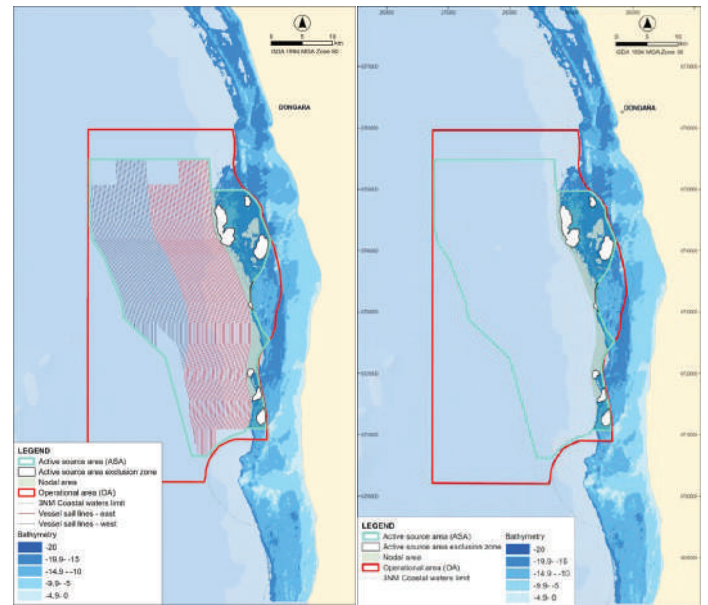


Pilot Energy is planning to undertake the Eureka 3D Marine Seismic survey in the North Perth Basin over the petroleum title WA-481-P, in Commonwealth waters. The survey vessel will sail back and forth, in an approximate N/S orientation, across the acquisition area. Based on a 6 streamer configuration with 100m streamer separation, the sail lines would be 300m apart. Seismic sound will be generated with a maximum source volume of 2,495 cubic inches (cui) and an operating pressure of 2,000 pounds per square inch (psi). The vessel will tow a minimum of 6 hydrophone streamer cables approximately 6,150 m long, which contain the sound sensors that detect the pressure and velocity of sound levels reflected from the geophysical structures being targeted.

Ocean Bottom Node (OBN) technology may be used to the east of the reef systems in the shallower water depths. These are small and light and are expected to be placed in a grid of 250 m x 250 m, resulting in the deployment of 2500 nodes. These nodes would be placed at the start of the survey and collected at the end of the survey timeframe.

Map of survey



**Please note that the sail lines shown here are subject to change*

Operational and Active Source Area Coordinates (GDA94)

Activity timing

Through consultation and environmental assessments, one suitable window has been identified, February – March. The activity will only occur once in this window in 2025 or 2026.

The survey duration is capped at 40 days with a maximum of 30 acquisition days.

The Operational Area is approximately 1575km² and the Active Source Area is approximately 946km².

Operational area	
Latitude	Longitude
-29.270842	114.606743
-29.274973	114.849632
-29.309620	114.851687
-29.350656	114.856948
-29.389779	114.895096
-29.449083	114.915039
-29.514094	114.925970
-29.568026	114.914272
-29.596011	114.895846
-29.627502	114.883474
-29.696458	114.897106
-29.733026	114.897460
-29.731198	114.844435
-29.741452	114.815726
-29.761163	114.799096
-29.793673	114.790001
-29.789274	114.593941
-29.270842	114.606743

Active source area	
Latitude	Longitude
-29.7548	114.7702
-29.6088	114.7284
-29.5489	114.6592
-29.5278	114.6573
-29.4597	114.6288
-29.4364	114.6111
-29.4131	114.6060
-29.3145	114.6083
-29.3174	114.8087
-29.3641	114.8112
-29.3646	114.8668
-29.3919	114.8930
-29.4029	114.8934
-29.4390	114.9096
-29.4850	114.8922
-29.4968	114.8806
-29.5437	114.8790
-29.5857	114.9044
-29.6228	114.8819
-29.7171	114.8953
-29.7155	114.8635
-29.7205	114.8605
-29.7391	114.8133

December 2023

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EP prepared by 

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Identified Fisheries

A review of the presence of commercial fisheries across WA was undertaken, and the following Commonwealth and state fisheries have been identified having management boundaries that overlap the Operational Area and/or EMBA. The following fisheries were active in the Operational Area within the past ten years¹.

