Sequoia 3D Seismic Survey

ConocoPhillips

Vessel Marine Diesel Oil Spill Modelling and Controls | October 2020

ConocoPhillips Australia has commissioned independent experts in vessel marine diesel oil (MDO) spill modelling to undertake vessel MDO spill modelling as part of the development of the Sequoia 3D marine seismic survey Environment Plan (EP). Vessel MDO spill modelling is a tool used to support spill preparedness, response planning and environmental impact assessment. While offshore MDO spills from vessels are rare, ConocoPhillips Australia believes it is important that risks and impacts are assessed and mitigated to as low as reasonably practicable.

This information sheet presents the results of the modelling undertaken to support the Sequoia 3D seismic survey in Exploration Permit T/49P.

What scenario was modelled?

As part of the risk assessment process a vessel collision resulting in a fuel tank rupture, while highly unlikely, was identified as the most significant, credible risk.

The scenario modelled was a loss of containment of 373 m^3 of MDO over a six-hour period with weathering and spread simulated for a 28-day period. This volume represents the average volume of an externally located fuel tank for potential seismic vessels.

What is Marine Diesel Oil?

MDO is a commonly used fuel for larger sized vessels. It is characterised by a high percentage of volatile components (95 per cent), which evaporates rapidly when on the sea surface. It also contains five per cent persistent hydrocarbons, which do not evaporate as rapidly and can be entrained in the water column and breakdown over time due to decay.

How is modelling undertaken?

Spill modelling takes into consideration water currents, tides and wind speeds, as well as the type of hydrocarbon and release rate to understand the potential spread and effect in the unlikely event of a MDO spill.

Both stochastic and deterministic modelling methods are used.

Stochastic modelling is created by overlaying a large number (often hundreds) of individual, computer-simulated hypothetical spills to result in an overall area of effect.

Deterministic modelling creates a computer simulation of a single hypothetical MDO spill subject to a single set of wind and weather conditions. Deterministic modelling is commonly used to model the 'worst-case' MDO spill scenario (i.e. the case that results in the area of greatest surface water or shoreline exposure).

What type of MDO exposure was modelled?

Three types of exposure were modelled:

Surface water MDO is the spread of MDO on the water surface.

Shoreline MDO is the accumulation of MDO on shorelines.

In-water MDO is the five percent of MDO that doesn't evaporate from the surface of the water and remains in the water column.

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What are the vessel MDO spill modelling results?

