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Sequoia 3D Marine Seismic Survey Environment Plan - Appendices

Appendix 1

Assessment of activity against the objectives of marine reserves in the spill EMBA

Assessment of the Sequoia MSS against the stated management strategies and actions of the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023 (DNP, 2013)

The following information summarises the risk to the park from the modelled spill scenario, being a 373 m^3 surface release of MDO over 6 hours.

AMPs:	Apollo	Beagle	Boags	Franklin	Zeehan
Sea surface:	14% probability of low threshold exposure. 2% probability of moderate threshold exposure. 1% probability of high threshold exposure.	No contact.	No contact.	No contact.	23% probability of low threshold exposure. 14% probability of moderate threshold exposure. 14% probability of high threshold exposure.
Entrained hydrocarbons:	22% probability of low threshold exposure at 0-10 m below sea surface. 10% probability of high threshold exposure at 0-10 m below sea surface.	6% probability of low threshold exposure at 0-10 m below sea surface.	7% probability of low threshold exposure at 0-10 m below sea surface.	8% probability of low threshold exposure at 0-10 m below sea surface. 1% probability of high threshold exposure at 0-10 m below sea surface.	24% probability of low threshold exposure at 0-10 m below sea surface. 13% probability of high threshold exposure at 0-10 m below sea surface.
Dissolved hydrocarbons:	5% probability of low threshold exposure at 0-10 m below sea surface. 1% probability of moderate threshold exposure at 0-10 m below sea surface.	No contact.	No contact.	1% probability of low threshold exposure at 0-10 m below sea surface.	6% probability of low threshold exposure at 0-10 m below sea surface. 1% probability of moderate threshold exposure at 0-10 m below sea surface.
Shoreline contact:	N/A (AMPs are in Commonwealth waters)				

The table on the following page provides an assessment of routine and non-routine operations against the stated management strategies and actions of the South-east Commonwealth Marine Reserves Network Management Plan 2013-2023.

Management Strategy	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Improve knowledge and understanding of the conservation values of the Marine Reserves Network and of the pressures on those values		
As part of a national-scale program for Commonwealth marine reserves, develop and implement a South-east Commonwealth Marine Reserves Network Research and Monitoring strategy that contribute to increased understanding of the values of the reserves and provides for ongoing reporting of their condition	No impacts.	No impacts.
Develop and implement a framework for the long-term scientific monitoring of changes in key conservation values protected by the Commonwealth marine reserves and on the pressures on those values.	No impacts.	No impacts.
Adopt standards and protocols for managing biophysical and ecological data collected within Commonwealth Marine Reserves.	No impacts.	No impacts.
Collaborate, including through developing partnerships, with national research facilities, science and academic institutions and, as appropriate, marine reserve users, to deliver on strategic information needs and to inform research programs and government and industry investment in marine research.	No impacts.	No impacts.
Minimise impacts of activities through effective assessment of proposals, decision-making and management of reserve-specific issues		
Establish in consultation with relevant stakeholders, efficient, effective and transparent processes for assessment, decision-making and authorisation of activities, and implement within the marine reserves network.	No impacts.	No impacts.
When the interests of a person or group are likely to be affected by a decision under this Management Plan, the Director will: a) as far as practicable consult them in a timely and appropriate way; b) provide an opportunity to comment on the proposed decision and associated actions; c) take any comments into account; d) give reasonable notice before decisions are taken or implemented (except in cases of emergency); and e) provide reasons for decisions.	No impacts.	No impacts.
Comply with Division 14.3 of the EPBC Regulations in relation to reconsideration of decisions about permits.	No impacts.	No impacts.