Commonwealth:

- Southern Bluefin Tuna Fishery
- Small Pelagic Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery
- Western Tuna and Billfish Fishery

Western Australian State Fisheries:

- Abalone Managed Fishery
- Abrolhos Islands and Mid West Trawl Managed Fishery
- Mackerel Managed Fishery
- Marine Aquarium Managed Fishery
- Octopus Interim Managed Fishery
- Open Access Fishery
- Specimen Shell Managed Fishery
- South West Coast Salmon Managed Fishery
- West Coast Deep Sea Crustacean Managed Fishery
- West Coast Demersal Gillnet and Demersal Longline Managed Fishery
- West Coast Purse Seine Managed Fishery
- West Coast Demersal Scalefish Fishery
- West Coast Rock Lobster Managed Fishery

The Eureka 3D MSS Commercial Fishery Review is available online in the document library on the Eureka project website: www.eureka3dmss.com.au

Commercial Fishers potential impacts and measures

Potential Impact	Description	Measure in place
Interaction with other vessels & Vessel Exclusion zone	During acquisition the vessel will host a minimum of 6 streamers, this means the vessel will have restricted manoeuvrability. Her minimum speed is 4.5 knots, and she cannot come to a complete stop. For the safety of your vessel and equipment, it is advised not to approach closer than 6 km to the seismic vessel or its streamers. To the east of the reef structures a smaller 3km exclusion buffer will be enforced, as the vessel will only be towing a sound source and no streamers. Please see the schematic diagram below, for a visual representation.	• A yellow-coloured float called a tail buoy (see photo below) will be attached at the end of each cable and will be equipped with a white flashing light. • Pilot Energy will inform the Australian Hydrographic Office of relevant survey details prior to, during (if alterations occur) and on completion of the survey to ensure a Notice to Mariners informs all third parties of survey details and are updated as required. • Pilot Energy will notify all relevant persons four weeks prior to the start (or re-start) of the survey to provide details about the order in which survey zones will be completed and the anticipated date and duration for their completion. • Commercial fishers actively operating in the Operational Area and will be issued a 7 to 10-day forecast prior to activities commencing in the Operational Area. This will include detailed maps showing the planned area of activity during the forecast period. • Commercial fishers actively operating in the Operational Area are kept informed of daily survey activities through Pilot's 24-hour look-ahead communication. • Pilot will continue to advise relevant fishers of planned sail-lines and dates and if any issues are raised by fishing stakeholders, Pilot will make reasonable effort to avoid or minimise conflicts. Controls to be considered will include: -moving to another sail-line -allowing fishers to fish area prior to seismic acquisition -minimise survey activity in areas where there is known fishing activity.

