VIC-9000-ENV-PLN-00007

Integrated Gas

CROWES FOOT 3D MARINE SEISMIC SURVEY

Environment Plan Summary

Review record

Rev	Date	Reason for issue	Author	Reviewer/s	Approver
0	13/11/2015	Issued to NOPSEMA	T. Hatfield		E. Brand
1	01/12/2017	Issued to NOPSEMA - Revised EP	C. Bignill	S. Cornish	Z. Brooking
2	14/12/2017	Issued to NOPSEMA	C. Bignill	S. Cornish	Z. Brooking

THE THREE WHATS

What can go wrong?
What could cause it to go wrong?
What can I do to prevent it?

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1. Introduction

Origin Energy Resources Limited (Origin) is proposing to undertake the Crowes Foot three-dimensional (3D) marine seismic survey (herein referred to as the 'survey') in the Otway Basin off southwest Victoria in exploration permits Vic/P69 and Vic/P43. The survey will predominantly be undertaken within Vic/P69 but will ingress Vic/P43 in order to produce seamless data coverage with existing seismic surveys.

The full fold coverage area for the survey (the 'acquisition area') will cover up to approximately 930 square kilometres (km^2) in water depths ranging from approximately 35 metres (m) to 90 m. Surrounding the acquisition area is an 'operational area', used for conducting operations ancillary to achieving coverage within the acquisition area.

At its nearest boundaries, the acquisition area for the survey is located 6.3 km (3.4 nm) southwest of Moonlight Head, Victoria and 66.8 km (36.1 nm) northwest of the northern tip of King Island, Tasmania (Figure 1).

The survey is expected to take place over approximately six weeks during the period 1st October to 31st January, 2015/16 or 2016/17. Exact timing is contingent on the confirmation of contractor resources and fair sea state conditions suitable for marine seismic acquisition.

The Environment Plan (EP) for the activity was approved by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on the 22th of November 2017.

2. Proponent

Origin Energy (ASX: ORG) is the leading Australian integrated energy company with market leading positions in energy retailing (approximately 4.3 million customers), power generation (approximately 6,000 MW of capacity owned and contracted) and natural gas production (1,093 PJ of 2P reserves and annual production of 82 PJe). To match its leadership in the supply of green energy, Origin also aspires to be the number one renewables company in Australia.

Through Australia Pacific LNG, its incorporated joint venture with ConocoPhillips and Sinopec, Origin is developing Australia's biggest CSG to LNG project based on the country's largest 2P CSG reserves base.

In the Otway Basin, Origin operates the:

- Otway Gas Plant, which processes and distributes gas from Origin's Geographe and Thylacine fields. The infrastructure consists of the Thylacine remotely-operated (unmanned) wellhead platform and a 70 km gas pipeline to the shore, together with onshore pipeline. The Geographe field ties into the Thylacine pipeline. The plant produces an average of 60 petajoules [PJ] per annum, 800,000 bbl of condensate and 100,000 tonnes of liquefied petroleum gas (LPG). Origin has a 67.23% stake in the development, which commenced production in mid-2007.
- Mortlake Power Station, a 550 MW gas-fired open cycle power station (the largest in Victoria), connected to the Otway Gas Plant by an 83 km gas pipeline. First generation of power commenced in early 2012.

Origin is also in the process of developing the Halladale and Speculant gas fields, located in Victorian state waters (Vic/L1(V)) west of Port Campbell, that will tie in to the Otway Gas Plant.

Origin's gas exploration and production portfolio includes acreage in the Otway, Bass, Cooper/ Eromanga, Surat, Denison, Perth, and Bonaparte Basins in Australia, the Taranaki, Northland, and Canterbury Basins of New Zealand.

3. Location

The area defined as the 'acquisition area' is located entirely within Commonwealth waters of the Otway Basin, with the coordinates provided in Figure 1. The acquisition area is the polygon of full fold coverage, which is 873 km^2. At its nearest point, the acquisition area is 15 km south of Princetown and 24 km south of Port Campbell.

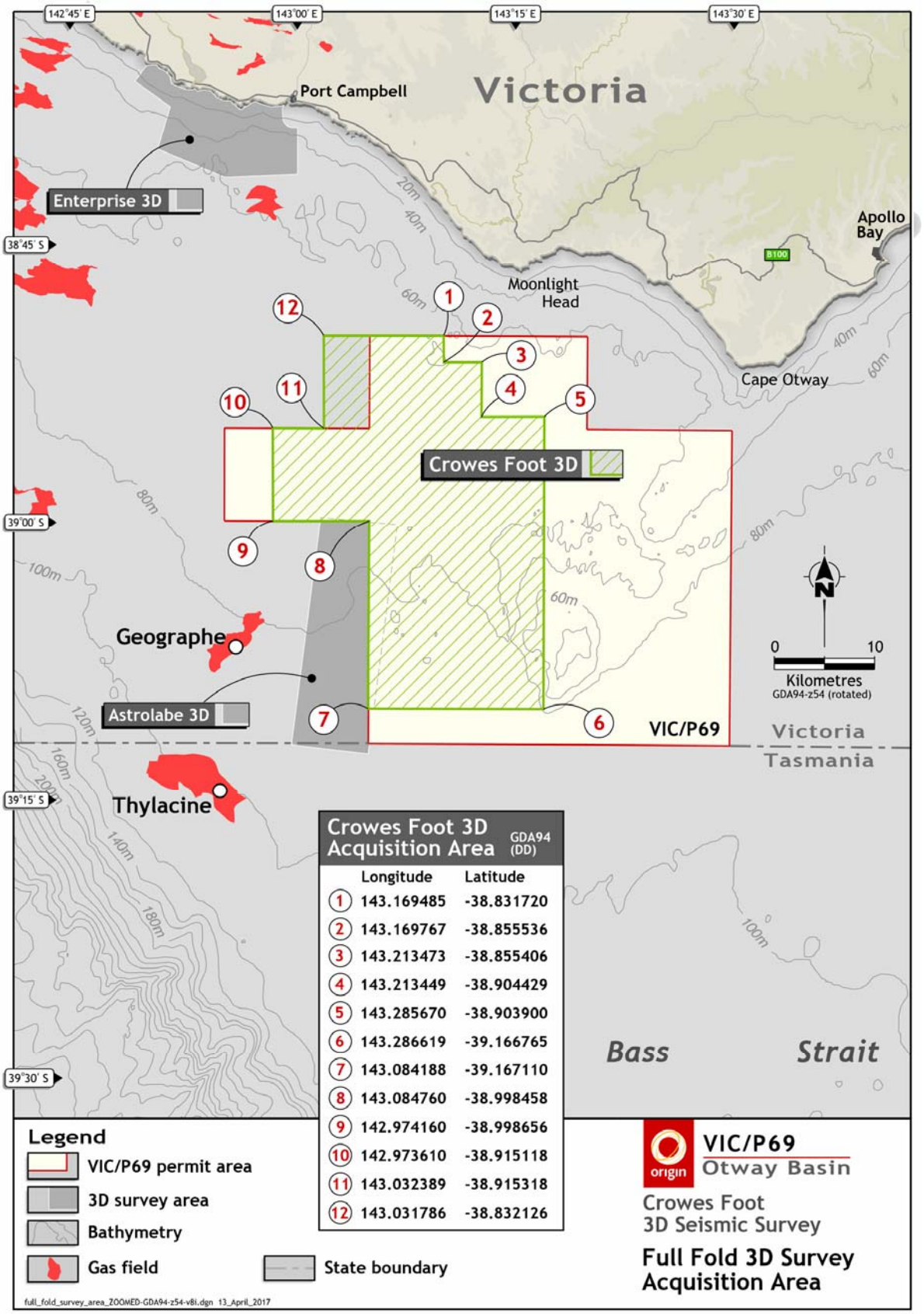

Figure 1. Crowes Foot 3D marine seismic survey location

The area defined as the 'operational area' is the physical area used for conducting operations ancillary to achieving coverage within the acquisition area, which generally encompasses a 10 km buffer around the acquisition area, though following the state waters boundary to the north. The operational area is 2,450 km^2. Activities conducted in the operational area include vessel approach, vessel turns, testing of the seismic source and miscellaneous maintenance operations. The vessel may sail beyond the operational area boundaries, including for vessel turns, during times of unfavourable environmental conditions (weather, currents, etc) or due to operational constraints (equipment maintenance/repair, obstructions, etc.). However, the source will not be activated outside the operational area.

The water depth of the operational area varies between 35 m to 90 m, with the deepest water depths situated in the south. The proximity of the acquisition area to key features in the region is listed in Table 1.

Table 1. Distance to key features in the region

Locality	Distance from acquisition area
Nearest landfall (Moonlight Head)	6.7 km (3.6 nm) north
King Island	69.5 km (37.5 nm) southeast
Commonwealth Marine Reserves	
Apollo	14.5 km (7.6 nm) east
Zeehan	69.4 km (37.2 nm) south
Victorian Marine Reserves	
Twelve Apostles Marine National Park	7.6 km (4 nm) north
The Arches Marine Sanctuary	21.3 km (11.5 nm) north
Marengo Reefs Marine Sanctuary	30 km (16.2 nm) east
Coastal towns	
Princetown	15.2 km (8.2 nm) north
Port Campbell	23.4 (12.6 nm) north
Peterborough	25.3 (13.6 nm) north-northwest
Oil and gas infrastructure	
Otway gas pipeline	Intersects both permits, but 1 km west of acquisition area at its closest point
Casino gas pipeline	12.5 km (6.7 nm) northwest
Minerva gas pipeline	15 km (8 nm) north

4. Activity Description

4.1 Timing

Origin has selected a survey window (1st October to 31st January in permit year 2015/16 or 2016/17) that balances operational requirements with environmental and socio-economic constraints, using recent past survey experience in the Otway Basin as a guide. Key considerations for survey timing are as follows:

- Sea state conditions optimal for survey occur from October to April inclusive. Beyond this time, sea state conditions are generally too rough for seismic acquisition. DITR (2005) verifies this by stating that in the Otway Region, seismic surveys can only be conducted outside of the winter season (May to September, inclusive) in order to escape the sound interference created by strong winds and waves.
- The peak pygmy blue whale feeding aggregation period near the operational area occurs from February to March (with a non-peak period either side of these months), which is outside the proposed survey window.

- Southern right whale peak mating and calving period occurs from mid-July to end of August, outside the proposed survey window.
- The rock lobster fishery opens on 15 November, so there is potential for overlap of activities if the Crowes Foot seismic survey occurs after this date.
- Australian fur-seals breed and feed during the proposed survey window, but this occurs onshore.
- Little penguins are present in the region year-round, with breeding occurring over the summer months.
- The Bonney Coast upwelling, with associated aggregations of krill that form an important feeding resource for the pygmy blue whale, peaks from December to April.
- Two recent seismic surveys undertaken by Origin in areas adjacent to the proposed Crowes Foot survey were conditioned by a Commonwealth regulatory agency to take place only in November and December (which were subsequently successfully undertaken during this these months).
- The first attempt to undertake the Astrolabe seismic survey during February 2010 had to be postponed due to the high number of whales encountered. This experience has been factored into 'lessons learned' for the planning of seismic surveys in nearshore areas of the Otway Basin.

DITR (2005) notes that in the Otway Basin, there is no clear period when seismic can be undertaken that will not overlap with other commercial uses of the area or periods of increased environmental sensitivity. Origin believes that the factors outlined above combine to make October to January the most suitable time to conduct the Crowes Foot seismic survey.

4.2 Survey Programme

The survey proposed by Origin is a typical 3D seismic survey similar to most others conducted in Australian marine waters (in terms of technical methods and procedures). No unique or unusual equipment or operations are proposed.

The survey vessel will acquire the seismic data by towing two acoustic source units operating alternatively, one discharging as the other recompresses. Each unit consists of up to 3 arrays of various sized airguns. There will be 6 to 14 hydrophone 'streamer' cables approximately 6,000 m long and 100 m apart towed behind the vessel at 6-50 m below the water surface (depending on bathymetry). The vessel will tow back and forth across the acquisition area in sail lines that are approximately 400m (8 streamers) to 600m (12 streamers) apart.

A series of acoustic pulses (discharged every 8 to 10 seconds) will be directed by the source down through the water column and seabed. The released sound will be attenuated and reflected at geological boundaries and the reflected signals are detected using hydrophones arranged along the streamers that are towed behind the vessel at an approximate depth of 6 m and 50 m. The reflected sound is evaluated to provide information on the structure and composition of the geological formation to identify and map hydrocarbon reserves below the seabed (Figure 2).

The survey will be conducted 24 hours a day except when sea states exceed operational parameters (~4.5 m significant wave height).

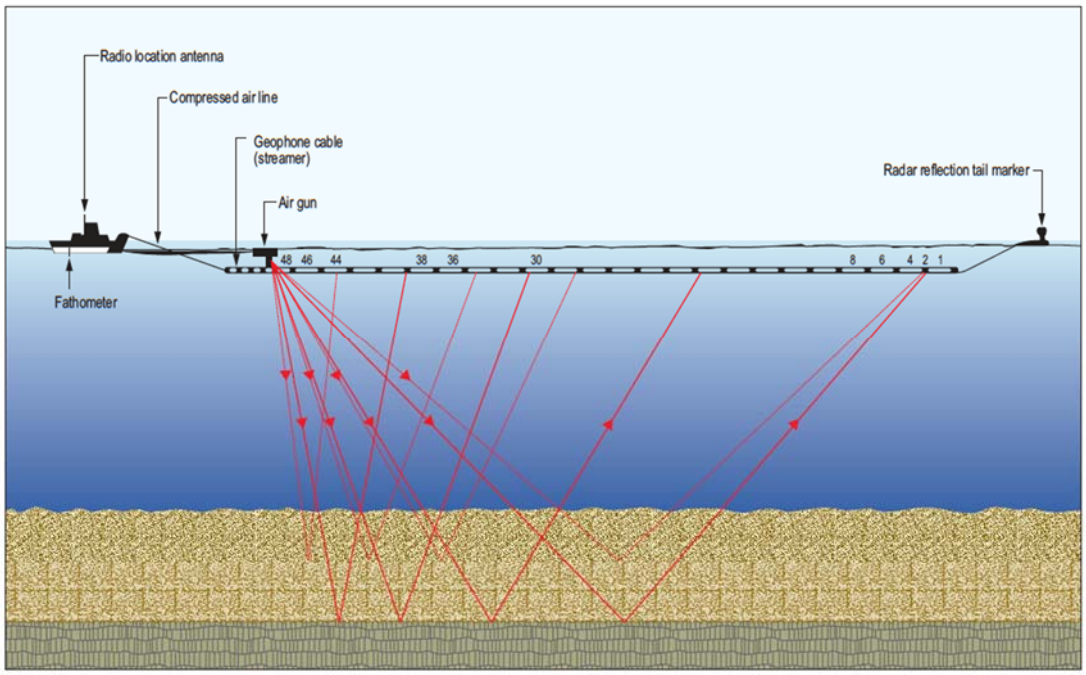

Figure 2. Typical marine seismic survey reflection schematic

4.2.1 Line Turns

The proposed survey will use the conventional methods of data acquisition where data is acquired along straight lines within the acquisition area, with air guns in use as the vessel turns (outside of the acquisition area) and runs into the next line. The number of sail lines has yet to be finalised, but is likely to be between 50 and 80 (dependent on streamer configuration), spaced approximately 400-600m apart. The orientation of the sail lines is yet to be decided, but is likely to be north-south.

4.2.2 Air Guns

The seismic energy source consists of individual airguns arranged in an array. The airguns in the array are strategically arranged to direct most of the sound energy vertically downward. The exact parameters of the airgun arrays will be finalized after Origin has chosen its seismic contractor. A generic description of possible airgun arrays is provided here and is meant to give the reader a sense of the range of array parameters that may be used.

The total volume of the airgun arrays utilized in the survey will be between 2,500 to 3,300 in^3, with a nominal operating pressure of 2,000 pounds per square inch (psi). The array will be towed at depths ranging from 5-8 m, approximately 100 m to 150 m astern of the seismic vessel.

The acoustic sources are suspended at a controlled depth and nominally generate an acoustic pulse every 18.75 m or approximately every 8-10 seconds. The distance and time between acoustic pulses may be adjusted if this will result in improved data.

4.2.3 Streamers

The streamers will be approximately 6,000 m in length with separations of 100 m between each (Figure 3). Each streamer will have depth controllers and emergency recovery units, and may have further positioning and steering units positioned not more than 600 m apart along the streamer length. The emergency recovery unit is a device attached to the streamer at intervals of ~300 m. It senses if the streamer sinks below a pre-determined depth, and in such events, deploys an automatic pressure-activated airbag to float the streamer back to the surface.

The streamers will be towed between 6-50 m under the water's surface, however, if deep streamer technology is available and the bathymetry of the selected acquisition area allows their use, the streamers may be tapered to depths less than 50 m. Streamers will not be deployed within 15 m of the seabed so as to avoid seabed features such as rocky reefs and shipwrecks. Spot checks of bathymetry will be performed using a standard onboard echo-sounder (essentially a 'fish finder') to validate the accuracy of the admiralty charts and ensure that streamer depths are appropriately set to avoid seabed features. Based on previous seismic surveys undertaken in the region, Origin notes that the admiralty charts are known to be very accurate.

An overall streamer spread width of between 700 m (8 streamers) and 1,100 m (12 streamers) is controlled by adjusting the rope lengths towing the barovane doors with an overall separation from door to door of approximately 900 m (8 streamers) to 1,300 m (12 streamers).

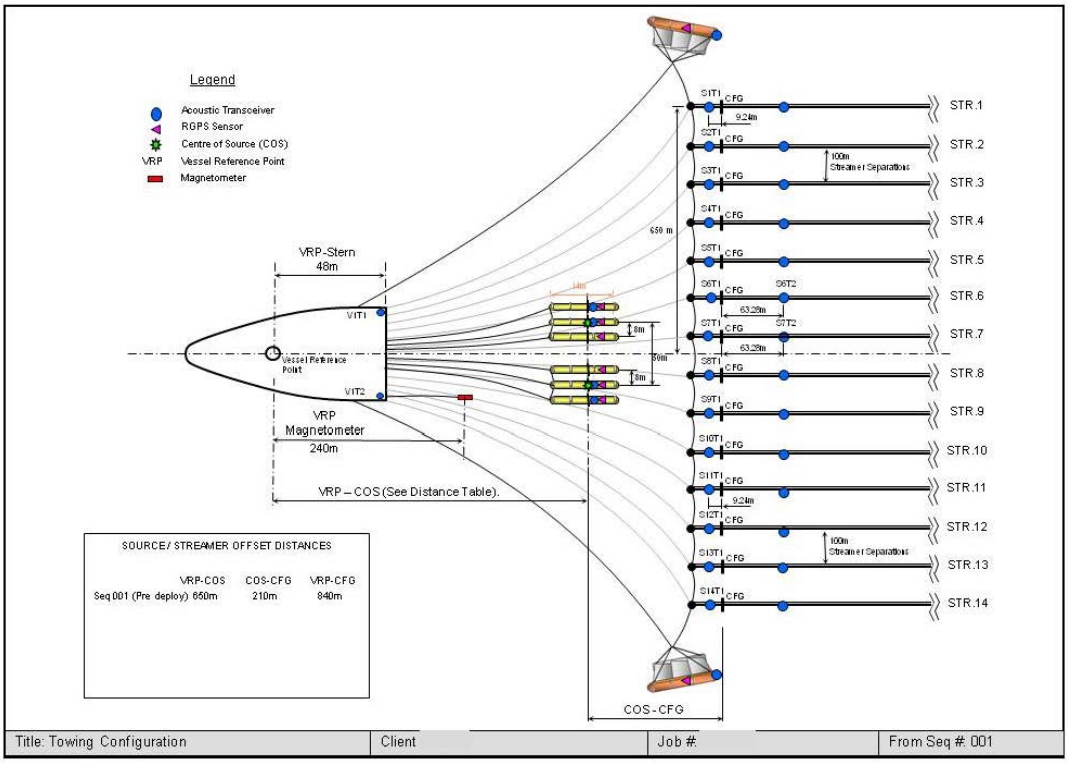

Figure 3. Typical towing diagram. As supplied by PGS.

The streamer medium will be either a solid foam construction or gel-filled. The streamers will display appropriate navigational safety measures such as lights and reflective tail buoys.

4.2.4 Data Collection and Analysis

The data is measured by hydrophones in the streamers and transmitted by fibre optics to the recording room on the seismic survey vessel. The data is checked by the processing department for quality control and merged with navigation data to correctly position the data in time and space. The processing methods conducted onboard check that the data has been acquired to a satisfactory quality.

After the data is successfully acquired it will be further processed to obtain a 3D image of the sub-surface geology. The 3D image of the subsurface is then interpreted by Origin geoscientists to assess gas prospectivity.

4.3 Vessels

4.3.1 Survey Vessel

The survey will be conducted using a purpose-built seismic vessel with support duties provided by at least at least two smaller dedicated vessels. The survey vessel will be approximately 100 m in length and approximately 40 m wide and carry up to a total of 70 persons. While the specific survey vessel that will be used for this survey is yet to be determined, it is likely to be similar to the *MV Polarcus Asima* contracted by Origin for the 2014 Enterprise 3D seismic survey in the Otway Basin (Figure 4).

Figure 4. The *MV Polarcus Asima* during the Enterprise seismic survey

Given the duration of the survey, all vessels may require refuelling in order to complete the survey. All vessels will bunker with marine diesel. The survey vessel will undertake refuelling either at sea and/or in port.

4.3.2 Support Vessels

At least two vessels will support the survey vessel, and will be comprised of a guard vessel and at least one smaller scout vessel. Preference will be given to engaging local vessels for these support roles.

The guard vessel will be approximately 30 m in length and approximately 10 m wide and may carry up to a total of 15 persons. The guard vessel will be experienced with towing requirements.

The scout vessels will be approximately 20 m in length and 6 m wide, have a rope hauler and carry up to 7 persons. They will undertake scouting, marine mammal observation, chase duties and the removal of entanglement hazards as necessary for the safe conduct of the survey. The operators of the support vessels will be licensed to move any unattended fishing gear that may have been lost, drifted or been deployed in the area prior to, or during, the survey period. This avoids damaging fishing equipment and lowers risk of entanglement with the towed seismic equipment. The vessels will liaise with any fishermen nearby to minimise interactions between the survey and fishing.

4.3.3 Maritime Safety

The vessel and towed array of equipment will operate in accordance with the Convention on the International Regulations for Preventing Collisions at Sea (COLREG, 1972).

The guard vessel will actively monitor a safety zone around the survey vessel. The survey vessel operator will issue a vessel positioning notification to the Australian Hydrographic Service (AHS), who will in turn publish the survey location in the Notice to Mariners (published fortnightly). A daily Auscoast warning of the survey vessel's location will also be issued to all vessels by AMSA through the Global Maritime Distress Safety System (GMDSS) communication network. The warning will provide details of the safe distance to be maintained around the seismic survey vessel and towed equipment.

The Master and Officer of the Watch of the survey vessel are responsible for maintaining control of the seismic fleet vessel operations and for establishing and maintaining communication with other vessels and marine traffic during the survey. The support and guard vessels follow all instructions from the survey vessel and communicate with other marine traffic during the survey.

Supplementary to radar detection, the support and the guard vessels will have additional transmitting beacons fitted for the duration of the survey. The vessels will use either Automatic Identification System (AIS) transponders or radio global positioning system (GPS) transponders. The addition of this equipment and the data it transmits provides accurate real-time updates of the position of all project vessels relative to the survey vessel and the towed seismic spread.

All vessels will be capable of communicating and operating both on dedicated ultra-high frequency (UHF) working channels and or Maritime very high frequency (VHF) working channels (typically monitoring Channel 16 and working on 74).

4.4 Survey Summary

Table 2 summarises the proposed survey parameters.

Table 2. Summary of acquisition parameters for the proposed survey

Parameter	Detail
Earliest commencement date	1st October 2015
Latest end date	31st January 2017
Duration of survey	Approximately 6 weeks
Water depths	~35-90 m
Acquisition area	930 km^2
Operational area	2,450 km^2
Operating period	24 hours, 7 days per week
Survey exclusion period	February to September (inclusive)
Survey contractor	Polarcus
Air guns	
Total volume of single source array	2,500 – 3,300 cui
Source operating pressure	2,000 psi
Source interval	18.75 m horizontal distance (8-10 seconds)
Compressed air source depth	5-8 m
Lines/streamers	
Number of sail lines	To be confirmed, based on streamer configuration
Orientation	Nominal north-south, though other azimuths may need to be acquired to obtain full-fold data acquisition
Line separation	To be confirmed, based on streamer configuration
Number of streamers	6 to 14
Streamer length	Approximately 6,000 m
Streamer depth (approx.)	6-50 m depending on bathymetry
Streamer separation (approx.)	100 m
Survey vessel details	
Name	Unknown at time of writing
Vessel speed (up to)	8–9 km/hr (i.e., 4–4.5 knots)
Refuelling	At-sea and/or in port
Support vessels	At least 2

5. Stakeholder Consultation

Origin developed a Stakeholder Engagement Plan (SEP) to provide guidance on how to communicate and engage with stakeholders in the development of the Environment Plan for the proposed Crowes Foot 3D seismic survey. The SEP provides an operating framework and structured approach to our interactions with external stakeholders.

The SEP was developed with reference to NOPSEMA Information Paper (N-04750-IP1411): Consultation requirements under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (December 2014) and also best practice stakeholder engagement from the International Association for Public Participation (iap2).

In keeping with Origin's policies and APPEA's Principles of Conduct, Origin is committed to open, on-going and effective engagement with the communities in which it operates and providing information that is clear, relevant and easily understandable.

5.1 Stakeholder Consultation Objectives

The objectives of Origin's stakeholder consultation for the environment planning of the Crowes Foot survey are to:

- Engage with key stakeholders and the community in an open, transparent and responsive manner;
- Demonstrate to NOPSEMA and any other relevant government regulatory agencies that stakeholders have been consulted in line with the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*;
- Minimise community and stakeholder's concerns where practicable; and
- Build and maintain trust with stakeholders and the local community.

The objectives will be achieved by:

- Identifying stakeholders whose functions, interests or activities may be affected by the survey.
- Confirming, through consultation, the 'relevant persons' (stakeholders) in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* and engaging them at the earliest opportunity.
- Ensuring all affected stakeholders are informed about the proposed Crowes Foot 3D seismic survey project and their potential environmental and social impacts.
- Proactively providing informative, accurate and timely information.
- Ensuring impacted stakeholders are fully informed about the process for consultation and what Origin will do with their feedback in the development of the Environment Plan.
- Ensuring that issues raised by affected stakeholders are adequately considered, and where appropriate, responses to feedback are communicated back to them.

5.2 Stakeholder Identification

For the purpose of stakeholder consultation to support environment planning for the Crowes Foot survey, Origin has identified and consulted with "relevant persons whose functions, interests or activities may be affected by the activities to be carried out under the EP".

Stakeholders were initially identified using Origin's existing stakeholder database which has been built upon knowledge gained from its ongoing activities in the region/Otway Basin since 2000, including:

- Halladale and Speculant gas development (current)
- Enterprise 3D seismic survey (2014)
- Geographe pipeline installation (2013)
- Geographe drilling (2012-13)
- Astrolabe 3D seismic survey (2013)
- Speculant 3D transition zone seismic survey (2010)

Further research was also undertaken to ascertain whether there were any other stakeholders (not previously identified) whom may be impacted by the proposed survey. For example, where potential impacts or activities are unique to this particular project or location, Origin undertook additional steps to identify and verify whether there were other stakeholders to be engaged. Such additional research was primarily directed toward verifying relevant State and Commonwealth fisheries, therefore relevant professional fishers. Professional diving, recreational and tourism activities in the survey area were also reviewed to identify relevant stakeholders.

5.2.1 Identification of commercial fisheries

The operational area is overlapped by the jurisdiction of several Commonwealth and State-managed fisheries. In addition, the Offshore Constitutional Settlement arrangement (OCS) between the Commonwealth of Australia and the State of Victoria determines management of some fisheries outside of the geographic boundary of state and Commonwealth waters. For example, Southern Rock

Lobster fishery occurs beyond the 3nm boundary but is managed under this arrangement by the State authority.

(i) Commonwealth-managed Fisheries

Commonwealth fisheries are managed by Australian Fisheries Management Authority (AFMA), with Commonwealth fisheries operating from 3 nm of baseline out to 200 nm (the extent of the Australian Fishing Zone, AFZ). The operational area lies within an area encompassed by several Commonwealth-managed fisheries, these being:

- Bass Strait Central Zone Scallop
- Eastern Tuna and Billfish
- Skipjack (eastern)
- Small Pelagic (western sub-area)
- Southern and Eastern Scalefish and Shark
- Southern Bluefin Tuna
- Southern Squid Jig

(ii) State-managed Fisheries

Victorian fisheries are managed by Fisheries Victoria within the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and may overlap Commonwealth fisheries areas. The survey area lies within an area encompassed by several State-managed fisheries, these being:

- Victorian Rock Lobster
- Victorian Giant Crab
- Abalone
- Scallop
- Ocean general (snapper)

(iii) Verification of commercial fishing activity within the survey area

The Commonwealth and State managed fisheries outlined above were researched further to identify actual fishing effort within the operational area over the last five years. This research enabled determination of potential impact from the survey and subsequently, the verification of Origin's database of relevant commercial fishing stakeholders.

The ABARES Fisheries Status Report for 2012 (Woodhams *et al.* 2013) and 2013-14 (Georgeson *et al.* 2013) were reviewed and relative fishing intensity maps with the operational area overlaid were prepared. These data showed there had been fishing effort for Commonwealth trawl sector; shark, gillnet, hook; and squid jig and can be summarised as "relatively small fishing effort". Consistent with AFMA's confidentiality requirements, this description has been approved by AFMA to provide in this EP.

Data requests for actual fishing effort within the proposed survey and operational area over the last five years were made to Fisheries Victoria and AFMA. Consistent with respective privacy policies of Fisheries Victoria and AFMA, the data outputs did not include personal information of professional fishers, or any catch data.

Fisheries Victoria data showed fishing effort per fishery, by number of fishing events (showing intensity) and by location within the fishing grid used by Fisheries Victoria. This grid enabled a more granular view of fishing effort than the one degree cells used by ABARES. Origin prepared a map of this fishing effort and provided to Fisheries Victoria for verification, in addition to seeking their permission to provide to Seafood Industry Victoria (SIV) to support consultations.

AFMA data showed fishing effort per fishery, by number of vessels but they did not provide further data to enable more granular mapping of fishing effort which we understand is due to the general principle of not displaying data where there have been less than 5 vessels fishing ('5 vessel aggregation rule'). Data showed fishing effort in the operational area for: squid jig; shark, gillnet, hook; and southeast trawl. The fishing intensity was low being under 5 vessels for each fishery.

5.2.2 Identification of commercial fisher stakeholders

Origin consults with associations representing commercial fishers in southwest Victoria and directly with commercial fishermen, particularly where they are unable to be engaged via an association. Contact details are maintained, along with identification of fishing activities and locations.

Nevertheless, the data from Fisheries Victoria and AFMA was analysed, compared and reconciled with Origin's stakeholder database which includes information on previous fishing locations and fishing intention. Origin is confident that commercial fishing stakeholders have been identified and engaged. Refer to Appendix A for the stakeholder consultation log.

Notwithstanding the process of stakeholder identification outlined above, commercial fishers may leave the area and new fishers may enter the area based on their past fishing outcomes in different locations and their changing business objectives. Therefore, Origin will manage ongoing engagement with known stakeholders before, during and at the completion of the survey. Should any new stakeholders appear in the operational area, operational arrangements such as notice to mariners via AMSA, use of support boats, communications with known fishers who will be in the area and typically share this information, will be employed during the survey.

5.2.3 Marine-based Tourism

Recreational and tourism activities are extremely valuable foundations for the local and regional economy. Key activities include sight-seeing, surfing and fishing, however, these are generally land-based or near-shore activities and are unlikely to be impacted by the survey.

(i) Sight-seeing

The visual beauty of the rugged coastal cliffs and the surf beaches make up the primary attractions to the area. This part of the Victorian coastline is promoted nationally as the 'Shipwreck Coast.' The sheer vertical coastal cliffs attract tourism, as does the promise of seeing migrating whales, such as the southern right whale, from vantage points around Warrnambool.

The Great Ocean Road tourist drive facilitates most tourist visits to the region. Numerous self-guided tours (e.g., Great South West Walk), picnic facilities and coastal lookouts are provided along the coast, with camping sites, caravan parks, guesthouses, motels and hotels encouraging tourism stays in the area. A number of operators provide scenic helicopter flights around the Twelve Apostles coastal area. The Port Campbell visitor information centre provides visitors to the area with information on all these local attractions. Origin maintains regular engagement with the 12 Apostles Tourism and Business association and the Port Campbell visitor information centre and will provide both with information sheets on the survey in case they receive inquiries from tourists.

(ii) Surfing

The high energy of the ocean in western Victoria and high waves (associated with the rocky reefs) make this section of coastline ideal for surfing. Surfing is concentrated at Shelly Beach, Crumpets, Murrell's, Yellow Rock, Blacknose Point, White's Beach, Bridgewater, Water Tower, Rifle Range and Narrawong. Surfing takes place close to the shoreline. The survey will not affect surfing activity given the 3 nm distance from shore of the survey operational area. Surfing is not considered an activity that will be affected by sound propagation from the survey given the short periods of time surfers spend underwater and the proximity to the surface.

(iii) Recreational Fishing

Recreational fishing includes rock, beach, boat and estuary fishing, using rod and line. Fishing licences are required for inland and ocean fishing. Common inshore fish species caught by recreational fishers include sand flathead (*Platycephalus bassensis*), John dory (*Zeus faber*), jackass morwong (*Namadactylus macropterus*), silver trevally (*Pseudocaranx dentex*), snapper (*Pagrus auratus*), barracouta (*Thyrsites atun*) and mullet (*Aldrichetta forsteri*). Fishing charter operators provide deeper water recreational fishing opportunities. Charter operators at Port Campbell and Apollo Bay have been identified and engaged, along with the peak recreational fishing association of Victoria.

(iv) Recreational Diving and Snorkelling

Scuba diving and snorkelling usually take place around the offshore reefs and historic shipwrecks along the coast east of Port Campbell including The Arches Marine Sanctuary (21 km from the acquisition area) and Twelve Apostles Marine National Park (7.6 km from the acquisition area). There is also a marine sanctuary at Marengo, west of Apollo Bay (30 km from the acquisition area).

Origin has adopted a conservative approach to managing safe diving in the vicinity of its marine seismic surveys and has operational plans to manage diving activity at 10 km, 5 km and 3 km ranges.

Origin has engaged with Parks Victoria offices at Port Campbell and Apollo Bay to inform them of the survey, in particular the safe diving procedures. We have requested their permission to place information signage at locations deemed by Parks Victoria to be relevant to recreational diving and boating activity. This approach with Parks Victoria's cooperation was successfully undertaken with the Enterprise Survey in November 2014.

5.3 Engagement Method and Approach

Origin's overarching stakeholder engagement approach consists of:

- Proactive identification of stakeholders and their issues, interest and/or concern
- Honouring commitments we make
- Adopt a 'no surprises' approach
- Allowing reasonable timeframe for stakeholders to respond
- Responses to enquiries are made within a reasonable timeframe

Origin proactively approached a wide range of stakeholders identified as having functions, interests or activities that may be affected by the proposed survey. Stakeholders were encouraged to advise if they believed there was any impact, raise concerns, ask questions and provide feedback via email or contact Origin directly to discuss or arrange to meet. The tools and methods that were, and will continue to be, used for stakeholder engagement are discussed below.

5.3.1 Project Information Sheet

This includes an overview of Origin, the proposed Crowes Foot 3D seismic survey project, and its associated activities, indicative timing, topics where we are seeking feedback and contact information. To commence the consultation process, this was provided as an attachment to an introductory email or by post or hand delivery (as noted in Stakeholder Consultation Log in Appendix A). It is also made available on the Origin corporate website. This was used as the primary information source for stakeholders to enable them to raise questions, objections, seek further information or consultations. The information sheet was issued in July 2014 (Information Sheet V1) to inform stakeholders and invite feedback and consultation. It was updated in March 2015 (Information Sheet V2) to include a revised map of the proposed survey and operational areas overlaid on the VicP69 permit area. It was further updated in May 2015 to include information on Origin's safe diving protocol (Information Sheet V2 + Diving).

5.3.2 Fishing Effort Maps

To verify relevant stakeholders and support consultations, maps of fishing effort overlaid on the proposed survey and operation area were prepared from varies fisheries effort data and reports:

- ABARES Fisheries Effort Report 2012 (Woodhams *et al.* 2013). These maps were used in relevant stakeholder conversations as it is publicly available information.
- Fisheries Victoria data supplied pursuant to Origin's formal data request. This map was only provided to SIV as permission was granted by Fisheries Victoria.

5.3.3 Face-to-face meetings

Stakeholders were offered face-to-face meetings with Origin's representatives. Typically led by the Community Relations Specialist, the purpose of the meetings has been to confirm the stakeholder's functions, activities and interests in the project, discuss their issues and concerns and provide them with an opportunity to ask questions. Origin has also used these meetings to formally seek stakeholder feedback and to identify further opportunities for engagement. Some of the stakeholders have had prior contact with Origin regarding this project. No meetings have been requested by stakeholders. However, Origin has proactively sought out meetings with commercial fishing associations and commercial fishermen who are or may be relevant persons as defined by the OPGGS(E) 2009 Regulations. Key association meetings include:

- Seafood Industry Victoria (SIV)
- Victorian Rock Lobster Association (VRLA)
- Commonwealth Fisheries Association (CFA)
- South East Trawl Fishing Industry Association (SETFIA)
- Apollo Bay Fishermans' Coop

- Port Campbell Professional Fishermen's Association
- Warrnambool Professional Fishermen's Association

5.3.4 Distribution of survey information via fishing associations

SIV agreed to distribute Origin's information sheet along and introductory letter, along with a letter from SIV to relevant Western Zone licence holders, which was a total of 433 SIV members. VRLA agreed to publish a notice of the survey in their Autumn 2015 newsletter. Victorian Abalone Divers Association (VADA) agreed to email Origin's information sheet including diving information to their members.

5.3.5 Project hotline and dedicated project email

Prominently located on all collateral to encourage questions and feedback are the contact details: 1800 797 011 and community.team@originenergy.com.au. These inquiries are managed by the Community Relations Specialist and all contact is recorded in the stakeholder log. This number remains in place for all Origin's marine seismic survey projects.

5.3.6 Stakeholder engagement log

All stakeholder engagement activities, including actions arising and commitments made are recorded and tracked via the stakeholder engagement log managed by the Community Relations Specialist. The log is a 'live' document that will be updated as consultation activities are undertaken (Appendix A).

5.4 Summary of key stakeholder consultation

5.4.1 General stakeholders

A summary of key stakeholder consultation undertaken before, during and after the survey completion, together with an assessment of merit of feedback, is presented in Table 3 below. This table focuses on key stakeholders who have been identified as 'relevant persons' whose functions, interests or activities may be affected by the survey. It also includes key stakeholders with whom engagement took place to enable Origin to determine whether they were 'relevant persons' in accordance with OPGSS(E) Regulations.

5.4.2 Commercial fishing stakeholders

Given the substantial engagement before, during and after the survey completion, with key stakeholders SIV and VRLA, a comprehensive schedule of stakeholder consultation is presented in Table 3 and 4 below.

The full Stakeholder Consultation Log showing all stakeholders and engagement is in Appendix A.

In accordance with Regulation 16(b)(iv) of the OPGSS(E), a complete copy of original responses from all stakeholders is provided in (correspondence numbers are identified on the Stakeholder Consultation Log to enable cross reference).

Table 3: Summary of stakeholder consultation undertaken for the survey

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Commonwealth Government			
Australian Fisheries Management Authority (AFMA)	Australian Government agency responsible for the efficient management and sustainable use of Commonwealth fish resources on behalf of the Australian community.	Recommended Origin consult directly with fishing associations and refer to ABARES report. Under AFMA Deed of Confidentiality, responded to Origin's data request and provided data of fisheries overlapping operational area and fishing intensity, by way of number of vessels per month from 2009 to 2014.	Provided assurance of Origin's direct engagement with commercial fishermen and associations. Requested data search of fishing effort in operational area to assist validation of active fisheries and further verification of potentially affected stakeholders. Data provided under Deed of Confidentiality showed some fishing effort in the operational area. Origin has reconciled this fishing effort with its stakeholder database, is confident that potentially affected stakeholders have been identified, survey will have minimal or no impact and will maintain engagement before, during and after the survey. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Border Protection Control (BPC) Command	Australian border protection	Forwarded information to relevant area within Border Protection Command. Advised no comment about proposed exploration activity was warranted but appreciated being informed.	Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Australian Maritime Safety Authority (AMSA)	Maritime safety, adherence to advice, protocols, regulations	Advised there will be significant shipping activity in permit area therefore collision risk, advised seismic vessel requirements, communication requirements from Origin.	Acknowledged requirements, advised communications requirements will be incorporated into survey acquisition Project Plan, requested information on shipping frequency in permit area. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Department of Defence (DoD)	Information on offshore exploration issues within Infrastructure Division's responsibilities.	No objections. No comments.	Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Australian Hydrographic Service (AHS)	Issues fortnightly notices to mariners for relevant nautical products.	No concerns raised. Requested Origin to provide updates so they can issue notices to mariners.	Advised procedure will be included in seismic survey contractor operational procedures. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Victorian Government			
Fisheries Victoria Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	Create the conditions to sustainably develop the Victorian economy and grow employment	No concerns raised throughout engagement process. Assisted Origin with supplying fishing effort data for state fisheries in operational area. Assisted with developing a process for recording a fisher's instruction to Fisheries Victoria (FV) to retire a specified quota amount. The enforcement of the retired quota request will be undertaken through the standard fisheries management regulatory procedures. FV advised they can also verify fishing history (quota fished and locations) information provided to Origin by fishers who wish to make a compensation claim. FV advised their initial feedback on Origin's impact assessment approach was that the logic / methodology appeared sound that Origin had covered NOPSEMA concerns, and FV would assess Origin's report to NOPSEMA and provide further feedback. With regard to Origin's "Approach for dealing with long-term population or catchability effects", FV requested Origin advise the fishing industry that FV was not involved in developing that framework, that Origin should develop such framework directly with the industry and after the framework is developed, FV can further consider its role.	Origin commenced engagement with FV at the outset of stakeholder engagement in July 2014 and continued to provide updates throughout. Origin appreciates support from FV in providing fishing data, assisting with validating Origin's assessment of data and confirming maps Origin created to overlay fishing effort data on Origin's survey area map. Along with VRLA, engaged FV for advice on processes for giving effect to a fisher electing to retire fishing quota (as requested by VRLA) as a condition of compensation for fishing displacement due to the survey. FV also advised they could verify a fishing history (locations and historic quota caught) of a fisher claiming compensation. Discussed FRDC research report with FV, Origin's approach to quantifying and assessing impact scenarios, sought FV's confirmation that Origin was using FV catch and effort data correctly and sought FV's feedback on Origin's overall assessment approach, in particular whether it sits comfortably beside the way FV manages the fishery. Also, advised that Origin is seeking ongoing engagement with FV to ensure that we set meaningful and practical future impact investigation triggers FV were very helpful in confirming fishing history and quota of fishers who made compensation claims and Origin acknowledged their prompt responses. Origin also advised local Fisheries Victoria enforcement officers of survey dates and provided map and will continued to provide updates that may assist them in the event of an inquiry from commercial or recreational fishers. Origin sought further engagement with FV to develop its "Approach for dealing with long-term population or catchability effects", submitted to NOPSEMA (RMS 0625 Response). (Origin had also sought engagement with SIV and VRLA regarding the framework). Origin acknowledged FV's guidance regarding direct engagement with the fishing industry on development of the framework. Origin will continue consultation with FV as they have requested.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Earth Resources Regulation Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	Create the conditions to sustainably develop the Victorian economy and grow employment	Confirmed department has no regulatory role but expect to be kept informed generally and fishers in Victoria to take an interest in this survey and be concerned about risks to their commercial interests. In the case of any incident or issue that is likely to have an impact on Victoria (environment or otherwise) or an issue likely to receive community or media attention in the state of Victoria, ask that these be brought to our attention at the earliest possible time in order for us to inform the Minister. Advised department is responsible for transport and Origin would be expected to link its emergency response and oil spill contingency plan arrangements seamlessly with those of the National Marine Oil Spill Contingency Plan 2011, Victorian Plan for Maritime and Environmental Emergencies and with Emergency Services Victoria in accordance with the applicable offshore legislation and NOPSEMA's direction.	Origin has and will continue engagement with relevant persons with ongoing fishing activity in the proposed operational area. In the event that the survey is required to operate concurrently with fishing activity, Origin will engage with relevant fishers to identify any alternative operating arrangements to safely share the space and should this not be possible, will enter into compensation arrangements with relevant fishers. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Department of Environment, Land, Water and Planning (DELWP)	Southern Right Whales (Geoff Brooks, previously Mandy Watson)	Engaged proactively at end of Enterprise Survey to debrief and explain overall approach to managing surveys. No reply to correspondence regarding Crowes Foot Survey.	Provided information on mitigation measures for Southern Right Whales and Blue Whales. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Commercial Fishers			
Commonwealth Fisheries Association (CFA)	Peak association representing commercial fishing in Commonwealth regulated fisheries.	May inform members but won't consult without remuneration. Recommended consultation best done at fishing association level. Verified Origin's identification of fisheries potentially affected.	Origin will meet any communication costs to CFA members. Origin made direct contact with SETFIA, SSFI, SSIA, and VSFA. CFA will inform scallop members. Unlikely or no impact on these fisheries. Provided information sheets and maps, advised survey dates and provided updates and notice of completion.
Seafood Industries Victoria (SIV). Johnathon Davey And Victorian Rock Lobster Association (VRLA) Markus Nolle, President and	Peak body representing professional fishing, seafood processors and exporters in Victoria. Association representing Victorian Rock Lobster Licence holders	Key concerns: consultation should commence at industry level before engaging individual fishers; sought confirmation that Origin takes a risk based approach and the lack of evidence does not mean no impact; feel Origin has not addressed past concerns about impacts; are concerned about knock-on effects of displacing fishers and want Origin to explore retirement of quota in any compensation model; requested further testing and studies to understand the impact of seismic surveys on the rock lobster fishery and submitted a draft research proposal to Origin for consideration; concerned about cumulative effects through the decades; requested Origin to avoid the lobster spawning period; believe oil and gas industry should fund all seismic impact research. Provided suggested compensation principles to Origin for individual fishers and the Apollo Bay Fishermen's Cooperative, which included the recommendation that a fisher should retire their quota to receive compensation to avoid a	Origin commenced engagement with SIV and VRLA regarding the Crowes Foot survey in July 2014. Consultation has included matters of research, engagement process, mitigation strategies and compensation principles. Origin requested development of a Memorandum of Understanding (MOU) with SIV and VRLA, who have agreed and SIV wishes to develop key headings to start the development of the MOU, which Origin has offered to draft. In the meantime, Origin has maintained direct communications to fishing sector stakeholders to honour existing commitments. Origin assured SIV and VRLA that all feedback has been addressed, have adjusted operational plans to minimise impacts, including excising parts of the survey area of most interest for lobster fishing. Where Origin has not agreed on SIV and VRLA's interpretation and extrapolation of research, we have explained our rationale and continued to invite further discussion. Origin believes that collaboration and joint funding of research by

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Apollo Bay rock lobster fisherman. Pauline Nolle, Secretary. Also representing Apollo Bay rock lobster fishermen. *(summary of engagement with SIV and VRLA combined as all correspondence circulated to both parties)*		knock on effect to fishers in different areas. Regarding FRDC research report published October 2016, on impact of seismic surveys on rock lobster and scallops, noted selected key outcomes and statement that further research required; asked how the new research is being incorporated into the EP following consultation with industry, if Origin was redoing risk assessment in EP and requested copy of sections relating to rock lobster risks, impacts and mitigation strategies; concerned the Crowes Foot survey could result in an industry quota reduction or impact any increases in Total Allowable Commercial Catch (TACC); noted regulatory requirements for titleholder not to undertake an activity after new or significant risk occurs; advised FRDC report is the first study on Australian southern rock lobster and it shows permanent damage to the species. Requested extract of Origin's EP before or at least the same time as submission to NOPSEMA. Feedback regarding Origin's compensation model: fair at individual fisher level but Origin's eligibility criteria of 3 year's fishing history may preclude retirement of sufficient quota to benefit local lobster population; compensation arrangements only cover displacement not "new risk" of impact to lobster population and VRLA expects Origin to discuss in good faith in due course. VRLA tabled the FRDC research and Origin's compensation offer at AGM on 3 November 2016. On 7 November VRLA advised Origin of their AGM discussion points and concerns: cumulative effect of seismic surveys; impact of selective compensation areas; no support at AGM for Origin's compensation package (as at 28/10/2016); seismic surveys should not go ahead until risks of damage to lobsters can be qualified and quantified and mitigation and remediation strategies are in place. On 9 November 2016, VRLA acknowledged Origin's response and advised they would circulate and provide feedback to Origin the following week. At meeting on 15 November 2016 in Apollo Bay, VRLA advised they were disappointed that the survey was going ahead and their attendance at the meeting was not to be construed as satisfaction with NOPSEMA's approval process; fishers want to be out fishing, not here at the meeting at commencement of the season; the framework of commitments regarding long term impacts that Origin has made to NOPSEMA aren't acceptable to VRLA; believe that other research matters should be included such as post-harvest mortality, fisher behaviour, timing of fishing , berried females; further discussions with Origin are required on this matter; fishers are	government and industries enables objectivity and allows competing considerations and views to be balanced. Origin will explore a request for further research funding from Southern Rock Lobster Inc. (via VRLA) with APPEA and continue consultation with SIV and VRLA. Prior to and after the public release of the FRDC research report in October 2016, Origin has reviewed potential risks, impacts and further mitigation strategies, and sought to continue engagement with SIV and VRLA. Origin has advised throughout its engagement with SIV and VRLA that it does not release EPs or extracts and the EP summary will be published in accordance with the regulations. Origin has also advised that after we have agreed on an MOU which will include the approach to consultation on research, in advance of submitting future relevant EPs, Origin is keen to consult with SIV and VRLA on relevant research, its application to Origin's proposed activities, possible impacts and mitigations. Origin will provide relevant sections of the final revised and approved EP regarding impact on the rock lobster fishery to SIV and VRLA. Origin has previously and will continue to apply the principle that commercial fishers should not suffer a detrimental economic impact as a result of its activities. Origin met all of VRLA's initial compensation model recommendations and has greatly extended the model to give impacted fishers the option to retire some, or all, of the quota ordinarily caught in the survey area, for the entire season. Compensation is based on the displaced area, plus the 'sound affected' survey area determined by cumulative sound impact modelling and verification completed by Curtin University. Origin and VRLA consulted with Fisheries Victoria (FV) on 25 October 2016 and agreed on a process for FV to verify fishing history and record retired quota for each fisher. On 27 October 2017, Origin sought VRLA's feedback on approach to enabling impacted fishers to retire remaining season quota for the survey area. Origin continued to seek consultation to develop a final compensation agreement before the survey commencement but SIV and VRLA were not available. On 8 November 2016 Origin responded to VRLA's feedback from their AGM and advised: we conducted an extensive review of the FRDC research report and remain committed to not only minimising disruption to fishers, but also to ensuring that no party is worse off economically as a result of our activities; and in response to VRLA feedback Origin revised the compensation framework, provided a summary, advised compensation documentation was forthcoming, and sought further meeting and feedback. Origin provided detailed compensation model on 10 November 2016 incorporating a simple and expedient claims process that included FV verification and payment of agreed claims within 5 days of contract execution.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
		extremely concerned about future of the industry. VRLA advised they would raise Origin's long term impact framework at the Victorian Rock Lobster Research Action Group on 18 January 2017 and give Origin feedback.	On 12 November 2016, Origin advised SIV and VRLA that the survey had received final approval from NOPSEMA; provided detailed covering letter, copies of Origin's submission to NOPSEMA (RMS 0625 Response) and NOPSEMA's Environmental Prohibition Notice to Origin, compensation offer to impacted fishers, draft settlement agreement for agreed claims; advised equipment layout to commence 14 November 2016; advised we were available anytime to discuss and requested meeting with SIV, VRLA and individual fishers. Origin met with VRLA, Apollo Bay fishers and some fishers based in Port Campbell and Warrnambool on 15 November in Apollo Bay. A group meeting was held to listen to the group's questions and objections, to explain details of compensation framework sent to fishers on 12/11, followed by individual meetings (to ensure privacy of their confidential fishing information) with fishers claiming compensation. Origin acknowledged fishers' concerns about impacts, reminded the fishers that the FRDC research showed no mortality of lobster and that they habituated to exposure, nevertheless adopting the precautionary principle, Origin was offering retirement of season quota to fishers with legitimate fishing history in the survey area. Individual meetings were held, claims were made to retire quota and nine agreements were settled with affected fishers, all of which were paid within five days of contract execution. Origin also completed a further assessment of compensation claims after in-field assessment and verification of the defined sound affected area was completed by Curtin University. This led to a further compensation payment to a small number of fishers and the Apollo Bay Fishermen's Cooperative (ABFC). Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey. Origin will continue to seek engagement with SIV on the development of an MOU. Origin has sought engagement and will continue to seek engagement with SIV and VRLA on Origin's "Approach for dealing with long-term population or catchability effects".

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Apollo Bay Fishermen's Coop (ABFC) (also VRLA members)	Cooperative for local fishermen to sell catch, wholesale and retail fish, sells fuel and supplies to local fishermen.	Concerned about number of seismic surveys and impact on gradual drop in quotas, drought years also cause poor catch, poor weather in October may prevent survey, if survey continues after 15 November would affect 3 fishermen who catch rock lobster off the Big Reef and would affect Apollo Bay Coop due to throughput of lobster sales and fuel. Understood mutual access rights and compensation principles. Agreed on approach to determining compensation and verification required.	Research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will firstly plan to minimise impact on fishing due to timing and direction of survey and if this is not possible, will enter into agreement with relevant fishermen and coop to compensate subject to fishermen not displacing others. Given the ABFC exists to supply members bait and fuel, to on-sell fishers' catch from areas impacted by the survey, and is a not for profit organisation, Origin acknowledges the direct impact from the survey on their operations and agreed to extend the compensation principle of 'no economic loss to commercial fishers due to its activities. Origin ascertained whether fishers who claimed compensation landed their catch at ABFC and purchased bait and fuel there, and consulted with these fishers to determine impacts relevant to their quota retired. Origin met with the ABFC on 1 December 2016 in Apollo Bay and discussed the approach to determining impact and evidence of impact to be provided by ABFC. Origin has settled two agreements with the ABFC: one after determination of local commercial fisher compensation claims; and a further agreement settled after completion of in-field validation of the sound affected area which led to settlement of subsequent claims. Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey.
South East Trawl Fishing Industry Association (SETFIA)	Association representing businesses with a commercial interest in the South East Trawl Fishery.	Initial concerns: assumed members would be affected but didn't know if trawling occurred in the operational area, critical of Origin's consultation and offered consulting services for stakeholder engagement. Appreciated Origin's visits to SETFIA at Lakes Entrance. Pleased at detailed maps tabled for discussion and based on these maps advised there didn't appear to be any or much trawling in the operational area. Noted Origin's commitment to advise further after data provided to Origin by AFMA. Felt that Origin should TEXT known fishers in the area during our operations. Confirmed Origin's assessment of minimal fishing effort in trawl areas, happy to forward emails from Origin to western trawl sector (before during and after survey), will charge small admin fee as Origin suggested.	In initial consultations Origin advised that the operational area was not generally subject to trawl fishing but requested SETFIA to advise Origin if members were impacted. Origin subsequently verified from AFMA data, that there is relatively small fishing effort of Commonwealth managed fisheries in the operational area. Origin has reconciled this fishing effort with its stakeholder database, is confident that potentially affected stakeholders have been identified, the survey will have minimal or no impact on Commonwealth trawling activity. Nevertheless maintained engagement before, during and after the survey as a precaution, should fishermen change their intentions. Origin uses a text messaging system for this purpose, but engaged SETFIA's services to pass on messages to SETFIA so they can advise their members. SETFIA have been very helpful with communications regarding the survey and issued messages to their members before, during and on completion of the survey.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Port Campbell Professional Fishermen's Association	Association representing Port Campbell fishermen, primarily rock lobster around Port Campbell and Peterborough	Remain opposed to marine seismic surveys which they believe have reduced rock lobster population in their region. Requested Origin carry out additional field research to place rock lobster pots under seismic survey. Advised members do not fish in operational area. Have participated in discussions regarding compensation arrangements for Crowes Foot survey with VRLA.	Given the size of the southern rock lobster population and recruitment of juvenile rock lobster from this substantial fishery, Origin believes that it is highly unlikely that Origin's seismic survey will impact rock lobster larvae at the population level. This assertion is supported by substantial catch variation over many years with and without seismic survey activity and, advising established causes of variations. Origin contributed to further research through its co-funding of rock lobster research by IMAS/UTAS. Reviewed hypotheses and design of this research and believe further research is unnecessary until the published results of current research can be assessed. Will continue to advise survey dates as a precaution if fishing intentions change. PCPFA President participated in discussions with VRLA and Origin regarding research, consultation approach and compensation model. Origin has advised survey timing update, vessel names, communications protocols, survey execution approach to minimise impact, and requested fishers to contact Origin (if they have proof of regular fishing activity in the area), to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. Origin consulted with one Port Campbell based fisher regarding compensation. Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey.
Warrnambool Professional Fishermen's Association	Association representing Warrnambool fishermen, primarily rock lobster on strip from Warrnambool to Port Campbell	Remain opposed to marine seismic surveys which they believe impact larvae and have reduced rock lobster population in their region. One member has replied to advise an interest in the operational area and Origin has consulted with this member.	Given the size of the southern rock lobster population and recruitment of juvenile rock lobster from this substantial fishery, Origin believes that it is highly unlikely that Origin's seismic survey will impact rock lobster larvae at the population level. This assertion is supported by substantial catch variation over many years with and without seismic survey activity and, advising established causes of variations. Origin has advised survey timing update, vessel names, communications protocols, survey execution approach to minimise impact, and requested fishers to contact Origin (if they have proof of regular fishing activity in the area), to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. Origin consulted with one Warrnambool fisher regarding compensation. Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Portland Professional Fishermen's Association	Association representing Portland fishermen	No direct feedback from President. One member advised sometimes fishes in area but will work around survey.	Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent to Portland based fishers who may traverse the survey area.
Victorian Abalone Divers Association (VADA)	Association representing the Central abalone zone	No concerns raised. Has passed on information to members. No members advised of any planned operations in relation to the Crowes Foot survey.	Consulted with VADA to explain safe diving protocols and establish communications requirements of members. Requested that any divers planning to operate within 10 km of the survey area to contact Origin to enable consultation and implantation of Origin's safe diving procedures. Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey.
Western Abalone Divers Association (WADA)	Association representing the Western abalone zone	Advised they fish over 60 km away from operational area.	Inform as a courtesy.
Southern Rock Lobster Limited (SRL) South Australian Rock Lobster Advisory Council Inc (SARLAC) South Eastern Professional Fishermen's Association Inc (SEPFA) Tasmanian Rock Lobster Fishermen's Association (TRLFA)	Associations representing State based commercial rock lobster fishers	Following release of FRDC research report, advised that the southern rock lobster is regarded as a single stock across the three relevant jurisdictions; Tas, SA and Vic. Despite jurisdictional management arrangements, some indicators, such as egg production, are assessed across jurisdictions for various purposes. Assessment of egg production, across the stock, under Commonwealth legislation is critical to our industry maintaining export accreditation and their industry is almost solely reliant on export markets. Damage, permanent or otherwise, to Rock Lobsters in Victoria, or any other jurisdiction, as a result of seismic survey work which may impact on the reproductive capacity is likely to impact across the stock and is of great concern to the industry. Believe the Crowes Foot survey should not proceed until suitable controls can be identified and implemented to address industry concerns. Understand that NOPSEMA has requirements to sufficiently reduce environmental impacts and risks. They have not been made aware of any suitable and proven / demonstrated controls to mitigate the now identified risks to rock lobster stocks. Both acknowledged Origin's reply.	Origin has not previously engaged with these stakeholders given the localised impact of the survey activity. Advised that Origin carried out an extensive review of the FRDC research report. We have also (in light of that report) fully re-assessed the risks and impacts associated with the survey in order to supplement and enhance the controls outlined in the current Environment Plan (EP). Some of the new and enhanced controls are directed to reducing disruption to fishers, as well as addressing other risks and impacts. NOPSEMA notified Origin that it is reasonably satisfied that in undertaking the survey as described in the environment plan in force and in accordance with the submission made in response to the direction, Origin will reduce impacts and risks to rock lobsters and the Victorian Rock Lobster Fishery to levels that are acceptable and as low as reasonably practicable. Origin provided a copy of its further submission to NOPSEMA (RMS 0625 Response). Origin remains committed to not only minimising disruption to fishers, but also to ensuring that no party is worse off economically as a result of our activities and have provided an extensive compensation framework to SIV/VRLA and potentially impacted commercial rock lobster fishers.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Oil spill preparedness and response agencies			
DEDJTR - Department of Economic Development, Jobs, Transport and Resources (Emergency Risk & Resilience/Marine Pollution Team)	Ensuring Victoria is adequately prepared for and effectively responds to a marine pollution incident in State coastal waters up to three nautical miles offshore	No specific comment regarding the survey. Advised their requirements in relation to offshore petroleum activities: http://www.transport.vic.gov.au/freight/marine-pollution	Acknowledged requirements and advised EP is being developed cognizant of stated requirements.
Australian Marine Oil Spill Centre Pty Ltd (AMOSC)	AMOSC and Industry Consultation under the OPGGS Act 2011 (August 2012)	AMOSC expects to review all EPs and OSCPs in which AMOSC is named as part of the support mechanisms.	As a potential hydrocarbon spill from the seismic vessel would be dealt with directly by AMSA and would not receive AMOSC assistance or support, Origin has not formally consulted with AMOSC for this survey. A courtesy email was sent but no reply has been received.
Community, tourism, recreation			
Parks Victoria (Port Campbell & Apollo Bay)	Managing State parklands including boat ramps, public beach access	Effective communication of survey in relevant recreational public boat ramps and ocean access points.	Placed signs at Port Campbell and Peterborough with cooperation from Parks Victoria, Port Campbell. Parks Victoria Ranger from Colac Otway advised no signs necessary other than at Apollo Bay Harbour, managed by Colac Otway Shire.
Colac Otway Shire (Apollo Bay Harbour)	Management of Apollo Bay Harbour	No concerns raised.	Consulted directly with Apollo Bay Harbour Master and toured harbour to determine best locations for public notice signs and agreed that three signs were required. Explained exclusion zone from fishing for safety requirements and advised Origin will be compensating impacted rock lobster fishers with proven history of fishing in the survey area. Discussed communications protocols from the support vessels, from Origin's SMS service and from AHS. Provided details of survey and support vessels.
Scuba Divers Federation of Victoria	Represent over 25 amateur dive clubs reaching 2,500 members.	Appreciative of notice of survey and shipwreck maps. No clubs operating in operational area but will pass onto Warrnambool, the closest club, plus general email list.	Origin has formal procedures to manage operations safely around diving activity and wish to meet and discuss if any dive events planned during the survey. Advised survey dates and map and provided updates and notice of completion.
Port Campbell Boat Charters. Surf 'n' Dive (Apollo Bay)	Dive and fishing charter operators in Port Campbell and Apollo Bay	Main charters near survey are Loch Ard shipwreck. Don't often have long advanced notice of charters. Happy to have our contact details and work in with us if they do have a charter closer to the survey.	Origin has formal procedures to manage operations safely around diving activity and wish to meet and discuss if any dive events planned during the survey. Throughout the consultation process Origin has provided updated information sheets and maps and extended invitations to meet. SMS updates were sent before during and after the survey.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
Victorian Recreational Fishers Association	Peak recreational fishing association	Operational area supports a highly valued forage fish resource and also recreational fishing for southern blue fin tuna but pleased the survey timing is outside the peak tuna season and will consider implications for other marine species such as gummy sharks and snapper.	Normal practice for surveys to operate with scout vessels who communicate with any local recreational fishing vessels in the vicinity to manage safe survey operations. In addition, Origin advises AHA who issue notices to mariners of approved exploration activity. Advised survey dates and map and provided updates and notice of completion.
Conservation interests			
The Blue Whale Study	Research to support conservation of Blue Whales	Would like to see an Otway basin ecosystem approach to research and data sharing of whale species calving, foraging and migration and further aerial surveys, for which they can provide a service. Regarding aerial survey maps of whales done in the past for Origin, advised February 2011 survey was a good example of blue whales being close inshore, November 2012 showed them more widely spread across the continental shelf and December 2012 showed them concentrated near the outer shelf. Said there is no way of predicting where they will be in any given month, but this area has shown itself to be important feeding habitat for blue whales, even in recent poor upwelling seasons. Would prefer to see the 4-month possible survey window narrowed down to minimise potential impact with blue whales, especially during early summer. Pointed out errors in Enterprise EP regarding krill and Bryde's whale (which was subsequently checked by Origin, verified correct and advised to stakeholder).	Origin concurs with the feedback on variability of past blue whale sightings in the planned survey months and has reviewed available contemporary blue whale sighting data to tailor mitigation measures accordingly. Mitigation plans exceed standard requirements in EPBC policy 2.1, and have also been developed cognizant of past mitigation plans used by Origin in the Otway basin, and recently used by other proponents in adjacent permit areas. Advised window for this survey cannot not be narrowed down at present, but will advise when confirmed. Origin will continue to engage throughout. Provided revised information sheets and maps, advised survey dates and provided updates and notice of completion.
Deakin University (Associate Professor John Arnould, School of Life and Environmental Sciences)	Marine avifauna,	Potential for impacts on all of the top marine predators in survey area, directly or via impacts on the prey populations they depend on. Proposed dates coincide with the breeding seasons of the main resident seabird (penguins, shearwaters, gannets) and marine mammal (Australian and New Zealand fur seal) species. Potential for effects to have substantial demographic impacts. Acquisition area is mostly out of the foraging range of little penguins from the London Bridge colony, but is well within the known foraging areas of the other species. Unfortunately, the direct effects of seismic surveys on shearwaters, gannets and fur seals, and the effects on their prey species, is not known, so not possible to estimate impacts of survey. As with the tracking of penguins before, during and after a seismic survey that was conducted last year (analysis still in progress), John's research group has the capacity to do the same with the gannets, shearwaters and fur seals as part of ongoing projects. John offered for discuss the possibilities with Origin further.	Seismic surveys have been conducted in the Otway Basin and central and eastern Bass Strait for several decades and, as far as Origin is aware, there is no evidence indicating negative impacts at the population level on these resident bird and fur seal species attributable to seismic surveys. Major influences on pinniped populations in Bass Strait appear to be recovery post-sealing (Kirkwood *et al*. 2009 and Kirkwood *et al*. 2010). Australasian gannet populations have increased (Bunce *et al.* 2002) and little penguin populations appear at least stable (Schuman *et al.* 2014) in central Bass Strait over this period. The very large short-tailed shearwater population may be in a declining trend (Schumann 2014). As such, Origin does not envisage conducting monitoring of seabirds or seals during the proposed survey. This position will be reviewed once the results of the little penguin monitoring during the Enterprise survey are available, as Origin will be in a better position to evaluate the contribution such monitoring can make to further understanding impacts of seismic surveys. Provided revised information sheets and maps, advised survey dates and provided updates and notice of completion.

Stakeholder	Functions, Interests, Activities	Potential Impacts, Concerns, Claims of Stakeholder	Origin's Assessment and Response
International Fund for Animal Welfare (IFAW)	IFAW works to rescue and protect animals with a focus on marine mammals and the protection of whales and dolphins in Australia	Requested information from blue whale aerial surveys undertaken in 2010-2013 and the MMO sighting records from the Astrolabe survey (Nov 2013). Did not consider Origin to have provided sufficient information until this information was provided. Considers the proposed time window of 1/10/2015 to 31/1/2016 to be inappropriate as it coincides with the arrival and presence of blue whales in this area. Believes that conducting the survey during October poses unacceptable risks to southern right whales due to proximity of breeding grounds. Concerned about cumulative impact from the numerous seismic surveys in this region and requested Origin provide further information on cumulative impacts as part of the environmental planning. Believes mitigation measures employed should go beyond the requirements of the EPBC Policy Statement 2.1 should this survey go ahead and requested that Origin provide detailed information about the intended mitigation methods to be employed aimed at reducing risk to marine mammals from noise pollution.	Provided information from MMO sightings and aerial surveys commissioned by Origin, and reminded about publicly available sightings data. Advised reasons for established timing window for marine seismic surveys in the Otway basin is in accordance with government guidance to minimise environmental impact particularly for avoidance of southern right whale calving. Explained assessment of potential impacts to southern right whales and results from acoustic monitoring and modelling to advise that Origin believes any impacts can be adequately managed. Noted IFAW concerns with cumulative impacts and advised Origin will meet all requirements contained in EP approved by regulator. Outlined additional mitigation measures (beyond standard measures in EPBC policy 2.1) to further mitigate potential impacts on blue whales and southern right whales, including: pre-survey scouting; number of scout vessels and MMOs; passive acoustic monitoring system; soft start-ups; and shut-down procedures if whales are sighted. Provided revised information sheets and maps, advised survey dates and provided updates and notice of completion.

Table 4: Comprehensive schedule of key stakeholder consultation – SIV and VRLA

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
Seafood Industry Victoria (SIV) (copied in on all correspondence with VRLA, the primary contact for commercial rock lobster fishers – see VRLA summary, not entered below where copied in)				
2014	• 11 July, Origin made initial contact via email, provided survey information sheet and requested meeting. • Met at SIV office on 16 July and SIV raised: o SIV's capacity to engage members regarding seismic survey EPs; o Engagement approach doesn't allow feedback loop before EP submission to regulator; o Literature review report on seismic impact on various marine species; o Compensation plans should be in EP. • 3 October, Origin advised via email that the survey	• Appreciated SIV's limited resources, did not expect SIV to meet any communication costs. • Reviewed article raised by SIV and found not relevant to other species within survey area. • Reviewed available research and found no support of population level impact on rock lobster larvae from seismic surveys.	• Origin emailed SIV on 14 August and advised: o Origin will fund costs for survey communications to SIV members; o Research on some species cannot be extrapolated to all (reference to scallop larvae research by Aguilar et al, referred to by SIV); o Milestone reports from UTAS research still in progress, not yet peer reviewed, therefore cannot be relied upon; o Currently no scientific basis to validate concerns of population level impacts to rock lobster larvae, this is supported by substantial rock lobster catch	• Origin understood SIV's concerns regarding the stakeholder consultation process. • Origin undertook to review all feedback and concerns, respond to all matters raised and ensure all stakeholder concerns were represented in its EP.

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
	will not be undertaken in the Oct 2014 to Jan 2015 window.	• Revised existing Origin Fisheries Management Plan draft to be used in the event of displacing fishers during the survey. • Reviewed NOPSEMA stakeholder engagement guidelines and discussed with project team to ensure Origin will consider all issues raised, respond to stakeholders and advise NOPSEMA of stakeholder concerns within its EP.	variation over many years with and without seismic survey activity, and cited a number of other impacts on lobster catch rates. • Further email to SIV on 18 August to advised detail on Origin compensation principles.	
2015 Mar-May	• 17 March Origin sent updated information sheet with new survey dates and requested further meeting. • Met at SIV office on 30 March to provide update on past and planned commercial fisher consultation, data Origin had requested from AFMA and FV, and seek SIV's advice on member fisheries in the survey area, and best communication approach. SIV feedback: o Confirmed Origin's assessment of fisheries in the survey area; o Advised lobster fishers will be stressed due to current discussion on lowering quotas; o SIV will assist with sending Origin's communications, advised 433 SIV members with fishing licence in the Western Zone, and advised costs.	• Given SIV's advice of 433 licence holders, Origin reviewed stakeholder database and commercial fishers active in the survey area. • On 2 April, Origin discussed further with SIV as a the large majority of Western Zone licence holders would not be impacted by the survey given the current active fishing effort compared to the declared fisheries. • Agreed to send information to all licence holders for the avoidance of doubt. • Origin reviewed FV's catch data in each FV grid block within the survey area and prepared a detailed map.	• Origin liaised with SIV regarding covering letter from SIV to accompany Origin's information sheet and prepared mail out materials, sent by SIV on 15 May. • On 15 May Origin emailed SIV: o Thanked them for sending; provided a detailed map of fishing effort within State fisheries in the survey area; o Provided information on Origin's safe diving protocol; o Advised we were engaging the abalone sector.	• Origin was confident in the desk and ground research undertaken to identify fisheries, active fishing effort and active commercial fishers in the survey area.
2015 Sep-Nov	• On 15 September and 13 November Origin emailed updates advising the survey was unlikely to commence in 2015, and would provide a minimum of 4 weeks' notice of survey start date when timing has been finalised.	• Given stakeholder feedback regarding concentration of rock lobster fishing effort over the Big Reef, Origin reviewed the technical data requirements from the survey	• On 13 November Origin advised SIV that the EP had been approved by NOPSEMA and of the exclusion of the Big Reef from the survey acquisition area.	• Consultation and preparation of additional detailed maps helped validate feedback from stakeholders about fishing effort, which led to further mitigation of impacts

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
		to consider the impacts of reducing the area over the Big Reef. • After further consultation with NOPSEMA regarding mitigation of potential impacts, Origin excluded the majority of the Big Reef from the survey acquisition area.		by reduction of the survey area over the Big Reef.
2016 Jul - Sep	• 7 July, meeting in Apollo Bay (see VRLA summary). • 11 August, further meeting in Apollo Bay (see VRLA) • 16 September, further meeting in Apollo Bay (see VRLA). • 23 September, advised relevant western zone licence holders and number for mail out, is working on covering letters, confirmed content in Origin's info sheet regarding rock lobster fishing.	See VRLA summary	• 23 September, emailed to confirm discussion on licence holders relevant for information sheet, thanked SIV for confirming details under "rock lobster fishing' heading in information sheet and asked costs for mail out.	See VRLA summary
2016 Oct - Dec	• 12 October, phone meeting re follow up on 16/9 meeting (see VRLA). • 13 October, sent cover letter for mail out. • 25 October, posted Origin's information sheet for Crowes Foot and Enterprise Surveys with covering letter from SIV to 148 rock lobster licence holders and 182 Ocean Access licence holders. • 25 October, email regarding recent FRDC/IMAS rock lobster research: o Noted outcomes and further research required; o Inquired about redoing risk assessment in EP and gave SIV views on what it should be; o Concerned Crowes Foot survey could result in an industry quota reduction; o Asked how the new research is being incorporated into the EP following consultation with industry; o Noted 'reg 8 of environment regs' requiring titleholder not to undertake an activity after new or significant risk occurs, that is not provided for in EP; o This is first study on Australian southern rock	• Origin carried out an extensive review of its EP in light of the FRDC/IMAS research report which identified sub-lethal effects on lobsters, and fully reassessed the impacts and risks from its survey and made a comprehensive assessment of regional catch data and seismic survey activity in the Otway basin. • Origin added and enhanced controls that are responsive to ecological and economic impacts and risks, including reduction of survey area over key fishing areas, reduction of cumulative sound, minimising duration of displacement, implementing a comprehensive compensation framework, including an approach to	• 26 October: acknowledged email of 25/10; advised are reviewing FRDC/IMAS research final paper with specific consideration of Crowes Foot EP and would like to discuss with SIV/VRLA as soon as possible and asked availability. • 31 October, phoned to discuss distribution of compensation offer by SIV to all licence holders: o VRLA has only ever mentioned up to 6 possible impacted fishers and had already said they would talk to them personally; o Only a very small percentage of the Western Zone catch comes from the overlap with the survey area and Origin understood that it was VRLA's intent and in the best interests of the fishery that the compensation offer was directed to those known to fish in the area. o Regarding ABFC, advised that with our offer to retire all of an impacted fishers quota, VRLA advised the cost impacts to the ABFC may be different from what we have been discussing (depending on how much quota is retired) and he wanted to canvass that with the ABFC; o Origin wishes to meet with coop (unless VRLA	• Origin is grateful for SIV's support to distribute Origin's information to members. • Origin has made genuine efforts to engage VRLA and SIV during this time and where that has not been possible, had provided detailed responses and additional information. • Origin has re-assessed risks and impacts, developed appropriate mitigation strategies and remains committed to minimising disruption, ensuring no party is worse off economically as a result of our activities.

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
	lobster and it shows permanent damage to the species. • 26 October, advised costs for correspondence handling. • 31 October, haven't read compensation offer line by line; VRLA is seeking feedback from different people in industry; have an AGM Thursday and will table then; SIV want to distribute the offer to all Western Zone licence holders they see this as setting a precedent for the industry; asked about compensation for coop; further engagement regarding the FRDC research; is available for further discussion at 3.30pm today.	assessing long term impacts.	continues as their rep). o Origin also wants to have a detailed discussion about the FRDC/IMAS research outcomes, application to our activities, mitigation etc and has expressed this to VRLA last week. • 7 December: Completion of survey notification sent.	
2017	• 26 April, Origin phone SIV to progress MOU. SIV advised: o Can't meet this week, maybe the week after; o Hasn't had a chance to put thoughts down about the MOU, but an MOU between only SIV and Origin may not meet their needs as they have limited resources and it would be more effective for SIV to have the same process of engagement for all oil and gas industry proponents. o The MOU with APPEA and fishing sector which he thinks was ratified in January 2016 established only high level cooperation and doesn't work at the operational level for an actual EP or project. o Referred to a recently cancelled meeting at APPEA to progress MOU discussions and a recently released draft communications and engagement strategy that he received last week but hasn't had a chance to review. May be elements of that strategy relevant to an MOU. o Open to meeting with Origin before Origin further consults with APPEA, to provide SIV perspective on how to move forward with an MOU that is practical.	Origin sees benefit in progressing a MOU with SIV for its activities in shared offshore spaces but will first explore the APPEA MOU as discussed with SIV.	• 12 January, requested a time VRLA would be available for a meeting with Origin and Fisheries Victoria to discuss long term impacts approach in EP. • 26 April, phoned to ask if SIV could meet next week regarding progress of MOU and discussed SIV's current views: o Explained Origin commitment in EPs to progress MOU which we're keen to progress if SIV are still open to that. Understand if they prefer an industry wide MOU; o Origin will review status of MOU with APPEA and revert back to SIV.	Origin will progress with both SIV and APPEA.

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Victorian Rock Lobster Association (VRLA) (all correspondence to VRLA also copied to SIV)				
2014	• Initial contact from Origin via email on 9 July, provided information sheet and requested meeting with VRLA and SIV. • 12 July VRLA advised happy to meet with SIV on 16 July and would like to address key concerns: o Survey planned for prime fishing season; o Displacement of fishers, domino effect, and intensity of fishing in reduced area; o Impacts on eggs and larvae from seismic surveys; o Emerging science from rock lobster research by UTAS to support concerns; • VRLA subsequently could not attend meeting on 16 July. • 23 August, VRLA acknowledged Origin's compensation policy, advised it still has concerns about engagement with multiple seismic survey proponents and will pursue this through SIV. • 10 October, Origin advised via email that the survey will not be undertaken in the Oct 2014 to Jan 2015 window.	• Origin reviewed available research and found no support of population level impact on rock lobster larvae from seismic surveys. • Origin made inquiry to FRDC regarding milestone report on rock lobster research by UTAS that was published online by a Tasmanian fishing association. FRDC advised they do not usually release preliminary research as results can and do change as projects progress and are finalised.	As VRLA could not attend meeting, Origin responded to key concerns via email on 5 and14 August and advised: • Survey timing is yet to be determined and where possible Origin will seek to acquire the survey outside rock lobster fishing season; • Should it occur during rock lobster fishing season, Origin will minimise economic impact and explained existing cooperation and compensation principles; • Origin examined current relevant research in the public domain which continues to indicate no mortality to rock lobster adults, insignificant mortality to larvae and unlikely impact at a population level; • Seismic surveys have been conducted in the Otway Basin for the past 30 years. There is a vast disparity between the scales of effect of air gun discharges during a seismic survey and the epidemic of lobster larval hatching along the entire southern Australian margin. The lobster population continues to hatch trillions of larvae in the spring and these are widely dispersed as plankton in the Southern Ocean and south Tasman Sea for the next 12 to 24 months; • CSIRO has reported on larval transport and recruitment processes of southern rock lobster (Bruce et al 2007) and states that the main sources for Victorian settlement are from South Australian zones. Despite many seismic surveys having been conducted in South Australia since 1966 (Extracted from Seismic survey listings [XLS 200KB] - Geoscience Australia) the commercial rock lobster fishery for western Victoria has shown a cycle of good and bad years irrespective of the surveys; • This position has been accepted by regulators in recent EPs regarding seismic surveys submitted by Origin; • Origin understands fishers have experienced challenges in recent years which may have led to depressed catchability, including: introduction of the Twelve Apostles Marine National Park in 2002; impacts of the abalone virus; unusual weather patterns causing intense upwelling bringing very cold	• Origin undertook an extensive review of all current, relevant published research in order to assess and respond to stakeholder concerns. • As part of Origin's ongoing commitment to operating responsibly and sustainably, and contributing to advancing scientific knowledge around issues that are of interest to the fishing industry, Origin made a financial contribution to the FRDC project 2012_008 "Assessing the impact of marine seismic surveys on southeast Australian fisheries". • The milestone report from the above research, was not released by FRDC for use in the public domain as the research was incomplete.

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			water across the shelf; and the damage to fishing grounds caused by the bursting of the bar across the Curdies inlet (Parks Victoria Technical Series No 15 "Estuary Opening Management in Western Victoria"); • Fluctuation in rock lobster numbers needs to be considered in the context of broader regional trends in the biological oceanography that are natural events not related to seismic surveying; • Origin committed to further research through its co-funding of rock lobster research by FRDC / UTAS; • FRDC advised of the danger of drawing conclusions from the milestone FRDC/UTAS rock lobster research report; • Explained the challenges in engaging with stakeholders who have formed an opinion on scientific research that is not widely accepted, has been questioned by peers, is incomplete, and/or has been erroneously extrapolated from one species to another (gave example of scallop larvae research by Aguilar et al); • Origin has been engaging a diverse range of stakeholders, seeking feedback, reviewing applicable research; • Origin will note VRLA's concerns in the EP submission to NOPSEMA along with our review of current relevant marine science.	
2015 Mar-July	• 16 – 19 March, Origin phoned VRLA to recommence discussions and seek a meeting, sent email with updated information sheet and further stakeholder identification actions. • 18 March, VRLA advised not able to meet at present, send information and Origin should continue to meet with Apollo Bay Fishermen's Coop. • 14 April, VRLA agreed to place notice of survey and Origin's contact details in their newsletter and agreed costs with Origin. • 5 May, Origin met with VRLA at Apollo Bay where VRLA advised: o Origin's fishing grid map is helpful; o Provided copy of VRLA newsletter (with Origin	• The Origin geophysical operations team has significant international experience in marine seismic surveys and maintains a high level of knowledge of new technologies as a way of improving, processes and reducing impacts. This is achieved by continually reviewing industry journals, attending formal industry conferences, along with the expressions of interest and tendering processes that enable Origin to assess	• 15 May, Origin project leads held phone conference with VRLA to respond to technical queries. Origin advised: o Brief history of seismic surveys, 3D is latest technology and relevant for this survey; o Cannot adjust sound down for shallows once set but do power down on turns; o Can't eliminate sideways sound due to propagation properties (ripple effect); o Origin employs latest technologies and would embrace latest low impact seismic methods if they were commercially available and fit for the task; o Origin will consider water sample research	• Origin undertook a further extensive review of relevant current research, sought independent advice from an experienced international consulting firm, reviewed information provided by VRLA, and provided the opportunity for VRLA to consult with its Geophysical Operations team, before providing a comprehensive written response to VRLA's concerns. • Origin determined that the

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
	notice) that goes to 85 members (out of 88 licence holders, 3 licences not members are owed by SALCO); o Recommended SIV still do letter to western zone licence holders; o Restated concerns re larvae impact, asked about past efforts to improve seismic surveys and emerging technologies to reduce impact; o Asked what pre-and post survey analysis had been done in water columns; o Frustrated at FRDC communications about research project; o Origin's compensation plan should require impacted fishermen to remove pro-rata quota from season's quota so they don't get compensated by Origin whilst still fishing their whole quota which would cause displacement problems; o Discussed crew compensation and Apollo Bay Coop; • 15 May Origin and VRLA held a phone conference to respond to VRLA questions above. Given two Origin project members were on leave at that time, Origin sent a follow up email on 3 June with further information. • 27 June, VRLA replied to Origin's detailed email on 3 June. VRLA advised: o Surprised to see suggestion of planktonic water column testing during the survey was so readily dismissed by Origin; o Consulted with FV and IMAS on this matter, who advised such research would be valuable; o Will follow up with IMAS for further opinion and status of completed and planned research in this space; o Would like Origin to advise name of its environmental consultant and firm who provided Origin with its advice on planktonic research.	supplier technologies and capabilities. Notwithstanding current operational knowledge, the team reviewed VRLA's questions regarding seismic survey methodologies, including the reference provided by VRLA. Origin is confident that 3d marine seismic surveys are a low impact technology suitable for the task. • Origin consulted with RPS Australia Asia Pacific for advice on the feasibility of conducting water column sampling in field before and after the passage of the proposed 3D seismic survey. Origin concurred with ERM's advice regarding the complexity of carrying out such research in-field in order to realise a statistically valid result that would withstand peer review. • Origin carried out a further review of relevant current research in relation to the matters raised by VRLA and prepared a detailed response, including provision of all reference. • Origin understood that the potential impact on the southern rock lobster larvae from seismic surveys was very low, citing prevailing research, along with research that indicated declines due to excessive fishing over time along with natural climate and ocean	questions and will reply after consultation from our Environment Manager (unable to attend meeting); o Origin engaged FRDC to understand timings of rock lobster research and how they will approach communicating results and assisting fishing industry with education on research. • 3 June, Origin sent follow up email with further information (including a full schedule of references) from Origin's technical project team: <u>Seismic Survey Methods</u> o Origin reviewed the paper VRLA referred to (http://www.okeanos-foundation.org/assets/Uploads/Airgun.pdf). In that paper, 4 'alternatives' were suggested: 1. Electromagnetic (EM); 2. Marine vibroseis; 3. Passive seismic; and 4. Curtains. o Electromagnetic is already commercially available and in use for marine data acquisition, however it is not considered an alternative to 3D marine seismic but rather a different technology for different applications and different benefits and limitations including: ▪ EM technology produces much lower resolution images vs seismic technique; ▪ EM works best in deep water and only works in rare geological situations where a large electromagnetically resistive oil/gas reservoir is surrounded by a highly electromagnetically conductive geology. Origin has conducted past feasibility studies into applying EM surveying in the offshore Otway basin but these concluded that the technique would not be beneficial; ▪ EM is sometimes used to compliment seismic acquisition but never in isolation. o Marine Vibroseis is something we have been watching develop. Currently, Petroleum Geo-Services (www.pgs.com) is the only major marine	proposed 3D marine seismic survey technology was the only current suitable technology for the survey area. • Origin determined that in-field research during a seismic survey operation is not a feasible or robust research construct but remained open to further suggestions from VRLA.

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		impacts.	seismic company who has a conceptual marine vibroseis source. However, the development of this source remains an R&D project that is not yet ready for commercial operation. Origin is tracking the development of this technology and is open to using such source if it is proven commercially. o Passive seismic is the process of using sound monitors without using a sound source. It is not a mainstream technique for the gas industry but could be used to listen to 'creaking' within a gas reservoir due to fluid movement or to detect the natural sounds in the marine environment. The only application of passive seismic sensing which we currently believe to be of value in the offshore Otway basin is to use ocean bottom or streamer hydrophones to measure sounds from, and locate - marine life as part of environmental monitoring activities during operations. o The marine sound sources Origin currently uses for its marine seismic operations are airgun arrays. An array of airguns is used so that the lateral sound can be attenuated through sound wave interference between the individual airguns. At present, the development of airgun arrays is the most effective way to minimise lateral sound in the marine environment. o There are no known commercial source curtains available for marine seismic sources. We believe this is because curtains would interfere with the acoustic integrity of the seismic source and it would be extremely difficult to deploy such an instrument in open marine sea conditions. <u>Water Column Sampling:</u> o Origin discussed sampling of plankton assemblages (including fish and crustacean larvae) in the water column pre and post survey seismic surveys with an international environmental consultancy which has significant experience undertaking marine biological research. Advice from the environmental consultant is that they are not aware of such sampling being undertaken as part of operational seismic surveys and this is likely due to the very	

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
			high difficulty of obtaining statistically valid data that can separate the impact of a passing seismic vessel from background variation in the planktonic assemblage. The consultant has advised that plankton assemblages are extremely variable in space and time and any localised impacts from the seismic source are not likely to be distinguishable from natural variation. Given this advice we do not consider the cost and operational impacts of such a survey to be justifiable given the low likelihood of obtaining statistically defensible data. o The current approach undertaken by Origin to further understand impacts of seismic surveys to the rock lobster fishery is support of the IMAS/UTAS study. If an additional field research study is subsequently recommended following the IMAS/UTAS study, any further studies would be designed taking into consideration the outcomes of the experimental methods and field techniques that would have been fully tested and verified in the study currently underway. o It is acknowledged that the scientific literature assessing impacts of seismic discharges on crustacean larvae in the water column is currently very limited. It is also accepted that plankton in close proximity to a seismic source may suffer mortality. However the population level effect of this mortality does not appear significant relative to the impact of commercial fisheries and broad scale environmental conditions which operate at vastly larger scales than seismic surveys. o One of the few reported field studies, conducted by Pearson et al. (1994), exposed Stage II larvae of the Dungeness crab (Cancer magister) to 10 single discharges from a seven-airgun array and compared their mortality and development rates with those of unexposed larvae. No statistically significant differences were found in immediate survival, long term survival, or time to moult between the exposed and unexposed larvae, even those exposed within 1 m of the seismic source.	