Reconsider a decision about a class approval when requested by a person whose interests are affected by the decision. A request for reconsideration must be made and considered in the same manner as provided by Divison14.3 of the EPBC Regulations. Subject to the Administrative Appeals Tribunal Act 1975, a person who has requested a reconsideration may apply to the Administrative Appeals Tribunal for review of the reconsideration.	No impacts.	No impact.
Consider further use of class approvals where there is a sound case for effectively assessing and efficiently approving users that carry out a class of activities in a uniform way.	No impacts.	No impact.
Identify reserve specific issues and develop, implement and evaluate management responses where appropriate.	No impacts.	No impact.
Protect the conservation values of the Marine Reserves Network through management of environmental incidents		
Establish systems for timely reporting of, and assisting with responses to, environmental incidents.	No impacts.	No impacts.
Collaborate with responsible agencies and assist with responding to environmental incidents that threaten the values of the marine reserves network.	No impacts.	The OPEP takes into account risks to the open ocean and prioritises actions to reduce the spread and extent of oil on the sea surface.
Maintain effective liaison and partnerships with relevant environmental incident response agencies and organisations.	No impacts.	No impact.
Identify and assess potential incidents that may threaten conservation values of the Reserves and implement if feasible approaches to reduce the likelihood or consequence of such incidents.	No impacts.	No impact.
Facilitate compliance with this Management Plan through education and enforcement		
Implement reliable methods for monitoring compliance with this Plan.	No impacts.	No impact.
Develop, maintain and disseminate appropriate information to assist users of the marine reserves network to comply with the provisions of this Plan.	No impacts.	No impact.
Consult with users of the network to identify opportunities to improve the effectiveness and efficiency of compliance measures.	No impacts.	No impact.
Implement a risk-based annual compliance plan.	No impacts.	No impact.

Establish a reporting system that supports users and visitors of the marine reserves network to report suspected non-compliant activity.	No impacts.	No impact.
Build effective working partnerships and agreements with Commonwealth and state government agencies for the delivery of compliance services.	No impacts.	No impact.
Investigate and monitor suspected non-compliant activity and, where appropriate, take enforcement action.	No impacts.	No impact.
Support initiatives and programs which promote best practice standards that guide use, and minimise impacts on the marine environment	No impacts.	No impact.
Promote community understanding of, and stakeholder participation in, the management of the Marine Reserves Network		
Develop and implement a communication and education plan that increases community understanding of the importance of the marine reserves network and meets reserve-specific needs for communication about the values protected and management arrangements and requirements.	No impacts.	No impact.
Maintain effective working relationships with user groups to facilitate the exchange of knowledge, understanding and participation in the management of the marine reserves network.	No impacts.	No impact.
Within the first 12 months of the Plan's operation, establish consultative structures (e.g. committees) to guide and participate in the management of the marine reserves network.	No impacts.	No impact.
Support involvement of Indigenous people in management of Commonwealth Marine Reserves		
Drawing on the significant body of knowledge built as part of sea country planning and similar initiatives across Australia, and in consultation with relevant representative organisations, consolidate and communicate information about cultural values protected in the South-east Commonwealth Marine Reserves Network.	No impacts.	No impact.
Identify, and where feasible support, opportunities for Indigenous people to engage in the management of sea country in Commonwealth marine reserves, for example through the delivery of critical management services, such as monitoring surveillance, compliance and research.	No impacts.	No impact.
Build effective partnerships with Indigenous communities and organisations that have an interest in the marine reserves network.	No impacts.	No impact.
Comply with the requirements of the Native Title Act 1993.	No impacts.	No impact.

Evaluate and report on the effectiveness of this Management Plan through monitoring and review		
Within the first twelve months of the Plan's operation, design and initiate a program to measure and monitor progress on Actions and outcomes.	No impacts.	No impact.
Report annually on the South-east Commonwealth Marine Reserves Network in the Director of National Parks annual report.	No impacts.	No impact.
Evaluate and report on the implementation of the Management Plan before its expiry. The report will consider: a. An assessment of the existing measures to protect the South-east Commonwealth Marine Reserves Network; b. Progress of the strategies and actions towards achieving the stated outcomes; c. options for improving management of the marine reserves network.	No impacts.	No impact.

The table on the following page provides an assessment of the Sequoia MSS routine and non-routine operations against the IUCN objectives outlined in the Australian IUCN Reserve Management Principles for Commonwealth Marine Protected Areas (Environment Australia, 2002).