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Potential Impact	Description	Measure in place
		<i>cont.</i> • Provision of bathymetric survey data to commercial fishers who have requested the data. • No disruption to fishing activities (except for fishers with fixed equipment) beyond that required for safe passage of the seismic vessel whilst it is restricted in its ability to manoeuvre. • Payment of compensation to the rightful owner for any fishing equipment that has been damaged or lost by the survey.
Loss of catch & displacement	The survey has the potential to temporarily displace fish and other marine life from the survey area, which may temporarily impact the local fishing industry. Economic loss can occur due to: • reduced catch in the regular fishing area due to impacts from a seismic survey • reduced catch from fishing in a new area to avoid a seismic survey • relocation of fishing operations from the regular fishing area to avoid a seismic survey • fishing gear loss or damage caused by a seismic vessel (including its in-water equipment or supporting vessels)	The impact assessments have identified the Operational Area as being regular commercial fishing grounds for several species of fish and invertebrates, including Western Rock Lobster. Whilst temporary and transitory fishing exclusion zones will be active around the vessel and streamers, fishers will be temporarily relocated to alternative fishing grounds. It is Pilot Energy's aim to have the least amount of interference with marine users as possible during this period of activity. If interference cannot be avoided, Pilot Energy will implement a commercial fishing industry adjustment protocol within the acquisition area. This will follow the principles of the NERA protocol^{4,5} and allow for a practical, evidence-based process and ensure no commercial fisher is worse off due to the activity. This set of protocols has previously been endorsed by WAFIC when used on the North West Shelf, and is currently under review from Western Rock Lobster Council. All identified individual commercial fishers will also be invited to provide feedback on the NERA compensation protocol for input.
Introduction of invasive species	The introduction of marine pests could occur from vessels used for the Eureka 3D MSS because of: • Discharge of ballast water containing foreign species. • Translocation of species through biofouling of the vessel hull and/or niches (e.g., sea chests, bilges, and strainers) or in-water equipment (e.g., source array and streamers).	Pilot Energy will implement their marine assurance system to ensure compliance of contract vessels with pre-arrival biosecurity checks for international vessels, and ballast water and biofouling requirements⁶. The seismic source and towed streamers including all submersible equipment will be inspected and cleaned (where required) prior to deployment for the Eureka 3D MSS.
Setting of traps and fixed fishing gear	Fishing gear may become lost or damaged if set in the path of the vessel	Pilot Energy requests that fishers contact Pilot Energy prior to laying traps or setting fishing gear in the vicinity of the proposed Eureka 3D MSS Operational Area, to ensure full understanding of the seismic vessel's movements over the next days to weeks. This will enable you to plan your activities around the location and future path of the seismic vessel and to avoid negative interactions between the seismic vessel, seismic equipment, fishing vessels and fishing gear.



Potential Impact	Description	Measure in place
Commercial Divers	Seismic surveys generate intense, low-frequency sound waves that have the potential to pose risks to divers	Pilot Energy will put in place measures such as prior notification to relevant parties, exclusion zones, monitoring, gradual ramp up of the seismic source, open communication channels and diver safety briefings. If you are a diver in this region, whether recreational, commercial, or scientific, please contact us at contact@eureka3dmss.com.au
Sound: Whales	The Midwest is the site of several protected Whale species migration pathways including: •Pygmy Blue Whale •Humpback Whale •Southern Right Whale	Pilot Energy has altered their acquisition timing in response to new information on whale migration pathways by DBCA, to ensure no activity is undertaken during these periods of time. The February – March window, should have no impact on whale species, however additional measures are in place to protect these cetaceans including: • If there have been three or more humpback whale-instigated power-down or shut-down situations during the preceding 24-hour period, seismic acquisition will cease for 24 hours. Seismic acquisition may recommence after 24 hours if there has been no further sighting of humpback whales. • Two trained Marine Fauna Observers (MFOs) on the seismic vessel will watch for whales during seismic operations in daylight hours, throughout the duration of the survey. • If there have been three or more humpback whale-instigated power-down or shut-down situations during the preceding 24-hour period, Pilot will implement the following additional precautionary control measures: - increased pre-start up visual observation period to 45 mins - increased soft-start to 40 mins - increased low power zone to 3 km - increased shut-down zone to 1 km • The survey will be terminated if there are three consecutive days of no seismic acquisition due to the presence of migrating humpback whales.
Sound: Fish	Fish, and other marine fauna can be affected by the sound levels they are exposed to from a seismic survey.	Studies ^{2,3} were undertaken to understand the potential acoustic impacts on key regional receptors including fish and invertebrates, and a review of commercial fisheries that fish in the area to identify the commercial fish and invertebrate species. As required by EPBC Act Policy Statement 2.1 - Interaction between offshore seismic activities and whales, the seismic source is required to be slowly ramped up to full power over 30 minutes. For mobile species they would move away from the source before it is at full power.
Sound: Western Rock Lobster (Panulirus cygnus)	The Midwest is also a rich source of Western Rock Lobster fished both commercially and recreationally and has potential to be impacted by sound levels from a seismic survey.	Pilot Energy has acknowledged that Western Rock Lobster may aggregate in larger numbers around large reef structures. Independent sound modelling studies ³ have identified that there should be little to no impact within 300m of a sound source, and therefore a 300m exclusion zone has been placed around all built up reefs that reach the 12m contour mark where no vessel or acquisition activity can occur. This exclusion zone includes the placement and operation of Ocean Bottom Nodes that will act as listening devices to the east of the reef structures in shallower water.