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
			o As has been extensively documented, declining abundance of rock lobsters, inferred either from the results of stock assessments or from trends in puerulus and catch rates, has occurred throughout the entire range of Jasus edwardsii off southern Australia (Linnane et al., 2010). One of the factors for this decline is a high commercial harvest rate (>40% in many years in some areas) (Punt et al. 2012). o Given there is strong evidence for rapid increase in lobster abundance following removal of fishing pressure (see for example MacDiarmid and Breen 1993 and Barrett et al. 2009), the impact of lobster fishing on larvae production and lobster population demographics would seem to overwhelm any localised effects from seismic surveys. This is supported by the work of Parry and Gason (2006) who found no effects on southern rock lobster catches between 1978 and 2004 in western Victoria where seismic surveys had been consistently carried out. o In addition to fisheries impacts, recent simultaneous patterns of decline across the Australian range of the southern rock lobster have led various authors (see Linnane et al., 2010, Punt et al. 2012) to suggest that large-scale environmental influences may be playing a role. There are several possible mechanisms by which large-scale environmental change can impact the dynamics of lobster populations including, as summarised in Punt et al. (2012), impacts of: ▪ temperature on larval survival and growth; ▪ changing ocean currents on recruitment due to the lengthy pelagic phase; ▪ upwelling intensity where extreme cold-water events reduce growth rates of adult lobsters; ▪ reduction in kelp habitat driven by climatic changes causing reduced puerulus settlement (Hinojosa et al. 2014). o Similarly, investigations into sustained below average puerulus settlement of Western Rock	

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			Lobster have concluded that the decline is most likely driven by higher water temperatures at the time of the onset of spawning (October) since the mid-2000s. Statistical analysis shows that most (71%) of the variation in puerulus settlement was explained by the timing of spawning, storm activity during autumn/spring, and offshore water temperatures in February (Caputi et al. 2014). o To conclude, current evidence suggests that the key drivers of rock lobster abundance are large scale environmental influences and fishing pressure. The available evidence does not indicate population level effects on rock lobster species from seismic surveys. o Origin is keen to see findings from the FRDC / IMAS study that will keep building the research base. Given Origin's recent discussions with FRDC to understand their approach to communicating research to the different stakeholders, we look forward to FRDC taking further proactive steps when findings of the current study have been published. o Planning for the survey to be carried out between October 2015 and January 2016 is still under way. However, this may change subject to regulatory approvals, contractor availability and other operational requirements. If the dates do change, it is likely to be the same survey window (October to January) but commencing on or after October 2016. • 3 July, Origin replied to VRLA and advised: o The possibility of planktonic research was thoughtfully considered by key personnel at Origin. o Name of consultant and firm engaged by Origin. o Invited suggestions on how such research could be constructed to deliver statistically reliable data that would withstand the ordinary protocols of research peer review. o We need to understand the results and recommendations from current research being carried out by FRDC / IMAS before consideration	

Date	Information provided, Feedback given, Issues Raised	Origin's assessment of issues raised	Origin's response, including outcomes proposed or achieved	Summary of Origin's assessment and response
			of further research.	
2015 Sep-Nov	15 September and 13 November Origin emailed updates advising the survey was unlikely to commence in 2015, and would provide a minimum of 4 weeks' notice of survey start date when timing has been finalised.	• Given stakeholder feedback regarding concentration of rock lobster fishing effort over the Big Reef, Origin reviewed the technical data requirements from the survey to consider the impacts of reducing the area over the Big Reef. • After further consultation with NOPSEMA regarding mitigation of potential impacts, Origin excluded the majority of the Big Reef from the survey acquisition area.	13 November, Origin advised VRLA that the EP had been approved by NOPSEMA and of the exclusion of the Big Reef from the survey acquisition area.	Consultation and preparation of additional detailed maps helped validate feedback from stakeholders about fishing effort, which led to further mitigation of impacts from reduction of the survey area over the Big Reef.
2016 July	• 23 July, Origin phoned VRLA, requested meeting to consult on Enterprise2 survey and update on Crowes Foot survey. • 7 July, Origin met with VRLA in Apollo Bay (along with Apollo Bay Fishermen's' Coop Chairman). VRLA raised: o Preference for Origin to commence consultation with VRLA first so they can disseminate information; o Sought confirmation that Origin takes a risk-based approach to activities and impacts; o Lack of evidence does not mean no impact and believe that Origin has not addressed VRLA's past concerns; o Concerned about knock-on effects of displacement of fishing activities; o Requested further testing and scientific studies on impacts of seismic surveys on rock lobster; o Concerned with cumulative impacts of seismic surveys through decades.	• Agree with the approach of consulting VRLA first but Origin must continue direct engagement already commenced with some stakeholders who may or may not be members of VRLA. • Published results of FRDC/IMAS research project must be analysed and understood before additional research requirements can be determined. • Origin's review and analysis of research and data showed that variations in rock lobster catch in the Otway Basin has not correlated with incidents of seismic surveys.	• 7 July, meeting in Apollo Bay, Origin discussed: o Revised survey timing to Oct 2016 – Jan 2017 window. o Approach to preparing EPs, including defining the biological and socio-economic environment, identifying relevant stakeholders, identifying and assessing risks, developing mitigation strategies to manage risks to "as low as reasonably practicable" (ALARP). o Origin is happy to engage at industry level (SIV / VRLA) first but must also continue existing commitments to engage with individuals identified in its EP. o Restated Origin's compensation principles which include approach to prevent displacement and knock-on effects. o Victorian rock lobster management plan and status of the fishery.	• Origin followed a thorough risk based assessment of potential impacts in preparation of its EP. • Origin has listened to VRLA's questions and feedback and has provided detailed responses. • Origin believed there was sufficient evidence to support its impact assessment of the survey.
2016 Aug - Sep	• 11 August, Origin arranged further meeting with VRLA, SIV and ABFC in Apollo Bay to progress discussions on compensation principles. VRLA tabled a memo of concerns:	• All matters raised by VRLA have been fully considered by Origin's geophysical operations, environment and	• 11 August meeting, summary of Origin's responses: o Origin's first principle is that no fisher should be worse off or better off due to our proposed operations;	• Origin has responded to issues raised by VRLA but has sometimes not agreed with interpretations or

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	o Based on the Crowes Foot 3D Seismic Survey – Environmental Plan Summary VIC-9000-ENV-PLN00007, VRLA: ▪ Feels issues they raised were dismissed and there was no right of reply; ▪ Concerned at Origin's response regarding 'no impact to larvae at the population level'; ▪ Believes Origin's exclusion of some research amounts to "cherry picking"; ▪ Restated their concern about Origin dismissing water column research pre and post seismic surveying; ▪ A recent report (Day et al (2016)) shows documented uncertainty about impact on embryonic lobster from seismic surveys; ▪ Believed further research is required, Origin should have fully funded the whole FRDC/IMAS research (and not part) and following the 'user pays' principle, Origin should fund the next stages of research recommended by that project. ▪ Requested that the still unquantified threat to the fishery be included in the environmental impact matrix assessment within any EP. o Under the heading "Compensation principles (commercial rock lobster fishing industry), VRLA included definitions for discussion: individual fisher; displacement; fishing opportunity. Also included other points for discussion: fishing business losses; community impacts; fishers' mental health; consultation time and costs; fishery rehabilitation bond. • 26 August, VRLA emailed request for Origin to include a mitigation measure for survey timing to avoid the local spawning of the southern rock lobster fishery (September 15 to November 15). Cited the WA Fisheries Guidance Statement on Undertaking Seismic Surveys in Western Australia as an identified clear precedent that Origin should consider as it is required to continue to identify and reduce impacts to ALARP and continue consultations with relevant persons.	community personnel. • Origin sought independent environmental consultant's advice on matters raised by VRLA, to inform its assessment of impacts and mitigation strategies. • Origin has met with VRLA in Apollo Bay several times with relevant Origin technical and community team members (relevant to current issues) to listen to questions and concerns. • VRLA's request to further reduce survey area was thoroughly assessed and Origin agreed to this and opted to forgo data collection over an even larger area than VRLA requested in the knowledge that it is a highly contested fished area. In addition, Origin developed a survey sail line approach to prioritise areas adjacent the Big Reef in order to free up the area for fishers as soon as possible. • Origin has reviewed all relevant published research, prepared detailed responses to questions and feedback raised by VRLA. • Origin cannot reference the FRDC/IMAS research report until it is completed and published. • Further research requirements cannot be assessed until the FRDC/IMAS final report can	o Origin is open to discussing different arrangements for different impacts which may include VRLA's suggestion of fishers retiring quota to minimise displacement impacts; o Origin was unaware of any request to further fund rock lobster research and VRLA will supply the FRDC further research request to Origin; o Origin will respond to VRLA and SIV by 25th/26th with Origin's review and thoughts on the VRLA memo, including compensation principles, and will schedule another meeting around 8/9 Sept. • 26 August, follow up email from Origin: o Given additional information request from VRLA on 26 August, Origin will require more time to review and respond and suggest date for next meeting is 15 or 16 September; o Regarding compensation, Origin advised: ▪ Oil and gas and commercial fishing are both regulated activities with access rights to harvest crown resources; ▪ Origin will continue to work with commercial fishers to minimise any impacts and apply a fair and reasonable approach to compensation to ensure that; ▪ From commercial fisher's feedback, Origin understands the many different types of fishing operations. And there are different exploration permits which require different seismic survey methodologies. Some will enable simultaneous operations with fishing, some will cause limited displacement and some will require exclusion zones. Given there is no 'one size fits all' and Origin appreciates the opportunity to work with VRLA and SIV on this. o Origin sought further engagement on communicating survey start notice and further engagement of potentially impacted fishers. o Origin looks forward to continuing to work with VRLA to identify ways to sustainably share access to common operating areas with minimal	assessment of research. • Origin adapted its operational plans and mitigation strategies based on consultation with VRLA. • Origin believed there was adequate published research and data upon which its risk assessments have been made and determined as ALARP and will review and assess the FRDC/IMAS research and its implications for the survey, when it has been peer reviewed and the final report published. • Origin agreed with most of VRLA's recommendations regarding a compensation model and was confident of resolving the finer details with VRLA, and implementing a fair, efficient and expedient compensation process. • Origin will share EP extracts with VRLA in accordance with an agreed MOU framework. • Each industry has a statutory right to conduct its activities without interference, but Origin will honour its existing position that commercial fishers would not suffer an economic loss due to displacement caused by our activities.

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	• 29 August, VRLA emailed reply: o Confirming meeting on 16 September; o Keen to discuss survey timing; o Recommend Origin fund a SIV mail out to all Western Zone licence holders and notify all local commercial rock lobster fishing associations; o Raised the WA Fisheries Guidance Statement on direct, indirect, long term and cumulative impacts, in reference to compensation principles. • 7 September, VRLA emailed reply confirming meeting date, time and a summary of matters on which VRLA is seeking Origin's response. • 16 September, Origin met with VRLA, SIV, PCPFA and ABFC in Apollo Bay to progress discussions. Key points from VRLA: o Developing an MOU: ▪ All agreed to develop MOU between Origin and SIV. SIV will develop dot points of key inclusions and pass to Origin for initial drafting; ▪ SIV recommended reviewing APPEA MOU and stakeholder engagement research paper funded by FRDC (developed by SIV and Fishwell Consulting). o Stakeholder engagement approach: ▪ SIV wants to issue communications to all Western Zone licence holders and Origin agreed; ▪ SIV will seek both licence holder and operator lists for communications and prepare a covering letter to go with Origin's latest information sheet; ▪ Origin will do all printing, provide to SIV for posting and pay all costs. o Environmental risk assessment and methodology: ▪ VRLA/SIV want to see Origin change posture of 'no harm' and cherry picking of research; ▪ VRLA raised FRDC/IMAS research which is at draft stage and they understood Origin has a copy; ▪ VRLA believe the current published paper from FRDC/IMAS states there is insufficient evidence	be analysed and understood. • Origin project team reviewed VRLA request to provide extract of EP on rock lobster impacts and mitigations. Origin felt the EP is a highly technical document written for assessment by the regulator and not a 'lay-person', and after Origin has agreed an MOU with VRLA, which Origin believes will help build a more collaborative working relationship, Origin envisages a process of sharing and assessing research with VRLA in the course of preparation of its EPs.	impacts. • 2 September, Origin provided update on preparation of response and confirmed meeting on 16 September. • 12 September, Origin provided detailed response: o Industry to industry engagement: Origin would like to explore developing a voluntary MOU with VRLA, outlining respective commitments; o Stakeholder engagement: ▪ Assured VRLA that Origin has and will continue to address all of VRLA's feedback and questions; ▪ Origin has taken steps to adjust plans to minimise potential impacts, have considered research suggested by VRLA and where Origin has not agreed (eg water column testing), we have kept the door open for further discussion; ▪ Invited VRLA to visit the seismic vessel and join the project team operational meeting to view first hand, Origin's risk based discussion and decision process; o Environmental risk assessment and methodology: ▪ In response to VRLA's concerns about spawning, Origin engaged ERM Australasia to conduct additional review of potential impacts to rock lobster spawning and the applicability of the WA Fisheries Guidance (as provided by VRLA). A full copy of ERM's report, including references, was provided to VRLA; ▪ ERM concluded that the potential for larvae mortality due to seismic surveys are likely to be negligible relative to natural mortality; ▪ Delaying the survey until December will significantly increase the likelihood of encountering blue whales which are listed as endangered under the Federal EPBC Act; ▪ Origin does not consider that the	

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	which means that Origin should apply a precautionary principle. o Research funding: ▪ VRLA advised that Southern Rock Lobster (SRL) a not for profit organisation which has a participation agreement with FRDC and decides on research funding priorities, has determined no further FRDC funding on seismic impacts. Therefore the next phase of research, excluded from the current project, will not be funded by FRDC. SIV will therefore table a research proposal to Origin; ▪ VRLA believes there is a research gap in analysis of water column testing in a live survey scenario and referred again to consultation with IMAS last year which led VRLA to believe this would not be difficult. o Compensation principles: ▪ VRLA confirmed their view that there should be 3 levels of compensation: displaced fisher who should be required to retire their quota for the period of displacement to avoid a domino effect; the ABFC which is a not for profit organisation which exists to serve the fishing fleet; and "goodwill" for longer term environmental impacts; ▪ VRLA tabled and discussed a calculation method and will send Origin a detailed email as their recommended basis for calculation, along with estimates of cost impacts for ABFC; ▪ VRLA discussed appropriate time frame for evidence of fishing history in the survey area which should be 'recent years' and not for example, 10 years. Also said Origin should be fair and flexible in the event of individual circumstances such as a newly established fisher in the area; ▪ VRLA believes Origin should fund SIV's participation in stakeholder engagement. o Crowes Foot survey timing – Origin advised will be on or after 19th October, to be determined with contractor.		environmental benefit associated with delaying the survey until after the rock lobster spawning period is proportional to the potential additional risk of disrupting blue whale foraging activity. o Research funding: ▪ Origin views that collaboration and joint funding of research by government and industries is a common approach, reflects the importance of a sustainable future for all industries, ensures objectivity and allows competing considerations to be balanced; ▪ Final findings of the four-year FRDC/IMAS research program on seismic impacts on rock lobster and scallops, that Origin co-funded has not yet been released.; ▪ The findings of this research need to be fully analysed and understood before determining further research needs or funding. o Compensation principles: ▪ Origin's fundamental compensation principle is that no party should suffer a detrimental economic impact as a result of our activities; ▪ In the first instance, Origin will try to avoid or minimise impact, such as excluding the Big Reef and completing survey lines close to the Big Reef before start of the rock lobster season; ▪ Origin will honour commitments in a timely manner with an efficient, non-onerous model; ▪ Origin has historically compensated at the end of a fishing season on the basis of demonstrated loss, but is keen to discuss this with VRLA to simplify this approach; ▪ In anticipation of the next meeting with VRLA, Origin proposes a model where a fisher 'downs tools', does not displace other fishers, explore the option to retire quota for that period, agree on an upfront payment to compensate for loss of income, based on past catch records and current market rates.	

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	o VRLA asked if Origin could exclude the extension of the Big Reef at the northern aspect and marked this on Origin's map for consideration. o Origin provided revised information sheet and asked if VRLA / SIV could give feedback before finalising the update. • 23 September, Origin emailed VRLA notice of commencement of survey on 24 October or soon after, included updated information sheet with new map showing reduced area. Also advised: o To further minimise impacts on rock lobster fishing, survey will start on eastern boundary parallel to Big Reef first; o Will provide regular updates to commercial fishers on completed survey areas, to enable fishing to continue safely around the survey; o If fishers intend to fish near the survey area, please advise Origin so we can SMS updates; o If fishers have proof of regular fishing history in the area, Origin would like to consult regarding displacement and compensation if the survey continues after 15 November; o NOPSEMA has approved the EP (provided link to the EP summary); o Seismic vessel will have restricted manoeuvrability and other vessels will be requested to maintain safe distance; o AMSA will issue notice to mariners; o Guard and support vessels will communicate with water users, standard maritime protocols and precautions will be in place.		▪ The survey is of short duration and does not limit access to fishing grounds that are substantially larger than the survey area. Origin is not aware of any significantly adverse impact of past surveys or the planned survey on fishing support, or other businesses. ▪ Origin appreciates that uncertainty around compensation may be a cause for concern. We reiterate that we will compensate to ensure no adverse economic impact on commercial fishers as a result of our activities, will simplify the model and reach agreements to give certainty. ▪ Origin does not believe there is any basis for a bond as Origin and the fishing industry can both impact fishing grounds, and both have a common interest in not adversely impacting the fishery. o Origin reiterates its desire to work with VRLA to identify ways that allow us to sustainably share access, with minimal impacts, to common operating areas in the Otway. • 16 September, Origin met with VRLA, SIV, PCPFA and ABFC in Apollo Bay to progress discussions. Key points from Origin: o Origin does not state there are no impacts, it acknowledges harvesting of Crown resources by both industries has an impact and works to the ALARP principle using a risk-based approach; o Origin also believes the commercial fishing sector cherry picks research and is keen to develop an MOU where we can share all relevant research, discuss respective views on the application of research to risk assessments and discuss a way forward for further research; o Origin is subject to contractual embargo regarding the FRDC/IMAS research and cannot reference or discuss the paper until it has been published; o Will discuss further research funding applications	

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			firstly with APPEA; o Will discuss VRLA's further request for in-field water column testing with IMAS; o Each industry has a statutory right to conduct its activities without interference, the legislation is silent on one party requiring exclusive access, but Origin's position remains that commercial fishers would not suffer an economic loss due to displacement caused by our activities; o Understand concerns about uncertainty of compensation and will work with SIV and VRLA to finalise; o Origin cannot compel a fisher to 'down tools' if they wish to continue fishing outside of a survey area. (VRLA agreed and believe that Origin should only offer compensation on the basis of retiring quota) o Origin doesn't compensate supply chain participants but would discuss ABFC matter further with Origin's compensation manager; o Origin doesn't agree to fund long term un-proven impacts and the current research indicate any long term impact on the lobster fishery form seismic surveys; o Origin believes payment to an industry association for stakeholder engagement is not appropriate given the role of the association to represent members' interest and engage with other parties, however Origin will pay for time and costs to distribute communications. • 21 September, Origin phoned VRLA: o Sending meeting minutes to progress actions; o Have reduced survey area, will explain in email; o Asked if VRLA had progressed compensation calculations and had any feedback on the information sheet; o Advised other community stakeholders engaged and sought feedback on signage and notices in Apollo Bay; o Explained that Origin has not provided extracts	

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			from its EPs due to protection of intellectual property, Origin too has concerns about VRLA 'cherry picking' information in the absence of an agreed MOU and full consultation on research, impacts, risks and mitigation strategies. • 22 September, Origin emailed draft minutes of the meeting (16/9) for review, and responded to matters raised at meeting: o Assessed request to further reduce the survey area north of the Big Reef and is prepared to forego data capture and reduce the area even further than the request made on 16 September. Sent revised map reflecting this; o Preparing additional map to show indicative sail lines from the vessel to assist in understanding fishing displacement impacts and will also prepare a map applying Admiralty Charts for further definition.	
2016 Oct	• 3 October, Origin emailed VRLA and SIV to progress discussions from 16 September, suggested weekly 30 minute meetings in the lead up to the survey, if they had made progress on the compensation calculations and cost impacts for ABFC. • 3 October, VRLA replied: o Included a proposed compensation model based on impacted fisher with history or proven intent to fish in the area 'downing tools' and not displacing other fishers, retiring quota for the number of days of exclusion and being compensated at average catch per unit effort (CPUE) x pots x days x beach price; o Also raised concerns about timeliness of payment by Origin, given fishers would be emerging from the closed season and relying on early payments from first catch. • 5 October, VRLA forwarded a draft research funding application from IMAS/UTAS to FRDC for Origin to consult with APPEA regarding assessment of industry support. • 7 October, VRLA requested a position statement from Origin regarding the research, to table at a	• Origin appreciated the proposed compensation model put forward by VRLA and the participation and time taken by VRLA to provide Origin with information and their views on a fair compensation approach, and arranging consultation with FV to agree on a simple verification approach. • After assessing this information, Origin felt that commercial fishers would benefit from the certainty and simplicity of a model that enabled the fisher to nominate the amount of quota to retire, provide fishing history and set a single price per kilogram based on a projected season average.	• 4 October, Origin replied to VRLA's email (3/10): o Will review VRLA's compensation model with Origin's compensation manager and revert back to VRLA; o Searched information on ABFC, can VRLA assist with information such as ownership, board, management structure, member types and numbers etc? o Gave update on stakeholder engagement regarding commencement notice; o Inquired again if VRLA (or any members) wish to visit the seismic vessel? • 11 October, Origin replied to VRLA's email (7/10) with requested position statement: "The final findings of the four-year FRDC program researching seismic impacts on southern rock lobsters and scallops are expected to be released before end of October, 2016. Origin will need to analyse the findings before determining a position on further research needs or funding. We will then table this for discussion at the APPEA HSE Committee." • 12 October, Origin arranged phone meeting with	• Origin's draft compensation framework has incorporated all of VRLA's inputs and feedback and endeavoured to provide a simple, fair and expedient process, including verification process with FV. • The FRDC/IMAS research did not identify any lethal, nor population level impacts on rock lobster. Nevertheless, for the avoidance of doubt of yet unquantified and unverified population impact on rock lobster, Origin's compensation framework embodies the precautionary principle, enabling fishers to retire and be compensated for their entire season quota.

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	meeting with Southern Rock Lobster Ltd on 20 October. • 10 October, Origin sought a phone conference to follow up on actions from the last meeting and Origin's responses to the compensation model and research matters. • 11 October, Origin checked if VRLA had information on ABFC, if VRLA wanted to visit the seismic vessel, advised survey won't be starting on 24 October, provided a survey map placed over Admiralty charts for VRLA/SIV feedback before wider distribution. • 11 October, VRLA asked why NW corner of survey area is outside VIC/P69 permit but no other feedback on map. Will provide ABFC information soon, no one has expressed interest in visiting seismic vessel or discussing operational details with the project team. • 12 October, phone meeting with Origin, VRLA raised: o Believe Origin is still cherry picking Parry and Gason 2006 research but will accept Origin has responded; o Requested water column testing some time ago and not surprised Origin is now saying it's too late and believe knowledge gaps remain; o Wants Origin to demonstrate good will by paying 'beach price' for lost catch, not gross margin; o Whilst any closure period due to the survey may be relatively short, fishers will catch all of their quota as they have over the last 6 years, but due to overall decreasing quotas and fixed overheads, to maximise profitability fishers will fish to the market conditions which are optimal in the lead up to Christmas and Chinese New Year; o Believe evidence of retiring quota is relatively simple and will arrange meeting with FV, VRLA and Origin to discuss further; o There is a real impact on the ABFC if fishers retire quota, as it's a not-for-profit to serve the fishermen. • 13 October, VRLA send email on ABFC membership, structure, services to members, annual business activities, fixed costs that continue regardless of volume of catch processed; re-stated any retirement	• The FRDC/IMAS research report provided new information but did not extend to assessment of lobster population level impacts and therefore could not be used to guide economic impacts now or in the future. Therefore, Origin applied the precautionary principle in determining its compensation framework. • Origin understood VRLA's perspective and their reasons for wanting the EP extract before (or at the same time) as resubmission to NOPSEMA. After full consideration of the request, Origin decided to retain the existing regulatory process in which NOPSEMA assess and approve EPs, after which a summary is published. After NOPSEMA's approval of the revised EP, Origin will provide an extract of relevant chapters to VRLA. • Origin is seeking an MOU with SIV (there thereby covering engagement with VRLA and other fishers) so it can confidently review relevant research, risks, implications and mitigations, with SIV / VRLA before submitting future EPs.	VRLA / SIV to progress actions from 16/9: o Sought further review from ERM re relevance of Perry and Gason 2006 research to Crowes Foot survey. ERM confirmed P&G 2006 findings relevant to Crowes Foot survey location, timing and water depths; o Origin contacted Jayson Semmens at IMAS to discuss feasibility of water column study during survey. He advised insufficient time before survey, but has just completed studies on effects of seismic on plankton, preferred to wait until results released before determining any suitable follow up program, recognized this type of research on an operational seismic vessel would be very difficult and would look at alternative investigation methods first; o Remain concerned about methodology and reiterated importance of good science; o Evidence of regular fishing grounds to be provided by fishing records supplied to FV or reasonable intent; o Agree on compensation calculation except 'gross margin' should replace 'beach price' as catch effort consumables (bait, ice, fuel) will not be used whilst the fisher has 'downed tools'; o Must agree on evidence of retiring quota to FV in advance of agreed compensation, Origin suggested a visit with VRLA and FV to finalise; o Discussed change to closure period if there's a major event (eg. whales present, breakdown, storm) and notice required for this (but not resolved at this discussion); o Origin is awaiting ABFC info from VRLA before reviewing compensation approach; o NW corner of survey outside of permit area is within another Origin permit. • 13 October, acknowledge ABFC information and will follow up solar panel suggestion with project team. • 18 October, phoned VRLA with questions and updates :	• Origin made a thorough assessment of VRLA's request for relevant EP sections prior to resubmission of the EP and decided retain the current process and to provide the extract after NOPSEMA's approval of the revised EP. • Origin is keen to develop an MOU with SIV (thereby including VRLA) which will include an agreed approach to consulting on assessment of research.

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	of quota will have a direct impact. • 13 October, VRLA sent further email suggesting lateral approach of Origin setting up solar panels for ABFC as one of their largest bills is electricity. • 14 October, Origin sent VRLA and SIV indicative turning circle map to support description in information sheet of how the survey is carried out. • 18 October, VRLA advised in phone meeting: o Licensed operator would provide copy of license which includes quota and pot numbers and is correct party to any claim; o Payments by ABFC to fishers varies from weekly to monthly as some fishers must pay up front for their quota lease at going rate of $30k per tonne and thus more sensitive to cash flow; o ABFC has an overdraft to fund purchase of fish at beginning of season; o About 6 fishers may be active in survey area but not all may claim compensation; o Hadn't yet reviewed indicative turning circle map but did over the phone call and then understood the impacted area will reduce as survey progresses, as such the survey may not affect any depending on timing; o If survey is interrupted by a major event, fishers will need 3 days' notice to restart fishing, 2 days to cease and pull pots; o SMS is ideal form of communication and fishers will need latitudes and longitudes. • 21 October, Origin phoned to ask whether ABFC handles catch for lobster fishers other than members and if beach price varies at different ports in western zone. • 21 October, Origin emailed survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, progress on compensation approach. • 21 October, VRLA replied to Origin, advising ABFC does take catch from non-members, the beach price varies seasonally but all buyers are pretty much the		o Is the 'licensed operator' the correct legal and impacted entity for compensation claims as opposed to 'quota owners'?; o How frequently ABFC pays for landed catch?; o Has VRLA has reviewed indicative turning circle map and could they estimate number of potentially impacted fishers?; o Explained impacted area will reduce as survey progresses and we will aim to complete survey near Big Reef before 15 Nov; o Advised if survey extends past any fishing area closure periods where fisher has agreed to 'down tools', we would extend compensation on day rate as per agreed calculation (agreed); o Discussed major event causing survey to be delayed for 7 days or more and notice required to fishers to recommence fishing and then cease to allow survey to restart; o Discussed our approach to provide daily updates by SMS and exact information fishers would need; o Offered to pay VRLA's costs to send SMS messages if they prefer (not necessary); o Suggested Origin could draft letter for fishers to advise FV and copy in Origin, of retiring quota (agreed). • 25 October, Origin met with VRLA and FV in Melbourne regarding process for validating compensation claims to Origin and discussed: o Verification of fishing data to establish fishing history in survey area; o Verification of quota caught in the survey area; o Process for FV to record retirement of quotas; o Correct identification of Rock Lobster Fishery Access Licence Holder and Person Professional Fisher Number (PPFN) is necessary for verification steps; o Agreed a simple approach and Origin will draft forms and engage for confirmation.	

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	same at any point in time. • 27 October, discussion with Origin regarding Origin's mitigation response to FRDC/IMAS research report (offer of retiring quota for the whole season), VRLA advised: o Prefer the survey not to go ahead but the approach suggested would help; o Won't know the impact of the survey on that particular population / cohort of lobster for some years; o Ultimate precaution would be to retire aggregate quota for survey area for 5 years; o To understand fishers' views there's only about up to 6 impacted and would need to now discuss with them; o Depending on what percentage of the ABFC's total throughput comes from the survey area, it could be quite a hit for them. Their business is split into 2 parts; lobster processing; and everything else (bait, fuel, retail). Lobster processing is almost break even as margins are tight. Should get data from FV to look at this. ABFC has fixed costs regardless of volume processed, plus consumables like packaging. ABFC use an export agent to shift a tonne at a time, would need to discuss any impacts on Chinese client relationships with them. ABFC has good reputation with Chinese clients as they have a low mortality rate on shipped lobster; would need to discuss further. • 28 October, VRLA sent text reply to Origin's meeting request. Advised they can't meet today, talked with NOPSEMA yesterday, believe they will be making some determinations on Monday on the concerns that have been raised. Need to hear what they have to say to inform next steps. • 31 October, VRLA responded to Origin's compensation proposal and advised: o Circulated Origin's position to VRLA management committee over weekend, received some feedback, some away due to long weekend; o Will take current negotiated position to the AGM		• 27 October, regarding mitigation response to FRDC/IMAS research report, Origin phoned VRLA to provide update and seek feedback: o Origin has reviewed FRDC/IMAS final research report and the Crowes Foot EP; o Given the new information Origin wants to go through the research thoroughly and discuss with VRLA; o Although the research provides new information, it does not guide Origin nor the fishing sector on potential lobster population level impacts and therefore cannot be used to guide economic impacts now or in the future; o Given survey timing limitations, Origin is exploring options to demonstrate a precautionary approach, is thinking boldly about this along the lines of enabling fishers who have a history of regular fishing in the survey acquisition area to retire all of their quota for the season and not fish lobster in the survey area at all. o This approach would effectively give fishers the option to rest the local fishery for the season, for the avoidance of doubt on population impacts from potential predation; o Discussed flow on impact to ABFC who export 90% of product to China; o Origin understands there will be short-term margin impacts to ABFC but the Chinese market is robust, they would buy as much as available and any reduction in volume due to retired quota would not have a lasting impact; o Origin is seeking VRLA and SIV's views on this approach and any other ideas they may have; o Origin has asked FV for data on catch in grids J13 J14, K13, K14 to review in light of this approach and will also provide to VRLA; o Origin is keen to agree on a fair and simple compensation model promptly, to remove uncertainty. • 27 October, Origin sent follow up to VRLA:	

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	(3/11) for an industry endorsed position and will also seek independent legal advice; o Member feedback thus far: unanimous position that no further seismic surveys should go ahead until risk of damage to lobster in latest FRDC/IMAS report can be qualified and quantified and mitigation and remediation strategies be put in place; compensation arrangements discussed thus far only cover displacement not "new risk" of impact to lobster population and VRLA expects Origin to discuss in good faith in due course; fishers displaced in operating areas (not just acquisition areas) should also have opportunity for compensation; VRLA welcomes Origin's offer to simplify process, $95kg set price and 5 day payment terms; question regarding consideration of tides at north of survey area close to coastline. • 31 October, follow up phone conference with VRLA/ SIV to discuss compensation. VRLA's feedback: o Compensation offer at an individual level was fair, VRLA will table for discussion at their AGM. o When will Origin engage with VRLA and SIV on FRDC/IMAS report, feel Origin has known about research should have been discussing earlier; o Eligibility test of 3 years fishing history in the area may preclude the retirement of sufficient quota to benefit the local lobster population, suggested that in the acquisition area, at best 2 or 3 fishers may retire between 5 to 10 tonne of quota; o Survey has potential to impact K14 block which includes a research site that collects data input into TACC quota; o SIV received 3 calls from fishers since SIV distributed Origin's correspondence to all Western Zone licence holders (25/10) and will follow up; o Will Origin be reviewing and resubmitting EP? Want to see what's being submitted to NOPSEMA (extract from EP is fine); o Will any acquisition take place in the turning circles outside the marked acquisition area?		o Appreciate VRLA's time to discuss; o debriefed VRLA's feedback to project team; o Origin is very close to finalising a compensation agreement that we believe SIV/VRL, displaced fishers and the coop would find acceptable; o Origin is keen to finalise tomorrow so we can have documents in place before 2nd November; o Requested visit in Apollo Bay tomorrow to progress. • 28 October, left phone message saying Origin was also liaising with NOPSEMA but we are keen to resolve compensation matters directly with VRLA and would like to meet today or discuss over the phone to resolve as soon as possible to give fishers certainty. • 28 October, Origin emailed data from FV to VRLA, showing 2015/16 catch from FV grid blocks in Crowes Foot survey area represented 8% of Western Zone TACC and 13% of actual catch in 2015/16. We are hoping to discuss further today. • 28 October, emailed proposed compensation model to VRLA and included draft of offer letter and claim form for commercial lobster fishers, and sought VRLA's feedback. Proposed compensation covered a simplified model (from VRLA's proposal) including: o Compensation = Quota to retire x $95; o Quota relevant to survey area; o $95 is anticipated average beach price for the season, fixed to give certainty and enable settlement of claim at beginning of season, and does not exclude operating costs; o 3 years fishing history in survey area; o Simple one page claim form; o FV to verify fishing history and quota, then record retirement of quota; o Simple 2 page contract pro-forma; o Origin to pay within 5 days of contract execution. • 31 October, follow up phone conference with VRLA and SIV to respond to VRLA email (31/10) and	

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			discuss compensation offer: o Regarding timing of feedback from VRLA, Origin understands VRLA would want to table at AGM but Origin wasn't aware of AGM until today and understood from past discussions that VRLA would directly engage the possible 2-6 impacted fishers; o Origin has been bound by confidentiality until the FRDC/IMAS research was published, has previously advised we want detailed discussions with VRLA / SIV on FRDC/IMAS report implications, are happy to do this before we've agreed on an MOU, but given the FRDC/IMAS report doesn't give guidance on population level impact and Crowes Foot timing limitations, our immediate focus is on precautionary mitigation via compensation model, which in good faith, Origin has extended to compensation offer to cover the fisher's entire season of quota relative to the survey area; o Percentage of catch in western zone from survey acquisition area was 7% last season and average 5% over last 3 years, estimated 6 fishers in the area, therefore Origin believes compensation offer that gives fishers the choice to retire entire season quota is a fair mitigation measure; o Will take new information regarding FV research site on notice; o All past correspondence has requested potentially impacted fishers to contact us and we've only heard from 3, so any prompts from SIV / VRLA would be welcomed; o Origin is reviewing risk assessment and EP and resubmitting to NOPSEMA, we don't provide EPs to stakeholders as previously advised, extract of relevant sections of EP will be provided when completed; o Part of reason we're seeking an MOU is so we can confidently review research and assessments with SIV / VRLA before submitting EPs. This isn't in place yet and timing won't allow this at present. Nevertheless, we will put VRLA's request for the EP extract to senior management team and revert	

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			with reply; o Assured VRLA we include all correspondence and stakeholder engagement summaries to NOPSEMA including objections raised by stakeholders; o Will reply to question regarding survey acquisition in turning circles; o Explained reason for surveying north/south is to meet technical requirements of survey and minimise displacement impacts for fishers, and we're aware of tides and currents.	
2016 Nov 1 - 14	• 2 November, Origin sent courtesy note to advise VRLA and SIV that Polarcus Amani is leaving Geelong around 3.00pm today and this is not for conducting the survey. • 2 November, VRLA replied to Origin's letter (1/11): o Want extracts of Origin's revised EP, preferably before or at least same time as NOPSEMA; o No evidence that mitigation strategy of avoiding key lobster fishing area and the compensation model offered will mitigate 'new risks' from FRDC report to ALARP; o Want more information on sound source proposed; o Compensation model is a mitigation to impact on a few individual fishers (of which there is no guarantee), no evidence that retirement of quota will be a meaningful mitigation for the new risks identified in FRDC/IMAS report, how can Origin claim reduced impacts to ALARP? o Believe the entire rock lobster population in the survey area will be permanently damaged and precautionary principle should be applied whereby no seismic surveys occur until more research is done; o Included graph showing history of Western Zone catch since 1970 and introduction of TACC in 2009 and stated fishers have good reason to be concerned about further seismic surveys; o Requested (6.26 pm) updated written offer before AGM at 9.30 am tomorrow; o Will seismic guns be turned off through turning	• Origin carried out an extensive review of its EP in light of the FRDC/IMAS research report which identified sub-lethal effects on lobsters, and fully reassessed the impacts and risks from its survey and made a comprehensive assessment of regional catch data and seismic survey activity in the Otway basin. • Origin added and enhanced controls that are responsive to ecological and economic impacts and risks, including reduction of survey area over key fishing areas, reduction of cumulative sound, minimising duration of displacement, implementing a comprehensive compensation framework, including an approach to assessing long term impacts.	• 1 November, follow up letter to recap discussion on 31/10, reply to questions. Attached NOPSEMA direction notice RMS0625 (31/10/17). Advised Origin has been working closely with NOPSEMA and expect to reasonably satisfy their requirements in coming days. Origin is keen to maintain regular consultation with VRLA and SIV and advised available tomorrow to discuss Direction Notice and any questions or feedback. Confirmed: o The FRDC/IMAS research has been assessed and key mitigation strategies for the survey include: ▪ Avoid key fishing areas by reduction of survey; ▪ Limit the size of the source ▪ Compensation model enabling fishers to retire entire season quota in relation to the survey area; o Compensation for displacement in buffer or operational areas is included and will be reflected in the compensation offer; o There will be no survey acquisition outside of marked "proposed acquisition area" on the map; o Origin will pay compensation within 5 days after FV have completed verifications and receipt of a signed agreement from a fisher; o Origin requires further information from ABFC. In the meantime reiterated compensation principle, we understand their operations are sensitive to cash flow, will offer an up-front payment based on agreed estimate and follow up with a true-up. • 3 November, replied to VRLA:	• Origin has made genuine efforts to engage VRLA and SIV during this time and where that has not been possible, had provided detailed responses and additional information. • Origin has re-assessed risks and impacts, developed appropriate mitigation strategies and remains committed to minimising disruption, ensuring no party is worse off economically as a result of our activities.

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	circles outside of the acquisition area; o VRLA will discuss Origin's proposal for ABFC with their chairperson tomorrow. • 3 November, VRLA advised that due to attendance at leadership program next week, unavailable to meet this week. Would be helpful if Origin could provide a written response. • 7 November, VRLA advised that Origin's proposed 'key mitigation strategies' and compensation principles were discussed at VRLA AGM on 3/11. VRLA provided a verbatim extract from the draft minutes of the AGM, for Origin's information and discussion: o "There is no consideration of the cumulative effect of repeated Seismic surveys. o Lack of a whole picture – e.g. we have Crowes Foot followed quickly by Enterprise (2). However, what is the total impact on all these to (and previously) surveyed areas when you add it all up. Especially considering that what is being left behind in an increasing population of permanently damaged lobsters that will take 5 – 7 years to replace (assuming there is sufficient recruitment to even do this)? o Impact outside of the acquisition grids – turning circle. Origin has not provided a definitive answer to the question of whether the airguns are switched off during the turn. Leaving the H grids of the inshore fishing grounds particularly vulnerable. It was also noted that these H grids are outside of Origin's permit VIC/P69 and VIC/P43. o Past experience of selective compensation is not good. E.g. Marine Parks where an area that arguably affects the whole fishery is removed and compensation is only to a few fishers. o Impact to the whole fishery as acquisition is on key 'fixed site' surveys for TACC. Hence, any subsequent downturn in fishery performance in that area could translate into Industry having to take a TACC cut (across the whole zone – as that is how the TACC is set) to 'repair' the damage.		o Given availabilities and time differences, unable to respond to their email before their AGM: o Had productive and open discussions with VRLA and SIV, understand importance of sustainability of their industry and request a meeting to discuss in good faith, as we believe we can demonstrate mitigation strategies to reduce risks to ALARP. • 8 November, provided update on EP review and compensation principles, and responded to AGM minutes: o Origin has been carrying out an extensive review of the recently published FRDC/IMAS research report and have fully re-assessed the risks and impacts to supplement and enhance the controls in the EP; o Origin has been consulting with NOPSEMA and responding to their requests for further information, will update our EP in due course and provide relevant sections after it has been finalised; o Origin remains committed to minimising disruption, ensuring no party is worse off economically as a result of our activities; o Cognisant of VRLA's feedback we're determined the compensation process will be as simple as possible and ensure timely payments, and have revised the framework comprising following: ▪ *Compensating fishers up front (before or during the season) if they choose to retire any or all of their season quota as it relates to a (newly defined) affected area;* ▪ *Compensating fishers (other than those who retired their entire season quota) during or at the end of the season if they fish elsewhere (in substitution for fishing in the operational area during the survey period) if they experienced lower catch, lower CPUE or higher costs;* ▪ *Compensating fishers who fished after the survey period (in substitution for fishing in the operational area during the survey period) if they receive lower beach prices than they would have had they fished during the survey period;* ▪ *Compensating "displaced fishers" during or at the*	

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	o Origin offer is limited to 1 year of compensation (and even then, only to some fishers). However, it takes 5-7 years for stocks to rebuild, pushing future fishing effort to be transferred to other fishing grounds. o Origin's past 'we do no harm' backed by realms of so called evidence. Future action on damage done by previous surveys. Rock Lobster requires further research on other life-stages – any the damage done to spawning and peurulus. Funding of this research is the issue – should be by O&G at APPEA level. o Apollo Bay Fishermen's Co-op impacted with no lobsters to process – acknowledged by Origin that the co-op is the fishers and would discuss compensation. Origin in the latest letter stated that 'Origin's fundamental compensation principle is that no party should suffer a detrimental economic impact as a result of their activities'." *(end of AGM minutes extract)* o VRLA is seeking written compensation proposal for fishers disrupted by the survey outside of the acquisition grids. o Motion called to ascertain support for the 'package' of offers from Origin. Resolution: - NO SUPPORT (unanimous). o Industry position of a request for a moratorium on further seismic testing remains, until full impacts of the latest FRDC research is understood and appropriate principles for ecological remediation and industry compensation are established. • 9 November, VRLA thanked Origin for the response which will be circulated to VRLA management committee and provide feedback as soon as practicable next week. Requested revised map of the 'affected area'. • 10 November, Origin sent VRLA and SIV revised compensation model, proposed compensation offer letter for fishers including claim form, revised map showing "affected area'. • 12 November, Origin sent VRLA, SIV and FV:		*end of the season if they experienced lower catch, lower CPUE or higher costs during the survey period due to a disrupted fisher coming into their fishing grounds.* o Framework is responsive to VRLA's feedback, and allows fishers the power to make their own business decisions and choose how to respond to Origin's activities and how to be compensated; o Finalising the documentation within the next two days, in the meantime, keen to seek VRLA's feedback, via email, phone or meeting; <u>Responses to VRLA's AGM discussion points</u>: o We have reviewed the data from catch and effort surveys and other factors potentially influencing rock lobster numbers. Found there's been no recordable declines in catch levels attributable to exploration in the 57 years during which seismic surveys have been undertaken in the offshore Otway Basin; o First seismic survey was acquired in the Otway Basin in 1959 and since then, 86 surveys have been conducted; o Previous research (such as Parry and Gason 2006) found no evidence that catch rates of rock lobsters in western Victoria have been affected in the weeks or years following seismic surveys; o Current Victorian Rock Lobster Fishery Management Plan (released in 2009) identified seismic impacts as a low risk; o Prior to quota restrictions being introduced in 2002/2003, the first Origin Otway Basin offshore 3D seismic survey (Investigator 3D) was acquired in 1999 and was followed by the two highest years of lobster industry catch in over 20 years - 521 tonnes in 1999/2000 season and 525 tonnes in the 2000/20001 season; o Seasonal fluctuations in commercial fisheries are affected by longer term factors such as significant weather events, water temperature and sustainable fishing practices. Previous declines in population counts have been attributed to natural events, such as the abalone virus, upwelling of cold water in the	

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	o Notice that Origin has final approval from NOPSEMA to proceed with the survey under specific control measures that NOPSEMA set out in a Prohibition Notice. o Advised that given the current rough weather, the Polarcus Armani is planning to layout out equipment on the afternoon of 14/11 and commence the survey shortly afterwards. o Attached documents: ▪ Letter to VRLA including revised compensation framework including approach to managing medium to long term impacts; ▪ Origin's final submission to the Notice of Direction issued by NOPSEMA; ▪ Copy of the Prohibition Notice issued by NOPSEMA to Origin; ▪ Origin's compensation offer to commercial rock lobster fishers (separate to Origin's letter to VRLA, to enable VRLA / SIV to distribute to fishers); ▪ Origin's compensation settlement agreement pro-forma draft (for distribution to fishers), o Origin acknowledged VRLA's preference to liaise with fishers and thank VRLA for circulating information, but as Origin is yet to receive VRLA's and fishers' feedback on the compensation offer letter, we feel we must provide the compensation offer to potentially impacted commercial rock lobster fishers at the same time as we provide notice of the survey commencement. o Origin remains committed to building our working relationship and developing the MOU. IN the meantime we will focus on the immediate need to finalise compensation arrangement for fishers and area available any time next week to meet with VRLA and fishers. We are also available anytime this weekend to discuss. 14 November, VRLA requested meeting on 15/11 in Apollo Bay with Origin's authorised representative to discuss compensation with impacted fishers. 14 November, Origin phone VRLA to discuss		region, and sedimentation during estuary opening and heavy rainfall events; o Nonetheless, our monitoring, investigation and compensation framework is adaptive and makes specific provision for any material decline in catch and catchability to be investigated, and we will compensate if the survey causes or contributes to an economic impact for fishers. Our preference would be that this approach matures through agreement with you (such as in a Memorandum of Understanding which we have previously proposed); o Latest research (FRDC – Day et al. 2016) regarding impacts of seismic surveys found there was no effect from seismic exposure on lobster survival and the nutritional condition of control and exposed lobsters improved considerably during the prolonged post exposure period (120-365 days); o While individual studies point to some physiological and behavioural impacts of seismic surveys on lobsters and related groups, none of the 11 studies conducted since 1992 and including the latest research (FRDC – Day et al. 2016) point to population-wide impacts, either immediate or chronic; o Origin's monitoring, investigation and compensation framework is responsive to cumulative impacts and this can be the subject of MOU discussions; o Whilst our area of interest for mapping of subsurface geology is marked as the "acquisition area" in our current information sheet map, we have prepared a revised map that now shows what is described as an "affected area" which includes all areas where the seismic source will or may be activated. It also includes an additional 2 km buffer, which we have determined as a conservative buffer based on sound propagation modelling carried out by Curtin University; o Our revised compensation offer covers a range of scenarios, all aimed at clarifying our original position that no commercial rock lobster fisher will	

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	arrangements for meeting tomorrow, attendees, privacy requirements, catch and effort verification required and thanked VRLA for setting up the meeting. Origin will give FV notice of the meetings, which will trigger the verification of fishing history and quota process with FV.		be financially worse off as a result of Origin's activities. We have carried out many marine seismic surveys (as well as other oil and gas activities) and have a strong track record of resolving compensation matters by agreement; o We are including a provision in the revised offer to compensate for any resulting economic impact in the future if it is demonstrated that the survey caused or contributed to any actual impact on population or catchability in the affected area. Further, we are seeking to continue negotiations in good faith with VRLA and SIV to enter into a MOU that will include setting out a process for compensation claims in the future. We believe that the substantial data already collected in the regular determination of TACC could be established as investigation triggers. In order to monitor any ongoing impacts, Origin would like to explore with Fisheries Victoria, options to participate in relevant existing consultation forums around the status of the populations, what the factors may be in any changes and, if required, trigger any further investigations into what factors may have contributed. o With regard to further research, as previously committed, we will table Southern Rock Lobster's request (via VRLA) with APPEA for industry wide discussion and provide SRL, VRLA and SIV feedback on this process. In addition, we commit to ongoing engagement through our MOU once developed and are seeking ongoing engagement with Fisheries Victoria in this regard. o We are keen to meet with the ABFC board. Our current thinking is that we would offer an up-front payment of compensation (based on a realistic impact scenario depending on how your members take up the compensation framework), with an offer to "true-up" when the true financial impact is known. o The FRDC report identified sub-lethal effects on lobsters. We have fully reassessed the impacts and risks and do not believe there is any actual or potential impact or risk that warrants a moratorium.	

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			o We have added and enhanced controls that are responsive to ecological and economic impacts and risks, including specifically to address your feedback. o We will minimise the disruption to fishers through the implementation of various controls including reducing the survey acquisition area (873 km2 – 730 km2), reducing the cumulative sound exposure levels, conducting the survey by moving from east (closest to Big Reef and Moonlight Head) to west, and progressively releasing back parts of the operational area. This will minimise the period of time for which access to these key fishing areas is disrupted. We have also offered to compensate commercial lobster fishers to ensure no economic impact results from our survey activity. The proposed compensation model includes a clear and fair approach, including the ability for an impacted fisher to seek compensation up front. We have a strong track record of applying fair compensation principles and resolution of such matters by agreement. In developing the compensation framework, we have sought to "cover the field" in terms of the potential impacts on fishers depending on their fishing and business practices. If indeed it does not achieve that and there remains a gap that doesn't allow an economic impact to be compensated for in a timely manner, we need to know so we supplement the framework. We have no desire for a fisher to be worse off, and we want a simple and fair model to allow us to make good any impact this season, complemented by a robust framework to identify and respond to any longer term impacts on the fishery and / or fishers.	
2016 Nov 15 - 30	• 15/11/2017: Group meeting in Apollo Bay with VRLA, fishers and Origin: o VRLA is disappointed the survey is going ahead and their attendance at the meeting was not to be construed as satisfaction with NOPSEMA's approval process; o Fishers want to be out fishing, not here at the meeting at commencement of the season;	• Origin met with fishers, considered each one's personal circumstances and claims, reviewed their fishing history, sought FV verification, prepared and delivered agreements, and paid all compensation agreements within 5 days of	• 15, November, group meeting in Apollo Bay with Origin (Geophysical Operations Manager, seismic survey project manager, community managers), VRLA and fishers: o Commenced with open forum to provide survey update, listen to questions, concerns, feedback, explain compensation framework; o Origin acknowledged fishers concerns about	• Origin acknowledges there are different interpretation of events and expectations of each other, which is understandable. • Origin is keen to build a positive working relationship and commence development

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	o Long term framework is an issue, who's paying for investigations, commitments Origin has made to NOPSEMA aren't acceptable to VRLA; o Other research matters should be included such as post-harvest mortality, fisher behaviour, timing of fishing when females are pregnant; o Further discussions with Origin are required on this matter; o Fishers are petrified about future of the industry. • 16 November, VRLA email: o Providing an EP submission after the regulator has accepted it is simply unjust; o Fishers should have been enjoying their first day of fishing for the season yesterday; o With uncertainty and threat to the fishery, this leaves the mental health of the fishers at stake o The survey will cause chronic and permanent damage to 33,000 adult rock lobsters representing nearly 15% of the Western Zone rock lobster fishery catch; o The fishing grounds may take 5-7 years to rebuild; o Retirement of quota is simply damage control; o No fisher wants to see long-lasting devastation, this is not a monetary issue, it is an ethical one. • 19 November, VRLA replied to Origin's email of 18/11, expressing their ongoing dissatisfaction with the consultation process with Origin and timing of events, and their firm belief that seismic surveys damage their resource.	agreement execution. • Origin has received feedback from some local commercial rock lobster fishers that their fishing season has progressed in accordance with their expectations, and that Origin has been professional and responsive in regard to managing compensation claims. • Origin will continue to consult with VRLA on the model that Origin prepared in the EP for long term impact assessment.	impacts, reminded the fishers the FRDC/IMSA research showed no mortality of lobster and that they habituated to exposure, nevertheless adopting the precautionary principle, Origin was offering retirement of season quota to fishers with fishing history in the survey area; o Origin advised that VRLA wasn't available to consult in setting framework for long term impact assessment; o Origin will continue to work with SIV / VRLA and FV on this; o Overriding principle is no economic impact now or long term due to Origin's seismic surveys; o Held individual meetings with impacted fishers to ensure privacy of their confidential fishing information. • 17 November, acknowledged (16/11) email, advised will respond as soon as possible as we're currently expediting fishers' compensation claims. • 18 November, replied to VRLA 16/11 email, reaffirmed Origin's commitment to minimising impacts, our enhanced controls and our position on compensation is a demonstration of that commitment, all questions and comments from VRLA re the FRDC/IMAS research have been responded to and reason given why draft version of the EP are not in the public realm, we remain open to constructive discussion with VRLA so our two industries can jointly access crown resources. • 30 November, Origin replied to VRLA 19/11 email with update on progress of compensation agreements, said we have a different interpretation of events and expectations of each other which is only natural, Origin would like to 'call a truce' and work toward a positive working relationship. Keen to start development of MOU which Origin has offered to draft due to limited availability of resources in SIV.	of an MOU. • Origin honoured all of the commitments made in its compensation offer to fishers.
Dec 2016 – May	• 8 December, VRLA acknowledged Origin's email (30/11), they are overseas and will follow up issues after debrief with SIV & the affected fishers on their return.12 January, VRLA advised Origin they would discuss Origin's long term impact framework at the	• Origin understands the natural differences in opinions that emerge given our different industries, and has tried to bridge gaps	• 7 December, completion of survey notification sent. • 20 December, courtesy call to update on compensation process and outcomes, left message.12 January, advised VRLA that Origin has	• Origin is confident it has conducted the survey professionally and in accordance with EP

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2017	Rock Lobster Research Action Group (RLRAG) on 18 January and provide feedback to Origin. • 18 January, VRLA email to NOPSEMA, forwarded by NOPSEMA to Origin regarding two queries from VRLA about the outcomes of the survey. • 2 March, VRLA emailed further questions on Origin's reply 28/11 regarding turtles, 'affected area' and number of streamers • 9 March, VRLA replied to Origin' email (28/2): o Would appreciate if Origin could respond in writing; o VRLA is in no position to be involved in an MOU, SIV have limited resources and an MOU is a low priority; o VRLA has advised that the long term impact assessment of seismic should be addressed by the Rock Lobster and Giant Crab Resource Advisory Group, will be discussed at their next meeting and Origin will be advised of outcomes.	through being readily available to meet with VRLA on their 'home turf', with Origin's technical and community team members participating in discussions. • Origin has invested considerable time in providing detailed responses and consulting with VRLA and will continue to do so. • From time to time, Origin has required additional time to prepare responses depending on the nature of questions, research and preparation required, and on resource availability.	been seeking a meeting with FV to progress discussions on assessment of potential long term impacts, checking VRLA availability and if VRLA wishes to meet with Origin first. • 28 February, Origin responded to VRLA's questions to NOPSEMA. Provided information on environmental plan compliance other than three minor matters, turtle observations, surveying within the 'affected area' and subsequent planned sound analysis during the survey, tidal currents and flows, and the planned increase number of streamers. • 9 March, Origin replied to VRLA's email (2/3): o Completely confident we have conducted operations in accordance with EP commitments; o Happy to arrange a meeting with our project and environment manger to respond to further questions o Believe that face-to-face meeting enabling detailed two-way discussions will be far more effective in getting to the bottom of VRLA'S questions and concerns; o Have reached out to VRLA and SIV several times to try and develop MOU to facilitate a productive and mutually beneficial working relationship; o Have tried to initiate engagement with VRLA and SIV regarding the long term assessment approach in our EP; o Can you please advise a couple of options for times to meet your preferred location? • 28 March, Origin replied to VRLA's email (9/3) advising disappointed we are unable to meet and we believe that a meeting would help build our relationship, however we are preparing our response. • 18 May, Origin replied to VRLA's email (2&9/3): o SIV recently advised it believes an industry wide MOU may be more effective; o Regarding the long term impact assessment: we appreciate VRLA and SIV would have preferred input before commencement of the survey and we did try to consult; since then we have tried to	commitments. • Origin has endeavoured at all times to conduct its engagement with VRLA ethically, transparently and professionally. • Origin has continued consultations regarding approach to assessing potential long term impacts to rock lobster from the seismic survey (see section 3.8 below). • Origin will continue engagement with VRLA and strive to build a positive working relationship.

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			engage VRLA, SIV and FV (now VFA) to progress this; recently NOPSEMA suggested a round table discussion with VRLA, SIV, VFA and NOPSEMA and we are keen to arrange this; o Regarding inquiry on turtles, all mitigation measures were followed and there were no marine fauna injury or deaths due to vessel strike or entanglement reported from the survey; o Provided additional map to clarify terminology regarding survey areas (operational, acquisition, sound affected); o There was no source activated outside of the Source Activation Area; o We engaged with fishers directly regarding increase to the "affected area" following in-field validation by Curtin University, and with ABFC; o The increase in number of streamers was done to improve survey efficiency and there was no correlating increase in source size, but enabled reduction of survey time by 11 days.	

5.5 Ongoing consultation

In accordance with standard operating procedures, Origin continued engagement with stakeholders during the preparation, execution and close-out of the survey. Stakeholder lists and maps were reviewed, along with timelines, consultation approach, key concerns and messages. An outline of key SEP components is included below.

5.5.1 Stakeholder review

Communications from Origin during the development of the EP asked stakeholders to advise Origin if their operations will be affected by the survey. The stakeholder verification process and consultation enabled Origin to determine the functions, interests and activities of stakeholders and make an assessment of the stakeholder status as:

- engage throughout;
- inform only;
- not relevant person;
- don't want further info;
- close.

Upon publication of approved initial Crowes Foot EP Summary, stakeholders previously engaged, other than stakeholders identified as “closed” and “not relevant person” in the consultation log, were notified of such approval, how to access the EP summary and indicative survey timings. Stakeholders were asked if they wished to be further informed before, during and after the survey and in the case of affected stakeholders, consulted to avoid or reduce impact. Stakeholder lists were reviewed and a new consultation log commenced.

5.5.2 Timing of further notifications

Upon determination of the successful seismic contractor, scheduled survey start date and other operational details:

- Further information was provided to stakeholders as identified in the review process outlined above.
- Professional fishing stakeholders who previously advised Origin that they may fish in the survey area were requested to provide up-to-date information of fishing intentions during the survey period.
- Professional fishing stakeholders who previously advised Origin that they regularly fish in the survey area were provided with detailed timings to facilitate further consultation with Origin to obtain up-to-date information on fishing intentions, identify potential alternative operating arrangements, and reach agreement on compensation principles should such agreements be subsequently required.
- Fishers and divers were provided with at least four weeks’ notice prior to acquisition of the seismic survey.

5.5.3 Consultation methods

Consistent with the SEP for development of the initial EP, stakeholders were sent a revised survey information sheet via email unless they nominated a preference for traditional mail and provided their postal address. Origin sought face to face consultation meetings with commercial fishing stakeholders based in Apollo Bay and a small number of other stakeholders who advised they regularly fish in the survey area.

Before, during and upon conclusion of the survey, regular updates on times and locations were sent by SMS/text message to commercial fishing stakeholders who opted into the message service offered by Origin. The SMS service was also offered to Commonwealth maritime agencies and other stakeholders who advised they wish to be kept informed.

SETFIA offered to facilitate Origin’s SMS/text messages before, during and upon conclusion of the survey, for a handling fee and Origin accepted the offer.

Signage in public boat ramps was placed before the survey and a toll free phone number and email address was provided for further inquiries.

5.5.4 Consultation management

A stakeholder communications and consultation timeline was prepared after determination of the successful survey contractor and scheduled start date.

Consistent with the SEP for development of the EP, all communications and consultation was entered into the consultation log. A new survey operations consultation log was created to track all communications and consultation after initial submission of the EP to NOPSEMA for review and approval.

All postal and email correspondence was filed in a dedicated project folder and file notes were prepared after key stakeholder meetings. Any commitments made to stakeholders were confirmed via email, phone or post as appropriate.

Any new objections, concerns or claims that arose from a stakeholder were:

- captured in the stakeholder log;
- raised with the relevant survey project team member responsible for reviewing, assessing, researching the matter as applicable and preparing a response;
- tabled at a regular project review meeting, where the response was also discussed.

5.6 Consultation update and outcomes

5.6.1 Review of stakeholders and planning

Following the initial EP approval, confirmation of seismic contractor and project start dates, stakeholder planning was reviewed. 23 new stakeholders were identified, 8 of whom were commercial fishers. A further 6 stakeholders from the commercial fisher sector were identified in November 2016. The stakeholder map below is an assessment tool used to consider key concerns, review consultation approach and revise information materials.

5.6.2 Review of sufficient information

The information sheet used to provide sufficient information was revised several times to ensure provision of sufficient information to relevant persons:

- July 2014 – Information sheet issued;
- March 2015 - revised detailed map with bathymetry, revised survey size;
- May 2015 - including SCUBA diving procedures;
- November 2015 - advised EP approval, Big Reef exclusion; and
- September 2016 - revised map with further reduced survey area; additional information regarding survey area and rock lobster fishing.

In addition to the information sheet, different versions of survey area maps were prepared to assist different stakeholders including:

- Map showing shipwrecks within the survey area, provided to dive associations and recreational diving organisations;
- Map showing survey overlaying Admiralty charts, provided to commercial fishers;
- Map showing indicative survey turning circles, provided to commercial fishers;
- Map showing Fishing Victoria grids overlayed on survey areas: permit; survey acquisition; sound affected area; and operational area; and
- Map showing the proportions of each survey sound affected area within each Fishing Victoria block was also prepared and used in consultation with fishers claiming compensation.

5.6.3 Engagement timeline

Following the initial EP approval, then appointment of seismic survey contractor, key project timings were reviewed to ensure a reasonable time period for consultation was allowed (see Table 5 below). With each issue of updated survey information, stakeholders were requested to reply if they had questions, feedback, concerns, and if they wished to consult with Origin.

In recognition of potential impacts on the rock lobster fishery, face to face consultations were specifically sought with SIV and VRLA. Six meetings were held with VRLA throughout the consultation process, along with many phone calls and emails.

Table 5: Timeline of key engagement activities

Key Engagement Activities	Jul 2014	Aug 2014	Mar 2015	May 2015	Sep 2015	Nov 2015	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017
Commenced stakeholder engagement, issued first information sheet													
Commenced consultation with SIV, sought VRLA meeting													
Commenced consultation with SIV / VRLA re compensation													
Consulted with VRLA regarding research on rock lobster impact													
Reviewed stakeholder communications and maps													
Advised commercial fishers survey unlikely to commence in 2015													
Advised commercial fishers: EP approved; reduced survey area; start after Oct 2016													
Consultation with SIV / VRLA re: timing; research; impacts; mitigation; compensation													
Reviewed stakeholder list, added 23 stakeholders													
Advised commercial fishers proposed start date, updated further reduced survey map													
Advised commercial fishers timing update, vessel names and contacts, compensation advice													
SIV issued Origin's survey													
Installed signs at Apollo Bay harbour, Port Campbell and Peterborough													
Ran public notices in: The Warrnambool Standard; Cobden Timboon Coast Times; Colac Otway Herald; The Beacon (Port Campbell)													
Advised notice of survey delay													
Consulted with impacted rock lobster fishers regarding compensation													
Consulted with Apollo Bay Fishermen's Coop regarding compensation													
Issued survey commencement notice													
Issued SMS messages													
Issued survey completion notice													
Reviewed Apollo Bay Fishermen's Coop													

Key Engagement Activities	Jul 2014	Aug 2014	Mar 2015	May 2015	Sep 2015	Nov 2015	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017
compensation													
Review compensation calculations based on in-field validation of sound affected area and re-engage relevant fishers													
Request meeting with Fisheries Victoria to review long term impacts													

5.6.4 Public notices

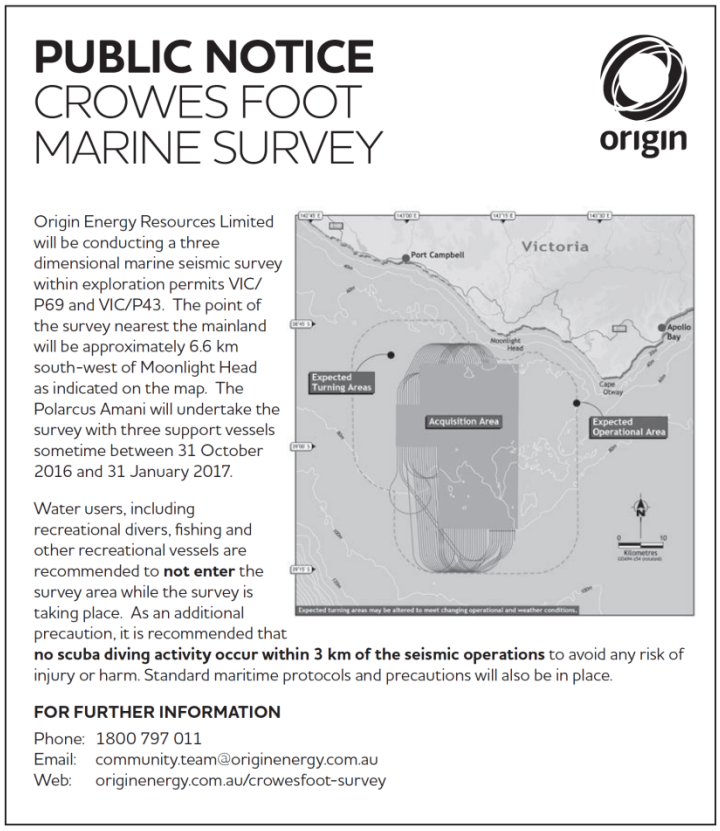
Public notices were placed (Figure 5):

The Warrnambool Standard – Saturday 29 October 2016

Cobden Timboon Coast Times – Wednesday 26 October 2016

Colac Otway Herald – Wednesday 26 October 2016

The Beacon (Port Campbell) – Tuesday 8 November 2016



PUBLIC NOTICE
CROWES FOOT
MARINE SURVEY

origin

Origin Energy Resources Limited will be conducting a three dimensional marine seismic survey within exploration permits VIC/P69 and VIC/P43. The point of the survey nearest the mainland will be approximately 6.6 km south-west of Moonlight Head as indicated on the map. The Polarcus Amani will undertake the survey with three support vessels sometime between 31 October 2016 and 31 January 2017.

Water users, including recreational divers, fishing and other recreational vessels are recommended to **not enter** the survey area while the survey is taking place. As an additional precaution, it is recommended that **no scuba diving activity occur within 3 km of the seismic operations** to avoid any risk of injury or harm. Standard maritime protocols and precautions will also be in place.

FOR FURTHER INFORMATION

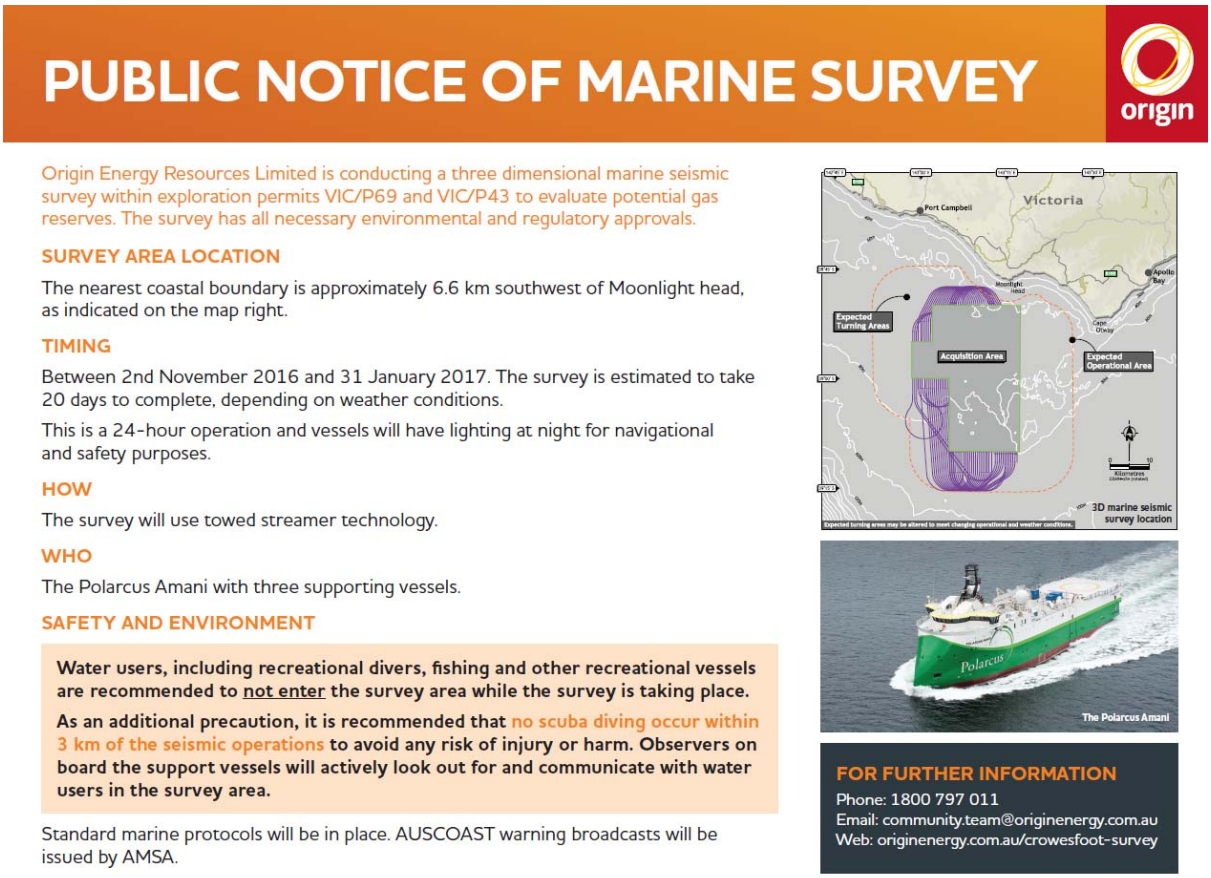
Phone: 1800 797 011
Email: community.team@originenergy.com.au
Web: originenergy.com.au/crowesfoot-survey

Figure 5 - Public notice of survey

5.6.5 Signage

In consultation with the Apollo Bay Harbour Master and Parks Victoria Port Campbell Head Ranger, signs (Figure 6 and 7) were erected on 27 October 2016 and removed upon completion of the survey. One call was received from a stakeholder who noted the contact number on the sign as he left Apollo Bay harbour and contacted Origin to determined location of the survey vessel.

Figure 6 - Photos of public signs



PUBLIC NOTICE OF MARINE SURVEY

origin

Origin Energy Resources Limited is conducting a three dimensional marine seismic survey within exploration permits VIC/P69 and VIC/P43 to evaluate potential gas reserves. The survey has all necessary environmental and regulatory approvals.

SURVEY AREA LOCATION

The nearest coastal boundary is approximately 6.6 km southwest of Moonlight head, as indicated on the map right.

TIMING

Between 2nd November 2016 and 31 January 2017. The survey is estimated to take 20 days to complete, depending on weather conditions.

This is a 24-hour operation and vessels will have lighting at night for navigational and safety purposes.

HOW

The survey will use towed streamer technology.

WHO

The Polarcus Amani with three supporting vessels.

SAFETY AND ENVIRONMENT

Water users, including recreational divers, fishing and other recreational vessels are recommended to not enter the survey area while the survey is taking place.

As an additional precaution, it is recommended that no scuba diving occur within 3 km of the seismic operations to avoid any risk of injury or harm. Observers on board the support vessels will actively look out for and communicate with water users in the survey area.

Standard marine protocols will be in place. AUSCOAST warning broadcasts will be issued by AMSA.

FOR FURTHER INFORMATION

Phone: 1800 797 011
Email: community.team@originenergy.com.au
Web: originenergy.com.au/crowesfoot-survey

Figure 7– Public notice sign

5.6.6 SMS messages

Short message service (text) messages were sent to 40 stakeholders.

Messages commenced on 17 November 2016 with:

> *Msg from Origin.*
>
> *Crowes Foot survey testing to start around 17:00 hours today at: 39.20deg S 143.12deg E; Speed 4.20 Kts; Heading: 001deg. Survey acquisition to start approximately 22:00 tonight. Operating under Fisheries Victoria permit number SP442, the 'Northern Star' and 'Dell Richey 2' may be required to clear commercial fishing gear in survey path. Where owner ID is on gear, it will be returned as soon as possible and Origin will compensate for any loss or damage of equipment due to the survey.*
>
> *Kind regards, Origin.*

Messages were not sent on 18, 19 and 20th of November due to the slow survey progress at the commencement and an internal misunderstanding about message frequency. Messages were then sent from 21 November to 7 December with daily updates similar to the message below:

> *Msg from Origin.*
>
> *Crowes Foot survey progressing well with 82% completed. Fishing activities can now take place East of Longitude 143.214degE*
>
> *Over the next 24 hours the Polarcus Amani will be operating between:*
>
> *NW corner: 38.785degS 143.046degE*
>
> *SW corner: 39.265degS 143.046degE*
>
> *NE corner: 38.785degS 143.214degE*
>
> *SE corner: 39.265degS 143.214degE*
>
> *Location inquiries may be made to support vessels on channel 72: Northern Star VJN4125; Del Richey II VM4068.*
>
> *Kind regards Origin.*

The completion message was sent on 8 December 2016:

> *Msg from Origin.*
>
> *Crowes Foot survey has completed. The survey vessel will now commence retrieval of equipment for approximately 48 hours. The vessel has left the area of operations and the area is now clear for all fishing activities to recommence.*
>
> *At 10:50 local time the vessel was as at following position*
>
> *Latitude: 39.314degS*
>
> *Longitude: 142.977degE*
>
> *Travelling at a speed of 4.40 knots on bearing 191deg*
>
> *Thank you to all fishers operating or traversing the area for your patience and cooperation.*
>
> *Kind regards Origin.*

5.7 Consultation regarding potential long term impact assessment

After the survey was completed, Origin sought consultation with SIV, VRLA, Victorian Fisheries Authority (VFA, formerly Fisheries Victoria) to review the approach to assessment of any long term impacts from the seismic survey within the Crowes Foot survey area, as documented in Origin's submission to the NOPSEMA direction notice RMS0625 (31/10/17). Origin's objective of that consultation was to assess options and reach agreement with stakeholders on an approach to measure the potential long term socio- economic impacts from the Crowes Foot seismic survey to ALARP and acceptable level standards within its revised EP.

NOPSEMA recommended a round-table approach to consultations with SIV, VRLA, VFA and DEDJTR/ERR, to be chaired by NOPSEMA and coordinated by Origin. Two round-table consultation sessions were held, along with several additional consultation meetings with Origin and stakeholders, and several internal review sessions with Origin project team and senior leaders to assess stakeholder feedback and review options under consideration.

5.7.1 Summary of consultation events

Consultation events, along with formal internal meetings are summarised in the Table 6 below:

Table 6: Timeline of key consultation May to September 2017

Parties	Objective	May	Jun	Jul	Aug	Sep
NOPSEMA, Origin, VFA, SIV, VRLA	First round-table workshop to develop agreed long term impact assessment approach and frame each stakeholder's future engagement objectives and expectations.	29				
Origin, VFA	Origin sought consultation to review VFA's approach to rock lobster stock monitoring and assessment, to enable further assessment of existing data and monitoring as possible inputs for the long term impact assessment approach.		6			
NOPSEMA, Origin	Origin sought consultation to review long term impact assessment options jointly identified at first round-table, and to seek guidance on NOSPEMA's expectations.		8			
Origin	Internal review of 'no economic disadvantage' mitigation approach.		9			
Origin	Internal review of options identified at first round-table and VFA data and monitoring approach.			13		
Origin, SIV, VRLA	Origin sought consultation to update progress on reviewing options from round-table discussions and seek feedback from SIV & VRLA.			18		
Origin, VFA, IMAS	Origin sought consultation with IMAS as key subject matter experts to assist with evaluating options identified at first round-table, along with any other ideas or feedback.				3	
Origin	Internal review of outcomes from meeting with IMAS and VFA, further assessment of options.				8	
Origin, SIV, VRLA	Origin sought further consultation after review of options with IMAS and VFA and Origin's internal assessment which narrowed down the options.				10	
Origin	Internal review of options after SIV and VRLA consultation.				11	
NOPSEMA, Origin	Origin sought further consultation to review assessment of options and seek NOSPEMA's feedback.				14	
Origin, SIV, VRLA, VFA, IMAS	Origin sought further consultation to provide update on assessment of options, before follow up round-table workshop.				17	
NOPSEMA, VFA, SIV, VRLA, Lattice	Second round table workshop on long term impact assessment approach in EP.				18	
Origin	Internal review and assessment of options and recommendations regarding strategic relationship with SIV and VRLA.				23	
NOPSEMA, Origin	Origin sought consultation and feedback on final assessment of options and NOPSEMA requirements for EP resubmission.				23	
Origin	Internal review and decision on strategic relationship with SIV and VRLA.					19
SIV, VRLA, Lattice	Origin sought consultation to confirm approach to long term impact assessment as tabled at second round-table workshop, and to discuss Origin's recommendation to developing collaborative working relationship and MOU with SIV and VRLA.					22

5.7.2 Objectives of round table consultation

The primary objective of the round table discussions was to consult with stakeholders on longer-term measures, to deliver on the intent in the EP of 'no fisher being better or worse off'. The key requirements being that Origin must demonstrate that impacts to fishers are of an acceptable level and that all reasonably practicable measures have been adopted that reduce impacts

The first round table session commenced with an open discussion of what each organisation was seeking to achieve from the session and in the longer term. The following points were agreed by all:

- A sustainable coexistence between industries is achievable and is the intent of governments
- A fair and reasonable basis for this coexistence needs to be established
- There is a willingness to find long-term collaborative solutions for:
  - Transparent and inclusive risk management practices and process
  - Efficient and effective communication processes and protocols
- Continually improving an understanding of the impacts from both industries
- The future work of this group could be used to set an example for the national agenda.

5.7.3 Framework for good working relationship

Each organisation at the first round table consultation session discussed their expectations of a good working relationship and agreed on the following:

- Mutual understanding of each organizations role, responsibilities and funding
- All parties feel engaged throughout a defined consultation process
- There is a clarity on expectations others have of one another
- Clear and comprehensive policy. National policy agreed by industry to cover all fisheries should be consistent with regional policy including a policy that focuses on the sustainability of the rock lobster fishery in Victoria
- Trusting relationships that understand how decisions get made
- Timeliness of engagement and appropriate engagement
- Underpinning knowledge about the fishery and petroleum activities is shared.

Measures that could assist to achieve a good working relationship were also discussed, with the key points being:

- Regionally focussed calendar providing overview of each industry's possible activities
- Regionally focussed consultation process
- Regionally focussed Memorandum of Understanding (MOU)
- Public policy regarding fisheries interaction with the oil and gas sector being developed by FV
- Establishing agreed risk and impact frameworks
- Education of new fishers and titleholders in arrangements for sustainable coexistence.

To build upon the working relationship already established by Origin and give effect to the points above where agreed by all parties, Origin will continue engagement with SIV and VRLA regarding development of an MOU either on a regional basis or directly with SIV and VRLA.

The roundtable engagement is summarised in the Table 7.

Table 7 – Rocklobster fishery roundtable engagement summary

Matters discussed	Issues or concerns raised by stakeholders	Origin's assessment and response
Long term impact measurement At the first round table consultation the following possible measures for determining any long term impacts were agreed for further consideration by Origin and discussion with stakeholders: 1. Re-evaluation of existing data about the health of the fishery to create multiple predictions of impacts 2. Monitoring of the actual impacts for comparison against predicted impacts in the EP 3. Commitment to fund or contribute to the proposed extended FRDC study 4. Establish a framework for long-term (7 years) compensation of affected fishers 5. Expand the Fisheries Victoria monitoring program to be able to detect other	**Option 1**: VRLA was keen for IMAS to model scenarios including "book-ending" a range of outcomes, such as total mortality through to minimal losses. Modelling has been done for the Victorian Rock Lobster Resource Advisory Group (RLRAG) to look at different exploitation rates. However, VRLA also noted: • it's possible the error bars on the forward projection model may swamp the modelled impacts from the scenario testing • if IMAS don't have the ability to model down to the Crowes Foot survey area level, then the modelling should include all seismic testing in that zone to 'compare apples with apples'. IMAS confirmed they could only model scenarios at the Western Zone level and not specific to the Crowes Foot survey area. Acknowledged the limitations of this approach due to data granularity, ecosystem variability and absence of pre-seismic survey data points. VFA advised they could make data available for modelling by IMAS for Origin under current confidentiality provisions. **Option 2**: With regard to Origin's inquiries about analysis of current VFA monitoring program data to assess impacts, VFA advised that any process to definitively determine population impacts from seismic surveys may require a long, to very long term monitoring program that covers all ecosystem variables (environment and human influences) to have any chance of detecting impact of seismic. VRLA advised: • spatial granularity of catch data does not match the scale of the survey area and is not sufficient for analysis • with so many variables in the marine environment, it's very challenging to design a sensible, cost-effective, robust experiment which would likely require 10-15yr timeframe • doubt whether research could solve this issue. IMAS advised spatial resolution would only enable identification of catastrophes. **Options 3, 5, 6**: All stakeholders agreed that the scope of the second FRDC research on rock lobster, whilst important work, doesn't provide an opportunity to measure the impact on rock lobsters from the Crowes	Origin consulted with stakeholders and undertook extensive assessments of information provided and their feedback to: • explore the methodology, scope, benefits and limitations of using the current stock assessment model to run modelling scenarios that may predict various impacts from the Crowes Foot survey • review the current VFA stock assessment and management process including the data collected and monitoring undertaken, and the ability to utilise this benchmark data for assessing any impacts from the Crowes Foot survey • examine further research and monitoring programs that may contribute to a robust measurement of any long term impacts from the Crowes Foot survey. **Option 1**: modelling of existing data to create multiple predictions of impacts, was not supported by Origin as the results would be: purely hypothetical; unable to be compared with actual catch data in the future given the number of other variables that could influence the fishery; unable to provide a robust or absolute conclusion on future impacts. In addition, the hypothetical approach of 'book-ending' scenarios from worst to best case could also be easily open to misinterpretation, particularly in the absence of any evidence that seismic surveys cause mortality (an outcome not supported in the FRDC research report). **Option 2**: notwithstanding stakeholder feedback on the spatial extend of current data sets being a major limitation, Origin believes there is still merit in this option which would involve reviewing current catch data pre and post seismic surveys in the Otway basin and assessing trends and variances to provide confidence in any conclusions. Such review would be subject to VFA providing access to the data. **Options 3, 5, 6**: future research and monitoring options examined would help fill some of the many gaps in knowledge of the fishery. And there were many unanswered questions raised by the FRDC research report including: catchability impacts; potential for increase predation; potential for decreased reproduction. However, Origin does not support these options as they would not contribute to measurement, with any reasonable level of reliability, of any long term impacts from the Crowes Foot survey. Origin does not have any further seismic surveys planned at present, so an in-situ survey will not be feasible as an approach to

Matters discussed	Issues or concerns raised by stakeholders	Origin's assessment and response
impacts 6. Design and undertake a new research on impacts to rock lobsters as designed by the University of Tasmania.	Foot survey. VFA advised that the current fixed site survey monitoring program measures lobster abundance (number), size, gender and reproductive condition at established sites on an annual basis. However, there are no established sites within the Crowes Foot survey area, and this lack of baseline data would thwart attempts to detect biological impacts through this program. Expansion of the program to additional sites would not provide insight into the effects of the seismic survey. All stakeholders agreed. In addition, VRLA advised that the Crowes Foot survey area is very challenging as it's not fished in continuous pattern and is very dependent on weather and seasons, and fishers' records are not accurate due to small grids in log book not facilitating data collection across multiple grids on a single day. IMAS advised that in-situ survey coinciding with a new seismic survey would give a definitive answer, albeit expensive and have very long timeframes.	measurement of impacts form the Crowes Foot survey. Nevertheless, Origin will consider supporting any relevant future research programs coordinated by APPEA.
Framework for long term compensation (Option 4 above)	VRLA advised there are 2 classes of impact, biological and economic. This matter isn't about compensation to individual fishers as that was well addressed for year one of the Crowes Foot survey. This is about fishery level impact. But there's no ability to do an empirical study of the economic impact over the long term. A model compensation approach that shows good intent and a boost for the industry could be considered. VRLA are pragmatic about solutions, such as a possible alternate direction for research funding, given the consensus that long term lobster impact studies may not be practicable. VRLA accepts that Origin is doing due diligence on research and if it concludes that the cost / benefit is not worth it, then negotiating an agreement which is positive for the environment would bypass the complexity of life cycle assessment which hasn't even been mapped fully for the southern rock lobster. Maybe some clever things can be done to replicate nature such as a puerulus seeding program (see section below). In the event that Origin did not support industry level compensation for biological impact or some other solution, VRLA strongly asserted that it was disingenuous for Origin to expect an individual fisher to provide the basis for a claim as they have no resources to do so. In addition, fishers move throughout the fishery to target lobsters, rather than lingering in one place where catch is low, so future data is not likely to show a	Biological harm shown within FRDC research report was not disputed by Origin. But any future claims or agreements regarding compensation would have to be supported by evidence of actual economic loss before Origin could approve. This is a normal and fair approach in approving any claim for loss. Therefore, Origin does not support the view that compensation be considered at a broad fishery level, without any evidence of fishery level impact. Origin will establish a compensation framework that enables an affected fisher to make a future claim of economic loss, subject to evidence of that loss. Whilst such process is available under Common Law, fishers may not be aware of this and Origin could facilitate a less onerous process whereby a claim would be assessed, on the balance of probability with regard to all data available including (but not limited to) quota retired during the survey, existing TACC data and assessments. Origin recognises that demonstrating direct causal links may be difficult given the complexity of the ecosystem. However, this control measure would provide a robust 'back-stop' in the event there was a significant impact from the Crowes Foot seismic survey. Origin is disappointed the fishers compensated during the Crowes Foot survey did not appear to consider other potential affected parties such as their deckhands. Origin will continue to consult with VFA and VRLA to improve any processes required should the need arise in the future to

Matters discussed	Issues or concerns raised by stakeholders	Origin's assessment and response
	decrease in catch. Quotas in the fishery have been held at low levels in recent years in an effort to build stock. Therefore, in the short term, quotas can be expected to continue to be met. In the long term however, commercial fishers expect stock levels to increase and quotas to be expanded and this may be affected by the impacts of the seismic survey. This increase is not formally forecasted and VFA advised that any increase in quota above the current 230 tonne is unlikely as recruitment has been low. VFA provided feedback to optimise any future individual fisher compensation models, including distribution of compensation to other affected parties such as deck hands, the limited scope VFA has to manage fishers' actions in the event of retired quota, and accommodating the range of different parties who may be involved such as licence holders, operators, leased quota arrangements.	compensate individual fishers.
Environmental offsets	VRLA believes that the FRDC research report is evidence of permanent biological impact to rock lobsters in the Crowes Foot survey area. Therefore, Origin should remedy the impact through funding an 'environmental offset' to rehabilitate the environment, benefit the fishery population, and therefore the local commercial fishers. IMAS advised a biological off-set could involve growing out puerulus past the high mortality bottleneck to 12 months and translocate to seismic survey areas. Puerulus could be sourced from Tasmanian oyster farms but there's currently no one doing this so the set-up and transport costs could be high. Also would have to manage biosecurity questions. VRLA expressed interest in a pursuing a reseeding program as it could assist in adding to juvenile lobster recruitment which is currently used as a strong indicator of population health. Although having been done in other fisheries and with other species, this has not been done for southern rock lobster and the potential success rate is not known. VFA explained there would be regulatory requirements, including controls for biosecurity, but that Victoria has a Translocation Policy in place that is already used for various fish populations. VRLA accepted the challenges of this initiative but added that industry collaboration among SIV, VRLA, Southern Rock Lobster Inc, VFA and FRDC would be good backing for such an initiative.	Origin has listened to VRLA's recommendations that puerulus seeding is agreed by many as having the potential to boost recruitment which is the greatest indicator of future stock levels. However, an 'environmental offset' would not be an acceptable Performance Standard within this EP as any potential net benefit could not be measured or assessed against any potential long term impacts from the survey. In addition, Origin believes that an 'environmental offset' is not warranted because any potential impacts on the rock lobster fishery from the Crowes Foot seismic survey are already ALARP and acceptable, given the body of evidence assessed within this EP including: • Absence of research or evidence of population level or socio-economic impact from seismic surveys on the rock lobster fishery • Origin's past mitigation by way of compensation already paid to commercial rock lobster fishers within the Crowes Foot survey area, on the basis of potential socio-economic impact • Compensation for and retirement of a substantial proportion of rock lobster season quota that would otherwise have been caught within the Crowes Foot seismic survey area.
No economic disadvantage	At the first round-table consultation session, VRLA sought clarification on different terminology used in regard to Origin's 'no economic	Origin undertook a comprehensive review of all communications relating to its 'no economic disadvantage' commitment made in relation

Matters discussed	Issues or concerns raised by stakeholders	Origin's assessment and response
	disadvantage' commitment made in its various communications in relation to the Crowes Foot survey. References had been made to both: 'no fisher' and 'no party'.	to the Crowes Foot survey. References to 'parties' in earlier statements had the intent of relating to fishers and were made in the context of discussions between Origin and fishers. In good faith, Origin offered to give certain undertakings in favour of fishers, because it was fishers who were the group identified as having the potential to suffer loss as the result of the survey. However, Origin did not intend to assume liability in favour of any individual or group of whom Origin did not have knowledge of at the time. If some other person can demonstrate loss suffered as the result of the survey, Origin will assess that person's claim on its merits and in good faith. Any such loss was and remains hypothetical. Therefore, Origin has not made and does not intend to make any specific undertakings or promises in favour of any such person.
Zooplankton study	VFA agreed that the zooplankton research raised by Origin was a likely point of discussion for the next round-table consultation and Origin should prepare a response. VRLA advised they had reviewed the McCauley research and also had a copy of the CSIRO model, which they believed couldn't be extrapolated to Victorian waters, and there were assumptions that had to be made in the modelling. They believe that further work needs to be done in this area.	Origin raised the recent zooplankton studies by McCauley et al. (2017) and subsequent research from CSIRO funding by APPEA for discussion with VFA. Origin advised it's assessment that the hypothesis in the research attributing potential mortality in commercial fisheries species from seismic is not backed by comprehensive data. Nevertheless, Origin will apply the precautionary approach when assessing impacts to the zooplankton and apply the findings of the paper in its revised EP. Origin also raised the recent zooplankton studies with SIV and VRLA and asked if they were aware of it. VRLA's response was noted and there was no further discussion. The matter was not subsequently raised by any party at the round table discussions. Origin will continue to review all relevant research in relation to existing EP commitments and in the preparation of new EPs.
Ongoing relationship	VRLA and SIV welcomed Origin's suggested approach to continue developing the working relationship.	Both the commercial fishing and oil and gas industries have rights to access the ocean for their productive efforts and therefore, quite simply need to work together. Origin coexists among many different stakeholders and has developed strong and collaborative relationships with the communities in which it operates, where there are sometimes impacts, and where Origin invests in the development of its communities. It is Origin's genuine desire to achieve the same level of collaboration with our 'commercial fishing' community that has been achieved in Origin's 'land based' communities. To that end Origin will continue

Matters discussed	Issues or concerns raised by stakeholders	Origin's assessment and response
		consulting with SIV and VRLA to include the local rock lobster commercial fishing community as a key stakeholder in its community development strategy, explore relevant initiatives, and develop an MOU that reflects mutually agreed expectations of each organisation.