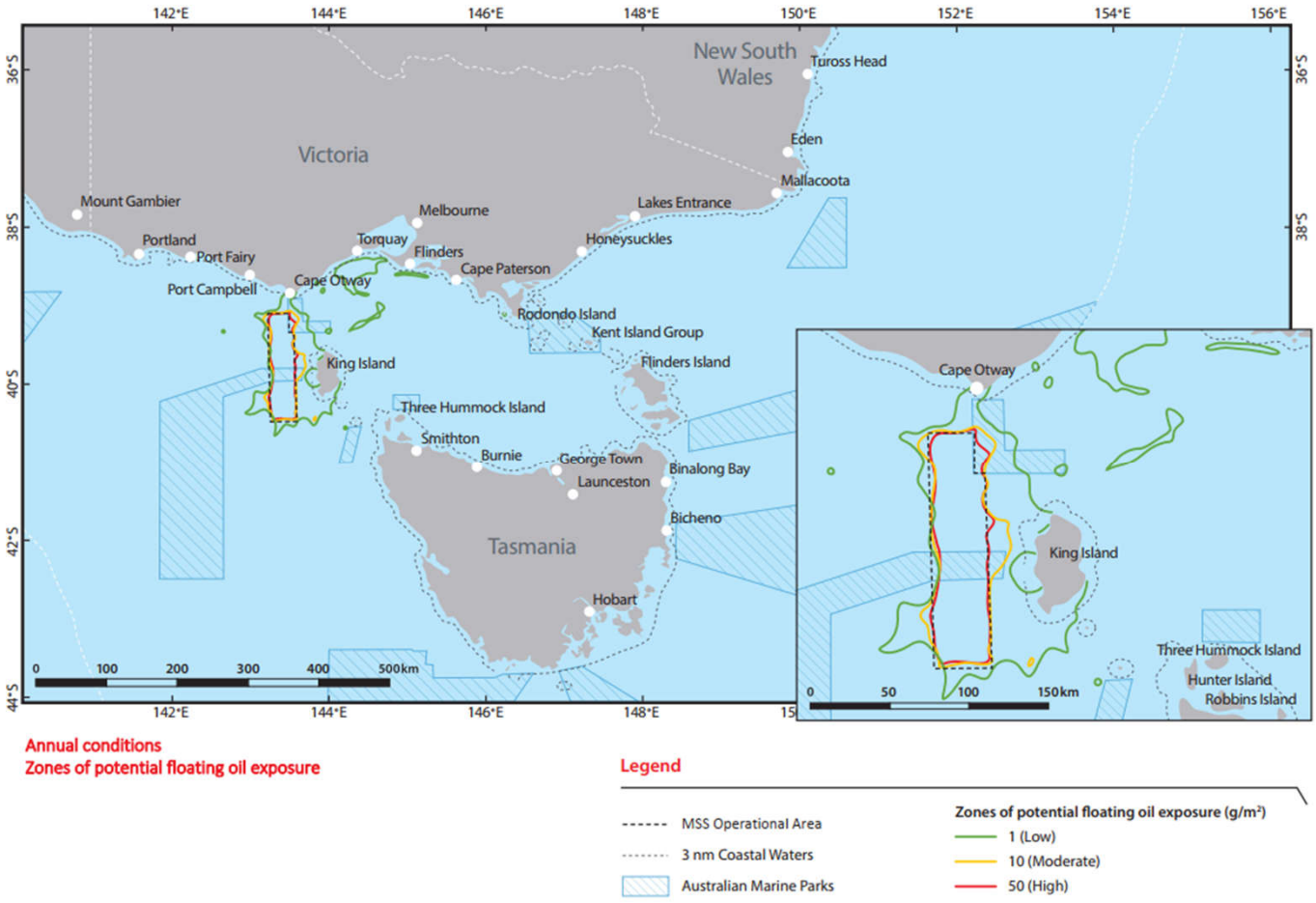
In the extremely rare event that a spill of MDO occurred, the following maps outline the potential exposures. It's important to note that the three stochastic exposure maps identify the amalgamation of the 100 modelled simulations and not the result of a single spill simulation.

Surface Water Exposure

Exposure to floating oil was predicted at a range of sensitive receptors including the Apollo and Zeehan Australian Marine Parks (AMP), the West Tasmania Canyons Key Ecological Feature (KEF) and the Point Addis Marine National Park.

Stochastic modelling showed that the minimum time before exposure at or above the low threshold ranged from 1 hour for sensitive receptors located within the operational area and up to 6.67 days for sensitive receptors such as Wilsons Promontory Marine Reserve national park.

The map below shows an amalgamation of 100 spill simulations under varying weather and ocean conditions. It is not representative of one single spill simulation.



Exposure level	Threshold (g/m²)	Description of potential impact
Low	1	Exposure at this level is unlikely to affect species but would be visible and detectable by instrumentation and may cause a range of socio-economic effects, like the temporary closure of beaches
Moderate	10*	Exposure at this level would likely result in behavioural changes such and changes in reproduction or growth in some species. Exposure at this level is unlikely to result in death, however, this may occur MDO was ingested.
High	50	Exposure at this level would likely result in changes in reproduction or growth in some species and would reduce survival rates of sensitive species.

* 10 g/m² also used to define the threshold for actionable sea surface MDO.