Commonly asked questions:

Will there be any impact to recreational fishing access?

Launching areas and ports will still be open during project operations. There will be notifications put up at all major ports to raise awareness around the ongoing activities. Specific areas of closure will be communicated via email and text. If other forms of communication are more appropriate for recreational fishers, it would be great feedback to accommodate the changes that will be occurring in the area.

If there are impacts, how long will it take for fish to recover?

Temporary threshold shift affects that may result from seismic activity are temporary and recoverable. With effects lasting up to 24 hours but in many cases due to avoidance behaviour (swimming away) likely to be much less. No study to date has demonstrated direct mortality of free-swimming adult fish in response to seismic activity (even when fired at close proximity 1-7m).

Have any studies been undertaken in WA?

The Scott Reef Study associated with the Woodside Maxima 3D survey reported in McCauley et al. (2008) and Miller and Cripps (2013) is a study undertaken in the North West of WA which included a component that examined how the behaviour of caged fish exposed to seismic signals changed. This study examined the effects to fish species including the Bluestripe Snapper, a demersal species similar to the demersal species that are most likely to occur in the Eureka 3DMSS Operational Area.

The captive fish in the study showed alarm responses such as startle and avoidance behaviour when less than 200m passing by. Less significant agitation levels (defined by changing swim direction) increased with increasing received sound levels for some fish species however, did not seem to increase with increasing received sound levels for the less sensitive Bluestripe Snapper (McCauley et al., 2008).

Fish began to feed and behave normally again within 20-minutes after the passage of the seismic source (McCauley et al., 2008; Miller and Cripps, 2013).

A link to a YouTube video on this study can be located here

[Maxima 3D MSS - Seismic Survey in a Coral Reef Environment](#)

What are the impacts of seismic surveys on fish behaviour and health, including spawning activities?

Our assessments and modelling are generally undertaken on the two lifecycles of fish, adult and fish spawn.

For zooplankton the underwater noise modelling study and subsequent impact assessment determined that there was mortal injury within 270m for fish eggs and larvae from the seismic source. However, any potential mortal impacts to zooplankton communities have to be assessed in the context of natural mortality in these populations and effects to zooplankton (including fish eggs and larvae) resulting from seismic noise emissions are likely to be inconsequential compared to natural mortality rates, which are very high - over 50% per day in some species and commonly exceeding 10% per day.

One study (Sætre and Ona, 1996) calculated the 'worst-case' scenario, was 0.45% of the total population, and they concluded that mortality rates caused by exposure to airgun sounds are so low compared to natural mortality that the impact from seismic surveys must be regarded as insignificant.

For fish we categorise fish based on their auditory biology:

- Fish without a swim bladder
- Fish with a swim bladder but not used for hearing.
- Fishes with swim bladder used for hearing.



Our impact assessments use widely accepted (by scientific and regulatory communities) papers of the most recent and relevant information. There are not always papers that can provide direct comparison with a species of fish, however comparison with fish of similar auditory biology is accepted by scientists.

Every species of fish studied to date is able to hear. The critical issue for understanding whether an anthropogenic sound will affect the hearing of a fish is whether it is within the hearing frequency range of the fish and loud enough to be detectable above background ambient noise.