6. Existing Environment

The physical, biological and socio-economic environment in and around the operational area and the 'region' in general are described in this chapter, together with the values and sensitivities of the region.

6.1 Conservation Values and Sensitivities

6.1.1 Commonwealth Marine Reserves

The acquisition area is located in the vicinity of two Commonwealth Marine Reserves (CMR), as described below:

- Apollo – located 14 km to the east. The Apollo CMR is located off Apollo Bay on Victoria's west coast in waters 80 m to 120 m deep on the continental shelf. The reserve covers 1,184 km^2 of ocean, including the Otway Depression, an undersea valley that joins the Bass Basin to the open ocean. Apollo is a relatively shallow reserve with big waves and strong tidal flows, while the rough seas are habitats for fur seals and school sharks. The entire CMR is classified as a Multiple Use Zone.
- Zeehan – located 69 km to the south. The Zeehan CMR covers an area of 19,897 km^2 to the west and south-west of King Island in Commonwealth waters surrounding north-west Tasmania. It covers a broad depth range from the shallow continental shelf of about 50 m to the abyssal plain that is over 3,000 m deep. Four submarine canyons incise the continental slope, extending from the shelf edge to the abyssal plains. A rich community made up by large sponges and other permanently attached or fixed invertebrates is present on the continental shelf, such as giant crab (*Pseudocarcinus gigas*). Concentrations of larval blue warehou (*Seriolella brama*) and ocean perch (*Helicolenus spp*.) demonstrate the role of the area as a nursery ground. Rocky limestone banks provide important seabed habitats for a variety of commercial fish species including the giant crab.

6.1.2 World, Commonwealth and National Heritage Places

There are no marine or coastal World, Commonwealth or National Heritage places in the vicinity of the operational area.

6.1.3 Wetlands of International Importance

There are no marine or coastal Wetlands of International Importance (Ramsar-listed wetlands) in the vicinity of the operational area. The closest sites are Livinia on King Island (83 km southeast) and the Western District Lakes (60 km northeast of the operational area).

6.1.4 Victorian Marine Protected Areas

Victoria has a representative system of 13 Marine National Parks and 11 Marine Sanctuaries established under the *National Parks Act* 1975 (Vic). Several of these are located in the vicinity of the operational area, these being:

- Twelve Apostles Marine National Park - located 7.6 km north of the acquisition area.
- Port Campbell National Park - located on the coast, 14.5 km north of the acquisition area.
- The Arches Marine Sanctuary - located 21 km north of the acquisition area.
- Bay of Islands Coastal Park - located on the coast, 25 km northwest of the acquisition area.
- Marengo Reefs Marine Sanctuary – located 30 km east of the acquisition area.
- Merri Marine Sanctuary - located 70 km northwest of the acquisition area.
- Eagle Rock Marine Sanctuary - located 80 km northeast of the acquisition area.

The three closest parks are briefly described below.

The Twelve Apostles Marine National Park is located 7 km east of Port Campbell and covers 16 km of coastline from east of Broken Head to Pebble Point to an offshore limit of 5.5 km (and covers an area of 75 km^2. The area is representative of the Otway Bioregion and is characterised by a submarine network of towering canyons, caves, arches and walls with a large variety of seaweed and sponge gardens plus resident schools of reef fish. The park contains calcarenite reef supporting the highest diversity of intertidal and sub-tidal invertebrates found on that rock type in Victoria. The park includes

large sandy sub-tidal areas that are extremely high in biodiversity, with 860 species recorded in a 10 m^2 area. Port Campbell National Park

The Port Campbell National Park covers a long section of the coastline (~27 km), stretching from the eastern side of Curdies Inlet (at Peterborough) to Princetown, covering 1,830 ha. Port Campbell National Park is world famous for its extraordinary collection of wave-sculpted rock formations and the Twelve Apostles that can be seen from the park.

The Arches Marine Sanctuary protects 45 ha of ocean directly south of Port Campbell. Located 19 to 25 m below the water surface is a labyrinth of limestone canyons, caves, arches and walls characterised by high-energy waves.

The complex limestone structures provide a foundation for seaweeds and sponges to grow on. Due to the shaded underside of the underwater arches, habitats here are typical of those found in the deeper waters of Bass Strait. A diverse array of life including gorgonians, sponges, bryozoans and hydroids exists in the sanctuary, with the upper side of the structures covered in the thick, brown kelp (*Ecklonia radiata*) with an understory of delicate red algae. These habitats support schools of reef fish, seals and a range of invertebrates such as lobster, abalone and sea urchins.

6.1.5 Key Ecological Features

The Conservation Values Atlas indicates that the operational area does not intersect any Key Ecological Features (KEF). The closest KEF to the operational area is the Bonney Upwelling, mapped in the Conservation Values Atlas as approximately 100 km west from the closet point of the operational area.

The Bonney Upwelling is a prominent and classical oceanographic upwelling. Surface upwelling of cold, nutrient rich water typically occurs in the summer and autumn along the narrow continental shelf between Robe, South Australia, and Portland, Victoria.

The primary ecological importance of the Bonney Upwelling is as a feeding area for the blue whale (*Balaenoptera musculus*). The upwelled nutrient-rich re-heated Antarctic intermediate water promotes blooms of coastal krill (*Nyctiphanes australis*), which in turn attracts blue whales to the region to feed. The upwelling is one of only three identified feeding areas consistently used by blue whale for feeding Australian coastal waters, which occurs during November to April.

6.2 Cultural Environment

6.2.1 Maritime Archaeological Heritage

Shipwrecks over 75 years old are protected within Commonwealth waters under the *Historic Shipwrecks Act* 1976 (Cth) and in Victorian waters under the *Victorian Heritage Act* 1995 (Vic).

The stretch of coastline north of the operational area is known as the ‘Shipwreck Coast’ because of the number of shipwrecks, most of which were wrecked during the late nineteenth century. The strong waves, rocky reefs and cliffs of the region contributed to the loss of these ships. Shipwrecks known to occur in and around the acquisition and operational areas are:

Within acquisition area

- *Minerva* – wrecked in 1849 in about 80 m of water. Little is known and recorded about this shipwreck. Although the actual position of this wreck is unknown, Heritage Victoria mapping indicates an indicative position near the eastern edge of the acquisition area.

Within operational area

- *Selje* – wrecked in 1929 west of Cape Otway, off Wreck Beach, in water depths of 70-80 m. This means the wreck may lie within the north-western section of the operational area.
- *BAT* – wrecked in 1882, and has not been located, but is thought to be located near the Selje wreck.

Outside of but in proximity to operational area

- *City of Rayville* – wrecked in 1940 after striking a German mine, this was the first US vessel lost in World War II, it is located on the eastern edge of the Vic/P69 permit boundary, ~9 km east of the operational area, in ~70 m of water.
- *Fiji* – wrecked in 1891 at Wreck Beach, about 6.6 km north of the operational area.
- *Marie Gabrielle* – wrecked in 1859 at Wreck Beach, located about 6.6 km north of the operational area.

- *Jenny* – wrecked in 1854 at Moonlight Head, though the main site of the vessel has not been located. It is located about 6.6 km north of the operational area
- *Joanna* – wrecked in 1843 on Joanna Beach between Moonlight Head and Rotten Point, about 6.6 km north of the operational area.

None of the shipwrecks on the Victorian west coast are covered by shipwreck protected zones declared under Section 103 of the *Victorian Heritage Act* 1995, with the nine protected zones that do exist occurring within Port Phillip Bay and adjacent to the west Gippsland coast.

The Australian National Shipwreck Database indicates there are no historic shipwreck protection zones in or around the operational area.

6.2.2 Aboriginal Heritage

Aboriginal groups inhabited the southwest Victorian coast as is evident from the terrestrial sites of Aboriginal archaeological significance throughout the area. During recent ice age periods (the last ending approximately 14,000 years ago), sea levels were significantly lower and the coastline was a significant distance seaward of its present location, enabling occupation and travel across land that is now submerged. However, it is highly unlikely that any evidence of occupation or sites of significance would remain in or near the operational area.

A search of the National Native Title Tribunal (NNTT) database indicates there are no claims for Native Title over the operational area.

6.3 Physical Environment

6.3.1 Climate

The operational is located in the western Bass Strait. The area is typical of a cool temperate region with cold, wet winters and warm dry summers. It is influenced by rain-bearing cold fronts that move from south-west to north-east across the region, producing strong winds from the west, north-west and south-west.

6.3.2 Winds

Bass Strait is located on the northern edge of the westerly wind belt known as the ‘Roaring Forties’. In winter, when the subtropical ridge moves northwards over the Australian continent, cold fronts generally create sustained west to south-westerly winds and frequent rainfall in the region. In summer, frontal systems are often more shallow and occur between two ridges of high pressure, bringing more variable winds and rainfall.

Winds in this section of the Otway basin and western Bass Strait generally exceed 13 knots (23.4 km/h) for 50% of the time. Winds contribute to the predominant moderate to high wave-energy environment of area and are predominantly south-westerly cycling to north-westerly.

6.3.3 Ocean Currents

Ocean currents in Bass Strait are primarily driven by tides, winds and density-driven flows. During winter, the South Australian current moves dense, salty warmer water eastward from the

Bight (GAB) into the western margin of the Bass Strait. In winter and spring, waters within the strait are well mixed with no obvious stratification, while during summer the central regions of the strait become stratified.

6.3.4 Bathymetry

Gradients are generally mild with water depth varying from 60 m to approximately 90 m from the northern to southern boundaries of the operational area.

In the south eastern corner of the acquisition area, a subsea high rises to a depth of approximately 45 m below sea level from the limestone platform at 80 m. This feature is known locally as the ‘Big Reef’. The rises are submerged volcanoes that lie on the Torquay Fault and are well known by local professional fisherman who collect rock lobster from their summits.

6.3.5 Seabed Sediments

The Otway continental margin is a swell-dominated, open, cool-water, carbonate platform. A conceptual model divides the Otway continental margin into six depth-related zones – shallow shelf, middle shelf, deep, shelf, shelf edge and upper slope.

In the shallow shelf are exhumed limestone substrates that host dense encrusting mollusc, sponge, bryozoan and red algae assemblages. The middle shelf is a zone of swell-wave shoaling and

production of mega-rippled bryozoan sands. The deep shelf is described as having accumulations of intensely bioturbated, fine, bioclastic sands. At the shelf edge and top of slope, nutrient-rich upwelling currents support extensive, aphotic bryozoan/sponge/coral communities. The upper slope sediments are a bioturbated mixture of periplatform bioclastic debris and pelleted foraminiferal/nanno-fossil mud. The lower slope is crosscut by gullies with low accumulation rates, and at the base of the slope the sediments consist of shelf-derived, coarse-grain turbidites and pelagic ooze.

A sampling survey of the surficial sediments, benthic invertebrates and demersal fishes of Bass Strait was undertaken by the Victorian Museum between 1979 and 1983, with 18 sites sampled within or adajcent to the operational area. These samples indicate that surficial sediments throughout the operational area are dominated by carbonate rich medium to coarse sands.

In the south eastern corner of the acquisition area a subsea high rises to a depth of approximately 35 m bsl from the limestone platform at 80m. This feature is known locally as the 'Big Reef'. Traverses of the 'Big Reef' and five other smaller rises which are the east of the operational area but outside the acquisition area were under taken in 1986 with twelve basalt boulders obtained from the summits of three of the rises. Grab samples from the 'Big Reef' were also obtained during 1987 at reported depths of 34 and 38 metres respectively. Fresh and weathered basalt was obtained from these samples.

These results indicate that the rises are submerged volcanoes which lie on the Torquay Fault. The rises are estimated to be of Upper Pliocene age (3.6-2.5 mya), with evidence of basalt being discharged sub aerially (on land) at a time of low sea level.

6.3.6 Sea Temperature

The waters of Bass Strait have average surface temperatures ranging from 14°C in winter to 21°C in summer. However, subductions of cooler nutrient-rich water (upwellings) occur along the seafloor during mid to late summer, though this is usually masked in satellite images by a warmer surface layer.

6.3.7 Ambient Underwater Sound Levels

Natural sea sound sources in the Otway Basin are dominated by wind noise, but also include rain noise, biological noise and the sporadic noise of earthquakes. Man-made underwater sound sources in the region comprise shipping and small vessel traffic, petroleum-production and exploration-drilling activities and sporadic petroleum seismic surveys.

Actual measurements of ambient sound levels in the Otway Basin have been undertaken as part of impact assessment activities for the petroleum industry. Acoustic monitoring prior to the development of the Thylacine wells and platform, adjacent to the south western corner of the Crowes Foot operational area, recorded broadband underwater sound of 93 to 97 decibels dB re 1 µPa. Passive acoustic monitoring commissioned by Origin from April 2012 to January 2013, 5 km offshore from the coastline east of Warrnambool, identified that ambient underwater noise in coastal areas are generally higher than further offshore, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa.

Typical Australian continental limestone shelf seabeds result in relatively poor propagation of low-frequency sound, except in narrow frequency bands. The measurements and modelling are important in the context of sound impacts of seismic surveys as they show that man-made (and natural) noise signals in the major frequency bands of whale vocalization attenuate rapidly.

6.3.8 Coastal Environment

The Port Fairy to Lady Bay (Warrnambool) coastline is dominated by sandy beaches, while the section of coast between Warrnambool and Cape Otway (covering a distance of ~100 km) is dominated by intertidal rocky shore (backed by steep rocky cliffs) and sub-tidal rocky reefs, interspersed with small sections of sandy beach.

Lady Julia Percy Island, 9 km off the coast offshore Yambuk (west of Port Fairy), is a triangular shaped, offshore remnant volcanic island (Australia's only one), dominated by tall rocky cliffs on all sides, with a sheltered cove on the northern side. It is an important breeding colony for the Australian fur seals, New Zealand fur seals, little penguins and shearwaters.

The Twelve Apostles limestone rock formations, a popular tourist attraction with nearby cliff top viewing platforms, lies east of Port Campbell within the Twelve Apostles Marine National Park.

Intertidal rocky shores stretch east to Marengo, with forest of the Great Otway National Park reaching the cliffs. From Marengo east to Anglesea, the coastline is dominated by long stretches of sandy beach interspersed with intertidal rocky shores and sub-tidal rocky reefs.

6.4 Biological Environment

A search of the EPBC Act Protected Matters Search Tool (PMST) lists 27 threatened species that may occur in or near the operational area and 30 migratory species that may pass through the operational area. These species are described in this section.

6.4.1 Benthic invertebrates

The dominant benthic habitat throughout the operational area, as indicated by sampling and video studies, is medium to coarse carbonate sands with areas of low relief exposed limestone.

Carbonate sands in the Otway middle shelf support a benthic fauna dominated by bryozoans, infaunal echinoids and assemblages of sponges. Other components include bivalves (commonly *Mysella donaciformis* and *Legrandina bernadi*), *Chlamys sp*. scallops and small gastropods. The sand octopus (*Octopus kaurna*) also inhabits sandy sediments.

Within the inner shelf, benthic communities associated with hard limestone substrates consist of sponges, encrustlng and branching corailine algae, poysonellid algae, bryozoa, benthic forams, robust sarpullds, brachiopods, bivalves, gaslropods, fleshy red algae and kelp.

A benthic survey of inner shelf sediments in the vicinity of the Minerva Gas Field development, directly inshore form the operational area, found the seafloor was composed of coarse, well-sorted sand. This survey identified 196 species and a total of 5,035 individuals comprised of 63% crustaceans, 15% polychaetes, 8% molluscs and 5% echinoderms.

Demersal fishes likely to be associated with carbonate sands on the middle and inner shelf include eastern stargazer (*Kathetostoma laeve*), elephant shark (*Callorhynchus milli*), greenback flounder (*Rhombosolea taoarina*), gummy shark (*Mustelus antarcticus*), long-snouted flounder (*Ammotretis rostraus*), saw shark (*Pristiophorus nudipinnis*), southern sand flathead (*Platycephalus bassensis*) and southern school whiting (*Sillago bassensis*).

There is no published information on the species assemblages of the basalt rises in the south east and east of the operational area, other than general information on their importance as a southern rock lobster fishing area. In general, deep reef biota is typified by invertebrate animals rather than algae, usually in the form of sessile, filter feeding fauna. Organisms such as sponges, octocorals, bryozoans and ascidians usually dominate rock faces on deep reefs. The most common algae present on deep reefs are encrusting coralline red algae that are able to tolerate low levels of penetrating light.

6.4.2 Plankton

There have been relatively few studies of plankton populations in the Otway and Bass Strait regions, with most concentrating on zooplankton. A high diversity of zooplankton is reported in eastern Bass Strait, with over 170 species recorded. However, only 80 species in their surveys of western and central Bass Strait.

Plankton distribution is dependent upon prevailing ocean currents including the East Australia Current, flows into and from Bass Strait and Southern Ocean water masses. Populations near the operational area are expected to be highly variable both spatially and temporally and are likely to comprise characteristics of tropical, southern Australian, central Bass Strait and Tasman Sea populations.

6.4.3 Invertebrates

The marine invertebrates in the region include porifera (sponges), cnidarians (jellyfish, corals, anemones, seapens), bryozoans (microscopic filter feeders), arthropods (sea spiders), crustaceans (rock lobster, krill), molluscs (scallops, sea slugs), echinoderms (urchins, sea cucumbers) and annelids (polychaete worms).

Invertebrate diversity is high in southern Australian waters, although the distribution of species is patchy, with little evidence of any distinct biogeographic regions.

On 21 October 2016, the Fisheries Research and Development Corporation (FRDC) published a report following a 4 year study into the potential impact of seismic surveys on economically important fishery species, including the southern rock lobster *Jasus edwardsii*.

Day et al. (2016) note that there was no effect from seismic exposure on lobster survival and the nutritional condition of control and exposed lobsters improved considerably during the prolonged (120-365 days) post exposure period. They conclude that impacts to statocyst morphology, behavioural reflexes and immune response functions in adult lobsters with seismic exposure was relatively minor, but consequences may be greater for animal fitness in more difficult wild conditions.

The FRDC report found that exposure to seismic sound did not result in any mortalities of adult lobsters, even at close proximity. The report concluded that seismic surveys appear to be unlikely to

result in immediate large scale mortality in the southern rock lobster fishery, and did not (on their own) appear to result in any degree of mortality.

Whilst not fully explored in the FRDC study, reduced mobility and immunity could impact survival of affected lobsters in the wild (and therefore abundance). For example, the study did not conclude whether the sub-lethal effects observed would reduce an affected lobster's ability to compete for food or avoid predators. The FRDC report did conclude that early stage embryos showed no effect (and were resilient to exposure and that subsequent recruitment should be unaffected). However, it did not assess the effect of seismic exposure on hatched larvae in the water column.

6.4.4 Fish

According to the EPBC Act PMST, four species of fish listed as threatened or migratory may occur in or around the operational area. These are briefly described herein.

The great white shark (*Carcharodon carcharias)* is widely distributed and located throughout temperate and sub-tropical waters with their known range in Australian waters including all coastal areas except the Northern Territory. Studies of great white sharks indicate that they are largely transient. However, individuals are known to return to feeding grounds on a seasonal basis. Observations of adult sharks are more frequent around fur seal and sea lion colonies, including Wilsons Promontory (approximately 265 km east of the operational area) and the Skerries (approximately 555 km east of the operational area). Given their transitory nature and the proximity of known congregation areas to the operational area, it is likely that great white sharks may transit the operational area on occasion.

The shortfin mako shark (*Isurus oxyrinchus*) is a pelagic species with a circum-global oceanic distribution in tropical and temperate seas. It is widespread in Australian waters, commonly found in water with temperatures greater than 16°C. Populations of the shortfin mako are considered to have undergone a substantial decline globally. These sharks are a common by-catch species of commercial fisheries. Due to their widespread distribution in Australian waters, shortfin mako sharks may be encountered in the operational area, albeit in low numbers.

The porbeagle shark (*Lamna nasus*) is widely distributed in the southern waters of Australia including Victorian and Tasmanian waters. The species preys on bony fishes and cephalopods, and is an opportunistic hunter that regularly moves up and down in the water column, catching prey in mid-water as well as at the seafloor. It is most commonly found over food-rich banks on the outer continental shelf, but does make occasional forays close to shore or into the open ocean, down to depths of approximately 1,300 m. It also conducts long-distance seasonal migrations, generally shifting between shallower and deeper water. The porbeagle shark may occasionally transit the operational area but is not expected to occur in significant numbers.

The Australian grayling (*Prototroctes maraena*) typically inhabits the coastal streams of New South Wales, Victoria and Tasmania, migrating between streams and the ocean. Most of its life (including spawning) is spent in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters, though its precise marine habitat requirements remain unknown. They are a short-lived species, usually dying after their second year soon after spawning.

Australian grayling has been recorded from the Gellibrand River (its mouth being on the coast directly north of the operational area), making it likely that it occurs in coastal waters north of, or in the northern parts of, the survey's operational area. As marine waters are not part of the species' spawning grounds, these waters are not likely to represent critical habitat for the species.

All of the marine ray-finned fish species (26 of them) identified in the EPBC PMST are sygnathiformes, which includes seahorses and their relatives (seadragaon, pipehorse and pipefish). The majority of these fish species are associated with seagrass meadows, macroalgal seabed habitats, rocky reefs and sponge gardens located in shallow, inshore waters (e.g., protected coastal bays, harbours and jetties) less than 50 m deep. They are sometimes recorded in deeper offshore waters, where they depend on the protection of sponges and rafts of floating seaweed such as *Sargassum*.

The sygnathiforme species listed for the acquisition area are widely distributed throughout southern, south-eastern and south-western Australian waters. So although the water depths of the operational area are mostly greater than 50 m, and thus unlikely to provide habitat for high numbers of sygnathiformes, it is still possible that low numbers may exist within the operational area.

6.4.5 Cetaceans

Seven species of whales and fives species of dolphin (collectively referred to as cetaceans) are identified in the EPBC Act PMST as having the potential to occur within or around the operational area. These are:

- Minke whale (*Balaenoptera acutorostrata*)
- Common dolphin (*Delphinus delphis*)

- Blue whale (*B. musculus*)*
- Bryde's whale (*B. edeni*)
- Pygmy right whale (*Caperea marginata*)
- Southern right whale (*Eubalaena australis*)*
- Humpback whale (*Megaptera novaeangliae*)*
- Killer whale (*Orcinus orca*)
- Risso's dolphin (*Grampus griseus*)
- Dusky dolphin (*Lagenorhynchus obscures*)
- Indian Ocean bottlenose dolphin (*Tursiops aduncus*)
- Bottlenose dolphin (*Tursiops truncates*)

For the purposes of brevity, only the three species (*) on this list are described herein.

6.4.5.1 Blue whale

The blue whale is a cosmopolitan species, found in all oceans except the Arctic, but absent from some regional seas such as the Mediterranean, Okhotsk and Bering seas. There are two recognised sub-species of blue whale in Australian waters; the true blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*B. musculus brevicauda*). The pygmy blue whale is mostly found north of 55°S, while true blue whales are mainly sighted south of 60°S.

Pygmy blue whales are most abundant in the southern Indian Ocean on the Madagascar plateau, and off South Australia and Western Australia, where they form part of a more or less continuous distribution from Tasmania to Indonesia. Acoustic monitoring has found the presence of true blue whales in the Otway region to be rare.

Bass Strait is considered to be a migratory corridor for blue whales, as confirmed by passive acoustic monitoring and aerial surveys conducted by Origin during its prior activities in the region. The migratory period for the blue whales into Bass Strait generally commences in November or December. There had been fewer than 50 sightings of blue whales in Bass Strait up to the year 1999, but since that time feeding blue whales have been more regularly observed in the Discovery Bay area (130 km northwest of the operational area) and more generally along the Bonney coast from Robe to Cape Otway.

The time and location of the appearance of blue whales in the east generally coincides with the upwelling of cold water in summer and autumn along this coast (the Bonney Upwelling) and the associated aggregations of krill that they feed on. The Bonney Upwelling generally starts in the eastern part of the GAB in November or December and spreads eastwards to the Otway Basin around February as southward migration of the subtropical high pressure cell creates upwelling favourable winds.

Figure 8 illustrates that the Otway region is a Biologically Important Area (BIA) for foraging of the pygmy blue whale according to the DoE's National Conservation Values Atlas.

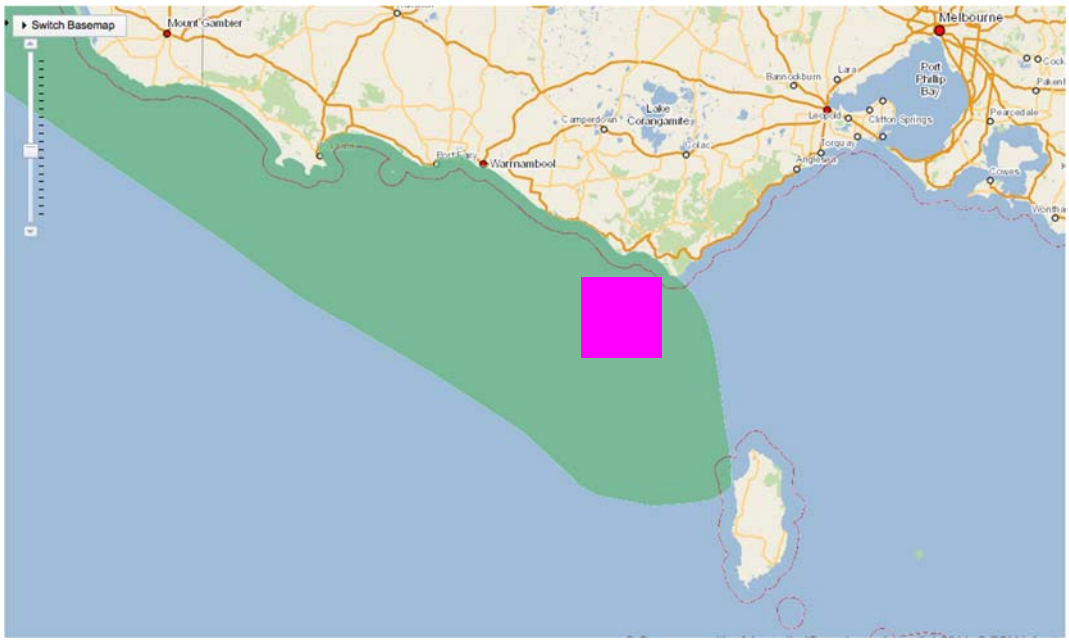


Figure 8. Pygmy blue whale biologically important area for foraging.
(Magenta box represents approximate operational area location)

In 69 seasonal aerial surveys for blue whales between Cape Jaffa and Cape Otway undertaken over six seasons (2001-02 to 2006-07), it was found that the general pattern of seasonal movement of blue whales is from west to east, with whales foraging in between the GAB and Cape Nelson in November and spreading further east in December. The whales are typically widely distributed throughout Otway shelf waters from January through to April. Evidence indicates that statistically the peak months for presence of blue whales in the operational area are likely to be February and March. This species, however, has been previously recorded in the region surrounding the operational area during November and December.

There were no confirmed sightings of the blue whale during Origin's:

- Enterprise 3D seismic survey undertaken during late October and early November 2014 (15 km north of the operational area).
- Astrolabe 3D seismic survey (adjoining the operational area to the south) undertaken during early November 2013; and
- Speculant 3D transition zone seismic survey undertaken during November and December 2010 (10 km north of the operational area);

Hence while the proposed timing of the Crowes Foot 3D survey has been selected in part to minimise the scope for interactions with blue whales by avoiding the period of statistical peak abundance (February/March), it is possible that blue whales will be present. The likelihood and extent of the interaction is dependent on broad scale environmental factors affecting the abundance and distribution of blue whale feeding resources.

6.4.5.2 Southern right whale

The southern right whale (*Eubalaena australis*) is distributed in the southern hemisphere with a circumpolar distribution between latitudes of 16°S and at least 65°S. The species is pelagic in summer foraging in the open Southern Ocean between 40° and 65°S and migrating from the subantarctic to lower latitude coastal waters during winter to calve and mate. The distribution in winter, at least of the breeding component of the population, is concentrated near coastlines in the northern part of the range.

Several breeding populations (Argentina/Brazil, South Africa and south-west Australia) of southern right whales have shown evidence of strong recovery post whaling, with a doubling time of 10-12 years. Estimated population sizes (1,600 mature females in 1997, and approximately twice that number in 2007) and the strong observed rate of increase in some well-studied parts of the range, indicate the species, although still scarce relative to its historic abundance, is not considered under threat at the hemispheric level.

The operational area is within the range of the south-east Australian breeding population. Whilst there are some signs of slow recovery in the south-east Australian population, abundance remains very low in comparison with expectations based on historical evidence of occupation.

The species is regularly present along the Australian coast during their breeding season of winter and spring. Peak periods for mating in Australian coastal waters are from mid-July through August. Pregnant females generally arrive during late May/early June and calving/nursery grounds are generally occupied until October (occasionally as early as April and as late as November), but not at other times. Calving takes place very close to the coast in Australia, usually in waters less than 10 metres deep.

Female southern right whales show calving site fidelity, generally returning to the same location to give birth and nurse offspring. Female-calf pairs generally stay within the calving ground for 2–3 months. Other population classes stay in coastal areas for shorter and more variable periods, and generally depart the coast earlier then female-calf pairs.

Southern right whales generally occur within two kilometres off shore and tend to be distinctly clumped in aggregation areas. Aggregation areas are well known with the largest being in Western Australian and at the Head of Bight in South Australia. A smaller established areas (regularly occupied) occurs at the Warrnambool region in Victoria. Small but possibly growing numbers of non-calving whales regularly aggregate for short periods of time in coastal waters off Peterborough, Port Campbell, Port Fairy and Portland in Victoria.

The closest known calving/nursery grounds to the operational area occur at Logan's Beach off the coast of Warrnambool in southwest Victoria (approximately 65 km northwest of the closest point of the

acquisition area) and intermittently at Portland (125 km northwest of the acquisition area). The operational area is adjacent to the potential emerging aggregation area at Port Campbell but is not located in any recognised BIA (feeding, breeding or aggregation areas) for southern right whales identified in the national conservation values atlas (Figure 9).

Figure 9. Southern right whale biologically important areas.
(Magenta box represents approximate operational area location)

As a highly mobile migratory species, southern right whales travel thousands of kilometres between habitats used for essential life functions. Movements along the Australian coast are reasonably well understood, but little is known of migration travel, non-coastal movements and offshore habitat use. Southern right whales are thought to be solitary during migration, or accompanied by a dependent calf or occasionally a yearling offspring.

The proposed timing of the Crowes Foot 3D survey reduces the likelihood of encountering southern right whales by avoiding peak times for coastal migration and inshore nursing. It is possible, however, that southern right whales may be present in adjacent coastal areas and may transit through the operational area during their migration to the Southern Ocean if the survey is undertaken during October.

6.4.5.3 Humpback whale

Humpback whales (*Megaptera novaeangliae*) are present around the Australian coast in winter and spring. Humpbacks undertake an annual migration between the summer feeding grounds in Antarctica to their winter breeding and calving grounds in northern tropical waters. Along the southeast coast of Australia, the northern migration starts in April and May while the southern migration peaks around November and December. A discrete population of humpback whales have been observed to migrate along the west coast of Tasmania and through Bass Strait, and these animals may pass through the operational area. The exact timing of the migration period varies between years in accordance with variations in water temperature, extent of sea ice, abundance of prey, and location of feeding grounds. Feeding occurs where there is a high krill density, and during the migration this primarily occurs in Southern Ocean waters south of 55°S.

Waters of western Bass Strait are not known feeding, resting or calving grounds for humpback whales, although feeding may occur opportunistically where sufficient krill density is present. The nearest area to the survey representing important habitat for migrating humpback whales is Twofold Bay, a resting area off the NSW coast 620 km to the northeast of the operational area (Figure 10).

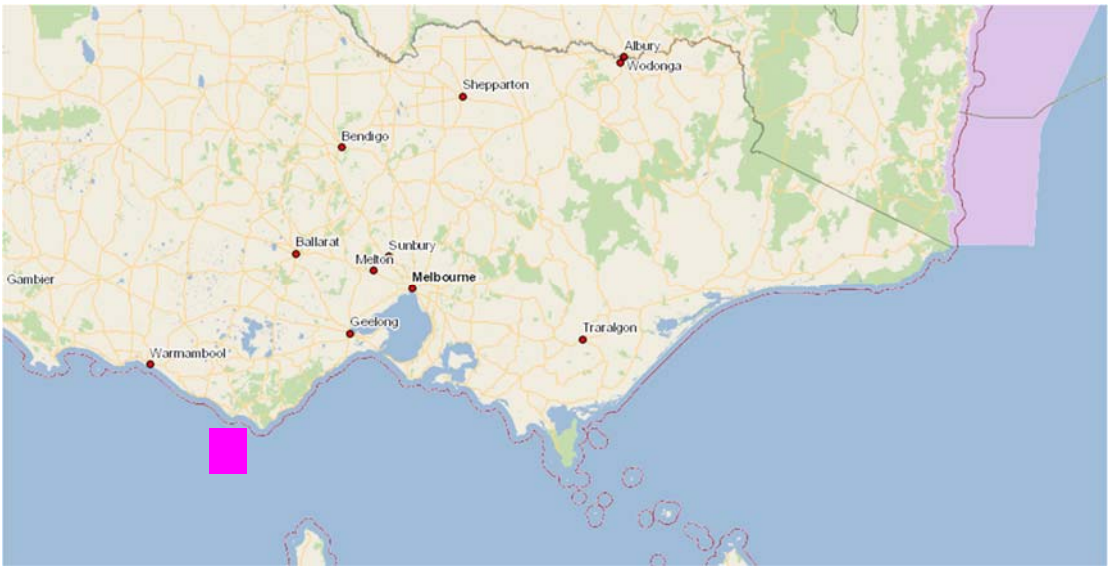


Figure 10 - Humpback whale biologically important area for migration.
(Magenta box represents approximate operational area location)

Although the operational area is located west of the humpbacks' normal summer migration route, during Origin's Enterprise 3D seismic survey undertaken during early November 2014 (15 km north west of the operational area), 16 humpback whales were sighted. As such, there is some chance that humpback whales may be sighted during this survey.

6.4.6 Pinnipeds

Australian fur seals (*A. pusillus*) and New Zealand fur seals (*Arctocephalus forsteri*) are listed marine species under the EPBC Act.

Australian fur seals breed on islands of the Bass Strait but range throughout waters off the coasts of South Australia, Tasmania, Victoria and New South Wales. Numbers of this species are believed to be increasing as the population recovers from historic hunting (Hofmeyr *et al.,* 2008).

Their preferred habitat, especially for breeding, are rocky islands with boulder or pebble beaches and gradually sloping rocky ledges. A large breeding colony (about 650 individuals) of the Australian fur seal is located at Cape Bridgewater (91 km northwest of the operational area) while small non-breeding colonies occur in caves at the same location. Australian fur seals are present in the region all year, with breeding taking place during November and December.

Research being undertaken at Lady Julia Percy Island (91 km northwest of the operational area) indicates that adult females feed extensively in the waters between Portland and Cape Otway, out to the 200 m bathymetric contour. Seal numbers on the island reach a maximum during the breeding season in late October to late December. By early December large numbers of lactating females are leaving for short feeding trips at sea and in late December there is an exodus of adult males.

Male Australian fur seals are bound to colonies during the breeding season from late October to late December, and outside of this they time forage further afield (up to several hundred kilometres) and are away for long periods. It is therefore possible that seals will move through the operational area.

New Zealand fur seals may forage throughout waters around the southern part of Australia, with population studies for New Zealand fur seals in Australia carried out in 1990 estimating an increasing population of about 35,000. The species breeds in southern Australia at the Pages Islands, and on Kangaroo Island, which produces about 75% of the total pups in Australia.

6.4.7 Marine Reptiles

Three threatened marine reptile species (turtles) are listed as potentially occurring in western Bass Strait, these being the loggerhead turtle (*Caretta caretta*), leatherback turtle (*Dermochelys coriacea*) and green turtle (*Chelonia mydas*). There are no identified BIAs for these reptiles in western Bass Strait and the operational area is distant from their normal tropical habitats. As such, they are unlikely to be present throughout the operational area.

6.4.8 Avifauna

A diverse array seabirds and terrestrial birds utilise the Otway region and may potentially forage within or fly over the operational area, resting on islands during their migration. Infrequently and often associated with storm events, birds that do not normally cross the ocean are sometimes observed over the Otway shelf, suggesting the birds have been blown off their normal course or are migrating.

Twenty-six (26) bird species are listed by the EPBC Act PMST as possibly occurring in or around the operational area.

Albatrosses and petrels (comprising 18 of the 26 species listed) are among the most dispersive and oceanic of all birds, spending more than 95% of their time foraging at sea in search of prey and usually only returning to land (remote islands) to breed. Only five species of albatross and the southern and northern giant petrel are known to breed within Australia. Breeding within Australian territory occurs on the isolated islands of Antarctica and the Southern Ocean, as well as islands off the south coast of Tasmania and Albatross Island off the north-west coast of Tasmania in Bass Strait.

There are no islands with colonies of albatross within the immediate vicinity of the operational area. Albatross Island, supporting a breeding population of approximately 5,000 shy albatross (*Thallassarche cauta*), is the closest breeding colony of threatened seabird to the operational area, located approximately 165 km to the southeast.

All Australian waters can be considered foraging habitat for albatross and petrels, with the most important habitat considered to be south of 25°S, which includes the operational area. Given these species' ability to cover vast ocean distances while foraging, it is possible these species may overfly and forage in the vicinity of the operational area.

The orange-bellied parrot (*Neophema chrysogaster*) (listed as critically endangered under the EPBC Act) migrates from the mainland across Bass Strait to King Island and Tasmania. Birds depart the mainland for Tasmania in September and November. Orange-bellied parrots arrive at King Island in March and depart in June. The parrot's breeding habitat is restricted to southwest Tasmania, where breeding occurs from November to mid-January mainly within 30 km of the coast. The species forage on ground or in low vegetation. The orange bellied parrot may overfly the operational area however the species is not likely to be impacted as there are no suitable resting, nesting or feeding sites in proximity to the survey.

The short-tailed shearwater (*Puffinus tenuirostris*) (not listed as threatened under any State or Commonwealth legislation) is known to occur and breed in western Bass Strait. It is Australia's most abundant seabird, with millions of birds converging on small offshore islands along the southern Australia's coast during their summer breeding season, with Bass Strait being their stronghold. It is the only petrel species that breeds exclusively in Australia. The shearwaters winter in the North Pacific, and return to southern Australia in summer to breed, and feeds on krill, small fish and other marine creatures, mostly feeding on the water surface. During consultation with Parks Victoria in June 2012, it was noted that a colony of approximately 12,000 short-tailed shearwaters nest on Mutton Bird Island in Victorian State waters from September through to April. This nesting location is 10 km north of the operational area.

Several populations of the little penguin (*Eudyptula minor*) (not listed as threatened under any State or Commonwealth legislation) occur within Bass Strait, with nesting sites located on islands within Bass Strait and at various mainland shorelines. The little penguin usually builds nests at the end of September, incubate the eggs in October and raise their nestlings through November and December. The nearest breeding populations to the operational area are the Twelve Apostles (London Arch) (8.5 km to the north) and Bay of Islands (19 km to the northwest).

6.4.9 Threatened Ecological Communities

The giant kelp marine forests of South East Australia' is listed as a threatened ecological community (TEC) and protected under the EPBC Act.

Giant kelp (*Macrocystis pyrifera*) is a large brown algae that grows on rocky reefs from the sea floor 8 m below sea level and deeper. Its fronds grow vertically toward the water surface, in cold temperate waters off south east Australia. It is the foundation species of this TEC shallow coastal marine ecological communities. The kelp species itself is not protected, rather, it is communities of closed or semi-closed giant kelp canopy at or below the sea surface that are protected.

Species known to shelter within the kelp forests include weedy seadragons (*Phyllopteryx taeniolatus*), six-spined leather jacket (*Mesuchenia freycineti*), brittle star (*Ophiuroid sp*), urchins, sponges, blacklip abalone (*Tosia spp*) and southern rock lobster (*Jasus edwardsii*).

The largest extent of the ecological community is in Tasmanian coastal waters. Some patches may also be found in Victoria and South Australia. Inshore of the operational area, giant kelp forest may be present in the Arches Marine Sanctuary, Twelve Apostles National Park and other areas where rocky reef occurs in waters 8 m or deeper.

Surveys of macroalgal communities along the Otway Shelf from Warranambool to Portland in western Victoria found that overall brown algal cover decreases with depth, particularly below 22 m water depth. Water depths at the closest inshore sections of the operational area are in the vicinity of 60 m, which is too deep to support this TEC. The shallowest water depth within the operational area is approximately 35 m. This water depth is at the extreme limit for giant kelp. It is therefore highly unlikely that the giant kelp marine forests of South East Australia TEC occurs within the operational area.

6.5 Socio-economic Environment

6.5.1 Settlements

The coastal communities of Apollo Bay, Princetown, Port Campbell, Peterborough, Warrnambool, Port Fairy and Portland all provide services to the commercial and recreational fishing industries in southwest Victoria. Portland is Victoria's western most commercial port, and is a deep-water port with breakwaters sheltering a marina and boat ramp. The Port of Warrnambool has a breakwater and yacht club, and provides shelter for commercial fishing boats. Port Fairy has both harbour and fish processing facilities, but is not suitable for use by large vessels, nor is Port Campbell.

6.5.2 Shipping

The South-east Marine Region is one of the busiest shipping regions in Australia. AMSA has advised Origin that there are established converging shipping routes which lead to and from Bass Strait and major southern ports through the operational area. As a result it is likely that there will be substantial volumes of shipping traffic within the operational area.

6.5.3 Petroleum Exploration and Production

Petroleum exploration has been undertaken within the Otway Basin since the early 1960s. Gas reserves of approximately 2 trillion cubic feet (tcf) have been discovered in the offshore Otway Basin since 1995, coming from five gas fields using 700 km of offshore and onshore pipeline.

In 2010-11, there was 97 megalitres (ML) of condensate production from the Otway Basin, down from 120 ML in 2008-09, and 148 ML of liquefied petroleum gas (LPG) in 2010-11, up from 6 ML in 2007-08 (more recent figures are not available).

There are a number of production fields located in the Otway Basin which include the following:

- The Otway Gas Field Development, operated by Origin, is located 70 km south of Port Campbell. The development consists of a remotely operated platform (at Thylacine) (~5 km southwest of the southwest corner of the operational area), offshore and onshore pipelines and a gas processing plant located about 6 km north of Port Campbell.
- The Casino Gas Project, developed by Santos in 2005, comprises subsea wellheads and pipeline to shore (35 km offshore and 12 km onshore) to Energy Australia's Iona gas plant for processing and distribution.
- The Minerva Gas Development is operated by BHP Billiton and commenced production in April 2005. This development involved the drilling and installation of two subsea wells in shallow waters (60 m deep and 10 km from the coast), which were tied back to an onshore gas plant (4.5 km inland) via a single pipeline.

6.5.4 Commercial Fisheries

The operational area is overlapped by the jurisdiction of several Commonwealth and State-managed fisheries, as outlined in Table 8.

Table 8. Commercial fisheries operating in or around the operational area

Fishery	Target species	Intersects operational area?
Commonwealth		
Bass Strait Central Zone Scallop Fishery	Scallops (*Pecten fumatus*).	**No** Fishing effort is concentrated around King and Flinders islands (2012 and 2013-14 data). Recent AFMA data verifies this.

Eastern Tuna and Billfish Fishery	Albacore tuna (*Thunnus alulunga*). Bigeye tuna (*T. obesus*). Yellowfin tuna (*T. albacares*). Broadbill swordfish (*Xiphias gladius*). Striped marlin (*Tetrapturus audux*).	**No** Fishery effort is concentrated along the NSW coast and southern Queensland coast (2012 and 2013-14 data). No Victorian ports are used. Recent AFMA data verifies this.
Skipjack Fishery (Eastern) (Sub-area 03, southern inshore area)	Skipjack tuna (*Katsuwonus pelamis*).	**No** Fishery effort concentrated in the GAB and north of Eden, NSW (2012 and 2013-14 data). Recent AFMA data verifies this.
Small Pelagic Fishery (western sub-area)	Jack Mackerel (*Trachurus declivis, T. symmetricus, T. murphyi*). Blue Mackerel (*Scomber australasicus*). Redbait (*Emmelichthys nitidus*). Australian Sardine (*Sardinops sagax).*	**No** Fishery effort concentrated in the near-shore GAB, west and south of Port Lincoln (2012 and 2013-14 data). Recent AFMA data verifies this.
Southern and Eastern Scalefish and Shark Fishery (SESSF) (Commonwealth Trawl Sector [CTS] and Gillnet, Hook & Trap sectors)	Blue Grenadier (*Macruronus novaezelandiae*). Tiger Flathead (*Platycephalus richardsoni*). Pink Ling (*Genypterus blacodes*). Silver Warehou (*Seriolella punctata*).	**Unlikely** 2012 and 2013-14 data fishing data indicates that fishing in the CTS is concentrated along the 200 m bathymetric contour and there is a low fishing intensity around Portland and west of Cape Otway for the Shark Gillnet sector. Recent AFMA data verifies this.
Southern Bluefin Tuna Fishery	Southern bluefin tuna (*Thunnus maccoyii*).	**No** Fishery effort concentrated in the GAB and the southern NSW coast 2012 and 2013-14 data. Recent AFMA data verifies this.
Southern Jig Squid Fishery	Arrow squid (*Nototodarus gouldi*).	**Unlikely** 2012 and 2013 data fishing data indicates that fishing is concentrated along the 200 m bathymetric contour with highest fishing intensity south of Portland and Warrnambool. Recent AFMA data verifies this.
Victorian		
Rock Lobster Fishery	Predominantly southern rock lobster (*Jasus edwardsii*), along with small quantities of eastern rock lobster (*J. verreauxi*).	**Yes** Fishery effort is throughout the operational area but concentrated over the 'Big Reef' in the south-east of the proposed acquisition area and near shore rocky reefs. The survey will impact on fishing activity should it proceed past 16 November, which is the re-opening of the season
Giant Crab Fishery	Giant crab (*Pseudocarcinus gigas*).	**Likely** Although concentrated on the continental shelf, fishing effort does occur in on the outer perimeters of the operational area. Given licence holdings are linked to rock lobster licences, impact on fishing is similar, albeit limited to a small number of commercial fishers.
Abalone Fishery	Blacklip abalone (*Haliotis rubra*) and greenlip abalone (*H. laevigata*).	**Unlikely** Due to proximity of dive activity to shoreline (generally to depths of 30 m) it is unlikely that this fishery operates in the operational area. Engagement is required with this fishery, however, due to Origin's safe diving procedures in the vicinity of seismic surveys.
Scallop Fishery	Scallop (*Pecten fumatus*).	**No** Mostly fished from Lakes Entrance and Welshpool. Fisheries Victoria data showed no scallop

		fisheries in the operational area.
Snapper Fishery (Ocean general licence)	Snapper (*Pagrus auratus*).	**Likely**

7. Environmental Impact Assessment

No activity is without its impacts and risks, some of which are known or planned, some of which are unknown or unplanned. For the Crowes Foot 3D marine seismic survey, Origin has undertaken its environmental impact in accordance with the following methology.

- **Planned events** are those impacts that **will** occur as a consequence of undertaking the activity (i.e., noise and light emissions).
  - Planned events are assessed for their *consequence* to determine their impacts (defined as a change to the environment, whether positive or negative). No assessment of likelihood is required, given that the event will occur. Consequence is rated from minor through to catastrophic, as outlined in Table 9.
- **Unplanned events** are those impacts that may occur as a result of undertaking the activity (i.e., unauthorised release of chemicals or hydrocarbons) and as such have an element of risk associated with them (i.e., the likelihood that the event could be realised).
  - Unplanned events are assessed for their known *risk* (the effect of uncertainty on objectives), based on an assessment of consequence and likelihood. The assignment of likelihood and consequence is based on the knowledge and experience of those involved in the risk assessment as well as utilising historical data on event probabilities (e.g., vessel collision frequencies). Risk is rated from low through to extreme, as outlined in Table 10.

The purpose of impact and risk evaluation is to assist in making decisions, based on the outcomes of analysis, about the sorts of controls required to reduce an impact or risk to ALARP. Planned and unplanned events are subject to this step in the same manner.

Risk evaluation involves comparing the level of risk found during the analysis process with risk criteria established when the context was considered. Based on this comparison, the need for treatment can be considered.

The EP provides detailed analysis to demonstrate that all risks are reduced to as low as reasonably practicable (ALARP) and that all risks are acceptable.

Table 11 presents a summary of the environmental impact assessment and the subsequent section outline in further detail the impact assessment sections of the EP.

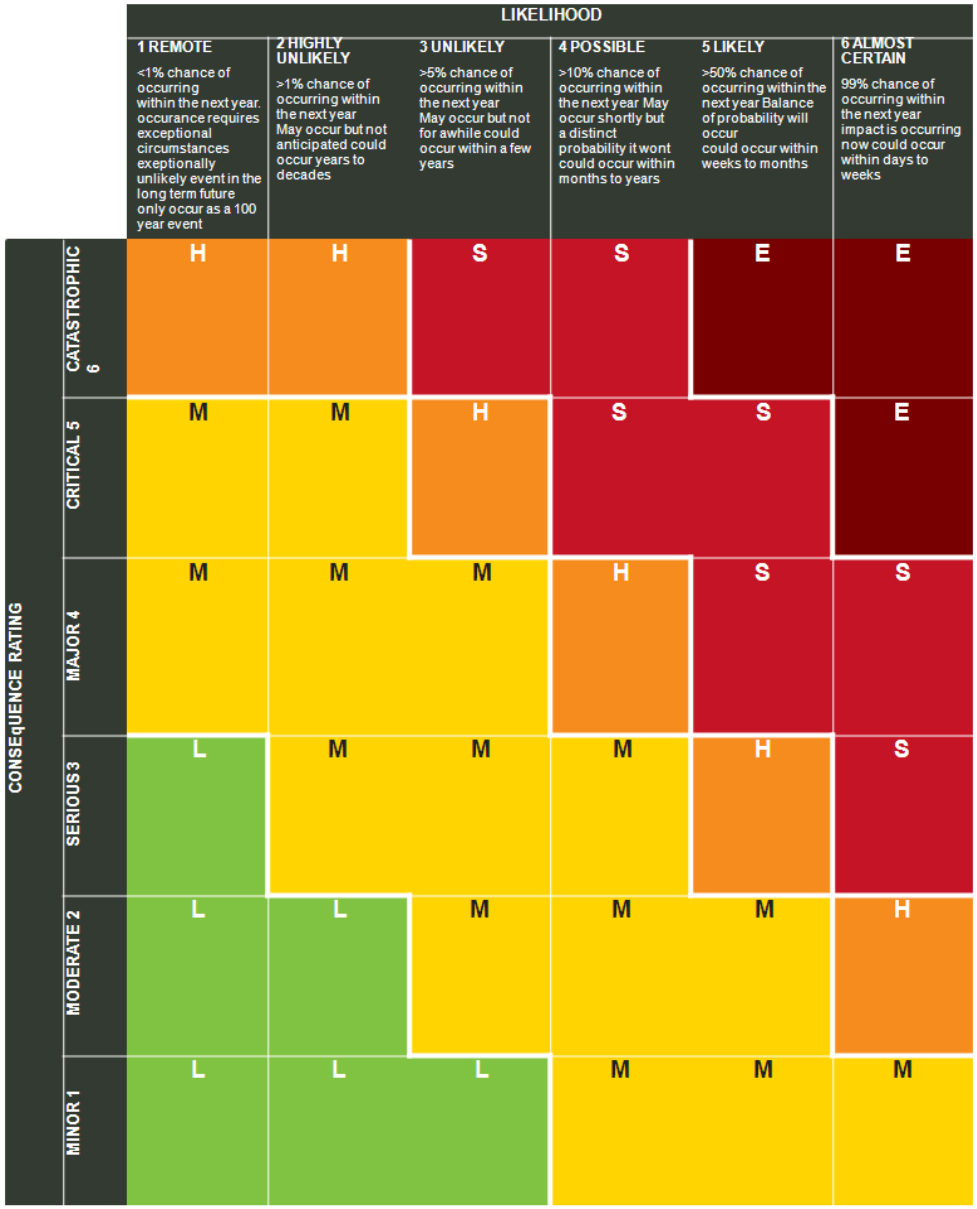
Table 9. Origin's consequence matrix

CONSEQUENCE CATEGORIES (B)+(D)

	Impact to Origin or contracting personnel	Natural environment	Community damage/ impact/ social/ cultural heritage	Financial impact (eg. due to loss of revenue, business interruption, commodity trading, asset loss)	Damage to reputation, services interruption, customer interruption	Breach of law or criminal prosecution or civil action (eg. OHS, environment, industrial relations, trade practices, industry acts)
CATASTROPHIC 6	Multiple fatalities >4 or severe irreversible disability to large group of people (>10).	Long term destruction of highly significant ecosystem or very significant effects on endangered species or habitats.	Multiple community fatalities, complete breakdown of social order, irreparable damage of highly valued items or structures of great cultural significance.	EBIT: Impact, loss or deterioration from expectation greater than $100m. CASH FLOW: Severe cash flow crisis, unable to source funds.	Negative international or prolonged national media (e.g. 2 weeks). Continued severe degradation of services to customers > 1 month or > 10,000 customer days.	Potential jail terms for executives and or very high fines for the Company. Prolonged multiple litigations.
CRITICAL 5	1-3 fatalities or serious irreversible disability (>30%) to multiple persons (<10).	Major offsite release or spill, significant impact on highly valued species or habitats to the point of eradication or impairment of the ecosystem. Widespread long-term impact.	Community fatality. Significant breakdown of social order. Ongoing serious social issue. Major irreparable damage to highly valuable structures/ items of cultural significance.	EBIT: Impact, loss or deterioration from expectation greater than $30m but less than $100m. CASH FLOW: Severe cash flow crisis, difficulty to source funds. Probable credit rating downgrade.	Negative media national for 2 days or more. Significant public outcry. Severe degradation of services to customers up to 1 month or >5,000 customer days	Very significant fines and prosecutions. Multiple prosecution and fines.
MAJOR 4	Serious permanent injury/ illness or moderate irreversible disability (<30%) to one or more persons.	Offsite release contained or immediately reportable event with very serious environmental effects, such as displacement of species and partial impairment of ecosystem. Widespread medium and some long-term impact.	Serious injury to member of the community. Widespread social impacts. Significant damage to items of cultural significance.	EBIT: Impact, loss or deterioration from expectation greater than $3m but less than $30m. CASH FLOW: Loss of flexibility and/or increase in cost to source funds. Market explanation required.	Negative national media for 1 day. Individual customers or segments disadvantaged up to 1 week. Customer interruption >500 customer days. NGO adverse attention.	Major breach of regulation and significant prosecution including class actions.
SERIOUS 3	Serious reversible/ temporary injury/illness (e.g. lost time >5 days or hospitalisation or Alternate/Restricted Duties > 1 month).	Moderate effects on biological or physical environment and serious short term effect to ecosystem functions.	Media attention and heightened concerns by local community and criticism by NGOs. Ongoing social issues. Permanent damage to items of cultural significance.	EBIT: Impact, loss or deterioration from expectation greater than $0.3m but less than $3m. CASH FLOW: Material impact to cash flow.	Negative state media. Heightened concern from local community. Service interruption up to 1 day or > 10 customer days. Criticism by NGOs.	Serious breach of law/regulation with investigation or report to authority with possible prosecution. Performance Infringement Notice (PIN).
MODERATE 2	Reversible temporary injury/illness requiring Medical Treatment (e.g. lost time <5 days or Alternate/Restricted Duties for <1 month).	Event contained within site. Minor short term damage to area of limited significance. Short term effects but not affecting ecosystem functions.	Medical treatment injury to a member of the community. Minor adverse local public or media attention and complaints. Minor medium term social impact on local population, mostly repairable.	EBIT: Impact or loss greater than $30K but less than $0.3m. CASH FLOW: Impact to project or business unit cash flow.	Public concern restricted to local complaints Negative local media. Internal escalation to senior management. Few hours service interruption. Adverse local public attention.	Breach of law/regulation or non-compliance. Minor legal issues, minor litigation possible.
MINOR 1	Injury/illness requiring Medical Treatment (no lost time, no Alternate/ Restricted Duties), First Aid, Report Only.	Minor consequence, local response. No lasting effects. Low level impacts on biological and physical environment to an area of low significance.	Public concern restricted to local complaints, low level repairable damage to common place structures.	EBIT: Impact or loss greater than $3K but less than $30K. CASH FLOW: No significant impact.	Public concern restricted to local complaints.	Local investigation, minor breach of regulation, on the spot fine or technical non-compliance. Prosecution unlikely.

CONSEQUENCE RATING

Table 10. Origin's risk management action matrix



CONSEQUENCE RATING	LIKELIHOOD					
	1 REMOTE <1% chance of occurring within the next year. occurance requires exceptional circumstances exeptionally unlikely event in the long term future only occur as a 100 year event	2 HIGHLY UNLIKELY >1% chance of occurring within the next year May occur but not anticipated could occur years to decades	3 UNLIKELY >5% chance of occurring within the next year May occur but not for awhile could occur within a few years	4 POSSIBLE >10% chance of occurring within the next year May occur shortly but a distinct probability it wont could occur within months to years	5 LIKELY >50% chance of occurring within the next year Balance of probability will occur could occur within weeks to months	6 ALMOST CERTAIN 99% chance of occurring within the next year impact is occurring now could occur within days to weeks
CATASTROPHIC 6	H	H	S	S	E	E
CRITICAL 5	M	M	H	S	S	E
MAJOR 4	M	M	M	H	S	S
SERIOUS 3	L	M	M	M	H	S
MODERATE 2	L	L	M	M	M	H
MINOR 1	L	L	L	M	M	M

Risk Management Action

Level of Risk	Action Required	Escalation and Approval of Treatment Plans	Acceptance Authority
Extreme	• Risk treatment Plan must be in place immediately • Risk reviewed monthly by Risk owner	Managing Director for review and approval of the treatment plan	Managing Director
Severe	• Risk treatment must be considered • Risk reviewed monthly by Risk owner	executive general Manager for review and approval of associated treatment plan (if applicable)	executive general manager
High	• Risk treatment must be considered • Risk reviewed twice per year by Risk owner	general Manager for review and approval of associated treatment plan (if applicable)	general Manager
Medium	• Risk treatment may be considered • Risk reviewed annually by Risk owner	group/asset/Project Manager	group/asset/Project / site Manager
Low	• no risk treatment required • Risk reviewed annually by Risk owner	site/activity Manager	site/activity Manager

Table 11. Summary environmental impact assessment

Potential risk	Potential consequences	Key avoidance, mitigation & management measures	Residual risk ranking
Planned events			
Underwater sound	Temporary and localised disturbance, physiological or pathological impacts to sound-sensitive fauna, such as cetaceans.	• The survey will be conducted outside of peak whale migration seasons (survey to occur from start of February to end of September). • A total of three (3) Marine Mammal Observers (MMOs) will be on duty to undertake marine fauna observations (cetaceans, seals, turtles and penguins) from three (3) vessels during daylight hours for the duration of the survey. • The survey operations will be conducted in accordance with EPBC Act Policy Statement 2.1 (Section A.2 to A.3), using MMOs to implement the policy. This involves: o Use of a trained crew. o Pre-start up visual observation. o Soft-start procedure. o Start-up delay procedure. o Operations procedure. o Stop-work procedure. o Night-time and low-visibility procedures. • The acoustic source will be shut down if a southern right whale or blue whale approaches within 3 km of the seismic source. Soft start procedures will commence once the whale has been observed to move outside the 3 km zone or has not been observed for 1 hr. • The acoustic source will be shut down if any other species of whale approach within 2 km of the seismic source. Soft start procedures will commence once the whale has been observed to move outside the 2 km zone or has not been observed for 30 minutes. • A passive acoustic monitoring (PAM) system will be used during non-daylight hours when the source is active and during pre-starts to provide supplementary information regarding whale presence. • If PAM is unavailable at any point during the survey (for example, due to equipment malfunction), non-daylight acquisition will not occur if there have been three consecutive days of three or more whale instigated shut-downs. • In the event that Origin is made aware of the potential for another survey/s to take place in the same area at the same time as the Crowes Foot survey, at least a 40 km (21 nm) separation will be maintained between active sources the surveys to ensure sound from one source doesn't interfere with sound from the other and to reduce the possibility of cumulative sound impacts. • An area of 57 m^2 over the 'Big Reef' has been excised from the acquisition area to minimise potential for impacts to site-attached species. • A cetacean strategy meeting will be held each evening during the survey to assess all available data on whale presence. This information will be used to inform the operational strategy for the following day.	Moderate
Light emissions	Attractant to fauna, temporary increase in predation rates on fauna attracted to lights.	• Vessel lighting will be managed in accordance with maritime safety standards.	Minor
Atmospheric emissions	Temporary and localised reduction	• Marine-grade (low sulphur) diesel will be used. • Fuel use will be monitored and abnormally high consumption	Minor

	in air quality.	investigated in order to minimise excessive air pollution. • Vessel engines and machinery will be maintained in accordance with the vessel's planned maintenance system. • Only a MARPOL-approved incinerator is used to incinerate solid waste. Oil and other noxious liquids will not be incinerated.	
Cooling and brine water discharge	Temporary and localised elevation in surface water temperature and salinity.	• Cooling water and reverse osmosis systems will be maintained in accordance with the vessel's planned maintenance system.	Minor
Sewage, grey water and putrescible waste discharge	Temporary and localised reduction in water quality from increased nutrient and pathogen load. Increase in svavenging behaviour or marine fauna and seabirds.	• All sewage and grey water is discharged via a MARPOL-approved sewage treatment plant. • The sewage treatment plant will be maintained in accordance with the vessel's planned maintenance system. • No discharge of sewage and putrescible waste will take place within 12 nm of land. • Putrescible waste will be macerated to <25 mm in size prior to discharge.	Minor
Bilge water drainage	Temporary and localised reduction in water quality from trace volumes of hydrocarbons and chemicals.	• All bilge water is treated through an oil-in-water (OIW) treatment system, with no water discharges greater than 15 ppm OIW. • Oil captured from the OIW treatment system will be transferred to shore for disposal. • Chemical storage and fuel transfer areas are bunded.	Minor
Unplanned events			
Hazardous and non-hazardous solid waste discharges	Temporary and localised water pollution. Fauna injury or death.	• A Vessel Waste Management Plan will be in place and implemented (for vessels >400 gross tonnes or certified to carry 15 persons or more): o Crew are inducted into waste management procedures. o A Safety Data Sheet (SDS) register is maintained and available in key locations. o Solid wastes bagged and sent ashore for disposal. o All bins secured to deck and covered with lids. o Only small volumes of chemicals kept on board. o Waste streams will be sorted on board according to shore-based recycling capabilities. o Garbage Record Book will be maintained. • Hydrocarbon and chemical storage areas are bunded and drain to the bilge water tank. • Spills on deck are rapidly cleaned up by a comptetent deck crew that has access to appropriate response resources.	Low
Seabed disturbance	Temporary and localised turbidity and displacement of seabed habitat.	• Vessel anchoring will only occur in an emergency and outside of the operational area (e.g., lee of King Island) in areas free of significant environmental features. • Large bulky items will be securely stored on the deck. • Deep streamer technology is not deployed within 10 m of the seabed. • Streamers will be raised to above 15 m of the seabed during line changes. • The location of suspected shipwrecks not marked on admiralty charts will be reported to authorities.	Low
Interference with third-party (merchant and fishing) vessels	Exclusion from fishing grounds. Damage to and/or loss of fishing equipment.	• Ongoing stakeholder consultation will take place with potentially impacted commercial rock lobster fishers. • Origin's fisheries management plan (including claim form) will be provided to commercial rock lobster fishermen likely to be impacted by the survey where actions to reduce overlap of	Medium

	Loss of commercial fish catches. Disruption to commercial shipping activities.	activities cannot be identified. • The vessel and streamers will be readily identifiable to other vessels through the use of anti-collision monitoring equipment. • The survey vessel location will be communicated to other users via the Notice to Mariners and AusCoast warnings. • Vessels will employ standard maritime safety measures (e.g., lighting, 24-hr visual, radio and radar watch). • The support vessels will liaise/interact with third-party vessels to avoid damage to the seismic survey streamers and/or the third-party vessels and their equipment. • Investigate potential long-term impacts to commercial rock lobster fishers and mitigations, by working with industry representatives to develop reasonable controls. • Reduce the spatial and temporal extent of the Operational Area. • Compensate potentially impacted fishers using the Origin's compensation framework. • Implement a claims and compensation process for any potential long term impacts.	
Interaction with divers	Disturbance to divers.	• Consultation will occur with diving stakeholders on the activities to be undertaken during the Crowes Foot campaign and the timing of these events. • The support vessels will liaise/interact with diving vessels in the area.	Medium
Introduction of invasive marine species	Loss of diversity and abundance of native species.	• Vessels will have anti-fouling paint applied to their hulls and internal niches. • Vessels are cleared to enter Australian waters (if previously mobilised from outside Australian waters) in accordance with the Australian Ballast Water Management Requirements.	Medium
Vessel strike or entanglement with cetaceans	Injury or death to cetaceans (whales and dolphins).	• The Australian Guidelines for Whale and Dolphin Watching (2005) for sea-faring activities will be implemented. • Cetacean observations will be reported to the Department of the Environment. • Incidents of vessel strike or streamers causing known or suspected injury or death to threatened fauna will be reported to the Department of the Environment within 2 hours.	Medium
Diesel spill (refuelling spill or vessel-to-vessel collision)	Injury or death to marine fauna through ingestion or contact. Temporary decrease in water quality. Habitat damage in the case of shoreline contact.	• As per 'Interference with third-party vessels'. • The vessel bunkering procedure will be implemented. • Refuelling equipment will be maintained in the accordance with the vessel's planned maintenance system. • Shipboard Oil Pollution Emergency Plan (SOPEP) and Emergency Response Plan (ERP) will be in place, and implemented in the event of a diesel spill. • Diesel spill will be promptly reported internally and externally in accordance with the project Oil Pollution Emergency Plan (OPEP). • Operational and scientific monitoring will take place to support the spill response and characterise environmental impacts.	Medium

7.1 Impact 1 - Underwater sound

The following activities will generate underwater sound:

- Sound pulses from the seismic airgun array
- Engine noise transmitted through the hull and propeller noise from the survey and support vessels

7.1.1 Known and Potential Environmental Impacts

The known and potential environmental impact to marine fauna from underwater sound is:

- Localised and temporary disturbance to noise-sensitive species, such as cetaceans and turtles

- Potential physiological and pathological effects to marine invertebrates

An intrinsic environmental risk from seismic surveys is sound emissions caused by the discharge of underwater seismic pulses impacting marine fauna. The level of impact to marine fauna depends on multiple factors, such as sound intensity and duration, distance from the source, fauna species and the mitigation measures employed. Potential impacts range from mortality or pathological damage from close exposure to high sound levels, to various behavioural responses such as area avoidance (McCauley, 1994; McCauley *et al.*, 2000).

Cetaceans are widely regarded as being the most sensitive marine animals to noise, given that they use sound to communicate between individuals and locate their prey. As described in Section **Error! Reference source not found.**, the key cetaceans identified as sensitive receptors in the operational area (i.e., those that are listed as 'threatened' under the EPBC Act and have BIAs in the region) are southern right whales and blue whales.

The decibel (dB) scale is a logarithmic scale used to measure the amplitude (the height of a sound pressure wave or "loudness") of a sound. If the amplitude of a sound is increased in a series of equal steps, the loudness of the sound will increase in steps that are perceived as successively smaller. Because the dB scale is relative, reference levels must be included with dB values if they are to be meaningful. The commonly used reference pressure level in underwater acoustics is 1 micropascal at 1 m (1 µPa @ 1 m). Sound pressure levels (SPL) measured in water are usually reported as dB relative to a reference pressure of 1 µPa. The reference level used in air (20 µPa @ 1 m) was elected to match human hearing sensitivity. Because of these differences in reference standards, noise levels in air do not equal underwater levels. To compare noise levels in water to noise levels in air, it is necessary to subtract 62 dB from the noise level referenced in water.

Sound exposure level (SEL) is a metric used to describe the amount of acoustic energy that may be received by a receptor (such as a marine animal) from an event – such as the discharge of a seismic airgun array. It is regarded as an appropriate measure of acoustic intensity as it takes into account the overall acoustic energy impinging on an animal per unit area. SEL is the dB level of the time-integrated, squared sound pressure normalized to a 1 second period, and is expressed as dB re: 1 µPa^2-s. This measure is extremely useful for pulses and transient non-pulse underwater noise because it enables sounds of differing duration to be characterised in terms of total energy for the purposes of assessing exposure risk.

The EPBC Act has set the standard measurement for underwater sound in Australia as the SEL; this measurement normalises the amplitude of the sound with time (normally referenced to 1 µPa², where 'µ' is micro and 'Pa' is Pascal, over 1s underwater) but does not account for frequency sensitivity of the receptor. In air and for human conditions, this value is normally replaced by a weighted value to account for human sensitivity at certain frequency thresholds.

7.1.1.1 Background sound

Both physical and biological processes contribute to natural background sound. Physical processes include that of wind and waves whilst biological noise sources include vocalisations of marine mammals and other marine species (WDCS, 2004). Iceberg calving, shoaling and disintegration has recently been identified as a dominant source of low frequency (<100 Hz) noise in the Southern Ocean. Wind is also a major contributor to noise between 100 Hz and 30 kHz (WDCS, 2004).

Turnpenny and Nedwell (1994) found that in some species continuous ambient sound alone resulted in auditory masking, and that sound had to be 20dB above ambient sound to be audible. Table 12 presents a comparison of biological and anthropological sounds in the marine environment.

Table 12: Sound intensity and pressure (dB re 1uPa) @ 1 m from source for some common marine sources, and source proposed for the Survey.

Source	Sound Intensity (dB re 1 uPa)	Frequency (Hz)	Reference
Natural noises			
Ambient sea sound	80-120	Varied	2
Undersea earthquake	272	50	2
Seafloor volcanic eruption	255+	Varied	2
Lightning strike on sea	250	Varied	2

surface			
Iceberg calving, shoaling and disintegration	220-245	Varied	5, 6
Bottlenose dolphin click	Up to 229	Up to 120,000	2
Breaching whale	200	20	2
Blue whale vocalisations	190	12 – 400 (16 – 25 dominant)	2
Blue whale moans	188	12 – 390 (16 - 25 dominant)	1
Southern right whale	172 - 186	30 – 2,200 (50 – 500 dominant)	1
Humpback whale	144-174	30 – 8,000 (song) (120 – 4,000 dominant) 50 – 10,000 (social calls)	1, 3
Sperm whale clicks	Up to 235	100 – 30,000	2
Anthropogenic noise			
Seismic acoustic source (32 guns)	178-210	Most energy 5 to 200Hz	1
Ship sound (close to hull)	200	10 - 100	2
Survey vessel	110-135 (without thrusters) 121-146 (with thrusters)	20-1,000	4
Fishing trawler	158	100	3
7 m outboard motorboat	156	630	3
Tanker (179 m)	180	60	3
Supertanker (340 m)	190	7	3
Containership (274 m)	181	8	3
Navigation transponders	180 – 200	7,000 – 60,000	3
Side scan sonar	220 – 230	50,000 – 500,000	3
Bottom profilers	200 – 230	400 – 30,000	3
References			
1 – Richardson et al (1995).	3 – WDCS (2004).	5 – Chapp *et al.* (2005).	
2 – APPEA (2006).	4 – Total (2004).	6 – Matsumoto *et al.* (2014).	

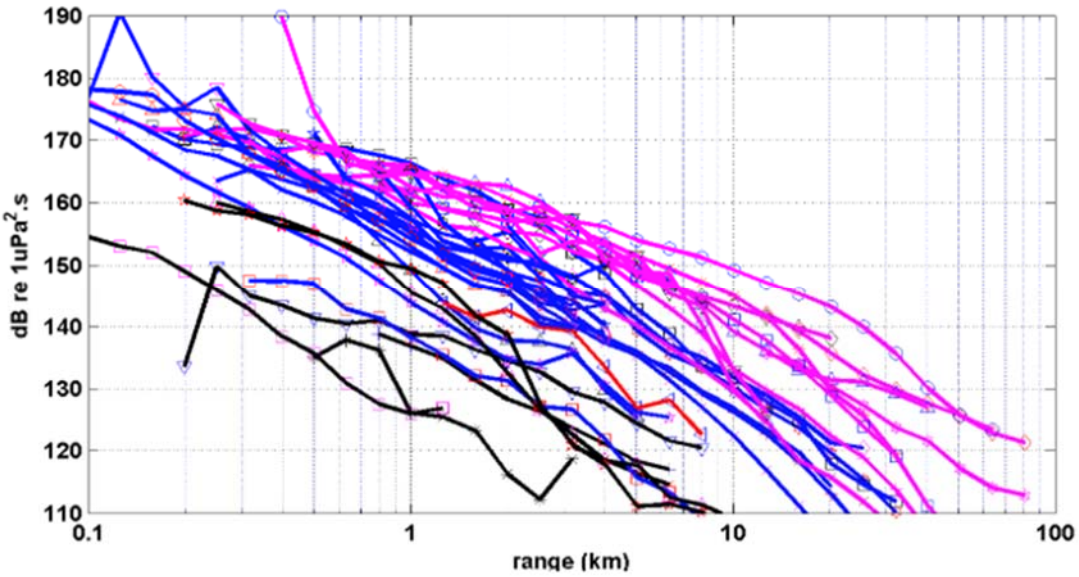
7.1.1.2 Seismic source array

Acoustic sources produce energy with dominant frequencies of approximately 10 - 250 Hz and relative amplitudes of approximately 230 to 255 dB re 1µPa² at 1 m from the source (McCauley, 1994).

When considering long-range transmission of sound underwater it is the near horizontal energy output from the sound source which is the most critical. The devices towed by the survey vessel are arranged in precise offset distance and locations according to their volume, amplitude and frequency group called sub arrays. These are specifically designed and oriented such that the sound energy is directed vertically downwards towards the seafloor to be most efficient and effective in transmitting the tuned sound source signal through the water column to the seabed. Thus energy is not directed, nor does it travel very far horizontally.

Figure 11 indicates that that noise emanating from seismic surveys with an air gun array maximum volume of 3,090 cui or less, is likely to reach background ambient levels (i.e., <120 dB) within 10-40 km

from the sound source, dependent on the sound propagation characteristics of the area. It also indicates that the SEL from a single shot at a distance of 1 km from the source is below the threshold of 160 dB re 1 µPa established under the EPBC Act Policy Statement 2.1 (Interaction between offshore seismic exploration and whales, DEWHA 2008) used to determine whale exclusion zones where seismic surveys must lower their acoustic power output or shut down completely in order to prevent significant exposure to SEL that could induce temporary threshold shifts (TTS) in cetaceans.



All air gun measurements where received levels for a given survey have been averaged in log spaced range bins and presented as the mean value/bin +95% confidence limit. The black curves are arrays or single air guns of <1,000 cui capacity; the **red curve** is array of 1,000-2,000 cui; the **blue curves** 2,000-3,000 cui and the **magenta curves** 3,000-4,000 cui.

Figure 11: Noise decay curves for a number of different seismic airgun sources in western and southern Australian waters Source: McCauley & Duncan (unpublished) in Galaxia (2009).

Also, the seabed geology of the western Bass Strait continental shelf results in relatively poor propagation of low-frequency sound, except in narrow frequency bands. The sound exposure level (SEL) of airgun signals, based on measurements of sound exposure level and spectral characteristics of noise from the Bellerive seismic survey conducted by Origin Energy, are shown in Figure 12 (Gavilrov, 2012). Importantly sound exposure measured at distances of 40 km and larger was detectable only at frequencies below 20 Hz. The airgun signals recorded on logger 2 deployed closer to the continental slope were noticeably weaker than those received on loggers 1, 3 and 4 and are not shown.

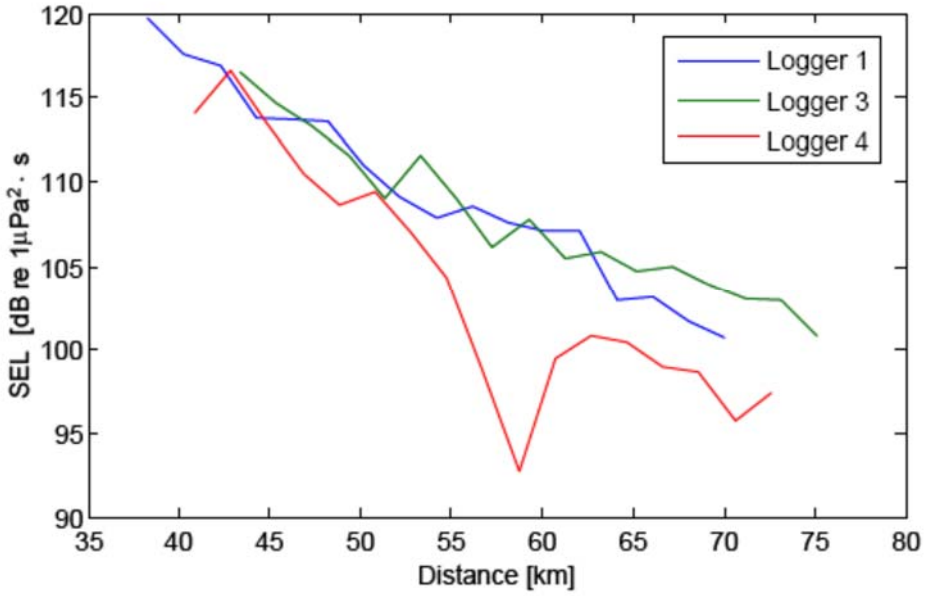


Figure 12: SEL vs range measured for airgun shots from the Bellerive seismic survey shows the rate at which sound attenuates. Sound exposure measured at distances of 40 km and larger was noticeable only at frequencies below 20 Hz.

Origin has also previously commissioned the Centre for Marine Science and Technology, Curtin University, to complete sound transmission loss modelling (STLM) for the Astrolabe (Maggi and Duncan 2011) and Enterprise seismic surveys (Duncan *et al.* 2012), overlapping the western boundary and approximately 16 km north north west of the Crowes Foot acquisition area respectively.

The Astrolabe modelling is considered to be illustrative of sound propagation from mid shelf regions which encompass the majority of the Crowes Foot acquisition area. Maximum modelled sound exposure levels at any depth are shown in Figure 13 for the mid shelf Astrolabe survey.

Key findings from the Astrolabe modelling, which assessed a 3090 in^3 and 4130 in^3 source, are as follows (Figure 13, Figure 14):

- SELs below 160dB re 1µPa^2.s are expected to be achieved within approximately 1km of the source array;
- SELs at 3km from the acoustic array are approximately 145db re 1µPa^2
- SELs at 36km directly inshore coastal are approximately 120dB re 1µPa^2.s
- SELs directly below a 4130m^3 seimic array at a seabed depth of up to 80m are 160dB re 1µPa^2.s

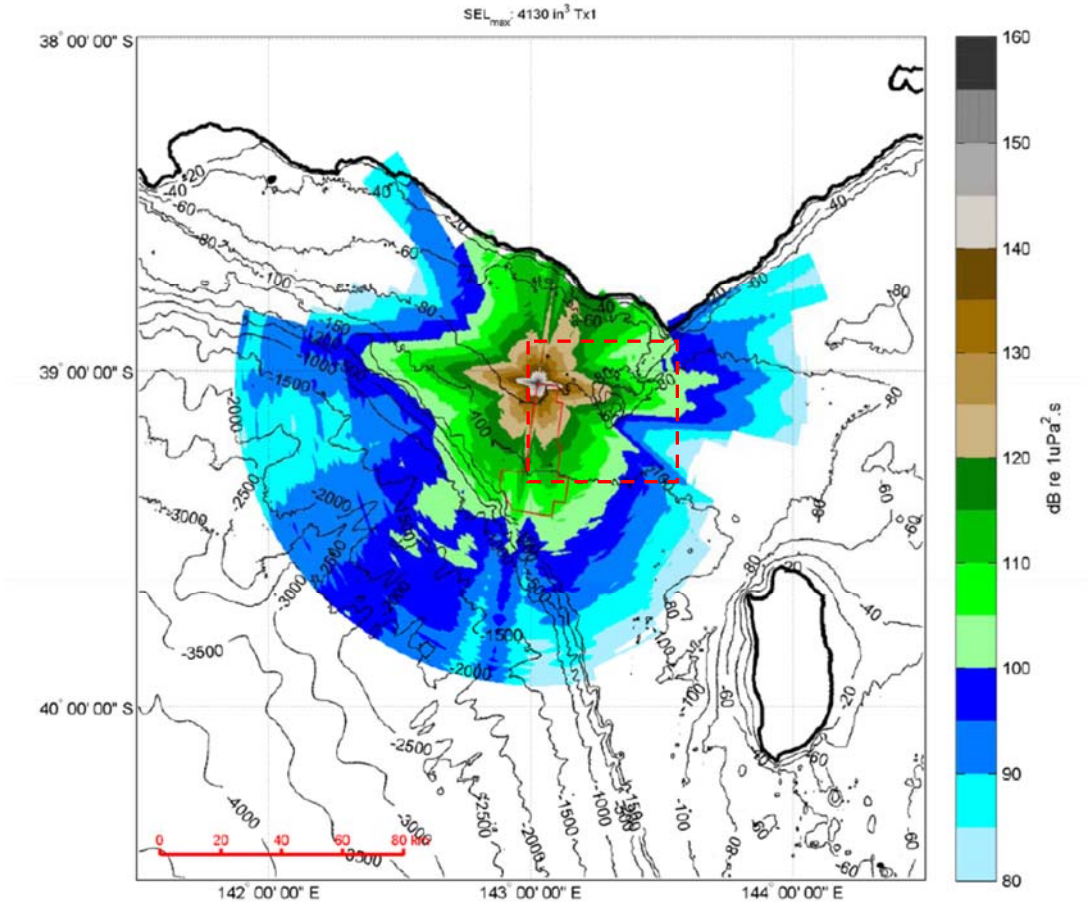


Figure 13: Modelled maximum received sound exposure level at any depth based on a 4130 in3 source array. Red dashed line is the approximate location of the CF3D operational area.

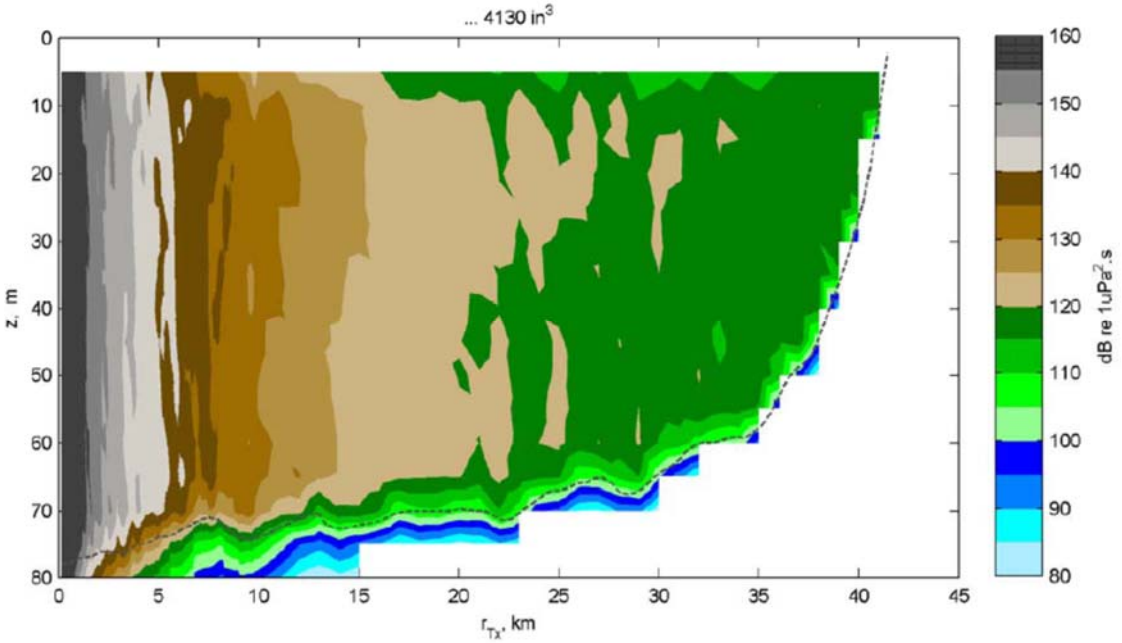


Figure 14: Modelled SEL in the vertical plane inshore along 9.06°. The dotted line indicates seabed bathymetry.

The modelling undertaken for the Enterprise survey provides an assessment of sound propagation from near shore areas in the vicinity of the operational area. Note that the Enterprise survey was significantly closer to shore in shallower water than the proposed Crowes Foot survey so modelling results are not considered directly applicable. Key findings from the Enterprise modelling (which assessed 900in^3, 2500 in^3 and 3560in^3 arrays) are as follows:

- 95% of received levels would be below 160 dB re 1 µPa^2.s at a range of 400 m when the source is located in 17.4 m of water or more. Note that the minimum depth for the Crowes Foot survey is approximately 35m over the 'Big Reef' and approximately 60m at the northern boundary of the operational area.
- In all cases maximum modelled sound exposure at the 10 m contour inshore of the source, range from 160 to 175 dB re 1 µPa^2.s.
- Maximum exposure values were 140 to 150 dB re 1 µPa^2.s at 20 km from the source.
- Hydrodynamic modelling of representative ocean waves was used to estimate an environmental baseline. The results indicated that the peak absolute acoustic pressures produced by the modelled seismic sources are between 10% and 50% of the acoustic pressures produced by ocean waves with a median annual wave height and corresponding modal wave period.

Origin has also previously commissioned deployment of three passive acoustic monitors in coastal areas between Moonlight Head and Warrnambool between April 2012 and January 2013. Data were successfully obtained from only one of these loggers, situated 5km from the coastline east of Warrnambool. These data identified that ambient underwater noise in this location is generally high, with a mean of 110 dB re 1 µPa, and up to 161 dB re 1 µPa (McCauley & Gavrilov 2013).

As discussed during the Crowes Foot survey the seismic source will be directed downwards and water depths will vary between 90 and 35m, further attenuating the source energy. This indicates that under modelled conditions near shore, the natural marine noises are likely to mask any noise from the seismic source.

For the purpose of assessing the potential impacts and risks, Origin has re-defined the proposed acquisition area, and the operational area, and introduced an area likely to be affected ("affected area"). The affected area consists of the source activation area with an additional buffer. The source activation area is an area in which the source may be activated during line acquisition, any shooting in the turns, run-outs and ramp-up, and any source testing or maintenance, or times when the source might be fired at lower volumes. Note that the cumulative sound exposure levels will be highest within the acquisition area, and the source activation area is therefore the most conservative assessment of the area required in which to fire the source. The source will not be activated outside this area.

These areas are shown in Figure 15 along with the relevant fishing grid blocks within the Western Zone of the Victorian southern rock lobster fishery. The affected area represents a conservative view of the area in which the sub-lethal effects on lobsters described in the FRDC report may occur, and was derived using the following logic:

- The maximum single shot sound exposure levels (SELs) described in the FRDC report were 190 dB re 1 µPa^2.s and maximum cumulative SELs were199 dB re 1 µPa^2.s.
- SELs experienced in the lobster experiments were equivalent to the nearest sail line of a 3065 source (mean of measured transmission of a 3040 and 3090 in^3 source, McCauley et al. 2016) at 100-200 m.
- The median cumulative exposures experienced during experiments were equivalent to a set of five seismic lines with the nearest sail line at 200-500 m range.
- Thus the exposures experienced during lobster experiments can be considered to be equivalent to a commercial ~ 3100 in^3 seismic source passing within 100-500 m range adjacent the lobsters.
- Curtin University was commissioned to undertake sound propagation modelling of the seismic parameters proposed for the Crowes Foot survey to assess cumulative SELs in water depths of 40m and 75m water depth. Whilst this model focussed on the Big Reef and seismic sound propagation and transmission losses at any given location will depend on a range of factors such as seabed geology and water depth, the model is considered illustrative of cumulative SELs at similar water depths throughout the survey area.
- Modelling provided estimated distances to the maximum cumulative SEL levels described in the FRDC report of ~400m and ~600m for 40m and 75m water depths respectively. These

water depths are representative of the Crowes Foot survey area and therefore it would be reasonable to assume that the conservative buffer is applicable for the source activation area, especially for the important fishing areas of Moonlight Head, 3, 9 and 11 mile. Though it is noted that the survey area is deeper in the south of the operational area (up to 90m water depths).

- As the FRDC study did not establish a minimum threshold at which the sub-lethal effects begin to occur advice was sought from Curtin University on a suitable no 'effect distance'. A conservative cumulative SEL of 183 dB re 1 μPa^2.s was proposed. Estimated distances to this level was 1.1km and 2km for 40m and 75m depths respectively.
- Using a conservative approach a buffer of 2km will be added to the source activation area to define an affected area of potential impact.
- Single shot SELs were predicted to fall below the FRDC research levels within ~100m (Day et al, 2016a.

