  - Specific mitigation measures for Level 1 & 2 surveys for marine mammal groups according to sensitivity, with three defined 'mitigation zones';
  - Increased focus on notifications of surveys to provide for pre-survey planning engagement with departmental officials;
  - Requirements for Marine Mammal Impact Assessments (MMIA) covering entire operational area to be submitted to the Director-General;
  - Sound transmission loss modelling required as part of the MMIA for operations in Areas of Ecological Importance or Marine Mammal Sanctuaries, with scope for additional mitigation measures as specified by the Director-General;
  - Requirement for 2 qualified & independent MMO, and 2 qualified & independent PAM operators, on all Level 1 surveys;
  - Requirement for 2 qualified MMO on all Level 2 surveys;
  - Requirements for operating in poor sighting conditions or at night, or in new areas within the survey;
  - Provisions for marine mammal observations at all times while the acoustic source is in operation;
  - Limitation of individual observer effort to 12 hours in any 24 hour period;
  - Development of observer training, performance and reporting standards;

- Expanded recording and reporting requirements, including data on all marine mammal observations regardless of location;
  - Recommendation to consider impacts on other marine species and habitats at the planning stage, and to record observations where possible;
  - Prohibition on the use of explosives as acoustic sources; and,
  - Focus on industry responsibility for research
5. Application of the Code, NZ Continental Waters
  6. Acoustic source capacity vs underwater sound

### **3.2 Trained vs Qualified Observers**

1. 12 week NZ experience
2. Mentoring
3. Interim provisions

### **3.3 Role of the Qualified Observers**

1. Compliance *and* science (Noting the primary purpose of ensuring operational compliance with the Code)
2. Effective communications between observers and with crew (Establishing within the 'Chain of Command', agreeing detection/mitigation procedures – with Party Chief or other seismic crew and between MMO/PAM)
3. Briefings
4. Authorities
5. Duties
6. Effort
7. Working with and positively influencing crew
8. Alternative deployment in fleet
9. Crew observations
10. Standardised data collection
11. Mitigation Zones
12. Pre-start observations (new location, good vs poor sighting conditions/night)
13. Delayed starts & shutdowns
14. Reporting
15. Managing commercial pressures and on-board conflicts
16. Maintaining MMO effort during safety drills
17. Professional behaviour

### **3.4 New Zealand Marine Mammal Species**

1. Taxonomy
2. Identification
3. Distribution
4. Ecology
5. Habitats
6. Behaviour (including guidance on defining behaviour and understanding variability)
7. Marine mammal acoustics

8. Sensitivities to acoustic disturbance
9. Areas of Ecological Importance and potential additional mitigation measures<sup>1</sup>
10. Operational issues (Species of Concern & Other Marine Mammals)

### **3.5 General Seismic Operations Overview**

1. Purpose of seismic surveying
2. Terminology
3. Types of survey (2D, 3D, 4D, OBS, VSP)
4. Operational procedures & equipment
5. Testing (eg drop, bubble)
6. Ramp up/soft start procedures
7. Line turns/mitigation guns
8. Onboard systems (eg RobTrack, Orca, amongst others) and interpretation of data displays (eg navigation screens)
9. Chain of Command on-board (including necessity of establishing communication protocol between qualified observers and Party Chief or other appropriate crew)

### **3.6 Vessel Health & Safety**

(This module is not intended to replicate any areas that would normally be included in offshore survival or emergency training required by industry for offshore operations, such as BOSIET or STCW.)

1. Overview of vessel operations
2. Personal safety
3. Emergency procedures
4. Personal Protective Equipment
5. High voltage systems (for PAM operations)
6. Industry requirements for appropriate offshore survival and medical fitness certificates
7. Writing, reviewing and modifying risk assessments and procedure documents

### **3.7 Navigation**

1. Basic vessel navigation principles (heading, course, true speed etc)
2. Compass use (including magnetic deviation and variation)
3. Positions in relation to moving vessel and acoustic source
4. GPS use, format, units, downloading (track logs) and accounting for GPS antenna position in relation to acoustic source
5. Plotting positions, projections, track logs, transferring true plots to report form

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<sup>1</sup> Further measures may include, for example, additional observers or observation platforms, aerial observation, acoustic source power restrictions, extending pre-start observations for deep-diving species, deployment of static PAM equipment in sensitive areas, or designing the survey so as to avoid trapping marine mammals in confined areas such as narrow, constricted sea ways.

### **3.8 Weather & Environmental Conditions**

1. Sighting conditions (outlining potential effects on ability to observe/detect marine mammals, and relevance of collecting information of direct relevance to data use)
2. Beaufort sea state
3. Cloud cover
4. Swell/wave height (for the purposes of the Code, crest to trough)
5. Wind strength
6. Visibility

### **3.9 Visual Observations**

(This module must be in comprehensive detail for MMO course; though only a conceptual outline is required for PAM course. For MMO course must include practical instruction in vessel based field operating conditions, with ground-truth testing of participant distance/bearing estimations.)