Zonation of each CMR based on IUCN categories

	IUCN Ia	IUCN Ib	IUCN II	IUCN III	IUCN IV	IUCN V	IUCN VI
Zeehan	-	-	-	-	-	-	
Apollo	-	-	-	-	-	-	
Boags	-	-	-	-	-	-	
Franklin	-	-	-	-	-	-	
Beagle	-	-	-	-	-	-	
East Gippsland	-	-	-	-	-	-	

Note: Only Category IUCN VI AMPs are relevant to the Sequoia MSS. As such, only the Category IUCN VI management principles are assessed.

Category	IUCN 1994 category description	IUCN 1994 primary objective	Australian IUCN reserve management principles (Schedule 8 of the EPBC Regulations 2000)	Predicted consequences from routine activities or a worst-case hydrocarbon spill
IUCN VI *Managed Resource Protected Area*: Protected Area managed mainly for the sustainable use of natural ecosystems	Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.	To protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.	The reserve or zone should be managed mainly for the sustainable use of natural ecosystems based on the following principles: The biological diversity and other natural values of the reserve or zone should be protected and maintained in the long term.	Routine discharges from the survey vessel and support vessels do not impact on the AMPs. The AMPs may only be impacted in the event of a Level 3 hydrocarbon spill. Response strategies outlined in the OPEP aim to protect the AMPs from the impacts of hydrocarbons. An assessment of the risk of a hydrocarbon spill on sensitivities in the region is presented in the EP.
			Management practices should be applied to ensure ecologically sustainable use of the reserve or zone.	Routine and non-routines discharges from the survey vessel and support vessels will not impact on the management practices of the AMPs.
			Management of the reserve or zone should contribute to regional and national development to the extent that this is consistent with these principles.	Routine and non-routines discharges from the survey vessel and support vessels will have no influence on management of the zones within the CMRs.

Assessment of the Sequoia MSS against the stated management actions of National Light Pollution Guidelines (DoEE, 2020)

The table on the following pages provide an assessment of the Sequoia MSS against the stated management actions of the Guidelines.

Note: impacts to turtles are not assessed because there are only vagrant individuals and no nesting beaches present in the Otway region. Similarly, impacts to shorebirds are not assessed given that nearest part of the survey area is located over 20 km from the shoreline.

Management Actions	Achievable?	Assessment of the Sequoia MSS against stated management actions
Implement management actions during the breeding season.		
Maintain a dark zone between the rookery and the light sources.	Yes	The nearest bird rookery location is 22 km away on King Island. As such, there is a large dark zone between the rookery and the survey area.
Turn off lights during fledgling season.	N/A	MSS operations are conducted 24-hours a day and light is necessary for personnel safety. Most seabirds in the region are migratory with breeding occurring internationally, so fledglings are not an important consideration in this area.
Use curfews to manage lighting.	N/A	MSS operations are conducted 24-hours a day and deck lighting is necessary for personnel safety. Lighting maintained in accordance with legislation and for human safety overrides environmental considerations.
Aim lights downwards and direct them away from nesting areas.	Yes	Where practicable, lights will be directed towards working areas for the safety of personnel. The nearest rookery location is 22 km away on King Island.
Use flashing/intermittent lights instead of fixed beam.	No	MSS operations are conducted 24-hours a day and deck lighting is necessary for personnel safety. Vessel lighting is installed and maintained in accordance with the *Navigation Act* 2012. Lighting for human safety overrides environmental considerations.
Use motion sensors to turn lights on only when needed.	No	MSS operations are conducted 24-hours a day and lighting of all areas is necessary for personnel safety. Lighting for human safety overrides environmental considerations.
Prevent indoor lighting reaching outdoor environment.	Yes	Blinds will be lowered on portholes and windows at night where this does not interfere with safe work practices.