The affected area is shown if Figure 15

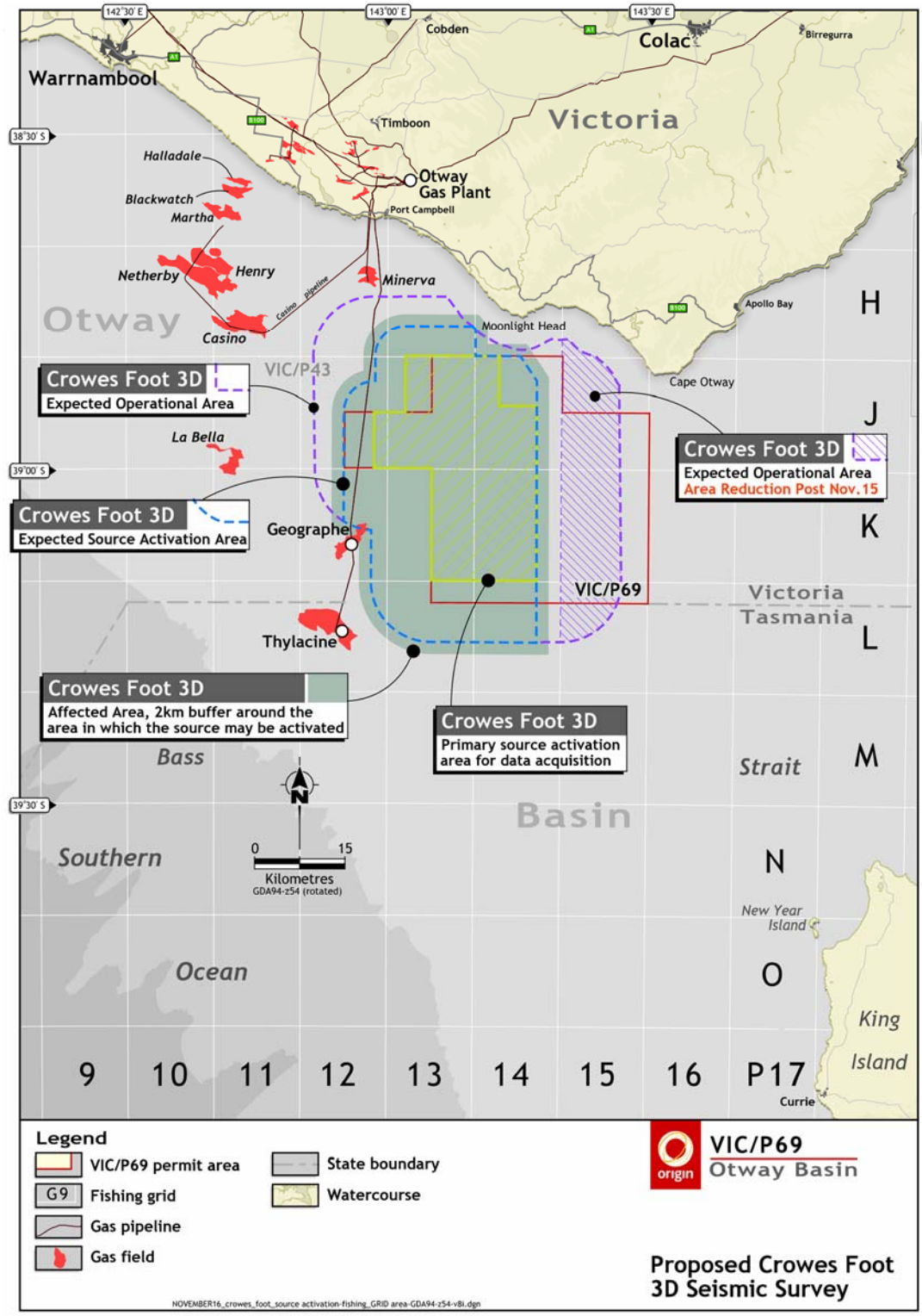


Figure 15 - Acquisition area, operational area and affected area

7.1.1.3 Vessel sound

The sound levels and frequency characteristics of underwater noise produced by vessels are related to ship size and speed. When idle or moving between sites, vessels generally emit low-level noise. Tugboats, crewboats, supply ships, and many research vessels in the 50-100 m size class typically have broadband source levels in the 165-180 dB re 1µPa range (Gotz *et al.*, 2009). In comparison, underwater noise levels generated by trawlers can peak at around 175 dB re 1µPa, and large ships can produce levels exceeding 190 dB re 1µPa (Gotz *et al.*, 2009).

However, when the vessel is holding its position using thrusters, noise may be detectable up to 20 km, although this audibility range is reduced under windier (noisier) conditions (BHP Billiton, 2005).

7.1.1.4 Helicopter sound

The main acoustic source from helicopters is the impulsive sound from the main rotor, which consists of blade-vortex interaction noise in descent or level flight at low and medium velocities and high-speed impulsive noise related to trans-sonic effects on the advancing blade. The rotating blades of helicopters produce tones with fundamental frequencies proportional to the rotation rate and number of blades. Dominant tones in noise spectra from helicopters and fixed wing aircraft are generally below 500 Hz (Richardson *et al.*, 1995). Other tones associated with the main and tail rotors and other engine noise can result in a larger number of tones at various frequencies. Information on reactions of whales to aircraft is mostly anecdotal. Reactions of baleen whales to circling aircraft (fixed wing or helicopter) are sometimes conspicuous if the aircraft is below an altitude of 300 m (1,000 ft), uncommon at 460 m (1,500 ft) and generally undetectable at 600 m (2,000 ft) (Richardson *et al.*, 1995; NMFS, 2001).

Increased underwater and airborne noise from helicopter movements has the potential to cause impacts to birds along flight paths due to behavioural disturbance, and behavioural changes in cetaceans. Airborne noise from helicopters generally only penetrates water at angles greater than 26° (Richardson *et al.*, 1995). Generally this only results in a temporary change in behaviour (e.g., diving, tail slaps) in whales, which return to normal behaviour once the helicopter has passed (Richardson *et al.*, 1985; Richardson and Malme, 1993), and occasional overflights are thought to have no long term impact on cetaceans (NMFS, 2001).

7.1.2 Evaluation of Environmental Impacts

Activities that generate underwater noise can affect marine fauna by interfering with aural communication, eliciting changes in behaviour and, potentially, causing either acute or chronic (over time) physiological damage. Various studies have investigated the effects of seismic discharge upon a range of marine biota. These studies have generally concluded that, although a seismic source poses a potential risk to individuals in very close proximity, the transitory nature of seismic operations and the limited range over which possible effects could occur make it unlikely that seismic noise poses any significant hazard to populations of marine species (McCauley *et al.*, 2000; Wardle *et al.*, 2001; Gausland, 2000).

The known and potential impacts on various groups of marine fauna are outlined herein.

7.1.2.1 Plankton

The work by McCauley et al. (2017) is the first large-scale field experiment on the impact of seismic activity on zooplankton. Their study overturns the conventional idea of limited and localised impact on zooplankton. They found that air gun exposure significantly decreased zooplankton abundance and increased the mortality rate from a background level of 19% per day to 45% per day (for the day of exposure). These impacts were observed out to the maximum assessed range of 1.2 km.

APPEA has commissioned CSIRO (Richardson et al (2017) to model a hypothetical seismic survey using McCauley et al (2017) research findings and extrapolating to common industry scale seismic survey in the North West shelf of Western Australia.

McCauley et al. (2017) concluded that zooplankton mortality was the same across all sampled drift-corrected ranges (200, 600 and 1200 m), although the zooplankton biomass declined at the maximum range sampled. Given the study did not show a significant range-dependent mortality curve, the abundance data supports the adoption of a maximum mortality range of 1.2 km for the purposes of this modelling exercise. This input to the modelling study was confirmed and agreed with Rob McCauley.

The measured received levels of the 150 cui airgun at the largest sampled distance (1.2 km) was approximately 178 dB re 1 uPa (peak to peak sound pressure level (pk-pk SPL)) and 153 dB re 1uPa.2.s (single shot sound exposure level (ssSEL)). Extrapolating these levels to a larger 3000 cui commercial array was undertaken in discussion with Rob McCauley, who confirmed that the peak to peak sound pressure level is the most appropriate metric to adopt for the purpose of the modelling

report. This rationale is based on the untested assumption that the peak level is inducing the impacts to zooplankton, compared to sound exposure level.

The measured airgun received levels from the 150 cui within McCauley et al. (2017) were extrapolated to a larger 3000 cui commercial survey array, using a dataset of measured levels of commercial seismic surveys within the north-west shelf. The dataset consisted of measured received levels of six commercial arrays (3040-3147 cui) in 180-500 m water depths. Measured levels showed that the 178 re 1 uPa pk-pk SPL received level associated with the range of 1.1-1.2 km for the 150 cui airgun within McCauley et al. (2017) correlated to an equivalent range of 2,526 m for a 3000-3147 cui airgun array.

In summary, to replicate the stated effects within McCauley et al. (2017), a flat mortality rate (above natural mortality) was applied out to a range of 2.5 km (quoted received level of 178 dB re 1µPa pk-pk SPL). This was considered the most appropriate and agreed in discussion with Rob McCauley prior to commencement of the modelling.

APPEA has commissioned CSIRO to model a hypothetical seismic survey using McCauley et al (2017) research findings and extrapolating to common industry scale seismic survey in the North West shelf of Western Australia.

Simulations that included ocean circulation showed that the impact of the seismic survey on zooplankton biomass was greatest in the Survey Region (0.78, i.e., 22% of the zooplankton biomass was removed) and declines as one moves beyond it to the Survey Region + 15 km (0.86), and the Survey Region + 150 km regions (0.98, see Table for values); there was no discernible effect on the entire Northwest Shelf Bioregion. The time to recovery for the Survey Region and Survey Region + 15 km recovery was 39 days (38-42 days) after the start of the survey and 3 days (2-6 days) after the end of the survey.

7.1.2.2 Fish

Fish detect sound and may respond to seismic sounds with startle or alarm responses (Parry & Gascon, 2006). Direct physical damage may occur to fish if they approach within a few metres (< 5 m) of the seismic source (Gausland, 2000; McCauley *et al.*, 2000; Parvin *et al.*, 2007).

Lethal effects of seismic on fish have not been reported, but those with a swim bladder closely connected to the inner ear are more susceptible than those without (McCauley, 1994). Fishes with thin-walled, lightly damped, and large swim bladders with a resonant frequency near 100 Hz will be most susceptible to mechanical damage or trauma from seismic shots. Other fishes, including the elasmobranchs (sharks and rays), family Scombridae (mackerels and tuna) and many of the flatfishes and flounder do not possess a swim bladder and so are not susceptible to swim bladder-induced trauma (McCauley, 1994). According to Turnpenny and Nedwell (1994), inshore, shallow water fish communities are largely benthic species without a swim bladder and are therefore also less sensitive to sound.

Available evidence suggests that behavioural change for some fish species may only be localised and temporary, with displacement of pelagic or migratory fish populations having insignificant repercussions at a population level (McCauley, 1994).

Trials of effects of nearby airgun operations on captive fish, undertaken by McCauley *et al.* (2000) showed a generic fish ‘alarm’ response of swimming faster, swimming to the bottom, tightening school structure, or all three, at an estimated 2–5 km from a seismic source.

From their review of trials and published information, McCauley *et al.* (2000) concluded the following effects on fish:

- Demersal fish could be expected to begin to change their behaviour by increasing speed and swimming deeper in the water column
- As airgun level increases, these fishes would be expected to form compact schools probably near the bottom in continental shelf depths (<200 m)
- Eventually levels may be reached at which involuntarily startle responses occur in the form of the classic C-turn (involuntary flexing of the body and subsequent darting swim away from the source)
- In deeper water (>200 m) any effects would be expected to lessen with increasing depth, as the airgun signal level dropped accordingly
- Startle responses may be generated by fish within 300 m and up to 2,000 m of an airgun array

- Flight response could be expected up to several kilometres

These trials, as well as studies by Wardle *et al.* (2001), Dalen *et al.* (1996) and Gausland (2000) also indicate the following:

- Fish generally show little evidence of increased stress from exposure to seismic signals unless restricted from moving away from the source
- Fish may become acclimatised to seismic signals over time

The threshold for the initial increases in swimming behaviour recorded were of the order of 156 dB re 1µPa rms, and at levels of around 161-168 dB re 1µPa rms active avoidance of the airgun source would be expected to occur. For the 3D array measured (2,678 cui in 100–120 m water depths) as part of the study, this corresponded to a range of around 3–5 km and 1–2 km, respectively (McCauley *et al.*, 2000). Serious injuries to fish only appear to occur at sound levels in the order of 220 dB re 1µPa, that is, very close to the source (Turnpenny and Nedwell, 1994). However, avoidance by fish occurs at ~160–180 dB re 1µPa.

Exposure of fish to seismic airguns has been shown to have detrimental effects to fish ears, in particular snapper (*Pagrus auratus*), a species widely distributed in southern and eastern Australian waters (McCauley *et al.*, 2003). Damage to fish sensory epithelia was apparent as ablated hair cells, repair or replacement of these damaged sensory cells was not evident up to 58 days after exposure (McCauley *et al.*, 2003). The fish in this study were exposed to an airgun with a source level at 1 m of 222 dB re 1µPa peak to peak. Although this study provides information on the potential effects of seismic airguns on fish, it was carried out in cages where the fish were not able to swim away from the noise source. Turnpenny and Nedwell (1994) state that there is no recorded evidence that airguns have killed fish or caused injury during seismic operations and that the information available pertaining to damage to fish derives from caged experiments which are unrepresentative of normal operational use.

Hastings *et al.* (2008) found that close passes of a seismic array with measured cumulative SEL of up to 190 dB re 1 µPa, at ~45 m from the seismic source, did not damage the hearing sensitivity of caged hearing specialist reef fish (pinecone soldierfish, *Myripristis murdjan*) and non-hearing specialist reef fish species (blue green damselfish, *Chromis viridis*; sabre squirrelfish, *Sargocentron spiniferum*) and bluestripe seaperch, *Lutjanus kasmira*).

Gausland (2000) postulates that seismic airgun operation causes little direct physical damage to fish at distances greater than 1-2 m from the source; that it is evident that fish respond to sounds emitted from airguns; and that avoidance seems to be the primary response for all species. Damage to seismic survey hydrophone cables by pelagic fish imply that some fish species show no long distance avoidance reaction to seismic sounds (McCauley, 1994).

Impacts to site attached fish, such as are likely to occur at the 'Big Reef' in the south-east of the acquisition area and at localised areas of exposed low relief limestone throughout the operational area, can be assessed through comparison with studies undertaken by Woodside at Scott Reef on tropical reef fish during 3D seismic survey activities. The received sound pressure for the Scott Reef survey of 220-240 dB re 1µPa is higher than the estimated SEL of 160 dB re 1 μPa^2.s at 35m in the vertical plane based on modelling. 35m is the approximate depth at the summit of the 'Big Reef'.

The Scott Reef study (Woodside, 2012a, Woodside, 2012b) identified the following impacts to reef fish:

- No lethal or sub-lethal effects on fish were experienced. Behavioural responses were observed at close range with general movement from the water column to the seabed, however normal feeding behaviour returned within 20 minutes of the survey vessel passing and when the vessel was beyond a distance of 1.5 km (Woodside, 2012a).
- Fish exposed to acoustic pulses shown no structural abnormalities, tissue trauma or lesions, or auditory threshold changes (highest exposure level 190 dB re 1μPa^2.s). However, a small number of damaged hair cells (less than 1% of fish hearing capacity) were observed in fish exposed to acoustic noise (Woodside, 2012b).
- No significant decreases in the diversity and abundance of fish after the seismic survey were detected compared with the long-term temporal trend before the survey (Woodside, 2012c).
- The lack of significant impacts to fish species considered sensitive because of their site-fidelity requirements (i.e., being restricted to reef habitat and unable move far when the seismic sound approaches) indicates that pelagic fish able to swim away from disturbing noise are likely to be even less at risk of impacts from seismic noise.

Given these findings, the seimic survey is not considered to present a very low risk of physiological impacts to site attached fish within the acquisition area. Overall, the behavioural changes expected in fish exposed to seismic sounds would be localised and temporary, with displacement of pelagic or migratory fish highly unlikely to have significant impacts at a population level (McCauley, 1994; McCauley *et al.*, 2000).

7.1.2.3 Elasmobranchs (sharks and rays).

Limited research has been conducted on shark and ray responses to marine seismic surveys. Sharks and rays differ from bony fish in that they have no accessory organs of hearing (i.e., a swim bladder) and therefore are unlikely to respond to acoustical pressure (Myrberg, 2001). The lateral line system does not respond to normal acoustical stimuli, and is unable to detect sound-induced water displacements beyond a few body lengths, even with large sound intensities (Myrberg, 2001). Sharks are highly sensitive to low frequency sound between 40 and 800 Hz (Myrberg, 2001), sensed solely through the particle-motion component of an acoustic field. This range overlaps with seismic sound frequencies. Klimley and Myrberg (1979) established that an individual shark will suddenly turn and withdraw from a sound source of high intensity (more than 20 dB re 1µPa above background ambient noise levels) when approaching within 10 m of the sound source. The available evidence indicates sharks will generally avoid seismic sources and, with the management measures provided, the likely impacts on sharks are expected to be limited to short-term behavioural responses, such as avoidance of waters around the operating survey vessel.

Trauma from acoustic sources to marine fauna appears linked to the presence of a swim bladder, which is a gas-filled chamber that assists with buoyancy or an aid in hearing. Vibrations in the water can induce trauma in species with swim bladders, though this may be limited to juvenile fish as many adult fish (including sharks and rays) do not possess swim bladders (McCauley, 1994). Fish attacks on seismic streamers from large pelagic fish is not uncommon (McCauley, 1994), indicating a tolerance (or limited sensitivity) to acoustic sound.

The proposed operational area does not contain biologically important habitat for any of the threatened shark species that may occur in the region and these species are not expected to occur in large numbers in the operational area. Coupled with their lack of a swim bladder and their known avoidance response to sudden sound increases, it is anticipated that the survey will have minimal effect on shark and ray populations or their normal movements through the region. The risk of significant impact to any shark or ray species from the proposed survey is low.

7.1.2.4 Cetaceans

The operational area spatially overlaps a BIA for pygmy blue whales and is adjacent to a BIA for southern right whales. The operational area also overlaps habitat for several other cetacean species (see Section **Error! Reference source not found.**). Given this environmental context, a range of mitigation measures in addition to the standard mitigation measures outlined in the EPBC 2.1 Policy have been adopted for the survey to mitigate potential impacts to cetaceans.

Instantaneous physiological damage is only likely to occur to cetaceans if peak sound levels exceed 265–275 dB re 1 µPa, with such levels unlikely to be exceeded beyond approximately 50 m from a typical seismic source (Parvin *et al.*, 2007). Therefore, the primary concern arising from noise generation is the potential non-physiological effects on cetaceans including:

- Increased stress levels
- Disruption to underwater acoustic cues
- Behavioural changes
- Localised avoidance

Toothed whales. Toothed whale species that may traverse the area include the killer whale and dolphin species. The auditory bandwidths and frequency of calls produced by toothed whale species are well above the low frequency range that marine seismic surveys are concentrated in (NOO, 2001). The majority of toothed cetaceans have their highest sensitivity to sound in the ultrasonic range (>20,000 Hz), though most have a moderate sensitivity from 1,000-20,000 Hz (APPEA, 2006). The killer whale and dusky dolphin have hearing in this mid-frequency bandwidth of 150 Hz to 16,000 Hz (Southall *et al.*, 2007), with killer whales producing pulsed sounds typically of 500 Hz to 25 kHz (Richardson *et al.*, 1995). These frequencies are above those generated by seismic sound and, as such, it is considered unlikely that these species will be impacted.

Baleen whales. Baleen whales communicate using low frequency sound and are therefore considered to be the most sensitive marine mammals to the low frequency noise produced by seismic surveys (McCauley, 1994; Richardson *et al.*, 1995). Richardson *et al.* (2005) reported that baleen whales seem

tolerant of low- and moderate-level noise pulses from distant seismic surveys, usually continuing their normal activities when exposed to pulses with received levels as high as 150 dB re 1 µPa, and sometimes even higher (typically 50 dB+ above typical ambient noise levels). SELs greater than 160 dB re 1 µPa are known to cause behavioural responses in baleen whales (as per EPBC Act Policy Statement 2.1). Studies indicate that cetaceans are less responsive when migrating or feeding than when resting, suckling or socialising (SCAR, 2002).

Blue whales produce most of their vocalisations in the frequency range 15 to 20 Hz in the North Atlantic and 10 to 30 Hz off Western Australia (Gill and Morrice, 2003). As this frequency range overlaps with seismic arrays (McCauley, 2004) there is potential for acoustic disturbance of Blue Whales by seismic surveys.

Numerous seismic surveys have occurred along the Bonney coast since the Blue Whale Study was initiated in 1998. The Blue Whale Study uses aerial surveys to assess distribution and migration movements of marine mammals, with particular attention to great whales, in Bass Strait and Otway Basin. Aerial surveys of Blue Whale distributions during seismic activities have observed the following:

- During the 1999-2000 seasons Woodside conducted a 3D seismic survey in VIC/P43 (sound source 2250 cubic inches). During aerial surveys, no Blue Whales were sighted within 90 km of the operating seismic vessel, despite abundant krill surface swarms in the area.
- During November-December 2002 Santos conducted 2D and 3D seismic surveys in VIC/P51 and VIC/P52 (source size 3,150 cubic inches) with no Blue Whale sightings within 60 km of the operating seismic vessel.
- During a seismic survey in VIC/P51 in November 2003, Blue Whales were sighted near krill swarms approximately 18 km from the seismic vessel, and left the area as the vessel approached closer. It is unknown if the approach of the vessel triggered the whales to move from the area.
- In December 2003 Santos carried out a 2D seismic survey (source size 3150 cubic inches) in EPP32 west of Kangaroo Island where Blue Whales were observed. Some of the whales approached as close as 2.4 km from the operating seismic vessel, feeding on dense krill swarms.
- In February 2011, during the Blue Whale peak migration period, Origin conducted aerial surveys and observed only a single Blue Whale within the Astrolabe 3D seismic survey area, and eight Blue Whales in a 10 km buffer area around the survey area. The total number of Blue Whale sightings during the February 2011 surveys was 51, of which 42 were located outside the 10 km buffer around the Astrolabe study area.
- In the February 2011 seismic program Origin noted that Blue Whales continued feeding behaviour at a distance of approximately 30 km from the operational seismic vessel, irrespective of the seismic operations.
- In their report on the EPP32 aerial survey program, Morrice *et al.* (2004) stress that the proximity of whales to seismic vessels must be interpreted in the context of their pressing need to consume tonnes of food per day. Blue Whales may need to feed into their zone of acoustic discomfort if the only krill available is in proximity to a seismic vessel.
- Aspects of the seismic survey that may affect whales (e.g. vessel movements and associated seismic noise) will be transitory at any given location as the vessel traverses the operational area at a rate of approximately 4 knots, and will potentially involve only very temporary and localised exposure. It is considered unlikely that any marine mammals will be exposed to levels likely to cause physiological damage because of their ability to avoid the vessel and seismic source array (McCauley, 1994).
- Blue Whales have also been sighted within approximately 2.4 km of an active seismic source array and cow and calf pairs, which are considered the most sensitive of whale aggregations, were recorded within 7.1 km (Morrice *et al.* 2004).

Given these observations it is recognised that the Crowes Foot seismic survey has the potential to cause behavioural disturbance or avoidance behaviour for blue whales within an area of identified feeding habitat. The primary measure proposed to mitigate impacts of seismic sound on blue whales is to undertake the Crowes Foot survey outside of the period of peak blue whale abundance (Feb/March) identified by Gill *et al.* (2011). As the seasonal distribution and abundance of blue whales can be variable, however, a range of additional mitigation measures have also been developed to mitigate impacts should blue whales be present whilst the survey is being undertaken.

These mitigation measures are designed to increase the likelihood of detecting blue whales in the operational area and avoid or mitigate impacts to any blue whales present through implementation of a conservative shut down radius and adaptive positioning of the seismic vessel, where practicable.

To increase the likelihood of detecting whales, two support vessels, each with an experienced MMO on shift during daylight hours, will be deployed during 1st to 31st October and from 1st to 31st January when presence of southern right whales and blue whales is more likely. A single support vessel with one (1) experienced MMO on duty during daylight hours will operate at all other times. An MMO will also be on duty during daylight hours on-board the seismic vessel.

For the period 1st to 31st January the western section of the operational area will be patrolled by a support vessel to increase the likelihood of detecting any blue whale migrating from the west into the operational area, unless whale sightings mean that there is greater value in the support monitoring elsewhere.

A passive acoustic monitoring (PAM) system will also be used during non-daylight hours when the source is active and during pre-starts, to provide supplementary information regarding whale presence. A qualified operator will be on duty to analyse PAM data, and if PAM is unavailable at any point during the survey (for example, due to equipment malfunction), non-daylight acquisition will not occur if there has been 3 consecutive days of 3 or more whale instigated shut-downs

The acoustic source will be shut down if a southern right whale or blue whale approaches within 3km of the seismic source. Soft start procedures will commence once the whale has been observed to move outside the 3 km zone or has not been observed for 1hr.

A cetacean strategy meeting will be held at the end of each day shift. The meeting will review cetacean observations from the previous 24 hours and discuss implications for the following day's operations, including initial positioning of support vessels and selection of acquisition lines to maximise the distance from the last observed locations of any blue whale or southern right whale, where practicable.

This suite of mitigation measures exceeds the standard requirements defined in EPBC Act Policy Statement 2.1 (Interaction between offshore seismic exploration and whales) (Parts A and B) in recognition of the importance of the area as blue whale feeding habitat. This approach is considered to demonstrate best practice environmental management for seismic surveys in the Otway Basin and with these measures in place impacts to blue whales are not predicted to be significant.

As described previously a southern right whale nursery ground is located at Logan's Beach, approximately 65 km north-west of the nearest point of the acquisition area. It is possible that mothers and calves will be present in this area if the survey commences during October.

Figure 11 and Figure 12 indicate that noise generated from a 3,000-4,000 cui source will reach background levels at 10-40 km from the source. As such it is considered unlikely that noise from operation of the seismic source at the closest point of the acquisition area will detectable above ambient noise at Logan's Beach. In addition, the calling frequencies of the southern right whale are higher than the frequencies shown to be propagated by seismic surveys in western Bass Strait. Clark (1983) found that the frequency range of an upsweeping call used by the southern right whale to maintain long distance contact was 50-200Hz. Other sounds including tones, high frequency sweeps and broadband blows had most energy in the 50-1000Hz range (Clark 1982, 1983). Cummings *et al.* (1972) found the frequency of the most common Southern right whale call ranged from 30-2,200Hz with most energy around 235Hz. McCauley (2013) identified a cetacean call around 25Hz from recordings in western Bass Strait calls and attributed this to southern right whales.

The frequencies of these calls is important because, as noted earlier, Duncan *et al.* (2013) found that no energy above approximately 35 Hz was detectable from a seismic survey in western Bass Strait due to the effect of the calcarenite sea floor geology on sound energy propagation, and that attenuation was rapid except at two frequencies around 5 and 15Hz. Given the close proximity of the acquisition area to the study site of Duncan *et al.* (2013) it is considered likely that similar attenuation effects will occur. As such, in the unlikely event that sound generated by the seismic source is detectable above ambient noise at Logan's Beach, it is unlikely to be in a frequency range that will cause masking of southern right whale communication.

Sound from the Crowes Foot survey also has the potential to impact any southern right whale undertaking near shore coastal migration north of the acquisition area. Hydrodynamic modelling undertaken by Curtin University for the near shore Enterprise seismic survey found that very loud ambient wave noise in the coastal environment comprised of cliffs is significantly greater than the peak acoustic pressure from the largest modelled seismic source of 3,560 in^3. Additionally, passive acoustic monitoring undertaken 5km from the coastline east of Warrnambool identified that ambient underwater noise in near shore areas is generally high, with a mean of 110 dB re 1 µPa, and up to 161 dB re 1 µPa. As such it is considered likely that sound from the Crowes Foot survey in nearshore areas potentially used by southern right whales will be masked by high levels of ambient noise.

Passage of southern right whales through the operational area when migrating from coastal areas to the Southern Ocean is also possible. To mitigate potential impacts to any migrating southern right

whale it is proposed to conduct pre commencement survey of the operational area using a scout vessel with one experienced MMO on duty. Additionally, if the survey is being undertaken during October when there is an increased likelihood of migration through the operational area the northern section of the operational area will also be patrolled by a scout vessel to increase the likelihood of detecting any migration by southern right whales into the operational area.

The southern right whale is a highly mobile migratory species which travels thousands of kilometres between habitats used for essential life functions. For example the direct distance from the operational area to estimated feeding areas in the Southern Ocean around 50ºS is approximately 1,300km. In some summers the species has been recorded at the edge of the Antarctic pack ice, which would require a direct migration in the order of 3,000km if these individuals have travelled from the southern Australian coastline. Any localised avoidance of an active seismic source when leaving the coastline could plausibly add a few tens of kilometres to this migration. Such a marginal increase is not considered likely to significantly affect the metabolic demands of individuals whose migrations occur over such large distances.

Southern right whales have been observed in significant numbers adjacent to the Antarctic sea ice during the Austral summer. Southern right whales observed adjacent to the sea ice during the 1997/98 and 2007/08 seasons are proximal to the West, Shackleton and Totten icefields, which have been estimated by Deerporter *et al.* 2013 to collectively calve more than 100GT of icebergs annually.Tens of thousands of icebergs drift out from Antarctica annually into the open waters of the Southern Ocean, creating a ubiquitous natural source of low frequency sound as they calve, shoal and disintegrate (Matsumoto *et. al*.2014). Observations of southern right whales adjacent to the summer sea ice extent, and in proximity to areas of significant iceberg calving, suggests that this species is likely to be tolerant of low frequency sound in this environment.

All species of large whales, except Bryde's whale, are known to have populations that migrate from winter breeding grounds in the tropics to summer feeding grounds in the Antarctic (Kasamatsu, and Joyce, 1995, Kasamatsu *et al.*, 2000). In common with other large whales which feed within Antarctic waters during the Austral summer, the southern right whale has evolved within, and annually enters, an environment with a ubiquitous natural source of low frequency sound.

Humpback whales are not significantly displaced from their migration by seismic sound, with the most consistent observed response to seismic activity being an alteration of course and swimming speed (McCauley *et al.*, 2000). Cows with young calves may have greater susceptibility to acoustic disturbance (McCauley *et al.*, 2000).

A study carried out by McCauley *et al.* (1998) monitored the effects of seismic survey noise on humpback whales in the Exmouth Gulf region of Western Australia, from which the following conclusions were drawn:

- Only localised avoidance was seen by migrating whales during the seismic operation, indicating a comparatively short period and small range displacement;
- The generalised response of migrating humpback whales to a 3D seismic vessel was avoidance at 4 km from the vessel;
- Humpbacks were seen actively utilising the 'sound shadow' near the surface, suggesting that it is unlikely that animals will be at any physiological risk unless at very short range from a large airgun array, perhaps in the order of a few hundred metres;
- Short and localised displacement suggests a low overall risk for migrating animals; and
- Humpback pods containing resting cows (as opposed to migrating) were more sensitive and showed an avoidance response estimated at 7–12 km from a large seismic source.

Dunlop *et al.* 2013 carried out a behavioural response study of migrating humpback whales off eastern Australia to test the response of groups to one recording of conspecific social sounds and an artificially generated tone stimulus. The artificial tone consisted of a sequence of tones swept in frequency from 2 to 2.1kHz over a period of 1.5s, repeated every 8s for 20min. Source levels varied from 148 to 153dB re. 1µPa at 1m root mean square (r.m.s.) The response to the artificial tone was found to be consistent, in that groups moved offshore and surfaced more often, suggesting an aversion to the stimulus.

As a result of the ability of cetaceans to avoid vessels or the acoustic source and the procedures that will be implemented during the survey (in particular soft start and start-up delay), it is highly unlikely that any cetaceans will be exposed to sound levels that may cause pathological damage. There is no conclusive evidence of a link between sounds of seismic surveys and mortality of marine mammals (Gotz *et al.*, 2009).

7.1.2.5 Pinnipeds

It has been suggested that seals may tolerate seismic pulses of high intensity and may be able to approach operating seismic vessels to a close range, because their hearing is poor in low frequencies (McCauley, 1994). However, McCauley also suggests that seismic activities may affect seals' prey abundance or behaviour, particularly if the seismic survey runs for long periods. Seal breeding success may be affected by long surveys over feeding areas during the breeding season (mating occurs in November to early December and pups are born in late November to early December, which coincides with the Crowes Foot survey period). The seals commonly found in Australian waters belong to family Otariidae, which are less sensitive to low frequency sounds (<1 kHz) than to higher frequencies (>1 kHz). McCauley (1994) suggests that the sound frequency of seismic air gun pulses is below the greatest hearing sensitivity of Otariid pinnipeds, but data are lacking for Australian species. Aerial sounds produced by the Australian fur seal (*Arctocephalus pusillis*) have strong tonal components at frequencies that are less than 1 kHz, although they all range up to 6 kHz with most energy between 2-4 kHz. If the low frequency components of calls are used then seals may also hear at low frequency and may be at some risk from seismic air-gun pulses. However, Shaughnessy (1999) states that seismic activity will only be a threat to pinnipeds if it takes place close to critical habitats.

Gotz et al (2009) reports that controlled exposure experiments with small airguns (215 – 224 dB re 1 µPa) were carried out over 1 hr to individual harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), and in seven out of eight trials with harbour seals, the animals exhibited strong avoidance reactions. Two harbour seals equipped with heart rate tags showed immediate, but short-term, startle responses to the initial airgun pulses. The behaviour of all harbour seals seemed to return to normal soon after the end of each trial, even in areas where disturbance occurred on several consecutive days. Only one harbour seal showed no detectable response to the airguns and approached to within 300 m of them, and seals remaining in the water returned to pre-trial behaviours within two hours of the end of the experiment (Gotz *et al.*, 2009). General avoidance behaviour of other northern hemisphere seal species was exhibited at exposure levels above 170 dB re 1 µPa.

Other than the colonies at Lady Julia Percy Island and Cape Bridgewater, the majority of Australian fur seal and New Zealand fur seal breeding colonies are well east of the operational area, between Wilsons Promontory and Flinders Island. At a population level, fur-seals are therefore unlikely to be impacted by the seismic survey.

7.1.2.6 Avifauna

The operational area contains potential foraging habitat for a diverse array of seabirds and terrestrial birds may potentially fly over the area. In the event that individual birds or flocks are present in the operational area during operations, vessel movement may temporarily deter them from foraging in the immediate vicinity of the vessel. The risk of underwater noise significantly impacting a population of any given species or even individuals is extremely low.

An indirect impact may occur if air gun discharges causes changes to the abundance or behaviour of marine animals predated upon by avifauna. However, the extent to which temporary 'descending' or 'tightening' responses of schooling prey fish such as pilchards (if it occurs) affects availability to avifaunal predators either positively or negatively, is not known.

The survey will be transitory through the area as the vessel makes way along each transect at a speed of 4 – 6 knots before turning to commence the next transect. Following a racetrack pattern the vessel would not pass the same point along the adjacent transect until at least 10 hours later. As a result, fish that had moved away from the source would likely re-enter the area over the time between transect runs. It is therefore considered that any temporary movement of fish as the vessel passes would not result in any significant impacts to predatory avifauna.

Little penguins

Penguins communicate via calls (vocalisations) that allow partners to recognize each other and their chick. There is a lack of information on the auditory systems and communication of penguins however the hearing range of most birds lies between 0.1 - 8 kHz (McCauley, 1994). It is therefore inferred that penguins have relatively poor hearing thresholds in the lower frequencies, where seismic surveys have the most energy (10-250 Hz) (McCauley, 1994). This is supported in part by observations made by dedicated on-board marine mammal observation personnel of little penguins approaching seismic vessels during airgun discharge in eastern Bass Strait during 2001 and 2002 (Doodie, pers. comm., 2003; Pinzone, pers. comm., 2003), while previous seismic surveys conducted by Origin in the Otway region observed a similar situation, suggesting that this species is not disturbed by the seismic sound source. It may be that the penguins are unaffected as they are in the seismic 'shadow' area, predominantly above the downward focus of the pulse.

A literature review on penguin hearing by SCAR Ad-hoc Work Group (2002) found that:

- Penguin hearing capacities can be partially alluded to by consideration of bird behaviour. For example, many penguin displays are based on voice recognition;
- On land it is known that penguins use sounds extensively for intra specific communication including mate and chick recognition; and
- The sound range used for this varies between about 0.3 and 3 kHz and that these contact calls may be heard up to 1 km from the originating bird(s).

McCauley (1994) concluded that:

- Due to lack of threshold data it can only be assumed that in-air hearing for penguins is similar for other birds in air (i.e., 40-80 dB 20µPa (the reference pressure in air)) or between 66-106 dB re 1µPa (the reference pressure used in water).
- The perception for the low frequency of sounds of seismic array 'shots' (10-300 Hz) in water will be high but only at short distances. However, this does not rule out the possibility that seismic pulses could be detected at long ranges, given their high intensities.
- Prey species may have changes in their abundance or behaviour.
- Seismic noise induced changes in prey behaviour for protracted periods and within 15 km of important penguin rookeries during the summer months could have the greatest impact on the penguin's reproductive output.

Passive acoustic monitoring commissioned by Origin from April 2012 to January 2013, 5km offshore from the coastline east of Warrnambool, identified that ambient underwater noise in coastal areas are generally higher than further offshore, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (McCauley & Gavrilov 2013). During Origin's Speculant seismic survey undertaken in 2010 immediately north of the proposed Crowes Foot seismic survey area (using smaller volume source than that for the proposed Crowes Foot survey), the array was drowned out by the noise of the high intensity coastline, resulting is periods where the survey could not be acquired until noisy wave action calmed. It is considered likely that little penguins nesting in the area would be habituated to the ambient wave sound levels and would therefore not be significantly disturbed by the seismic source.

As with other predatory avifauna, penguins may be indirectly affected if air gun discharges changes the abundance or behaviour of prey. The time between survey transects indicates that significant impact to little penguins due to changes in prey abundance are not likely, particularly given this species routinely forages over distances of 15 – 50 km and are highly mobile in the water. The survey will, however, likely be audible to little penguins that are known to forage further offshore during the proposed time of the survey and may be subject to temporary behavioural alteration in the near vicinity of the seismic source.

7.1.2.7 Marine invertebrates

Marine invertebrates are considered to have poorly developed mechano-sensory systems, due in part to the absence of gas-filled organs such as swim bladders and the absence of ears (Parry & Gason, 2006). These species detect sound through other external and internal physiological structures such as hairs, statocysts and muscles.

There is relatively little information on the effect of underwater noise on the behaviour of marine invertebrates. The available literature suggests that because of their physiology, marine invertebrates appear to be resilient to adjacent seismic operations (Keevin & Hempen, 1997; McCauley *et al.*, 2000, Parry & Gason, 2006; Harrington *et al.*, 2010). Some research postulates that shellfish, crustaceans and most other invertebrates only 'hear' seismic sounds at very close range, such as less than 15 m (McCauley, 1994; Parry & Gascon, 2006). Invertebrate larval stages are expected to be more vulnerable than adults, however impacts have only been observed within a few metres of airguns (McCauley, 1994; Parry & Gason, 2004).

However, low frequency noise has reportedly been used to successfully deter barnacle larvae from settling on ship hulls (Branscomb and Rittschof, 1984) and there is anecdotal evidence of squid being attracted to intermittent, low frequency noise. Strandings of giant squid have also been reported in the vicinity of seismic survey activity (Guerra *et al.*, 2004). It has also been shown that at least some species of cephalopods and crustaceans are capable of 'hearing' within the frequency range of seismic survey noise (Hanlon & Budelmann, 1987; Hu *et al.*, 2009; Lovell *et al.*, 2005; Packard *et al.*, 1990).

Marine invertebrates also generally have far lower mobility than pelagic vertebrates and are often localised to particular microhabitats. As such, they have generally have less ability to avoid seismic sound by moving away from an area. The cephalopods have greater mobility and are expected to move away from areas where sound levels might have the capacity to cause physiological damage.

Sound exposure levels directly below the seismic array will be approximately 160dB re 1μPa^2.s in the range of water depths (35m - 90m) present in the operational area. A 35m water depth occurs only in a highly localised area at the summit of the 'Big Reef'. The other basalt rises are outside of the acquisition area and are not likely to be exposed to seismic discharges from directly overhead.

Benthic and site attached invertebrates exposed to an SELs of 160dB re 1μPa^2.s would be expected to demonstrate localised avoidance responses and behavioural reactions, as described in the following sections, when the seismic source is overhead. No mortality would be expected at the the predicted sound exposure levels. Any disturbance to benthic invertebrates immediately below the seismic array will be transitory as only a single 'shot' is fired before the array moves to the next firing location (-25 m further on) as the vessel traverses the operational area at a rate of approximately 4 knots. As such exposure of marine invertebrates directly below the seismic array is temporary and localised.

The available literature indicates that seismic nose can induce behavioural responses in adults of some invertebrate species and physiological and pathological impacts are also possible. There is, however, no evidence of population level impacts on invertebrates from seismic noise. McCauley *et al.* (2000) extensively reviewed seismic surveys and their effects on marine life, reporting that the amount of exposure to air-gun signals for the larvae of a given invertebrate species will depend upon its abundance, spatial distribution, depth distribution, seasonal timing and the persistence of seismic surveys in the region where it occurs. McCauley *et al.* (2000) concluded that a single seismic survey has a negligible impact on larval supply by comparisons with the size of the larval populations involved.

Cephalopods

Fewtrell and McCauley (2012) observed alarm responses and changes in swimming patterns and vertical position in the southern calamari squid (*Sepioteuthis australis*) exposed to air gun noise. This study indicated that noise levels greater than 147 dB re 1 μPa^2.s are required to induce avoidance behaviour in this species. The results also suggest that a ramped (i.e. gradual increase in signal intensity) air gun signal and prior exposure to air gun noise decreases the severity of the alarm responses in this species.

Andre *et al.*, 2011 found that laboratory exposure to continuous low frequency sounds resulted in damage to the sensory epithelium of the organ (the statocyst) thought to be responsible for hearing in cephalopods. Such damage is a possible explanation for the decrease in the severity and number of alarm responses to successive air gun signals observed by Fewtrell and McCauley (2012). If this was the case, however, it appears that any alteration in hearing ability resulting from the noise exposure is not permanent, as the same squid were used in later trials with similar number of alarm responses observed in both trials.

Crustaceans

Specific studies examining the effect of seismic survey signals on crustaceans, including larval stages, are relatively rare. There is sufficient evidence to indicate that sound plays an important role in the general behaviour of both larval and adult crustaceans (Stanley *et al.*, 2011; Stocker, 2001; Moriyasu *et al.*, 2004; Lovell *et al.*, 2005) including rock lobster species (Buscaino *et al.*, 2011). Adult crustaceans detect sound though the statocyst organ which is located below the eyestalk on the peduncle of the bilateral antennules (Lovell *et al.*, 2005).

One of the few reported field studies on crustacean larvae, conducted by Pearson *et al.* (1994), exposed Stage II larvae of the Dungeness crab (*Cancer magister*) to 10 single discharges from a seven-airgun array and compared their mortality and development rates with those of unexposed larvae. No statistically significant differences were found in immediate survival, long term survival, or time to moult between the exposed and unexposed larvae, even those exposed within 1 m of the seismic source.

Studies on the effect of seismic surveys on adult crustaceans generally show no lethal effects of intense low frequency acoustic signals (Christian *et al.*, 2003; DFO, 2004; Payne *et al.*, 2007). In several of these studies, however, sub-lethal effects have been demonstrated including increased serum protein concentration (DFO, 2004) as well as changes to food consumption and a decrease in serum enzymes (Payne *et al.*, 2007). Wale *et al.* (2013) undertook controlled tank-based experiments and showed that noise from lower level sources such as ships altered behaviour in the shallow water European Shore Crab (*Cancer maenus*) by disrupting feeding, slowing reaction time to threats, and hastening turn-over times for crabs placed on their backs.

The FRDC research into rock lobster concluded results that may be applicable to other crustaceans species. At this stage due to the lack of published scientific information that directly to associate is difficult to determine such impacts to other crustaceans but it would be conservative to apply findings other crustaceans. Further information on the FRDC research is outlined below.

7.1.2.8 Summary of FRDC Research on Individual Lobsters

On 21 October 2016, the Fisheries Research and Development Corporation (FRDC) published a report following a 4 year study into the potential impact of seismic surveys on economically important fishery species, including the southern rock lobster *Jasus edwardsii*.

The FRDC research program involved exposure of cohorts of southern rock lobster to multiple seismic airgun pulses at two sites (sandy substrate and limestone rock platform), both in 10-12 m water depths off the coast of Tasmania. The exposed lobsters and control lobsters (no exposure) were also examined during subsequent analyses undertaken at 0, 14, and 120 days post-exposure. Exposure experiments were undertaken in July 2013 (45 cui airgun, 2,000 psi), July 2014 (150 cui airgun, low pressure 1,300 psi and standard pressure 2,000 psi) and February 2015 (150 cui airgun, 2,000 psi).

The airgun was towed at approximately 5 m depth from a distance of 1 km away and circled in close proximity to the lobster pots at a speed of approximately 3-4 nm per hour (approximately 5.5-7.4 km/hr) and with a shot interval of 11.6 seconds. Source levels for the different airgun configurations were predicted to be 223 to 227 dB re 1 µPa $_{peak\text{-}peak}$ SPL and 200 to 205 dB re 1 µPa^2.s SEL. Received levels depended on the airgun configuration and proximity of the lobster pots, but the maximum measured exposures were 209 to 212 dB re 1 µPa $_{peak\text{-}peak}$ SPL, and 186 to 190 dB re 1µPa^2.s SEL. The maximum cumulative SEL received from multiple shots was between 192 and 199 dB re 1 µPa^2.s.

As described in the accepted Crowes Foot EP single shot SELs levels directly below the array at depths of 35m and 60m are calculated to be approximately 208 dB re 1 µPa2·s and 204 dB re 1 µPa2·s respectively. As such single shot SELs directly below the array are calculated to be significantly higher than those generated during the FRDC research. The uncertainty that this introduces into an assessment of impacts is acknowledged.

A summary of the findings is as follows:

- Exposure to seismic sound did not result in any mortalities of adult lobsters, even at close proximity.
- The time taken for exposed lobsters to right themselves, a complex reflex, was several seconds longer in exposed lobsters compared to controls over long term (120 days post-exposure) in three of the four experiments. As this effect persisted past moulting it is likely to be permanent for the lifespan of the southern rock lobster.
- Mean righting times for control lobsters in the July 2013 and July 2014 (low pressure) experiments varied from 1.4 to 3.4 seconds, with exposed lobsters requiring 4.2 to 5.5 seconds. Mean righting times for control lobsters in the February 2015 experiment varied from approximately 3 to 6 seconds with exposed lobsters requiring approximately 7 to 11 seconds.
- Mean righting times in the July 2014 (standard pressure) experiment showed no significant difference between treatments. One cohort of control lobsters (males measured at day 0) demonstrated the longest mean righting time of any experiment at approximately 30 seconds.
- This righting response was linked to damage to a proportion (9-11%) of sensory hairs of the statocyst, the primary mechano-sensory and balance organ in lobsters. A significant positive correlation between lobster size and righting time (larger lobsters took longer to right themselves) was also found.
- The 63 control lobsters used for the July 2014 standard pressure experiment, which were collected from the Crayfish Point Scientific Reserve (CPSR) in the Derwent Estuary near Taroona, were found to have a high level of pre-existing impairment to statocysts similar to that induced by the airgun experiments. The exposed lobsters in this experiment did not exhibit a significant increase in statocyst damage compared to the controls, and the degree of damage was 25-35% less than that of exposed lobsters from the other experiments. This may indicate that lobsters are able to adapt to statocyst damage, as these lobsters did not display impaired righting reflexes relative to exposed lobsters.
- Tail extension, a simple behavioural reflex response, showed a slight (approximately 3.5% of body length) but statistically significant reduction in exposed lobsters in one (February 2015) of the four experiments. It is unclear how significant this finding is, as the warm summer water conditions during this particular experiment may be a contributing factor. The relative tail gape of exposed lobsters during this experiment was also within the range observed for control animals in the July 2013 and July 2014 (low pressure) experiments.
- Haemolymph (blood) biochemistry showed no effect to pH or 23 electrolyte or mineral ions, organic molecules or enzymes, which suggests that the haematological homeostasis of *J. edwardsii* is reasonably resilient to seismic acoustic signals.

- The refractive index of haemolymph (a measure of nutritional condition, indicating how well lobsters are able to consume, digest and assimilate food) showed a response in the winter 2014 low pressure experiment, with exposed lobsters showing significantly reduced levels at 120 and 365 days post exposure. However, this result was not found in any of the other three experiments and no other condition indicators suggested the exposed lobsters were negatively affected.
- Haemocyte count (indicative of immune response function) in exposed lobsters showed a long term decline of up to 60% at 120 days post-exposure. Haemocyte counts subsequently recovered in one cohort of exposed lobsters to double the number of haemocytes observed in control lobsters at 365 days post-exposure, which may indicate a possible immune response to pathogens, although further investigation is necessary to evaluate this hypothesis.

Day et al. (2016b) note that there was no effect from seismic exposure on lobster survival and the nutritional condition of control and exposed lobsters improved considerably during the prolonged (120-365 days) post exposure period. They conclude that impacts to statocyst morphology, behavioural reflexes and immune response functions in adult lobsters with seismic exposure was relatively minor, but consequences may be greater for animal fitness in more difficult wild conditions.

The FRDC report found that exposure to seismic sound did not result in any mortalities of adult lobsters, even at close proximity. The report concluded that seismic surveys appear to be unlikely to result in immediate large scale mortality in the southern rock lobster fishery, and did not (on their own) appear to result in any degree of mortality. It is noted that the affected area takes in less than half a percent of the entire Australian southern rock lobster population area (spatially).

In a worse case scenario which assume total mortality in affected area, extrapolated from fisheries data the exploitated available biomass isapproximately 5% of the 650 t available biomass of the Western Zone (refer Section 7.7.3). In a state and national context this is proporation is less and consider to be minimal compared to current exploitation rate defined by Fisheries Victoria.

Given the knowledge of rock lobster populations and life cycles outlines above, the further impact assessment will be focussed on the affected area and the Western Zone.

Potential Consequences of the Sub-Lethal Effects in the Western Zone (abundance and recruitment)

The two features that are of most importance to determining impacts in the Western Zone and the affected area are abundance and recruitment. Fishers are additionally concerned with catchability, which is discussed in section 7.6

Whilst not fully explored in the FRDC study, reduced mobility and immunity could impact survival of affected lobsters in the wild (and therefore abundance). For example, the study did not conclude whether the sub-lethal effects observed would reduce an affected lobster's ability to compete for food or avoid predators. The FRDC report did conclude that early stage embryos showed no effect (and were resilient to exposure and that subsequent recruitment should be unaffected). However, it did not assess the effect of seismic exposure on hatched larvae in the water column. Section 7.1.2.8 contains a description of the existing science and how it may relate to assessing impacts to southern rock lobster populations and individuals present in the affected area.

The potential impact on larval success is unclear. Factors that mitigate against a material impact on larvae (and therefore recruitment) include:

- the short duration of the survey relative to the breeding cycle
- the avoidance of peak larval hatching season
- the distance from key larval production areas (for example, 200 kilometres from a key production area in South Australia)
- significant dispersion of larvae by currents and winds prior to the puerulus settling inshore

Assessment of Correlation between Seismic Surveys and Catch

In the absence of peer-reviewed research specifically correlating seismic acquisition to lobster population effects, Origin has consulted empirical data for the region. One way to test whether there are population impacts on lobsters is to consult the documented history of annual lobster catches in the region, where seismic surveys have been conducted regularly over the past 55 years.

Parry and Gason (2006) undertook a statistical analysis of catch-per-unit-effort (CPUE) data collected over nearly 30 years in the Victorian southern rock lobster fishery which showed no influence of historical 2D and 3D seismic survey activity. Analyses looked at short-term (weekly) and long term variations (up to 7 years) in catch per unit effort to determine whether changes were correlated with the seismic surveys. The surveys occurred in water depths ranging from 10 m to 150 m; therefore, the study is representative of the water depths planned for the Crowes Foot survey. The study included surveys occurring during the rock lobster spawning period as well as during the rock lobster fishing season and so would have interacted with adult lobsters and larvae in the same way that the Crowes Foot survey may.

Parry and Gason (2006) found no evidence that catch rates were affected in the weeks or years following the surveys; however, Day et al. (2016b) suggest that catch rates would have had to decrease by around 50% for this study to detect a result. In addition, it is acknowledged that the authors caution that most of seismic surveys occurred in 'deep water' and therefore the statistical power of the analyses of short term (weekly) effects on catch rates from surveys in shallow water depths may provide less statistical certainty than the long term analyses (the shallower surveys were represented by lower levels of survey effort, lower rock lobster abundance and lower levels of fishing effort). The distinction made by Parry and Gason (2006) between 'deep' and 'shallow' water surveys corresponds with water depths greater than or less than 50 m so the results are still applicable to the Crowes Foot survey. The long term analyses were less sensitive and so the statistical power of these results was not affected.

However, this analysis and findings of Parry and Gason (2006) is relevant to the Crowes Foot survey location, timing and water depths.

In the absence of material that enables a conclusion to be drawn regarding any impact of seismic surveys on abundance and recruitment (arising out of the sub-lethal effects found in the FRDC study), Origin has assessed a hypothetical scenario (including on catchability) in section 7.7.3. That scenario assumes a defined significant impact within the affected area.

Cumulative effects

Refer Section 7.7.3

Molluscs

Recent research on the impact of seismic activities on scallops did not find any statistically significant short-term impacts to adult scallops before or after seismic surveying within the Bass Strait Central Zone Scallop Fishery (BSCZSF) (Parry *et al.*, 2002; Harrington *et al.*, 2010). In the same study, no sub-lethal effects were noted in scallop gonad and meat tissue two months after exposure to seismic noise, (Harrington *et al.*, 2010) nor was there any evidence of loss of adductor muscle strength (Parry *et al.*, 2002).

Conversely, Matishov (1992, in Parry and Gason, 2006) reported shell splitting in scallops located two metres from an air gun source. This, however, was based on one split scallop from a total sample size of three. Furthermore, the close proximity of the scallop to the airgun source is not representative of the situation in Bass Strait, as scallop beds in Bass Strait are generally found in water depths greater than 20 meters.

Aguilar de Soto *et al.* (2013) found scallop larvae exposed to playbacks of seismic pulses showed significant developmental delays and 46% developed body abnormalities. However, significant design issues with this study mean that these results cannot be interpreted as representative of sound exposure from a seismic survey. Notably pulse rate (1.5 seconds) and pulse duration (3 seconds) were significantly more frequent and longer than is typically used during seismic surveys, exposure was in a small tank (2 m diameter by 1.3 m deep) causing very strong particle motion and the minimum exposure period was 24 hours of effectively continuous exposure. This noise regime is not representative of the open ocean or a seismic survey.

On 21 October 2016, the Fisheries Research and Development Corporation (FRDC) published a report following a 4 year study into the potential impact of seismic surveys on economically important fishery species, including the Commercial Scallop *Pecten Fumatus*.

Seismic exposure did not cause immediate mass mortality; however, there was a trend between exposure level and mortality and scallop showing severely compromised physiology over a chronic time frame (4 months), from which there were no signs of recovery. There were also significant changes in behaviour and reflexes following seismic exposure. Given the compromised physiological condition of the exposed scallop in the study, it is likely that they would have reduced tolerance to

subsequent stressors, including environmental, nutritional and pathological stressors. Furthermore, it is presently unclear whether the observed physiological impairment would result in heightened chronic mortality in timeframes beyond those in the current study (Day *et al*, 2016)

Description of the existing science assessing impacts to southern rock lobster

Specific studies examining the effect of seismic survey signals on crustaceans, including larval stages, are relatively rare. The following studies are considered relevant when using the findings of Day et al (2016) to assess impacts to southern rock lobster populations and individuals present in the affected area. While individual studies point to some physiological and behavioural impacts of seismic on lobsters and related groups, none of the studies point to population-wide impacts, either immediate or chronic.

- *Link between statocysts and mobility*. An investigation of the statocyst of the American lobster *Homarus americanus* by Patton & Grove (1992) demonstrated how the signals from statocyst hair cells are interpreted to coordinate the muscular reaction to changes in body position, such as pitch or roll, and provides insight into the relationship between the hair cell damage and righting results. Their work showed that the irregular shape of the statocyst resulted in variability in the number and distribution of hair cells touching the statolith as the lobster changed its body orientation. Their finding indicates that lobsters compensate for this by summing the inputs from many hairs to formulate a determination of body position, with hair cells demonstrating the capacity for an adaptive response to sensory input as the irregularity in the shape of the statolith results in a haphazard variation in hair angle, forcing the lobster to "learn" to interpret the signal from the hair as the statocyst changes position following violent movements like the tail flip escape response or after the statolith is replaced following moulting. While Patton and Grove (1992) described the evolution of this system as "clumsy and metabolically expensive," this adaptation to irregularities in the statolith may provide lobsters with a degree of resilience to the loss of hair cells, with the summative nature of the sensory response providing a redundancy mechanism, allowing the lobsters to adapt to the loss of hair cells through the recruitment of other nearby hairs as they do when the statolith is reoriented or replaced.
- *Impact of seismic on early development of crabs*. A pilot study on snow crabs (Christian et al., 2003; 2004) exposed captive adult male snow crabs, egg-carrying female snow crabs, and fertilized snow crab eggs to variable SPLs (191–221 dB re 1 µPa0-p) and SELs (<130–187 dB re 1 µPa2·s) under controlled field experimental conditions. The crabs were exposed to 200 discharges over a 33 minute period. Neither acute nor chronic (12 weeks post-exposure) mortality was observed for the adult crabs. There was a significant difference in development rate noted between the exposed and unexposed fertilized eggs/embryos in this study with the egg mass exposed to seismic energy demonstrating a higher proportion of less-developed eggs than the unexposed mass. However, this experiment was performed on eggs stripped from a single berried female and cultured in a laboratory for six weeks prior to exposure and eighteen weeks following exposure. Subsequent work on larvae that had been exposed to seismic array signals as embryos but were allowed to hatch normally without being stripped from berried females did not suffer any negative effects (Payne et al., 2008).
- *Impact of seismic on behaviour of crabs*. Christian et al. (2003) also investigated the behavioural effects of exposure to seismic survey sound on snow crabs. Caged animals on the ocean bottom at a depth of 50 m were monitored with a remote video camera during exposure to seismic sound and did not exhibit any overt startle response during the exposure period. Eight animals were equipped with ultrasonic tags, released, and monitored for several days prior to exposure and after exposure. None of the tagged animals left the immediate area after exposure to the seismic survey sound. Five animals were captured in the snow crab commercial fishery the following year, one at the release location, one 35 km from the release location, and three at intermediate distances from the release location.
- *Impact of seismic on crab health*. In 2003, a collaborative study was conducted in the southern Gulf of St. Lawrence, Canada, to investigate the effects of exposure to sound from a commercial seismic survey on egg-bearing female snow crabs (DFO, 2004). Caged animals were placed on the ocean bottom at a location within the survey area and at a location outside of the survey area. The maximum received SPL was ~195 dB re 1 µPa0-p. The crabs were exposed for 132 hours of the survey, equivalent to thousands of

seismic shots of varying received and cumulative SPLs. The animals were retrieved and transferred to laboratories for analyses. Neither acute nor chronic lethal or sub-lethal injury to the female crabs or crab embryos was indicated. DFO (2004) reported that some exposed individuals had short-term soiling of gills, antennules and statocysts, bruising of the hepatopancreas and ovary, and detached outer membranes of oocytes. However, they were found to be clean of sediment when sampled five months later.

- *Impact of seismic on lobster health*. Payne et al. (2007) conducted a pilot study of the effects of exposure to seismic sound on various health endpoints of the American lobster (*Homarus americanus*). Adult lobsters were exposed either 20 to 200 times to 202 dB re 1µPa p-p or 50 times to 227 dB re 1µPa p-p, and then monitored for changes to survival, food consumption, turnover rate, serum protein level, serum enzyme levels, and serum calcium level. Lobsters exposed to seismic pulses were located at very close range to the source (~2 m). The SEL that the lobsters were exposed to was not described in the report but can be estimated to be up to 207 dB re 1 µPa2·s. Observations were made over a period of a few days to several months. Results indicated no effects on delayed mortality or damage to the mechanosensory systems associated with animal equilibrium and posture (as assessed by turnover rate).
- *Underwater noise and crab behaviours*. Wale et al. (2013) undertook controlled tank-based experiments and showed that noise from lower level sources including ships altered behaviour in the shallow water European shore crab (*Cancer maenus*) by disrupting feeding, slowing reaction time to threats, and hastening turn-over times for crabs placed on their backs.
- *Shipping noise and invertebrate behaviours*. Exposure to shipping noise has also been shown to reduce common social interactions, aggressive behaviours and tail flips in the crayfish *Procambarus clarkia* (Celi et al. 2013) as well as and disrupting communal structure and locomotory patterns, through increases in the frequency, distance and velocity in movements of the lobster *Panulirus elephas* (Filiciotto et al. 2014).
- *Impact of seismic on lobster eggs and larval development*. Day et al. (2016a) describes findings related to seismic exposure of egg-bearing female spiny lobsters and subsequent larval development. This study concluded that there was no difference in fecundity between control and exposed lobsters. A small (~1.5%) but statistically significant difference in the length of the larvae was observed in the exposed lobsters compared with control lobsters. This difference is well within the range of natural variation in larval length. No difference was found in width or dry mass of the larvae and hatches were not found to suffer from high mortality rates or deformities. No energy difference was identified between larvae from control and exposed lobsters. Larval activity and survival between control and exposed lobster groups was not significantly different. Overall there were no differences in the quantity or quality of hatched larvae, indicating that the condition and development of spiny lobster embryos were not adversely affected by air gun exposure (Day et al., 2016a).
- *Causes of haemocyte count variations*. Studies into immune function in different crustacean species have been undertaken and have observed reduced haemocyte counts as a result of changes in environmental parameters such as salinity, temperature, dissolved oxygen, water quality and bacteria (Verghese et al., 2007; Phillips, 2008; Leema et al., 2010), and seasonal trends in haemocyte counts associated with lobster lifecycle (moult) stages (Chandpavan et al. 2011). Chandpavan et al. (2011) monitored the total haemocyte count (THC) of southern rock lobsters taken from a deep water site off southern Tasmania prior to translocation to a shallow water site (the CPSR) and for a period of 14 months following translocation. The THC of the resident southern rock lobster population at the CPSR was also monitored. The THC of the deep water population was found to be significantly lower than the shallow water population prior to translocation but no significant differences were evident 12 months after translocation. Clear temporal trends in THC (and other indicators of physiological condition) were identified, largely influenced by the natural annual moult cycle. Mean THC was between approximately 57 and 72% less during the moult and post-moult phases than THC following recovery. As such the THC of the southern rock lobster can fluctuate significantly (maximums around two to four times higher than minimums) during its annual lifecycle (comparable or higher than to the 23% to 60% decreases in THC recorded by Day et al. (2016b) at 120 days post-exposure to the seismic exposure experiments).
- *Haemocyte counts and nutritional status*. Pascuel et al. (2006) reported reduced haemocyte counts linked to nutritional status. Celi et al. (2014) and Filiciotto et al. (2014)

observed reduced haemocyte counts in the European spiny lobster (*Palinurus elephas*) in response to acoustic stress where short-term reductions in haemocyte counts of approximately 58% were detected from playback of recorded shipping noise, including fishing vessels. Jussila et al. (1997) found that the stress of handling and transporting live lobsters after capture increased haemocyte counts by 200% in the short term and then led to a decline of up to 55%. Fotedar and Evans (2011) found that sickness in lobsters could also decrease haemocyte counts, although conversely, Sequeira et al. (1996) reported dramatic haemocyte increases in response to bacterial infections in shrimp, and Day et al. (2016b) postulate that the large increase and recovery in haemocyte counts observed in one cohort 365 days post-exposure may have been the result of an immune response to pathogens, although there were no visible signs of infection and no mortality was observed.

The implications of statocyst damage, THC reduction and tail response reduction for southern rock lobster individuals and populations in the affected area are discussed below.

Statocyst damage

The FRDC study identified that exposure to airgun sound resulted in damage to the hairs within the statocysts, which was identified as the cause of increased righting time by several seconds for exposed lobsters in three of the four experiments. The July 2014 (standard pressure experiment) control lobsters from the population at CPSR was found to have pre-existing statocyst damage, as well as the longest righting times compared to any of the seismic exposure experiments. Day et al (2016b) suggest that statocyst impairment may reduce ability to avoid predators or compete with other lobsters for food or reproduction.

The southern rock lobster population within the CPSR provides the best available surrogate to assess the impacts of damaged statocysts and increased righting times on individual and population effects such as predator avoidance and intra-specific competition for food and/or reproduction. The CPSR population has been subject to intensive long term monitoring which indicates that population density within the CPSR is high (~13,000 individuals - Green and Gardner, 2009) and thought to be at carrying capacity (Kordjazi et al., 2015). Survival rates of individual southern rock lobsters within this reserve have been estimated through capture and release studies at around 97% over monthly timescales (Green and Gardner, 2009), and between 60% and 78% over annual timescales (Kordjazi et al., 2015). This population is described in the FRDC report as 'thriving'.

Ling et al. (2009) compared the size distribution and relative abundance of the southern rock lobster populations at CPSR and Maria Island Marine Reserve (MIMR) with nearby reefs subject to fishing pressure. At each observational site, the size and abundance of southern rock lobster populations was assessed within six belt transects (50 × 4 m). Results revealed highly significant marine protected area effects ($P < 0.01$ for both reserves) with significantly larger size classes and greater abundance of southern rock lobster within reserves, and CPSR in particular (note the different y axis scale for CPSR), relative to nearby fished areas. Results are displayed in Figure 16 with data for MIMR and nearby fished area in the top row and CPSR and nearby fished area in the bottom row.

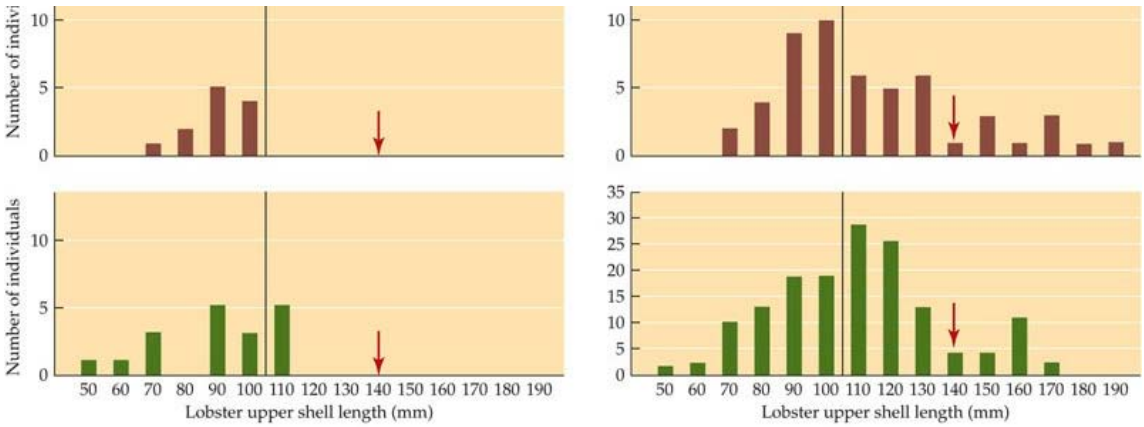


Figure 16: Size and relative abundance of the southern rock lobster at sites inside and outside of the Crayfish Point Scientific Reserve and Maria Island Marine Reserve. Vertical line represents legal minimum size limit for J. edwardsii in Tasmania. Data from Ling et al. (2009).

Whilst these studies of the southern rock lobster population within the CPSR are not designed to detect any effects of statocyst damage to individuals or the population, they do provide important contextual findings. The high population density at or approaching carrying capacity within the CPSR indicates that increased righting time, or other consequences of statocyst damage, cannot be a critical factor in the ability to compete for food. If it were, the population could not be at, or approaching, carrying capacity. The substantially longer righting times (meaning those righting times up to 30 seconds) demonstrated by the CPSR population compared to exposed lobsters in the other experiments (July 2013, July 2014 low pressure, and February 2015) indicate that the effects of increased righting time within the affected area on the ability of southern rock lobsters to compete for food and mates are not likely to be greater than the effects occurring within the CPSR, which are apparently minor.

The effect of damaged statocysts on the ability of southern rock lobsters to find mates and reproduce can be informed through review of the experiment assessing air gun exposure during early-stage embryonic development (Day et al 2016b).

The July 2014 (standard pressure) component of this experiment was performed on 16 berried (egg carrying) female lobsters taken from the Crayfish Point Scientific reserve (CPSR). Lobsters from this site were subsequently found to have pre-existing statocyst damage. Berried females were also collected from another site (Shoemaker Point, Tasmania) and assessed in the same manner for the July 2013 and July 2014 (low pressure) experiments.

Lobsters for each experiment were randomly allocated into control and exposed treatments. Larvae from each experiment were then assessed for a range of morphological and functional parameters as described in Day et al (2016b).

Findings where that:

- Larval morphology revealed no abnormalities in any of the hatches
- No significant differences were found within or between hatches for dry mass or larval energy content
- No significant difference was found for larval competency
- Fecundity (as indicated by counts of hatched larvae) of the female lobsters from the CPSR was significantly higher than lobsters from Shoemaker Point

These findings demonstrate that lobsters with damaged statocysts within the CPSR are capable of producing eggs, finding mates to successfully fertilise eggs and producing normal larvae from fertilised eggs. Exposed lobsters from the CPSR exhibited higher fecundity than control lobsters from the same site, though this was not statistically significant. Interestingly, the CPSR lobster population has significantly higher larvae production than the Shoemaker Point lobsters. This effect was found to be significantly correlated to lobster size, and therefore likely caused by the higher abundance of larger lobsters in the CPSR compared to Shoemaker Point given the long term absence of fishing within the CPSR. The comparison

of fecundity between female lobsters from the CPSR and Shoemaker Point is shown in Figure 17 below.

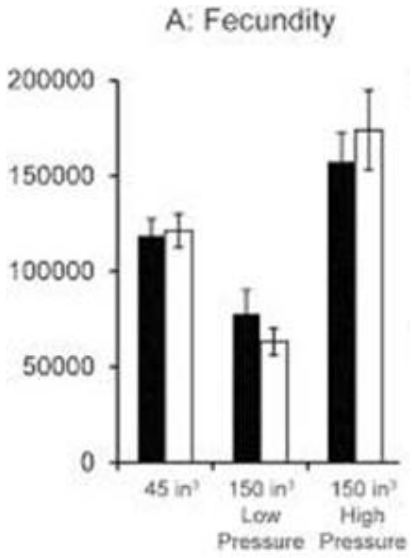


Figure 17: Comparisons of fecundity for lobsters in the 45 in^3 and 150 in^3 low pressure experiments (lobsters from Shoemaker Point) and 150 in^3 standard pressure air gun exposure experiment (lobsters from the CPSR). Control animals are black bars, exposed animals white bars.

In addition, the CPSR southern rock lobster population is likely to be permanently affected by statocyst damage given its location adjacent to a major shipping lane causing ongoing exposure to lobsters as they are recruited into the population. The Crowes Foot survey area is also located in an area of dense shipping and therefore, some pre-existing statocyst impairment may exist in lobsters within the survey area. In contrast, however, the affected area will not be subject to ongoing or frequent 3D seismic exposures, and the statocysts of any lobsters subsequently recruited into the adult population in this area following the seismic survey will not be affected by the survey. Adult lobsters affected during the survey may be affected long term, but the ecological implications of this over and above the potential statocyst impairment in lobsters exposed to other natural and anthropogenic noise sources in the region is difficult to predict. As time passes the proportion of lobsters in the affected area that experience any additional statocyst impairment as a result of seismic exposure is expected to become negligible as natural recruitment and mortality occurs. Lobsters in proximity to the major shipping lanes in the affected area, such as occurs near the Big Reef, may continue to experience some ongoing statocyst damage, including those recruited into the population.

The effect of predation avoidance is more difficult to assess as there are no data to compare predation pressure within the CPSR relative to the affected area, or empirical studies specifically comparing predation rates on lobsters exposed to seismic sound. Harrington et al (2005) assessed long term data sets to determine differences in the catch rates of the Maori octopus *Pinnoctopus cordiformis* (a key predator of the southern rock lobster), and octopus- induced mortalities of southern rock lobsters in lobster traps over at a range of sites around Tasmania, including the CPSR. Results indicated spatial variation in octopus catch rates, with significantly higher catch rates in the CPSR relative to some other sites, but no spatial variation in lobster mortality rates within pots. This study indicates a relatively high density of one key predator (Maori octopus) in proximity to the CPSR; however, the abundance of the southern rock lobster population with damaged statocysts and very long righting times within the CPSR remains at or close to carrying capacity (Kordjazi et al., 2015). Effects for other key predators are not known, but if they are similar to the Maori octopus, then the slightly longer righting time observed in exposed lobsters does not appear to cause increases in predation rates that are sufficient to induce changes to population structure.

Given these factors, it is concluded that statocyst damage predicted to occur in the affected area will persist over medium time scales but will not be permanent. Such damage is not predicted to significantly affect the ability of southern rock lobsters to compete for food and mates, and seems unlikely to cause a significant increase in predation rates.

Total Haemocyte Count

A reduction in the number of haemocytes was also observed in the FRDC study, which may correlate with compromised immunity of lobsters in the wild. Although these physiological changes were non-lethal in the FRDC study, it is reasonable to assume that they may affect individual lobster health and behaviour.

The potential biological or ecological significance of the reduced haemocyte counts as an indicator for immune function described in the FRDC report (Day et al. 2016b) is difficult to assess. It is possible that a reduced immune function may cause affected lobsters to be more susceptible to pathogens. Other studies into immune function in different crustacean species have been undertaken and have observed reduced haemocyte counts as a result of changes in environmental parameters such as salinity, temperature, dissolved oxygen, water quality and bacteria (Verghese et al., 2007; Phillips, 2008; Leema et al., 2010), and seasonal trends in haemocyte counts associated with lobster lifecycle (moult) stages Chandpavan et al. (2011).

Chandpavan et al. (2011) monitored the total haemocyte count (THC) of southern rock lobsters taken from a deep water site off southern Tasmania prior to translocation to a shallow water site (the CPSR) and for a period of 14 months following translocation. The THC of the resident southern rock lobster population at the CPSR was also monitored. The THC of the deep water population was found to be significantly lower than the shallow water population prior to translocation but no significant differences were evident 12 months after translocation. Clear temporal trends in THC (and other indicators of physiological condition) were identified, largely influenced by the natural annual moult cycle. Mean THC was between approximately 57 and 72% less during the moult and post-moult phases than THC following recovery. As such the THC of the southern rock lobster can fluctuate significantly (maximums around two to four times higher than minimums) during its annual lifecycle.

By comparison, the natural fluctuations of approximately 57% to 72% in mean THC recorded by Chandpavan et al (2011) during the moult cycle are proportionally comparable or higher than to the 23% to 60% decreases in THC recorded by Day et al. (2016b) at 120 days post-exposure to the seismic exposure experiments.

Pascuel et al. (2006) reported reduced haemocyte counts linked to nutritional status. Celi et al. (2014) and Filiciotto et al. (2014) observed reduced haemocyte counts in the European spiny lobster (*Palinurus elephas*) in response to acoustic stress where short-term reductions in haemocyte counts of approximately 58% were detected from playback of recorded shipping noise, including fishing vessels. Jussila et al. (1997) found that the stress of handling and transporting live lobsters after capture increased haemocyte counts by 200% in the short term and then led to a decline of up to 55%. Fotedar and Evans (2011) found that sickness in lobsters could also decrease haemocyte counts, although conversely, Sequeira et al. (1996) reported dramatic haemocyte increases in response to bacterial infections in shrimp, and Day et al. (2016b) postulate that the large increase and recovery in haemocyte counts observed in one cohort 365 days post-exposure may have been the result of an immune response to pathogens, although there were no visible signs of infection and no mortality was observed.

The lobster population in the affected area is expected to experience short term (< 1 year) reductions in THC as a consequence of the seismic survey. While it is difficult to predict whether such lobsters may be impacted by pathogens and disease, available research indicates that numerous other factors and stressors, including environmental factors, lifecycle, shipping noise, translocation, capture and handling during fishing, can also result in significant changes in haemocytes. Unlike regional changes in environmental conditions which can affect large lobster populations, lobsters exposed within the affected area are limited to a relatively small area. As such any effects would plausibly be limited to the affected area and significant population impacts are not expected. In addition, there has been no reported southern rock lobster pathogen outbreak in the offshore Otway Basin in 55 years of shared access between seismic surveys and the fishery.

Tail extension reduction

A slight (ca. 3.5% of body length), but statistically significant, reduction in tail extension was found to persist for at least 14 days following seismic exposure during summer conditions. The FRDC report did not investigate the ecological effects of this but noted that disruption of a simple reflex may underlie the disruption of more complex behaviours, including feeding, predator avoidance, locomotion and social behaviours.

Effects of a slight reduction in tail extension for predator avoidance, locomotion and social behaviours are not known. It is noted that the relative tail gape of exposed lobsters during this experiment was within the range observed for control animals in the July 2013 and July 2014 (low pressure) experiments which may indicate that significant effects to predator avoidance, locomotion and social behaviours are unlikely.

There was no significant difference in Brix index (considered a reliable indicator of nutritional condition of lobsters with a reduced Brix representing poorer nutritional condition) between exposed and control lobsters for the summer 2015 experiment and nutritional condition of all lobsters improved considerably during the prolonged period post-exposure period (120-365 days). These results suggest small reductions in tail extension are not likely to cause impairment of feeding.

Impacts to larvae

Day et al. (2016a) investigated impacts of seismic exposure on embryo development, but the exposure of larval stages was not included in the experiments. After rock lobster eggs hatch, the planktonic larvae are dispersed offshore and over very large distances for many months before developing into post-larval puerulus and returning inshore to settle on shallow coastal reefs. Currents and winds play a key role in larval dispersal, and survival and can result in significant natural spatial and temporal variability in puerulus settling and stock recruitment from across the wider region (Gardener et al. 2001; Hobday and Flint 2000; Linnane et al. 2010; 2011; Chiswell and Booth 2008; Phillips and McWilliam 2009; DoF 2011). Only a very small number of the millions of larvae that initially hatch survive to reach the puerulus stage and return to the coast (DoF 2011; Mills et al., 2006; Southern Rocklobster Limited n.d. a, b).

While it is likely that the seismic survey will interact with larvae dispersing in waters of the acquisition area, seismic impacts to plankton and larvae are typically understood to occur in close proximity to the seismic source. For example, the impact threshold criteria proposed by Popper et al. (2014) for mortality of eggs and larvae exposed to seismic airguns is >207 dB re 1 µPa peak SPL or >210 dB re 1 $\mu Pa^2 \cdot s$ cumulative SEL, which is typically limited to tens of metres from the seismic source. The threshold criteria were derived from a study by Bolle et al. (2012) that indicated no damage was caused to fish larvae by simulated pile driving signals of 210 dB re 1 $\mu Pa^2 \cdot s$ cumulative SEL and therefore Popper et al. (2014) state that this threshold is likely to be conservative. This is consistent with other studies suggest that egg and larval mortality and tissue damage is localised and limited to close proximity to the seismic source, and that larval mortality rates caused by exposure to airgun sounds are generally insignificant compared to natural mortality rates (Kostyuchenko 1973; McCauley 1994; Booman et al. 1996; Sætre and Ona 1996; Payne et al. 2004).

It is acknowledged, however, that there are no published studies on the effects of seismic sound on the full suite of southern rock lobster embryonic and larval stages, which introduces uncertainty when assessing impacts. To address this uncertainty a qualitative impact assessment was undertaken on the basis that that impacts to larval phases of the southern rock lobster could occur at distances several or orders of magnitude (100's to 1,000's of metres) greater than current published studies would indicate. This impact assessment assumes mortality of all southern rock lobster larvae dispersing in waters of the acquisition area at the time of the survey.

The southern rock lobster (Hutton, 1875) is distributed throughout New Zealand from the Three Kings Islands to the Auckland Islands, on seamounts in the Tasman Sea (Booth, 2000), and in southern parts of Australia south of about 30° S (Phillips et al., 2000). The Australian fishery is managed as separate jurisdictions within South Australia, Tasmania, Victoria and Western Australia. The Victorian fishery is divided into an Eastern Zone and a Western Zone, with the operational area occurring near the eastern border of the Western Zone.

Reproductive success is correlated to size for both male and female *J. edwardsii*. Fecundity of the largest females can be more than an order of magnitude greater than the fecundity of the smallest females, and larger females produce larger eggs (MacDiarmid & Kittaka, 2000; Green et al., 2009 – cited in Jeffs et al 2013). Linnane et al (2008) found that fecundity of females in the South Australian fishery ranged from 45,292 to 466,800 eggs per female and increased proportionally with size. Off western Victoria small individuals carry approximately 150,000 eggs, while large individuals carry about 680,000 eggs (Hobday & Ryan, 1997).

Large males control the mating access to females and will mate with the majority of the females in a den (MacDiarmid, 1989). Furthermore, larger males produce more sperm than smaller males resulting in larger clutch sizes, and thus, the reproductive output of lobster populations that have a low abundance of large males may be constrained by sperm limitation (MacDiarmid & Butler, 1999).

The size frequency distribution in southern rock lobster populations subject to fishing is heavily skewed towards smaller lobsters below the legal catch. Fished populations generally have significantly reduced abundance relative to unfished populations (Young 2016, Barret et al. 2009, Freeman 2008). These effects strongly suggest that southern rock lobster populations subject to fishing pressure have significantly lower reproductive potential than unfished populations.

Mating in the Australian population occurs between April and July, followed by a brooding period of 3–6 months before hatching between September and November throughout their geographical range, peaking around October (MacDiarmid, 1989; Edmunds 1995; Linnane et al. 2008; Department of Primary Industries 2009; Southern Rocklobster Limited n.d.a). The survey will avoid the peak hatching season though some hatching may still be occurring in November when the survey is likely to commence.

The larval lifecycle of *J. edwardsii* is complex. The first larval stage is a very short-lived naupliosoma that develops into a 2 mm long phyllosoma within 30–60 minutes (MacDiarmid, 1985; Kittaka, 1997 – cited in Jeffs et al 2013). Phyllosomas also undergo a series of distinct morphological stages with some stages including several moults, with 11 stages identified for *J. edwardsii* before settling onto inshore reefs as juvenile pueruli (Jeffs et al. 2013).

The larval period for Jasus species is very long, with phyllosomas estimated to spend between 9 and 24 months as planktonic larvae (Booth, 1986; Pollock, 1986; Booth & Phillips, 1994). After hatching the early phyllosoma are transported hundreds of kilometres offshore where the majority of their development occurs, often within large ocean gyres (Booth 1994; Booth et al. 2002; Bradford et al. 2005; Chiswell and Booth 2005; Bruce et al., 2007). Late stage phyllosomas are dispersed widely offshore (Chiswell & Booth 1999; 2005 - cited in Jeffs 2013), with metamorphosis from phyllosoma to puerulus most often occurring beyond the continental shelf, on average around 200 km offshore (Jeffs et al., 1999; 2001 - cited in Jeffs et al. 2013). Only a very small number of the millions of larvae that initially hatch survive to reach the puerulus stage and return to the coast (Department of Fisheries 2011; Mills et al., 2006; Southern Rocklobster Limited n.d. a, b). The duration of any direct impact to larvae from the survey is limited to a period of up to 6 weeks in a single year, which is considered a minor temporal effect given the long duration of larval dispersal and development that may occur in the region.

Given the long duration of the larval period, the poor horizontal swimming ability of phyllosomas, and the speed of ocean currents it is theoretically possible that phyllosomas could be dispersed over extensive areas of the Southern Hemisphere. Booth and Ovenden (2000) reported finding Jasus larvae, and *J. edwardsii* in particular, within 1000 km of natal adult populations for different populations across much of the range of the genus in the Southern Hemisphere. In general, they found the greatest densities of phyllosomas within a few hundred kilometres of known adult populations, and densities declined with increasing distance from adult populations.

In studies off New Zealand's North Island, Booth et al. (1998) recorded *J. edwardsii* larvae up to 1,300 km offshore. Booth and Ovenden (2000) refer to *J. edwardsii* larvae occurring across the Tasman Sea and the modelling work of Chiswell et al. (2003) predicts that *J. edwardsii* larvae from Australian waters should be distributed across the Tasman Sea. As such, the extent of the acquisition area (650km^2) is considered negligible relative to the very large scales over which larvae disperse.

In contrast to the wide dispersal of phyllosomas, *J. edwardsii* pueruli are rarely caught more than 100km from the coast (Booth, 1994), although pueruli have been caught up to 330km from the coast (Booth & Chiswell, 2005). The mechanisms by which pueruli make their way from far offshore to coastal waters where they settle is poorly understood. Climatic conditions are thought to have an impact on recruitment in some areas, with significant correlations between wind stress and data from puerulus settlement monitoring sites indicating that wind influenced settlement patterns in the South Australian fishery (Linnane et al., 2010a).

However, no similar correlation between southerly winds and pueruli settlement was found for the east coast of Tasmania (Booth et al., 2000).

Within the region of the survey area, settlement of pueruli as recorded at monitoring stations at Apollo Bay peaks between July and September with lowest settlement rates between February and May (Bruce et al. 2007). As such, whilst it is likely that some puerulus will be present at the time of the seismic survey the peak settlement period will not be impacted.

An oceanographic model of larval dispersal of *J. edwardsii* in Australia developed by Bruce et al. (2007) indicates that larval flow is generally from west to east with recruitment in easterly management jurisdictions of Tasmania and the Victorian Eastern Zone supplemented by larvae thought to be arriving from the west. Larvae are also found within offshore eddy systems and these provide an element of westward flow. An example of the oceanographic model illustrating the vast scale of dispersal of 1,363 larvae from the Robe region in South Australia is shown in Figure 18 (Bruce et al. 2007).

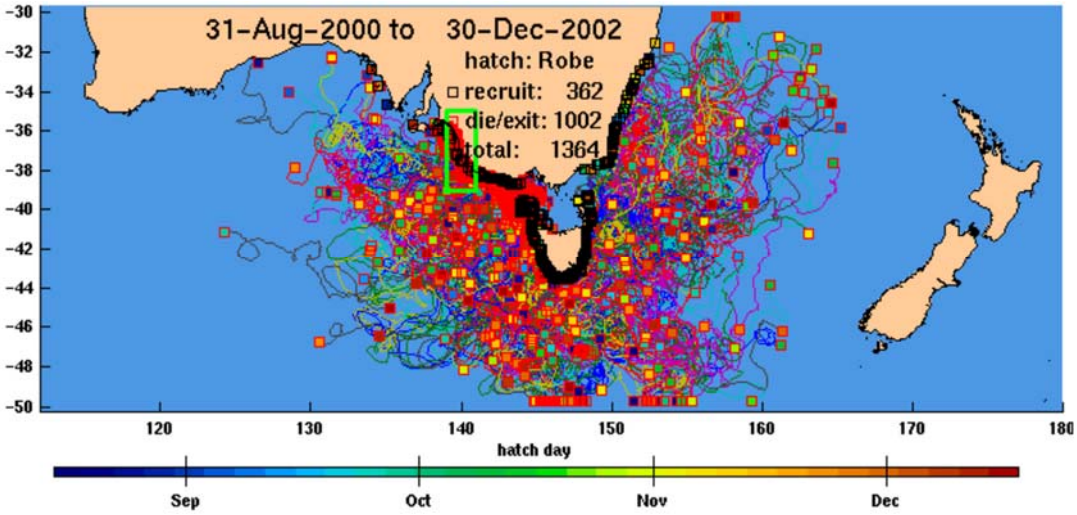


Figure 18 - Modelled tracks and end-points (black squares for those that settle, red squares for those that died) for 1,364 larvae hatched in the Robe region. Fill colours of squares denote the hatching dates for each larva (see key below figure). Tracks are coloured simply to help distinguish individuals.

The model predicted that the most important sources of successfully settling pueruli into the south-east Australian fishery are the South Australian and West Australian management zones. The Victorian Western Zone was identified as the next most important zone with the east Victorian and Tasmanian zones considered of lowest importance. With the exception of southwest Western Australia, all regions receive more pueruli from outside their own boundaries than from self-recruitment.

The CF3D survey is located within the eastern extent of the Victorian Western Zone. The area of the western zone is approximately 60,000km^2, with 30,000km^2 of this located over the continental shelf so likely to support suitable habitat for Jasus edwardsii. The Northern Zone of the South Australian rock lobster fishery in South Australia is extensive, covering approximately 207 000 km^2 (McGarvey et al 2016). The Southern Zone, although smaller in area (22,000km^2), is the more productive zone, primarily due to the presence of ideal lobster

habitat in the form of continuous limestone reefs and high levels of primary productivity as a result of annual upwelling events.

The survey area is approximately 200km from the South Australian Management Zones so impacts to larval productivity from the survey are not considered plausible. The acquisition area of the CF3D survey is 650km2, and as such encompasses some 2.2% of the productive area of the Victorian Western Zone and 0.25% of the area encompassed by the South Australian zones and Victorian Western Zone. Any effect on larval productivity of these zones due to impacts on such a localised area is likely to be negligible relative to the size of the productive area of the fishery, and the vast areas and timescales over which larval dispersal, development and subsequent puerulus settlement and recruitment may occur.

In summary:

- Southern rock lobster larvae are distributed across vast areas of the Southern Ocean. The area of potential direct impact within the acquisition area is insignificant relative to such areas.
- The duration of any direct impact from the survey is limited to a period of up to six weeks in a single year, which is considered a minor temporal effect given the southern rock lobster annual breeding cycle and continuous transfer of larvae of various life stages on ocean currents.
- The survey will avoid the peak larval hatching season but may commence whilst some larval hatching is underway.
- The CF3D seismic survey cannot affect larvae productivity in the most important zones of the fishery (SA) due to the very large distance (approximately 200km) between the survey area and these zones.
- The area potentially affected by the survey assuming worst case scenarios is some 2.2% of the productive area of the Victoria Western Zone fishery and 0.25% of the area encompassed by the zones of high and moderate larval production for the fishery. Any effect on larval productivity or recruitment into management zones to the east from such a localised area is likely to be negligible relative to the regional scale of larval productivity and recruitment within the fishery.
- The survey will avoid the peak larval hatching season but may commence in November whilst some larval hatching is underway.
- Peak settlement rates of puerulus in the vicinity of the survey area occur between July and September, which is outside of the survey window.
- Natural larval mortality rates are understood to be very high.
- The key driver of larval productivity of southern rock lobster populations is the abundance of large southern rock lobster. The survey will not affect the size distribution of adult southern rock lobster within the survey area and is highly unlikely to affect the abundance of adult southern rock lobster.

Given these considerations the effect of the survey on larval abundance, productivity, dispersal and settlement for the south-east Australian (South Australia, Victorian, Tasmania) southern rock lobster fishery, assuming a conservative area of impact, is considered unlikely to be significant. Decreases in larval abundance in the highly localised area of the survey are likely for a short duration until replacement by ongoing easterly flows.

7.1.2.9 Marine reptiles

Marine turtles do not have an external hearing organ but can detect sound through bone-conducted vibration, where the skull and the shell are the receiving surfaces (Lenhardt *et al.*, 1983). Electro-physical studies have indicated that the best hearing range for marine turtles is in the 100–700 Hz range, which overlaps with the frequency range of the seismic source (McCauley, 1994). However, with the exception of very high intensity sound sources which may cause damage to air cavities, there are no known levels for the sensitivity of turtles to underwater sounds that may result in temporary or permanent threshold shifts and thus physiological damage (McCauley, 1994).

Underwater noise behavioural response trials have demonstrated that adult marine turtles may begin to show behavioural changes (increased swimming activity) to an underwater noise source at a received level of ~166 dB re 1µPa, and avoidance responses at 175 dB re 1µPa (McCauley *et al.*, 2000). The

same paper estimates, based on extrapolations from a sample of caged loggerhead and green turtles, that a 3D seismic survey operating in water depths of 100-120 m would induce behavioural changes on turtles at about 2 km range and avoidance at about 1 km range.

Hatchlings that are travelling within oceanic currents may also transit through the operational area, however it is expected that affected numbers would be very small compared to overall numbers and natural mortality rates.

Turtles swimming through or near to the array could possibly be exposed to noise levels sufficient to cause physical damage if the source started suddenly. However, with the absence of known turtle habitat in the operational area and the application of soft start procedures, the likely impacts of the survey on marine turtles will therefore be extremely low.