1. Standards in the Code
2. Watch-keeping (including use of optimum vantage points with unimpaired vision, scanning techniques, right-to-left observation method, detection procedures, fatigue management, avoiding distractions)
3. Sextants (lightweight plastic Davis Mark 15 or alloy Astra IIIB recommended as minimum for operational use in field conditions)
4. Reticle binoculars (including 'mil' scale standardisation)
5. Measuring Sticks
6. Eye Estimations
7. Angle boards and compass use
8. Accounting for height of observer
9. Accounting for distance to acoustic source
10. Estimating mitigation zone boundaries on the water in relation to the acoustic source
11. Thermal imaging & high resolution digital photography<sup>2</sup>
12. Other technologies<sup>3</sup> (including practical limitations, eg laser range-finders, infra-red)
13. Use of marine mammal identification keys
14. Recording initial and subsequent behaviour
15. Benefits of using dedicated hand-held GPS units to assist visual observations

### **3.10 PAM Operations**

(This module must be in comprehensive detail for PAM course; though only a conceptual outline is required for MMO course. For PAM course, must include practical instruction on at least one PAM array<sup>4</sup> deployed from a vessel in field operating conditions.)

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<sup>2</sup> May be theory only.

<sup>3</sup> May be theory only.

<sup>4</sup> A theoretical introduction to the key functional/operational characteristics of the range of common, commercially available equipment is required. However, reflecting the practical difficulties of

1. Standards in the Code
2. Importance of bioacoustician training and experience in system design and set-up
3. Static and towed systems
4. Array design (appropriate broadband element frequencies, relevant sound data acquisition frequencies for NZ species, Nyquist Theorem)
5. Single vs multiple strings
6. Redundancy
7. Left/right ambiguity
8. Commercially available systems (eg Seiche, MSeis, Vanishing Point, Ocean Science Consulting, outlining operational features, specifications and differences)
9. Deployment and optimisation (in relation to specific circumstances of vessel and seismic array)
10. Calibration & testing
11. Software (notably industry standard PAMguard recommended, but also IFAW, Ishmael, RavenPro, Logger, others as appropriate) including practical instruction on key features
12. Operation
13. Detections (monitoring, software aided)
14. Acoustic sample analysis and filtering
15. Saving data (techniques to assist operations, automatic saving, buffering, or for reporting purposes)
16. Identification of species or cetacean groups
17. Distance/bearing estimation (including factors affecting variability) & plotting positions
18. Calibrating detections with visual observations
19. Watch-keeping (including 'listening' techniques, detection procedures, fatigue management, distraction management, maintaining focus on detections)
20. PAM alternatives
21. Limitations of PAM technology
22. Simulation modelling software
23. Importance of ongoing training
24. Vessel self-noise assessment
25. Pre-survey planning (clearly define objectives of PAM, determine species of particular interest/concern, identify appropriate mitigation zone performance expectations, determine process for calling for a PAM initiated shut-down)

### **3.11 Recording and Reporting**

1. The standardised NZ Report Form (Excel based)
2. Units
3. Determination of 'confidence' in identification (underlining need for realistic assessment of certainty, and resisting the tendency/pressure to assign a positive identification without having high confidence)
4. Operations

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providing access to multiple technologies, competency need only be demonstrated on a single system deployed from any suitable vessel.

## *Department of Conservation*

*2012 Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations  
- Model Curriculum*

5. Effort
6. Recording sightings - 'On-survey' (while acoustic source is in the water in the operational area) and 'Off-survey' (at any other times)
7. MM Sightings
8. Other sightings
9. Differentiating data on NZ fur seals for practical efficiency
10. Acoustic source activities, including exceeding notified operational capacity
11. Generating pivot tables within the standard NZ Report Form for daily, weekly and trip reporting (opportunities, functions and advantages)
12. Submission of summary trip report
13. Submission of raw data sheets
14. Requirement to inform DOC immediately if higher numbers of cetaceans/Species of Concern encountered than indicated in Marine Mammal Impact Assessment
15. Reporting non-compliance (both immediate requirements and in the summary trip report)
16. Communicating with Department of Conservation to ascertain correct measures in instances of ambiguity or uncertainty.
17. Maintaining personal records/log books for training, qualifications and sea-time (signed off by vessel masters)

### **3.12 Assessment/Examination**

1. Demonstration of competence in all above areas
2. Trained observers recognised for results of 75% and above
3. Reassessment procedures for those initially scoring less than 75%
4. Certification/personal log book stamp

### **3.13 General Observer Issues**

(Optional module, but seen as potentially adding significant value)

1. Living and working offshore (practical advice for life onboard a commercial vessel, eg facilities on board, shop, gym, laundry, library, luggage weight limits, internet access, communications to shore)
2. Appropriate personal conduct on board
3. Other potential observer roles outside the scope of the Code (non-seismic activities, eg pile driving, offshore renewable energy projects, navy sonar testing, well head removal and use of demolition explosives).
4. Benefits of joining a professional industry association for ongoing support, mentoring, professional/career development. Key benefits may include:
  - Providing a means for employers to identify observers
  - Representation of member interests to industry
  - Working with regulators to represent member interests
  - Providing a platform to bring independently working observers together as community, where experienced observers can discuss or highlight any issues they encounter, give or seek advice from other members, and for networking.
  - Providing a central information directory for resources such as research papers, guidelines, PAM, or training courses to support observation work.