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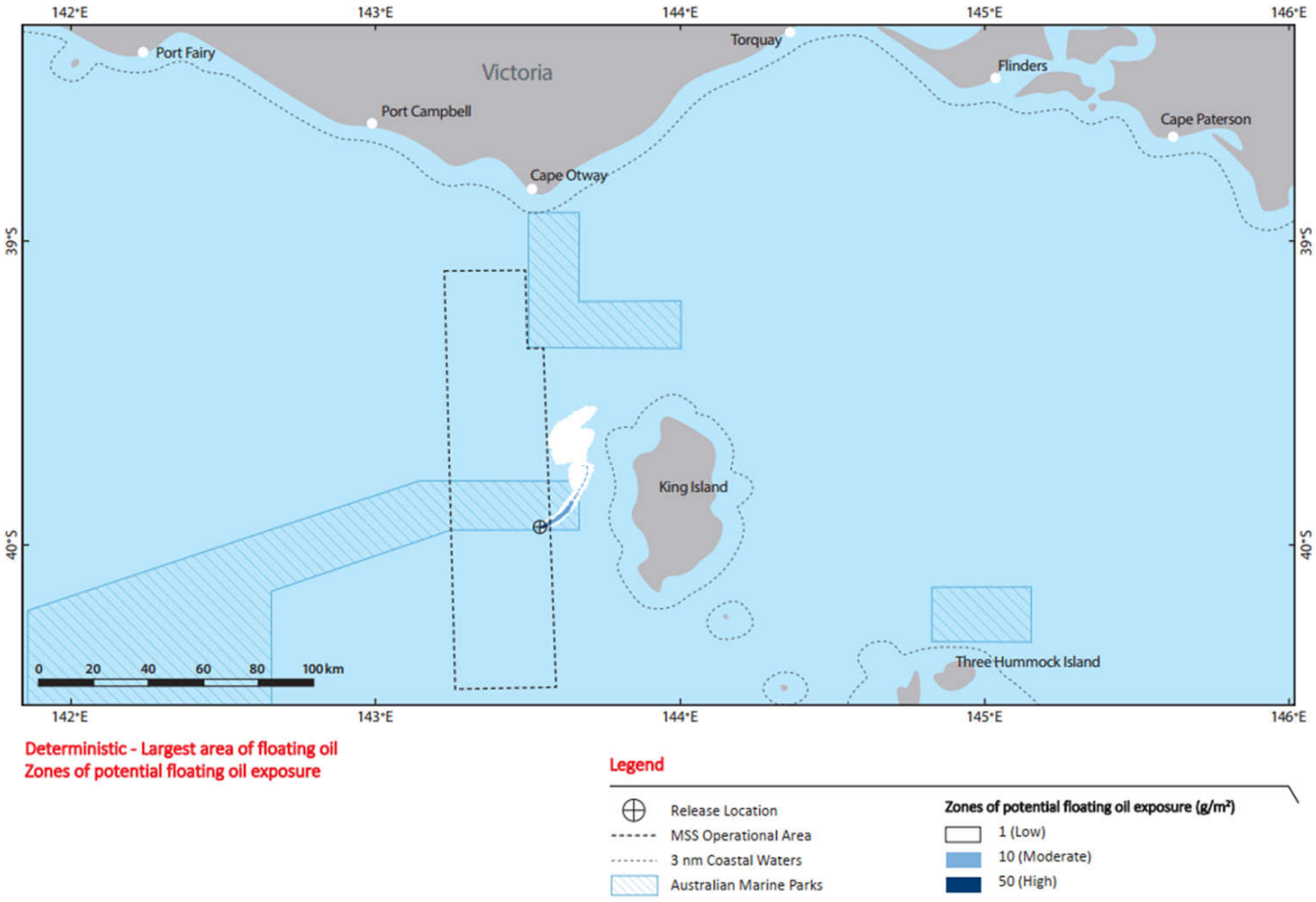
Largest Area of Floating MDO

Deterministic modelling was used to model a spill trajectory that was the largest area of low (1-10 g/m^2) surface water MDO exposure. This used the most severe weather conditions on record for the modelling period.

The map below shows the potential zone of exposure from floating MDO for the worst-case spill simulation. The low floating MDO exposure was predicted to extend a maximum of ~48 km from the release site towards the northeast. Moderate (10-50 g/m^2) and high (≥50 g/m^2) exposure MDO extended a maximum of ~26 km north and 3.3 km northeast from the release location, respectively.



Fuel Tank Comparison

How a seismic vessel fuel tank compares to other vessels in the Otway Basin.

Container Ships	Seismic Vessels	Fishing Vessels
~7 000 m^3 – 13 000 m^3	~2000 m^3	~35 m^3 – 60m^3

Did You Know?

Based on a review of the Australian Transport Safety Bureau's marine safety database there are no recorded instances of collisions, grounding or sinking of a seismic vessel or its support vessels in Australian waters in at least the last 30 years.