7.1.2.10 Impacts to fishery target species

Fish may avoid areas of seismic activity, and fish schools may disperse or change feeding behaviour patterns, resulting in fewer fish being attracted to baited traps or hooks. This can potentially reduce the availability of commercially valuable species or iconic recreationally targeted species. Studies support the view of many commercial fishers that seismic surveys scare fish away (except for reef-dwelling fish), but there is minimal information on the time taken for fish to return after the completion of surveys, with overseas studies indicating fish returning within one to five days after the completion of the survey (Parry & Gason, 2006).

In March 2013, the CFA submitted to the Commonwealth DoE that marine seismic activities are a key threatening process under the EPBC Act (CFA, 2013). A key threatening process is defined as something that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community. The nomination listed nine species that could become vulnerable or more highly endangered. Ultimately, the DoE did not accept this nomination. The species nominated, and proposed impacts to them from the survey, are outlined below:

- Black jewfish (*Protonibea diacanthus*) – forms spawning aggregations in northern Australia, especially around Darwin, and does not occur in southern Australian waters. The survey will therefore have no impact on this species.
- Scampi (*Metanephrops australiensis*) – a deep water species occurring in northwest Australian waters in water depths between 250 and 500 m. The survey will therefore have no impact on this species.
- Orange roughy (*Hoplostethus atlanticus*) – this species is found in water depths between 700 and 1,200 m, precluding it from occurring within or near the operational area.
- Loggerhead turtle (*Caretta caretta*) – this species is limited to northern tropical and sub-tropical waters in eastern Australia, precluding it from occurring within or near the operational area.
- Bass Strait scallop (*Pecten fumatus*) – the geographical extent of this species, being coastal waters of eastern and southern Australia, and particularly Bass Strait, means this species is likely to occur within or near the operational area however beds of sufficient abundance to support fishing operations are not present.
- Arrow squid (*Nototodarus gouldi*) – this species is present only in southern Australian waters (as far north as Ningaloo Reef in WA and across to southern Queensland). As such, they may at times occur within or near the operational area.
- Blue warehou (*Seriolella brama*) – this species is restricted to southern Australian waters off the Victorian and Tasmanian coasts. Fishing has been implicated in the population decline of this species. They may at times occur within or near the operational area.
- Southern bluefin tuna (*Thunnus maccoyii*) – spawning grounds are located south of Java, with juveniles migrating to southern waters along the WA coast. As such, they may at times occur within or near the operational area.
- Gemfish (*Rexea solandri*) (east Australian population) – found in southern Australian temperate waters and undertaking a pre-spawning migration up the southeast Australian coast. As such, they may at times occur within or near the operational area.

In addition to impacts on adults of a fishery species, any reduction in spawning or recruitment success may reduce the yield of a species in subsequent years. This can, in turn, contribute to longer-term impacts due to a reduction in spawning stock for the following year. Studies show that effects on fish eggs and larvae populations within survey areas are insignificant, especially when considered with respect to population size and the natural mortality rates for these organisms. Current literature

suggests this situation applies to species that use broadcast reproductive strategies, releasing eggs or larvae in vast numbers. For example, at a population level, trillions of southern rock lobster larvae hatch in the spring and are widely dispersed as plankton in the Southern Ocean and south Tasman Sea. The vast disparity between the scale of effect of airgun discharges during a seismic survey and the trans-ocean dispersal of trillions of lobster larvae strongly indicates a negligible affect at a population level from airgun discharges (McCauley, 1994).

Concerns have been raised by rock lobster fishery stakeholders about seismic surveys reducing catch rates. As discussed previously, it is not considered that there is potential for any population level impacts on rock lobster as a result of the survey. A review of historic quota changes does not show any evidence of a link with previous marine seismic surveys.

Marine invertebrates including scallops and rock lobster have been recreationally and commercially fished prior to seismic surveys commenced in the Bass Strait in the early 1960s. Studies on the effects of 33 seismic surveys undertaken between 1978 and 2003 on the southern rock lobster (*Jasus edwardsii*) fishery in the waters off southwest Victoria did not find any impacts to the catch rates of rock lobsters in the weeks and years after the surveys (Parry & Gason, 2006).

A decline in the abundance of *Jasus edwardsii* has been extensively documented throughout the entire range off southern Australia, inferred either from the results of stock assessments or from trends in puerulus and catch rates, (Linnane *et al.,* 2010). One of the factors for this decline is a high commercial harvest rate (>40% in many years in some areas) (Punt *et al.* 2013). There is strong evidence for rapid increase in lobster abundance following removal of fishing pressure (see for example MacDiarmid and Breen 1993 and Barrett *et al.* 2009).

In addition to fisheries impacts, recent simultaneous patterns of decline across the Australian range of the southern rock lobster have led various authors (see Linnane *et al.,* 2010, Punt *et al.* 2013) to suggest that large-scale environmental influences may be playing a role. There are several possible mechanisms by which large-scale environmental change can impact the dynamics of lobster populations including, as summarised in Punt *et al.* (2013), impacts of:

- temperature on larval survival and growth
- changing ocean currents on recruitment due to the lengthy pelagic phase
- upwelling intensity where extreme cold-water events reduce growth rates of adult lobsters

A reduction in kelp habitat driven by climatic changes has also been identified as a potential cause of reduced puerulus settlement in waters off eastern Tasmania (Hinojosa *et al.* 2014).

Similarly, investigations into sustained below average puerulus settlement of Western Rock Lobster have concluded that the decline is most likely driven by higher water temperatures at the time of the onset of spawning (October) since the mid-2000s. Statistical analysis shows that most (71%) of the variation in puerulus settlement was explained by the timing of spawning, storm activity during autumn/spring, and offshore water temperatures in February (Caputi *et al.* 2014).

A before and after study undertaken by Harrington et al (2010) of the short-term effects of seismic surveying on adult commercial scallops (*Pecten fumatus*) was undertaken within the BSCZSF between February and June 2010. The study aimed to determine the survival and health of adult scallops within impacted (directly below seismic survey transects), semi-impacted (within the seismic survey transect grid) and control (outside of the seismic survey transect grid) strata two months after seismic surveying. No change in the abundance of live scallops (or related change in dead scallop categories) or macroscopic gonad and meat condition was detected after seismic surveying within either the control, impacted or semi-impacted strata. There was also no observable change in the size frequency distribution of scallops in the impacted and semi-impacted strata following seismic surveying. Harrington *et al.* (2010) concluded that no short-term (< 2 months) effects on the survival or health of adult scallops were detected after the seismic survey.

Parry *et al.* (2002) also found no evidence of a lethal impact of seismic surveying on commercial scallops in Bass Strait. However, this experiment suspended scallops in the water column where they may not be exposed to the same sound or vibration stimuli compared to scallops on the benthos because low frequency seismic waves interact and travel through the sediment. For example, Walmsley (2007) showed that substratum vibrations resulted in shell closure of cockles. Persistent seabed vibrations, which result in continued shell opening and closure, could potentially result in cessation of filter feeding and decreased health and survival of affected individuals.

Brand and Wilson (1996, in Parry and Gason, 2006) also assessed potential lethal impacts of seismic surveying on scallops by examining long term commercial catch rates of queen scallops within the Isle of Man (United Kingdom) fishery, and comparing these with catch rates following seismic surveys. Although there was evidence of a decline in catch rates following one 3D seismic survey, they

concluded that this result was due to two years of poor scallop recruitment prior to the seismic activity, not the seismic activity itself, and concluded overall that there was no effect of seismic surveying on scallop catch rates.

A study undertaken by the CSIRO and Geoscience Australia (Thomson *et al.*, 2014) examined fisheries catches (10 species of interest) and catch rates for potential effects from 183 seismic surveys undertaken in the Gippsland Basin (Bass Strait). This study found no clear or consistent relationships between seismic surveys and subsequent fisheries catch rates (Thomson *et al.*, 2014).

7.1.2.11 Commonwealth and State Marine Reserves

While the Crowes Foot seismic survey will not be undertaken within the Apollo or Zeehan CMRs, sound from the survey is likely to travel into the reserves. Acknowledging this, there is value in assessing whether transmitted sound sound will meet the management objectives of these reserves.

CMRs are divided into various zones depending on the conservation values present within each CMR, which in turn determine what activities can be undertaken in each zone. Of the six zones available for CMRs, the Apollo and Zeehan CMRs are comprised of two only. Table 13 outlines management objectives for these reserves and assess the potential impact of sound from the Crowes Foot seismic survey on these objectives.

Table 13: Apollo and Zeehan CMR management objectives

CMR	Zonation	Purpose of zone	Impacts from survey
Apollo	Multiple Use (IUCN Category VI)	Multiple Use zones provide for a wide range of sustainable activities by allowing those that do not significantly impact on benthic (seafloor) habitats or have an unacceptable impact on the values of the area.	The impact assessment provided throughout this section demonstrates that the survey will not have a significant impact on benthic impacts in the region or on the values of the area. Decades of seismic surveying in the Otway Basin have not reduced biodiversity or fauna abundance in the region. Approval to undertake seismic surveys in CMR Multiple Use and Special Use zones is provided under section 359B of the EPBC Act (Director of National Parks, 2013), subject to the approval of an EP, indicating that the DoE considers that seismic surveys pose no threat to the conservation values of these CMRs.
Zeehan	Multiple Use (IUCN Category VI)		
	Special Purpose Zone (IUCN Category VI)	Special Purpose zones provide for a wide range of activities provided they will not have an unacceptable impact on the values of the area. This zone allows for limited access to mining and low level extractive activities.	

Source: Director of National Parks (2013).

Sound from the seimic survey is also likely to travel into the Twelve Apostles Marine National Park, north of the operational area and adjacent to the Victorian coastline. Passive acoustic monitoring commissioned by Origin from April 2012 to January 2013, 5km offshore from the coastline east of Warrnambool, identified that ambient underwater sound in coastal areas, are generally high, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (McCauley & Gavrilov 2013). Ambient sound levels in this marine park are likely to be higher than those recorded by McCauley & Gavrilov (2013) due to sound generated by wave motion on coastal cliffs, rock formations and the shallow seabed.

Sound exposure levels of 160dB re 1µPa^2.s are only likely to be generated within approximately 1km of the source array (Maggi and Duncan 2011). The Twelvle Apostles Marine National Park is 7.6km from the closest point of the acquisition area. At this distance, sound from the seismic survey is not likely to be significantly different to ambient sound levels which can be generated at this nearshore environment. As such, sound generated by the seismic survey is highly unlikely to compromise pubished management strategies for the Twelvle Apostles Marine National Park.

7.2 Impact 2 - Light emissions

7.2.1 Hazard

Light emissions will occur from the survey, guard and support vessels. The following activities will result in artificial lighting:

- Vessel navigation lighting will be kept on 24 hours a day for maritime safety purposes in accordance with Part 30 (Prevention of Collisions) of the Marine Orders made under the *Navigation Act 2012* and deck lighting for the safety of personnel working on deck.
- The floating towed equipment trailing at the tail end of the cables is lit by warning lights flashing the morse code letter 'U' (two short flashes and one long flash).

7.2.2 Known and Potential Environmental Impacts

The known and potential environmental impacts of artificial lighting are:

- Localised light glow may act as an attractant to light-sensitive species (e.g., seabirds, squid, zooplankton), in turn affecting predator-prey dynamics; and
- Attraction of light sensitive species during breeding periods (e.g., turtle hatchlings).

7.2.3 Evaluation of Environmental Impacts

Seabirds may be attracted to the vessels at night due to the light glow. Bright lighting can disorientate birds, thereby increasing the likelihood of seabird injury or mortality through collision with infrastructure, or mortality from starvation due to disrupted foraging at sea (Wiese *et al.*, 2001 in DSEWPC, 2011). The relatively small size of the survey vessel compared to large commercial ships in the area and the short duration of the survey means there are unlikely to be any measureable impacts from vessel lighting.

Nesting birds may be disorientated where lighting is adjacent to rookeries. This is evident in young fledglings leaving breeding colonies for the first time, in particular wedge-tailed shearwaters. Light pollution is a particular issue for wedge-tailed shearwaters due to their nocturnal habits, but they are not recorded in the PMST as occurring in or near the proposed operational area.

Bright lights can also impact on migrating birds. Anecdotal evidence from crew on offshore drilling rigs is that offshore drilling rigs and vessels often act as an important resting place for migrating seabirds, and that no harm comes to them by resting on the vessel. Pinzone (pers. obs., 2013) observed hundreds of seabirds (mostly terns) roosting on the *Stena Clyde* drill rig while drilling in the Gulf of Papua, about 110 km from the nearest land. They did not appear disturbed by light generated by the rig (they remained on the drill rig day and night), which acted as a resting place. No resting birds were noted on the same rig at the Geographe location (9 km from the operational area) in April 2013 (Pinzone, pers. obs., 2012).

Other marine life may also be attracted to the waters around the vessels as a result of an attraction by prey items (e.g., worms, squid, plankton) that can aggregate directly under downward facing lights.

Light pollution along, or adjacent to, turtle nesting beaches poses a particular issue for turtles because it alters critical nocturnal behaviours, particularly the selection of nesting sites and the passage of adult females and emerging hatchlings from the beach to the sea (Limpus, 2009 in DSEWPC, 2011). Light impacts to turtle hatchlings will not occur due to the absence of nesting sites in Bass Strait.

There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding or breeding behaviours of cetaceans (DSEWPC, 2011). Cetaceans predominantly utilise acoustic senses to monitor their environment rather than visual sources (WDCS, 2004), so light is not considered to be a significant factor in cetacean behaviour or survival.

Based on this information, it is considered that impacts to marine fauna species as a result of light emissions will be negligible.

7.3 Impact 3 - Atmospheric emissions

7.3.1 Hazard

The following activity will generate atmospheric emissions:

- Combustion of marine diesel from the vessel engines and fixed and mobile deck equipment during the survey;
- Solid waste combustion within an incinerator, if logistics don't allow for the timely removal of waste from the vessel.

7.3.2 Known and Potential Environmental Impacts

The known and potential environmental impacts of atmospheric emissions are:

- Localised and temporary decrease in air quality due to particulate matter from diesel combustion; and
- Contribution to the global greenhouse gas (GHG) effect.

7.3.2.1 Evaluation of Environmental Impacts

The use of fuel to power engines, generators and mobile and fixed plant (e.g., ROV) and any combustion of wastes within an incinerator will result in gaseous emissions of GHG such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHG particulate emissions such as sulphur oxides (SO_X) and nitrous oxides (NO_X).

The emissions generated from the vessel add to the GHG load in the atmosphere, which adds to global warming potential. The emission of non-GHG particulate matter, such as NO_X and SO_X, can lead to a reduction in local air quality.

The combustion of fuels, and potentially wastes, in such a remote locality will not impact on the health or amenity of the nearest human settlements of Port Campbell or Princetown as offshore winds will rapidly disperse and diffuse gaseous and particulate emissions.

7.4 Impact 4 – Marine discharges

7.4.1 Hazard

Routine discharges to marine waters expected from the survey are expected to include:

- Cooling water and brine
- Treated sewage and grey water
- Oily water
- Bilge water
- Deck drainage
- Putrescibles waste (organic/food wastes).

The following activities will result in routine operational discharges to the ocean from the vessels during the proposed survey:

- Seawater is used as a heat exchange medium for cooling machinery engines and other equipment. Seawater is drawn up from the ocean, where it is de-oxygenated and sterilised by electrolysis (by release of chlorine from the salt solution) and then circulated as coolant for various equipment through the heat exchangers (in the process transferring heat from the machinery), and is then discharged to the ocean.
- Brine water (hyper saline water) is created through the vessel's desalination process that creates freshwater for drinking, showers, cooking etc. This is achieved through reverse osmosis (RO) or distillation resulting in the discharge of seawater with a slightly elevated salinity (~10% higher than seawater). The freshwater produced is then stored in tanks on board.
- The use of ablution, laundry and galley facilities on the vessels.
- Discharge of bilge waters with ≤15 ppm OIW content. Bilge water consists of deck drainage that has been captured in a closed-loop system (e.g., bunded areas are directed to the bilge water tank for removal of oil prior to discharge).
- Deck washing, ocean spray and rain ('green water') that capture trace quantities of contaminants such as oil, grease and detergents on the deck prior to draining overboard. Deck water consists of rain and wash down water that may contain small amounts of detergents, oils and other materials spilt or stored on the deck floor.

- Food scraps will be generated through cooking and food consumption, with wastes macerated and discharged overboard. It is expected that the average volume of putrescible waste discharged overboard is ~10 kg/day.

7.4.2 Known and Potential Environmental Impacts

The known and potential environmental impacts of operational discharges are:

- Temporary and localised increase in sea surface water temperature;
- Temporary and localised increase in sea surface salinity;
- Temporary and localised increase in the content of nutrients and pathogens in the surrounding surface waters;
- Temporary and localised increase in trace amounts of hydrocarbons and chemicals; and
- Increase in scavenging behaviour of marine fauna and seabirds.

7.4.3 Evaluation of Environmental Impacts

7.4.3.1 Temperature

Once in the water column, cooling water will remain in the surface layer, where turbulent mixing and heat transfer with surrounding waters will occurs. This will cause localised increases in water temperature.

The potential impacts of increased seawater temperatures downstream of the cooling water discharge are localised changes to the physiological processes of marine organisms (particularly plankton) including attraction or avoidance behaviour, stress or mortality.

Modelling undertaken for the BHP Petroleum Pyrenees floating production, storage and off take (FPSO) development in the Exmouth Basin (BHP, 2005) shows that based on a discharge of 100,000 m^3/day (~4,166 m^3/hr) at a water temperature of 25°C above that of the surrounding ocean, there is a 50% probability of the temperature of surface water within 25 to 50 m of the discharge point exceeding the ambient temperature by more than 2°C. This decreases to 1% within about 60 to 85 m of the discharge point, depending on seasonal variations in the water current. Impacts from a seismic survey are likely to be much lower given the moving nature of the vessels.

Modelling of continuous waste water discharges (including cooling water) undertaken by Woodside for its Torosa South-1 drilling campaign in the Scott Reef complex (northwest Western Australia) found that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being less than 1°C above background levels within 100 m (horizontally) of the discharge point, and will be within background levels within 10 m vertically (Woodside, 2008). Impacts from a seismic survey are likely to be much lower given the moving nature of the vessels.

Given that the temperature of the discharges is likely be only marginally higher than that of the receiving waters, that the receiving environment is subject to strong currents, and that the vessels are constantly in motion, the impacts of cooling and brine water discharges from are considered negligible and will be temporary and localised.

7.4.3.2 Salinity

Brine water (salinity of about 40,000 ppm) is denser than seawater (35,000 ppm). As such, discharged brine water will sink through the water column where it will be rapidly mixed with receiving waters, and disbursed by ocean currents.

The greatest impact associated with the brine discharge will be an approximate 10% increase in seawater salinity in the immediate vicinity of the discharge point (i.e., prior to any meaningful dilution taking place). Walker and MacComb (1990) found that most marine species are able to tolerate short-term fluctuations in water salinity in the order of 20-30%, and it is expected that most pelagic species passing through a denser saline plume would not suffer adverse impacts.

7.4.3.3 Nutrients and pathogens

Intermittent release of sewage and greywater will cause localised nutrient enrichment of the water column. The overboard discharge of macerated food wastes will also create a localised and temporary increase in the nutrient load of the surface waters. This may in turn act as a food source for scavenging marine fauna and seabirds, whose numbers may temporarily increase as a result.

Sewage can also contain hazardous pathogens (including faecal coliform bacteria), intestinal parasites, viral agents that, if released untreated to the marine environment, may cause. Grey water can contain a wide variety of pollutant substances at different strengths, including oil and some organic

compounds, hydrocarbons, detergents and grease, metals, suspended solids, chemical nutrients, food waste, coliform bacteria and some medical waste.

Modelling of continuous wastewater discharges (including sewage and greywater) undertaken by Woodside for its Torosa South-1 drilling campaign (in the Scott Reef complex) found:

- Rapid horizontal dispersion of discharges occurs due to wind-driven surface water currents;
- Vertical discharge is limited to about the top 10 m of the water column due to the neutrally buoyant nature of the discharge; and
- A concentration of a component within the discharge stream is reduced to 1% of its original concentration at no less than 50 m from the discharge point under any condition (Woodside, 2008).

Sewage discharges will be rapidly diluted in the surface layers of the water column and dispersed by currents. The biological oxygen demand of the treated effluent is unlikely to lead to oxygen depletion of the receiving waters (Black *et al.*, 1994), as it will be treated prior to release. Surface currents will also assist with oxygenation of the discharge once it is released.

Given the rapid rate of mixing and the absence of nearby sensitive environments or biological communities, there will be a negligible impact on the marine environment as a result of sewage and grey water discharge.

Additionally, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of putrescible waste discharges are short-lived and insignificant.

7.4.3.4 Hydrocarbons and chemicals

With routine controls in place, only trace quantities of contaminants would be expected in deck drainage and bilge water discharge, and these would be rapidly diluted and dispersed, especially with the vessels in constant motion. Given the very small volumes of such chemicals or hydrocarbons (oil, grease) that may be released, the high rates of dilution and dispersion in the open ocean environment and the temporary presence of the vessels, it is not expected that marine fauna or plankton will be exposed to chemicals or hydrocarbons in quantities that would induce acute or chronic toxicity impacts due to routine deck cleaning or release of treated bilge water.

7.5 Risk 1- Release of hazardous and non-hazardous wastes

7.5.1 Hazard

During the survey, small quantities of hazardous and non-hazardous wastes will be created, handled and stored on the vessels in accordance with each vessel's Garbage Management Plan, which aim to avoid releases to sea. However, accidental releases to sea are always a possibility, especially in rough ocean conditions when items may roll off or be blown off the deck.

The following non-hazardous wastes have the potential to be accidentally disposed overboard or disposed of inappropriately onshore:

- Paper and cardboard;
- Wooden pallets;
- Scrap steel, metal, aluminium, paint cans;
- Glass; and
- Plastics and ropes.

The following hazardous wastes will be generated through the use of consumable products on board the vessels and may be accidentally discharged overboard:

- Hydrocarbon-based or -contaminated materials (e.g., oily rags, oil filters, hydraulic oils); and
- Batteries, empty paint cans, cleaning products, aerosol cans, fluorescent tubes.

The following activities have the potential to result in the discharge of contaminated wastes to the ocean from the vessels during the survey:

- Discharge of contaminated bilge waters (due to malfunction of the oily water separator) with >15 ppm oil-in-water (OIW) content;
- A chemical, oil or grease spill or leak on deck that is washed overboard.

7.5.2 Known and Potential Environmental Impacts

The known and potential environmental impacts of hazardous and non-hazardous waste disposal to the marine environment are:

- Pollution of surrounding surface waters;
- Injury and entanglement of marine fauna and seabirds;
- Toxicity to marine fauna;
- Smothering or pollution of benthic habitats; and
- Onshore litter (visual pollution).

7.5.3 Evaluation of Environmental Impacts

Hazardous Waste

Hazardous waste is defined as a substance or object that exhibits hazardous characteristics, is no longer fit for its intended use and requires disposal. Some of these hazardous characteristics (as outlined in Annex III to the Basel Convention) include being toxic, flammable, explosive and poisonous.

Hazardous wastes released to the sea cause pollution and contamination, with either direct or indirect effects on marine organisms. For example, chemical spills can impact on marine life from plankton to pelagic fish communities, causing physiological damage through ingestion or absorption through the skin. Impacts from an accidental release would be limited to the immediate area surrounding the release, prior to the dilution of the chemical with the surrounding seawater. In an open ocean environment such as that of the operational area, it is expected that a release would be rapidly diluted and dispersed, and thus temporary and localised.

Solid items of hazardous waste, such as paint cans containing paint residue, batteries and so forth, would settle on the seabed if dropped overboard. Over time, this may result in the leaching of hazardous materials to the seabed, which is likely to result in a small area of substrate becoming toxic and unsuitable for colonisation by benthic fauna.

All hazardous waste will be disposed of at appropriately licensed facilities, so impacts such as illegal dumping or disposal to an unauthorised landfill that is not properly lined (to prevent groundwater pollution) are unlikely to result from the proposed survey.

Non-hazardous Waste

If accidentally discharged overboard (i.e., dropped object, storm that results in goods rolling or blowing off decks), non-hazardous wastes can cause smothering of benthic habitats as well as injury or death to marine fauna or seabirds through ingestion or contact (e.g., high-order fish mistaking plastics for jellyfish, rope getting caught around the necks of seabirds).

7.6 Risk 2 - Seabed disturbance

7.6.1 Hazard

Vessel activities that may result in seabed disturbance are:

- Anchoring;
- Streamer drag; and
- Dropped objects.

7.6.2 Known and Potential Environmental Impacts

The known and potential environmental impact of seabed disturbance are:

- Localised turbidity of the near-seabed water column;
- Temporary disturbance to benthic habitats and fauna from turbidity;
- Disturbance to unmarked shipwrecks; and
- Temporary displacement of a small area of seabed habitat.

7.6.3 Evaluation of Environmental Impacts

As described in Section **Error! Reference source not found.Error! Bookmark not defined.**, there are few known or likely sensitive ecological seabed features in the operational area. The survey and support vessels will use thrusters to maintain position and will not need to anchor unless in an emergency. In the event of anchoring, seabed disturbance will be created at the anchor location and there is likely to be some associated anchor chain drag.

The stirring up of sand and other seabed material is not considered a significant environmental impact. Surveys of seabed disturbance from anchoring activities indicate that recovery of benthic fauna in soft sediment substrates occurs between 6 to 12 months after the disturbance was created (URS, 2001). The anchor depression acts as a trap for marine detritus and sand, which will quickly fill and be recolonised by benthic organisms (Currie and Isaac, 2005). The area impacted by single anchor points is extremely small and will not pose a threat to seabed habitats or fauna communities.

Objects that may be dropped into the ocean include survey equipment (such as streamers) and containerised deck equipment. Loss overboard may be caused when items roll off the deck in poor ocean conditions (e.g., storms) or due to human error when equipment is deployed over the edge of the vessel by the vessel-mounted crane (or equivalent). Dropped objects would have the impact of temporarily smothering benthic habitat and fauna. Impacts from the loss of equipment overboard (assuming no buoyancy) would be the localised loss of a small area of benthic habitat.

Anchor drop over or streamer drag through a shipwreck (unmarked on admiralty charts), which may be fully or partially buried, is likely to create irreversible damage to that shipwreck.

The operational area is well known and traversed, and unmarked subsea obstructions are unlikely to occur. This, combined with the shallowest water depths being approximately 35m, ensure that the seismic streamers (during normal operations) do not come into contact with the seabed or other features, such as the ‘Big Reef’ or other basalt rises in the south and south-east of the operational area. If deep streamer technology is to be employed, streamers will be towed at a minimum of 10 m from the seabed. Bathymetric data (such as admiralty charts) will be acquired prior to final survey planning. Streamer recovery devices will be adjusted according to the seabed depth so that they are activated at a depth shallower that the seabed. For line changes in areas where the seabed is less than 15 m below streamer depth, the streamers will be raised such that reduced vessel speed does not result in streamer drag.

7.7 Risk 3 - Interference with merchant and fishing vessels

7.7.1 Hazard

The physical presence of the survey and support vessels may have an adverse effect on third-party vessels, such as merchant vessels, fishing vessels and supply vessels.

Note that this section deals with interference in a socio-economic sense; impacts causing a diesel spill are addressed in Section **Error! Reference source not found.**.

7.7.2 Known and Potential Environmental Risks

The known and potential risks of interaction with third-party vessels are:

- Damage to fishing equipment;
- Loss of fishing equipment (e.g., trawling nets);
- Loss of commercial fish catches; and
- Disruption to commercial activities.

7.7.3 Evaluation of Environmental Risks

AMSA mapping shows a significant volume of vessel traffic passes through the operational area. Interactions between the survey vessel and third-party vessels are unlikely to occur, due principally to the slow moving nature of the seismic survey vessel while on location. This means that other vessels will have sufficient time to notice the survey vessel (visually or by radar).

The presence of the seismic vessel may also temporarily disrupt commercial and recreational fishing activities in the immediate area as a result of the need to ensure navigational safety for both the seismic vessel, towed equipment and other vessels in the area. The temporary exclusion of fixed bottom to surface floats and fishing gear (e.g. lobster pots) in the seismic area would also be required to avoid the risk of entanglement and damage to fishing and or towed marine seismic equipment. The vessel will be present in the operational area over a period of approximately 6 weeks for acquiring seismic data, and the area will be immediately available for access by fishing operators at the conclusion of the survey.

It is unlikely that fishing gear (such as trawl nets) would be damaged, as trawling is not known to occur within the operational area and vessels would have enough advanced warning to detour around the survey vessel.

A guard vessel that will identify potential shipping threats, together with navigational warnings issued via the AHS (Notice to Mariners) and the AMSA Rescue Coordination Centre (RCC) (Auscoast warnings) will be in place prior to and during the survey such that commercial vessels are aware of vessel movements for the duration of the survey.

The operational area is located in an area of significant fishing effort for rock lobster, with lower fishing effort likely for snapper and giant crab. The operational area is not an important fishing ground for any other fishery.

The fishing season for rock lobster (and giant crab) is from 16th November to 14th September of the following year. As such, there is potential for displacement of rock lobster and giant crab fishers from the operational area if the survey is underway after mid-November. Origin will engage with relevant fishers to identify any alternative operating arrangements to safely share the space and should this not be possible, will enter into compensation arrangements with relevant fishers.

Through direct consultation with VRLA president based in Apollo Bay, Apollo Bay commercial fishers and Apollo Bay Fishermans' Cooperative Director, Origin has identified a small group of commercial fishers who regularly fish in the operational area. It is probable that such fishers would be able to provide verifiable catch and effort data to validate any claim of lost catch.

Among other commercial fishers based along the Otway coast through to Portland, some have claimed that they also fish in the operational area when asked by Origin. This could only be validated by reviewing historical, verifiable catch and effort data. Nevertheless, Origin would also consult with such commercial fishers who may claim an intention to fish in the survey area during the survey. Origin would advise such fishers that any agreement to compensate would only be made upon verification of historical catch and effort data that could reasonably be expected to demonstrate future fishing locations of the commercial fisher.

In October 2016, the Fisheries Research and Development Corporation (FRDC) published a report following a four year study into the potential impact of seismic surveys on economically important

fishery species, including the southern rock lobster *Jasus edwardsii*. The southern rock lobster has long been considered to form a single population throughout the range of Australasia (Smith et al 1980, Ovenden et al 1992). A recent study (Morgan et al 2013) found genetic differences between New Zealand and Tasmanian lobsters, which may indicate separate populations; however, the Australian population is still considered a single population. The species is listed as least concern on the IUCN Red List.

The findings of the FRDC research were that, while seismic exposure did not cause any lobster mortality over the course of the experiments, sub-lethal effects that influenced lobster mobility and immune function were observed. These effects may impact catchability, and some effects were observed to last for up to 365 days following seismic exposure.

Based on the FRDC report, the affected area was calculated. The affected area falls within the Victorian southern rock lobster fishery. The abundance of rock lobsters in the Victorian fishery naturally declines from west to east as the availability of rocky reef habitat declines. The Victorian fishery is divided into two zones, with the Western Zone (in which the survey will be carried out) estimated by Fisheries Victoria to have twice the available biomass (650 tonnes) as the Eastern Zone (319 tonnes) (DEDJTR, 2016).

The southern rock lobster has been exploited for commercial purposes since at least 1951. The current assessments of biomass use a baseline from 2001-02 and this information is used to benchmark the abundance of the rock lobster population in Victoria. Fisheries Victoria is actively managing the fishery in accordance with the principles of ecologically sustainable development. The management framework includes the use of a quota system as the management control to protect the ecosystem and the sustainable use of the fishing resource. In the 2009 Victorian Rock Lobster Fishery Management Plan, Fisheries Victoria's highest order objective was to rebuild the available stock biomass. Since the introduction of the 2009 plan, stocks in both the Western and Eastern Zones have consistently improved as a result the reductions in quota (Figure 18).

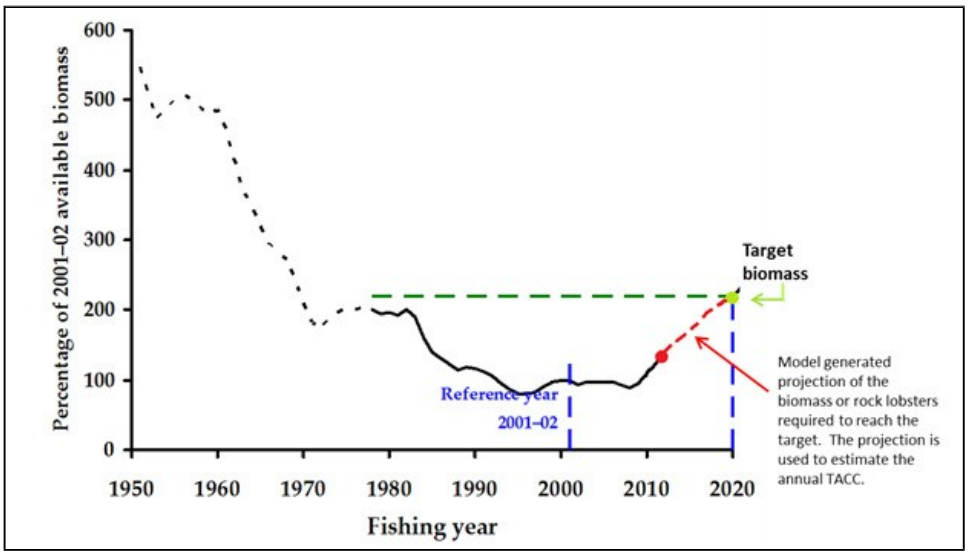


Figure 18: Trajectory of available biomass required to rebuild the stock to the target by 2020/21 (Total Allowable Commercial Catch, 2016)

The primary indicator of rock lobster abundance (i.e. biomass) is Catch Per Unit Effort (CPUE) (DEDJTR, 2016). CPUE has increased in the Western Zone in recent years, indicating again that stock is improving, such that available biomass is currently estimated to be 650 tonnes. However, catch and length-frequency data suggests that recruitment is currently low. Given the 2014/15 TACC of 230 tonnes was fully taken, the resultant exploitation rate of southern rock lobsters in the Western Zone is 34.4%.

The fishing industry relies on the southern rock lobster population to sustainably harvest rock lobsters, principally for export. As such, it is important to the industry that there is no serious impact or irreversible decline in the southern rock lobster population (which would present a long-term ecological and economic threat), as well as a mechanism to make good for any decline in abundance or catchability within the region and affected area (which could present a short or long-

term economic impact for affected fishers either through declining catch or higher effort and operational costs as well as the Apollo Bay Fishermen's Cooperative).

As set out above, it has been predicted that the survey will not result in a serious or irreversible impact to the entire southern rock lobster population.

However, there may be impacts on abundance and recruitment in the Western Zone, as well as impacts on lobsters within the affected area (including catchability effects), which could affect the fishing industry.

Assessment of Correlation between Seismic Surveys and Catch

In the absence of peer-reviewed research specifically correlating seismic acquisition to lobster population effects, Origin has consulted empirical data for the region. One way to test whether there are population impacts on lobsters is to consult the documented history of annual lobster catches in the region, where seismic surveys have been conducted regularly over the past 55 years.

Parry and Gason (2006) undertook a statistical analysis of catch-per-unit-effort (CPUE) data collected over nearly 30 years in the Victorian southern rock lobster fishery which showed no influence of historical 2D and 3D seismic survey activity. Analyses looked at short-term (weekly) and long term variations (up to 7 years) in catch per unit effort to determine whether changes were correlated with the seismic surveys. The surveys occurred in water depths ranging from 10 m to 150 m; therefore, the study is representative of the water depths planned for the Crowes Foot survey. The study included surveys occurring during the rock lobster spawning period as well as during the rock lobster fishing season and so would have interacted with adult lobsters and larvae in the same way that the Crowes Foot survey may.

Parry and Gason (2006) found no evidence that catch rates were affected in the weeks or years following the surveys; however, Day et al. (2016b) suggest that catch rates would have had to decrease by around 50% for this study to detect a result. In addition, it is acknowledged that the authors caution that most of seismic surveys occurred in 'deep water' and therefore the statistical power of the analyses of short term (weekly) effects on catch rates from surveys in shallow water depths may provide less statistical certainty than the long term analyses (the shallower surveys were represented by lower levels of survey effort, lower rock lobster abundance and lower levels of fishing effort). The distinction made by Parry and Gason (2006) between 'deep' and 'shallow' water surveys corresponds with water depths greater than or less than 50 m so the results are still applicable to the Crowes Foot survey. The long term analyses were less sensitive and so the statistical power of these results was not affected.

However, this analysis and findings of Parry and Gason (2006) is relevant to the Crowes Foot survey location, timing and water depths.

Consultation with the rock lobster industry has not presented a method to determine impacts to the fishery from the Crowes Foot survey.

In the absence of material that enables a conclusion to be drawn regarding any impact of seismic surveys on abundance and recruitment (arising out of the sub-lethal effects found in the FRDC study), Origin has assessed a hypothetical scenario (including on catchability) that scenario assumes a defined significant impact within the affected area.

Effect on fishing industry

The fishing industry relies on the southern rock lobster population to sustainably harvest rock lobsters, principally for export. As such, it is important to the industry that there is no serious impact or irreversible decline in the southern rock lobster population (which would present a long-term ecological and economic threat), as well as a mechanism to make good for any decline in abundance or catchability within the region and affected area (which could present a short or long-term economic impact for affected fishers either through declining catch or higher effort and operational costs as well as the Apollo Bay Fishermen's Cooperative).

As set out above, it has been predicted that the survey will not result in a serious or irreversible impact to the entire southern rock lobster population.

However, there may be impacts on abundance and recruitment in the Western Zone, as well as impacts on lobsters within the affected area (including catchability effects), which could affect the fishing industry.

It should be noted that it is a requirement for any fisherman who take Giant Crab are required to have Rock Lobster licence as a prerequisite. Giant crab is sometimes a bycatch of rock lobster fishing but there are a small number of fisherman who do target them in the Western Zone. All potential giant crab fisherman in the affected area have been consulted regarding the FRDC research.

Abundance and recruitment – Western Zone

The southern rock lobster fishery is a valuable commercial fishery for Victoria, and is important to the State's economy, as well as to coastal communities and fishers. In total, approximately 3,600 tonnes of southern rock lobsters are caught each year across six fishery zones in the South Australian, Victorian and Tasmanian fisheries (refer Figure 19 and 20 and Table 14).

As set out above, Fisheries Victoria actively manages the fishery with an objective of including available biomass. It uses a quota system as a management tool. Since introduction, the quota system has significantly reduced the permitted catch. Without doubt, the maintenance or increase of total allowable catch is critically important to fishers. In setting the quota, Fisheries Victoria assesses abundance and recruitment, with the three most important factors being Catch Per Unit Effort (CPUE), catch weight and numbers, and length-frequency data. Stock assessments in recent years indicate that CPUE is increasing; however, recruitment remains low. It is reasonable to expect that fishers want to minimise the likelihood of the survey reducing CPUE or recruitment, as that could result not only in an impact on health and abundance, but to a further reduced quota.

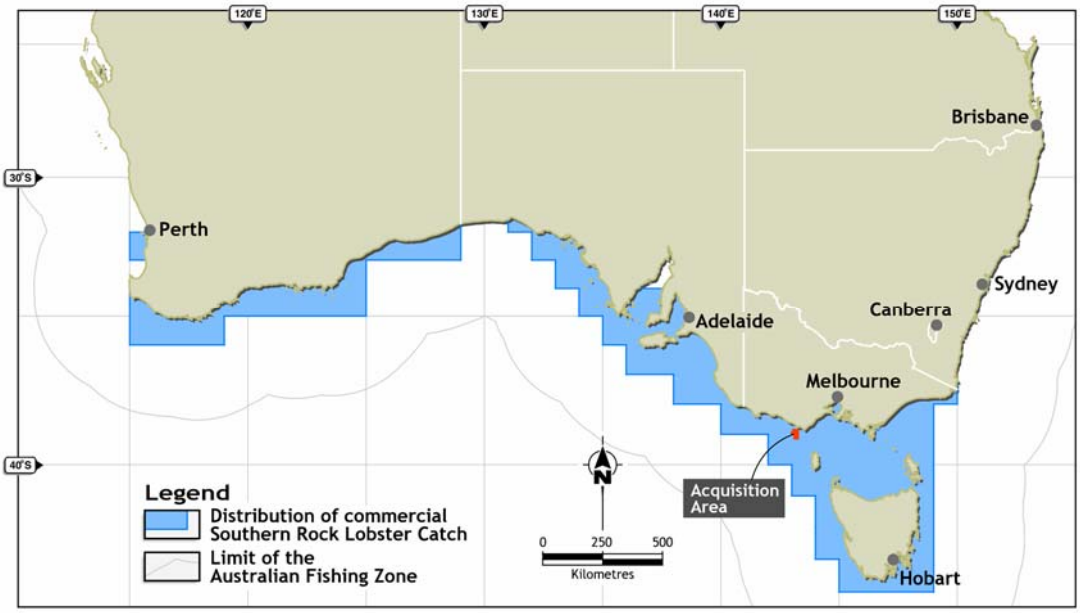


Figure 19: Distribution of reported commercial catch of Southern Rock Lobster in Australian waters in the 2012-13 fishing season. (Note fishing seasons are October 2012 – May 2013 South Australia; November 2012 – September 2013 Victoria; November 2012 – September 2013 Tasmania; November 2012 – June 2013 Western Australia south coast)

Table 14: Mean annual catch in the South Australian, Victorian and Tasmanian fisheries

Fishery	Mean annual	Years
Northern Zone (SA)	441.1	2003 - 2010
Southern Zone (SA)	1500.0	2007 - 2010
Western (VIC)	342.5	2002 - 2014
Eastern (VIC)	52.7	2002 - 2014
Southern Rock Lobster	1219.2	2007 - 2016
East Coast Catch Cap Area	116.5	2014 - 2016

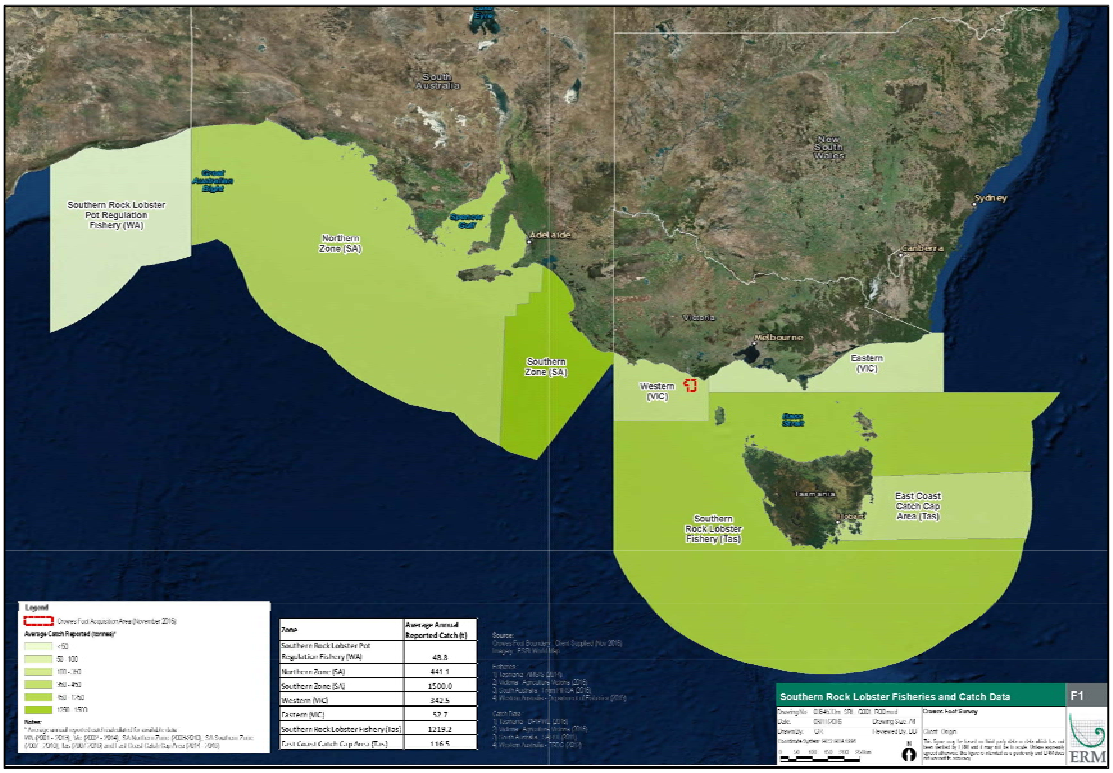


Figure 20: South Australian, Victorian and Tasmanian fishing zones for Southern Rock Lobster

Commercial fishers must have a licence to fish for southern rock lobsters, and there are currently 71 licenses for the Western Zone. Most of the catch is caught in baited pots, and there is a limit on the number of pots that may be used as well as a seasonal quota. That quota is divided into transferrable units and allocated to the licensed fishers.

Fishers in the Western Zone report catch and effort data to the Fisheries Victoria, using a grid system to record location. Grids are based on divisions of 10' latitude × 10' longitude (approximately 10 ×10 nm). Twelve such fishing grids intersect the affected area. Nine of these grids (H13, J12, J13, J14, K12, K13, K14, L13 and L14) substantially overlap with the affected area whilst only very small areas of the remaining grids are intersected.

Catch and effort data are available from Fisheries Victoria for grids which have information comprised from five or more data sources (“five fisher rule”). Most fishing grids which intersect the affected area do not meet this criteria (**Figure** 21 and Table 15). To estimate the mean annual catch for blocks intersected by the affected area the following methods were employed:

- Data for three years, 2011-2012; 2012-2013 and 2013-2014 were averaged.
- Data from all 12 intersected grids were utilised.
- Five of the grids had zero catch data, due to no fishers (K12, K13, L12, L13, L14).
- Two of the grids had more than five fishers, so a full dataset was available (H14, K14). For those two grids the data were averaged over three years.
- For the other grids, as there were less than five fishers per grid, the average number of fisher per year has been multiplied by the average catch per fisher from the two known grids (H14, K1). Given the water depths and number of fishers in these blocks this is considered a conservative approach.

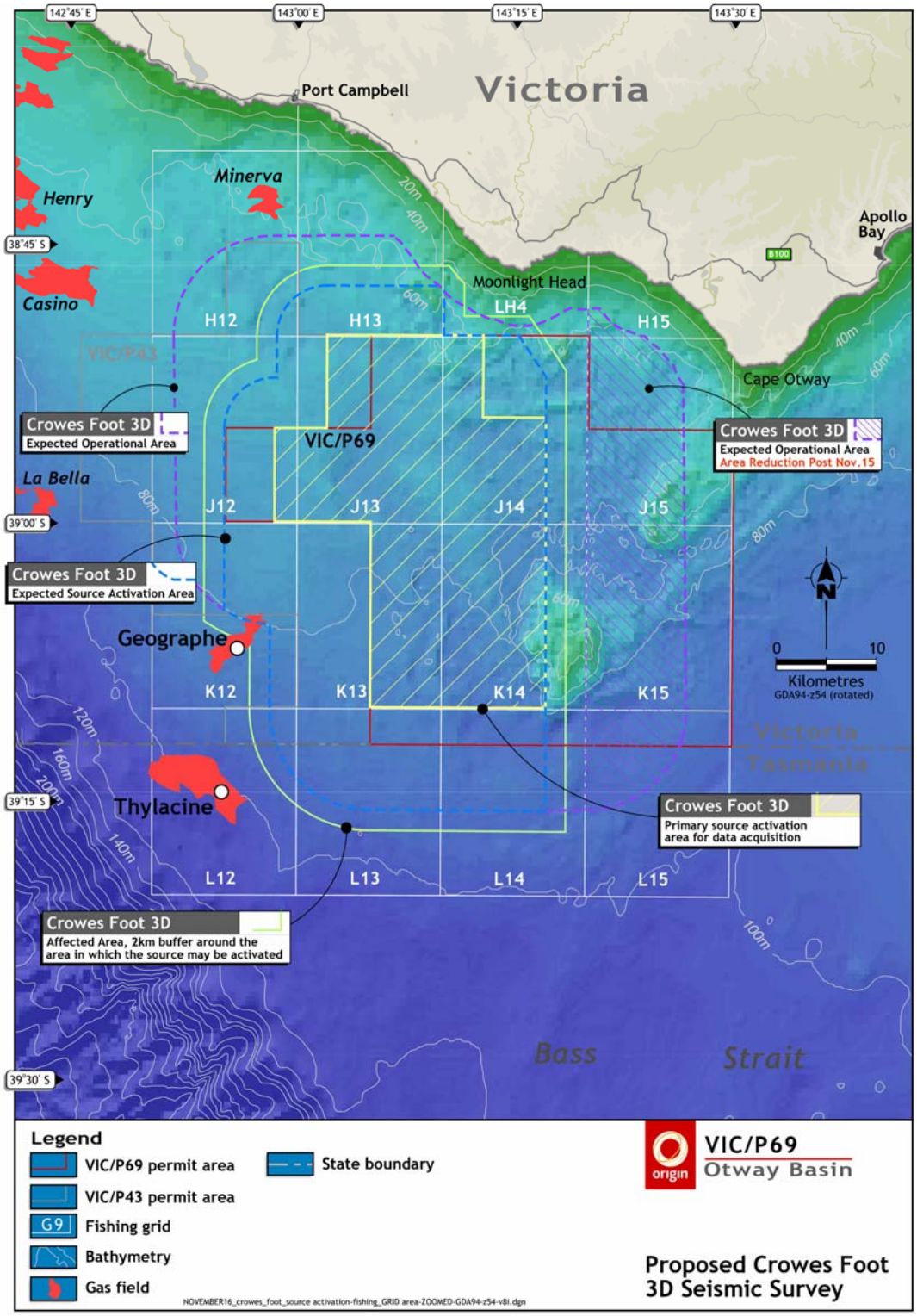


Figure 21: Fisheries Victoria Grid Blocks, with Affected Area overlaid and with Bathymetry

Table 1: Fisheries Victoria Block Reference, Average Fishers and Catch over seasons 2011 through 2014, with calculated percentage of catch in affected area.

Block Reference	Average Number of Fishers (2011-2014)	Average catch (kgs) (2011-2014)	Block Area (sqkm)	Size of affected area within block (sqkm)	Percentage of block covered by affected area	Total catch within affected areas of blocks (kg)
H12	0.67	855.81	268.03	19.1	7%	60.99
H13	1	1283.71	254.69	103.12	40%	519.75
H14	6.67	7581	127.99	35.88	28%	2125.22
J12	0.67	855.81	267.41	149.84	56%	479.54
J13	0.67	855.81	267.45	267.45	100%	855.81
J14	1	1283.71	267.48	228.1	85%	1094.72
K12	0	0	266.79	136.42	51%	0.00
K13	0	0	266.83	266.83	100%	0.00
K14	5	7203	266.83	228.91	86%	6179.36
L12	0	0	266.17	31.39	12%	0.00
L13	0	0	266.2	167.84	63%	0.00
L14	0	0	266.24	149.94	56%	0.00

Total catch from Affected Area (kg)	11315

Thus this provides an estimate of average annual catch in the fishing grids which intersect the affected area of approximately 11,315 kg. This estimated annual catch represents approximately 0.31% of the mean annual catch of the southern rock lobster fishery (Vic, SA and Tas using Mean Data from Table 15), and approximately 2.9% of the mean annual catch in the Victorian fishery.

For season 2011-14 data (referTable 15), the proportion catch from the affected area versus the rest of the Western Zone average (246.25 t) was 4.6%. This proportion shows even at the recent lower catch rates the proportion of affected catch potentially is still relatively low in local fisheries terms and would be less in a state and national context.

During this time, catch rates have also increased, thereby resulting in a more economically efficient commercial fishery (Draft Victorian Rock Lobster Fishery Management Plan, 2015). Indeed despite lower quotas reducing TACCs, beach price has steadily risen since the mid-2000s ensuring that the fishery remains profitable (Figure 22).

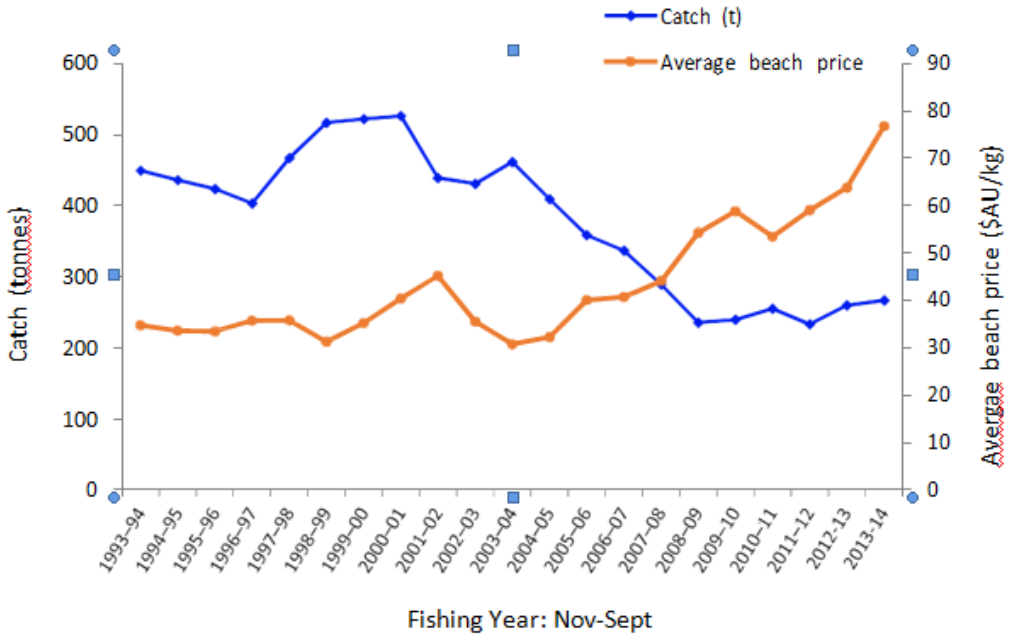


Figure 22: Changes in the average beach price in the Western Zone from 1993/94 to 2013/14 (Draft Victorian Rock Lobster Fishery Management Plan, 2015).

Catchability

In relation to catchability, the primary physiological response detected in the FRDC study which points to a loss of function in the exposed lobsters that may translate to reduced mobility or sensory ability (and thus catchability) is damage to the statocyst. Impairment to spatial orientation ability due to statocyst damage may reduce the ability of a southern rock lobster to navigate to and enter a baited trap. A lobster's ability to locate food is also a factor.

Assessments of the catchability of the southern rock lobster population with impaired statocysts within the CPSR have been undertaken by Ziegler et al. (2002a, 2002b) by comparing catch rates obtained in the trapping surveys to the density of lobsters on the reef determined through underwater observations. Catch rates of males and females and the sex ratio of trapped lobsters was found to vary strongly with season, implying that catchability varies seasonally and with sex. Catchability generally increased with size, with larger lobsters over represented in the catch. No indication of low or impaired catch rates were presented in these studies and suggest that there is no highly significant effect on catchability due to statocyst damage. However, the methods used preclude a direct comparison with catch rates reported by commercial fishers in adjacent areas.

Chemosensory systems have been identified as centrally involved to the feeding behaviour of rock lobsters (Derby and Atema 1981, Derby et al. 2001). Whilst the FRDC study did not directly assess chemosensory systems, no change in nutritional status of adult lobsters was observed that could be attributed to seismic exposure. The nutritional condition of all lobsters improved considerably during the prolonged period post-exposure period (120-365 days). This finding suggests that the lobsters' chemoreceptory facilities that would influence the lobsters' ability to locate food (e.g. bait within traps) were not impaired.

Consultation with the rock lobster industry has not presented a method to determine impacts to catchability from the Crowes Foot survey.

Significance of Worst Case Scenario on Biomass Population in the Western Zone

As already stated, the FRDC report found that exposure to seismic sound did not result in any mortalities of adult lobsters, even at close proximity. However, the consequences of the sub-lethal effects found in the study as they relate to abundance, recruitment and catchability are unknown. Rather than predict how those effects play out in the real world, a worst-case scenario has been taken for impact assessment purposes. The scenario considered assumes a lethal effect on the available

biomass in the affected area. In order to assess this impact, the estimated biomass in the affected area is considered “exploited” (i.e. taken from the area). It follows that the exploitation rate in the Western Zone would then increase from 34.46% (as presented in the Stock Assessment Report, 2014/15) to 39.51%. This increase is calculated based on an estimated 100% exploitation of available biomass for affected area. Using the 2011-2014 affected area catch result of 11.315 t at exploitation rate 33.46% it was extrapolated to 100% to get 33 t exploited available biomass or approximately 5% of the 650 t available biomass of the Western Zone. In the context of historical exploitation rates and available biomass, this percentage increase is well within year-to-year variations (Figure 23) where available biomass as defined by Fisheries Victoria as a measure of the stock biomass of rock lobsters that can legally be caught. It would also be less when put into a state and national context.

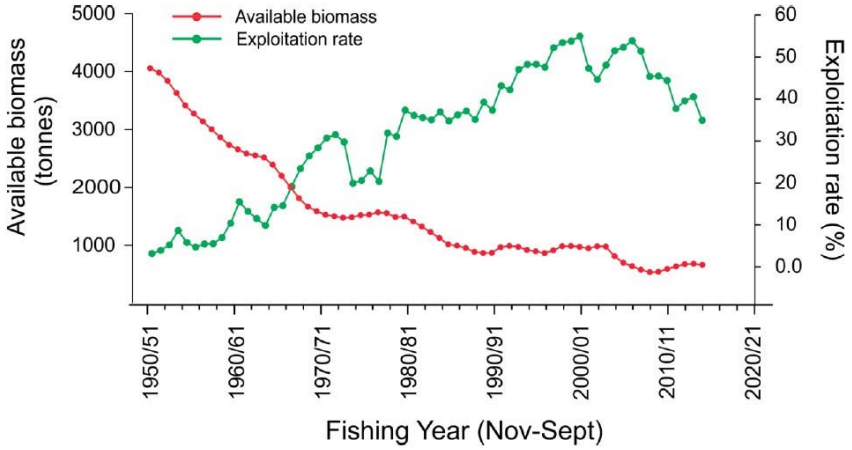


Figure 23: Model estimate levels of available biomass and associated fishing exploitation rates in the Western Zone fishery between 1951 and 2014 (DEDJTR, 2016).

The report concluded that seismic surveys appear to be unlikely to result in immediate large scale mortality in the southern rock lobster fishery, and did not (on their own) appear to result in any degree of mortality. It is noted that the affected area takes in less than half a percent of the entire Australian southern rock lobster population area (spatially).

Significance to individual fishers in the Western Zone

A relatively small number of fishers traditionally fish in the affected area. The importance of areas such as the Big Reef, the reefs offshore of Moonlight Head and the 3, 9 and 11 mile reef features, is such that the affected area is likely to represent a significant part of the area in which these fishers catch their quotas. Therefore, Origin has concluded that any impact on abundance and recruitment (particularly CPUE) and catchability would be material for those fishers. Relevant stakeholders have also expressed the view that the impact on relevant fishers (and the Apollo Bay Fishermen’s Cooperative) is material. Origin has worked with fishers and the ABFC to identify and respond to impacts through its compensation model.

Origin has been engaging with stakeholders including the Victoria Rock Lobster Fishers Association (VRLA), Seafood Industry Victoria (SIV) and individual fishers on an ongoing basis. Origin’s preference is to agree how the two industries can work with each other for mutual benefit, and has (in September 2016) proposed that Origin and SIV enter into a Memorandum of Understanding (MOU) for that purpose. VRLA has indicated that it agrees in principle with that approach.

In the absence of an MOU, a key reason for Origin to engage with the fishing industry is to ensure Origin understands the importance of the fishery to the industry and how it is used so as to be able to work effectively with the fishers and to avoid or minimise any disruption and economic impact. The affected area takes in areas of the Western Zone that are vitally important to the fishers who traditionally fish in the area or otherwise would (but for the survey) fish in the area during the survey period. Origin also understands from its engagement with stakeholders that each of the fishers have different practices and preferences, and that the compensation framework Origin adopts should not be one size fits all.

Origin Fisheries Management Plan

Origin's objective is to identify genuinely affected commercial fishers, ensure they are not financially disadvantaged due to the survey operating whilst they would have been fishing, and ensure that such compensation approach does not cause any displacement of fishers in other areas. The in principle approach reflected in Origin's Fisheries Management Plan includes:

- Validation of historical catch and effort data to determine likelihood that the fisher would have fished in the survey area during the survey.
- Agreement of commercial fisher to not fish elsewhere during the period of downtime due to the survey so as not to displace other fishers, and to retire quota relevant to the period of downtime, so as not to displace other fishers.
- Provision by commercial fisher of verifiable catch and effort data from historical fishing years as a measure of lost catch for the downtime caused by the survey.
- Acceptance by the commercial fisher to receive prevailing market rates to compensate for the lost catch due to downtime.

The Crowes Foot stakeholder log includes records of consultations with VRLA and Apollo Bay fishers regarding Origin's compensation approach, recommendations from these commercial fishers to refine Origin's approach to require commercial fishers to retire the value of their quota whilst being compensated by Origin (should this be required), and in principle agreement with the approach.

Victorian Rock Lobster Fishery Management Plan

The VFA is implementing a new harvest strategy as part of the Fisheries Management Plan. This will provide an updated structured framework for assessing the status of a fishery and a set of rules to determine what the annual catch limits will be to ensure long term sustainability of the fishery. Trial implementation of this harvest strategy is in place is this year.

This management plan represents the third plan for the fishery. The first was a five year plan declared in 2003, which contained two key objectives to (i) rebuild the rock lobster biomass and (ii) promote commercial use for economic prosperity.

The second management plan for the fishery came into effect in 2009. It was prepared after undertaking a review of the effectiveness of the first plan and an ecological risk assessment of the fishery. In the years between the two plans, available biomass had only marginally increased and catch rates had fallen sharply in some areas of the fishery.

The core objective of the second management plan was a deliberate stock rebuilding scheme, where commercial catches were constrained to levels that ensured a significant increase in the available biomass over the life of the management plan.

The scheme, which was implemented though a harvest strategy, included a rebuilding target and the implementation of commercial catches that maintained stock growth along a predetermined trajectory to a biomass target. The target was based on a 10-year time line and set a trajectory to rebuild the available biomass to 40% of the estimated biomass in 1951 (the first year of records for the fishery). The volume of available biomass, as well as other aspects of the fishery such as levels of recruitment, were estimated using a range of fishery dependent and independent data and calculated using the rock lobster fishery model. The fishery model was also used to calculate the annual total allowable commercial catch (TACC) required to stay on the trajectory to the target.

Since the introduction of the second plan, the stocks in both zones of the fishery have consistently improved as a result of reducing the TACC in accordance with the requirements of the harvest strategy, and despite lower than average recruitment to the fishery over the past decade. Correspondingly, catch rates have also increased, resulting in a more economically efficient commercial fishery (DEDJTR 2015)

Cumulative impacts and long term impacts to the Southern Rock Lobster

Previous Origin projects within the vicinity of the Crowes Foot survey area have included the Enterprise 3D seismic survey (2014) and Astrolabe 3D seismic survey (2013). To consider the potential

cumulative impacts of these projects on the rock lobster populations, an assessment of overlapping survey areas in association with fishing zones has been undertaken.

Following in-field sound verification modelling a buffer area for potential sound impacts to rock lobsters of 3.2km has been identified. As such, cumulative impacts from these surveys has considered this buffer.

The Enterprise survey location was a sufficient distance from the Crowes Foot survey, including the 3.2km buffer, to ensure that no overlapping effects would occur. At the closest point, a distance of 9.7km remains between the survey areas.

The Astrolabe survey overlaps the south-western corner of the Crowes Foot survey Table 16 outlines those areas of overlap between the two projects.

Table 16: Areas of overlapping acquisition areas between Astrolabe and Crowes Foot surveys

Fishing Zone	Area of project overlap (km2)	Area of buffer overlap (km2)
J12	0	2.06
J13	0.66	43.91
K12	0	35.81
K13	31.73	83.68
L12	0	23.16
L13	0	48.46

The overlap in some of these fishing block is significant at local scale but catch and CPUE have all increased during this period which would suggest any localised impact if present is minimal.

Figure 24 shows the historical Western Zone fishery catch data plotted against the timing of seismic survey in the Otway basin. No distinct correlation can be made between the survey timing and catch data. This does not dismiss potential mortality due to sub-lethal effects described in the FRDC research but potentially indicates more significant drivers of population change. This could be due to a number factors including small size of seismic acquisition areas relative to the fishery, larval dispersal providing buffering to fishery population impact, other parties impact on the fishery and environmental factors.

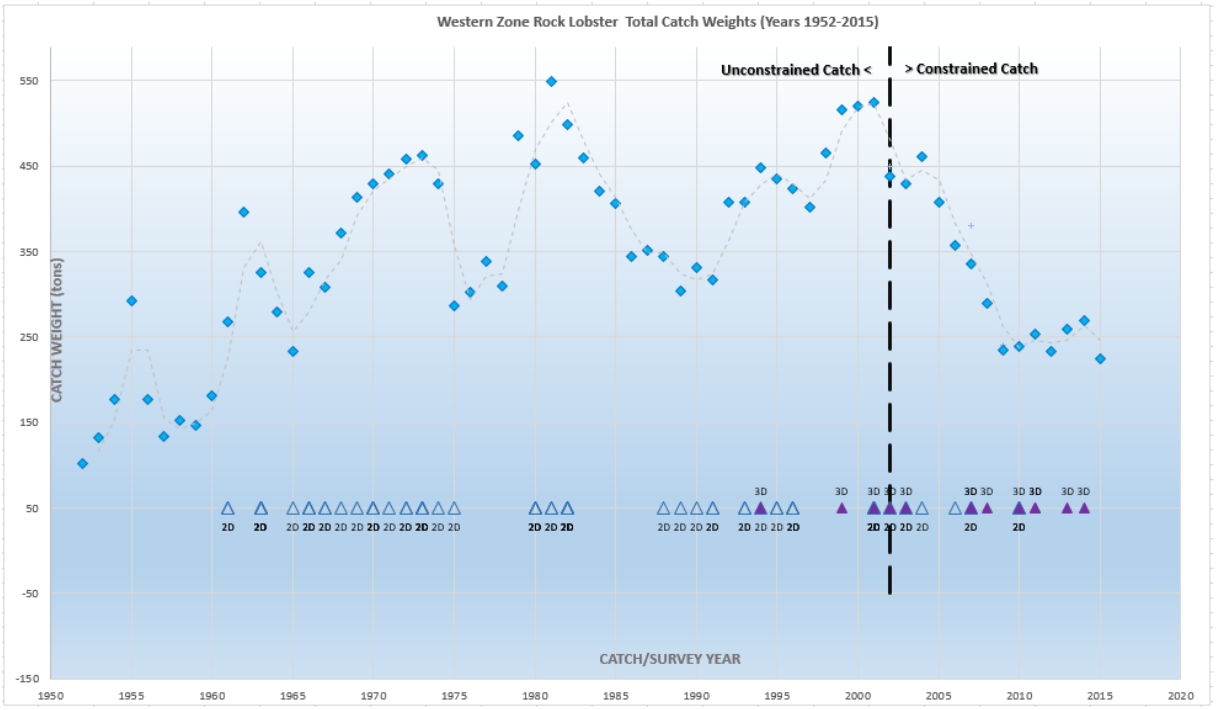


Figure 24: Historical catch data for the Western Zone and Seismic Surveys.

The draft harvest strategy is proposed to have a TACC cap of 300 t under the new strategy which will keep the catch rate below historical catch rates peaks of the last 25 years. This is important because the trend in catch since it has been sustained below 300 t has seen a rebuilding of available biomass. In this period various seismic survey has also taken place which may suggest at a catch rate below 300 t that the fishery population may have enough resilience to continue available biomass increases even in the event that mortality for other sources was occurring on the population (refer Figure 25).

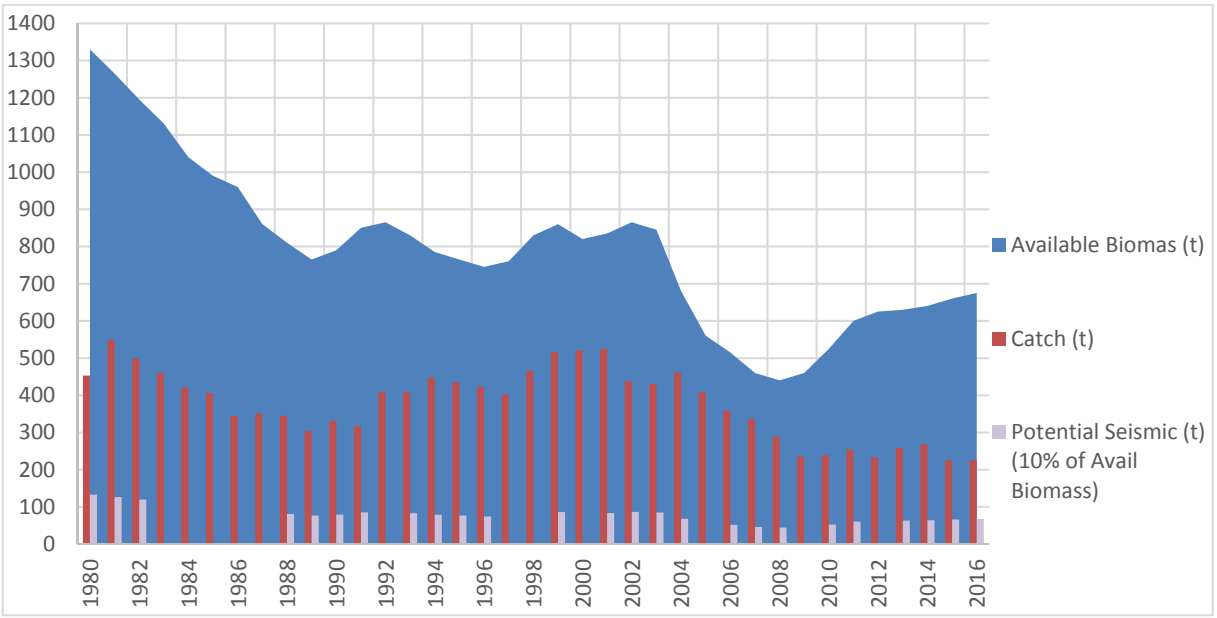


Figure 25: Available biomass and catch comparison including a worst case estimate for seismic.

A qualitative assessment of available biomass vs catch from 1980-2016 (Figure 25) shows a trend that periods of sustained decline in available biomass are preceded by sustained catch rates above 300 t

per year (e.g. 1980-1988 and 1992-2007). From 2009 to 2016 with catch rates maintained below 300 t the available biomass has been on an upward trajectory.

The harvest strategy including implementing a 300 t TACC cap would appear to identify this a key threshold for the western zone fishery but this has not been confirmed with VFA. However the historical data provides some evidence that limiting catch below this level may be an effective control.

Providing context to impacts on the rock lobster population

When assessing the impact to fishery from changes in the rock lobster population it important to ensure each potential impact is assessed in relation to other factor in the fishery. There is still no research that show seismic survey's cause mortality of rock lobster and in turn have an impact of catch rate for the fishery.

Known stressors to the rock lobster population include but are not limited to commercial fishing mortality; recreational fishing mortality; illegal fishing mortality and climatic factors like sea temperature changes influencing recruitment. Seismic operations has the potential to be population stressor but there are other anthropogenic noise sources that also have the same potential to be a stressor to the rock lobster population including shipping traffic and port operations.

Day et al (2016b) did present that control lobsters collected from Taroona site had damaged statocyst organs prior to exposure in experiments whilst remote location did not. Simultaneous sea noise loggers were placed at both sites from June 2015 to July 2015 to determine what ambient noise lobsters may have been exposed to revealed high noise levels due to shipping and low frequency tones due to pumping station at Taroona Reserve location. The shipping example also creates uncertainty around the general level of statocyst damage to rock lobster population that is existing but also could suggest potential adaptation to the damage.

The frequency of shipping is a more constant source of sound into the marine environment could be a stressor of greater influence that seismic operation on the basis of frequency but without research into specific impacts of shipping on rock lobster the evidence is anecdotal but acknowledged by Day et al (2016b). Figure 26 show shipping intensity in the Crowes Foot survey region.

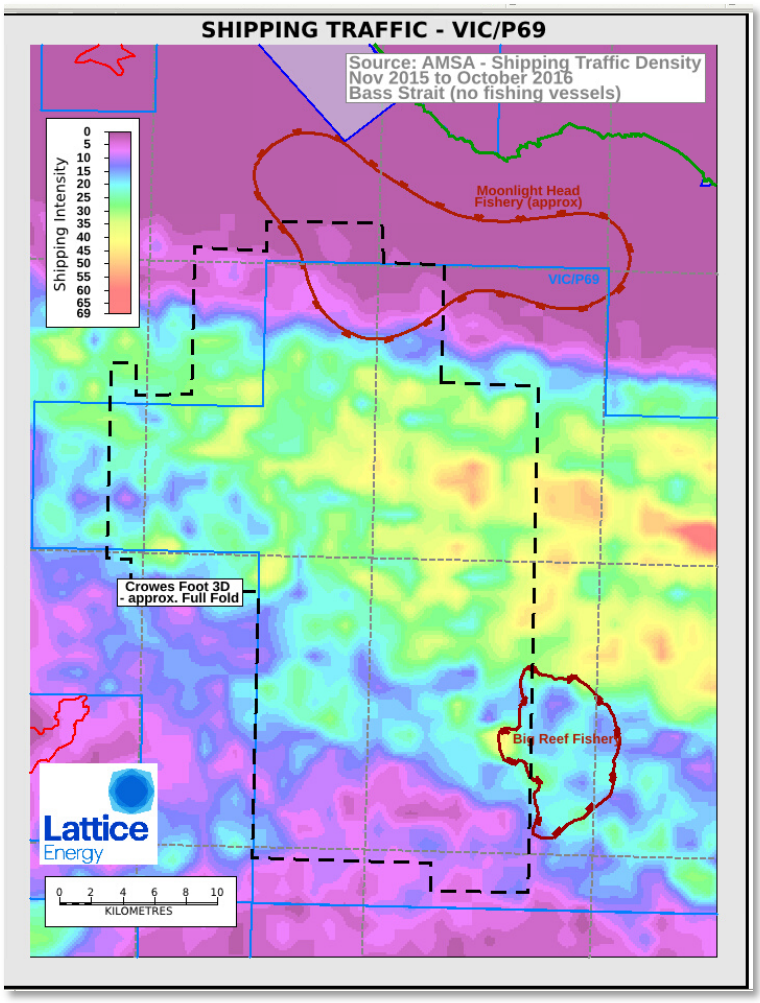


Figure 26: Shipping intensity in the Crowes Foot survey region

The most likely significant stressor on the rock lobster is the mortality from fishing. Figure 25 shows data for the last 25 years of fishing but this can also provide insight into the influence of other stressors on the population, it's resilience and its ability recover population decline event as these stressors although difficult to quantify were occurring at the time of capturing this data.

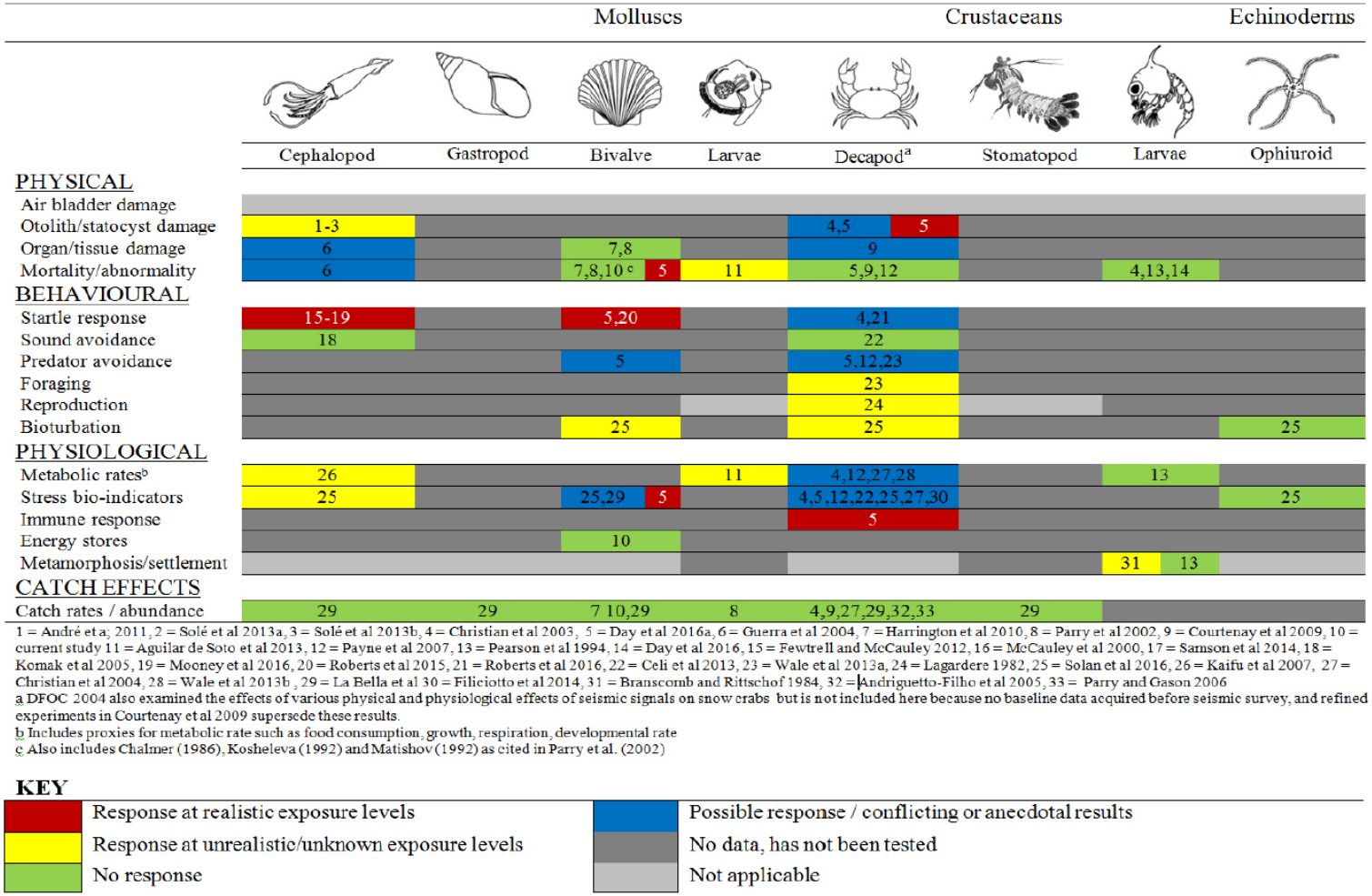
A conservative seismic impact has been plotted based on Figure 25. This impact has used Crowes Foot catch impact estimate of 5% of available biomass and doubled to capture potential multi survey years. This would be conservative due to the size of the acquisition area in relation to others survey area, Crowes Foot being a 3D survey and overestimate significantly in years of only one survey. Qualitatively no clear trend presents with available biomass or catch.

In 2012 it was reported that for the Southern Rock Lobster fishery (South Australia, Tasmania and Victoria) fishing mortality, combined with low recruitment, led to a steady decline in egg production from 2002 to 2008. Total allowable commercial catches (TACCs) were reduced in response, and egg production began to recover in 2009 (Linnane et al 2012). This is consistent with the Victorian Western Zone Rock Lobster fishery trend.

Further recent research has been published around impact to fishery species that provides more evidence of unlikely impacts to the fishery. Snow crab harvesters in Atlantic Canada contend that seismic noise from widespread hydrocarbon exploration has strong negative effects on catch rates. They repeated a Before-After-Control-Impact study over two years to assess the effects of industry scale seismic exposure on catch rates of snow crab along the continental slope of the Grand Banks of Newfoundland. Their results did not support the contention that seismic activity negatively affects catch rates in shorter term (i.e. within days) or longer time frames (weeks). However, significant differences in catches were observed across study areas and years. While the inherent variability of the CPUE data limited the statistical power of this study, their results do suggest that if seismic effects on snow

crab harvests do exist, they are smaller than changes related to natural spatial and temporal variation (Morris et al 2017).

Figure 27 below is from the Przeslawski et al 2016 and provides summary of current research on impacts of seismic to invertebrates including decopods. This figure shows there is evidence response, possible response and anecdotal or conflicting results for physical behavioural and physiological factors but there is also a body of evidence which show no catch effect in relation to seismic activities. This said, the report does emphasis that the assessment of impacts is complex and no research could be definitive for all scenarios.



1 = André et a; 2011, 2 = Solé et al 2013a, 3 = Solé et al 2013b, 4 = Christian et al 2003, 5 = Day et al 2016a, 6 = Guerra et al 2004, 7 = Harrington et al 2010, 8 = Parry et al 2002, 9 = Courtenay et al 2009, 10 = current study 11 = Aguilar de Soto et al 2013, 12 = Payne et al 2007, 13 = Pearson et al 1994, 14 = Day et al 2016, 15 = Fewtrell and McCauley 2012, 16 = McCauley et al 2000, 17 = Samson et al 2014, 18 = Komak et al 2005, 19 = Mooney et al 2016, 20 = Roberts et al 2015, 21 = Roberts et al 2016, 22 = Celi et al 2013, 23 = Wale et al 2013a, 24 = Lagardere 1982, 25 = Solan et al 2016, 26 = Kaifu et al 2007, 27 = Christian et al 2004, 28 = Wale et al 2013b , 29 = La Bella et al 30 = Filiciotto et al 2014, 31 = Branscomb and Rittschof 1984, 32 = Andriguetto-Filho et al 2005, 33 = Parry and Gason 2006

a DFOC 2004 also examined the effects of various physical and physiological effects of seismic signals on snow crabs but is not included here because no baseline data acquired before seismic survey, and refined experiments in Courtenay et al 2009 supersede these results.

b Includes proxies for metabolic rate such as food consumption, growth, respiration, developmental rate

c Also includes Chalmer (1986), Kosheleva (1992) and Matishov (1992) as cited in Parry et al. (2002)

Figure 27: A summary of the potential impacts of low-frequency sound on various responses of marine invertebrates. Identified impacts are classified according to sound exposure treatments as realistic for seismic surveys (i.e. a few short bursts of low-frequency at a distance greater than 1-2 metres) or unknow/unrealistic (i.e. continuous sound exposure >100 bursts of nearfield sound exposure). N.B. there are significant difference between seismic studies including air gun size, the number of air gun, the operating pressure to the guns, the sound exposure and recovery time of fishes and the environment in which studies were conducted (Przeslawski et al 2016

7.8 Risk 4 – Interaction with divers

7.8.1 Hazard

The northern boundary of the operational area is approximately 3nm from the shoreline. Near shore areas between the operational area and the shoreline may be utilised for commercial and recreational abalone fishing and recreational diving activities. As such there is the potential that the seismic survey will be audible to humans engaged in diving activities below the water surface.

The following activities will generate underwater noise:

- Sound pulses from the seismic airgun array; and
- Engine noise transmitted through the hull and propeller noise from the survey and support vessels.

7.8.2 Known and Potential Environmental Impacts

Three main physiological symptoms associated with high level low frequency sound sources have been identified in humans (NATO n.d.). The first involves the Pacinian corpuscle, a sensor of the nervous system that is distributed throughout the epidermis and provides for vibrotactile sensitivity. The frequency response of the Pacinian corpuscles peaks at about 250Hz, the most annoying frequency in divers' complaints of tingling and numbness. The second effect involves acoustically forced vibrations of gas pockets in the gastrointestinal tract, which may be responsible for complaints of abdominal discomfort. The third major effect is one involving temporary hearing threshold shifts caused by the high levels of sound.

7.8.3 Evaluation of Environmental Impacts

A conservative safety threshold for recreational divers of 154-155 dB re 1 µPa is recommended in the United Kingdom and United States. Prior to any risk of physiological harm, a diver would be expected to hear underwater noise and experience discomfort as they approached the sound source. At volumes of 100 – 140 dB re 1 µPa, divers can hear underwater sound, but it is masked by exhaust bubble noise from the diver's regulator during normal breathing. Between 140 and 154 dB re 1 µPa the sound is clearly audible to bareheaded divers, but is generally tolerated well with only a slight aversion rating. When the diver is wearing a hood (likely to occur in most cases in the cold waters off the Victorian coastline) the audible signal would be reduced (Ainslie 2008, Parvin 2012).

In the case of the marine seismic surveys, it is possible for the 154 dB re 1 µPa threshold to be exceeded at distances of a few, and potentially to 10 kilometres in specific locations depending on the substrate and bathymetry. The majority of the underwater noise would be concentrated over a narrow depth band horizontal to the seismic source, with decreases of approximately 10 dB re 1 µPa for every 5 meters of depth above and below this (Duncan *et al.* 2012).

Consultation has been undertaken with abalone fishery associations, the Scuba Divers Federation of Victoria and local vessel charters operating out of Port Campbell and Apollo Bay (see **Error! Reference source not found.** for the fact sheet provided). No specific concerns were raised by abalone fishery associations regarding underwater noise. Advice from recreational diving stakeholders is that there are no dive clubs operating in operational area and recreational diving activity is generally concentrated around the wreck site of the Loch Ard, approximately 20km north of the nearest point of the acquisition area.

Origin proposes to manage any risk to abalone and recreational divers in the area through ongoing consultation with abalone fishery associations, the Scuba Divers Federation of Victoria and local vessel charters operating out of Port Campbell and Apollo Bay prior to and during the survey. Additionally, signage will be posted at boat ramps managed by Parks Victoria which are used by divers in the area.

A support vessel will accompany the seismic survey vessel at all times and will provide liaison with any vessels in the area, including those that may be planning diving activities. In these cases Origin would be recommending that divers avoid activities in the area for the duration of the survey.

7.9 Risk 5 - Introduction of invasive marine species

7.9.1 Hazard

During the survey, the vessels will ballast and de-ballast to improve stability, even out vessel stresses and adjust vessel draft, list and trim, with regard to the weight of equipment and fuel, potable water and so forth on board at any one time. The following activities have the potential to result in the introduction of Invasive Marine Species (IMS):

- Discharge of vessel ballast water containing foreign species; and
- Translocation of species through biofouling of the vessel hull or niches (e.g., sea chests, bilges, strainers).

7.9.2 Known and Potential Environmental Risks

The known and potential environmental impacts of IMS introduction (assuming their survival, colonisation and spread) are:

- Competition with native species for resources, reducing native species diversity and abundance.

7.9.3 Evaluation of Environmental Risks

IMS are marine plants or animals that have been introduced into a region beyond their natural range and have the ability to survive, reproduce and establish. More than 200 non-indigenous marine species including fish, molluscs, worms and a toxic alga have been detected in Australian coastal waters (AMSA 2010).

The survey vessel to be contracted for the survey may be mobilised from international waters which introduces the risk of translocating IMS to the operational area. The support vessels are likely to be mobilised from local ports, so their risk of introducing IMS is far less.

The operational area does not present a location conducive to IMS survival because it is located in deep oceanic waters (the WA DoF states that water depths greater than 50 m are unlikely to provide a settlement site for marine pests; the operational area is mostly deeper than 50 m). Establishment of IMS is mostly likely to occur in shallow waters in areas where large numbers of vessels are present and are stationary for an extended period.

Successful IMS invasion requires the following three steps (AQIS, 2009):

- Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g., home port);
- Survival of the settled marine species on the vector during the voyage from the donor to the recipient region; and
- Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population.

Successful IMS invasion as a result of the proposed survey is highly unlikely to occur as the three steps required for successful IMS invasion are unlikely to materialise, as outlined below:

- There is a low risk of colonisation and establishment of the marine vector:
- The survey vessel, if mobilised from international waters, must first dock at an Australian port whereby the relevant Department of Fisheries (or equivalent) will determine the vessel's compliance with the Commonwealth biosecurity standards, who have significant powers to prevent the arrival and establishment of IMS of concern.
- The survey vessel will have a current International Anti-fouling system Certificate.

Survival of the settled marine species on the vector during the voyage from the port to the recipient region is unlikely:

- The vessels will be travelling from port to the survey location at a speed that is likely to prevent fouling species adhering to the hull (enhanced through the application of anti-fouling paint).

Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population, is unlikely:

- The vessels are constantly in motion, making hull fouling less likely.
- Species that may be picked up when the vessel is stationary (in shallow port waters) are unlikely to survive at the project location due to the deep, cooler and dark nature of the seabed.
- If the vessel has recently spent time outside of Australian waters, it will have had to gain AQIS clearance and certification for an anti-fouling coating that complies with the requirements of Annex I of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships prior to entry to any Australian port.

With the adoption of the listed ballast water management and biofouling control measures, the likelihood of IMS introduction during the proposed survey is considered to be remote.

7.10 Risk 6 - Vessel strike or entanglement of cetaceans

7.10.1 Hazard

The following activity has the potential to cause interference with cetaceans:

- Movement of the vessels throughout the survey and operational areas.

7.10.2 Known and Potential Environmental Risks

The known and potential environmental risks of the vessel movements are:

- Injury from vessel strike or entanglement; and
- Death from vessel strike or entanglement.

7.10.3 Evaluation of Environmental Risks

Cetaceans are naturally inquisitive marine mammals that are often attracted to offshore vessels, and dolphins commonly 'bow ride' with offshore vessels.

The reaction of whales to the approach of a vessel is quite variable. Some species remain motionless when in the vicinity of a vessel (e.g., narwhals) while others are known to be curious and often approach ships that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster moving ships (Richardson *et al.*, 1995).

Collisions between vessels and cetaceans occur more frequently where high vessel traffic and cetacean habitat coincide (WDCS, 2006). There have been recorded instances of cetacean deaths in Australian waters (e.g., a Bryde's whale in Bass Strait in 1992) (WDCS, 2006), though the data indicates this is more likely to be associated with container ships and fast ferries. The Whale and Dolphin Conservation Society (WDCS) (2006) also indicates that some cetacean species, such as humpback whales, can detect and change course to avoid a vessel. The Australian National Marine Safety Committee (NMSC) reports that during 2009, there was one report of a vessel collision with an animal (species not defined) (NMSC, 2010).

When the survey vessel is stationary or slow moving, the risk of collision with cetaceans is extremely low, as the vessel's size and underwater noise 'footprint' will alert cetaceans to its presence and thus illicit avoidance.

Laist *et al.* (2001) identifies that larger vessels moving in excess of 10 knots may cause fatal or severe injuries to cetaceans with the most severe injuries caused by vessels travelling faster than 14 knots. The survey vessel will typically be travelling at speeds of 4-5 knots (8-9 km/hr) while acquiring seismic data in the operational area, so the risk of strikes with cetaceans is low, and the risk of injury or death to megafauna that may be struck by a vessel is lower again.

It is considered that a greater risk of cetacean collision would occur with the support vessels, as they can travel at higher speeds to effectively patrol the requested clearance zone around the survey vessel and towed array.

No incidents of collision with or entanglement of cetaceans has occurred during any seismic survey conducted by Origin in the Otway basin.

7.11 Risk 7 - Diesel spill

7.11.1 Hazard

Marine diesel fuel is used in large offshore vessels. The following activities have the potential to result in a spill of fuel:

- A collision between the survey or support vessel and a third-party vessel.
- Refuelling of the survey vessel.