In some fish species we recognise that temporary hearing impairment (a temporary threshold shift TTS) can occur due to fatigue and temporary changes to the hair cells of the inner ear and/or damage to the auditory nerves when exposed to sound pressures for prolonged periods of time (Smith et al., 2006; Popper et al., 2014; Liberman, 2015).

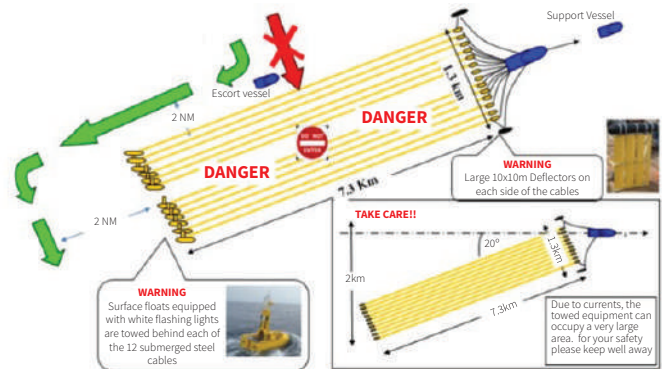
However, the types of fish that are likely to occur in the Operational Area do not possess a direct connection between the swim bladder and the inner ear; they are therefore sensitive primarily to particle motion rather than sound pressure.

It is worth noting that many of the studies available on temporary threshold shifts (short term changes such as temporary hearing impairment) are based on captive fish, whereas free-swimming fish in the wild are likely to make some effort to avoid the intense sound pressures that contribute to temporary threshold shifts.

McCauley, R.D., Salgado Kent, C. and Archer, M. 2008. Impacts of seismic survey pass-bys on fish hearing and caged fish behaviour, Scott Reef Lagoon, Western Australia. Prepared for ERM and Woodside Energy, CMST Report No. 2008-52, Curtin University, Perth, Australia.

Meekan, M.G., Speed, C.W., McCauley, R.D., Fisher, R., Birt, M.J., Currey-Randall, L.M., Semmens, J.M., Newman, S.J., Cure, K., Stowar, M., Vaughan, B., Parsons, M.J.G., 2021. A large-scale experiment finds no evidence that a seismic survey impacts a demersal fish fauna. *Proceedings of the National Academy of Sciences of the United States of America* 118(30): e2100869118.

Schematic diagram of vessel and towed streamers



Tail Buoy



How to get in touch

Via email at - contact@eureka3dmss.com.au

Via our website - www.eureka3mss.com.au

Via our project hotline - +61 497 832 046

Other functions, interests, or activities in the activity area?

Please contact us describing these so we can work with you to ensure any potential impacts are managed and any measures required are put in place. For example, an individual may be a relevant person via commercial fishing activities or through a spiritual connection to Sea Country.

Know someone who may be relevant?

We encourage you to share our consultation material and contact details with anyone you may know who may be affected by this activity. We understand this process is voluntary, however we believe it's important to hear from people who live, work and enjoy the environment we would like to work in, prior to us submitting our Environment Plan.

December 2023

References

- 1 Klarite, Eureka 3D MSS: Draft Description of the existing environment - Socio-economic and cultural environment: Commercial fisheries
 - 2 Klarite, Eureka 3D MSS: Environmental Impact Assessment - Impact 1 - Underwater sound from seismic: Fishes and elasmobranchs
 - 3 Klarite, Eureka 3D MSS: Acoustic modelling for assessing marine fauna sound exposures
 - 4 NERA: Commercial fishing industry adjustment protocol
 - 5 NERA: Commercial fishing industry operational protocol
 - 6 Klarite, Eureka 3D MSS: Draft Control Measures - Risk 2: Introduction and establishment of invasive marine species
- Further information can be supplied on request, or visit our comprehensive website with document library: www.eureka3dmss.com.au