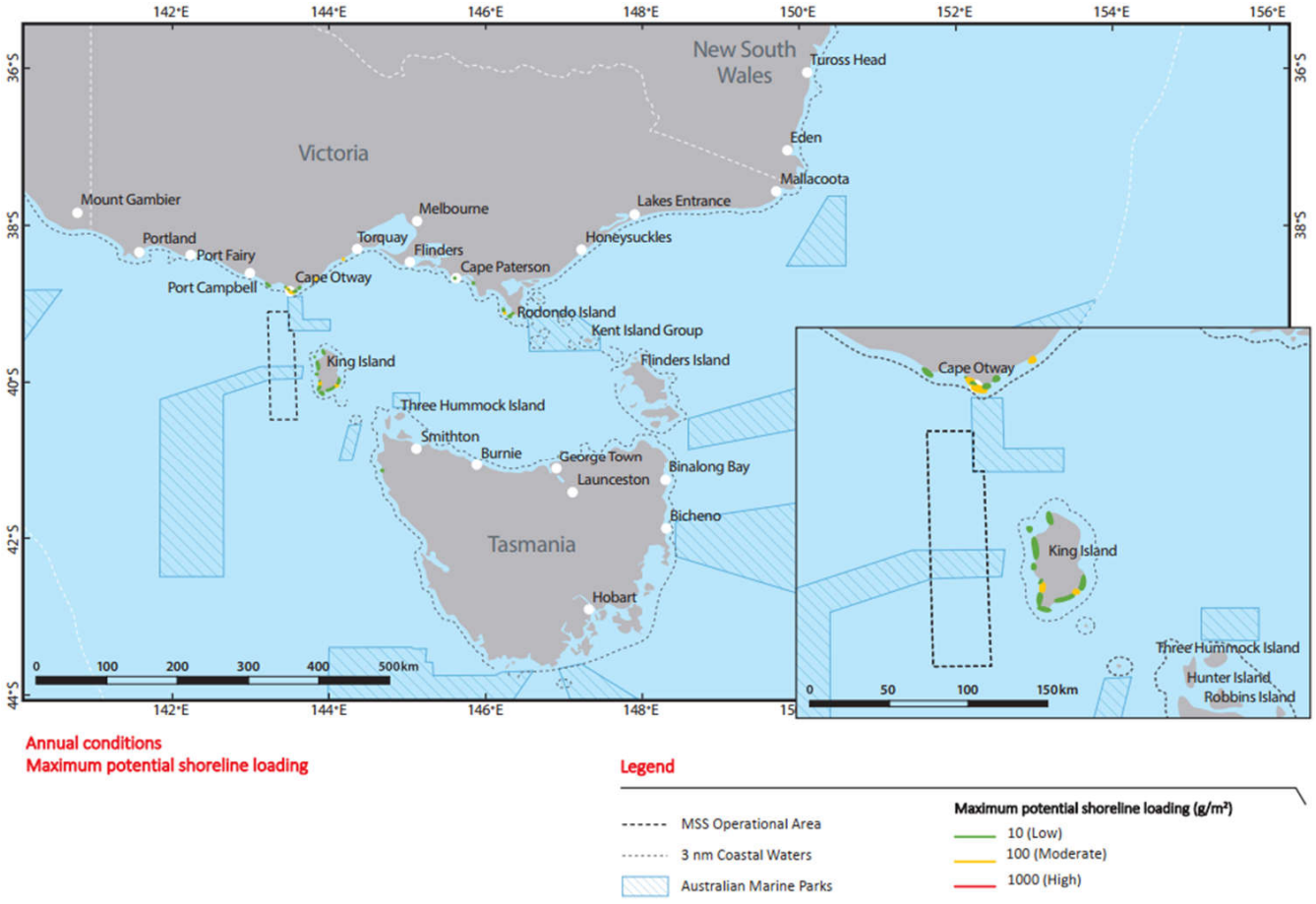
Although a seismic vessel has a fuel tank volume of ~2000 m^3 ConocoPhillips Australia has undertaken MDO spill modelling on a volume of 373 m^3 . This is because the seismic vessels have multiple, separate tanks, with externally located tanks averaging 373 m^3 .