7.11.2 Known and Potential Environmental Risks

The known and potential environmental impacts of a diesel spill are:

- Temporary decrease in marine water quality;
- Injury or death of exposed marine fauna; and
- Habitat damage where the spill reaches shorelines.

7.11.3 Evaluation of Environmental Risks

Diesel oils are generally considered to be low viscosity, non-persistent oils, which are readily degraded by naturally occurring microbes.

Diesel oils are considered to have a higher aquatic toxicity in comparison to many other crude oils due to the types of hydrocarbon present and their bioavailability. They also have a high potential to bio-accumulate in organisms.

Diesel is a medium-grade oil (classified as a Group II oil) used in the maritime industry. It has a low density, a low pour point and a low dynamic viscosity (Table 17**Table**), indicating that this oil will spread quickly when spilled at sea and thin out to low thicknesses, increasing the rate of evaporation.

Due to its chemical composition, approximately 40% will generally evaporate within the first day, with the remaining volatiles evaporating over 3-4 days depending upon the prevailing conditions. Diesel shows a strong tendency to entrain into the upper water column in the presence of moderate winds and breaking waves (>12 knots) but floats to the surface when conditions are calm, which delays the evaporation process.Table 18 shows the boiling point ranges for the diesel used in the spill modelling (see later in this section).

Table 17: Physical characteristics of marine gas oil

Parameter	Marine gas oil
Density (kg/m^3)	830 @ 15 ºC
API	36.4
Dynamic viscosity (cP)	2.5 @ 40 ºC
Pour point (ºC)	-36
Oil category	Group II (ITOPF & USEPA)
Oil persistence classification	Light persistent oil

Table 18: Boiling point ranges of marine gas oil

Characteristic	Volatiles (%)	Semi-volatiles (%)	Low volatiles (%)	Residual (%)
Boiling point (ºC)	<180	180 – 265	265 – 380	>380
Aromatics	MAHs	2-ring PAHs	3-ring PAHs	≥4 rings
Aliphatics	C_4-C_{10}	C_{10}-C_{15}	C_{15}-C_{20}	>C_{20}
Marine gas oil	16.4	49.0	31.9	2.7
	Non-persistent (bioavailable)			Persistent (non-soluble)

7.11.4 Modelling Results – Vessel Collision Spill

The proposed survey location is in a high-density shipping area, though an errant vessel collision with the survey or support vessels is an extremely remote likelihood. DNV (2011) indicates that for the period 1982-2010, there were no spills over 1 tonne (1 m^3) for offshore vessels caused by collisions or fuel transfers. The same DNV (2011) report also states that there were 24 recorded passing vessel collisions with offshore installations worldwide during 1990-2002, with the total oil spill frequency (per ship year) being 3.1 x 10^{-6} (0.0000031).

RPS APASA was engaged to complete oil spill trajectory modelling for a diesel release form a ruptured fuel tank in the operational area.

AMSA's Technical Guidelines for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities (AMSA, 2013, pg 26) indicates that an appropriate spill size for a vessel collision should be based on the volume of the largest tank. The volume of diesel to be carried by the survey vessel cannot be provided given that the vessel has yet to be selected. For Origin's Astrolabe marine seismic survey (using the *Viking II*) and the Enterprise marine seismic survey (using the *Polarcus Asima*) in the Otway Basin, the vessels had a total fuel capacity of 1,650 m^3 and 1,867 m^3 respectively

(divided over several tanks). The estimate of the largest capacity tank is 300 m^3. Origin has thus assumed the largest tank size for this modelling to be 300 m^3, which what has been modelled.

A diesel release resulting from a refuelling spill has not been modelled. This is because such fuels are typically in the order of only a few cubic metres. The NOAA (n.d) confirms that small diesel fuel spills (500-5,000 gallons, or 1.9–19 m^3) will evaporate or naturally disperse within a few days or less and is readily and completely degraded by naturally-occurring microbes within 1-2 months. Such spills are highly unlikely to reach the coastline from the operational area.

For this assessment, 200 random release sites were selected within the operational area with one simulation run from each point. This removes any bias in selecting a single spill location, and is the preferred method for modelling spills from moving vessels because:

- The survey vessel is a moving point, so selecting just one spill location would put an undue emphasis on that location;
- The point that is selected might be the closest to one particular receptor, but it may be further from others; and
- The nearest point within the operational area to a receptor may not pose the greatest risk. Depending on the prevailing metocean conditions, it may be a point further north or south, east or west.

The parameters for the spill modelling undertaken by RPS APASA (2015) are outlined in Table 19.

Table 19: Diesel spill modelling parameters

Number of random spill simulations	200
Hydrocarbon type	Marine gas oil
Release type	Sea surface (vessel collision)
Total spill volume	300 m^3
Spill volume justification	As per '*Determining spill size*'.
Release duration	6 hours
Release duration justification	In reality, fuel loss resulting from a collision is likely to occur over several days. To build conservativeness into the model, a constant rate of release over 6 hours (50 m^3/hr) has been modelled.
Simulation length	20 days
Period analysed	Summer (October to March)
Water temperature	Varies from 12.6°C to 18.4°C, with an average temperature of 15°C used.
Surface oil concentration thresholds	0.5 - 10 g/m^2 (or 0.0005 – 0.01 mm, equivalent to rainbow sheen) LOW exposure 10 – 25 g/m^2 (or 0.01 – 0.025 mm, equivalent to metallic sheen) MODERATE exposure > 25 g/m^2 (or > 0.025 mm, equivalent to metallic sheen) HIGH exposure
Shoreline oil concentrations	100 – 1,000 g/m^2 – LOW to MODERATE exposure > 1,000 g/m^2 - HIGH exposure
Dissolved aromatic dosages to assess the potential exposure (ppb.hrs) – upper 10 m of water column	576 ppb.hrs (6 ppb x 96 hours) - LOW exposure 4,800 ppb.hrs (50 ppb x 96 hours) - MODERATE exposure 38,400 ppb.hrs (400 ppb x 96 hours) - HIGH exposure

Entrained oil dosages to assess the potential exposure (ppb.hrs) – upper 10 m of water column	ANZECC (very conservative) 960 ppb.hrs (10 ppb x 96 hours) - LOW exposure 9,600 ppb.hrs (100 ppb x 96 hours) - MODERATE exposure 48,000 ppb.hrs (500 ppb x 96 hours) - HIGH exposure OSPAR (conservative) 67,200 ppb.hrs (700 ppb x 96 hours) - LOW exposure 676,800 ppb.hrs (7,050 ppb x 96 hours) - MODERATE exposure 7,718,400 ppb.hrs (80,400 ppb x 96 hours) - HIGH exposure

Table 20 provides a justification of how the hydrocarbon thresholds used in the spill modelling are selected.

Table 20: Diesel spill concentration thresholds used in defining the survey ZPI

Threshold	Selected for ZPI boundary	Justification
Shoreline contact		
Oil stain 10 – 100 g/m^2	No	
Oil coat 100 – 1,000 g/m^2	Yes	100 g/m^2 (approximately equivalent to 100 µm) is considered the lethal threshold for invertebrates living on hard substrates (rocky, artificial/man-made, rip-rap, etc.) and sediments (mud, silt, sand or gravel) in intertidal habitats. The 100 g/m^2 threshold is also recommended in the Australian Maritime Safety Authority's (AMSA) foreshore assessment guide as the acceptable minimum thickness that does not inhibit the potential for recovery and is best remediated by natural coastal processes alone (AMSA 2007).
Oil cover >1,000 g/m^2	No	More than 1,000 g/m^2 of oil during the growing season would be required to impact marsh plants significantly, according to observations by Lin and Mendelssohn, 1996. Similar thresholds have been found . in studies assessing oil impacts on mangroves (Grant *et al.*, 1993 and Suprayogi and Murray, 1999). Thus 1,000 g/m^2 is representative of higher level ecological impacts (i.e. ecosystem based impacts).
Sea surface contact		
Low **0.5 - 10 µm** (0.5 - 10 g/m^2)	No	The 1.0 µm thickness threshold provides a conservative assessment of when a risk of ecological impacts may begin to occur. This thickness is likely to be observed in areas where the hydrocarbon is spread thinly, and as such has already undergone evaporation and weathering. The majority of the lighter, more toxic compounds will have been removed from the surface in that process.
Moderate **10 - 25 µm** (10 – 25 g/m^2)	Yes	This is the minimum thickness of oil that could impart a lethal dose to wildlife that comes into contact with surface hydrocarbons. Research has shown that harm to seabirds through ingestion from preening of contaminated feathers, or the loss of thermal protection of their feathers occurs at 10 µm (10 g/m^2) to 25 µm (25 g/m^2) (RPS APASA, 2015).

Threshold	Selected for ZPI boundary	Justification
High **>25 µm** (>25 g/m^2)	No	A concentration of surface oil greater than 25 g/m^2 would be harmful to marine birds that come in contact with the slick. Marine birds may be affected should they come into direct contact with the hydrocarbon, and mortality may result from ingestion during preening, or from hypothermia from matted feathers (RPS APASA, 2015).
Dissolved aromatic hydrocarbons		
Low exposure **6 ppb (96 hour LC_{50})** **576 ppb-hrs** Very sensitive species (99% species protection)	No	The LC_{50} for species toxicity within the water column is based on global data (French *et al.* 1999; French-McCay, 2002; French- McCay 2003 in RPS APASA, 2015) that showed species (115 fish, 129 crustaceans, 34 other invertebrates inclusive of sensitive life stages such as eggs and larvae) sensitivity to dissolved aromatics exposure (LC_{50} over 96 hours) over a range of environmental conditions spanned from 6–400 ppb (95% of species tested) with an average of 50 ppb. On the basis of this global data set, LC_{50}s of 6 ppb, 50 ppb and 400 ppb are used to define the low, moderate and high threshold values for the analysis of potential impacts from dissolved aromatics. Based on scientific literature, a minimum threshold of 6 ppb over 96 hours or equivalent was used to assess in-water low exposure zones (Engelhardt, 1983; Clark, 1984; Geraci & St. Aubin, 1988; Jenssen, 1994; Tsvetneko, 1998 in RPS APASA, 2015). French-McCay (2002) indicates that an average 96 hour LC_{50} of 50 ppb and 400 ppb could serve as an acute lethal threshold to 5% and 50% of biota, respectively. Hence, the thresholds were used to represent the moderate and high exposure zones, respectively. Further support for the adoption of the moderate threshold of 4,800 ppb.hrs (50 ppb x 96 hrs) is that the 99% species level of protection for the PAH naphthalene in ANZECC & ARMCANZ (2000) is 50 ppb in marine waters.
Moderate exposure **50 ppb (96 - hour LC_{50})** **4,800 ppb-hrs** Average sensitive species (95% species protection)	Yes	
High exposure **400 ppb (96 - hour LC_{50})** **38,400 ppb-hrs** Tolerant species (50% species protection)	No	
Entrained exposure		
Low exposure OSPAR 67,200 ppb.hrs ANZECC 960 ppb-hrs Very sensitive species (99% species protection)	No	The entrained hydrocarbon droplets are not considered to have the same level of toxicity as the dissolved aromatics because they are likely to be comprised of a greater percentage of aliphatic hydrocarbons with lower toxicity than the dissolved aromatics. Due to the requirement for relatively long exposure times for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or is trapped against a shoreline for

Threshold	Selected for ZPI boundary	Justification
Moderate exposure **OSPAR** **676,800 ppb.hrs** **ANZECC** **9,600 ppb.hrs** Average sensitive species (95% species protection)	Yes	periods of several days or more. Entrained hydrocarbon thresholds are derived from an OSPAR study (2012) on the Predicted No Effects Concentration (PNEC) for dispersed oil using conservative assumptions (as outlined in the left hand column). Appropriate threshold values can be extrapolated from the No Observed Effect Concentrations (NOECs) examined in Smit *et al.* (2009, in RPS APASA, 2015) based on effects ranging from oxidative stress to impacts on growth, reproduction and survival and are represented by: • 7 µg/l (7 ppb) (for 1% affected fraction of species); • 70.5 µg/l (70 ppb) (for 5% affected fraction of species); and • 804 µg/l (804 ppb) (for 50% affected fraction of species). These threshold levels represent acceptable long-term chronic exposure levels from continuous point source discharges in the North Sea, one of the most concentrated areas in the world for oil and gas production. These values have been based upon biomarker testing specifically looking at DNA damage and oxidative stress (Smit, 2009) for a variety of oils. Utilising methodologies contained in USEPA Guidelines (1986) to establish LC_{50} data from PNECs, LC_{50} values have been derived by applying a conservative factor of 100 to the PNEC values. This approach is supported by assessment factor criteria contained within the European Chemicals Agency (2008) and the OECD Existing Chemicals Programme 2002 (OECD, 2011 in RPS APASA, 2015). The final exposure values assume a 96-hour exposure period. In addition to these OSPAR thresholds, more conservative thresholds were used to indicate potential zones of exposure for entrained hydrocarbons. The lowest threshold concentration was set at 10 ppb, which corresponds generally with the lowest trigger levels for chronic exposure for total petroleum hydrocarbons in the ANZECC water quality guidelines (ANZECC, 2000). Due to the requirement for relatively long exposure times for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or is trapped against a shoreline for periods of several days or more. To indicate potential zones of acute exposure, which is more meaningful over shorter durations, a threshold of 100 ppb was set, along with a second threshold of 500 ppb, to cover the range of thresholds outlined in the ANZECC water quality guidelines.
High exposure **OSPAR** **7,718,400 ppb.hrs** **ANZECC** **48,000 ppb.hrs** Tolerant species (50% species protection)	No	

Table 21 provides a summary of the modelling results. Using the OSPAR entrained hydrocarbon thresholds, there are no zones above the lowest thresholds modelled. For the sake of conservativeness, Origin has modelled the ANZECC in-water thresholds to determine potential impacts of a diesel spill. Weathering analysis indicates that about 50% of the spilled diesel evaporates after 3 days.

Table 21: Summary diesel spill modelling results

Threshold	Used to define ZPI?	Stochastic modeling results (summer season, Oct-Mar)
Shoreline contact		
Oil stain 10 – 100 g/m^2	No	
Oil coat 100 g/m^2	Yes	Moonlight Heads recorded the highest probability of shoreline contact above 100 g/m^2 with 10%.
Oil cover >1,000 g/m^2	No	Cape Otway West recorded the highest probability above 1,000 g/m^2 with 9%.
Sea surface		
Low 0.5 - 10 g/m^2	No	Reached a maximum of 136 km east and 83 km west of the operational area.
Moderate 10 – 25 g/m^2	Yes	Reached a maximum of 42 km east and 19 km west of the operational area.
High >25 g/m^2	No	Reached a maximum of 17 km east and 7 km west of the operational area.
Dissolved		
Low impact 576 ppb-hrs	No	No zones above the lowest threshold.
Moderate impact 4,800 ppb-hrs	Yes	No zones above the lowest threshold.
High impact 38,400 ppb-hrs	No	No zones above the lowest threshold.
Entrained (ANZECC thresholds)		
Low impact 960 – 9,600 ppb.hrs	No	Widespread, Portland to Wilsons Promontory. (OSPAR - No zones above the lowest threshold).
Moderate impact 9,600 – 48,000 ppb.hrs	Yes	Restricted to two small zones west of Cape Otway. (OSPAR - No zones above the lowest threshold).
High impact >48,000 ppb.hrs	No	No exposure. (OSPAR - No zones above the lowest threshold).

Table 22 and Table 23 provide a summary of the modelling results for shoreline contact. Figure 29 illustrates the potential zones of sea-surface exposure and Figure 30 illustrates the minimum time before sea-surface exposure.

Table 24 provides a summary of the probability of exposure to shorelines at various locations and Figure 31 illustrates the probability of shoreline exposure (< 10 g/m^2).

Table 22: Summary of shoreline exposure above 100 g/m^2, in the event of a 300 m^3 surface release of diesel over 6 hours

Shoreline statistics	Summer season (Oct- Mar)
Probability of contact to any shoreline	38%
Absolute minimum time before visible oil to shore	6 hours
Maximum volume of hydrocarbons ashore	179 m^3
Average volume of hydrocarbons ashore	101 m^3

Table 23: Predicted maximum length of shoreline exposed by a single oil spill trajectory and average length of shoreline exposed across all replicates above 100 g/m^2 and 1,000 g/m^2 in the event of a 300 m^3 surface release of diesel over 6 hours

Shoreline statistics	Summer season (Oct- Mar)
Maximum shoreline length (km) with stranded hydrocarbon concentration >100 g/m^2	16
Average shoreline length (km) with stranded hydrocarbon concentration >100 g/m^2	6
Maximum shoreline length (km) with stranded hydrocarbon concentration >1,000 g/m^2	7.6
Average shoreline length (km) with stranded hydrocarbon concentration >1,000 g/m^2	3

Table 25 provides a summary of the predicted probability of in-water exposure (dissolved aromatic and entrained hydrocarbons) at various locations and Figure 32 illustrates the zones of potential entrained hydrocarbon exposure.

Table 24: Summary of the predicted probability of oil contact and shoreline loading to the Victorian coastline in the event of a 300 m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

	Anglesea	Apollo Bay	Apollo CMR	Bay of Islands	Cape Otway West	Cape Patton	Childers Cove	Lorne	Moonlight Head	Port Campbell	Port Fairy	Torquay	Warrnambool
Maximum probability of shoreline loading (%) >100 g/m^2	1	4	N/A	5.5	14	2.5	2	1.5	14.5	8	1	1	1
Maximum probability of shoreline loading (%) >1,000 g/m^2	NC	0.5	N/A	0.5	9	1	0.5	NC	7.5	2.5	0.5	0.5	0.5
Probability of sea surface exposure (%) >0.5 g/m^2	1	5	7	3.5	7	2	2	1.5	12	4.5	0.5	1	0.5
Probability of sea surface exposure (%) >10 g/m^2	NC	NC	1	NC	1.5	NC	NC	NC	3.5	0.5	NC	NC	NC
Minimum time before sea surface oil contact >0.5 g/m^2 (hrs)	64	8	5	15	6	40	78	54	14	10	85	55	72
Minimum time before sea surface oil contact >10 g/m^2 (hrs)	NC	NC	7	NC	11	NC	NC	NC	18	11	NC	NC	NC
Minimum time before shoreline accumulation >100 g/m^2 (hrs)	82	8	N/A	17	6	43	87	63	17	11	88	118	76
Average load on shoreline per area of interest (g/m^2)	6.2	30.2	N/A	34.4	169.2	30	32.1	4.3	162.8	62	17.8	8.7	8.6
Maximum peak load on shoreline per area of interest (g/m^2)	802	1,328	N/A	2,839	3,314	1,828	2,403	467	3,311	3,312	1,561	1,452	1,074
Average oil on shoreline (m^3)	12.7	10	N/A	16.1	48.7	28	15.9	8.4	41.9	19.5	14.5	7.7	5
Maximum oil on shoreline (m^3)	50.2	50.3	N/A	64.9	162.1	93.8	80.9	22.1	159.2	113	51.8	38.4	13.9
Average length of shoreline contacted >100 g/m^2 (km)	7	4.4	N/A	4.5	5.2	5.6	5	3	5.8	5.3	3	2.5	3
Maximum length of shoreline contacted >100 g/m^2 (km)	12	10	N/A	12	13	8	7	4	12	13	4	4	4

NC = no contact. N/A = not applicable (no shoreline).

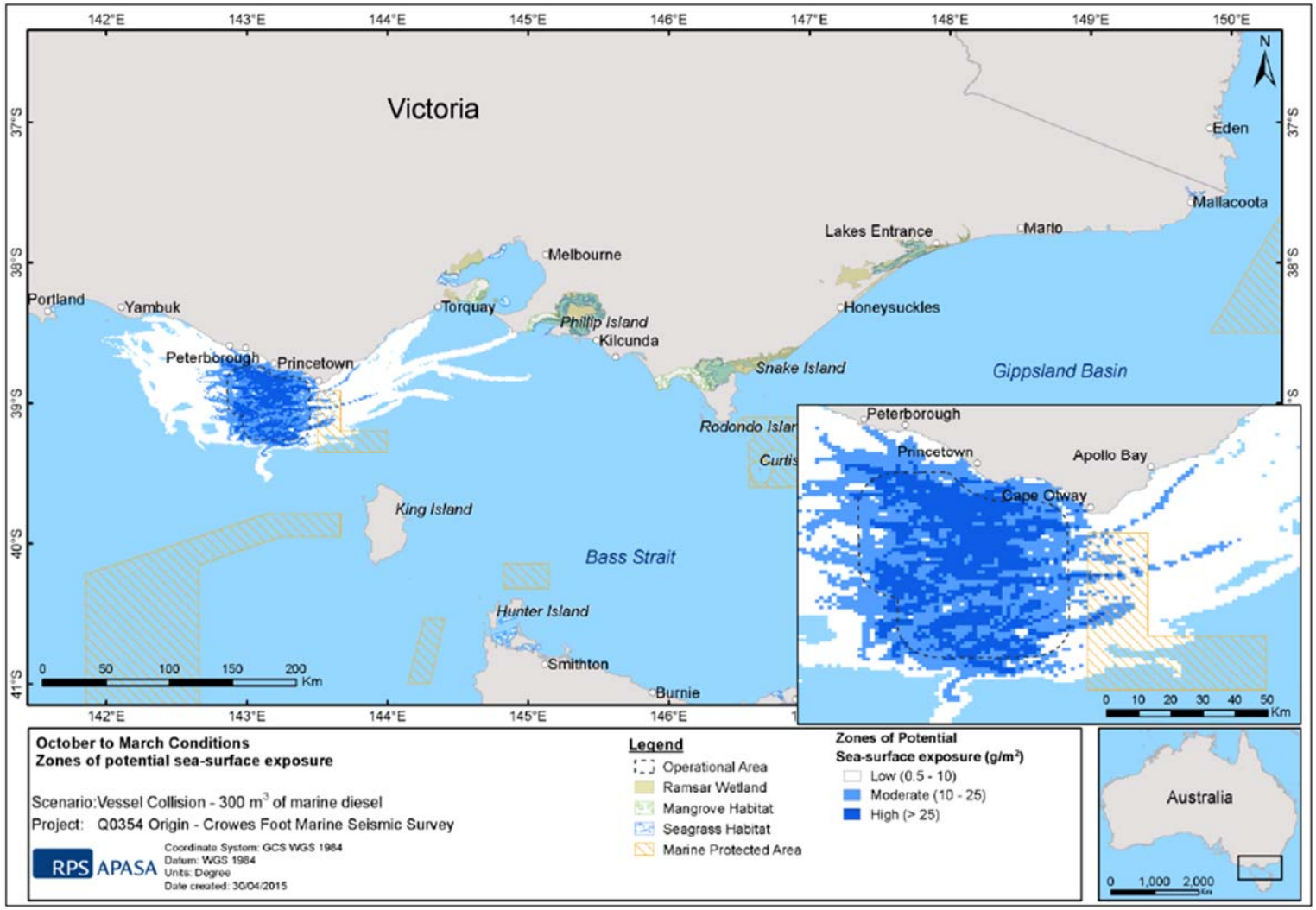


Figure 29: Potential zones of sea surface exposure in the event of a 300m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

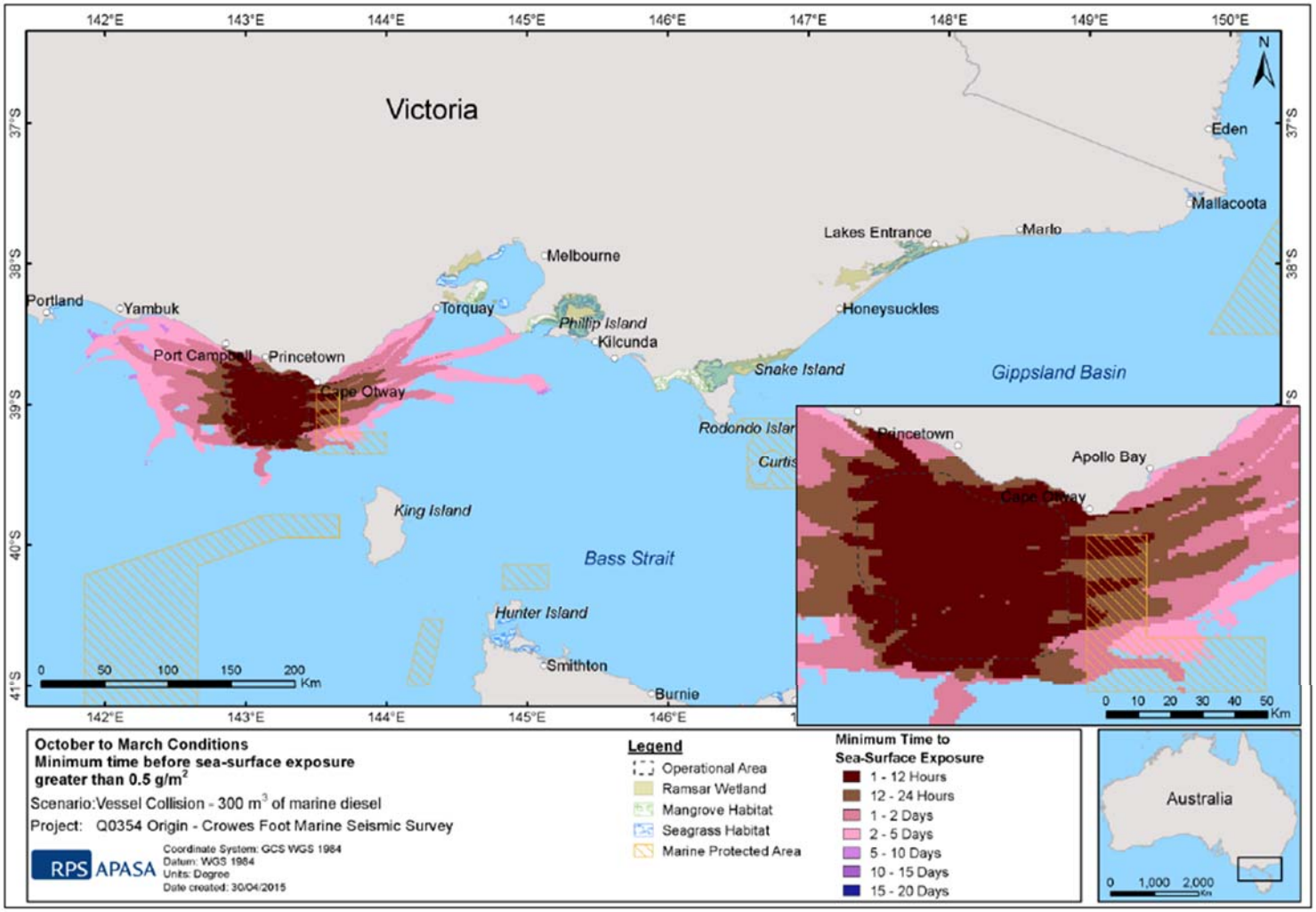


Figure 30: Minimum time before sea surface exposure (>0.5 g/m^2) in the event of a 300m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

Figure 31: Probability of shoreline exposure (>100 g/m^2) in the event of a 300m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

Table 25: Summary of the predicted probability of in-water exposure in the event of a 300 m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

	Anglesea	Apollo Bay	Apollo CMR	Bay of Islands	Cape Otway West	Cape Patton	Childers Cove	Lorne	Moonlight Head	Port Campbell	Port Fairy	Torquay	Warrnambool
Maximum probability of entrained oil at 960 ppb.hrs (%) (ANZECC)	2.5	5	3	3.5	13	4	2.5	2.5	8.5	6	0.5	2	2
Maximum probability of entrained oil at 9,600 ppb.hrs (%)(ANZECC)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of entrained oil at 48,000 ppb.hrs (%)(ANZECC)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of entrained oil at 67,200 ppb.hrs (%) (OSPAR)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of entrained oil at 676,800 ppb.hrs (%)(OSPAR)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of entrained oil at 7,718,400 ppb.hrs (%)(OSPAR)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum exposure to entrained hydrocarbon concentrations (ppb.hrs)	1,848	2,894	2,979	3,678	17,367	3,072	3,931	3,339	9,694	7,616	1,685	3,445	5,660
Maximum probability of dissolved aromatic hydrocarbon at 576 ppb.hrs (%)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of dissolved aromatic hydrocarbon at 4,800 ppb.hrs (%)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum probability of dissolved aromatic hydrocarbon at 38,400 ppb.hrs (%)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Maximum exposure to dissolved aromatic hydrocarbon (ppb.hrs)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

NC = no contact.

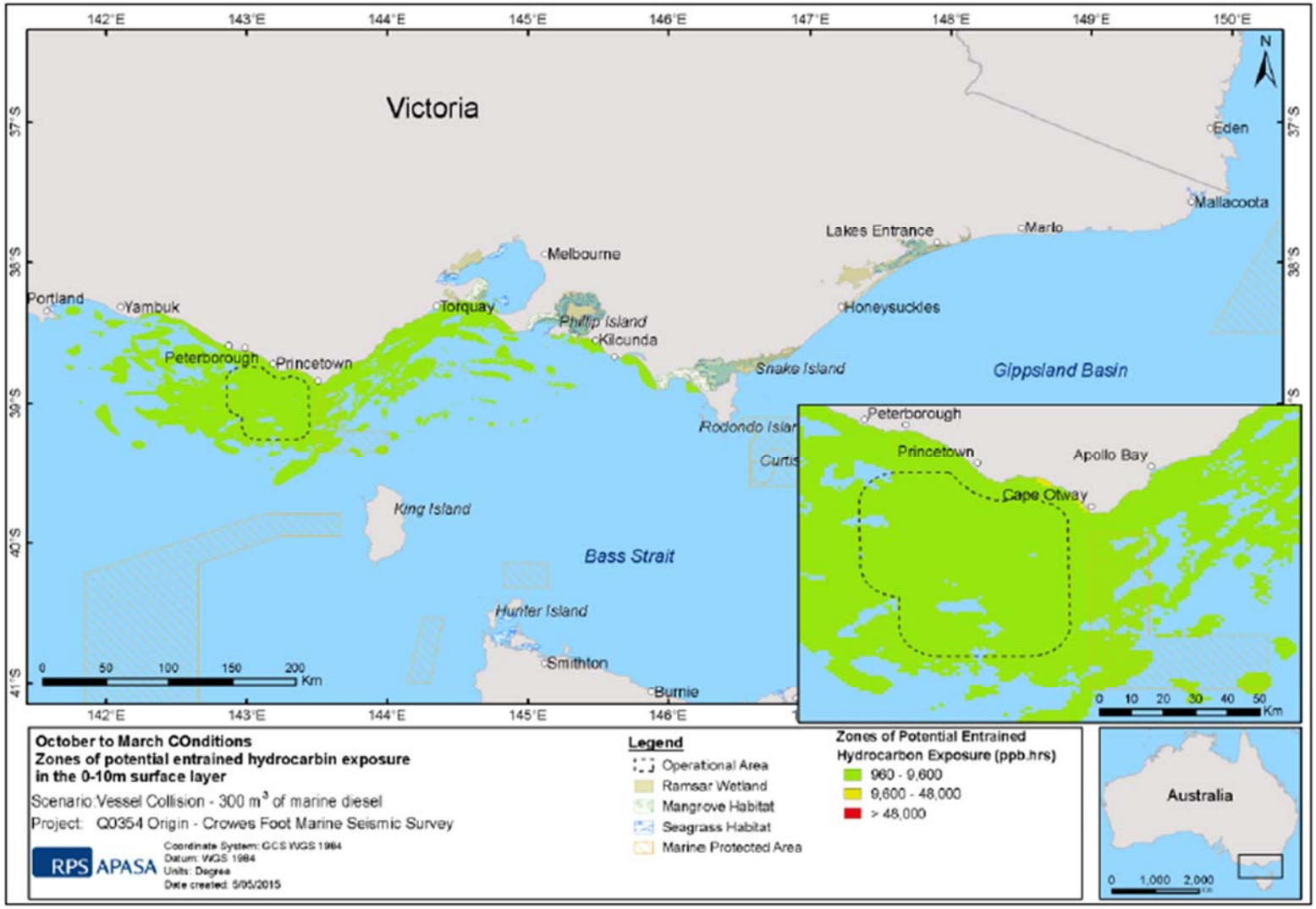


Figure 32: Zones of potential entrained hydrocarbon exposure in the top 10 m of the water column in the event of a 300m^3 surface release of diesel over 6 hours during the summer (October to March) metocean season

7.11.5 Ecological impacts of diesel spills

Due to rapid and high levels of evaporation when spilt at sea, the environmental effects of diesel spills are generally short-term, and not as visually apparent as those of heavier fuel oils or crude oils. The following information regarding the impacts of a diesel fuel spill on the marine environment is supplied by APASA (2012).

Diesel is dominated by n-alkane hydrocarbons that give diesel its unique compression ignition characteristics and usually consist of carbon chain C_{11}-C_{28} but may vary depending upon specifications (e.g., winter vs. summer grades). While diesel is generally considered to be a non-persistent oil, many can contain a small percentage (approximately 3-7%) by volume of hydrocarbons that are classified as 'persistent' under IOPC Fund definition (i.e., greater than 5% boiling above 370°C). While the majority of diesel will quickly evaporate once spilled, it is common for the residues of diesel spills after weathering to contain n-alkanes, iso-alkanes and naphthenic hydrocarbons. Minor quantities of polycyclic aromatic hydrocarbons (PAHs) will be present.

When spilt at sea, diesel will spread and thin out quickly and more than half of the volume can be lost by evaporation within 12 hours depending upon sea temperature and winds. Diesels also have low viscosities and can result in hydrocarbons becoming physically dispersed as fine droplets into the water column when winds exceed 10 knots. Droplets of diesel oil that are naturally or chemically dispersed will be sub-surface and will behave quite differently to surface oil. Diesel droplets will now move 100% with the currents under water but on the surface are affected by both wind and currents. Natural dispersion of diesel will reduce the hydrocarbons available to evaporate into the air.

Although evaporation reduces the level of hydrocarbons on the water surface, it increases the level of hydrocarbons able to be inhaled. This increased hydrocarbon vapour exposure can affect any air breathing animal including whales, dolphins, seals and turtles.

The different diesel product compositions, together with different environmental conditions during marine spills (sea temperature, wind and sea states) can vary the quantities of hydrocarbons lost to the atmosphere due to evaporation (but generally ranges between 40-65%). Dispersion into the sea by the action of wind and waves can result in 25 to 50% of the loss of hydrocarbons from surface slicks and dissolution (solubility of hydrocarbons) can account for 1-10% loss from the surface.

The environmental effects of diesel spills are not as visually obvious as those of heavier fuel oils or crude oils. Diesel oils are considered to have a higher aquatic toxicity in comparison to many other crudes oils and condensates due to the types of hydrocarbons present and that dispersed droplets of diesel can be more bio-available to marine organisms. Diesel oils have a high potential to bio-accumulate in organisms and have high water solubility along with a higher potential to naturally entrain into the water column than heavy fuel oils (HFO).

Due to their higher solubility and ease of entrainment/dispersion into the water column, diesel spills can have a greater ecological impact in comparison to other floating oil slicks and are known to taint seafood. According to the International Maritime Organisation (IMO), diesel oil has a GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) rating of 3 for acute toxicity (damage to living organisms) and 4 for bioaccumulation/tainting (4 = high potential to bioaccumulate, 5 is the highest).

Diesel in the water column can adhere to fine-grained suspended sediments that can settle out and result in oiled sediments being deposited on the seabed. Diesel spills that reach shorelines are usually still mobile residues and will penetrate shoreline sediments due to the low viscosity (i.e., easy spreadability) of the oil and have direct consequences on in-faunal organisms.

Accurate information on the measured impacts of hydrocarbon spills on marine mammals is limited due to the paucity of historical data from actual spills, due in most part to their reclusive and migratory behaviour, such as that of whales. The information presented herein is available from AMSA (2012).

The nature of the oil, location, volume, concentration levels, exposure time and how much it has weathered may also affect the potential impacts. Potential physiological effects, which (depending on species) are documented to likely include to varying degrees:

- Hypothermia due to conductance changes in skin, resulting in metabolic shock (expected to be more problematic for non-cetaceans in colder waters)
- Toxic effects and secondary organ dysfunction due to ingestion of oil
- Congested lungs
- Damaged airways
- Interstitial emphysema due to inhalation of oil droplets and vapour

- Gastrointestinal ulceration and haemorrhaging due to ingestion of oil during grooming and feeding
- Eye and skin lesions from continuous exposure to oil
- Decreased body mass due to restricted diet
- Stress due to oil exposure and behavioural changes

Individual mammals exposed to hydrocarbons early in a spill may be exposed to its more toxic components by direct contact and ingestion and suffer greater toxicity per unit time and volume than those affected by a more weathered hydrocarbon.

Impacts to cetaceans

Cetaceans in particular have mostly smooth skins with limited areas of pelage (hair covered skin) or rough surfaces such as barnacled skin. Oil tends to adhere to rough surfaces, hair or calluses of animals, so contact with hydrocarbons by whales and dolphins may cause only minor hydrocarbon adherence.

The way a cetacean consumes its food affects the likelihood of it ingesting spilled hydrocarbon. Baleen whales (such as humpbacks) skim the surface for krill and are more likely to ingest oil than 'gulp feeders' (toothed whales). Further, oil may stick to the baleen while they 'filter feed' near slicks. Sticky, tar-like residues are particularly likely to foul the baleen plates.

It has been stated that pelagic species will avoid hydrocarbon, mainly because of its noxious odours, but this has not been proven. The strong attraction to specific areas for breeding or feeding (e.g., use of the Kimberley coastline as a nursery area for humpback whales) may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons.

So weathered or tar-like oil residues can still present a problem by fouling baleen whales feeding systems. Researchers have also indicated that inhalation of oil droplets, vapours and fumes is a distinct possibility if whales surface in slicks to breathe. Exposure to hydrocarbons in this way could damage mucous membranes, damage airways or even cause death.

Implications for this survey: Marine mammals that may occur within waters affected by a diesel spill include various whales and dolphins, seals and sea lions, with the BIA for the blue whale overlapped by the ZPI. The ZPI does not enter waters known to be important for southern right whale calving and nursing around Warrnambool. The timing of the survey and extent of the ZPI means it is likely that marine mammals may be exposed to diesel at the sea surface, and less so for diesel dissolved or entrained in the water column.

Impacts to seabirds

Volkman et al (1994) identify seabirds as being the most vulnerable organisms to a hydrocarbon spill in oceanic environments. Birds are particularly susceptible due to the high potential for contact with the sea surface or shoreline where they feed, rest of moult.

Contact with hydrocarbons can have lethal or sub-lethal physical and toxic effects due to external exposure and ingestion. The oiling of feathers can cause a bird to lose its natural buoyancy, as well as the insulation and water repelling properties of the feathers. It is also possible that exposure to fumes from a surface slick could cause impacts to birds eyes and skin. Further impacts may be observed from ingestion caused by preening of hydrocarbon-coated feathers. The impact of the hydrocarbon ingestion is dependent on the hydrocarbon type, stage of weathering and its toxicity.

When first released, the diesel is higher in toxicity due to the volatile components. Individuals that make significant contact close to the source early in the spill may suffer impacts however it is unlikely that a large number will be impacted in the operational area due to its long distance from significant bird aggregations and its short time on the sea surface.

Weathered diesel will travel a significant distance while entrained in the water column. If a spill reaches areas that are used as feeding grounds by seabirds, it is possible that a larger number of individuals will come into contact with the diesel. However in most instances this will be the less toxic, weathered components and toxic impacts are likely to be lessened.

Implications for this survey: Avifauna residing on beaches along the southwest coast of Victoria may be ingest weathered diesel via preening of feathers and consumption of affected prey. This may or may not be ingested in quantities considered to be toxic to any given individual or species group.

Impacts to Fish

A wide variety of fish occur in the waters of the operational area. In the open ocean, most pelagic and demersal fish live relatively deep in the water column and are unlikely to contact surface spills or be exposed to toxic concentrations of dissolved hydrocarbons for a sufficient period of time to cause

lasting impacts. As a result, pelagic and demersal fish of the open ocean are not highly susceptible to a diesel spill.

Fish are most vulnerable when at the larval stage; however, impacts would be over a small portion of the sea area in which they may occur and unlikely to result in any measurable impacts at a population level (especially in comparison to natural predation).

Studies on the influence of oil on plankton communities carried out by Varela *et al.* (2006) demonstrated that despite limitations (oil type, environmental conditions and planktonic communities), it was not possible to demonstrate any effects on plankton communities; any changes were found to be within the range of natural ecosystem variability. Variations in the temporal scale of oceanographic processes typical of the ecosystem have a greater influence on plankton communities than the direct effect of spilt hydrocarbons.

Laboratory and controlled ecosystem experiments demonstrate oil toxicities to plankton. However, there is a general agreement in the literature that spills in the field show minimal or transient effects on marine plankton (Volkman *et al.*, 1994). Once background water quality conditions have re-established, the plankton community will take weeks to months to recover (ITOPF, 2011), allowing for seasonal influences on the assemblage characteristics.

Crabs and shellfish can be tainted from diesel spills in shallow, nearshore areas. While the organisms will bioaccumulate the oil, they will also depurate it, usually over a period of several weeks after exposure (NOAA, n.d.).

Implications for this survey: The waters of the operational area are not known to have BIAs for any fish species. The spill modelling indicates that the ZPI is restricted to a small area. Because of the high mobility of most pelagic fish species, fish are not expected to remain in contact with zones of high toxicity for long enough to cause impacts. Volatile and sticky oil on the sea surface is not likely to cause impacts to many individuals, though the larval stage of fish may be caught in a slick and would be expected to die if caught in the fresh diesel.

Lobsters fished from nearshore rocky reef areas along the southwest coast of Victoria will not be exposed to diesel at the sea surface (except for planktonic phases, see previous discussion), and the modelling indicates an absence of dissolved or entrained phase diesel above low concentrations are unlikely to have ecological impacts.

Impacts to coastal sensitivities in the ZPI

The spill modelling shows that spilled diesel will make contact at various parts of the southwest Victorian coastline, from near Warrnambool to just west of Torquay, though all at low sea surface exposures and generally with low volumes washing ashore at any one location.

The vulnerability of coastlines to oiling is dependent on its topography, composition and position (IPIECA, 1995). Rocky shorelines (see Section **Error! Reference source not found.**) are unlikely to hold much oil due to the action of the reflected waves continuously depositing and washing oil off the rocks. However, oil trapped under rocks in sheltered areas is likely to take longer to biodegrade. Even where immediate damage has been considerable, it is unusual for this to result in long-term damage and fauna communities living on/in rocky habitats (such as limpets, barnacles, other molluscs and macroalgae) often recover within 2-3 years. Brown algae are relatively insensitive to oil due to the slimy mucilage that coats their surface (IPIECA, 1995). Fresh diesel could cause toxic effects on red algae in the short time before it weathers away (IPIECA, 1995).

The impacts of diesel stranding on sandy beaches are dependent largely on the depth of penetration (which is related to particle size, oil viscosity, drainage and the presence of animal burrows and root pores) (IPIECA, 1999). As oil weathers it becomes more viscous (i.e., more solid) and less toxic, often leaving little but a small residue of tar. Although this can persist as an unsightly stain for a long time, it is unlikely to cause any more ecological damage (IPIECA, 1995). As such, impacts to benthic intertidal species (i.e., mostly burrowing species) are unlikely to be significant or long-term.

OSRA mapping and aerial imagery of the coastline indicates that there are no stands of tidally-influenced vegetation (such as mangroves and salt marshes), so impacts to these sensitive coastal vegetation communities will not occur.

A summary of the impacts of a diesel spill on the sensitivities of the region is presented in Table 26.

Table 26: Summary of impacts of diesel spill to conservation values and sensitivities in and around the operational area

Feature	Location	Sensitivity	Details
Coastal			

Feature	Location	Sensitivity	Details
The Arches Marine Sanctuary	21 km north of the acquisition area	S1	Exposed to the 'moderate' zone of sea surface exposure. Kelp forest, sponge gardens, reef fish, seals and lobsters are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Marengo Reefs Marine Sanctuary	30 km north of the acquisition area	S1	Exposed to the 'low' zone of sea surface exposure and 'oil coat shoreline exposure. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Area of sandy beach may accumulate oil. Kelp forest and sponge gardens are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
The Twelve Apostles Marine National Park	7.3 km north of the acquisition area	S1	Exposed to the 'moderate' zone of sea surface exposure and 'oil coat shoreline exposure. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Kelp forest and sponge gardens are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Merri Marine Sanctuary	70 km north west of the acquisition area	S1	Exposed to the 'low' zone of sea surface exposure and 'oil coat shoreline impact. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Area of sandy beach may accumulate oil. Subtidal communities are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Eagle Rock Marine Sanctuary	70 km north east of the acquisition area	S1	Exposed to the 'low' zone of sea surface exposure and 'oil coat shoreline impact. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Area of sandy beach may accumulate oil. Subtidal communities are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Point Addis Marine National Park	70 km north east of the acquisition area	S1	Exposed to the 'low' zone of sea surface exposure and 'oil coat shoreline impact. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Area of sandy beach may accumulate oil. Subtidal communities are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Seabird breeding colonies	'London Bridge', 18 km north of the acquisition area	S1	Nesting sites for many seabirds such as the little penguin, short-tailed shearwater and fairy prion should not be affected by oil washing ashore, as nesting sites are above the high tide mark. Birds may drag minor quantities of oil into nests/burrows when wading along beaches or bring oil-affected prey into nests/burrows.
Australian fur seal breeding colonies	Islands and coastline between Portland and Cape Otway	S3	The ZPI does not extend to Lady Julia Percy Island or Seal Rocks. However, seals may consume oil-affected prey (though pelagic fish are not expected to be exposed to dissolved or entrained oil above the 'low' threshold, so fish are unlikely to bioaccumulate oil to toxic levels).

Feature	Location	Sensitivity	Details
Sandy beaches	Scattered along coastline	S3	Exposed to the 'moderate' and 'low' zones of sea surface exposure and 'oil coat shoreline exposure. As oil weathers it becomes more viscous (i.e., more solid) and less toxic, often leaving little but a small residue of tar. Although this can persist as an unsightly stain for a long time, it is unlikely to cause any more ecological damage (IPIECA, 1995). As such, impacts to benthic intertidal species (i.e., mostly burrowing species) are unlikely to be significant or long-term. Sandy beaches are interspersed along the southwest Victorian coast (see Section **Error! Reference source not found.**).
Cliffs	Scattered along coastline	S4	Exposed to the 'moderate' and 'low' zones of sea surface exposure and 'oil coat shoreline exposure. Rocky shorelines are unlikely to hold much oil due to the action of the reflected waves continuously depositing and washing oil off the rocks. However, oil trapped under rocks in sheltered areas is likely to take longer to biodegrade. Even where immediate damage has been considerable, it is unusual for this to result in long-term damage and fauna communities living on/in rocky habitats (such as limpets, barnacles, other molluscs and macroalgae) often recover within 2-3 years. Cliffs are interspersed along the southwest Victorian coast (see Section **Error! Reference source not found.**).
Macroalgal beds (e.g., kelp forest)	Scattered along coastline to ~6m depth	S3	Exposed to the 'moderate' and 'low' zones of sea surface exposure. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Kelp forest and sponge gardens are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold. Algae are considered to be tolerant to the effects of hydrocarbon pollution, however, intertidal sea grasses and their associated invertebrates, may incur adverse impact. Macroalgae are likely to be present wherever rocky reefs exist (see Section **Error! Reference source not found.**).
Intertidal rocky reef	Scattered along coastline from Port Fairy to Apollo Bay	S4	Exposed to the 'moderate' and 'low' zones of sea surface exposure and 'oil coat shoreline exposure. Rocky coastline will serve to rapidly weather the diesel through wave action against rocks. Kelp forest and sponge gardens are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold. Intertidal rocky shores are the predominant habitat from Port Fairy to Apollo Bay. Any impact to intertidal rocky reefs is dependent on depth, exposure and level of wave energy. Organisms associated with this zone are generally hardy and have a fast recovery rate from disturbance, due to rapid re-colonisation by more species.

Feature	Location	Sensitivity	Details
Shallow rocky reef	Scattered along coastline from the low water mark to ~20-30 m water depth	S2	Exposed to the 'low' zone of sea surface exposure. Oil will not strand and accumulate in shallow rocky reefs. Kelp forest and sponge gardens are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Offshore			
Open waters	Operational area	S1	Provides habitat for blue whales and southern right whales. Local breeding populations of larval fish and shellfish may be affected but are likely to recover. Plankton in the upper water column are expected to be susceptible to the effects of a diesel spill, but recovery is expected to be rapid from surrounding waters. Tainting of fish or prawn flesh may occur in shallow waters.
Apollo CMR	14 km east of the acquisition area	S1	Exposed to the 'moderate' and 'low' zones of sea surface exposure. Impacts are as those discussed for marine mammals and fish.
Zeehan CMR	69 km east of the acquisition area	S1	No contact with diesel.
Deep rocky reefs	Scattered along coastline	S4	Kelp forest, sponge gardens and associated fauna are unlikely to be affected as there is no exposure to dissolved or entrained diesel above the 'low' threshold.
Cetaceans	Waters between Portland and Cape Otway	S1	As previously described.
Abalone and rock lobster fisheries	Generally coastline and nearshore	S2	As previously described.
Pelagic fisheries	Mainly coastal and nearshore	S3	As previously described.

A Project specific Oil Pollution Emergency Plan (OPEP) has been developed and is provided in **Error! Reference source not found.** of this Environment Plan. The objective of the OPEP is to allow procedures to be implemented to minimise impacts of a diesel spill on sensitive resources. .

In the event of a diesel spill which does contact the coastline, the options for response will be significantly limited by the high energy nature of the area and difficulties for access of shorelines. The OPEP (**Error! Reference source not found.**) describes a range of spill response options that would be considered. Each response option would be evaluated through Net Environmental Benefit Analysis (NEBA), taking account of the degree to which the response option to improve protection and recovery of sensitive resources and sites along with any potential impacts from the response (as described in the OPEP. Approaches to operational and scientific moitoring are also described in the OPEP.

8. Hydrocarbon Spill Preparedness and Response

An OPEP is in place for the Crowes Foot survey. The hierarchy of protection priorities for the survey, reflecting NatPlan criteria, is as follows:

1. Human health and safety;
2. Habitat and cultural resources;
3. Threatened flora and fauna;
4. Commercial resources; and
5. Amenity.

The following oil spill response priorities have been identified for this survey in the event of a Level 2 spill:

- Remove marine users from areas that present a safety hazard;
- Minimise exposure to diesel to threatened species that may transit area; and
- Prevent exposure to the spill by commercial fisheries in proximity to the operational area.
- Prevent, or minimise, diesel exposure to the coast through physical agitation of the diesel slick in deeper waters.

The response structure for hydrocarbon spill depends on the size of the spill, as outlined below.

- A Level 1 spill (typically < 10 tonnes) will be managed solely by the personnel on board the vessel.
- A Level 2 spill (typically 10 – 100 tonnes) will involve onshore vessel contractor and Origin personnel, and possibly government personnel.
- Level 3 spills (typically >100 tonnes) are not a credible scenario for the survey.

On release, marine diesel is expected to undergo a rapid spreading and evaporative loss with the remainder becoming dispersed in the water column. Although classed as ‘persistent oil’, a diesel slick tends to break up quickly. During evaporative weathering, low molecular weight aliphatic and aromatic hydrocarbons and phenols are lost from the oil, leaving higher concentrations of less volatile, higher molecular weight hydrocarbons. The heavier components have a strong tendency to entrain in the upper water column as oil droplets in the presence of wind/waves but can re-float to the surface if these energies abate.

Scientific (Type 2) monitoring following a significant spill is the responsibility of Origin and a scientific monitoring plan has been included in the OPEP. To enable rapid implementation of scientific monitoring, an Operational and Scientific Monitoring Program (OSMP) Implementation Plan has been developed for Origin’s operations in the Otway Basin. The OSMP implementation plan contains information and arrangements for resources required to execute scientific monitoring at the time of an incident in the Otway Basin including vessels, consultants and laboratories.

9. Implementation Strategy

Origin retains full and ultimate responsibility as the Titleholder of the activity and is responsible for ensuring that the survey is implemented in accordance with the performance objectives outlined in this EP. Day-to-day management of the survey vessel, however, will be the responsibility of the survey contractor.

9.1 Environmental Management System

Origin’s Health, Safety and Environmental (HSE) Policy commitments are communicated and implemented through its HSE Management System (HSEMS). Origin’s HSEMS is based on the continual improvement methodology of Commit-Plan-Do-Check and Review. The HSEMS is aligned with recognised international and national standards including ISO 14001, OHSAS 18001, ISO 31000 and AS 4801.

9.2 Key Roles and Responsibilities

The organisation structure for the survey consists of onshore and offshore Origin and survey contractor representatives.

Day-to-day implementation of the EP will occur on the survey vessel under the leadership of the Party Chief and the Client Site Representative. The Origin Project Manager will have oversight of the performance of the project against the EP and other project plans, and will initiate reviews and audits as required. In the event of a vessel incident, the Origin Emergency Response Team (ERT) will work together with HSE and technical advisors and government combat agencies as required to respond.

9.3 Training and Awareness

During its contractor selection process, Origin will conduct thorough due diligence to ensure that the chosen contractor has in place procedures to ensure the correct selection, placement, training and ongoing assessment of employees, with position descriptions (including a description of HSE responsibilities) for key personnel being readily available.

A shore-based desktop exercise of Origin's Southern Australia ERP will be conducted by Origin prior to the survey commencing.

All offshore personnel working on the survey and support vessels will be provided with Origin 'Leading HSE' training. A survey-specific HSE induction for the same personnel will also be undertaken prior to the survey.

Regular (quarterly) training of vessel crew in SOPEP procedures is a MARPOL requirement for vessels over 400 GRT (Annex 1, Regulation 37). During its contractor selection process, Origin will ensure that the chosen contractor has been implementing this requirement.

Only appropriately qualified and experienced MMOs and PAM operators will be hired by the survey contractor. There is now a large pool of such personnel in Australia spread across various consultancies (e.g., RPS, Blue Planet Marine, etc). This is linked to HSEMS Standard 18 (Environmental effects and management).

The MMOs and PAM operators will provide an information session to control room operators and other essential personnel at the start of the survey regarding their fauna observation duties and the communication protocols required with the control room operators to ensure shut downs and power downs occur efficiently.

Environmental matters will be included in daily toolbox talks as required by the specific task being risk assessed (e.g., waste management). Environmental issues will also be addressed in Weekly HSE Meetings, where each shift will participate with the Client Site Representative, Party Chief and Vessel Master in discussing HSE matters that have arisen in the previous week, and issues to consider for the following week.

9.4 Emergency Response and Preparedness

Survey-specific emergency response procedures for the proposed survey are included in the Survey HSE Plan. The Survey HSE Plan contains instructions for vessel emergency, medical emergency, search and rescue, reportable incidents, incident notification and emergency contact information.

In the event of an emergency of any type, the Vessel Master will assume overall onsite command and act as the Emergency Response Coordinator (ERC). All persons aboard the vessel/s will be required to act under the ERC's directions. The survey vessel Client Site Representative will maintain communications with the Origin Emergency Team Leader and/or other emergency services in the event of an emergency. Emergency response support will be provided by Origin as required by the situation.

The survey and support vessels will have equipment aboard for responding to emergencies, including but not limited to lifesaving appliances, medical equipment, fire fighting equipment and oil spill response equipment.

9.5 Incident Recording and Reporting

All breaches of the EP are considered non-compliances. Non-compliances may be identified during an audit, inspection, crew observation or as a consequence of an incident.

All EP non-compliance issues must be communicated immediately to appropriate offshore and onshore management personnel. This expectation will be reinforced at inductions, daily toolbox meetings and weekly HSE meetings. Any EP non-compliances will be investigated as per the survey contractor's and Origin's investigation procedures. Following an investigation, remedial actions will be developed to prevent recurrence and these actions will be tracked to completion.

Recordable and reportable environmental incidents will be reported to NOPSEMA and other regulatory agencies in accordance with detailed requirements listed in the EP.

9.6 Environmental Monitoring

Origin will maintain a quantitative record of emissions and discharges as required under Regulation 14(7) of the OPGGS(E). This record will include all emissions and discharges to the air and water and can be monitored and audited against the environmental performance standards. Results will be reported in the end-of-survey EP performance report submitted to NOPSEMA.

9.7 Audit and Review

Environmental performance of the survey will be reviewed in a number of ways to ensure that:

- Environmental performance standards to achieve the environmental performance outcomes are being implemented, reviewed and where necessary amended;
- Potential non-compliances and opportunities for continuous improvement are identified; and
- All environmental monitoring requirements have been met before completing the activity.

The following arrangements will be established to review environmental performance of the activity:

- An inspection(s) of the vessels will be carried out before or during the survey to ensure that procedures and equipment for managing routine discharges and emissions are in place to enable compliance with the EP.
- A summary of the EP commitments for the activity will be distributed aboard the survey vessel, and implementation of the environmental performance standards will be monitored by the Client Site Representative.

Any non-compliance with the environmental performance standards outlined in this EP will be subject to investigation and follow-up action.

10. Further Information

For further information, please contact:

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Appendix A – Stakeholder Log

ORIGIN ENERGY - CROWES FOOT Vic/P69 EP - Stakeholder Consultation Log July 2014 - June 2015

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Commonwealth Fisheries Association	11/07/2014 15/7/2014 10/10/2014 19/3/2015 30/3/2015	Info Sheet V1 Follow up Timing update Info Sheet V2 Consultation	Email Email Email Email Meeting	Peak NFP body representing commercial fishing industry in Commonwealth regulated fisheries.	11/07/2014: Providing information is not consultation, CFA may inform its members but not their duty to consult / collate feedback, consultation with proponents would require remuneration, consultation best handled at fishing association level, recommended SETFIA's services for this. 30/03/2015: no concerns raised at meeting, consensus reached over identification and engagement of fishing associations.	15/07/2014: We asked what costs involved in consulting CFA members and was advised to consult through associations, suggesting SETFIA. Origin does not require SETFIA's services and would be concerned about a trawl association engaging with other fisheries, especially rock lobster.	08/08/2014: Origin conducted direct engagement of individual fishers and specific associations from most recent publications of fishing effort, own database records and local wharf visits. Confident that thorough identification of stakeholders completed. 30/03/2015: met and verified that our identification of fisheries and associations in VicP69 and advised direct engagement being undertaken with SETFIA, SSFI, SSIA, VSFA. CFA will pass on info to 2 scallop licence holders. We reminded that if there's costs involved in them communicating with members to advise us for consideration.	Inform only
Seafood Industry Victoria	11/07/2014 16/7/2014 18/08/2014 21/08/2014 17/3/2015 19/3/2015 30/03/2015 02/04/2015 07/04/2015 14/04/2015 08/05/2015 11/04/2015 15/05/2015 19/05/2015	Info Sheet V1 Consultation Compensation Follow up Meet request Info Sheet V2 Consultation Follow up Follow up Follow up Follow up Follow up Fisheries map/dive info Follow up	Email Meeting Email Phone Email Phone Email Meeting Email Phone Phone Email Phone Email	Peak body representing professional fishing, seafood processors and exporters in Victoria.	16/7/2014: capacity of SIV to engage members re proponents EP, stakeholder engagement approach doesn't allow feedback loop before submission of EP to regulator, research / reports on negative impact of seismic on fish which he hopes the regulator reviews, communication of compensation plans (should be in EP). 30/03/2015: verified Origin's identification of fisheries in VicP69 - that is, rock lobster confirmed, possibly some state trawl and small pelagic subject to checking with Fisheries Vic. Said lobster fishermen will be stressed due to quota issue currently in discussion. Will help with communications to relevant members and will get back to Origin with number of members (licence holders in and around VicP69) and costs for a mail out. 01/04/2015: emailed to advise member numbers and costs to post out Origin's info sheet 11/05/2015: happy with Origin's offer to do all printing, envelope stuffing, supply postage paid envelopes so they only had to apply labels 12/04/2014: advised he is happy to send Origin's letter to 433 SIV members with Western Zone licence and send his covering letter for Origin to review 19/05/2015: sent revised administration costs	08/2014: Reviewed literature review article sent by stakeholder on various marine species and do not believe it is relevant to local species. Our research review does not show population impact on identified fish species. Compensation arrangements are not required within EPs but Origin does have a Fisheries Management Plan (FMP) draft to be used to finalise a compensation payment should we displace fishers during our survey. 30/03/2015: SIV did not raise any further objections regarding impact on species or research. Amicable discussion on correct identification of stakeholders and support requested by Origin agreed to. 01/04/2015: large number of licence holders not relevant to VicP69, don't wish to provoke rivalry among professional fishers 05/2015: Ongoing engagement has enabled Origin to demonstrate response to feedback, knowledge of actual fishing activity in the survey area, distinct from licence holdings and breadth of engagement with stakeholders.	14/08/2014: We remain open to funding communication costs to engage SIV members, no scientific basis to validate concerns on impact on rock lobster population, research on some species cannot be extrapolated to all, milestone reports from research still in progress cannot be relied upon, have not been peer reviewed, any displaced fishers will be compensated in accordance with Origin's Fisheries Management Plan. 14/8/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 18/08/2014: emailed compensation principles 30/03/2015: advised of past and planned further consultation with rock lobster fishers, requests to AFMA and Fisheries Victoria for most recent fishery data. 02/04/2015: queried selection criteria that determined mail out list of 433 fishers, as we know from our current database and stakeholder visits that the number of fishers in VicP69 is small. 07 & 14 /04/2015: sought update on mail out numbers, Origin suggested qualifying statement in letter to explain why letter sent even though it may not be of interest to the fisher, J Davey preferred to review list and get back to Origin. 08/05/2015: no response on refined list so Origin sent email with recommended cover letter and info sheet and requested mail out to SIV members 11/05/2015: advised Origin would organise all printing, envelope stuffing (including SIV letter) and supply postage paid envelopes so they only needed to apply labels 15/05/2015: thanked SIV for sending letters, sent map of state fishing effort in survey and operational area, sent revised dive info sheet and advised we are engaging abalone divers. 19/05/2015: approved revised administration costs and sought confirmation of date letters posted	Engage throughout
Victorian Rock Lobster Association (VRLA)	9/07/2014 9/07/2014 5/08/2014 5/08/2014 18/08/2014 21/08/2014 10/10/2014 16/03/2015 18/03/2015 19/03/2015 29/03/2015 14/04/2015 05/05/2015 15/05/2015 15/05/2015 03/06/2015	Info Sheet V1 Meeting request Reply re concerns Consultation Compensation approach Follow up Updated timing Meeting request Meeting request Info Sheet V2 Meeting request Consultation Consultation Follow up	Email Email Email Email Email Phone Email Email Phone Email Phone Email Phone Meeting Email Email	Industry association representing commercial rock lobster and giant crab fishers	10/07/2014: Apollo Bay Fisherman would like more time to consider impacts, VRLA happy to meet with Origin and SIV on 16/7. 23/08/2014: acknowledged compensation policy. Advised still has concerns about engagement with multiple seismic survey proponents and will pursue through SIV 12/07/2015: advised key concerns of seismic surveys occurring in prime fishing season, displacement and domino effect for fisherman, impact on eggs and larvae, and more science emerging that supports these concerns citing milestone report on rock lobster research from UTAS 18/03/2015: can't meet at moment, send info sheet and to Apollo Bay Coop and he will discuss with members 29/03/2015: still can't meet but we should go ahead with meeting Apollo Bay Coop 14/04/2015: agreed to put notice of Crowes Foot survey in newsletter 05/05/2015: Origin's fishing grid map is helpful, provided us with copy of VRLA newsletter (with Origin notice included) that goes to 85 members (out of 88 licence holders, 3 licences not members), recommends SIV still do letter to western zone licence holders despite double up, restated concerns re larvae impact, asked about past efforts to improve seismic surveys and reduce impact, what pre and post survey analysis had been done in water columns, frustrated at FRDC communications about research project, Origin's fisheries management/compensation plan should require impacted fishermen to remove pro-rata quota from season's quota so they don't get compensated by Origin whilst still fishing their whole quota - will cause displacement problems, said this is fair, more sustainable on the fishery and recommended Origin has conversations with Fisheries Vic about this - or could get fishermen to transfer quota to Origin for that period, compensated fishermen will get pure profit as there's no costs so they shouldn't double dip. Discussed crew compensation and Apollo Bay Coop. 15/05/2015: seeking response to a paper on seismic methodologies www.okeanos-foundation.org and request to Origin to do pre and post survey research on water column impact. Wants to know more about the history of seismic technology advances and Origin's use of innovation to reduce impact.	11/7/2014: advised Origin was at beginning of consultation and was seeking to notify and validate relevant persons for subsequent engagement. 16/7/2014: Origin expected to discuss concerns from VRLA but he did not attend meeting at SIV. 08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 18/08/2014: Origin planned to meet with VRLA and Apollo Bay fishers but was cancelled by VRLA. 04/2015: advised Origin will pay advertising costs for newsletter article. 05/2015: research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will endeavour to plan operations to minimise impact and if not possible, will enter into Fisheries Management Plan that includes compensation agreement for fishermen. All subject to evidence of lost income and requires no displacement of other fishers. 15/05/2015: will further examine research and technology questions and continue engagement. 05/2015: remains concerned about impact of seismic surveys, continue to engage before and during the survey to minimise impact or agree on compensation plan as applicable. 05/2015: detailed review of questions re seismic technology and water column research, Origin is confident that 3d marine seismic surveys are a low impact technology suitable for the task in our survey areas and that impact on the southern rock lobster is very low, citing prevailing research shows any decline is due to excessive fishing and natural climate / ocean impacts.	5/8/2014: reaffirmed Origin's commitment to minimise economic impact on fisherman and provided compensation principles. Re concerns on damage to eggs and larvae from seismic surveys, Origin has reviewed research in the public domain which continues to indicate no mortality to Rock Lobster adults, insignificant mortality to larvae and unlikely impact at a population level. This position has been accepted by the Australian Government, Department of The Environment in recent Environmental Management Plans regarding seismic surveys submitted by Origin. Origin has committed to further research through its co-funding of rock lobster research by UTAS. Regarding the milestone report referenced by M Nolle, the FRDC advised of the danger of drawing conclusions from the milestone UTAS rock lobster research report. Explained the challenges in engaging with stakeholders who have formed an opinion on scientific research that is: not widely accepted and has been questioned by peers; is incomplete; and/or has been erroneously extrapolated from one species to another (gave an example) 18/08/2014: emailed compensation principles 14/04/2015: thanked VRLA for placing notice of Crowes Foot Survey and contact details in VRLA newsletter. 05/05/2015: appreciated input on compensation plan, sounded fair and will review. Noted technology and research questions and follow up. Origin will firstly plan to minimise impact on fishing due to timing and direction of survey and if this is not possible, will enter into agreement with relevant fishermen to compensate subject to fishermen not displacing others. Will engage further once the EP is approve, the seismic contractor is engaged, and we can discuss proposed survey dates and impact on fishermen and Coop. 15/05/2015: Origin project representatives and VRLA discussed history of Seismic surveys, 3D is latest technology and relevant for this survey, cannot adjust sound down for shallows once set but do power down on turns, can't eliminate sideways sound due to propagation properties (ripple effect), advised Origin does employ latest technologies and would embrace latest low impact seismic methods if they were commercially available and fit for the task, as an integrated energy company we have many stakeholders to care for and a good reputation to protect. Origin will consider water sample research questions and will reply from our Environment manager who could not attend meeting. Advised VRLA that Origin engaged FRDC, explained VRLA keen to understanding methodology and timings of rock lobster research, discussed FRDC's approach to communicating results and assisting fishing industry with education on research. 15/05/2015: follow up email advising will seek further responses, sent updated info on diving in vicinity of seismic surveys, revised survey area map with state fisheries info plotted. 03/06/2015: detailed response to questions of best practice low impact seismic survey technology used by Origin, water column research, impact on lobster species.	Engage throughout
Apollo Bay Fishermen's Cooperative Society VRLA member	9/07/2014 10/10/2014 19/03/2015 01/04/2015 23/04/2015	Info Sheet V1 Updated timing Info Sheet V2 Consultation Follow up	Email Email Email Meeting Phone	Not for profit cooperative. Purchase and sell fish local fish stock, sell fuel and supplies to local fishermen.	01/04/2015: number of seismic surveys and impact on gradual drop in quotas, drought years also cause poor catch, poor weather in October may prevent survey, if survey continues after 15 November would affect 3 fishermen who catch rock lobster off the Big Reef and would affect Apollo Bay Coop due to throughput of lobster sales and fuel. Understood mutual access rights and compensation principles.	01/04/2015: research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will endeavour to plan operations to minimise impact and if not possible, will enter into Fisheries Management Plan that includes compensation agreement for fishermen and Apollo Bay Coop where there is direct supply chain impact. All subject to evidence of lost income and requires no displacement of other fishers. 05/2015: stakeholder leases fishing licence in the area, director of coop that on-sells produce, remains concerned about impact of seismic surveys, continue to engage before and during the survey to minimise impact or agree on compensation plan as applicable.	01/04/2015: research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will firstly plan to minimise impact on fishing due to timing and direction of survey and if this is not possible, will enter into agreement with relevant fishermen to compensate subject to fishermen not displacing others. Will engage further once the EP is approve, the seismic contractor is engaged, and we can discuss proposed survey dates and impact on Coop. 23/04/2014: further discussion, he confirmed that 3 fishermen fish the Big Reef and sell to the Apollo Bay coop, advised coop confidential details on tonnage handled, prices and mark-ups, in the event that compensation is required.	Engage throughout
Apollo Bay Fisherman VRLA member	9/07/2014 10/10/2014 19/03/2015 01/04/2015	Info Sheet V1 Updated timing Info Sheet V2 Consultation	Email Email Email Meeting		01/04/2015: initially advised he (and 3 others) fishes over the Big Reef and he will fish from 15 November regardless of survey and will test the law. Said no-one really knows the impact on crayfish from fishing boats, electronic gear, global warming. Said north/south direction for survey and finishing area over the Big Reef first was his preference. Concluded by saying that if he can be compensated properly by to tie the boat up during the survey, that's the only logical way.	01/04/2015: research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will endeavour to plan operations to minimise impact and if not possible, will enter into Fisheries Management Plan that includes compensation agreement for fishermen. All subject to evidence of lost income and requires no displacement of other fishers. 05/2015: stakeholder fishes in the area, remains concerned about impact of seismic surveys, continue to engage before and during the survey to minimise impact or agree on compensation plan as applicable.	01/04/2015: research shows no link between seismic survey activity and catch / effort outputs and there are many ecosystem / climate impacts on catch, therefore quotas. Origin will firstly plan to minimise impact on fishing due to timing and direction of survey and if this is not possible, will enter into agreement with relevant fishermen to compensate subject to fishermen not displacing others. Will engage further once the EP is approved, the seismic contractor is engaged, and we can discuss proposed survey dates, sail lines, timing and direction.	Engage throughout
Retired Apollo Bay Fisherman	9/07/2014 10/10/2014 19/03/2015	Info Sheet V1 Updated timing Info Sheet V2	Email Email Email		29/03/2015: email reply to advise he was fully retired and leases his licence to other fishermen and he keeps an interest in the industry.	N/A	N/A	Inform only
Apollo Bay Fisherman VRLA member	9/07/2014 10/10/2014 19/03/2015	Info Sheet V1 Updated timing Info Sheet V2	Email Email Email		01/04/2015: advised he would speak to other Apollo Bay fishermen and provide Origin's information sheet. Also advise that another Apollo Bay fisher shark nets as well.	01/04/2015: as above, via VRLA. 05/2015: stakeholder fishes in the area, continue to engage via VRLA before and during the survey to minimise impact or agree on compensation plan as applicable.	as above, VRLA	Engage throughout

ORIGIN ENERGY - CROWES FOOT Vic/P69 EP - Stakeholder Consultation Log July 2014 - June 2015

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Apollo Bay Fisherman VRLA member	09/07/2014 14/08/2014 10/10/2014 19/03/2015 23/03/2015 07/05/2015	Info Sheet V1 Follow up Timing update Info Sheet V2 Follow Up Follow up	Meeting Email Email Email Email Meeting		09/07/2014: prefer timing of March to May as no larvae being hatched and no fishing. From 15th November about 4 fisherman fish the Big Reef including him. Would like to see mitigating arrangements made regarding conflicting usage over the Big Reef if the surveying was during open lobster season. Has many years experience working alongside seismic surveys. He has also previously provided chase boat services for Santos during their 2006 Southern Margins 2D survey. Believes the Big Reef is not prospective due to understanding of coal and scoria sub surface from survey work he was involved in some time ago with a researcher. Advised very deep waters with lots of tides and currents in that area. 23/03/2015: email acknowledgement of information received. 07/05/2015: suggested compensated quota be retired for the quota year to prevent double dipping, using catch and effort history was essential as some operators are prone to exaggeration, is unconcerned about effects of seismic after 40 years of seeing numerous surveys over the ground he fishes.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: stakeholder fishes in the area, is not concerned about impact of seismic surveys, continue to engage before and during the survey to minimise impact or agree on compensation plan as applicable.	09/07/14: Explained timing of survey and the survey area being a smaller footprint to permit area, yet to be determined. Explained timing due to avoidance of whales, and compensation approach should timing overlap with rock lobster fishing. 14/8/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 07/05/2015: Confirmed fishing areas of fisher. Discussed compensation policy details including importance of the approach to compensation not encouraging displacement of fishers and double dipping.	Engage throughout
Apollo Bay Fisherman VRLA member	9/07/2014 13/08/2014 22/08/2014 19/03/2015	Timing, location Info Sheet V1 Follow up Info Sheet V2	Phone Post Post Post		No Contact from stakeholder	04/2015: No objections raised but continue to engage along with other Apollo Bay fishers. 05/2015: stakeholder fishes in the area, continue to engage before and during the survey to minimise impact or agree on compensation plan as applicable.	22/08/2014: no response from Stakeholder, nevertheless sent follow up letter outlining approach to compensation, rock lobster impact research, commitment to reporting engagement and ongoing offer to discuss or meet.	Engage throughout
Rock Lobster licence holder VRLA member	08/04/2015 20/05/2015	Info Sheet V2 Follow up	Email Email		09/04/2015: advised he will discuss with his fishing operator	No objections raised but continue to engage along with other Apollo Bay fishers	20/05/2015: advised we will engage further once date for survey is set.	Engage throughout
Apollo Bay Fisherman VRLA member	13/05/2015 22/05/2015	Location, timing Info Sheet V2	Phone Email		13/05/2015: was aware of proposed survey from VRLA newsletter and will contact us as he requires.	05/2015: contact details provided to Origin by VRLA. 05/2015: stakeholder fishes in the area, continue to engage via VRLA before and during the survey to minimise impact or agree on compensation plan as applicable.	22/05/2015: advised we will engage further once date for survey is set.	Engage throughout
Port Campbell Professional Fisherman's Association (PCPFA) VRLA member	10/07/2014 14/08/2014 10/10/2014 19/03/2015 24/03/2015	Info Sheet V1 Follow up Consultation Info Sheet V2 Research review	Meeting Email Meeting Email Email		Most engagement re past Enterprise Survey (November 2014) 10/07/2014: PCPFA members don't fish in Vic P69. But still concerned about seismic surveys which they believe have reduced Rock Lobster population in their region. 10/10/2014: Origin advised timing for VicP69 but PCPFA advised again, not interested as don't fish there. Despite current FRDC - UTAS/IMAS research in progress, stated they wanted further field study by way of putting pots under the seismic source with different size crayfish and assess the impact, or they won't believe the current science. Origin undertook to review this request with project manager but said it may already be covered by the current research project and if not, would be unlikely to be organised for the Enterprise Survey. 22/03/2015: advised they don't fish in Vic P69 but remain opposed to seismic surveys, asked if Origin had considered their research suggestion. 27/03/2014: acknowledged and appreciated Origin's detailed reply and asked to be kept informed re VicP69.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 03/2015: assessed request for further research, consulted with UTAS/IMAS re research hypotheses and design of research, deemed further research unnecessary until all results of current research published. 04/2015: Port Campbell fishers don't fish in VicP69 but remain opposed to Seismic surveys. Consult further on FRDC-UTAS/IMAS Rock Lobster research when information becomes publicly available.	14/8/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 24/03/2015: advised that research design of current study very robust and Origin's view is that supplementary research is not necessary at this stage. Will review this again after results and further recommendations are published. Will keep stakeholder informed re VicP69 as requested.	Inform only
Port Campbell Professional Fisherman's Association (PCPFA) member and VRLA member	21/07/2014 25/07/2014 13/08/2014 3/10/2014 19/03/2015	Timing, location Fact Sheet V1 Reminder Updated timing Fact Sheet V2	Phone Post Post Phone Post & Email		Most engagement re past Enterprise Survey (November 2014). 21/07/2014: Overall objections to Enterprise Survey due to consultation and believed impact of seismic surveys on rock lobster, particularly during early development of rock lobsters, believes seismic surveys have been the cause of reduced quotas. 7/11/2014: advised only fish close to Port Campbell 9/11/2014: advised keen for industry wide consultation, i.e. through SIV and keen to see reports from UTAS/IMAS research.	21/07/2014: Origin was seeking to inform, not consult, as this was the first notification of proposed VicP69 survey. 13/08/2014: asked if they wished to engage re VicP69. 08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 7/11/2014: No impact on fishing activity as they do not fish in Vic/P69. 9/11/2014: Origin will continue to engage industry through SIV, VRLA but not all fishers are members so will continue to engage directly where relevant. 05/2015: no response to updated info on VicP69. Previously advised they only fish close to Port Campbell and not in VicP65.	22/8/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings.	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	10/07/2014 14/08/2014 09/10/2014 19/03/2015	Info Sheet V1 Follow up Consultation Info Sheet V2	Meeting Email Meeting Email		Most engagement re past Enterprise Survey (November 2014). 09/07/2014: doesn't currently fish in VicP69 but may upgrade vessel in future and may consider this area. Overall objection to seismic surveys as believes it damages the larvae and causes long term damage to the lobster fishery, referenced an article he had read about snow crabs in Canada in support of this view. Would rather exploration permits 'stay locked up' until there's a better exploration methodology than the current 3D seismic survey. 09/10/2014: objected to sharing the space during Enterprise survey and advised he would fish regardless.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	09/07/2014: There's no scientific evidence to support rock lobster population decline due to seismic surveys. Re 'locking up permits' view from Stakeholder, Origin discussed the need for Australian governments to pursue both energy security and food security concurrently, along with diversified industry growth and productivity. 14/8/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 09/10/2014: further consultation re Enterprise survey, each party's rights to access, Origin's compensation policy, updated timing for Crowes Foot survey.	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	09/07/2014 15/08/2014 30/10/2014 19/03/2015	Info Sheet V1 Follow up Updated timing Info Sheet V2	Meeting Email Phone Post		09/07/2014: Believes the lighter lobster grounds adjacent the Big Reef in VicP69 had not appeared to have fished well since seismic surveys and along with fears for larvae was concerned about potential damage to the fishery.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	15/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings.	Engage throughout
WPFA member VRLA member	09/07/2014 14/08/2014 09/10/2014 19/03/2015	Info Sheet V1 Follow up Consultation Info Sheet V2	Meeting Email Meeting Email		09/07/2014: Does not regularly fish in Crowes Foot survey area. Concerns about damage to lobster fishery from seismic survey impact.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	14/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 09/10/2014: further consultation re Enterprise survey, each party's rights to access, Origin's compensation policy, updated timing for Crowes Foot survey.	Inform only
WPFA member VRLA member	22/08/2014 27/08/2014 09/10/2014 19/03/2015	Info Sheet V1 Consultation Consultation Info Sheet V2	Post Phone Meeting Post		27/08/2014: Fishes near Bay of Islands then works his way back to Warrnambool (ie. Not in VicP69). Believes seismic surveys damage rock lobster larvae and have previously caused reduced catch rates.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	27/08/2014: advised Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity.	Inform only
WPFA member VRLA member	08/07/2014 22/08/2014 19/03/2015	Location, timing Info Sheet V1 Info Sheet V2	Phone Post Post		08/07/2014: advised he fishes the coastal strip from Warrnambool to Port Campbell and until recent years has fished the Big Reef at the season opening. Voiced strong objection to oil and gas activity, not willing to consult and advised would not be shifting for any survey. 11/10/2014: does not want further contact with Petroleum industry.	08/2014: reviewed concerns, past research, recent EMP, recent paper on dangers of extrapolating research to other species. Found there's no subsequent information that supports concerns for impact at the population level. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	22/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings.	Inform only
WPFA member VRLA member	22/05/2015 22/05/2015	Location, timing Info Sheet V2	Phone Email		22/05/2015: concerned about impacts of Seismic on rock lobster larvae.	05/2015: no research / information that supports concerns for impact at the population level. Has not historically fished in survey area. Will inform date of survey when confirmed in case he decides to change fishing grounds.	22/05/2015: acknowledged concern. Will provide update of confirmed survey dates in case he decides to fish in the area in the future.	Inform only
WPFA member VRLA member	08/07/2014 22/08/2014 19/03/2015	Location, timing Info Sheet V1 Info Sheet V2	Phone Post Post		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	N/A	Inform only
WPFA member VRLA member	08/07/2014 22/08/2014 19/03/2015	Location, timing Info Sheet V1 Info Sheet V2	Phone Post Post		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	N/A	Inform only
Port Fairy based rock lobster fisher VRLA member	09/07/2014 19/03/2015	Location, timing Info Sheet V2	Meeting Email		09/07/2014: Sometimes fishes in south east of Crowes Foot permit area. Didn't want a Crowes Foot fact sheet as had little interest.	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	N/A	Inform only

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Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Port Fairy based rock lobster fisher VRLA member	09/07/2014 22/08/2014 19/03/2015 07/04/2015	Info sheet V1 Follow up Info Sheet V2 Consultation	Meeting Post Email Phone		07/04/2015: called to advise objection to seismic surveys as he believe it harms rock lobsters. Said he only fishes from Warrnambool to Peterborough. Completed his quota for the year last week but said someone told him fishing at Port Campbell was no good this year even though he didn't fish there. Was very upset at possibility of reduced quota in coming year. Believes scientific testing should prove 100% certainty of no harm to rock lobsters before any more seismic surveys occur.	08/2014: research has shown no impact at population level and no correlation between catch rates and seismic surveys. He does not fish in VicP69 so there will be no impact on his fishing activity. If stakeholder's fishing grounds change, we will re-engage. 05/2015: does not fish in Crowes Foot area.	22/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings. 07/04/2014: explained research has shown no impact at population level and no correlation between catch rates and seismic surveys. Advised we had not received any complaints from the many fishers we engage re reduced catch at Port Campbell to Peterborough.	Inform only
Retired shark and giant crab fisher	09/08/2014 19/03/2015	Info Sheet V1 Location, timing	Email Phone		Discussion primarily about Enterprise survey	Stakeholder no longer operating	N/A	Close
Retired shark fisher	08/07/2014 07/08/2014 19/03/2015	Location, timing Info Sheet V1 Info Sheet V2	Phone Meeting Post		08/07/2014: Phone discussion - advised area close to the coast along the 3mile state limit was targeted for gummy shark from Portland to Cape Otway. He also had two shots near to the Big Reef – one at right angles to the west and the other to the east. Believes the seismic scared the shark and it took an area about a month to be repopulated. He said that school shark were in plague proportions but the small available quota mostly prevented keeping them. He feared they were taking over from gummy shark. Expressed an interest in providing chase boat services.	05/2015: has moved back to South Australia now that seal and dolphin closures are finished. May return to area, depends on fishing success in SA.`		Engage throughout
Port Fairly based rock lobster fisher	08/07/2014 09/08/2014 22/08/2014 19/03/2015	Location, timing Info Sheet V1 Follow up Info Sheet V2	Phone Post Post Post		08/07/2014: Advised he was not sharking this year and was going lobster fishing instead. He said he was likely to be working between Port fairy and Warrnambool and not fishing near the Enterprise Survey area. The Crowes Foot area did not affect him.	08/2014: research has shown no impact at population level and no correlation between catch rates and seismic surveys. He does not fish in VicP69 so there will be no impact on his fishing activity. If stakeholder's fishing grounds change, we will re-engage. 05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey. Does not fish in survey area.	22/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings.	Inform only
Southeast Trawl Fishing Industry Association	30/07/2014 06/08/2014 10/10/2014 10/02/2015 19/03/2015 19/03/2015 03/06/2015 03/06/2015	Info Sheet V1 Stakeholder verification Updated timing Consultation Update, timing Info Sheet V2 Follow up Follow up Follow up	Email Email Email Meeting Phone Email Phone Email	Industry association representing businesses with a commercial interest in the South East Trawl Fishery.	18/07/2014: offered consulting services to Origin re stakeholder engagement for Crowes Foot survey. 30/07/2014: assumed SETFIA members would be affected and was seeking information for newsletter. 05/08/2014: advised SETFIA did not know if trawling occurred in VicP69 and questioned Origin's stakeholder identification approach. 10-11/2014: emails criticising Origin for lack of discussion and stakeholder identification. 10/02/2015: appreciated Origin visiting him at Lakes Entrance to discuss approach to engagement in the future. 24/03/2015: replied re arranging meeting time. 31/03/2015: appreciated second visit from Origin at Lakes Entrance. Pleased at detailed maps tabled for discussion and based on these maps advised he didn't think there was any or much trawling in VicP69 and noted Origin's commitment to advise him further after data provided to Origin by AFMA. Felt that Origin should TEXT known fishers in the area during our operations - we advised that we had done and will continue this. 03/06/2015: confirmed Origin's assessment of minimal fishing effort in trawl areas, happy to forward emails from Origin to western trawl sector (before during and after survey), will charge small admin fee as Origin suggested.	06/08/2014: advised our research showed trawl fishing didn't occur in VicP69 but were happy to discuss if SETFIA believed otherwise. 10-12/2014: criticisms about consultation and stakeholder identification were unfounded given many requests for SETFIA to advise Origin if they disagreed with our research about absence of trawl fishing in VicP69, and many offers to meet and discuss. 05/2015: AFMA data request and ABARES reports verify Origin's assessment of relatively small trawl fishing in the survey area. Checked this with trawl fishing stakeholders in Origin's database, and validated fishermen who had previously done some 'try shots' in the area but found not much fish.	06/08/2014: advised our research showed trawl fishing didn't occur in VicP69 but were happy to discuss if SETFIA believed otherwise. 11/2014: reminded SETFIA of Origin's ongoing invitations to meet, which have not received a reply; Origin's determination of no trawl fishing in VicP69; ongoing invitation for SETFIA to demonstrate members' functions, interests, activities in Vic P69; invited SETFIA's suggestions for future meaningful engagement; reiteration of eagerness to meet; advised we have never refused to meet (SETFIA confused us for a different proponent). 10/02/2015: putting aside unfounded criticisms, Origin met with SETFIA in Lakes Entrance to 'clear the air' and ask how they would prefer to be consulted. 19/03/2015: sent revised info sheet 24/03/2015: email re arranging time to meet 31/3/2015: met again at Lakes Entrance to engage in person. Showed detailed survey and operational maps of Crowes Foot survey, detailed bathymetry, detailed fishing effort maps from ABARES data. Advised we will update our maps if any knowledge from an AFMA search changes current stakeholder identification. We will re-engage after AFMA data received. 03/06/2015: AFMA have provided data of fishing effort in Cwlth managed fisheries as per Origin's request, we cannot give details but can say there is relatively small fishing effort of Cwlth managed fisheries in the survey area. Origin has reconciled this fishing effort with its stakeholder database, is confident that potentially affected stakeholders have been identified, the survey will have minimal or no impact on Cwlth trawl activity, nevertheless we will maintain engagement before, during and after the survey as a precaution, should fishermen change their intentions; happy for SETFIA to forward on to members and pay small admin fee for this.	Engage throughout
Portland based rock lobster and giant crab fisher	08/08/2014 19/03/2015	Location, timing Info Sheet V2	Meeting Email		08/08/2014: viewed VicP69 map, advised areas of no concern as they are rock lobster grounds. Has done some try shots toward the coast between Cape Otway and Moonlight head but there was not enough fish there to risk his equipment. The main grounds are at the shelf break and upper slope.	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey. Does not fish in survey area.	N/A	Not relevant person
Portland based trawl fisher	08/08/2014 21/05/2015	Location, timing Info Sheet V2	Meeting Meeting		08/08/2014: VicP69 area of no concern 21/05/2015: Origin visited at Portland wharf. Confirmed he does not fish in survey area.	08/08/2015: Visited at Portland Wharf. Does not fish in VicP69. 21/05/2015: Visited at Portland wharf to check his trawl locations after receiving AFMA data. Confirmed he does not fish in survey area.	N/A	Not relevant person
Portland based trawl fisher	08/08/2014 19/03/2015 21/05/2015	Location, timing Info Sheet V2 Follow up	Meeting Email Meeting		08/08/2014: VicP69 area of no concern. There are some shots around to the east Otway coast off Apollo Bay (i.e.. Not in VicP69) 21/05/2015: Origin visited at Portland wharf. Confirmed he does not fish in survey area.	08/08/2014: visited at Portland Wharf. Does not fish in VicP69. 21/05/2015: visited at Portland wharf to check his trawl locations after Origin received and reviewed AFMA data. Confirmed he does not fish in survey area.	N/A	Not relevant person
Portland Professional Fisherman's Association (PPFA)	05/08/2014 14/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Follow up Timing update Info Sheet V2	Email Email Email Email		None raised.	05/2015: Does not fish in survey area.	22/08/2014: sent follow up to advise approach to compensation, Origin's understanding that seismic survey activity did not impact rock lobster larvae at the population level, supported by the fact that there has been substantial catch variation over many years with and without seismic survey activity. Impacts have included; 12 Apostles marine park declaration; Curdies inlet outflow; abalone virus; larvae originating from South Australian waters with no impact from local seismic activity; unusual weather patterns causing intense upwelling and very cold water across the shelf. Advice that feedback will be reported to regulator, invited continued feedback, questions, meetings.	Inform only
Port Welshpool based trawl fisher	19/03/2015 22/05/2015	Info Sheet V2 Follow up	Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: known to fish in a variety of locations but our research and confirmation from AFMA data shows he is very unlikely to fish in survey area. Nevertheless, Origin will engage further before the survey and during if applicable.	N/A	Engage throughout
Trawl fisher - various ports	19/03/2015 21/05/2015	Info Sheet V2 Follow up	Email Phone		21/05/2015: Has had some try shots while in transit across survey area, but not much fish there. Fishes upper continental slope and shelf edge. (Skippers for stakeholder below)	21/05/2015: unlikely to fish in survey area, engage before the survey as a precaution, and during if applicable.	21/05/2015: phoned to check his trawl locations after Origin received and reviewed AFMA data. Confirmed he has fished in area before but unlikely to fish there given poor outcome. Origin will engage before the survey as a precaution, and during if applicable.	Engage throughout
Portland based trawl fisher	19/03/2015	Info Sheet V2	Email		21/05/2015: See comments above.	21/05/2015: unlikely to fish in survey area, engage before the survey as a precaution, and during if applicable.	21/05/2015: phoned to check his trawl locations after Origin received and reviewed AFMA data. Confirmed he has fished in area before but unlikely to fish there given poor outcome. Origin will engage before the survey as a precaution, and during if applicable.	Engage throughout
Portland based trawl fisher SETFIA member	19/03/2015 25/05/2015	Info Sheet V2 Follow up	Email Meeting		25/05/2015: has no concerns - do not fish in this shallower area. On water communications when entering and exiting site for lay down and pick up of gear will be appreciated. Use VHF Channel 16 for communications on water	05/2015: does not fish in survey area, engage before the survey as a precaution, and during if applicable.	25/05/2015: advised will engage before the survey date is confirmed and during survey if applicable.	Engage throughout
Rock lobster and shark fisher PPFA member VRLA member	19/03/2015 25/05/2015	Info Sheet V2 Follow up	Email Meeting		20/03/2015: replied advising survey will affect his operations. 25/05/2015: will be sharking until week before lobster season opens and then lobster from opening. Will work around survey.	25/05/2015: ok to work around survey if required. Use VHF Ch 16 if vessel needs to be contacted. Engage before survey and during survey if required to advise locations.	25/05/2015: advised will engage before the survey date is confirmed and during survey if applicable.	Engage throughout
Rock lobster fisher PPFA member VRLA member	08/04/2015 13/05/2015	Info Sheet V2 Follow up	Email Phone		13/05/2015: may reach outer areas of survey area but later in the season.	13/05/2015: Does not fish in survey area during proposed times.	13/05/2015: Advised we will inform proposed start date when confirmed.	Inform only
Rock lobster fisher PPFA member VRLA member	23/03/2015	Info Sheet V2	Post		covered under contact above	covered under contact above	covered under contact above	Inform only
Corporate Alliance Enterprises (Manager)	19/03/2015 19/05/2015 19/05/2015	Info Sheet V2 Info Sheet V2 Follow up	Email Phone	Commercial trawl fishing company	20/05/2015: confirmed received information sheet, no objections raised, referred Origin to one of their vessel owners. Advised currently operating out of Port Welshpool. Will forward information sheet to him.	03/2015: Stakeholder not engaged in initial consultations re VicP69 as there's no Cwlth trawl fishing in the area. Engaged during Enterprise survey to advise lay-down areas, therefore included in VicP69 engagement as a precaution if their vessels intend to traverse the area on route to fish trawl areas. 20/05/2015: no trawl fishing activity in survey area, engage before and throughout operation of survey as a precaution in case their vessels are planning to traverse the area.	20/05/2015: called to check trawl locations after Origin received and reviewed AFMA data. Confirmed they do not fish in survey area.	Engage throughout
Corporate Alliance Enterprises. (co-owner)	20/05/2015	Location, timing	Phone	Commercial trawl fishing company	20/05/2015: confirmed home port and advised he used to have occasional try shots while in transit past Big Reef to Melbourne or to the shelf edge but doesn't fish in survey area now. Interested in operational aspects, such as turning circle, on-water communication protocols, lay down area and transit path.	20/05/2015: no trawl fishing activity in survey area, engage before and throughout operation of survey as a precaution in case their vessels are planning to traverse the area.	20/05/2015: called to check trawl locations after Origin received and reviewed AFMA data. Confirmed they do not fish in survey area. Explained operational aspects as per questions. Will communicate before and during the survey as required depending on his vessel location.	Engage throughout