Manage artificial light on jetties, wharves, marinas, etc.	N/A	Not relevant.
Reduce unnecessary outdoor, deck lighting on all vessels and permanent and floating oil and gas installations in known seabird foraging areas at sea.	No	MSS operations are conducted 24-hours a day and deck lighting is necessary for personnel safety. Lighting for human safety overrides environmental considerations.
Night fishing should only occur with minimum deck lighting.	N/A	Not applicable - fishing is not permitted from the platform.
Avoid shining light directly onto fishing gear in the water.	N/A	Not applicable - fishing is not permitted from the platform.
Ensure lighting enables recording of any incidental catch, including by electronic monitoring systems.	N/A	Not applicable - fishing is not permitted from the platform.
Avoid shining light directly onto longlines and/or illuminating baits in the water.	N/A	Not applicable - fishing is not permitted from the platform.
Vessels working in seabird foraging areas during breeding season should implement a seabird management plan to prevent seabird landings on the ship, manage birds appropriately and report the interaction.	N/A	The survey and support vessels are equipped with lighting required under legislation to identify itself to other vessels, reduce the risk of at-sea collision and provide for the safety of its crew. Most seabirds in the region are migratory with breeding occurring internationally, with no breeding areas (i.e., islands) within 20 km of the survey area.
Use luminaires with spectral content appropriate for the species present.	No	The survey and support vessels are equipped with lighting required under legislation to identify itself to other vessels, reduce the risk of at-sea collision and provide for the safety of its crew. Most seabirds in the region are migratory with breeding occurring internationally, with no breeding areas (i.e., islands) within 20 km of the survey area.
Avoid high intensity light of any colour.	No	
Shield gas flares and locate inland and away from seabird rookeries.	N/A	Not applicable – no flaring undertaken during this activity.
Minimise flaring on offshore oil and gas production facilities.	N/A	Not applicable – no flaring undertaken during this activity.

In facilities requiring intermittent night-time inspections, turn on lights only during the time operators are moving around the facility.	N/A	The survey and support vessels are equipped with lighting required under legislation to identify itself to other vessels, reduce the risk of at-sea collision and provide for the safety of its crew.
Ensure industrial site/plant operators use head torches.	No	MSS operations are conducted 24-hours a day and lighting of all areas is necessary for personnel safety. As such, the use of head torches is not necessary.
Supplement facility perimeter security lighting with computer monitored infrared detection systems.	N/A	Not applicable, the survey area is located 22 km from the nearest shore and does not feature perimeter security lighting.
Tourism operations around seabird colonies should manage torch usage so birds are not disturbed.	N/A	Not applicable.
Design and implement a rescue program for grounded birds.	No	Due to the distance between the survey area and seabird rookeries, grounding of birds is unlikely to occur and thus a rescue program is not necessary.

Assessment of the Sequoia MSS against the stated aims of the Great Otway National Park Management Plan (Parks Victoria, 2007)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours.	
Sea surface:	2% probability of low threshold exposure at the sea surface.
Dissolved hydrocarbons:	3% probability of low threshold and 3% probability of moderate threshold exposure to dissolved hydrocarbons 0-10 m below sea surface.
Entrained hydrocarbons:	9% probability of low threshold and 1% probability of high threshold exposure to entrained hydrocarbons 0-10 m below sea surface.
Shoreline contact:	3% probability of low threshold and 3% probability of moderate threshold exposure to shoreline loading.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Climate change and resilience planning		
Increase park manager and community understanding of climate change, its consequences and resilience planning.	No impacts.	No impacts.
Develop and implement management strategies to build ecosystem and species resilience to climate change.	No impacts.	No impacts.
4.2 Landscape		
Protect, enhance and restore landscape values in the parks and minimise impacts of management or visitor activities on landscape values.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Encourage neighbouring developments and activities to have minimal adverse impact on landscape values.	No impacts.	No impacts.
4.3 Geological and geomorphological features		
Protect significant and fragile geological and geomorphological values.	No impacts.	No impacts.
4.4 Rivers, catchments, groundwater and coasts		
Protect, enhance and restore natural, social and resource values associated with rivers, catchments, groundwater and coasts.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve the condition of high-value streams that are not in good condition.	No impacts.	No impacts.
4.5 Vegetation		
Protect, enhance and restore indigenous flora species and communities.	No impacts.	No impacts.