Shoreline Exposure

Modelling found a probability of a MDO spill originating within the Sequoia 3D marine seismic operational area coming into contact to any shoreline at, or above, the low threshold (10 – 100 g/m^2) was 16 per cent. The minimum time before shoreline contact was approximately 1.67 days (40 hours) while the greatest volume of MDO ashore was predicted as 27.6m^3. Additionally, the greatest length of shoreline contacted by MDO at, or above the low thresholds was 37.5 km.

The stochastic modelling demonstrated potential MDO accumulation on the western and south-eastern coastline of King Island and isolated areas around Port Campbell, Cape Otway and Wilson Promontory. The time to contact King Island was predicted to be 50 hours and the longest length of shoreline contacted above the low threshold is predicted as 18.5 km.

The map below shows an amalgamation of 100 spill simulations under varying weather and ocean conditions. It is not representative of one single spill simulation.



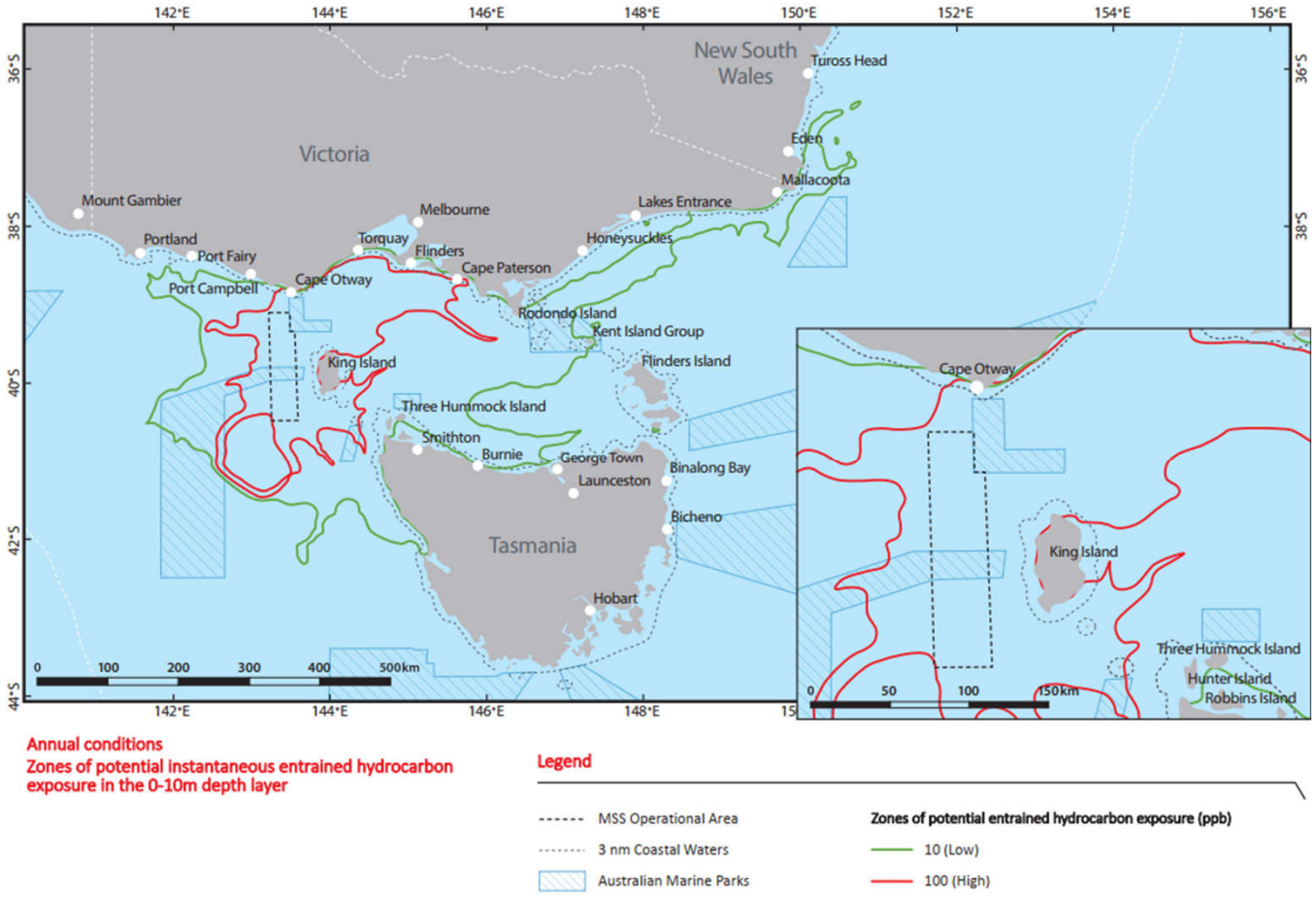
Exposure level	Threshold (g/m^2)	Description of potential impact
Low	10	Exposure at this level is unlikely to affect species but would be visible and detectable by instrumentation and may cause a range of socio-economic effects, like the temporary closure of beaches
Moderate	100*	Exposure at this level would likely result in behavioural changes such and changes in reproduction or growth in some species. Exposure at this level is unlikely to result in death, however, this may occur if MDO was ingested.
High	1 000	Exposure at this level would likely result in changes in reproduction or growth in some species and would reduce survival rates of sensitive species.