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Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Sustainable Shark Fishing Inc (SSFI)	05/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email	Association representing shark fishers	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a significant shark fishing ground. Engage before and throughout operation of survey as a precaution.	N/A	Inform only
Sustainable Shark Fishing Inc (SSFI)	05/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email	Association representing shark fishers	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a significant shark fishing ground. Engage before and throughout operation of survey as a precaution.	N/A	Inform only
Southern Shark Industry Alliance (SSIA)	05/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email	Represents interests of its Commonwealth-licensed shark gillnet and shark hook members in the Gillnet Hook and Trap Fishery.	05/08/2014: advised he was not SSF and email was not good enough as consultation. No subsequent replies	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a significant shark fishing ground. Engage before and throughout operation of survey as a precaution.	06/08/2014: apologised for typo. Advised we were introducing a new proposed survey so the purpose was to inform and invite comment.	Inform only
Victorian Scallop Fisherman's Association	01/08/2014 15/08/2014 22/08/2014 10/10/2014 26/03/2015 31/03/2015	Info Sheet V1 Follow up Follow up Timing update Info Sheet V2 Follow up	Email Email Email Email Email Phone	Industry Association representing commercial scallop fishers	19/08/2014: concerns over lasting impact from seismic sources, requesting technical details about acoustic equipment and source, details on survey area and marine life impact, and after receipt of information, will provide feedback.	08/2014: no scallop fishing in VicP69 but happy to discuss if their members intend to try and fish there. 05/2015: have made several attempts to engage. Advised we believe there is no scallop fishing in the survey area. Have verified this with fisheries reports from AFMA and Fisheries Victoria, along with a SIV board member who is also a scallop fisherman.	22/08/2014: detailed reply on likely acoustic source but not confirmed until contract awarded, detailed information re our understanding there's no scallop fishing in VicP69, advised we are happy to review any specific information they may provide to demonstrate VSFA members' scallop fishing functions, interests or activities in the proposed survey area to enable assessment of impact and subsequent engagement. 31/03/2015: arranged meeting in Lakes Entrance but was cancelled by VSFA. Advised again (via phone) our research tells us there's no scallop fishing in VicP69 but to advise us if they believe otherwise and we are happy to consult.	Inform only
Tasmanian Seafood Industry Council	24/07/2014 15/08/2014	Info Sheet V1 Follow up	Email Email	Peak body representing professional fishing, seafood processors and exporters in Tasmania	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	Sent info as courtesy note as our research showed no fishing activity by Tasmanian vessels in Vic P69.	N/A	Not relevant person
Retired squid fisher	08/08/2014	Info Sheet V1	Meeting		08/08/2014: recently retired from the squid fishery and sits on the Board of seafood Industry Victoria. Viewed information sheets and indicated VicP69 of no great concern, it gets a very small amount of effort occasionally but the timing of the survey avoids this.	Visited at wharf. No concerns re squid fishing generally in VicP69. Retired from fishing activity but sits on SIV board and has broad knowledge of squid fishing.	N/A	Not relevant person
Devonport based shark and squid fisher	14/07/2014 22/08/2014 19/03/2015	Location, timing Info Sheet V1 Info Sheet V2	Phone Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground and minimal shark fishing.	N/A	Inform only
Williamstown based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid or scallop ground.	N/A	Inform only
Lakes Entrance based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid or scallop ground.	N/A	Inform only
Lakes Entrance based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015 31/03/2015 19/05/2015	Info Sheet V1 Timing update Info Sheet V2 Consultation Follow up	Email Email Email Meeting Phone		31/03/2015: doesn't fish in VicP69 for scallops as he fished there about 15 years ago without much success and has tried since but bed not replenished. Verified this on 07/04/2014 with location coordinates. Does fish in VicP69 for squid but from February onwards, sometimes in January but unlikely. Advised it is generally known among local fishers that VicP69 does not have a scallop fishery.	04/2015: no impact on fishing activity, as a precaution Origin will communicate further if survey is likely to be operating in January. 19/05/2015: does not trawl in survey area (further verification completed after reviewing AFMA data)	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform. 19/05/2015: phone to check his trawl locations after Origin received and reviewed AFMA data. Confirmed he does not fish in survey area.	Inform only
Williamstown based squid and scallop fisher	8/8/2014 10/10/2014 19/03/2015 24/3/2015	Info Sheet V1 Updated timing Info Sheet V2 Returned call	Email Email Email Phone		24/3/2015: called to advise no concerns or objections. Does not fish in that area between October to January.	05/2015: does not fish in survey area	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
Geelong based squid fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
Lakes Entrance based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		None raised.	05/2015: re Squid, AFMA data search confirmed Origin's knowledge of survey area not being a squid ground. Re Scallops, data searches from AFMA and Fisheries Victoria, along with consultation with Andy Watts (SIV board member and scallop fisherman) confirmed no scallop fishing in survey area.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
Queenscliff based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015 20/03/2015	Info Sheet V1 Timing update Info Sheet V2 Consultation	Email Email Email Phone		20/03/2015: called to advise he believes Seismic surveys are terrible but recently fished at Port Campbell and the squid are resilient and come back a year later. Said the map we sent was helpful, survey won't affect his fishing at that time, don't need more information or updates as has no impact on his fishing. Having a good year as prices are up. Keen for work as chase boat.	05/2015: re Squid, AFMA data search confirmed Origin's knowledge of survey area not being a squid ground. Re Scallops, data searches from AFMA and Fisheries Victoria, along with consultation with Andy Watts (SIV board member and scallop fisherman) confirmed no scallop fishing in survey area.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform. 20/03/2015: thanked him for response. Said we would advise if timing changed.	Inform only if timing changes
Geelong based squid fisher	08/08/2014 19/03/2015	Info Sheet V1 Info Sheet V2	Post Post		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
Lakes Entrance based squid and scallop fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: re Squid, AFMA data search confirmed Origin's knowledge of survey area not being a squid ground. Re Scallops, data searches from AFMA and Fisheries Victoria, along with consultation with Andy Watts (SIV board member and scallop fisherman) confirmed no scallop fishing in survey area.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
San Remo based squid and shark fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
St Helens based squid fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
SA based squid fisher	08/08/2014 10/10/2014 19/03/2015	Info Sheet V1 Timing update Info Sheet V2	Email Email Email		05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data search confirmed Origin's knowledge of survey area not being a squid ground.	08/08/14: Sent information sheet and covering email which also stated our understanding that this area is not used frequently for squid fishing, but as a courtesy we were keen to inform.	Inform only
Seafish	24/03/2015	Info Sheet V2	Email	Commercial trawl fishing company based in Tasmanian ports	05/2015: Stakeholder has not replied to advise an interest in Crowes Foot survey.	05/2015: AFMA data request and ABARES reports verify Origin's assessment of relatively small trawl fishing in the survey area. Checked this with trawl fishing stakeholders in Origin's database, and validated fishermen who had previously done some 'try shots' in the area but found not much fish.	N/A	Inform only
Victorian Abalone Divers Association (VADA)	08/05/2015 15/05/2015	Location, timing Info Sheet V3	Phone Email	Industry association representing abalone fishers in the Central Abalone Zone	08/05/2015: will pass on Origin's info to members. No concerns raised. 20/05/2015: Sean emailed Origin's info sheet including safe diving information to 3 VADA members.	08/05/2015: will engage with abalone divers during operational planning for survey to verify if they plan to dive within 10km of the survey and if so, apply Origin's safe diving procedures.	08/05/2015: explained survey operations, diving procedures, need to contact divers working around Apollo Bay, request for him to distribute information to members (even though they would receive our info from SIV).	Engage throughout
Western Abalone Divers Association (WADA), SIV	15/05/2015	Info Sheet V3	Email	Industry association representing abalone fishers in the Western Abalone Zone	15/05/2015: advised his members dive some 60kms away and the survey will be of no consequence.	05/2015: no impact but inform only as a courtesy and given he is also SIV Chairman	15/05/2015: acknowledged prompt reply and advised this information had also been sent to VADA and SIV. Asked to advise us if there were any other divers he thought we should engage.	Inform only
Scallop fisher	15/05/2015	Info Sheet V2 via SIV	post	Scallop Fisherman	28/05/2015: phoned in response to our info posted by SIV. Advised overall objection to seismic surveys due to believed impact on scallops. Said he will strongly object to any seismic surveys east of Cape Otway. Asked what other surveys may be going on over scallop areas.	28/05/2015: no scallop beds in VicP69, Origin has no permits east of Cape Otway and does not know other proponents who may have an interest.	28/05/2015: Advised there are no Scallop beds in our proposed survey area (to which he agreed); none of our surveys have been over scallop beds; timing was October to Jan due to avoidance of Southern Right Whales and Blue Whales; not confirmed yet for this year;	Not relevant person

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Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Australian Fisheries Management Authority	11/07/2014 10/10/2014 17/2/2015 26/02/2015 17/03/2015 19/03/2015 08/04/2015 17/04/2015 22/04/2015 23/04/2015 28/04/2015 01/05/2015 07/05/2015 11/05/2015 19/05/2015 25/05/2015 27/05/2015 29/05/29/05 29/05/2015 02/06/2015 02/06/2015	Info Sheet V1 Updated timing Data request Reply qns Data request Info Sheet V2 Follow up Reply qn Reply qn Follow up Follow up Coordinates Deed Deed, request Missing data Follow up Follow up Follow up Follow up Data confirmation Data confirmation	Email Email Email Email Email Email Phone Email Email Phone Email Email Email/post Email Email Phone Email Phone Email Phone Email	Commonwealth fisheries management	14/7/2014: advised some fishing activity in past years in Vic/P69: Cwlth Trawl; Gillnet Hook and Trap; Squid Jig (as per 1 degree scale reported by ABARES Fisheries Status Report 2013/2014. Said Origin should consult directly with fisheries / associations. 17/02/2015: queried purpose of data request and advised info on fishing effort already available in ABARES report. 12/03/2015: sent formal data request form to be completed by Origin. 09/04/2015: advised data would be available on 30 April. Re SETFIA's query to AFMA, RG advised that AFMA has no "approved persons" list, Origin request is in line with data release policy. 17/04/2015: queried Origin's fisheries advisor's contract with Origin 20/04/2015: seeking Origin's address 21/04/2015: checked Origin's fisheries advisor's pecuniary interest in Cwlth fisheries following SETFIA comments. Checked legal signatories. 23/04/2015: provided draft deed of confidentiality for Origin to review. 23/04/2015: advised SETFIA raised issues about Origin sharing information with them, this is the first data request from a petroleum proponent, AFMA could have provided sooner if they didn't get all SETFIA queries. 01/05/2015: supplied deed for signing 11/05/2015: acknowledged receipts of deeds from Origin's fisheries advisor and Origin. 18/05/2015: emailed results of data request in spreadsheet. 27/05/2015: progress update on further data request, provided layout of fishing shot heat maps on a grid for survey area and sought Origin's feedback 29/05/2015: confirmed that missing data meant NULL values and is still pursuing heat maps 02/06/2015: confirmed Commonwealth fishing effort in survey area can be described as "relatively small"	7/2014: AFMA information re active fisheries in Vic/P69 is too generic due to mis matched spatial scales. 17/02/2015: notwithstanding Origin's confidence in identifying relevant stakeholders through own database and direct engagement, initiated formal data request as a further validation step. 04/2015: SETFIA raised confidentially concern with AFMA providing data to Origin, after asking Origin for a copy of the report we requested from AFMA (which we declined due to confidentiality). Unprofessional for AFMA to be discussing Origin's data request with SETFIA who appear to carry out the same stakeholder verification activities in their consulting services to the oil and gas sector. Further engagement with SETFIA will occur after we have assessed the data from AFMA. 05/2015: reviewed AFMA data which showed minimal Commonwealth fishing effort in Vic P69 and operational area. Checked stakeholder database, contacted relevant fishermen 02/06/2015: sought and received final confirmation of Origin's assessment of "relatively small fishing effort" in survey area.	16/07/2014: Origin directly engages with individual fishers and specific associations from most recent publications of fishing effort, own database records and local wharf visits. 17/02/2015: emailed specific data request for VicP69. 26/02/2015: advised reasons for data request, to assist with stakeholder engagement and mitigation planning for EP, and provide greater detail not available in ABARES Fishery Status Reports (2013-2014) which uses a 1º resolution, resulting in the misleading view that all of VicP69 is fished, and this view has been used by persons to make false inferences to a number of project proponents about being affected. 08/04/2015: queried when data could be supplied 17/04/2015: advised Origin's fisheries advisor is engaged by Origin and has been instructed to request data from AFMA 20/04/2015: advised address 22/04/2015: Origin's fisheries advisor confirmed verbal advice that he has no financial interest in Cwlth fisheries 23/04/2015: called to check deed details and provide assurances re Origin's privacy policy. Any fishery info from AFMA indicating fishing activity in VicP69 (not already known to us) would still require us to engage stakeholders including SETFIA to identify the actual fishermen. No data would be shared with any other parties. 01/05/2015: sent final coordinates for inclusion in deed 07/05/2015: send registered mail for signed deed of confidentiality 07/07/2015: resent data request and deed to data request inbox as further requested by AFMA 19/05/2015: reviewed data request, noted some fisheries requested by Origin was missing. We believe it is because they have null values but sent notice to AFMA requesting full data or confirmation 25/05/2015: followed up re missing data as no reply 27/05/2015: advised heat maps will be helpful in operational planning and please proceed. 29/05/2015: sent email to confirm agreed data outputs being described as "relatively small fishing effort" in the survey area. Advised still require 'heat maps' offered by AFMA which may be helpful in operational planning. 02/06/2015: asked again for final confirmation of Origin's assessment of fishing effort so we could engage SETFIA and summarise for NOPSEMA.	Inform only
2015: Department of Economic Development, Jobs, Transport and Resources (DEDJTR) / Fisheries Victoria 2014: DEPI - Fisheries Victoria	17/07/2014 24/07/2014 10/10/2014 16/02/2015 24/03/2015 31/03/2015 21/04/2015 23/04/2015 27/04/2015 01/05/2015 21/05/2015	Location, timing Info Sheet V1 Timing Update Data Request Info Sheet V2 Data clarification Data clarification Data clarification Fisheries Report Supplementary data Fisheries map, diving	Meeting Email Email Email Email Email Email Email Email Email Email	Management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreements	17/07/2014: concerns about short turnaround time for this EP (at that stage indicative plans were for Spring 2014 commencement). 19/02/2015: Advised data limitations due to privacy legislation but can provide qualitative data (what access licence classes are operating in the requested grids squares) but not information on harvest, effort or number of operators 31/03/2015: acknowledged info sheet, checked our acceptance of data limitations 16/4/2015 information received from FV analysed 23/4/2015 confirmed potential for double counting as some rock lobster licensees will hold crab licenses 27/04/2015: gave consent to provide catch and effort information to SIV 01/05/2015: acknowledge request and will process	03/2015: Search of Vic Fisheries Act did not show applicable privacy clauses, nevertheless Origin was aware that information could not be provided down to professional fishers level due to '5 boat' rule which is common knowledge in the fishing industry. 05/2015: Supply of data enabled: preparation of further fisheries maps; overlaid with bathymetry and survey area: preparation of report to seek Fisheries Victoria's validation; identification of missing data - further request to Fish Vic; then used to verify Origin's knowledge of fisheries and therefore professional fishers. No additional fisheries nor stakeholders were identified through this process. Nevertheless, the verification provided reassurance.	17/07/2014: EP will draw upon recent EP planning for other Seismic Surveys and recent stakeholder engagement therefore believed the timing to be reasonable. But timing not yet locked in for 2014 start. 31/3/2015 Accepted offer of qualitative data. 21/04/2015: Sought Offshore Constitutional Settlement (OCS) for Rock Lobster and Giant Crab. 23/04/2015 checked for potential double counting for licensees operating with a number of licenses. 27/04/2015: supplied Origin's report of fisheries activity in VicP69 area for verification and permission to discuss with SIV. 01/05/2015: requested supplementary data to initial data request 20/05/2015: thanked for support, provided maps and info sheet with dive details, advised maps enabled Origin to verify stakeholders.	Engage throughout
DEDJTR / Fisheries Victoria	17/07/2014 24/03/2015 10/10/2014 21/04/2015 21/05/2015	Location, timing Info Sheet V1 Timing update Info Sheet V2 Data clarification Fisheries map, diving	Meeting Email Email Email Email	Management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreements	21/04/2015: provided link on website to Offshore Constitutional Settlement (OCS)	05/2015: Supply of data used to verify Origin's knowledge of fisheries and therefore professional fishers	21/04/2015: Sought Offshore Constitutional Settlement (OCS) for Rock Lobster and Giant Crab. 20/05/2015: thanked for support, provided maps and info sheet with dive details, advised maps enabled Origin to verify stakeholders.	Engage throughout
DEDJTR / Fisheries Victoria	20/04/2015 23/04/2015 21/05/2015	Data clarification Data clarification Fisheries map, diving	Email Email	Control / enforcement of local fishing activity (recreational and professional)	21/04/2015: advised the Ocean Fishery Licence is a stand alone entity that limits the licence holder to operate within 3 nautical miles of the Victorian coast irrespective of whether the holder also holds a Rock Lobster/Giant Crab Fishery Access Licence. 22/04/2015: further advised agreement between the Commonwealth and the States extends to fin-fish therefore extending the operational limits of the Ocean Fishery Access Licence and provided map.	05/2015: Supply of data used to verify Origin's knowledge of fisheries and therefore professional fishers	20/04/2015: Checked applicability of OCS regarding situation where Ocean Access, Lobster and Giant Crab licenses are held by the same operator 23/04/2015 checked for potential double counting for licensees operating with a number of licenses 20/05/2015: thanked for support, provided maps and info sheet with dive details, advised maps enabled Origin to verify stakeholders.	Engage throughout
DEDJTR / Fisheries Victoria	16/04/2015 20/05/2015	Data clarification Fisheries map, diving	Email	Catch and effort data management	16/04/2015: Scallop and Inshore trawl not in survey operational area 05/05/2015: supplied revised report as per request from Origin to FV 01/05/2015	16/4/2015 information very broad but rules out Victorian scallop and inshore trawl fisheries. Sparked query regarding extent of usage of ocean access licenses in permit and adjoining areas and operators with multiple licenses. 05/05/2015: Origin now has complete information from Fisheries Victoria for State fishing effort in survey / operational area. Developed maps of fishing effort and reviewed all stakeholders engaged.	No objections raised. Origin engaged several other FV staff to ensure management and operational levels of Fisheries Victoria all had same information. Thanked Fisheries Victoria for their support in providing data. 20/05/2015: thanked for support, provided maps and info sheet with dive details, advised maps enabled Origin to verify stakeholders.	Closed
DEDJTR / Fisheries Victoria	20/04/2015 20/05/2015	Data clarification Fisheries map, diving	Phone	Control / enforcement of local fishing activity (recreational and professional)	20/04/2015: The survey will impact on some lobster fishers if conducted while season is open. Very small amount of Ocean Access activity and usually confined to vessels also licensed to take lobster	Very helpful, reverted OCS agreements and is aware of survey planning in progress	20/04/2015: Queried extent of Ocean Access at Apollo Bay, applicable OCS and flagging of Crowes Foot survey planning.	Engage throughout
2015: Department of Environment, Land, Water and Planning and Primary Industries (DELWP) 2014: DEPI - Fisheries Victoria	11/07/2014 24/07/2014 10/10/2014 24/03/2015	Info Sheet V2 Follow up Timing update Info Sheet V2	Email Email Email Phone	Management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreements	24/07/2014: advised relevant contact at DEPI.	24/03/2015: send updated info sheet as her role may have changed with department changes. Asked if she could forward on my email to any other relevant persons in her department.	24/07/2014: called to ask for meeting and clarify if she is best contact.	Not relevant person
Border Protection Command, Australian Customs and Border Protection	11/7/2014 8/08/2014 27/10/2014 23/3/2015	Info Sheet V1 Reminder Updated timing Info Sheet V2		Australian border protecti	11/8/2014: forwarded info to relevant area within Border Protection Command. No comment about proposed exploration activity warranted but appreciated being informed. Send future info to BPC_IPS@customs.gov.au	N/A	Provide general info only	Inform only
Australian Maritime Safety Authority (AMSA), Navigation and Safety & International Division, inc Emergency Response Division	11/07/2014 1/8/2014 5/8/2014 10/10/2014 06/06/2015	Info Sheet V1 Acknowledgment Data request Updated Timing Info Sheet V3		Commonwealth marine safety	14/7/14: advice re significant shipping activity in permit area therefore collision risk, advised seismic vessel requirements, communication requirements from Origin. 09/06/2015: replied with instructions re operation of survey vessel, communication requirements, map of shipping data, updated contact details for AMSA asking for an AMSA individual's email to be removed and group email address for AMSA to be used, along with group email address for Australian Hydrographic Service.	8/2014: Project Manager reviewed email request, incorporated into Project Plan.	8/2014 and 09/06/2015: acknowledged requirements, advised communications requirements will be incorporated into survey acquisition Project Plan, requested info on shipping frequency in permit area.	Engage throughout
Dept of Defence. Directorate of Property Acquisition, Mining & Native Title, property Management Branch - Infrastructure Division, Defence Support & Reform Group	15/7/2014 10/10/2014 23/3/2015	Info Sheet V1 Updated Timing Info Sheet V2		Information on offshore mining and petroleum exploration issues all fall within Infrastructure Division's portfolio of responsibilities.	5/8/2014: no objections	N/A		Inform only
Australian Hydrographic Service	15/7/2014 10/10/2014 23/3/2015	Info Sheet V1 Updated Timing Info Sheet V2		Issues fortnightly notices to mariners for relevant nautical products.	14/7/2014: No concerns raised. Requested Origin to provide updates so they can issue notices to mariners. Origin has actioned.	Requested to Origin Project Manager to include in contracting procedures. Will review and include for Crowes Foot.	01/8/2014 advised stakeholder of requested advice procedure would be included in seismic survey contractor procedures.	Engage throughout

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
2015: DEDJTR - Department of Economic Development, Jobs, Transport and Resources - Earth Resources Regulation. 2014: DSDBI	11/07/2014 08/08/2014 24/3/2015 20/04/2015	Info Sheet V1 Follow up Info Sheet V2 Follow up	Email Email Email Email	Victorian state economic development, impact on state fisheries	12/08/2014: advised DSDBI not the regulator re Crowes Foot Survey and requested the survey's environmental management commitments includes adherence to the Commonwealth Environment Policy 2.1 on the interaction between seismic surveys and whales, and that this apply to penguins as well. 01/04/2015: Confirmed department has no regulatory role but expect to be kept informed generally and fishers in Victoria to take an interest in this survey and be concerned about risks to their commercial interests. In the case of any incident or issue that is likely to have an impact on Victoria (environment or otherwise) or an issue likely to receive community or media attention in the state of Victoria, ask that these be brought to our attention at the earliest possible time in order for us to inform the Minister. Advised department is responsible for transport and Origin would be expected to link its emergency response and oil spill contingency plan arrangements seamlessly with those of the National Marine Oil Spill Contingency Plan 2011, Victorian Plan for Maritime and Environmental Emergencies and with Emergency Services Victoria in accordance with the applicable offshore legislation and NOPSEMA's direction.	03/2015: Origin has and will continue comprehensive engagement with relevant persons with ongoing fishing activity in the proposed survey area. In the event that the survey is required to operate concurrently with fishing activity, Origin will engage with relevant fishers to identify any alternative operating arrangements to safely share the space and should this not be possible, will enter into compensation arrangements with relevant fishers.	24/03/2015: sent revised info sheet and assurances re engaging state commercial fishers and minimising impact. 20/04/2015: confirmed we have been in contact with relevant persons with ongoing fishing activity in the proposed survey area, continuing to engage with AFMA and SIV, along with discrete fisheries associations to verify any other fishers who may be relevant. In the event that the survey be required to operate concurrently with fishing activity, Origin will engage with relevant fishers to identify any alternative operating arrangements to safely share the space and should this not be possible, will enter into compensation arrangements with relevant fishers. Re departmental changes, we have previously communicated with DELWP re transport/oil spill I have also advised our Project Manager and Environment Manager for the Crowes Foot survey of the departmental changes to ensure their Environment and Operational plans reflect these changes.	Inform only
2015: Department of Environment, Land, Water and Planning and Primary Industries (DELWP) - Warrnambool (Southern Right Whales) 2014: DEPI	28/07/2014 01/08/2014	Location, timing Info Sheet V1	Meeting Email	Environment protection, conservation of endangered species.	28/07/2014: very supportive of October to January timing as this avoided Southern Right Whale migration and calving activity which generally occurs in late May through to the Winter months along the Otway basin coast. Advised population of SRW's frequenting this area has been shown by Macquarie University to be genetically unique and is recovering from the brink of extinction; Humpback Whales undertake an annual migration back and forwards from southern latitudes up the east coast of Australia, commencing Autumn to avoid the Antarctic Winter; any Humpback Whales that may remain in the survey area during the proposed time,(despite the migration of most of the population) are young non breeding whales.	05/2014: all past correspondence has been in relation to the Enterprise Survey. Senior DEPI stakeholder advised Origin to ensure all future correspondence with his department (i.e. after Enterprise survey) is directed to himself.	28/7/2014: met to discuss Crowes Foot new survey / EP and update on Enterprise survey. Key points discussed for Crowes Foot survey were planned timing and location. Origin sought information on occurrence of Southern Right Whales and Humpback Whales in survey and adjacent areas.	Closed
2015: DEDJTR - Department of Economic Development, Jobs, Transport and Resources (Emergency Risk and Resilience/Marine Pollution Team) 2014: DTPLI	11/7/2014 08/08/2014 11/08/2014 27/10/2014 23/3/2015	Info Sheet V1 Follow up Follow up Updated Timing Info Sheet V2	Email Email Email Email Email	Marine pollution prevention and response State coastal waters	11/08/2014: no specific comment. Advised their requirements in relation to offshore petroleum activities: http://www.transport.vic.gov.au/freight/marine-pollutionSent information sheet and covering email.	8/2014: Ensure request included in EP	11/8/2014: acknowledged requirements and advised EMP is being developed cognizant of stated requirements.	Inform only
Heritage Victoria, Department of Planning and Community Development	24/7/2014 27/10/2014 23/3/2015	Info Sheet V1 Updated Timing Info Sheet V2	Email	Protection of maritime heritage / shipwrecks	8/8/2014: no concerns from seismic surveys, concerns about possible impacts from drilling or pipeline construction. Sought verification of further regulatory approvals for drilling / pipelines.	Towed streamer technology would not impact shipwrecks. Engagement re mitigation of impact on maritime heritage / shipwrecks would occur in subsequent planning phases.	8/8/2014: confirmed Origin would require subsequent environmental / regulatory approvals & thus stakeholder engagement should the seismic survey activity prove successful.	Inform only
Member for Wannon	11/07/2014 08/08/2014 17/10/2014 30/03/2015 13/04/2015	Info Sheet V1 Follow Up Update timing Info Sheet V2 Follow Up	Email Email Email Email Meeting	Constituents may have an interest or affected by the survey	No concerns	N/A	N/A	Inform only
Member for Corangamite	11/07/2014 08/08/2014 17/10/2014 26/03/2015 16/04/2015	Info Sheet V1 Follow Up Update timing Info Sheet V2 Follow Up	Email Email Email Email Email	Constituents may have an interest or affected by the survey	None received	N/A	N/A	Inform only
Member for South West Coast	07/2014 26/03/2015 16/04/2015	Location, timing Follow up Info Sheet V2	Phone Email Email	Constituents may have an interest or affected by the survey. Survey is outside of electorate	None raised	N/A	Discussed in regular briefings with Premier's office (pre November 2014) and State Energy Minister.	Inform only
Member for Polwarth	08/07/2014 27/10/2014 27/03/2015 31/03/2015	Info Sheet V1 Update timing Briefing Info Sheet V2	Email Phone Meeting Email	Constituents may have an interest or affected by the survey	07/07/14: Acknowledged receipt of information sheet. No issues raised.	N/A	N/A	Inform only
Moyne Shire Council	25/7/2014 27/10/2014 23/3/2015	Info Sheet V1 Updated Timing Info Sheet V2	Email Email Email Email	General interest in Origin activities as an operator in Moyne Shire	08/08/2014: acknowledged correspondence. No questions	N/A	N/A	Inform only
Corangamite Shire Council	15/7/2014 08/08/2014 17/10/2014 27/10/2014 23/3/2015	Info Sheet V1 Follow up Updated Timing Updated Timing Info Sheet V2	Email Email Email Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Port Campbell)	No reply	N/A	N/A	Inform only
Colac Otway Shire Council	18/7/2014 23/3/2015 23/04/2015 01/04/2015 28/04/2015	Info Sheet V1 Info Sheet V2 Follow up Briefing Follow up	Email Email Email Phone Meeting Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Apollo Bay)	26/03/2015: acknowledgement of correspondence and questions re impact on rock lobsters. 01/04/2015: meeting in Colac with Mayor and Manager Environment and Community Safety. Sought information on approvals process, impacts on environment and fishermen, engagement that has taken place. Requested copy of EP. 01/04/2015: email from Manager Environment and Community Safety, advising they were satisfied Origin had answered their questions. 28/04/2015: acknowledge Origin's reply and requested EP summary when available.	04/2015: will provide EP summary after NOPSEMA has published	01/04/2015: explained regulatory framework; EP preparation; research on rock lobster impact; engagement of rock lobster fishermen (focus in this discussion on Apollo Bay fishermen); compensation approach if impact on fishing activity. Advised full copy of EP is Origin's IP, but a summary will be prepared for NOPSEMA. Once published, we will direct him to this on NOPSEMA website or provide copy.	Engage throughout
Warrnambool City Council	15/7/2014 27/10/2014 23/3/2015	Info Sheet V1 Updated Timing Info Sheet V2	Email Email Email	General interest in Origin activities as an operator in the region	No reply	N/A	N/A	Inform only
DELWP (Fisheries Victoria)	24/03/2015	Info Sheet V2	Email	Control / enforcement of local fishing activity (recreational and professional)	No reply	N/A	N/A	Engage throughout
Australian Marine Oil Spill Centre Pty Ltd (AMOSC)	11/7/2014 8/08/2014	Info Sheet V1 Reminder		Oil spill management.	No reply	N/A	No reply from stakeholder. See advice from DTPLI which has been incorporated in operational communications requirements.	Not relevant person
Department of Resources Energy and Tourism	11/7/2014 8/08/2014	Info Sheet V1 Reminder	Email	No reply	No reply	N/A	None required. Have made direct contact with regional associations.	Not relevant person
Tasmanian Environment Protection Authority (EPA)	15/07/2014 06/08/2014 08/08/2014	Info Sheet V1 Information request Follow up	Email Email Email	Not relevant	15/08/2014: reply advising to make all contact with www.transport.vic.gov.au See correspondence with DWELP	N/A	N/A	Not relevant person
Department of Primary Industries, Parks, Water and Environment (Tasmania)	15/07/2014 08/08/2014	Info Sheet V1 Follow up	Email Email	Not relevant	No reply	N/A	N/A	Not relevant person

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Tasmanian Ports Corporation	15/07/2014 08/08/2014	Info Sheet V1 Follow up	Email Email	Not relevant	11/08/2014: advised has no comment to make.	N/A	N/A	Not relevant person
Department of Environment, Land, Water and Planning (DELWP)	27/03/2015 05/06/2015	Info Sheet V2 Follow up	Email Email	Environment protection, conservation of endangered species.	No reply	N/A	N/A	Inform only

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Parks Victoria - Port Campbell	11/07/2014 08/08/2014 10/09/2014 23/09/2014 27/03/2015 18/05/2015 18/05/2015 29/05/2015	Info Sheet V1 Follow up Follow up Consultation Info Sheet V2 Follow up Info Sheet V3 Follow up	Email Email Phone Meeting Email Phone Email Phone	Managing State parklands including boat ramps, public beach access	23/09/2014: meeting focused on Enterprise survey and concerns from residents re vibrations from near shore survey. Happy to assist with signage placement, Origin will require their approval.	23/09/2014: explained past Woodside survey where vibrations were felt but post analysis showed minimal possible impact. 05/2015: tried several times to contact and left messages for delegated authority. Will keep on engaging re signage.	Sept to Oct 2014: engagement focused on placement and wording of signage at beach and boat access points in relation to Enterprise survey. Also engaged re vibration monitoring near rock structures which Origin completed as a research exercise. 27/03/2015: emailed update on survey, diving safety, signage request, and to arrange time to share vibration monitoring data as Stakeholder asked Origin to wait until after peak tourist / summer season.	Engage throughout
Parks Victoria - Apollo Bay	18/05/2015 18/05/2015	Timing, Location Info Sheet V2	Phone Email	Managing State parklands including boat ramps, public beach access	18/05/2015: happy to consult	05/2015: will continue to engage re signage	18/05/2015: advised happy to visit in Colac.	Engage throughout
Great Ocean Road Regional Tourism	25/07/2014 25/07/2014 27/10/2014 27/03/2015	Timing, location Info Sheet V1 Timing update Info Sheet V2	Meeting Email Email Email	Regional tourism association for Shipwreck Coast	25/07/2014: Did not raise any concerns but said its good that we are keeping the tourism operators informed. 28/11/2014: email reply saying thank you for keeping them in the loop. Origin replied with advice we have also kept 12 Apostles Tourism and Business Association in the loop too. Replied with appreciation note. 27/03/2015: auto reply advising she has left the role and our email was diverted to new contact	05/2015: continue to engage as a courtesy but primary tourism engagement is through dive and fish charters	25/07/2014: Met to provide information sheets on survey, questions, feedback. Also asked for further contact details of relevant community and tourism operators in the region.	Inform only
Twelve-Apostles Tourism and Business Association	5/8/2014 06/08/2014 19/08/2014 10/10/2014 26/3/2015	Info Sheet V1 Follow up Consultation Updated Timing Info Sheet V2	Email Email Meeting Meet Email	Community volunteer group representing tourism / business interests of operators around Port Campbell and 12 Apostles.	06/08/2014: acknowledgement and arrangement for Origin to address members at meeting 19/08/2014: questions re technology, impact on recreational fishing, vibrations 26/03/2015: will advise members of update	05/2015: inform as a courtesy but primary tourism engagement is through dive and fish charters	19/08/2014: advised minimal impact on fishing, vibrations may be felt due to near shore survey but past experience from Woodside survey can be drawn upon to show no impact.	Inform only
Port Campbell Boat Charters	13/8/2014 8/10/2014 26/3/2015 17/04/2015 28/05/2015	Info Sheet V1 Updated Timing Info Sheet V2 Follow up, diving Info Sheet V3 + maps	Email Meet Email Phone Email	Based in Port Campbell, operates dive and fishing charter boat services.	17/04/2015: Origin phone to check common dive activity in the survey area. Advised most dive activity is around Port Campbell and Peterbourough, less on the shipwrecks in the survey area. Seji silts up but will occasionally get interest in the City of Rayville but it's very deep and needs 2 vessels for this dive. 28/05/2015: Origin called to discuss safe diving distance. Main charters near survey are Loch Ard. Don't often have long advanced notice of charters. Happy to have our contact details and work in with us if they do have a charter where they plan to go.	05/2015: Origins diving procedures will enable engagement and safe operations of diving.	28/05/2015: Advised we have a management plan used to engage diving stakeholders and manage operations safely and we will invoke that if he plans to do a dive charter during the survey.	Engage throughout
SCUBA Divers Federation of Victoria	11/7/2014 08/08/2014 26/09/2014 24/03/2015 15/05/2015	Info Sheet V1 Follow Up Follow UP Info Sheet V2 Info Sheet V3 + Shipwreck map	Email Email Email Email Email	Peak association, represent over 25 amateur dive clubs reaching 2,500 members.	15/8/2014: email received acknowledging notice and thanking Origin. No questions or concerns raised. 29/9/2014: email reply confirming he is correct contact, he will pass on information to members and provide contact details of Sally Watson of Warrnambool Sub-Aqua Club. 24/03/2015: email reply advising there aren't any of our diving clubs in that area, the closest is the Warrnambool Sub Aqua Club (Origin copied in SDFV rep). 29/05/2015: acknowledged email, checked shipwreck coordinate info, asked if we find and report shipwrecks.	05/2015: appreciated information and maps, no concerns raised, Origin will engage throughout.	15/5/2015: provided detailed information on our seismic survey safe diving procedures. 29/05/2015: advised we don't identify shipwrecks as seismic vessels don't generally carry equipment for this. Provided additional map of marine sanctuaries and distance from survey area. Advised we will keep engaging re timings.	Engage throughout
Port Campbell Tourism Information Centre	05/08/2014 07/08/2014 21/10/2014 26/3/2015	Info Sheet V1 Consultation Updated Timing Info Sheet V2	Email Meet Email Email	Local government run tourism information centre.	07/08/2014: Advised he is confident about environmental checks and balances. asked about seismic methodology, likely infrastructure if we were successful in finding suitable gas reserves. We explained seismic process in principle and advised more information would be available once we appointed the contractor. 05/2015: no subsequent replies	05/2015: will continue to engage re information at the centre for the Crowes Foot Survey	7/8/2014: Met to provide information sheets on Enterprise and Crowes Foot surveys, discuss and receive feedback. Also asked for further contact details of relevant community and tourism operators in the region. Discussion focused on Enterprise survey which is more relevant to the visitor centre in Port Campbell.	Inform only
Ocean Racing Club of Victoria	07/08/2014 27/10/2014 24/3/2015	Info Sheet V1 Updated Timing Info Sheet V2		Ocean racing	24/3/2015: No racing planned during proposed survey dates.	N/A	N/A	Inform only
Victorian Recreational Fishers Association	7/8/2014 27/10/2014 24/3/2015 24/03/2014 27/05/2015	Info Sheet V1 Updated Timing Info Sheet V2 Follow up Follow up	Email Email Email Email Email	Peak recreational fishing association	24/03/2015: asked when survey will occur. Advised the survey area supports a highly valued forage fish resource and also recreational fishing for southern bluefin tuna. 24/03/2015: replied re timing, the survey is outside the peak tuna season which is good news, will consider the implications for other marine species such as gummy sharks and snapper etc.	24/03/2015: survey area is very large and will not impact recreational fishing as operational communications will advise locations of survey on a daily basis thereby giving options for recreational fishers.	24/03/2015: advised dates and normal practice for these surveys to operate with scout vessels who will communicate with any local recreational fishing vessels in the vicinity to manage safe operations of the exploration activity. In addition, AMSA issue notices to mariners of approved exploration activity. 27/05/2015: Will continue to engage re survey dates, locations	Engage throughout
Apollo Bay Boat Charter & Fishing	18/05/2015	Info Sheet V2	Post	TBC	letter 'return to sender'	Found contact on-line, cannot find alternative contact details after returned mail.	N/A	Close
Apollo Bay Fishing & Adventure Tours	15/08/2014 24/03/2015 18/05/2015 18/05/2015	Info Sheet V1 Info Sheet V2 Info Sheet V3 + Shipwreck Map Follow up	Email Email Email Phone	Recreational fishing and tours run out of Apollo Bay	No contact	Verified information on-line also from contact details on boat in harbor. Advised by Sue from Surf n Fish that this stakeholder doesn't do dive charters. Have not replied to emails or returned calls.	N/A	Not relevant person
Surf n Fish	18/05/2015 18/05/2015	Location, Timing Info Sheet V3 + Shipwreck map	Phone Email	Dive charters Apollo Bay	18/05/2015: Don't often have long advanced notice of charters. Happy to have our contact details and work in with us if they do have a charter where they plan to go.	18/05/2015: Also asked Sue if she knew 2 other operators we found on internet. Said they don't operate scuba charter. Origins diving procedures will enable engagement and safe operations of diving.	18/05/2015: Advised we have a management plan used to engage diving stakeholders and manage operations safely and we will invoke that if they plan to do a dive charter during the survey.	Engage throughout
Apollo Bay Informal Fishing Group	24/03/2015	Info Sheet V2	Email	Recreational fishing	No reply	Continue to inform	N/A	Inform only
Apollo Bay Sailing Club	24/03/2015 24/03/2015	Location, timing Info Sheet V2	Phone Email	Recreational sailing	None raised	Continue to inform	N/A	Inform only
Dive Industry Association of Australia	28/05/2015	Info Sheet V3 + Shipwreck map	Email	Represents dive organisations	No reply	Continue to inform	N/A	Inform only

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Blue Whale Study Inc.	19/07/2014 23/07/2014 24/07/2014 27/03/2015 10/04/2015 16/06/2015 18/06/2015	Info Sheet V1 Consultation Quote request Info Sheet V2 Follow up Cetacean mitigation Follow up	Meeting Email Email Email Phone Email Email	Research to support conservation of Blue Whales	21/07/2014: confirmed meeting time 23/07/2014: Keen to see an Otway basin ecosystem approach to research and data sharing of whale species calving, foraging and migration and further ariel surveys which they can provide a service for. 23/07/2014: email follow up from meeting. Sent aerial maps from surveys done for Origin in the Otway over past few years. Advised February 2011 survey was a good example of blue whales being close inshore, while November 2012 showed them more widely spread across the continental shelf, and December 2012 showed them concentrated near the outer shelf. Said there is no way of predicting where they will be in any given month, but this area has shown itself to be important feeding habitat for blue whales, even in recent poor upwelling seasons. 31/07/2014: supplied research quote & revised quote on 01/08/2014 30/03/2015: acknowledged ongoing updates. Advised preference to see the 4-month possible survey window narrowed down as it will have a major bearing on potential conflicts with blue whales in the region as there can be a lot in that area during early summer. Asked to be kept in mind for review of the section in EP about whales including blue whales, said section of the Enterprise EP dealing with whales, that Origin showed him had some glaring errors. 17/06/2015: reply re cetacean mitigation plans: appreciated Origin applying greater than minimum requirements; believes MMO approach not sufficient as whales may be displaced by seismic but not detected outside of 3km range; hard to differentiate pygmy blue whales and fin whales but one has 3km and the other 2km shutdown requirement; PAM not useful for blue whale detection; understands Origin's safety concerns with aerial surveys but still keen to support if Origin wishes to use them; keen to discuss use of drones if Origin is considering using them. 18/06/2015: acknowledged Origin's reply	23/07/2014: Met to seek clarification about the temporal and spatial variability of Blue Whales, Sei Whales and Fin Whales, along with variability in krill swarms. Discussed options for determining likelihood of presence of whale species before and during the survey. Discussed training of MMOs and possibilities for joint industry research programs and data sharing. Conducted ongoing engagement as The Blue Whale Study was engaged for their services re whale spotting flights and inputs for MMO training. also provided contacts for Origin for trained MMOs. 01/08/2014: approved quote for research/inputs for preparation of Crowes Foot survey EP. 05/2015: followed up feedback re errors in previous EP. The krill species described in Enterprise and now Crowsfoot is Nyctiphanes australis which is correct. Bryde's whale is included as it shows up on the EPBC Act protected matters search. Determined there were no errors and will advise accordingly. Will update the whale section with info on whale sightings from Pete Gill's latest paper, therefore no need to engage The Blue Whale Study for review of our EP section on whales. 06/2015: reviewed available contemporary blue whale sighting data and tailored mitigation measures accordingly, also developed measures cognizant of EPBC policy 2.1, other mitigation plans used by Origin previously, and recently used by other proponents in relevant adjacent permit areas. Continue to engage re whale mitigation plans.	24/07/2014: sought quote for preparing a brief review of the current available knowledge for movement and activity of Blue Whales and Southern Right Whales within the Crowes Foot (Vic/P69) permit for the months of October through to January. Could include previous work you have performed for Origin including, reports maps of flight paths, spotting results, dates etc. Also asked that any knowledge gaps be identified. 27/03/2015: sent revised info sheet with survey and operational area map. Advised we have been developing our mitigation plans to minimize and manage any impact of our operations on Blue Whales, among other Cetacean and will seek further feedback on our mitigation plans. 10/04/2015: called to discuss his offer for further services re EP feedback and comment re errors in Enterprise EP. Explained we are still working on EP & mitigation plans, we would happily show him these proposals once assessment is completed so he can input. Said this was still quite a few weeks away from being able to provide. He seemed happy with this as was busy for next few weeks. Re "glaring errors", he can't remember which EP it was that Origin showed him but it included things like the BW prey species of Krill. Apparently we had the Arctic Krill species name and not the local Krill name. Also said there was some misinformation about the species of whales present during the upwelling, eg. Bruders included but shouldn't be and was missing Fin. Said they recently had a paper published on the species present during the upwelling and will send for our information. 16/06/2015: sent detailed information re cetacean mitigation measures (in addition to requirements in EPBC policy 2.1) to be included in Crowes Foot Survey EP; advised info re krill and Bryde's whale in Enterprise EP was correct; advised window for Crowes Foot survey cannot not be narrowed down at present and timing for start this year or next isn't confirmed but we will advise when we know; confirmed we don't require consulting services on EP; invited further feedback. 18/06/2015: reply to mitigation plan feedback: confirmed Origin's safety concerns re aerial surveys; whilst MMO approach isn't perfect we are committed to reducing impact as far as is practicable and have been using this approach without incident in our Otway Basin surveys; will apply highest standard for all unidentified whales (as per BW & SRW); committed to availing ourselves of latest PAM technology which is only current option for night time surveying; and will keep engaging re any use of drone technology.	Engage throughout
Deakin University	27/03/2015 30/04/2015 13/05/2015	Info Sheet V2 Consultation Follow Up Follow up	Email Email Phone	Academic and research University	17/04/2015: Potential for impacts on all of the top marine predators in survey area, directly or via impacts on the prey populations they depend on. Proposed dates coincide with the breeding seasons of the main resident seabird (penguins, shearwaters, gannets) and marine mammal (Australian and New Zealand fur seal) species. Potential for effects to have substantial demographic impacts. Survey area is mostly out of the foraging range of little penguins from the London Bridge colony, but is well within the known foraging areas of the other species. Unfortunately, the direct effects of seismic surveys on shearwaters, gannets and fur seals, and the effects on their prey species, is not known, so not possible to estimate impacts of survey. As with the tracking of penguins before, during and after a seismic survey that was conducted last year (analysis still in progress), my research group has the capacity to do the same with the gannets, shearwaters and fur seals as part of ongoing projects. If you were interested, I would be happy to discuss the possibilities with you further. 13/05/2015: no further comment re survey and Origin's reply to his email. Wanted to advise he can do further research and understands the stakeholder engagement process.	27/03/2013: sought update on penguin project for which Origin provided funding from the Enterprise survey. 04/2015: reviewed literature on species impact raised. Assessed as minimal. Replied with substantiation. Considered offer of further research, not required at this point. Will review outcomes of penguin research (further funded by Origin) when available.	30/04/2015: Seismic surveys have been conducted in the Otway Basin and central and eastern Bass Strait for several decades and, as far we are aware, there is no evidence indicating negative impacts at the population level on these resident bird and fur seal species attributable to seismic surveys. Major influences on Pinniped populations in Bass Strait appear to be recovery post sealing (Kirkwood et al. 2009 and Kirkwood et al. 2010). Australasian gannet populations have increased (Bunce et al. 2002) and Little Penguin populations appear at least stable (Schuman et al. 2014) in central Bass Strait over this period. The very large short-tailed Shearwater population may be in a declining trend (Schumann 2014). As such we do not envisage conducting monitoring of seabirds or seals during the proposed survey at this stage. We will review this position once the results of the Little Penguin monitoring during the Enterprise survey are available as we will be in a better position to evaluate the contribution such monitoring can make to further understanding impacts of seismic surveys. 13/05/2015: called to check if he had further comment on our reply to his feedback on potential impacts. Advised we don't believe there is a need for further research at this point but look forward to outcomes of penguin study.	Inform only
Victorian National Parks Association	11/07/2014 08/08/2014 11/08/2014 17/10/2014 26/03/2015 16/04/2015	Info Sheet V1 Follow up Consultation Timing update Info Sheet V2 Follow up	Email Email Phone Email Email Email	Conservation of national parks	08/08/14: requested phone call for further update 11/8/14: Asked why we needed to survey area again, concerns that there's gaps in the research especially re seismic impact on rock lobsters and abalone and that there is existing research that points to harm from seismic surveys. Said he would continue his own investigations and discussions with Seafood Industry Victoria, regarding research and would not be following through with Origin. Advised that he didn't believe we "ticked the stakeholder consultation box", when Origin asked how he wished to consult and offered to meet, he declined as he didn't have time or capacity, stated we didn't consult widely and waited for community to seek us out. Declined offers to receive further information from Origin or meet.	Unable to engage as reasonable offers were declined then stakeholder did not reply.	11/08/2014: advised Origin would not be carrying out further seismic surveys if complete data was available, discussed IMAS/UTAS research, consultation approach. Asked if he wanted to send us this research so we could comment and reference in our EP, also send us specific info on gaps in research so we could address. Advised that as per original communication, Origin would be presenting feedback in EP to NOPSEMA, asked how he wished to consult and offered to meet. Re VPNA assertion that Origin didn't consult widely, advised that we did and gave examples of actively seeking out further stakeholders and meeting them personally or through phone and email at the stakeholders preference. Advised Origin was happy to email him with our understanding of the prevailing research and was still available to meet and discuss further but VPNA declined both.	Inform only
International Fund for Animal Welfare	11/07/2014 08/08/2014 12/09/2014 17/10/2014 24/10/2014 14/11/2014 19/3/2015 20/03/2015 16/04/2015 11/06/2015	Info Sheet V1 Follow up Reply to info request Timing update Timing Follow up Follow up Info Sheet V2 Follow up Reply to info request	Email Email Post Email Email Email Phone Email Email Email	IFAW works to rescue and protect animals with a focus on marine mammals and the protection of whales and dolphins in Australia	12/08/2014: letter requesting information from blue whale aerial surveys undertaken in 2010-2013 and the MMO sighting records from the Astrolabe survey (Nov 2013) - does not consider Origin to have provided sufficient information until this information is provided. Timing - IFAW considers the proposed time window of 1/10/2015 to 31/1/2016 to be inappropriate as it coincides with the arrival and presence of blue whales in this area. Believes that conducting the survey during October poses unacceptable risks to Southern right whales as it believes that the survey is in close proximity of southern right whale breeding grounds. Concerns relating to cumulative impact from the numerous seismic surveys scheduled in this region and the impact on acoustic habitat for migratory species over the larger area b/c of concurrent or sequential surveys - requests Origin provide further information on cumulative impacts as part of the environmental planning. Believes that any mitigation measures employed should go beyond the requirements of the EPBC Policy Statement 2.1 should this survey go ahead - requests that Origin provide detailed information about the intended mitigation methods to be employed aimed at reducing risk to marine mammals from noise pollution. 24/09/2015: email request for shape files for survey areas (Enterprise and Crowes Foot). 17/10/2014: further query on timing for Crowes Foot survey. 02/12/2014: acknowledged update from Origin re Enterprise Survey and requested info on whale & dolphin sightings. 23/03/2015: acknowledged update and thanks for sending whale and dolphin info from Enterprise survey. Will revert with response on survey soon. 16/04/2015: letter requesting aerial survey data and including same concerns as per IFAW letter of 12/08/2014.	09/2014: Confirm process for assessment of risks to blue whales and southern right whales and extract relevant mitigation measures as outlined in EP. 06/2015: reviewed available contemporary blue whale sighting data and tailored mitigation measures accordingly, also developed measures cognizant of EPBC policy 2.1, other mitigation plans used by Origin previously, and recently used by other proponents in relevant adjacent permit areas. Continue to inform on survey timings.	12/09/2014: replied to information request: re whale sighting data and suggested publicly accessible sources for reference; survey timing is in accordance with government guidance to minimise environmental impact particularly for avoidance of southern right whale calving; re concerns on cumulative effect of surveys, Origin cannot comment on other proponents operations but will comply with all regulations and restated our commitment to minimising impact and approach to monitoring presence of whales during surveys. 17/10/2014: sent coordinates for Enterprise and Crowes Foot survey as requested and provided timing update for Crowes Foot. 24/10/2014: advised timing dependent on approvals and other operational matters. Will continue to inform. 14/11/2014: advised Enterprise survey completion without incident. 20/03/2015: supplied data re MMO's whale and dolphin sightings for Enterprise survey and advised information is provided to NOPSEMA and Cwlth Dept of Environment as per regulations. Sent updated Crowes Foot info sheet and offered meeting. 15/06/2015: replied to information request and advised; previous sighting info was provided to IFAW and supplied further info from aerial surveys commissioned by Origin; reminded about publicly available sightings data; explained assessment of potential impacts to southern right whales (known calving area over 65km away from survey area) and results from acoustic monitoring and modelling to confirm that impacts can be adequately managed; outlined additional mitigation measures in EP to further mitigate potential impacts on blue whales and southern right whales, e.g. number of scout vessels, MMOs, passive acoustic monitoring system, soft start procedures, shut-down procedures if whales are sighted, etc; noted concerns with cumulative impacts and advised Origin will meet all requirements contained in EP approved by regulator.	Engage throughout

ORIGIN ENERGY - CROWES FOOT Vic/P43 and Vic/P69 EP - Stakeholder Consultation Log From 22 June 2015 to 26 May 2017

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Commonwealth Fisheries Association	23/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion Notice	Email Email Email Email	Peak NFP body representing commercial fishing industry in Commonwealth regulated fisheries.		Origin has not recieved replies on any correspondence. There is mininmal fishing activity from the commwealth sector in the survey area and Origin has communicated directly with fishers in local ports.	03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Seafood Industry Victoria (SIV)	03/07/2015 15/09/2015 13/11/2015 07/07/2016 11/08/2016 16/09/2016 21/09/2016 22/09/2016 23/09/2016 26/09/2016 03/10/2016 04/10/2016 12/10/2016 14/10/2016 19/10/2016 21/10/2016 25/10/2016 28/10/2016 28/10/2016 28/10/2016 28/10/2016	Follow up Timing update Timing update Consultation Consultation Consultation Follow up Follow up Follow up Follow up Follow up Follow up Consultation Follow up Follow up Follow up Follow up Follow up Follow up Follow up Follow up	Email Email Email Meeting Meeting Meeting Email Phone Email Email Email Email Phone Email Email Email Email Email Email Email Email	Peak body representing professional fishing, seafood processors and exporters in Victoria.	07/07/2016: meeting in Apollo Bay - see VRLA notes 11/08/2016: further meeting in Apollo Bay - see VRLA notes 16/09/2016: further meeting in Apollo Bay - See VRLA notes and meeting minutes. 23/09/2016: advised relevant western zone licence holders and number for mail out, is working on covering letters, confirmed content in Origin's info sheet re rock lobster fishing. 03/10/2016: auto reply stating on leave until 07/10/16. 10/10/2016: advised available on 12/14/2016 to meet. 12/10/2016: joined in phone meeting re follow up on 16/9 meeting. 13/10/2016: sent cover letter. 25/10/2016: posted Origin's info sheets for Crowes Foot and Enterprise Surveys with covering letter from SIV to 148 rock lobster licence holders and 182 Ocean Access licence holders. 25/10/2016: email re recent rock lobster research released by FRDC, noting outcomes and further research required; inquired about redoing risk assessment in EP and gave SIV views on what it should be; concerned CF survey could result in an industry quota reduction; asked how the new research is being incorporated into the EP following consultation with industry; noted 'reg 8 of environment regs' requiring titleholder not to undertake an activity after new or significant risk occurs, that is not provided for in EP; this is first study on Australian southern rock lobster and it shows permanent damage to the species. 26/10/2016: advised costs for correspondence handling. 26 & 27/10/2016: exchanged emails re meeting time options. 28/10/2016: advised he is now not availble to discuss until Monday. 29/10/2016: email to advise he could possibly meet Monday.	Per VRLA	03/07/2015: copied on reply to VRLA re research responses. 15/9/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: advised EP approved, survey not likely to commence in 2015, Big Reef has been excluded from the survey acquisition area, minimum of 4 weeks notice will be given. 07/07/2016: meeting in Apollo Bay with VRLA, SIV and Apollo Bay Co-Op (see VRLA notes) 11/08/2016: further meeting in Apollo Bay (see VRLA notes) 16/09/2016 further meeting in Apollo Bay (see VRLA notes) 21/09/2016: phoned to follow up on actions arising from meeting 16/09/2016 advised we would send minutes. 22/09/2016: sent meeting minutes (16/09/2016) (see VLRA notes) 23/09/2016: called to advise we have reduced survey area even greater than request at meeting on 16/9; asked how many info sheets to print, progress on cover letter, feedback on info sheet. 23/09/2016: emailed to confirm discussion on licence holders relevant for info sheet, thanked him for confirming details under "rock lobster fishing' heading in info sheet and asked costs for mail out. 26/09/2016: email to advise info sheets area ready to insert cover letter. 03/10/2016: follow up on action items from meeting on 16/09, sought further meeting, asked about progress on cover letter. 04/10/2016: copied on follow up to VRLA. 12/10/2016: joined in further consultation with VRLA, asked if they have prepared cover letter to send out info sheets. 14/10/2016: acknowledged cover letter and requested 2 small changes. 19/10/2016: followed up request for change to letter. 21/10/2016: advised dispatching letter, maps, info sheets as discussed to SIV today, asked when they will be posted, asked again for SIV's costs. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, progress on compensation approach. 26/10/2016: acknowledged email of 25/10/2016; advised we are reviewing FRDC research final paper with specific consideration of Crowes Foot EP and would like to discuss with SIV/VRLA ASAP, asked when they're available. 26/10/2016: advised the charge is acceptable and we will obtain a purchase order. 26 & 27/10/2016: exchanged emails re meeting time options. 28/10/2016: we are trying to liaise with VRLA (VRLA) and asked for meeting with SIV at midday today. 28/10/2016: sent info on % of western zone catch for 2015/16 in fishing blocks relevant to Crowes Foot survey (follow up after discussions with VRLA). 28/10/2016: replied advising we are available at a moments notice, failing that can we discuss first thing Monday. 28/10/2016: emailed compensation offer in letter to VRLA, draft of offer letter and claim form for commercial lobster fisher.	Engage throughout
Seafood Industry Victoria (SIV)	31/10/2016 31/10/2016 01/11/2016 02/11/2016 03/11/2016 10/11/2016 12/11/2016 14/11/2016 14/11/2016 21/11/2016 28/11/2016	Follow up Consultation Follow up Timing update Reply Update Start notice Reply Reply Reply Follow up	Phone Phone Email Email Email Email Email Email Email Email Email	Peak body representing professional fishing, seafood processors and exporters in Victoria.	31/10/2016: haven't read compensation offer line by line; VRLA is seeking feedback from different people in industry; have an AGM Thursday and will table then; SIV want to distribute the offer to all Western Zone licence holders as he sees this as setting a precedent for the industry; asked about compensation for coop; further engagement regarding the FRDC research; is available for further discussion at 3.30pm today. 31/10/2016: see VRLA note for consultation also attended by SIV. 01/11/2016: see VRLA note for follow up letter. 03/11/2016: unavailable to meet next week due to leadership program. 21/11/2016: Advised that a fisher had been in contact with them and they had received radio contact saying that they needed to move their fishing gear and anchor in a position. The fishing gear was cleared the following morning. Said they need to be compensation for the displacement and wanted to know how to know details about how to make a claim and how long it takes to be processed/paid		31/10/2016: re distribution of compensation offer by SIV to all licence holders Origin advised that VRLA has only ever mentioned up to 6 possible impacted fishers and had already said he would talk to them personnally, only a very small percentage of the Western Zone catch comes from the overlap with the survey area and Origin understood that it was VRLA's intent and in the best interests of the fishery that the compensation offer was directed to those known to fish in the area. Re coop, advised that with our offer to retire all of an impacted fishers quota, VRLA advised the cost impacts to the coop may be different from what we have been discussing (depending on how much quota is retired) and he wanted to canvass that with the coop, also Origin wishes to meet with coop (unless VRLA continues as their rep). Origin also wants to have a detailed discussion about the FRDC research outcomes, application to our activities, mitigation etc and has expressed this to VRLA last week stating that the dicussion regarding compenstion is not in lieu of further engagement on research as we committed to when advising we with to develop a MOU with SIV/VRLA. Agreed on meeting time. 31/10/2016: see VRLA note for consultation also attended by SIV. 02/11/2016: courtesy note the Polarcus Amani has left Geelong but not for survey activity. 03/11/2016: cced on reply to VRLA re request for response before VRLA AGM. 10/11/2016: Provided a copy of the revised compensation model and compensation offer letter for fishers which included the revised map for 'affected areas' 12/11/2016: Advised we have received approval from NOPSEMA to proceed. Sent through copies of Origin's letter to VRLA which included the revised compensation framework, Origin's final submission to the Notice of Direction issued by NOPSEMA, the Prohibition Notice issued by NOPSEMA to Origin, Origin's compensation offer to commercial rock lobster fishers, Origin's compensation settlement agreement (draft). Also advised that compensation offers will be sent (to those who may also be potentially impacted) at the same time as the notice of the survey commencement is sent 14/11/2016: CC'd on email to VRLA - Confirmed as per phone conversation the represenatives from Origin who will be in attendance at the meeting tomorrow 14/11/206: CC'd on email to VRLA - Advised that in order for Origin to comply with our Privacy Directive, we need to get permission from the stakeholder to obtain their personal details (name, phone number etc) before we can store them on file. We also need to check with these stakeholders that they want us to copy in SIV & VRLA on the correspondence from us to them. 16/11/2016: CC'd on email to VRLA - Advised as per the review done on the Crowes Foot EP we are also reviewing the EP for the Enterprise Survey further to the recent FRDC research report. Confirmed we will provide the relevant extract from the EP for the survey after it has been accepted by the regulator. 18/11/2016: CC'd on email to VRLA - Reaffirmed Origin's position on being committed to minimising the impact of our activities on the environment and stakeholders, our enhanced controls and our position on compensation is a demonstration of that commitment. Discussed the progression of MOU (co-existance) and how VRLA's primary objective (based on recent communications) appears to be to stop the survey. Questioned how this leads us in terms of our relationship moving forward? All questions and comments from VRLA re the FRDC report have been responded to and reason given why draft version of the EP are not in the public realm. Stated we remain open to constructive discussion with VRLA so our two industries can jointly access crown resources. 21/11/2016: Advised we had been in communication with the fisherman and he has received a copy of our compensation letter. Confirmed the process behind claims and asured them all our necessary internal documentation is ready to go for when we receive confirmation from Fisheries Victoria re proposed retired quotas etc 28/11/2016: Provide an update that we have been met with the fisherman to assist them in completing their claim, it has been validated an agreement has been presented and we are waiting to receive the agreement back from the fisherman	Engage throughout
Seafood Industry Victoria (SIV)	30/11/2016 07/12/2016 12/01/2017 09/03/2017 28/03/2017 26/04/2017 22/5/2017 22/5/2017 24/5/2017 26/5/2017 26/5/2017	Follow up Completion notice Meeting request Reply Reply Follow up Meeting date Draft agenda Follow up Agenda Acknowledgement	Email Email Email Email Email Email Phone	Peak body representing professional fishing, seafood processors and exporters in Victoria.	26/04/2017: replied that he hasn't had a chance to put his thoughts down about the MOU, but an MOU between only SIV and Origin may not meet their needs as they have limited resources and it would be more effective for SIV to have the same process of engagement for all oil and gas industry proponents. The MOU with APPEA and fishing sector which he thinks was ratified in January 2016 established only high level cooperation and doesn't work at the operational level for an actual EP or project. Referred to a recently cancelled meeting at APPEA to progress MOU discussions and a recently released ddraft communications and engagement strategy that he recieved last week but hasn't had a chance to reveiw. May be elements of that strategy relvant to an MOU. Open to meeting with Origin before Origin further consults with APPEA, to provide SIV perspective on how to move forward with an MOU that is practical. 26/5/2017: shared correspondence from SIV to DEDJTR/ERR to request round table attendance.		30/11/2016: CC'd on email to VRLA - Provided an updated on the consultation we have being conducting, progressing claim forms for completion and verification. Agreements have been issued and we have been receiving agreements back for execution and payment. Called for a truce so that we can both sincerely start to work toward a positive working relationship. Keen to start development of MOU (Origin have offered to draft this) due to limited availability of resources in SIV & VRLA. 07/12/2016: Completion of survey notification sent. 12/01/2017: Requested a time that he would be avaiable for a meeting with Origin and Fisheries Victoria 09/03/2017: CC'd on email to VRLA - Advised OE are confident we have conducted our operations in accordance with our EP commitments. Suggested a meeting could be arranged for our project and environmental manager to meet with them and provide further response to their questions. Requested for them to send throguh some options of times we could meet and their preferred location for the meeting. 28/03/2017: CC'd on email to VRLA - Expressed disappointment in not being able to meet and discuss the responses and build our relationship, advised we are putting together some responses as requested. 26/04/2017: phoned to ask if he could meet next week regarding progress of MOU, not available but maybe the week after. Origin will review status of MOU with APPEA and revert back to SIV. Exlpained Origin commitment in EPs to progress MOU which we're keen to progress if SIV are still open to that. Understand if they prefer an industry wide MOU. 22/5/2017: sent email to confirm round-table consultation date. 22/5/2017: send draft round-table consultation agenda for feedback. 24/05/2017: sent follow up email re feedback on agenda. 26/05/2017: sent agenda.	Engage throughout

ORIGIN ENERGY - CROWES FOOT Vic/P43 and Vic/P69 EP - Stakeholder Consultation Log From 22 June 2015 to 26 May 2017

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Victorian Rock Lobster Association (VRLA)	03/06/2015 03/07/2015 15/09/2015 13/11/2015 23/06/2016 23/06/2016 07/07/2016 07/07/2016 11/08/2016 26/08/2016 02/09/2016 02/09/2016 12/09/2016 16/09/2016 21/09/2016 22/09/2016 23/09/2016 10/10/2016 11/10/2016 12/10/2016 13/10/2016	Follow up Follow up Update Update Follow up Follow up Consultation Follow up Consultation Follow up Follow up Follow up Response Consultation Follow up Follow up Start Notice Follow up Reply Consultation Reply	Email Email Email Email Email Phone Email Meeting Email Meeting Email Phone Email Email Meeting Phone Email Email Email Meeting Email	Industry association representing commercial rock lobster and giant crab fishers	27/06/2015: replied to Origin's email of 03/06/2015, believes Origin readily dismissed suggestion of planktonic research, said Fisheries Vic Research Director believes it can be done, is following up with IMAS, wants to know name of environment consultant Origin referred the question to. 07/07/2016:Discussed 4 matters: 1. Want consultation to commence with industry to industry level first, to enable industry associations to disseminate information. 2. Seeking confirmation that Origin undertakes a risk-based approach to their activities and the impacts that their activities cause. Strongly conveyed the concept that a lack of evidence does not mean no impact and feel that Origin has not addressed their past concerns. 3. Concerned about the knock-on effects of displacement of fishing activities during simultaneous operations. Want to explore the possibility of retiring quota and being compensated for not fishing. 4. Request for further testing / scientific studies to understand the impact of seismic surveys on the rock lobster fishery. In addition, concerned with regards to cumulative impacts of seismic surveys through the decades. 11/08/2016 : (VRLA, SIV, Apollo Bay Co-op). VRLA tabled a memo outlining: concerns regarding research on seismic impact on rock lobsters; their views on research funding; compensation principles (points for discussion). 26/08/2016: request that Origin has mitigation measures for avoiding local spawning period and referenced Western Australian Deparment of Fisheries guidelines; understand after acceptance of EP that Origin has ongoing requirements to continue to identify and reduce impacts and the WA guidelines sets a clear precedent for this type of mitigation strategy. 29/08/2016: Confirmed attendees for meeting 16 September, acknowledged Origin's response to being open to discuss. Advised how to contact stakeholders and provide information about Compensation principles. 07/09/2016: Confirmed meeting time and venue, restated matters for which they are seeking a response. 07/09/2016: email stating they've been advised by NOPSEMA to request the full evaluation for the risk of seismic energy to rock lobster that is not shown in the published EP summary. 16/09/2016: (VRLA, SIV Apollo Bay Co-op, Port Campbell Professional Fishers Association). Further meeting in Apollo Bay to consult on issues re Enterprise2 (state) and Crowes Foot (Cwlth) surveys. Agreed to voluntary MOU, will provide calculations to assist with finalising principles for compensation, discussed research and risks further - see minutes of meeting in stakeholder correspondence appendix. 03/10/2016: Sent proposed compensation model principles (as per discussions on 16/09/2016) 05/10/2016: sent draft research proposal to FRDC from IMAS for Origin to consult with APPEA (as per discussions on 16/09/2016). 07/10/2016: email to advise Southern rock Lobster Ltd (SRL) is meeting on 20/10/2016, they will discuss draft FRDC reserach proposal from IMAS and is seeking a position statement from Origin to table at that meeting. 12/10/2016: (VRLA, SIV) believe Origin is still cherry picking Parry and Gason 2006, will accept Origin has responded and move on from this matter; VRLA have requested water column testing some time ago and are not surprised that Origin is now saying it's too late, their original point about knowledge gaps on water column testing remains; thought Origin was adding another definition by introducting 'displaced' vs 'disrupted' impacts and want all aspects finalised and not left open; wants Origin to demonstrate good will by paying 'Beach price' for lost catch, not gross margin; whilst any closure period due to the survey may be relatively short, fishers will catch all their quota as they have over the last 6 years but due to overall decreasing quotas and fixed overheads, to maximise profitability fishers will fish to the market conditions which are optimal in the lead up to Christmans and Chinese New Year; believe evidence of retiring quota is relatively simple and will arrange meeting with FV, VRLA and Origin to discuss further; believes major delay due to weather highly unlikely; takes about a week for fishers to get into rythm of fishing effectively once they've started a season; re coop, predent is a legal term whereas there is a real impact on the coop (if fishers retire quota), it is a NFP and the coop is the fishermen and vice versa, therefore believe there is direct impact. 13/10/2016: emailed info on coop membership, structure, services to members, annual business activities, fixed costs that continue regardless of volume of catch processed; re-stated any retirement of quota will have a direct impact on coop. 13/10/2016: further email re coop suggesting latteral approach of Origin setting up solar panels as one of their largest bills is electricity, and this could also have educational element to it.	Origin will continue to engage with VRLA on matters of research, compensation and engagement principles, wants to explore voluntary MOU with SIV& VRLA who have agreed. Assured VRLA Origin has been addressing all feedback, have adjusted plans to minimise impacts and where we've not agreed, we've kept the door open for further discussion. Origin believes that collaboration and joint funding of research by government and industries enables objectivity and allows competing considerations and views to be balanced. Origin will continue to apply the principle of that commercial fishers should not suffer a detrimental economic impact as a result of our activities, has outlined compensation principles for discussion, and is working to agree on compensation principles in advance of the survey to provide certainty to any impacted fishers. As at 18/10/2016 significant progress has been made re individual fishers and conversations are continuing re Apollo Bay Coop. Given the recently released FRDC research on seismic impact on rock lobsters, Origin has reviewed risks and mitigation strategies, has engaged VRLA and SIV on these matters, has offered what it beleives is a fair compensation model for the specific circumstances of the Crowes Foot survey and will continue to consult with VRLA and SIV for the Crowes Foot survey and beyond.	03/06/2015: reply to questions re seismic survey methods and water column sampling research. 03/07/2015: advised the possibility of planktonic research was thoughtfully considered by key personnel at Origin, provided name of consultant, invited suggestions on how such research could be constructed to deliver statistically reliable data that would withstand the ordinary protocols of research peer review, advised we need to understand the results and recommendations from current research being carried out by UTAS/IMAS before consideration of further research. 15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: advised EP approved, survey not likely to commence in 2015, Big Reef has been excluded from the survey acquisition area, minimum of 4 weeks notice will be given. 07/07/2016: Meeting in Apollo Bay with VRLA, SIV and Apollo Bay Co-Op, Origin (Geophysical Ops Mgr); Snr Environmental Approvals Advisor). Discussed: the Rock Lobster Management Plan and other details of the Victorian rock lobster fishery; survey timing; compensation principles and engagement approach which Origin agreed we are happy to engage SIV and VRLA first but must also continue existing commitments to engage individuals. 07/07/2016: follow up email from Origin to VRLA re background work on estimating larval abundance. 11/08/2016: further meeting in Apollo Bay with VRLA, SIV, Apollo Bay Co-op, Origin (Geophysical Ops Mgr, Compensation Mgr) to progress discussion on compensation principles. VRLA tabled a memo on concerns regarding Enterprise2, and high level principles around compensation. Origin advised our first principle is no fisher should be worse off or better off due to our proposed operations and we are open to discussing different arrangements for different impacts which may include their suggestion of some fishers retiring quota to minimise impacts from displacement of fishers. VRLA agreed to supply the FRDC further research request to Origin as Origin were unaware of any request to further fund rock lobster research. Origin will respond to VRLA and SIV by 25th/26th with Origin's review and thoughts on the VRLA memo, including compensation principles, and will schedule another meeting around 8/9/ Sept. 26/08/2016: email reply to VRLA memo re Enterprise2 survey (and additional information sent by VRLA email on same day re Crowes Foot Survey). Given additional information just received, Origin requires more time to review and reply and suggested further meeting around 15/1 Sept in Apollo Bay. In the meantime, restated 'in principle' approach to compensation: requirement for both sectors not to interfere with each other's activities; both industries have equal rights to harvest crown resources but Origin will minimise impact and apply fair and reasonable compensation principles; due to different types of seismic surveys we can't apply a 'one size fits all' to compensation. 02/09/2016: Called to advise we are still working through the matters raised to Origin by VRLA and will have a response to them next week, followed conversation up with an email stating we are happy to meet on 16 September. 12/09/2016: Sent detailed reply (matters impacting both Crowes Foot and Enterprise2 survey) and confirmed meeting attendees for 16/09 meeting: Origin wants to explore voluntary MOU with VRLA re both parties commitments; assured we've been addressing all feedback and have adjusted plans to minimise impacts and where we've not agreed, we've kept the door open for further discussion; extended invitation to visit our seismic vessel for Crowes Foot survey and join the project team in an operational meeting; provided consultant's report (ERM) on lobster spawning and advised the potential for mortality effects to larvae are low (i.e. September to November - Crowes Foot survey); Origin believes that collaboration and joint funding of research by government and industries enables objectivity and allows competing considerations and views to be balanced; the 4 year FRDC research program has not yet been released and must be understood before determining further research needs; outlined Origin's compensation principles for further discussion on 16/09/2016. 16/09/2016: Origin (Geophysical Ops Mgr, Principle Environment Adviser, Community Relations Specialist). Further meeting in Apollo Bay to consult on issues re Enterprise2 (state) and Crowes Foot (Cwlth) surveys including: developing a MOU; engagement processes; environment risk assessment; research; compensation principles. Discussion re Enterprise survey focused on likely timing starting in mid to late January 2017 (subject to approvals, contractor availability and weather), Origin affirmed its commitment to compensation principles in the event of displacement (as previously communicated), Origin will seek further consultation re impacts, displacement and compensation in November 2016 and will continue engagement throughout. See minutes of meeting in stakeholder correspondence appendix. 21/09/2016: phoned VRLA to advise: we're sending formal meeting minutes to help progress agreed actions; we have reviewed their request to reduce survey area, explained our approach and the outcome of further reduction than they requested; asked for feedback on the info sheet; explained other community engagement and information and sought his feedback on other stakeholders and signage locations around Apollo Bay; discussed further why Crowes Foot EP extract wasn't provided including Origin's approval process for external documents, protection of IP, concerns about cherry picking information and desire to develop MOU which we see as the appropriate forum for each party to fully disclose and discuss research, impacts, risks and other matters. 22/09/2016: sent meeting minutes (16/09/2016). Responded to request to exclude additional shallow reef areas from survey, advised we reviewed and excluded even greater area than they requested and attached a revised map (in updated info sheet), requested feedback on info sheet, requested weekly half hour meetings. 23/09/2016: copied VRLA on email to SIV re sending out revised info sheet to Origin's commercial fisher database and awaiting draft covering letter from SIV to send to Western Zone licence holders. 23/09/2016: notice of commencement of Crowes Foot Survey (VRLA and Apollo Bay fishers), including request to notify Origin if they intend to fish near the survey area, and have proof of regular fishing history in the area, to discuss displacement arrangements which may include compensation if the survey continues in their fishing area after 15 November. 26/03/2016: copied VRLA on email to SIV advising info sheets ready to send. 03/10/2015: advised we wish to progress action items from 16/09/2016 and asked for their availability; asked SIV about progress with covering letter; asked VRLA about progress with compensation cost calculations. 04/10/2016: acknowledged their compensation principles/calculations doc which we'll review with Compensation Manager; asked for further info on Apollo Bay Fishermen's Coop; advised we have distributed revised info sheet to our stakeholders and are awaiting cover letter from SIV; asked again if they wanted to visit seismic vessel and join in on a project team meeting. 10/10/2016: sought meeting to progress action items from 16/9 meeting, including compensation and research matters. 11/10/2016: advised Origin's position on further research funding is that we need to analyse findings of 4 year FRDC research program, to be released in Oct 2016, then table at APPEA HSE committee for discussion. Reminded about meeting request for 12/10. 12/10/2016: progressed actions from 16/9/2016 meeting. RESEARCH: In response to VRLA's feedback, Origin sought further review from ERM re relevance of Perry and Gason 2006 research to Crowes Foot survey. ERM confirmed P&G 2006 findings relevant to Crowes Foot survey location, timing and water depths; Origin contacted IMAS to discuss feasibility of water column study during Crowes Foot survey. IMAS advised insufficient time before survey, they have just completed studies on effects of seismic on plankton and he would prefer to wait until results are released before determining any suitable program as follow up, recognized this type of research on an operational seismic vessel would be very difficult and would look at alternative investigation methods first; Origin advised VRLA it remains concerned about methodology and reiterated importance of good science. COMPENSATION MODEL: Origin agrees impacted fishers will have option to fish elsewhere or retire quota and claim compensation but need to distinguish between 'displaced' and 'disrupted' fishers depending on their fishing grounds and type of survey activity (eg. Crowes foot vs Enterprise2 surveys) and reminded VRLA of our discussion on 16/9 also with Port Campbell Professional Fishers Association President, where we drew this distinction; evidence of regular fishing grounds to be provided by fishing records supplied to FV or reasonable intent; agree on compensation calculation except 'gross margin' should replace 'beach price' as catch effort consumables (bait, ice, fuel) will not be used whilst the fisher has 'downed tools'; must agree on evidence of retiring quota to FV in advance of agreed compensation, Origin suggested a visit with VRLA and FV to finalise this; discussed changed to closure period if there's a major event (eg. whales present, breakdown, storm) and notice required for this (but not resolved at this discussion); discussed calculation for extension of closure period if required; Origin is awaiting info from VRLA re coop before reviewing standing position of no precedent for compensation unless directly impacted; Origin will consider feedback further and follow up on Monday 17/10. 13/10/2016: acknowledged additional info sent on coop and suggestion re solar panels and would discuss with team. 17/10/2016: left msg to progress discussions	Engage throughout

ORIGIN ENERGY - CROWES FOOT Vic/P43 and Vic/P69 EP - Stakeholder Consultation Log From 22 June 2015 to 26 May 2017

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Victorian Rock Lobster Association (VRLA)	18/10/2016 19/10/2016 21/10/2016 21/10/2016 25/10/2016 27/10/2016 27/10/2016 28/10/2016 28/10/2016 28/10/2016 28/10/2016	Consultation Follow up Follow up Timing update Consultation Consultation Follow up Follow up Follow up Follow up Follow up	Phone Phone SMS Email Meeting Phone SMS Phone Email Email Email	Industry association representing commercial rock lobster and giant crab fishers	18/10/2016: additional coop info: 10 of 15 members are lobster fishers; 'licensed operator' would provide copy of license which includes quota and pot numbers and is correct party to any claim; payments by coop to fishers varies from weekly to monthly as some fishers must pay up front for their quota lease at going rate of $30k per tonne and thus more sensitive to cash flow; coop has an overdraft to fund purchase of fish at beginning of season; advised about 6 fishers may be active in survey area but about 2 or 3 may claim; hadn't yet reviewed indicative turning circle map but did over the phone call and then understood the impacted area will reduce as survey progresses, as such the survey may not affect any depending on our timing; if survey is interrupted by a major event, fishers will need 3 days notice to restart fishing, 2 days to cease and pull pots; SMS is ideal form of communication and fishers will need lats / longs. 21/10/2016: reply to OE question, yes Apollo Bay Coop does take catch from others (than members), price varies seasonally but all buyers are pretty much the same at any point in time. 27/10/2016: re OE's suggestion of retiring quota for the whole season, advised they prefer the survey not to go ahead but the approach suggested would help; won't know the impact of the survey on that particular population / cohort of lobster for some years (response to Origin's advice that the FRDC research doesn't refer to population impact, and thus economic impact); ultimate precaution would be to retire aggregate quota for survey area for 5 years; to understand fishers' views there's only about up to 6 impacted and would need to now discuss with them; re coop depending on what percentage of their total throughput comes from the survey area, it could be quite a hit for them; their business is split into 2 parts - lobster processing and everything else; lobster processing is almost break even as margins are tight; should get data from FV to look at this; coop has fixed costs regardless of volume processed plus consumables like packaging; coop use export agents who shift a tonne at a time, would need to discuss any impacts on Chinese client relationships with them; coop has good reputation with Chinese clients as they have a low mortality rate on shipped lobster; would need to discuss further with coop. 28/10/2016: SMS - can't catch up today; "in talking with NOPSEMA yesterday, I believe they will be making some determinations on the concerns that have been raised with them on Monday. I think we probably need to hear what they have to say to inform next steps".		18/10/2016: advised we're discussing VRLA suggestion re Solar panels for Coop and explained Origin's community education program re solar and encouraging kids in STEM subjects could be a good compliment to such initiative; asked further info on coop; asked is the 'licensed operator' the correct legal and impacted entity re compensation claims as opposed to quota owners; asked how frequently coop pays for landed catch; asked how many fishers in survey area may claim; checked if VRLA has reviewed indicative turning circle map and could he estimate number of potentially impacted fishers; explained impacted area will reduce as survey progresses and we will aim to complete survey near Big Reef before 15 Nov; advised if survey extends past any fishing area closure periods where fisher has agreed to 'down tools', we would extend compensation on day rate as per agreed calculation (agreed); discussed major event causing survey to be delayed for 7 days or more and notice required to fishers to recommence fishing and then cease to allow survey to restart; discussed our approach to provide daily updates by SMS and exact info fishers would need and Origin will seek VRLA's further input on this; offered to pay VRLA to send SMS messages if they prefer (not necessary); suggested we could draft letter for fishers to advise FV and copy in Origin, of retiring quota (agreed). 19/10/2016: called to get details from coop re power bill so we could do solar panel assessment. 21/10/2016: checked whether Apollo Bay Coop handles catch for lobster fishers other than members and if beach price varies at different ports in western zone. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, progress on compensation approach. 25/10/2016: met with VRLA and Fisheries Victoria (FV) to discuss verification of fishing data to establish fishing history in survey area, verification of quota caught in that area, retirement of quota, notifications to FV by fishers, FV's requirements including correct identification of Rock Lobster Fishery Access Licence Holder and Personal Professional Fisher Number. Agreed on most simple approach. OE will draft and engage further for confirmation. 27/10/2016: we've been reviewing FRDC research and Crowes Foot EP given this information and trying to set up discussion to go through the research thoroughly; although the research provides new information, it does not guide Origin nor the fishing sector on potential lobster population level impacts and therefore cannot be used to guide economic impacts; as such and given timing considerations, we are exploring options to demonstrate a precautionary approach and are thinking boldly about this along the lines of enabling fishers who have a history of regular fishing in the survey acquisition area to retire all of their quota for the season and not fish lobster in the survey area at all, effectively giving fishers the option to rest the local fishery for the season for the avoidance of doubt on population impacts from predation; discussed flow on impact to coop who export 90% of product to China; OE understands there will be margin impacts to the coop; OE assumed Chinese market is robust, they would by as much as available and any reduction in volume due to retired quota would not have a lasting impact on such relationships; OE is seeking VRLA (and SIV when we can meet) views on this approach and any other ideas they may have; OE has asked FV for data on catch in grids J13 J14, K13, K14; OE is keen to agree on a fair and simple compensation model ASAP to remove uncertainty. 27/10/2016: SMS to advise Origin has discussed and we're close to finalising a compensation agreement, keen to finalise this tomorrow so we can have documents in place before 2nd Nov, can we visit VRLA (and coop rep) tomorrow to finalise. 28/10/2016: left message saying we too are liaising with NOPSEMA and we are keen to resolve compensation matters directly with them today, we can meet him in Melbourne today or discuss over the phone. 28/10/2016: emailed data from FV showing 2015/16 catch from FV grid blocks in Crowes Foot survey area represented 8% of Western Zone TACC and 13% of actual catch in 2015/16; hoping to discuss further today. 28/10/2016: sent info on % of western zone catch for 2015/16 in fishing blocks relevant to Crowes Foot survey (follow up after discussions with VRLA 27/10). 28/10/2016: emailed compensation offer in letter to VRLA, draft of offer letter and claim form for commercial lobster fisher.	Engage throughout
Victorian Rock Lobster Association (VRLA)	31/10/2016 31/10/2016 01/11/2016	Reply Consultation Follow up	Email Phone Email	Industry association representing commercial rock lobster and giant crab fishers	31/10/2015: Email feedback: VRLA circulated Origins position to VRLA mgmt ctee over weekend, received some feedback, some away due to long weekend, VRLA AGM scheduled for Thursday pm, will take whatever negotiated position to the AGM, and will seek independent legal advice on any final offers from Origin. Feedback in the meantime: unanimous position that no further seismic surveys should go ahead until risk of damage to lobsters can be qualified and quantified and mitigation and remediation strategies be put in place; compensation arrangements discussed thus far only cover displacement not "new risk" of impact to lobster population and VRLA expects Origin to discuss in good faith in due course; fishers displaced in operating areas (not just acquisition areas) should also have opportunity for compensation; VRLA welcomes Origin's offer to simplify process, $95kg set price and 5 day payment terms; question regarding consideration of tides at north of survey area close to coastline. 31/10/2016: follow up phone conference (VRLA & SIV): discussed all points above; VRLA advised compensation offer at an individual level was fair and VRLA will table for discussion at the VRLA AGM this Thursday. Additional discussion: when will Origin engage with VRLA and SIV on 26/10/2016 email to Origin from SIV re FRDC reprt; feel Origin has known about research 9 months ago and should have been discussing the resarch with SIV/VRLA earlier; felt that the eligibility test of 3 yrs fishing history in the area may preclude the retirement of sufficient quota to benefit the local lobster population and suggested that in the acquisition area, at best 2 or 3 fishers may retire between 5 to 10 tonne of quota; survey has potential to impact K14 block which includes a research site that collects data input into TACC quota; SIV has recieved 3 calls from fishers since SIV distributed Origin's correspondence to all Western Zone licence holders (on 25/10) and will follow up; asked if Origin will be reviewing and resubmitting EP and they want to see what we are submitting to NOPSEMA (extract from EP is fine); asked if any acquisition will take place in the turning circles outside the marked acquistion area.		31/10/2016: phone consultation with Origin, SIV, VRLA: Origin understands they would want to table at upcoming AGM but wasn't aware of AGM until today and understood from past engagment and discussion with VRLA on 27/10/2016 that they would directly engage the 6 possible impacted fishers; Origin has previously advised we want detailed discussions with VRLA & SIV on FRDC report implications, and are happy to do this before we've agreed on an MOU, but given the FRDC report doesn't give guidance on population level impact and Crowes Foot timings, our immediate focus is on precautionary mitigation via compensation model; Origin has been bound by confidentiality provisions until the research was published; percentage of catch in western zone from survey acquistion area was 7% last season and average 5% over last 3 yrs, approx 6 fishers in the area, therefore Origin beleives compensation offer that gives fishers the choice to retire entire season quota is a fair mitigation measure; will take new info re FV research site on notice; all Origin correspondence has requested potentially impacted fishers to contact us and we've only heard from 3, so any prompts from SIV / VRLA would be welcomed; Origin is reviewing its risk assessment and EP and resubmitting to NOPSEMA; we don't generally provide EPs to stakeholders to critique as that's the regulator's role, part of reason we're seeking an MOU is that we can confidently review research and assessments with them before submitting EPs but this isn't in place yet and timing wont' allow this at present, but will put request to mgmt team and revert with reply; assured VRLA we include all correspondence and stakeholder engagment summaries to NOPSEMA including objections raised by stakeholders; will reply with question re acquisition in turning circles; explained reason for surveying north/south is to meet technical requirements of survey and we're aware of tide / current / weather info. 01/11/2016: follow up letter covering consultation on 31/10/2016. Also confirmed: compensation for displacement in operational areas and will revert shortly with revised draft; no survey acquisition outside of marked area on map; Origin will provide extracts of revised EP shortly.	Engage throughout
Victorian Rock Lobster Association (VRLA)	02/11/2016 03/11/2016 08/11/2016 10/11/2016 12/11/2016 14/11/2016 14/11/2016 15/11/2016 16/11/2016	Timing update Reply Reply Reply Start notice Reply Reply Consultation Reply	Email Email Email Email Email Phone/Email Email Meeting Email	Industry association representing commercial rock lobster and giant crab fishers	02/11/2016:Email reply: want extracts of Origin's revised EP before or at least same time as NOPSEMA; no evidence that mitigation strategy of avoiding key lobster fishing area and the compensation model offered will mitigate 'new risks' from FRDC report to ALARP; want more info on sound source proposed; believes the entire rock lobster population in the survey area will be permantly damaged and precautionary principle should be applied whereby no seismic surveys occur until more research is done; provided graph of TACC history with commentary that suggested Origin's operations in the region were linked to drop in catch and advised fishers have good reason to be concerned about further seismic surveys; requested updated written offer before AGM; asked for clarification if seismic 'guns are turned off through turning circles outside of the acquisition area'; will discuss Origin's proposal re coop with the coop chair tomorrow. 03/11/2016: VRLA advised that due to being at a Leadership program next week he is unavailable to meet next week. Did say it would be helpful if Origin could provide a written response to the questions he raised previously. 07/11/2016: Provided a summary of the ensuing disucssions at the AGM, points provided are a verbatim extract from the draft minutes. 09/11/2016: Thanked us for the response, advised he will circulate it to the VRLA Management Committee and will provide further feedback next week. 09/11/2016: Email from VRLA requesting a copy of the revised map of the 'affected area'. 14/11/2016: Request received asking for VRLA and SIV to be included on notifications sent regarding Crowes Foot Survey to the listed fishers (list of names and phone number provided) 14/11/2016: Email requesting for Origin to confirm that an authorsied representative to discuss compensation with impacted fishers will be in Apollo Bay tomorrow. Confirmed the location and start time for the 'group meeting'. 14/11/2016: Confirmed that permission was given from the fishers for their name and contact number to be given to Origin. 14/11/2016: Origin cc'd in on email from NOPSEMA to VRLA Nolle, clarity provided re the role that Fisheries Victoria has had with this activity to date (copy of Origin & FV meeting minutes were also provided) 14/11/2016: Formal request from VRLA and SIV for Origin to provide the EP for Enterprise2 (email trial between VRLA & DEDJTR) 15/11/2016: Origin cc'd in on email from VRLA Nolle to NOPSEMA stating that key represenatives on policy matter in FV haven't been involved in establishing the FV position on the policy - they were also copied in on the email.		02/11/2016: courtesy note the Polarcus Amani has left Geelong but not for survey activity. 03/11/2016: given availabilities and time differences, unable to respond to their email (from 7.26pm 02/11/2016) before their AGM on 03/11/2016. We've had productive and open discussions with VRLA and SIV, understand importance of sustainability of their industry and requested meeting to discuss in good faith as we believe we can demonstrate mitigation strategies to reduce risks to ALARP. Asked if they are available Tuesday next week. 08/11/2016: Provided a response to the discussion points from the AGM. Advised Origin have conducted an extensive review of the FRDC research report and remain committed to not only minimising disruption to fishers, but also to ensuring that no party is worse off economically as a result of our activities. Based on feedback, in response Origin have revised the compensation framework (elements dot pointed), documentation is being finalised and should be completed within the next two days. Once again requested a meeting to obtain further feedback (over the phone or Meeting). 10/11/2016: Provided a copy of the revised compensation model and compensation offer letter for fishers which included the revised map for 'affected areas'. 12/11/2016: Advised we have received approval from NOPSEMA to proceed. Sent through copies of Origin's letter to VRLA which included the revised compensation framework, Origin's final submission to the Notice of Direction issued by NOPSEMA, the Prohibition Notice issued by NOPSEMA to Origin, Origin's compensation offer to commercial rock lobster fishers, Origin's compensation settlement agreement (draft). Also advised that compensation offers will be sent (to those who may also be potentially impacted) at the same time as the notice of the survey commencement is sent. 14/11/2016: Phoned to discuss arrangements for tomorrow including attendees, privacy requriements, catch and effort verification required, and thanked VRLA for organising. Sent email to confirm Origin represenatives from Origin who will be in attendance at the meeting tomorrow. 14/11/2016: Advised that in order for Origin to comply with our Privacy Directive, we need to get permission from the stakeholder to obtain their personal details (name, phone number etc) before we can store them on file. We also need to check with these stakeholders that they want us to copy in SIV & VRLA on the correspondence from us to them.	Engage throughout