Where possible, allow natural processes that shape floral biodiversity to continue with minimal interference.	No impacts.	No impacts.
Increase knowledge of flora species and communities, and threatening processes to improve management effectiveness.	No impacts.	No impacts.
4.6 Fauna		
Protect indigenous fauna and habitats from threatening processes where possible.	No impacts.	No impacts.
Where possible, allow natural processes that shape faunal biodiversity to continue with minimal interference.	No impacts.	No impacts.
Increase knowledge of fauna and threatening processes to improve management effectiveness.	No impacts.	No impacts.
4.7 Fire Management		
Protect human life, property and public assets as far as practicable from the deleterious consequences of wildlife.	No impacts.	No impacts.
Investigate, evaluate and where appropriate implement fire regimes and strategies to reduce the potential for the development of landscape scale fires and also maintain the environmental integrity of the landscape.	No impacts.	No impacts.
In partnership with other agencies and the community, undertake effective fire prevention, preparedness, response and recovery activities.	No impacts.	No impacts.
4.8 Pest Plants and Animals, and Diseases		
Eradicate or prevent the establishment of new or emerging pest plants, animals and diseases.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Control and where possible eradicate pest plants, animals and diseases from the parks, giving priority to areas with priority species and communities or areas in good condition.	No impacts.	No impacts.
Improve the effectiveness of pest and disease management by increasing the knowledge of pest species and treatment methods through research, record-keeping and monitoring.	No impacts.	No impacts.

5.1 Aboriginal and cultural heritage		
Recognise and respect the cultural connections that Traditional Owners and other Aboriginal people have with Country within the parks.	No impacts.	No impacts.
Provide and maintain opportunities for Aboriginal cultural connections and practices within the parks.	No impacts.	No impacts.
Work together with the Traditional Owners to protect and enhance Aboriginal cultural heritage.	No impacts.	No impacts.
5.2 Historic heritage		
Protect, conserve and present places with significant historic (non-indigenous) cultural heritage values in accordance with applicable legislation, strategies and charters.	No impacts.	No impacts.
Increase visitor and local community involvement, understanding and appreciation of Otway historic heritage, including sustainable provision of access, presentation, interpretation and promotion of selected sites.	No impacts.	No impacts.
5.3 Social values		
Understand the social values of the parks, and enhance and protect places, landscapes, features and character that contribute to social values.	No impacts.	No impacts.
6.1 Tourism and recreation directions		
Provide and enhance a sustainable range of tourism and recreation opportunities and products within the parks. Contribute to the region's tourism and recreation opportunities and profile.	No impacts.	No impacts.
Provide high quality, memorable, authentic and educational experiences for visitors that capitalise on the Otways unique attributes, to generate an understanding and appreciation of park values, and meet or exceed visitor expectations.	No impacts.	No impacts.
Increase opportunities for participation of commercial and community partners in the provision of tourism and recreation experiences, particularly the Aboriginal community.	No impacts.	No impacts.
Ensure that tourism and recreation activities and infrastructure are conducted and managed in a way that respects natural settings, conservation requirements, and cultural sensitivities.	No impacts.	No impacts.

6.2 Information, interpretation and education		
Promote and encourage visitors' safe and sustainable discovery, enjoyment, understanding and appreciation of the parks natural and cultural values.	No impacts.	No impacts.
6.3 Motor vehicle access		
Provide and maintain a sustainable network of roads for a variety of uses, including general access for recreation, tourism and transit, and access for park management activities, fire suppression and authorised resource extraction.	No impacts.	No impacts.
Provide opportunities for people to enjoy car and motorcycle touring, four-wheel driving and trail bike riding experiences within the parks, where this is sustainable and compatible with the protection of other park values.	No impacts.	No impacts.
Minimise impacts of the road network on natural, cultural and resource values of the parks.	No impacts.	No impacts.
Encourage responsible vehicle use to minimise damage to the road network and the environment, and minimise conflict between park users and with neighbours.	No impacts.	No impacts.
6.4 Visitor sites and services		
Provide a system of designated visitor sites and services for sustainable recreation, education and enjoyment of experiences in the parks, and as nodes for access to park features and recreation areas.	No impacts.	No impacts.
Minimise conflicts between parks users and impact on park values from visitor facilities.	No impacts.	No impacts.
6.5 Bushwalking		
Provide opportunities for visitors (including disabled and low mobility visitors) to enjoy a diverse range of bushwalking experiences in the parks by accessing a sustainable network of walking tracks of various lengths, standards, and degrees of challenge.	No impacts.	No impacts.
Minimise impacts of the track network and bushwalking activities on park values and on other park users, and minimise excessive safety risks. Encourage responsible bushwalking behaviour.	No impacts.	No impacts.