* 100 g/m^2 also used to define the threshold for an actionable shoreline MDO exposure.

In-water Exposure

Stochastic modelling demonstrated that MDO in the water column at or above the low threshold (10-100 parts per billion) could potentially travel up to a maximum distance of 742 km east-northeast from the operational area. This distance decreases to 236 km east for high exposure (≥100 parts per billion).

The map below shows an amalgamation of 100 spill simulations under varying weather and ocean conditions. It is not representative of one single spill simulation.



Exposure level	Threshold (ppb)	Description of potential impact
Low	10	Exposure at this level is unlikely to affect species but would be visible and detectable by instrumentation and may cause a range of socio-economic effects, like the temporary closure of beaches
High	100	Exposure at this level would likely result in changes in reproduction or growth in some species and would reduce survival rates of sensitive species.

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How will ConocoPhillips Australia reduce the risk of a vessel MDO spill occurring?

ConocoPhillips Australia will put in place a range of controls to avoid and minimise the risk of a MDO spill occurring as part of the Sequoia 3D marine seismic survey.

A range of controls have been identified and divided into three categories: compliance with regulation; emergency response preparedness and operations. These will be implemented to ensure the risk of a MDO spill as the result of a vessel collision is reduced to as low as reasonably practicable.

Control Category	Controls
Compliance with regulation	The survey vessel will have a current ship oil pollution emergency plan (SOPEP) in place.
	The survey vessel will hold a valid International Oil Pollution Prevention (IOPP) Certificate in accordance with vessel class requirements.
	The survey and chase vessels will maintain appropriate lighting, navigation and communication at all times to inform other users of the position and intentions of the survey vessel.
Operational Controls	The Australian Hydrographic Service (AHS) will be advised of the survey details (survey location and timing) four weeks prior to mobilisation and following demobilisation to allow for the distribution of Notice to Mariners.
	The Australian Maritime Safety Authority (AMSA) will be advised of the survey vessel's details, satellite communications details, area of operation and requested clearance distances from other vessels 24 to 48 hours before operations commence so that AusCoast warnings can be issued.
	One or more chase vessel will undertake surveillance at all times when streamers are deployed to manage interactions with other vessels transiting near the seismic vessel or streamers.
	Survey and chase vessels will only use MDO, not heavy fuel oil.
	The survey team and bridge crew will monitor the hull clearance and streamers depths at all times during seismic acquisition.
Emergency Response	There will be an approved Oil Pollution Emergency Plan (OPEP) in place prior to survey operations commencing, which will be implemented in the event of a MDO spill.
	The approved OPEP and SOPEP will be tested in a desktop exercise prior to the survey vessel commencing operations.
	The responsibilities of survey crew under the OPEP and SOPEP will be communicated to relevant personnel and included as part of survey induction.
	All relevant crew will be trained in the implementation of the OPEP and SOPEP.

Detailed Information:

Detailed information on the Sequoia 3D marine seismic vessel MDO spill modelling and controls will be available in the Environment Plan.

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