ORIGIN ENERGY - CROWES FOOT Vic/P43 and Vic/P69 EP - Stakeholder Consultation Log From 22 June 2015 to 26 May 2017

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Victorian Rock Lobster Association (VRLA)	17/11/2016 18/11/2016 30/11/2016 07/12/2016 20/12/2016 12/01/2017 28/02/2017 09/03/2017 28/03/2017	Acknowledgement Reply Reply Completion notice Follow up Meeting request Reply Reply Reply	Email Email Email Email Phone Email Email Email Email	Industry association representing commercial rock lobster and giant crab fishers	15/11/2017: Group meeting in Apollo Bay with fishers: dissapointed the survey is going ahead and their attendance at the meeting was not to be construed as satisfaction with NOPSEMA's approval process; fishers want to be out fishing, not here at the meeting at commencement of the season; long term framework is an issue, who's paying for investigations, commitments Origin has made to NOPSEMA aren't acceptable to VRLA, other research matters should be included sucha as post harves mortality, fisher behaviour, timing of fishing when females are pregnant, further discussions with Origin are required on this matter; fishers are petrified about future of the industry. 16/11/2016: Response further to Orign's reply advising the providing the EP submission after the regulator has accepted it is simply unjust. Stated concern for the mental health of the fishing community. 19/11/2016: Reponse to email from Origin (18/11) - detailing the timeline of discussions 19/11/2016: Advised a conversation has been had with the manager of the co-op to explain the initial 'up front' payment re retired quotas. Requested that in confidence a summary of each fisher be sent to the co-op manager so fuel/bait can be worked out etc 22/11/2016: Forwarded Payment Remittance Advice received from Origin for runing ad in VRLA newsletter 08/12/2016: Acknowledged email from Origin (30/11), they are overseas and will follow up issues after a debrief with SIV & the affected fishers on their return. 13/01/2017: Advised Origin they would discuss Origin's long term impact framework at the Rock Lobster Research Action Group (RLRAG) on 18 January and provide feedback to Origin. 18/01/2017: Via email received from NOPSEMA; VRLA have emailed NOPSEMA asking questions about evidence, audit and impact of the survey which VRLA expected NOPSEMA would have conducted by now (email from 16/01/2017) and they wanted to know if Origin's north/south line with strong tidal currents towing streamers which were increased from 6 to 10 did not impede the 'efficiency' of the survey? (email from 17/01/2017) - NOPSEMA replied to VRLA advising they did not conduct monitoring during the seismic survey and explained their process around risk levels and Origin's obligations to report any incidents while the activity was underway. Confirmed that as part of the EP Origin must submit an environmental performance report to NOPSEMA within three months of the survey completion. VRLA were advised that NOPSEMA would pass on their enquiries and response to Origin to encourage information to be provided to VRLA directly. 02/03/2017: Further questions from VRLA received (NOPSEMA were cc'd in) in response to email they received from Origin (28/02/2017), in particular about; Turtles; Affected Area and Increased number of streamers. 09/03/2017: Advised they would appreciate if we could respond to their questions in writing		15/11/2016: Meeting with VRLA and Apollo Bay Fishers to listen to group questions and objections and to explain details of compensation framework sent to fishers on 12/11, then hold individual meetings (to ensure privacy of their confidential fishing information) with fishers claiming compensation. Acknowledged fishers concerns about impacts, reminded the fishers the FRDC research showed no mortality of lobster and that they habituated to exposure, nevertheless adopting the precautionary principle, Origin was offering retirement of season quota to fishers with legitimate fishing history in the survey area. VRLA wasn't available to consult in setting framework for long term impact assessment, Origin will continue to work with SIV / VRLA and Fisheries Victoria on this; overriding principle is no economic impact now or long term due to Origin's seismic surveys. 16/11/2016: Advised as per the review done on the Crowes Foot EP we are also reviewing the EP for the Enterprise Survey further to the recent FRDC research report. Confirmed we will provide the relevant extract from the EP for the survey after it has been accepted by the regulator. 17/11/2016: Acknowledged email and advised we will response as soon as possible. 18/11/2016: Reaffirmed Origin's position on being committed to minimising the impact of our activities on the environment and stakeholders, our enhanced controls and our position on compensation is a demonstration of that commitment. Discussed the progression of MOU (co-existance) and how VRLA's primary objective (based on recent communications) appears to be to stop the survey. Questioned how this leads us in terms of our relationship moving forward? All questions and comments from VRLA re the FRDC report have been responded to and reason given why draft version of the EP are not in the public realm. Stated we remain open to constructive discussion with VRLA so our two industries can jointly access crown resources. 30/11/2016: Provided an updated on the consultation we have being conducting, progressing claim forms for completion and verification. Agreements have been issued and we have been receiving agreements back for execution and payment. Called for a "truce" so that we can both sincerely start to work toward a positive working relationship. Keen to start development of MOU (Origin have offered to draft this) due to limited availability of resources in SIV & VRLA. 07/12/2016: Completion of survey notification sent 20/12/2016: Courtesy call after their return from holidays, to update on compensation process and outcomes. Left message. Call not returned. 12/01/2017: Requested to know their availability for a meeting with Origin and Fisheries Victoria 28/02/2017: Response provide to VRLA based on the advice from NOPSEMA that VRLA have a few queries in relation to the Crowes Foot Survey, the response covered information in relation to Environmental Plan Compliance; Turtles; Affected Area; Tidal Curents and Flows and Increased number of streamers. 09/03/2017: Advised OE are confident we have conducted our operations in accordance with our EP commitments. Suggested a meeting could be arranged for our project and environmental manager to meet with them and provide further response to their questions. Requested for them to send throguh some options of times we could meet and their preferred location for the meeting. 28/03/2017: Expressed disappointment in not being able to meet and discuss the responses and build our relationship, advised we are putting together some responses as requested	Engage throughout
Victorian Rock Lobster Association (VRLA)	18/05/2017 22/5/2017 22/5/2017 24/5/2017 26/5/2017	Reply Meeting date Draft agenda Follow up Agenda	Email Email Email Email Email		19/05/2017: Advised they would be fine with the round table approach with Origin and both National and state regulators. Provided the date of 29 May in the morning is better for them in either Melbourne or Geelong.		18/05/2017: Reply to questions raised (09/03/2017); provide more info re looking at an industry wide MOU; advised NOPSEMA has suggested a round table meeting for further consultation. Provided information on 'Turtles', 'Affected area' and 'Increased number of streamers'. Confirmed source was not activated outside the "source activation area". 22/5/2017: sent email to confirm round-table consultation date. 22/5/2017: send draft round-table consultation agenda for feedback. 24/05/2017: sent follow up email re feedback on agenda. 26/05/2017: sent agenda.	Engage throughout
Apollo Bay Fishermen's Cooperative Society	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 15/11/2016 28/11/2016 01/12/2016 07/12/2016 20/01/2017	Timing update Timing update Start notice Timing update Timing update Start notice Consultation Follow up Consultation Completion notice Follow up	Email Email Email Email Email Email Meeting Email Meeting Email Phone	Not for profit cooperative. Purchase and sell fish local fish stock, sell fuel and supplies to local fishermen.	01/12/2016: agreed on approach described and said it was fair, will provide any information Origin requires from their records to enable verification.	No direct contact from other members. See VRLA records.	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers. 28/11/2016: Provided an update on where claim forms from fisherman are at and discussed that due to privacy reasons we have requested the fisherman to give their details re fuel and bait consumption. 01/12/2016: Visited ABFC at Apollo Bay to discuss details of compensation claim and agree on fair process, privacy of individual claims, approach to determining bait and fuel usage, verification required from the coop. 07/12/2016: Completion of survey notification sent 20/01/2017: phoned to advise that we had a further claim from a fisher after we determined their compensation and will do a further calculation of impact and be in touch with them shortly to advise.	Engage throughout
Apollo Bay Fisherman VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 15/11/2016 17/11/2016 18/11/2016 30/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start notice Consultation Follow up Follow up Follow up Completion	Email Email Email Email Email Email Meeting Phone Email Email Email		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session to discuss compensation claim.		15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fisherman VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 15/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Tining update Start Notice Consultation Completion notice	Email Email Email Email Email Email Meeting Email		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session and determined he doesn't fish in survey area.		15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fisherman VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Tining update Start Notice Completion notice	Email Email Email Email Email Email & Mtg Email		09/11/2016: checked start date as he was told by a fisher that at the VRLA AGM they said the survey had been postponed. Stated he has been fishing the big reef for significant number of years, has seen many seismic surveys come and go and there has been no impact that he has ever seen from seismic surveys; the crays are as big as ever and he caught quota early last year. 28/11/2016: advised he has continued fishing around the seismic survey and the catch is good, one other fisher is also fishing near survey area, discussed current beach price of lobster, $75 kg brindles and $85 for red. Communications and conduct of the survey has been very good.		15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 09/11/2016: Explained the survey has only been delayed, not postponed indefinately, explained compensation approach due to displacement 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fisherman VRLA member	26/09/2015 13/11/2015 15/09/2016 12/11/2016 15/11/2016	Start notice Timing update Timing update Start Notice Consultation	Post Post Post Post Meeting		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session to discuss compensation claim.		15/09/2015: notice advising unlikely to commence survey in 2015 26/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers	Engage throughout

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Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Apollo Bay Fisherman VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 29/11/2016 02/12/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start Notice Reply Follow up Completion notice	Email Email Email Email Email Email Email Email Email		29/11/2016: Commercial Fishing Operator Claim From Restriction of Access Form submitted via email		15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fisherman VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 13/11/2016 15/11/2016 16/11/2016 18/11/2016 18/11/2016 18/11/2016 18/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start Notice Reply Consultation Reply Information request Reply Follow up Reply Completion notice	Email Email Email Email Email Email Email Meeting Email Email Email Email Email Email		13/11/2016: Requested to know how the compensation for fishing block H14 or LH4 is being calculated 15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session to discuss compensation claim. 16/11/2016: Query if the form received at the meeting is so Origin can access his catch history 17/11/2016: called to clarify details of fishing location as PFN number is showing different licence holder 18/11/2016: Responded with the requested information 18/11/2016: Advise they would feel more comfortable if they could take their logbooks to the local fisheries office in Apollo Bay and get their assistance.		15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 13/11/2016: Provided information regarding how compensation for H14 block is being calculated - re retirement of quotas etc 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Engage throughout
Port Campbell Professional Fisherman's Association Members VRLA members	15/09/2015 13/11/2015 16/09/2016 23/09/2016 21/10/2016 03/11/2016 12/11/2016 15/11/2016 07/12/2016	Timing update Timing update Consultation Start notice Timing update Timing update Start Notice Consultation Completion notice	Email Email Meeting Email Email Email Email Meeting Email	Industry association representing commercial rock lobster fishers based in Port Campbell		Port Campbell fishers have not identified they fish in Crowes Foot survey area.	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 16/09/2016: attended SIV/VRLA consultation re mitigation and compensation principles. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start Notice Completion notice	Email Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	15/09/2015 13/11/2015 23/09/2016 06/10/2016 21/10/2016 03/11/2016 12/11/2016 15/11/2016 07/12/2016	Timing update Timing update Start notice Follow up Timing update Timing update Start Notice Consultation Completion notice	Email Email Email Email Email Email Email Meeting Email		27/09/2016: phoned to advise he received our email and does fish at the big reef and can provide evidence. 28/09/2016: emailed to confirm yesterday's conversation. 04/11/2016: phoned to confirm he fishes at big reef and discussed details of his catch and effort records. 15/11/2016: attended meeting with Apollo Bay fishers. 16/11/2016: follow up conversation regarding compensation claim.	See VRLA summary	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 27/09/2016: explained Origin's mitigation action is the first priority to avoid displacement and we will send further detail on dates and planned sail lines on maps to identify any impacts. Should there be displacement, explained approach discussed with VRLA to retire quota for the period of any compensation which was understood. Explained we would want to meet with him before the survey if he will definitely be impacted base on actual past fishing locations. 06/10/2016: confirmed above approach in email. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Engage throughout
Warrnambool Professional Fisherman's Association (WPFA) member	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start Notice Completion notice	Email Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement and corresponding compensation documents for stakeholder to complete and return to Origin 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	15/09/2015 13/11/2015 23/09/2016 12/11/2016	Timing update Timing update Start notice Start notice	Post Post Post Post				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool Professional Fisherman's Association (WPFA) member VRLA member	15/09/2015 13/11/2015 23/09/2016 12/11/2016 01/12/2016	Timing update Timing update Start notice Start notice Consultation	Post Post Post Post Meeting		01/12/2016: described most fishing is in Bay of Isles.	No valid claim for Crowes Foot survey area.	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland Professional Fisherman's Association (PPFA) President VRLA member	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start Notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Victorian Abalone Divers Association (VADA)	15/09/2015 13/11/2015 23/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start Notice Completion notice	Email Email Email Email Email Email Email	President, VADA Central Abalone Zone	25/08/2016: met with Origin to discuss proposed survey. Advised primary concern isn't seismic as with good communications we can work around each other given vast fishing grounds in the Central Zone and there are only 3 reefs within the proposed survey areas (provided Origin with a map). Would be concerned if Origin wanted to drill off shore close to abalone diving areas and want to be engaged if this occurs. Advised he represents 20 divers who operate from Hopkins River through to Lakes Entrance and is keen to continue engagement with Origin. 25/08/2016: Provided map Abalone Reef Codes Moonlight Head 27/09/2016: email reply advising he has forwarded Origin's information to Central Zone members. 26/10/2016: advised he has forwarded Origin's information to members.	Minimal impact, will engage in sim-ops if divers advise Origin they intend to dive near the survey area.	25/08/2016: met to consult and determine if any abalone diving activity occurs in the survey area which we understood has been little or no activity in recent years due to impact of a virus on abalone stocks. Malcolm advised that there's only 3 reefs in the survey area so there may be only 6 to 10 divers (included the Crowes Foot survey off Cape Otway and Enterprise survey area) but with good communication that can be managed due to the large fishery. Origin advised our SMS service too engage divers before during and after the survey and Malcolm said that would be very useful. Origin explained compensation principles of no commercial fisher being worse off or better off due to our activities, along with our mutual rights to access crown resources and our commitment to minimise any impacts. 27/09/2016: email reply thanking for passing on message and that we will follow up. 27/10/2016: replied with thank you. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Southeast Trawl Fishing Industry Association (SETFIA)	15/09/2015 13/11/2015 23/09/2016 29/09/2016 21/10/2016 03/11/2016 12/11/2016 13/11/2016 21/11/2016 07/12/2016	Timing update Timing update Start notice Confirmation Timing update Timing update Start Notice Follow up Follow up Completion notice	Email Email Email Email Email Email/Phone Email Email Email Email	Membership association representing businesses with a commercial interest in the South East Trawl Fishery.	29/09/2016: emailed reply advising SMS service to SETFIA members, message and timing details and costs. 29/09/2016: SMS message re survey sent to Western Zone operator members. 23/10/2016: send second SMS message to members re revised start date and contact details for survey and support vessels. 24/10/2016: verified if Origin received SMS 03/11/2016: acknowledged email, also phoned to check if they should issue SMS messages to members. 18/11/2016: Requested aonther fisher be added to the SMS list		29/09/2016: emailed response confirming SMS arrangements. 24/10/2016: thanked for send SMS. 24/10/2016: verified SMS received. 03/11/2016: Sent notice of survey delay, also phone disucssion re sending notice to SETFIA members, advised by Origin to go ahead. 12/11/2016: Sent notice of survey commencement 13/11/2016: Provided update and provide vessel location information 21/11/2016: Confirmed additional fisher has been added to SMS list 07/12/2016: Completion of survey notification sent	Engage throughout
Sustainable Shark Fishing Inc (SSFI)	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing updte Start notice Completion	Email Email Email Email Email Email	Association representing shark fishers			15/9/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Sustainable Shark Fishing Inc (SSFI)	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Association representing shark fishers			26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Southern Shark Industry Alliance (SSIA)	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Represents interests of its Commonwealth-licensed shark gillnet and shark hook members in the Gillnet Hook and Trap			26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Victorian Scallop Fisherman's Association	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion	Email Email Email Email	Industry association representing commercial scallop fishers		No actively fished scallop beds in survey area.	26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Lakes Entrance based squid and scallop fisher	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016 16/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 16/11/2016: copied on email to the ship captains we advised of Permit to move fishing gear 07/12/2016: Completion of survey notification sent	Inform only
SETFIA president	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Warrnambool Professional Fisherman's Association (WPFA) member	26/09/2016 12/11/2016	Start notice Start notice	Post Post				26/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
WPFA member	26/09/2016 12/11/2016	Start notice Start notice	Post Post				26/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
WPFA member	23/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Timing update Start notice Completion notice	Email Email Email Email Email				23/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, survey execution approach to minimise impact, request to contact Origin if they have proof of regular fishing activity in the area, to consult about displacement arrangements which may include compensation if the survey continues in their regular fishing area after 15 November. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
VRLA member	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
VRLA member	15/09/2015 13/11/2015 23/09/2016 12/11/2016 21/11/2016 22/11/2016 25/11/2016 28/11/2016 30/11/2016	Timing update Timing update Start notice Start notice Consultation Consultation Consultation Follow up Follow up	Post Post Post Post Phone Meeting Meeting Phone Phone		03/10/2016: call to advise he fished at Moonlight head last season. 14/11/2016: called to check his fishing locations, provided coordinates, confirmed he was outside operational area. 19/11/2016: called to advise he was asked by support vessel to move pots from survey location. 20/11/2016: provided further details of weekend fishing and request to move.	14/11/2016: mapped fishing locations provided on operational area map and determined they were outside of operational area. 24/11/2016: reviewed special circumstances and resolved matters re impacts.	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

ORIGIN ENERGY - CROWES FOOT Vic/P43 and Vic/P69 EP - Stakeholder Consultation Log From 22 June 2015 to 26 May 2017

Status Options: Engage throughout; Inform only; Not relevant person; Don't want further info; Close

Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Former Port Fairy based fisher	13/11/2015 26/09/2016 12/11/2016	Timing update Start notice Start notice	Post Post Post				13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Port Fairy based rock lobster fisher	13/11/2015 26/09/2016 12/11/2016	Timing update Start notice Start notice	Post Post Post				13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based giant crab fisher	13/11/2015 26/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email				13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based trawl fisher	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	inform only
Portland based trawl fisher	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based rock lobster fisher	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based rock lobster fisher	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based rock lobster fisher	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Welshpool based trawl fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Portland based rock lobster fisher	15/09/2015 13/11/2015 27/09/2016 21/10/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Timing update Start notice Completion notice	Email Email Email Email Email Email Email		24/09/2016: emailed reply saying he will be fishing and transiting area around that time and provided mobile number but cannot receive text messages.	Origin will reply with operational communications details of support vessel and radio protocol during the survey.	15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 21/10/2016: survey timing update, including vessel names, communications protocols, additional maps. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Portland based rock lobster fisher	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Portland based rock lobster fisher	15/09/2015 13/11/2015 23/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 23/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Devonport based shark and squid fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 16/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Permit advice Completion notice	Email Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015.13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 16/11/2016: Copied on email to the ship captains we advised of Permit to move fishing gear 07/12/2016: Completion of survey notification sent	Inform only
Willamstown based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Lakes Entrance based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Willamstown based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Geelong based squid fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Lakes Entrance based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Queenscliffe based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Geelong based squid fisher	13/11/2015 27/09/2016 12/11/2016	Timing update Start notice Start notice	Post Post Post				13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement	Inform only
Lakes Entrance based squid and scallop fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
San Remo based squid jos shark fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
St Helens based squid fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Trawl fisher	15/09/2015 13/11/2015 27/09/2016 03/11/2016 12/11/2016 07/12/2016	Timing update Timing update Start notice Timing update Start notice Completion notice	Email Email Email Email Email Email				15/09/2015: notice advising unlikely to commence survey in 2015. 13/11/2015: survey not going ahead until next year. 27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Trawl fisher	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion notice	Email Email Email Email				27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool rock lobster fisher	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion notice	Email Email Email/Phone Email		12/11/2016: called to advise its his first year of fishing at Warnambool and has a licence to fish in that area, plans to fish there this season.		27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 12/11/2016: Advised survey not operating over most of big reef and he can still fish there, Origin will send him SMS message of survey location so he can avoid it. 07/12/2016: Completion of survey notification sent	Inform only
Port Fairy based shark fisher	28/09/2016 12/11/2016	Start notice Start notice	Post Post				28/09/2016: proposed start date, updated reduced survey area map. 12/11/2016: Sent notice of survey commencement	Inform only
Corporate Alliance Enterprises (Manager)	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion notice	Email Email Email Email				26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Corporate Alliance Enterprises. (co-owner)	26/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion notice	Email Email Email Email				26/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Seafish	27/09/2016 03/11/2016 12/11/2016 07/12/2016	Start notice Timing update Start Notice Completion notice	Email Email Email Email				27/09/2016: proposed start date, updated reduced survey area map. 03/11/2016: Sent notice of survey delay 12/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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SA based shark fisher	03/11/2016 07/12/2016	Timing update Completion notice	Email Email				03/11/2016: Sent notice of survey delay 07/12/2016: Completion of survey notification sent	Engage throughout
Southern Rocklobster Limited (SRL) South Australian Rock Lobster Advisory Council Inc (SARLAC) South Eastern Professional Fishermen's Association Inc (SEPFA)	02/11/2016 17/11/2016	Acknowledgement Response	Email Email	Associations representing S.A. commercial rock lobster fishers; SRL - provides industry guidance on FRDC research funding priorities.	02/11/2016: Following release of FRDC research report, advised that the southern rock lobster is regarded as a single stock across the three relevant jurisdictions; Tas, SA and Vic. Despite jurisdictional management arrangements, some indicators, such as egg production, are assessed across jurisdictions for various purposes. Assessment of egg production, across the stock, under Commonwealth legislation is critical to our industry maintaining export accreditation and their industry is almost solely reliant on export markets. Damage, permanent or otherwise, to Rock Lobsters in Victoria, or any other jurisdiction, as a result of seismic survey work which may impact on the reproductive capacity is likely to impact across the stock and is of great concern to the industry. Believe the Crowes Foot survey should not proceed until suitable controls can be identified and implemented to address industry concerns. Understand that NOPSEMA has requirements to sufficiently reduce environmental impacts and risks. They have not been made aware of any suitable and proven / demonstrated controls to mitigate the now identified risks to rock lobster stocks.	Origin has not previously engaged with these stakeholders given the localised impact of the survey activity. Origin is addressing concerns raised by all rock lobster industry associations within and outside the Victorian fishery, is reviewing risks, impacts, mitigation strategies to respond to NOPSEMA and include in a revised EP. Will reply to stakeholders concerns by providing relevant extracts of the revised EP after it has been provided to NOPSEMA.	02/11/2016: acknowledged email, project team is reviewing and will reply as soon as possible. 17/11/2016: Advised that Origin have undertaken an extensive review of the FRDC report, provided a summary re stakeholders consulted and the approval has been given by NOPSEMA for the survey to commence.	Engage throughout
Tasmanian Rock Lobster Fishermen's Association	17/11/2016	Response	Email	Industry association representing commercial rock lobster and giant crab fishers	04/11/2016: email as per SRL/SARLAC/SEPFA email of 02/11/2016		17/11/2016: Advised that Origin have undertaken an extensive review of the FRDC report, provided a summary re stakeholders consulted and the approval has been given by NOPSEMA for the survey to commence.	
Western Abalone Divers Association (WADA), SIV				WADA Executive Officer, SIV Chairman Western Abalone Zone				Not relevant person
Victorian Scallop Fisherman's Association - Member								Not relevant person
Retired Apollo Bay Fisherman	15/09/2015	Timing update			22/06/2016: Advised he is retired			Not relevant person
Retired giant crab fisher								Not relevant person
Tasmanian Seafood Industry Council				No fishing activity by Tasmanian vessels in Vic/P69				Not relevant person
Retired squid fisher								Not relevant person
Retired from fishing	23/09/2016	Start notice	Email					Not relevant person
Retired from fishing	23/09/2016	Start notice	Email					Not relevant person
Retired from fishing					25/06/2016: Port Campbell Professional Fisher Association advised fisher has retired.			Not relevant person
Port Campbell Professional Fisherman's Association VRLA member	18/11/2016 28/11/2016	Reply Follow up	Email Phone		18/11/2016: Commercial Fishing Operator Claim From Restriction of Access Form submitted via email scan	Port Campbell fishers have not identified they fish in Crowes Foot survey area.	07/12/2016: Completion of survey notification sent	Inform only
Apollo Bay rock lobster fisher	15/11/2016 19/12/2016	Consultation Follow Up	Meeting Email		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session to discuss compensation claim. Did not follow up on claim.		15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 19/12/2016: Provided information regarding the claims and the compensation calculation and included a map of the affected area 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay rock lobster fisher	15/11/2016 17/11/2016 18/11/2016 28/11/2016	Consultation Information request Reply Follow up	Meeting Phone Email Phone		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey, also attended individual session to discuss compensation claim. 17/11/2016: called to clarify details of quota and licence		15/11/2016: Attendee at meeting with Origin and Apollo Bay Fishers 07/12/2016: Completion of survey notification sent	Engage throughout
Retired Portland Fisher	24/11/2016	Consultation	Meeting		24/11/2016: met to discuss some concerns under three topics; Consultation, Compensation and Individual circumstances	Does not fish in survey area (last fished there 20 years ago), Origin's consultation for this survey began in 2014, Origin's stakeholder research did not identify him as a fisher in the survey area, he has not previously responded to Origin's information sent via SIV, nor identified himself as an interested or impacted person, concerns about broader impacts in the far estern part of the western zone are unfounded.	24/11/2016:explained survey location, consultation undertaken, compensation process and discussed individual circumstances, including his retirement status	Not relevant person
Retired Portland Fisher	24/11/2016	Consultation	Meeting		24/11/2016: met to discuss some concerns under three topics; Consultation, Compensation and Individual circumstances	as above	24/11/2016:explained survey location, consultation undertaken, compensation process and discussed individual circumstances, including his retirement status	Not relevant person
Port Campbell Professional Fisherman's Association VRLA member	15/11/2016	Consultation	Meeting		15/11/2016: attended group meeting at Apollo Bay to discuss start of survey. Did not attend individual session as does not fish in area.			Engage throughout
	29/11/2016	Information	Phone		29/11/2016: called Origin's 1800 number as he saw the sign at Apollo Bay harbour, wants to know survey location as he is travelling past Cape Otway and his radio is broken.			Not relevant person
Apollo Bay rock lobster fisher	18/11/2016 22/11/2016 24/11/2016	Reply Follow up Follow up	Email Phone Phone		18/11/2016: Commercial Fishing Operator Claim From Restriction of Access Form submitted via email	Newly identified fisher	07/12/2016: Completion of survey notification sent	Engage throughout

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Department of Immigration and Border Protection / "Border Force"	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Australian border protection			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Australian Maritime Safety Authority (AMSA), Navigation and Safety & International Division, inc Emergency Response Division	28/09/2016 21/10/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Follow up Timing update Start notice Completion notice	Email Email Email Email Email	Commonwealth marine safety	11/10/2016: acknowledged notice, advised heavy shipping route and included map; advised AMSA only issues AUSCOAST warnings and notice to mariners won't be issued due to limited duration of activity. 18/11/2016: Advised the communication from AMSA re Crowes Foot MSS still stands based on their email 11/10. Provided an updated AIS traffic plot of the survey area. 08/12/2016: Acknowledged email notice		21/10/2016: acknowledged clarification provided; advised revised date; provided vessel names and call signs; advised AUSCOAST warning has been requested by Polarcus Amani Bridge. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Dept of Defence. Directorate of Property Acquisition, Mining & Native Title, property Management Branch - Infrastructure Division, Defence Support & Reform Group	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Information on offshore mining and petroleum exploration issues all fall within Infrastructure Division's portfolio of responsibilities.	09/11/2016: Letter received advising Defence has no objection to the proposed activities.		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Australian Hydrographic Service	28/09/2016 21/10/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Follow up Timing update Start notice Completion notice	Email Email Email Email Email	Issues fortnightly notices to mariners for relevant nautical products.	18/10/2016: queried dates and if vessel name is known yet.		21/10/2016: advised revised date 2nd Nov, provided vessel names and call signs, advised AUSCOAST warning has been requested by Polarcus Amani Bridge. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Australian Fisheries Management Authority	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Commonwealth fisheries management			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Department of Economic Development, Jobs, Transport and Resources (DEDJTR) - Earth Resources Regulation.	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Victorian state economic development, impact on state fisheries	28/09/2016: Out of office msg - back on 03/10/2016		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
DEDJTR (Emergency Risk and Resilience/Marine Pollution Team)	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Marine pollution prevention and response State coastal waters	28/09/2016: thanks for the update 08/12/2016: acknkowledged email notification		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Transport Safety Victoria (Marine Safety)	28/09/2016 29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Follow up Timing update Start notice Completion notice	Email Email Email Email Email	State Marine Safety	28/10/2016: acknowledged email 18/11/2016: acknowledged email		29/10/2016: acknowledged reply 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Fisheries Victoria (DEDJTR)	28/09/2016 28/10/2016 03/11/2016 03/11/2016 07/11/2016 07/11/2016 17/11/2016 07/12/2016 08/12/2016 19/12/2016 12/01/2017 19/01/2017 24/04/2017 24/04/2017 22/5/2017 22/5/2017 24/5/2017 26/5/2017 14/06/2017 23/06/2017 23/06/2017	Start notice Follow up Data request Timing update Follow up Follow up Start notice Completion notice Follow up Follow up Follow up Reply Follow up Reply Meeting date Draft agenda Follow up Agenda Follow up Reply Reply	Email Email Email Email Phone Email Email Email Phone Phone Email Email Email Email Email Email Email Email Phone/Email Email Email	Sustainable management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreeements	28/10/2016: provided data as requested 28/10/2016: provided further data with removal of grids that won't be impacted by survey (acquisition or operation). 03/11/2016: will get back to Origin re request. 11/11/2016: Re feedback sought by Origin, advised it sounds like Origin has covered NOPSEMA's concerns, methodology seems ok, and understand the worst case scenario is unlikely, will assess report and provide feedback. 17/11/2016: Left message regarding responses to our emails requesting verfication of fishers' claims 09/12/2016: Advised FV are not available to meet until the New Year. 16/01/2017: Advised FV was not involved in developing Origin's framework for managing long term impacts and would like Origin to make fishing industry aware of this. FV will continue to provide support to OE in verifying compensation claims but advised that development of the framework should be between Origin and the industry. Afterh this FV can consider its role. 24/04/2017: Advised request for meeting next week may not be possible but will let us know. 24/04/2017: Stated the 2015/16 RL stock assessment is being prepared and will be on their website when released. Provided the link to their website for RL fishery assessments back to 2011/12 and status reports back to 2010/11. 21/06/2017: Advised the week starting 02/07/2017 would work for them and requested for the meeting to be in Melbourne. 23/06/2017: Advised they are available on both dates proposed, requested for a final date and time so they can lock it into their calendar. 23/06/2017: Advised they are no longer availale on the 5th July however stil free the other two days.		28/10/2016: called to thank them for quick respons and to ask if data could be refined to remove 2 grids that won't be impacted. 28/10/2016: called to check email reference to grids. Emailed thanks for verification. 03/11/2016: requested catch data for all fishing grids in western zone. 03/11/2016: Sent notice of survey delay 07/11/2016: Advised the data query can be for only the Western Zone. 11/11/2016: Sought feedback on our data references and methodology to assessing impact on rock lobsters from the Crowes Foot Seismic Survey, approach to compensation framework for short, medium and long term, and any other feedback FV wished to provide. 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent 08/12/2016: Contacted re further meeting 19/12/2016: Discussed timing of meeting, FV suggested the third week in January 2017. Origin will contact SIV & VRLA and check their availability for that week. 12/01/2017: Fowarded the response from VRLA advising they have a RL RAG meeting (18/01/17) before they would be looking to have a meeting with Origin and Fisheries Victoria. 19/01/2017: Acknowledged and understand FV's position; Origin included FV role in it's long term approach framework out of respect for FV's role and the assessment and management framework already in place; Origin will consult with industry and seek further guidance from FV as per FV guidance. 24/04/2017: Requested a meeting with FV to look at development of further strategies to present to SIV & VRLA using catch data from Fisheries. 24/04/2017: Advised we will work in with Vic Fisheries re availability for meeting. 22/5/2017: sent email to confirm round-table consultation date. 22/5/2017: send draft round-table consultation agenda for feedback. 24/05/2017: sent follow up email re feedback on agenda. 26/05/2017: sent agenda. 14/06/2017: Looking to have a discussion to further understnad the Stock Assessment process prior to the next roundtable. 23/06/2017: Provided some dates in the week starting 02/07/2017 and advised another Origin person will likley be in attendance as well. 23/06/2017: Confirmed the date and time for the meeting on 6th July - sent placeholder for their calendar.	Engage throughout
Fisheries Victoria (DEDJTR)	28/09/2016 25/10/2016 27/10/2016 03/11/2016 08/11/2016 08/11/2016 11/11/2016 17/11/2016 24/11/2016 25/11/2016 28/11/2016 30/11/2016 05/12/2016 07/12/2016 07/12/2016 22/5/2017 22/5/2017 24/5/2017 26/5/2017	Start notice Consultation Data request Timing update Feedback request Follow up Follow up Start notice Meeting request Meeting request Reply Follow up Reply Request for details Completion notice Meeting date Draft agenda Follow up Agenda	Email Meeting Phone/Email Email Email Email Email Email Phone Email Email Email Email Email Email Email Email Email Email	Sustainable management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreeements	13/10/2016: email to arrange meeting time. 25/10/2016: happy to help with verifications and will confirm arrangements after dept memo sent by FV Director. 27/10/2016: advised another FV colleague will follow up. 08/11/2016: provided catch data as per request from 3 November 11/11/2016: email advising who at FV can assist. 25/11/2016: FV returned call, left a message re request to set up a meeting 28/11/2016: Email advising staff member has been unwell and isn't available to meet on the 30/11. Requested more information before we do meet as they have limited resources based on their current workloads. 28/11/2016: FV emailed NOPSEMA and copied Origin. Advised FV involvement with Origin regarding Crowes Foot survey. 05/12/2016: FV will follow up with Origin to get a better understanding of our data requests. Also advised she is unable to commit to being part of a steering committee. 07/12/2016: Provided colleague's contact details as requested.		25/16/2016: met with VRLA and Fisheries Victoria (FV) to discuss verification of fishing data to establish fishing history in survey area, verification of quota caught in that area, retirement of quota, notifications to FV by fishers, FV's requirements including correct identification of Rock Lobster Fishery Access Licence Holder and Personal Professional Fisher Number. Agreed on most simple approach. OE will draft and engage further for confirmation. 27/10/2015: requested catch total for fishing grids in survey area over last few years. 03/11/2016: Sent notice of survey delay 08/11/2016: Requested feedback on DRAFT Origin compensation claim form. 08/11/2016: confirmed the data had been received 11/11/2016: Advised FV staff have been able to assist with our queries. 17/11/2016: Left message regarding responses to our emails requesting verfication of fishers' claims 17/11/2016: Sent notice of survey commencement. 24/11/2016: Left a message for FV re setting up a meeting 25/11/2016: Requested a meeting for 30/11 for us to discuss next steps re commitments to NOPSEMA and working with Fisheries 28/11/2016: Advised we will send through a summary of topics for discussion as requested. 30/11/2016: Sent summary of what Origin would like to discuss in a meeting with FV (meeting to yet be set up) 05/12/2016: Confirmed Origin will contact another FV staff member re Origin email 07/12/2016: Requested the contact number for alternate FV staff member 07/12/2016: Completion of survey notification sent 22/5/2017: sent email to confirm round-table consultation date. 22/5/2017: send draft round-table consultation agenda for feedback. 24/05/2017: sent follow up email re feedback on agenda. 26/05/2017: sent agenda.	Engage throughout

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Fisheries Victoria (DEDJTR)	28/09/2016 03/11/2016 14/11/2016 17/11/2016 07/12/2016 23/12/2016	Start notice Timing update Survey update Start notice Completion notice Permit Report	Email Email Phone/Email Email Email Email	Sustainable management of Victorian Fisheries and Commonwealth fisheries managed under Offshore Constitutional Settlement Agreeements	28/09/2016: acknowledged email 23/12/2016: Out of office - back on 04/01/2017, advised to contact another colleague in his absence		03/11/2016: Sent notice of survey delay 14/11/2016: Summary of consultation process through to receiving regulatory approval. Also provided details of the vessels that will be used during the survey. 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent 23/12/2016: Sent Special Permit SP442 report, report sent through to FV	Engage throughout
Fisheries Victoria (DEDJTR)	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Catch and Effort Data processor. Provision of Catch and Effort Data	28/09/2016: Out of office - back on 04/10/2016		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Fisheries Victoria (DEDJTR)	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Control / enforcement of local fishing activity (recreational and professional)			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Fisheries Victoria (DEDJTR)	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Control / enforcement of local fishing activity (recreational and professional)			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Fisheries Victoria (DEDJTR)	28/09/2016 03/11/2016 14/11/2016 17/11/2016 07/12/2016	Start notice Timing update Follow up Start notice Completion notice	Email Email Phone Email Email	Control / enforcement of local fishing activity (recreational and professional)	28/09/2016: Out of office msg for xxx, back on 03/10/2016 28/09/2016: Out of office for xxx, back on 05/11/2016		03/11/2016: Sent notice of survey delay 14/11/2016: called to ensure he understood details of FV licence to pull pots, unlikely need for that due to compensation model, explained how this worked and consultation undertaken. Grateful for the chat, happy with depth of info provided. 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Department of Environment, Land, Water and Planning (DELWP)	28/09/2016 03/11/2016 04/11/2016 17/11/2016 07/12/2016	Start notice Timing update Reply Start notice Completion notice	Email Email Email Email Email	Environment, conservation of endangered species.	03/11/2016: Request to be removed from the email list		03/11/2016: Sent notice of survey delay 04/11/2016: Confirmed we would action her request 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Heritage Victoria, Department of Planning and Community Development	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Protection of maritime heritage / shipwrecks			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Premier's Resources Adviser	27/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Victorian State government			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Member for Wannon				Constituents may have an interest or affected by the survey				Inform only
Member for Polwarth	27/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Constituents may have an interest or affected by the survey			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Member for Western Victoria Region	27/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Constituents may have an interest or affected by the survey			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Office of The Minister for Resources	27/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Victorian State government			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Office of the Minister for Energy, Environment and Climate Change.	27/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Victorian State government			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Parks Victoria - Apollo Bay	15/09/2016 23/09/2016 27/09/2016 03/11/2016 17/11/2016 07/12/2016	Follow up Follow up Info sheet Timing update Start notice Completion notice	Phone Phone Email Email Email Email	Managing State parklands including boat ramps, public beach access	27/9/2016: Confirmed Origin's assessment of recreational access points in survey area. Said Aire River boat ramp was primarily used for estuary access. Said we may come across tuna fishers traversing through area.	Origin will continue to update Parks Vic, Apollo Bay so their rangers are familiar with the survey area and start dates.	15/09/2016: left message 27/09/2016: discussed Origin's approach to engagement and communications including range of recreational stakeholders contacted which he confirmed. Advised that the survey guard vessels also play an important role in communications if water users have not seen or have disregarded our communications. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Parks Victoria - Port Campbell	22/09/2016 27/09/2016 24/10/2016 25/10/2016 03/11/2016 17/11/2016 07/12/2016	Consultation Info sheet Follow up Follow up Timing update Start notice Completion notice	Meeting Email Email Email Email Email Email	Managing State parklands including boat ramps, public beach access	25/10/2016: confirmed signs for Port Campbell jetty and Peterborough at Boat Bay. 26/10/2016: confirmed sign locations from Origin photos sent.		22/09/2016: discussed location of CF survey, confirmed public access locations along coast, advised consultation with Colac Otway Parks Vic and shire; discussed sign locations at Port Campbell and Peterborough as a precaution. 27/09/2016: further update on locations and timing, sought confirmation on signs. 24/10/2016: sought confirmation on signs. 25/10/2016: sent photos of proposed sign placement for confirmation. 27/10/2016: signs installed 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Colac Otway Shire Council	23/09/2016 26/09/2016 28/09/2016 29/09/2016 29/09/2016 03/10/2016 11/10/2016 11/10/2016 13/10/2016 24/10/2016 03/11/2016 17/11/2016 21/11/2016 07/12/2016	Consultation Start notice Follow up Follow up Follow up Follow up Follow up Follow up Consultation Follow up Timing update Start notice Follow up Completion notice	Phone Email Email Email Phone Email Email Phone Meeting Email Email Email Email Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Apollo Bay)	29/09/2016: appologised for delay due to land slides in the shire, and will get back to Origin soon. 30/09/2016: has asked their Environment Coordinator to contact Origin. 11/10/2016: Apologised for delay, no need to visit, he wil email harbour master info. 11/10/2016: Forwarded harbour master's response - no problem with signage so long as it doesn't impede harbour amenibility and meets public safety guidelines, suggested locations. 18/11/2016: Requested additional information re groups Origin have consulted so their new Councillors can be updated.		23/09/2016: follow up on meeting last year to discuss and seek support for signage. 26/09/2016: further update on locations and timing, sought confirmation on signs. 28/09/2016: checked other recipients at the shire. 29/09/2016: we understand his priorities, would he rather we contact the Apollo Bay Harbour master directly. 29/09/2016: explained survey, sought support for signs. Resent info sent previously to colleage. 03/10/2016: advised we have engaged further contact at the shire 11/10/2016: follow up to see if he had any questions. Sought meeting. 11/10/2016: called Harbour Master to discuss and arrange visit for 13/10/2016. 13/10/2016: visited Apollo Bay Harbour and Harbour Master, explained survey, visited locations for signs with the Harbour Master, took photos, discussed manufacturing and safety. 21/11/2016: called Harbour Master to advise one support vessel was coming to harbour for fuel and gave their mobile phone number so he could provide port entry instructions 24/10/2016: sent Harbour Master update on survey, vessel names and call signs, further maps, photos of sign locations and layout and wording of sign. 26/11/2016: called Harbour Master to advise name of company to be installing signs tomorrow and check he could meet them. 27/11/2016: signs installed. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 21/11/2016: Provided a summary of groups we have engaged, offered to provide a project briefing to new Councillors 07/12/2016: Completion of survey notification sent	Engage throughout
Corangamite Shire Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Port Campbell)			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 23/11/2016: called Greg Hayes to inquire if he had any questions or new councillors required briefing. Appreciated the contact but happy with information provided and will let us know if further engagement required. 24/11/2016: called newly elected councillor to explain survey, ask if he had any questions, establish engagement for Otway Gas Plant, and seismic survey projects. 07/12/2016: Completion of survey notification sent	Inform only
Moyne Shire Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	General interest in Origin activities as an operator in Moyne Shire			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool City Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	General interest in Origin activities as an operator in the region	28/09/2016: Out of office msg, back on 11/10/2016		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Origin - Otway Gas Plant Community Reference Group	29/09/2016 25/10/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Consultation Timing update Start notice Completion notice	Email Meeting Email Email Email	Formal community engagement forum for Origin's Otway Gas Plant and surrounding operations, Chaired by Corangamite Shire			25/10/2016: provided update survey (has been presented in earlier meetings) 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Apollo Bay tourism Information Centre	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fishing & Adventure Tours	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational fishing and tours run out of Apollo Bay			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Not relevant person
Apollo Bay Surf n Fish	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Dive charters Apollo Bay			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Informal Fishing Group	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational fishing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Apollo Bay Sailing Club	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational sailing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Great Ocean Road Regional Tourism	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Regional tourism association for Shipwreck Coast			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Twelve-Apostles Tourism and Business Association	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Community volunteer group representing tourism / business interests of operators around Port Campbell and 12 Apostles.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Boat Charters	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Based in Port Campbell, operates dive and fishing charter boat services.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Port Campbell Tourism Information Centre	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Local government run tourism information centre.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Surf Life Saving Club	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email		29/09/2016: acknowledged email		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Progress Group	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Community group - focus on town amenity for residents			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Community Group	03/11/2016 17/11/2016 07/12/2016	Timing update Start notice Completion notice	Email Email Email	Community group - focus on natural environment / conservation			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
SCUBA Divers Federation of Victoria	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Peak association, represent over 25 amateur dive clubs reaching 2,500 members.	28/09/2016: advised this is outside of their user area 29/09/2016: acknowledged email		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Ocean Racing Club of Victoria	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Ocean racing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Victorian Recreational Fishers Association	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Peak recreational fishing association			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Dive Industry Association of Australia	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Represents dive organisations			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Parks Victoria - Apollo Bay	15/09/2016 23/09/2016 27/09/2016 03/11/2016 17/11/2016 07/12/2016	Follow up Follow up Info sheet Timing update Start notice Completion notice	Phone Phone Email Email Email Email	Managing State parklands including boat ramps, public beach access	27/9/2016: Confirmed Origin's assessment of recreational access points in survey area. Said Aire River boat ramp was primarily used for estuary access. Said we may come across tuna fishers traversing through area.	Origin will continue to update Parks Vic, Apollo Bay so their rangers are familiar with the survey area and start dates.	15/09/2016: left message 27/09/2016: discussed Origin's approach to engagement and communications including range of recreational stakeholders contacted which he confirmed. Advised that the survey guard vessels also play an important role in communications if water users have not seen or have disregarded our communications. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Parks Victoria - Port Campbell	22/09/2016 27/09/2016 24/10/2016 25/10/2016 03/11/2016 17/11/2016 07/12/2016	Consultation Info sheet Follow up Follow up Timing update Start notice Completion notice	Meeting Email Email Email Email Email Email	Managing State parklands including boat ramps, public beach access	25/10/2016: confirmed signs for Port Campbell jetty and Peterborough at Boat Bay. 26/10/2016: confirmed sign locations from Origin photos sent.		22/09/2016: discussed location of CF survey, confirmed public access locations along coast, advised consultation with Colac Otway Parks Vic and shire; discussed sign locations at Port Campbell and Peterborough as a precaution. 27/09/2016: further update on locations and timing, sought confirmation on signs. 24/10/2016: sought confirmation on signs. 25/10/2016: sent photos of proposed sign placement for confirmation. 27/10/2016: signs installed 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Colac Otway Shire Council	23/09/2016 26/09/2016 28/09/2016 29/09/2016 29/09/2016 03/10/2016 11/10/2016 11/10/2016 13/10/2016 24/10/2016 03/11/2016 17/11/2016 21/11/2016 07/12/2016	Consultation Start notice Follow up Follow up Follow up Follow up Follow up Follow up Consultation Follow up Timing update Start notice Follow up Completion notice	Phone Email Email Email Phone Email Email Phone Meeting Email Email Email Email Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Apollo Bay)	29/09/2016: appologised for delay due to land slides in the shire, and will get back to Origin soon. 30/09/2016: has asked their Environment Coordinator to contact Origin. 11/10/2016: Apologised for delay, no need to visit, he wil email harbour master info. 11/10/2016: Forwarded harbour master's response - no problem with signage so long as it doesn't impede harbour amenibility and meets public safety guidelines, suggested locations. 18/11/2016: Requested additional information re groups Origin have consulted so their new Councillors can be updated.		23/09/2016: follow up on meeting last year to discuss and seek support for signage. 26/09/2016: further update on locations and timing, sought confirmation on signs. 28/09/2016: checked other recipients at the shire. 29/09/2016: we understand his priorities, would he rather we contact the Apollo Bay Harbour master directly. 29/09/2016: explained survey, sought support for signs. Resent info sent previously to colleage. 03/10/2016: advised we have engaged further contact at the shire 11/10/2016: follow up to see if he had any questions. Sought meeting. 11/10/2016: called Harbour Master to discuss and arrange visit for 13/10/2016. 13/10/2016: visited Apollo Bay Harbour and Harbour Master, explained survey, visited locations for signs with the Harbour Master, took photos, discussed manufacturing and safety. 21/11/2016: called Harbour Master to advise one support vessel was coming to harbour for fuel and gave their mobile phone number so he could provide port entry instructions 24/10/2016: sent Harbour Master update on survey, vessel names and call signs, further maps, photos of sign locations and layout and wording of sign. 26/11/2016: called Harbour Master to advise name of company to be installing signs tomorrow and check he could meet them. 27/11/2016: signs installed. 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 21/11/2016: Provided a summary of groups we have engaged, offered to provide a project briefing to new Councillors 07/12/2016: Completion of survey notification sent	Engage throughout
Corangamite Shire Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Commercial fishers, recreational fishers, rate payers within Shire (primarily Port Campbell)			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 23/11/2016: called Greg Hayes to inquire if he had any questions or new councillors required briefing. Appreciated the contact but happy with information provided and will let us know if further engagement required. 24/11/2016: called newly elected councillor to explain survey, ask if he had any questions, establish engagement for Otway Gas Plant, and seismic survey projects. 07/12/2016: Completion of survey notification sent	Inform only
Moyne Shire Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	General interest in Origin activities as an operator in Moyne Shire			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Warrnambool City Council	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	General interest in Origin activities as an operator in the region	28/09/2016: Out of office msg, back on 11/10/2016		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Origin - Otway Gas Plant Community Reference Group	29/09/2016 25/10/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Consultation Timing update Start notice Completion notice	Email Meeting Email Email Email	Formal community engagement forum for Origin's Otway Gas Plant and surrounding operations, Chaired by Corangamite Shire			25/10/2016: provided update survey (has been presented in earlier meetings) 03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Apollo Bay tourism Information Centre	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Fishing & Adventure Tours	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational fishing and tours run out of Apollo Bay			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Not relevant person
Apollo Bay Surf n Fish	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Dive charters Apollo Bay			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Apollo Bay Informal Fishing Group	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational fishing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Apollo Bay Sailing Club	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Recreational sailing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Great Ocean Road Regional Tourism	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Regional tourism association for Shipwreck Coast			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Twelve-Apostles Tourism and Business Association	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Community volunteer group representing tourism / business interests of operators around Port Campbell and 12 Apostles.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Boat Charters	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Based in Port Campbell, operates dive and fishing charter boat services.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Port Campbell Tourism Information Centre	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Local government run tourism information centre.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Surf Life Saving Club	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email		29/09/2016: acknowledged email		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Progress Group	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Community group - focus on town amenity for residents			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Port Campbell Community Group	03/11/2016 17/11/2016 07/12/2016	Timing update Start notice Completion notice	Email Email Email	Community group - focus on natural environment / conservation			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
SCUBA Divers Federation of Victoria	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Peak association, represent over 25 amateur dive clubs reaching 2,500 members.	28/09/2016: advised this is outside of their user area 29/09/2016: acknowledged email		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Ocean Racing Club of Victoria	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Ocean racing			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Victorian Recreational Fishers Association	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Peak recreational fishing association			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Dive Industry Association of Australia	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Represents dive organisations			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Blue Whale Study Inc.	29/09/2016 04/10/2016 05/10/2016 23/10/2016 24/10/2016 31/10/2016 31/10/2016 03/11/2016 03/11/2016 06/11/2016 17/11/2016 30/11/2016 02/12/2016 04/12/216 07/12/2016 01/02/2017	Start notice Request for information Reply Reply Reply Follow up Reply Reply Timing update Reply Start notice Follow up Reply Follow up Completion notice Follow up	Email Email Email Email Email Email Email Email Email Email Email Phone/Email Email Email Email Email	Research to support conservation of Blue Whales	05/10/2016: Asked how many posters we needed in response to our request 23/10/2016: Missed our email so has now done up the quote for the posters 24/10/2016: Advised he hasn't sent the posters yet he will on Tuesday 25/10/2016: Advised the posters have been sent express post 31/10/2016: Confirmed who the posters were sent to and the address they were sent too 31/10/2016: Advised it was sent through Australia Post 06/11/2016: Requested to know if any blue whales were sighted during the survey 06/11/2016: Appreciated the reply 30/11/2016: Appreciated the update and asked if the MMOs had seen any krill surface swarms 02/12/2016: Appreciated the update		04/10/2016: Requested posters some as the ones provided for Enterprise 05/10/2016: Advised 15 would be good 23/10/2016: Queried if the posters have been sent yet? 24/10/2016: Provided the postal address, requeted them to be sent express post. 31/10/2016: Advised the posters haven't been received yet - asked for the artwork in case they don't arrive in time 31/10/2016: Thank him for the artwork and for confirming the address info 03/11/2016: Advised the posters have arrived and due to the delay we didn't need to use the artwork he provided 03/11/2016: Sent notice of survey delay 06/11/2016: Confirmed we would let him know of any sightings 17/11/2016: Sent notice of survey commencement 30/11/2016: Advised of 'possible' sighting in the morning and provide some information of sighting 02/12/2016: Advised MMOs have not noted any krill swarms but will let him know if that changes 04/12/2016: Advised MMO have reported seeing krill yesterday afternoon - provided location info 07/12/2016: Completion of survey notification sent 01/02/2017: Provided a copy of the Detection records and a map showing the positions of the sighted whales.	Engage throughout
Deakin University	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Academic and research University			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Victorian National Parks Association	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Conservation of national parks			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
International Fund for Animal Welfare	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	IFAW works to rescue and protect animals with a focus on marine mammals and the protection of whales and dolphins in Australia			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only
Eastern Maar Aboriginal Corporation	29/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Traditional Owners.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Date	From Origin	Mode	Functions, Interests, Activities of Stakeholder	Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Australian Marine Oil Spill Centre Pty Ltd (AMOSC)	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Oil spill management.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Adagold Aviation	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Oil spill management.			03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
Bristow, Asia Pacific Operations	28/09/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email	Oil spill management.	28/09/2016: Out office msg, back on 1 October 2016		03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Engage throughout
APPEA	03/10/2016 03/11/2016 17/11/2016 07/12/2016	Start notice Timing update Start notice Completion notice	Email Email Email Email				03/11/2016: Sent notice of survey delay 17/11/2016: Sent notice of survey commencement 07/12/2016: Completion of survey notification sent	Inform only

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Stakeholder / Organisation	Functions, Interests, Activities of Stakeholder	Date	From Origin	Mode	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Seafood Industry Victoria (SIV)	Peak body representing professional fishing, seafood processors and exporters in Victoria.	29/05/2017	First round table consultation	Meeting	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): As per summary below for VRLA.	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): As per summary below for VRLA.	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): As per summary below for VRLA.	Engage throughout
Seafood Industry Victoria (SIV)		18/07/2017	Consultation	Meeting	As per summary below for VRLA.	As per summary below for VRLA.	As per summary below for VRLA.	
Seafood Industry Victoria (SIV)		10/08/2017	Consultation	Phone conference	As per summary below for VRLA.	As per summary below for VRLA.	As per summary below for VRLA.	
Seafood Industry Victoria (SIV)		17/08/2017	Consultation	Phone conference	As per summary below for VRLA.	As per summary below for VRLA.	As per summary below for VRLA.	
Seafood Industry Victoria (SIV)		18/08/2017	Consultation	Meeting	As per summary below for VRLA.	As per summary below for VRLA.	As per summary below for VRLA.	
Seafood Industry Victoria (SIV)		22/09/2017	Consultation	Phone conference	As per summary below for VRLA.	As per summary below for VRLA.	As per summary below for VRLA.	
Seafood Industry Victoria (SIV)		16/10/2017	Consultation	Phone	Has been busy at conferences and preparing for AGMs. Suggested times to meet. No additional feedback.	Will continue to consult.	Origin called to see if any further follow up from last consultation. Discussed availability for further meeting on community development strategy, will check with VRLA for their availability.	
Victorian Rock Lobster Association (VRLA)	Industry association representing commercial rock lobster and giant crab fishers	29/05/2017	First round table consultation	Meeting	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): - Consensus reached on objectives of the round table discussion, factors contributing to a good working relationship moving forward, including: regional calendars of each industry's activities; documented consultation process and regional based MOU; public policy on seismic activity being developed by VFA; agreed risk and impact frameworks; and education of fishers and titleholders arrangements for sustainable coexistence; - Queried Origin's terminology: 'no party' vs 'no fisher', in relation to Origin's 'no economic disadvantage commitment'; - Discussed success of Origin's compensation framework applied in the Crowes Foot survey; - Rock Lobster Resource Allocation Group (RLRAG) determined the current data collection and stock assessment by VFA is not sufficient to determine rock lobster impact from seismic surveys; - Consensus reached on options for assessment of long term impact assessment from the Crowes Foot survey, to be considered by Origin and discussed with stakeholders.	- Will investigate further information from VFA regarding current monitoring and assessment program; - will consult with all stakeholders to investigate options determined at Round Table 1.	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): - Consensus reached on objectives and options to consider and consult stakeholders; - Calendars of activities may be a challenge where activities are confidential until reported to ASX (with listed companies); - Will investigate difference in terminology re 'no party' / 'no fisher' economically disadvantaged;	Engage throughout
Victorian Rock Lobster Association (VRLA)		18/07/2017	Consultation	Meeting	Key points (see meeting summary 20170718): - keen to hear input from IMAS on assessing options before next round table consultation; - would like to see 'bookend' modelling of stock assessment data model, has been done before; - current stock assessment model does not have sufficient spatial granularity to match seismic survey area; - baseline data not collected before Crowes Foot survey therefore difficult to see how option 2 could work (monitoring actual impacts from current VFA data); - marine environment has so many variables, hard to design effective experiment, would need 10-15 yr timeframe; - doubts whether research could solve this issue; - agreed scope of second phase of FRDC research may not solve current impact question; - 2 classes of impact: biological and economic; no ability to study economic impact over long term; compensation to show good intent / corporate citizenship, should be considered by Origin; open to pragmatic solutions; - have seen zooplankton study from McCauley and subsequent CSIRO study, can't be extrapolated to Victorian waters and included assumptions in the modelling, further work to be done; - further discussion on Crowes Foot survey model validation (from previous email correspondence); - understands Origin's position on compensation case study request from NOPSEMA, VRLA is happy with the summary they prepared and don't need to develop joint response with Origin.	- Origin is continuing to consult and investigate options determined at the round table consultation. - held internal review meeting on 13/7/2017 with project team and senior management after further consultation with VFA on data and monitoring, after further investigation of options, and in preparation for follow up with SIV and VRLA on 18/7/2017 and upcoming consultation with IMAS and VFA. - believe that analysis of existing data collected by VFA is of value, subject to availability and granularity of this data; - modelling is of interest, subject to consultation with IMAS and VFA; - research options being discussed would add to knowledge of rock lobster but may not provide any answers to Crowes Foot survey impact within any reasonable time frame, but will discuss further with IMAS; - reviewed zooplankton research in preparation for discussions with SIV and VRLA; - reaffirmed position that requirement of evidence in the event of any future compensation claims for impact is fair, consistent with laws of natural justice.	Origin sought consultation to update on progress of exploring the options determined at the first round table consultation and seek SIV/VRLA feedback. Key points (see meeting summary 20170718): - we will meet with IMAS and VFA to explore options and modelling and postpone next round table consultation until after then; - at this stage we recommend adopting option 1 and will discuss further with IMAS on what is possible; - we're continuing to explore using actual data collected by VFA for analysis of long term impact; - Options 5 and 6 (expand VFA monitoring program / design new study) will not address current impact assessment question within time frame but will discuss further with IMAS; - Option 3 (fund extended FRDC study) will not address current impact assessment question; - Option 4 (long term compensation framework) asked if SIV/VRLA had further ideas; advised Origin compensated fishers to retire quota for the remaining season in the absence of evidence of population impact and economic loss as Origin made a commercial decision. In the event of future claims, Origin will require evidence of loss which is a normal and fair approach; - repeated previous replies to VRLA question on Crowes Foot survey model validation, discussed again the additional compensation paid; - asked if SIV/VRLA were aware of recent zooplankton studies, no further discussion after VRLA response; - advised Origin does not see the compensation paid for the Crowes Foot survey as a model for future seismic surveys and have a very different approach to the case study VRLA prepared. Asked if VRLA wants to consult further.	
Victorian Rock Lobster Association (VRLA)		10/08/2017	Consultation	Phone conference	Key points (see meeting summary 20170810): - Option 1: if modelling can only be done at Western Zone level, then should include all seismic surveys in that area to compare apples with apples, re Origin's response that only surveys after FRDC research should be included, advised we should discuss cumulative impact further with IMAS, know that modelling is not going to get absolute answer; suggest phone conference with IMAS, should agree how modelling will be used in advance; - Option 2: IMAS agrees with our assessment re spatial resolution not being sufficient, so why keep looking at it; do nothing option is of interest but that's not the answer, negotiating a research approach is, data exists now; don't want to hang onto false hope if spatial data isn't good enough; - Option 3: scope of original FRDC research did include larval stage but was excluded; does Origin not think it's useful? Understand (Origin's Crowes Foot) priorities; could IMAS scope research priorities; how do we negotiate an outcome acceptable to all? - Option 5: option still suffers from lack of pre-survey data; site surveys are the most expensive research we do, have real issues with them, where they're done, who does them; Crowes Foot survey area is very challenging, not fished in continuous pattern, very depending on weather and seasons; fishers' records are not accurate due to small grids; 5 fisher rule and data protection issues. - Option 4: Origin addressed individual fisher compensation for year one of the survey well; future response is about industry level approach; 2 classes of impact - biological and economic; accept that Origin is doing due diligence now and if cost / benefit (of research) is not worth it then negotiating an agreement that's good for environment would bypass complexity of life cycle assessment which isn't fully mapped for rock lobster; request summary of options before next round table meeting.	Held further internal review meeting on 8/8/2017 with project team and senior management after last meeting with SIV/VRLA, consultation with IMAS and VFA on research and modelling options, further investigation of options, and in preparation for follow up with SIV and VRLA on 10/8/2017: - modelling of scenarios appears more challenging that initially thought due to IMAS guidance that it could only be done over the whole western zone and the inability to draw any robust conclusions of impact from the Crowes Foot survey; - analysis of existing data collected by VFA is still of interest as this data is used to assess the status of the fishery and therefore quota set, and it is the only data available on a graticular block basis; - at this stage, appears options 3,5 and 6 aren't viable as they won't enable measurement of any potential impacts from the Crowes Foot survey within a reasonable time frame.	Origin sought consultation to continue discussions on Origin's review of the long term impact assessment options, since consultation with IMAS and VFA, and seek feedback. Key points see meeting summary 20170810): - Option 6: ruled out this option as it would take a long time before any outcomes could be used in long term assessment approach, also very costly; IMAS have suggested reseeding idea but unproven and maybe biosecurity issues; - Option 1: IMAS can do modelling of hypothetical scenarios but only at the Western Zone (WZ) level, not the survey area; IMAS said drawing an absolute impact assessment from the modelling would be difficult due to many variables; re VRLA feedback that all seismic surveys in WZ should also be included, Origin would only agree to include surveys after FRDC research, i.e. Origins surveys; - Option 2: IMAS raised spatial resolution concerns again and couldn't suggest combination of measures to determine absolute impact; we still want to use this data to validate an long term impacts but do understand its limitations; it is the only data set over graticular blocks; - Option 3: this option is off the table as it won't help address the unanswered questions re Crowes Foot survey impacts; - Option 5: no pre-survey data which makes this difficult, asked IMAS about using analogous site but they advised it's not appropriate due to variability across the fishery, discussed expanding fixed site surveys by VFA and they are costing this; - Option 4: can VRLA/SIV provide more clarity on what's acceptable? Will take VRLA/SIV views back to Origin management for discussion but may not be a matter for Origin alone.	

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Stakeholder / Organisation	Functions, Interests, Activities of Stakeholder	Date	From Origin	Mode	Stakeholder Potential Impacts / Concerns / Claims	Origin Assessment of Objections / Claims	Origin Response to Stakeholder Objections / Claims	Status
Victorian Rock Lobster Association (VRLA)		17/08/2017	Consultation	Phone conference	Key points (see meeting summary 20170817): - discussions triggered by impacts from Crowes Foot survey but we want to know impacts as a whole over the broader Western Zone, not just Crowes Foot; - not trying to hold Origin accountable for other surveys, if we limit the research to post FRDC research then we may never be able to quantify impacts, therefore an alternative is whole WZ assessment; - should look at what we do know, as full behavioural modelling would take 10-15 years; - what if we said in worst case scenario all population was permanently damaged by the survey, how would it recover naturally, could we re-seed, what would it cost, will never know but on the balance of probability, is this reasonable and doable? - year one fishers were compensated, now looking at how we rehabilitate the environment; - if translocation done, we would have issues with depletion from the area where stock was removed stock, evidence that habitat isn't a problem as the reefs could support greater population, could harvest waste puerulus from Tasmanian oyster farms, W.A. saw large pulse in recruitment which led to large stock level improvements; - not trying to create aquaculture industry, simply augmenting nature through translocation, keen to look at novel ideas and it could attract other investment from the likes of FRDC, could be good news story from mitigating impacts to the environment, maybe worth scoping with FRDC, UTAS, APPEA; - if Origin is only looking at option 4 compensation, that's nonsense as fishers couldn't provide basis for their claim, this is disingenuous and VRLA will strongly object at round table tomorrow.	Held further internal review meeting on 11/8/2017 with project team and senior management after last meeting with SIV/VRLA (10/8/2017), further investigation of options, and in preparation for follow up for meeting with all stakeholders on 17/8/2017: - still feel there's merit in analysing VFA data if they can provide it, but concerns that stakeholders do not want Origin to do this; - modelling is not an appropriate approach as it is purely hypothetical and open to misinterpretation, its also not appropriate if it can only be done at the western zone level; - reseeding idea has some merit but there's no proven population level socio-economic impact to be addressed, and this idea would require extensive research to measure it's benefit to the local lobster population; - stakeholders have advised us that there's many gaps in research on the rock lobster life cycle which we appreciate, evidence by the substantial financial commitment from Origin in the past (FRDC research report); - it's a complex area due to the many human and environmental variables, but the research gaps identified either, do not help us measure the long term impacts of the Crowes Foot survey, or will not provide an outcome in any reasonable time frame to assess impacts from the Crowes Foot survey; - considering the FRDC research did not find lobster mortality, did not report on population level nor socio-economic impact, did find habituation to shipping noise and a thriving population in a control group, and the absence of any evidence of showing correlation between catch and seismic surveys over the years, Origin believes that whilst there may be biological impact proven in the FRDC report, the impact is ALARP and acceptable.	Origin sought consultation with SIV, VRLA, VFA and IMAS to discuss current position on investigation of options for long term impact assessment (see meeting summary 20170817). Key points: - options don't give absolute impact assessment, bookending scenarios is ok but finding relevant midpoint is very difficult and we need to be able to determine impacts from Crowes Foot survey; - scope of surveys included in any modelling can only be those done after FRDC research publication, understand VRLA's position but consideration of historical surveys is a much bigger exercise; - asked IMAS again about spatial impacts and sampling for only worse case scenario which we know didn't happen; - can discuss further at 2nd round table tomorrow, but our current assessment is that options 1,2,3,5 and 6 are not considered viable as there's no robust way to measure impacts; - reconfirmed commitment to 'no fisher worse off' and they may make claims if they feel they have been impacted; - Origin can't see evidence of impact on fishers if there's no proven economic loss; - there's an opportunity to discuss further tomorrow.	
Victorian Rock Lobster Association (VRLA)		18/08/2017	Consultation	Meeting	Round Table Consultation 2, key points raised (see NOPSEMA meeting record 20170818): - Option 1: interested in this option because it could bookend upper and lower limits of impacts and could inform any further options; - Option 2: didn't support as the spatial boundaries of the seismic survey don't correlate with the fishery, also fishers move throughout the fishery to target lobsters rather than linger if catch is low, so future data not likely to show an increase; - Option 3: agreed this will not enable measurement of impacts from the Crowes Foot survey; - Option 4: individual compensation for future impacts not likely to be taken up by fishers as they move throughout the fishery, rather than liger in areas with low catch so future data not likely to show catch decrease; quotas have been held low in recent years to build stock, so in the short term quotas will all be caught and in the long term, they expect quotas to increase and concerned this growth may be impacted by the Crowes Foot survey (VFA confirmed increase in quota not formally forecasted); prefer that compensation be considered at broad fishery level, not individual fishers, for example through stock readjustment or experimental re-seeding program; - Option 5: not supported; - Option 6: interested in pursuing reseeding program involving transferring lobster puerulus from Tasmania to the Crowes Foot survey area; accept the challenges of this idea but interested in pursuing collaboration from industry and government.	- Origin has consulted genuinely with stakeholders, been open to all ideas raised by them, and thoroughly investigated the options determined at the first round table consultation; - it is not appropriate to embark on modelling exercise that all parties have agreed would be based on hypothetical scenarios; - research options considered will not provide a relevant impact assessment or measurement; - Origin will stand by it's commitment to provide a simple process for fishers to make a claim supported by evidence; - Origin believes the revised EP will meet the standard of ALARP and acceptable impacts.	Round Table Consultation 2, key points raised (see NOPSEMA meeting record 20170818): - Option 1: Origin not supportive as results would be purely hypothetical, agreement on how results should be interpreted and therefore mitigation decisions would be difficult to achieve; - Option 2: Origin could do this internally, relatively straight forward as data is collected in the normal course of fishing; - Option 3: agree this will not enable measurement of impacts form the Crowes Foot survey; - Option 4: Compensation is available to impacted parties under Common Law but Origin will create a less onerous process for fishers who have evidence of economic impact due to the Crowes Foot survey; - Option 5: expansion of current fixed site survey program would not provide insights into the effects of the Crowes Foot survey; - Option 6: not viable for assessing impacts of Crowes Foot survey within reasonable time frame and costs; - Origin will consider options discussed, determine proposed actions and document in EP.	
Victorian Rock Lobster Association (VRLA)		22/09/2017	Consultation	Phone conference	- Welcomed Origin's approach, realise there's a more innovative way to move ahead, given the uncertainties on inability to measure long term impacts and a broader, collaborative approach is good; - provides a basis for a more meaningful working relationship; - MOU is a good idea, perhaps at the Southern Rock Lobster fishery level and will discuss further; - will come back to Origin with next steps to progress discussions.	Origin has undertaken considerable engagement with SIV and VRLA, particularly over the last 3 years and wishes to continue building its relationship through inclusion in it's community development strategy, development of a regional MOU and ongoing consultation in the event of further relevant research or data that may emerge.	Origin sought consultation to provide Origin's final assessment of options investigated for long term impact assessment. Key points discussed: - short term impacts (displacement) was managed through an effective compensation process; - compensation also led to retirement of 8.5 tonne of quota in the CF area, benefiting the fishery; - exploration of modelling and research options identified some potential positive steps forward in increasing knowledge, but didn't result in identifying a robust measure of potential long term socio-economic impacts and there was consensus on this from those involved; - Origin strongly believes the body of evidence, including the FRDC research report on RL, assessed in its EP meets the ALARP requirement; - revised EP is being prepared to include our assessment of research, the review undertaken of options for assessing long term impacts from the Crowes Foot survey; - a very detailed summary of the EP will be published in due course, as we heard from NOPSEMA this week the summaries are now very lengthy; - Origin will continue to support a simplified compensation claim process, subject to evidence of loss; - Origin will continue engagement with the rock lobster industry in the event of new evidence or research that may be evidence of long term socio-economic impact; - we have listened to VRLA's recommendations that puerulus seeding is agreed by many as having the potential to boost recruitment which is the greatest indicator of future stock levels, but such initiative (or any other type of 'offset') initiative cannot be included in our EP for assessment by NOPSEMA as it is not within their framework; - Origin coexists among many different stakeholders, has developed strong and collaborative relationships with the communities in which we operate, and where we do sometimes have an impact; - Each of our industries have rights to access the ocean for our productive efforts – put simply we have to work together; - Origin has a genuine desire to also achieve the same level of collaboration with our 'commercial fishing' community as we have with our 'land based' communities and will include this sector in our community development strategy; - Origin still believes that building an ongoing relationship underpinned by mutually agreed expectations documented in an MOU is the best way forward and recognising the limited resources at SIV and VRLA, we are prepared to draft it for discussion.	
Victorian Rock Lobster Association (VRLA)		16/10/2017	Consultation	Phone			Left phone message to see if VRLA has any feedback after last discussion.	
Victorian Rock Lobster Association (VRLA)		19/10/2017	Consultation	Phone	- Apologised for not calling back, been very busy with conferences and planning for AGMs, happy with approach for next steps re working relationship; - understood response on clarification of 'no party' vs 'no fisher'. No further questions or feedback on this.	Will broaden community development strategy to include local rock lobster fishers.	- Follow up call regarding next steps for further development of working relationship and will send confirmation letter; - also followed up on VRLA query re 'no party' vs 'no fisher' definition for Origin's \no economic disadvantage' commitment, advised the intent was absolutely to apply to fishers as we can't make commitments to parties unknown to us with unknown impacts or claims; - will send further correspondence regarding ongoing relationship.	

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Victorian Fisheries Authority (VFA)	Manager Marine and Estuarine Fisheries Fisheries Manager Rock Lobster, Giant Crab and Scallop Fisheries	29/05/2017	First round table consultation	Meeting	Round Table Consultation 1, key points raised (see NOPSEMA meeting record 20170529): - Consensus reached on objectives of the round table discussion, factors contributing to a good working relationship moving forward, including: regional calendars of each industry's activities; documented consultation process and regional based MOU; public policy on seismic activity being developed by VFA; agreed risk and impact frameworks; and education of fishers and titleholders arrangements for sustainable coexistence; - Provided over view of the FRDC rock lobster / seismic survey research and the gaps in research, also that it did not cover long term impacts; - Rock Lobster Resource Allocation Group (RLRAG) determined the current data collection and stock assessment by VFA is not sufficient to determine rock lobster impact from seismic surveys; - Consensus reached on options for assessment of long term impact assessment from the Crowes Foot survey, to be considered by Origin and discussed with stakeholders.	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): - will investigate further information from VFA regarding current monitoring and assessment program; - will consult with all stakeholders to investigate options determined at Round Table 1.	Round Table Consultation 1, key points raised (see NOPSEMA meeting record): - Consensus reached on objectives and options to consider and consult stakeholders.	Engage throughout
Victorian Fisheries Authority (VFA)		06/06/2017	Consultation	Meeting	No concerns raised, key points (see meeting record 20170706): - current stock assessment approach; - recently contracted to IMAS (from SARDI); - new zooplankton research likely to be a further discussion point (did not have any feedback); - would be valuable to have a joint consultation with stock assessment scientists (IMAS) and Origin; - puerulus settlement is difficult to determine origin and destination, research project underway; - explained current measurement and modelled parameters, data collection methodologies; - moving toward a new harvest strategy in next 12 months, which will use a 'pre-recruitment index' (PRI) and target to enable uplift in TACC (quota); - for life of harvest strategy, maximum of 32.5% of Western Zone biomass can be exploited; - any process to definitively determine seismic survey impacts on lobster population would require very long term monitoring of all ecosystem variables (human and environmental influences); - VFA will check Origin's request to obtain data and use current IMAS model to assess scenarios (as per round table option 1); - provided feedback on optimising Origin's compensation approach.	- Will arrange meeting with IMAS and VFA to explore options identified in first round table consultation; - Will continue to consult with VFA regarding any compensation to fishers in relation to Origin's activities; - See merit in assessing current catch and effort data in relation to seismic survey events and will discuss further with SIV, VRLA and VFA	Origin sought consultation with VFA to seek further information on (see meeting record 20170706): - VFA rock lobster stock assessment methodology; - VFA rock lobster harvest strategy; - Current VFA rock lobster monitoring program; - Use of current VFA assessment model for determining long term impacts from seismic to rock lobster; - VFA data collection, supply, quality; - Discuss recent plankton research. Objective of this consultation was to enable assessment of existing data and monitoring as inputs to developing an agreed approach for assessing long term impacts from the Crowes Foot survey.	Engage throughout
Victorian Fisheries Authority (VFA)		03/08/2017	Consultation	Meeting	Key points (see meeting summary 20170803): Option 5(expand VFA monitoring program): any increase in quota above 230 tonne is unlikely as recruitment has been low (response to Origin's query).		Origin sought consultation with VFA and IMAS to explore the options determined at the first round table consultation and seek feedback. Key points (see meeting summary 20170803); - as per summary below for IMAS; plus - Option 5(expand VFA monitoring program): Origin is aware industry discussions in 2015 canvassed lowering quota to 165 tonnes due to data interpretation, but quota settled on 230 tonnes, VRLA has advised that due to past quota constraints, the industry expects it to increase, we are querying this in relation to long term impacts.	Engage throughout
Victorian Fisheries Authority (VFA)		17/08/2017	Consultation	Phone conference		Held further internal review meeting on 11/8/2017 with project team and senior management after last meeting with SIV/VRLA (10/8/2017), further investigation of options, and in preparation for follow up for meeting with all stakeholders on 17/8/2017: - still feel there's merit in analysing VFA data if they can provide it, but concerns that stakeholders do not want Origin to do this; - modelling is not an appropriate approach as it is purely hypothetical and open to misinterpretation, its also not appropriate if it can only be done at the western zone level; - reseeding idea has some merit but there's no proven population level socio-economic impact to be addressed, and this idea would require extensive research to measure it's benefit to the local lobster population; - stakeholders have advised us that there's many gaps in research on the rock lobster life cycle which we appreciate, evidence by the substantial financial commitment from Origin in the past (FRDC research report); - it's a complex area due to the many human and environmental variables, but the research gaps identified either, do not help us measure the long term impacts of the Crowes Foot survey, or will not provide an outcome in any reasonable time frame to assess impacts from the Crowes Foot survey; - considering the FRDC research did not find lobster mortality, did not report on population level nor socio-economic impact, did find habituation to shipping noise and a thriving population in a control group, and the absence of any evidence of showing correlation between catch and seismic surveys over the years, Origin believes that whilst there may be biological impact proven in the FRDC report, the impact is ALARP and acceptable.	Origin sought consultation with SIV, VRLA, VFA, and IMAS to discuss current position on investigation of options for long term impact assessment (see meeting summary 20170817). Key points: - options don't give absolute impact assessment, bookending scenarios is ok but finding relevant midpoint id very difficult and we need to be able to determine impacts from Crowes Foot survey; - scope of surveys included in any modelling can only be those done after FRDC research publication, understand VRLA's position but consideration of historical surveys is a much bigger exercise; - asked IMAS again about spatial impacts and sampling for only worse case scenario which we know didn't happen; - can discuss further at 2nd round table tomorrow, but our current assessment is that options 1,2,3,5 and 6 are not considered viable as there's no robust way to measure impacts; - reconfirmed commitment to 'no fisher worse off' and they may make claims if they feel they have been impacted; - Origin can't see evidence of impact on fishers if there's no proven economic loss; - there's an opportunity to discuss further tomorrow.	Engage throughout
Victorian Fisheries Authority (VFA)		18/08/2017	Consultation	Meeting	Round Table Consultation 2, key points raised (see NOPSEMA meeting record 20170818): - Option 3: agreed this will not enable measurement of impacts from the Crowes Foot survey; - Option 4: supported VRLA's view; - Option 5: not supported; explained what the fixed site survey monitoring program measures, that there are no established sites within the Crowes Foot survey area, this lack of baseline data would thwart attempts to detect biological impacts through this program, expansion of the program to additional sites would not provide insight to the effects of the Crowes Foot survey; - Option 6: explained there would be regulatory requirements, including controls for biosecurity, but that Victoria has a Translocation Policy in place that is already used for various fish populations; - VFA is currently drafting a policy to advise petroleum titleholders and stakeholder on the range of impacts to the marine ecosystem that should be considered in impact assessments for seismic survey activities.	- Origin has consulted genuinely with stakeholders, been open to all ideas raised by them, and thoroughly investigated the options determined at the first round table consultation; - it is not appropriate to embark on modelling exercise that all parties have agreed would be based on hypothetical scenarios; - research options considered will not provide a relevant impact assessment or measurement; - Origin will stand by it's commitment to provide a simple process for fishers to make a claim supported by evidence; - Origin believes the revised EP will meet the standard of ALARP and acceptable impacts.	Round Table Consultation 2, key points raised (see NOPSEMA meeting record 20170818): - Option 1: Origin not supportive as results would be purely hypothetical, agreement on how results should be interpreted and therefore mitigation decisions would be difficult to achieve; - Option 2: Origin could do this internally, relatively straight forward as data is collected in the normal course of fishing; - Option 3: agree this will not enable measurement of impacts form the Crowes Foot survey; - Option 4: Compensation is available to impacted parties under Common Law but Origin will create a less onerous process for fishers who have evidence of economic impact due to the Crowes Foot survey; - Option 5: expansion of current fixed site survey program would not provide insights into the effects of the Crowes Foot survey; - Option 6: not viable for assessing impacts of Crowes Foot survey within reasonable time frame and costs; - Origin will consider options discussed and determine proposed actions and document in EP.	Engage throughout

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Institute of Marine and Antarctic Science (IMAS)	Marine research organisation within University of Tasmania; contract to VFA to carry out stock assessment research; conducted the FRDC research on impacts of seismic surveys on rock lobster	03/08/2017	Consultation	Meeting	Key points (see meeting summary 20170803): - Option 1 (scenario modelling): asked if Origin plans further seismic surveys, as there's no pre and post survey data; advised analogous site can't be used due to variability; hard to measure natural mortality due to many variables and measurement of seismic related mortality in addition to natural mortality poses even more challenges; best indication of recruitment is what's happened in the past; model applies to whole western zone and not just the Crowes Foot survey area; need to incorporate both recent Origin surveys in the modelling; running best and worst case scenarios is standard modelling technique; difference between long term shipping noise exposure and short term seismic exposure and leads to concerns about possible mortality impacts; only seismic impact on animals present at the time as eggs would disperse from other areas into the survey area; - Option 2 (monitoring actual impacts from stock assessment data): spatial extend of current data would only enable pick up of catastrophes; could rule out 100% mortality but difficult to quantify any other level of impact; - Option 5 (expand VFA monitoring program): could add another fixed site rock lobster survey closer to the survey area but without a 'before' study it's scientifically challenging to interpret meaningful results; - Option 6 (design new study): in-situ survey, during a seismic survey would be good but none are planned, however would be very expensive and have very long time frames; biological offset shouldn't be ruled out; discussed harvesting puerulus, growing and translocating.	- Origin is continuing to consult and investigate options determined at the round table consultation. - held internal review meeting on 13/7/2017 with project team and senior management after further consultation with VFA on data and monitoring, after further investigation of options, and in preparation for follow up with SIV and VRLA on 18/7/2017 and upcoming consultation with IMAS and VFA. - believe that analysis of existing data collected by VFA is of value, subject to availability and granularity of this data; - modelling is of interest, subject to consultation with IMAS and VFA; - research options being discussed would add to knowledge of rock lobster but may not provide any answers to Crowes Foot survey impact within any reasonable time frame, but will discuss further with IMAS.	Origin sought consultation with IMAS and VFA to explore the options determined at the first round table consultation and seek feedback. Key points (see meeting summary 20170803): - objective of meeting is to seek subject matter expert input to assist Origin with evaluating the options determined at the first round table consultation; - explained ALARP standard, NOPSEMA's role, assessment of biological and socio-economic impacts; - Option 1 (scenario modelling): exploring use of current stock assessment model to run hypothetical impact scenarios (including VRLA's suggestion to bookend scenarios), questioned total mortality scenario when we know the FRDC research found no mortality, concerned this approach may cause alarm to lay-person, noted thriving lobster population in Taroona Reserve (FRDC research) in spite of statocyst damage; discussed different scenarios that could be modelled, treatment of lobster quota retired due to Origin surveys. - Option 2 (monitoring actual impacts from stock assessment data): assumption of 100% mortality could be tested by catch data next season; - Options 5 and 6 (expand VFA monitoring program / design new study): opened discussion, asked if other options should be considered.	Consult regarding research
Institute of Marine and Antarctic Science (IMAS)		17/08/2017	Consultation	Phone conference	Key points (see meeting summary 20170817): - with data at hand we're unlikely to be able to assess impacts with any degree of precision, may be able to indicate impacts of mortality at certainly levels and mitigation strategies, in-situ sampling may also be required, eg lower TACC, reseeding of rock lobster stocks, most viable would be to reduce catch rates; - has been commercial translocation in Tasmania from low growing areas to other areas with a net benefit, could do this at population level and reduce TACC which would negate equity issues, has potential but hasn't been done anywhere else.	Held further internal review meeting on 11/8/2017 with project team and senior management after last meeting with SIV/VRLA (10/8/2017), further investigation of options, and in preparation for follow up for meeting with all stakeholders on 17/8/2017: - still feel there's merit in analysing VFA data if they can provide it, but concerns that stakeholders do not want Origin to do this; - modelling is not an appropriate approach as it is purely hypothetical and open to misinterpretation, its also not appropriate if it can only be done at the western zone level; - reseeding idea has some merit but there's no proven population level socio-economic impact to be addressed, and this idea would require extensive research to measure it's benefit to the local lobster population; - stakeholders have advised us that there's many gaps in research on the rock lobster life cycle which we appreciate, evidence by the substantial financial commitment from Origin in the past (FRDC research report); - it's a complex area due to the many human and environmental variables, but the research gaps identified either, do not help us measure the long term impacts of the Crowes Foot survey, or will not provide an outcome in any reasonable time frame to assess impacts from the Crowes Foot survey; - considering the FRDC research did not find lobster mortality, did not report on population level nor socio-economic impact, did find habituation to shipping noise and a thriving population in a control group, and the absence of any evidence of showing correlation between catch and seismic surveys over the years, Origin believes that whilst there may be biological impact proven in the FRDC report, the impact is ALARP and acceptable.	Origin sought consultation with SIV, VRLA, VFA, and IMAS to discuss current position on investigation of options for long term impact assessment (see meeting summary 20170817). Key points: - options don't give absolute impact assessment, bookending scenarios is ok but finding relevant midpoint id very difficult and we need to be able to determine impacts from Crowes Foot survey; - scope of surveys included in any modelling can only be those done after FRDC research publication, understand VRLA's position but consideration of historical surveys is a much bigger exercise; - asked IMAS again about spatial impacts and sampling for only worse case scenario which we know didn't happen; - can discuss further at 2nd round table tomorrow, but our current assessment is that options 1,2,3,5 and 6 are not considered viable as there's no robust way to measure impacts; - reconfirmed commitment to 'no fisher worse off' and they may make claims if they feel they have been impacted; - Origin can't see evidence of impact on fishers if there's no proven economic loss; - there's an opportunity to discuss further tomorrow.	