6.6 Camping		
Provide a sustainable range of opportunities for people to enjoy camping experiences in the parks, and utilise camping areas as a base for recreation activities.	No impacts.	No impacts.
Minimise impacts on park values and conflicts between park users from camping.	No impacts.	No impacts.
6.7 Cycling		
Provide opportunities for people to enjoy cycling experiences in the parks, including mountain biking and bicycle touring, where this is sustainable and compatible with the protection of other park values.	No impacts.	No impacts.
Minimise conflicts with other park users and impacts on park values from cycling activities.	No impacts.	No impacts.
6.8 Companion dogs		
Provide opportunities for people to enjoy experiences with dogs in the parks where this is sustainable and compatible with the protection of other park values.	No impacts.	No impacts.
Minimise impacts on park values and conflicts with other park users from dogs.	No impacts.	No impacts.
6.9 Horse riding		
Provide opportunities for enjoyable and diverse nature-based horse riding experiences in the parks, including trail riding and camping with horses, where this is sustainable and compatible with the protection of other park values.	No impacts.	No impacts.
Minimise impacts on park values and conflicts with other park users from horse riding activities.	No impacts.	No impacts.
6.10 Recreational fishing		
Provide high quality opportunities for recreational fishing in and adjacent to the parks, where this is sustainable and compatible with the protection of park values.	No impacts.	No impacts.
Maintain recreational fishing access while protecting environmental and cultural values.	No impacts.	No impacts.

Minimise conflicts with other park users and impacts on park values from fishing.	No impacts.	No impacts.
6.11 Recreational hunting		
Provide opportunities for enjoyable recreational hunting experiences in Otway Forest Park, where compatible with the protection of other park values and visitor safety.	No impacts.	No impacts.
Minimise conflicts with other parks users and impacts on park values from recreational hunting.	No impacts.	No impacts.
6.12 Fossicking and prospecting		
Provide opportunities for gemstone fossicking at Wreck Beach in Great Otway National Park, and fossicking and prospecting in all areas of Otway Forest Park.	No impacts.	No impacts.
6.13 Boating and other water sports		
Provide opportunities for enjoyable water sports including boating, swimming and surfing in and adjacent to the parks, where this is sustainable and compatible with the protection of park values.	No impacts.	No impacts.
Minimise conflicts with other park users and impacts on park values from boating, swimming and other water sports.	No impacts.	No impacts.
6.14 Recreational aircraft		
Permit opportunities for hang-gliding and paragliding activities in the parks, where this is sustainable and compatible with the protection of park values and does not significantly impact on the enjoyment of other park visitors.	No impacts.	No impacts.
Provide appropriate access by powered aircraft for scenic over-flights of the parks, where this is sustainable and compatible with the protection of park values and does not significantly impact on the enjoyment of other park visitors.	No impacts.	No impacts.
Minimise conflicts with other park users and impacts on park values from air sports and aircraft.	No impacts.	No impacts.
6.15 Events and commercial activities		

Allow and manage appropriate events and functions and minimise impacts on park values.	No impacts.	No impacts.
Provide for appropriate commercial businesses to operate within the parks.	No impacts.	No impacts.
Ensure commercial operators are licensed to conduct their business within the parks.	No impacts.	No impacts.
6.16 Public safety		
Promote awareness of recreation risks, responsibility for considering risks, and adherence to safe practices to park users.	No impacts.	No impacts.
Identify public safety risks and implement risk management strategies.	No impacts.	No impacts.
Plan for and respond appropriately to public safety incidents and emergencies.	No impacts.	No impacts.
7.1 Firewood harvesting		
Allow firewood harvesting for commercial and personal use from the Otway Forest Park in accordance with relevant legislation, codes of practice, procedures and prescriptions.	No impacts.	No impacts.
Minimise the impacts of harvesting firewood on the natural, cultural and recreational values of the Otway Forest Park.	No impacts.	No impacts.
7.2 Minor forest produce harvesting		
Allow minor forest produce harvesting in Otway Forest Park in alignment with relevant legislation, codes of practice, procedures and prescriptions.	No impacts.	No impacts.
Minimise the impacts of minor forest produce harvesting on the natural, cultural and recreational values of Otway Forest Park.	No impacts.	No impacts.
8.1 Public utilities infrastructure		
Manage authorised public utilities infrastructure within the parks through formal consents, leases, licences, permits and agreements in accordance with relevant legislation, and to minimise impacts on park values.	No impacts.	No impacts.

8.2 Private occupancies		
Manage authorised occupancies to allow for specified uses while minimising their impacts on park values.	No impacts.	No impacts.
Resolve unauthorised occupancies by removal or authorisation.	No impacts.	No impacts.
8.3 Cape Otway Lightstation		
Provide for the ongoing commercial operation of the Cape Otway Lightstation Tourist and Heritage precinct.	No impacts.	No impacts.
Provide for the ongoing operation of marine navigation and weather recording instruments.	No impacts.	No impacts.
8.4 Designated and Special Water Supply Catchment Areas		
Minimise impacts on water quality and yield in water supply catchment areas from fire, recreation, extraction and management activities.	No impacts.	No impacts.
Manage Designated Water Supply Catchments as closed catchments.	No impacts.	No impacts.
Protect the public health of communities that depend on water supply catchments, through minimising threats to water quality and yield within water supply catchment areas.	No impacts.	No impacts.
8.5 Grazing		
Permit low-intensity grazing in cleared areas of Otway Forest Park where it is pre-existing and consistent with conservation and recreation objectives.	No impacts.	No impacts.
Phase out grazing in Great Otway National Park.	No impacts.	No impacts.
8.6 Apiculture		

Provide for apiculture in Otway Forest Park while minimising impacts on other park values.	No impacts.	No impacts.
Do not allow apiculture in Great Otway National Park.	No impacts.	No impacts.
8.7 Commercial fishing		
Provide for existing commercial eel fishing entitlements in Great Otway National Park.	No impacts.	No impacts.
8.8 Earth resources		
Ensure that earth resources activities are conducted in accordance with the relevant legislation and that park values are adequately protected.	No impacts.	No impacts.
8.9 Occasional uses		
Allow authorised occasional uses and minimise their impacts on park values.	No impacts.	No impacts.
8.10 Park boundaries and adjacent uses		
Coordinate management activities with those of park neighbours where these are complementary to the protection of park values.	No impacts.	No impacts.
Work with park neighbours to address issues of pest plant and animal control.	No impacts.	No impacts.
Provide access through the parks to neighbouring properties for authorized uses such as timber carting where that access does not impact on park values.	No impacts.	No impacts.
Provide reasonable rights of access to freehold land abutting or surrounded by the Great Otway National Park and minimise the impacts on park values.	No impacts.	No impacts.
9.1 Community awareness		
Increase the community's awareness and understanding of the parks' values and management activities.	No impacts.	No impacts.

9.2 Traditional Owner partnerships		
Build collaborative relationships to engage Traditional Owners in the parks' planning and management.	No impacts.	No impacts.
Improve opportunities for Aboriginal participation in the parks' management.	No impacts.	No impacts.
9.3 Community participation		
Build a sense of shared ownership and custodianship for the parks among community groups and individuals.	No impacts.	No impacts.
Support and encourage people to actively assist in implementing the plan and managing the parks.	No impacts.	No impacts.
9.4 Agency partnerships		
Enhance park management by collaborating with other agencies to ensure they consider park values in planning and implementing activities that relate to the parks.	No impacts.	No impacts.
Contribute to cooperative programs and activities undertaken by other agencies where these complement management of the parks.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Marengo Reefs Marine Sanctuary Management Plan (Parks Victoria, 2007)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6hours.	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	5% probability of low threshold exposure.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and landform features		
Protect significant and fragile geological and seabed features in the park and sanctuaries.	No impacts.	No impacts.
4.2 Catchment and water quality		
Prevent where practicable, and minimise the impact of pollution and litter on sanctuary values.	The EP contains control measures aimed to minimise the risk of pollution and litter to Victorian waters.	No impacts.
4.3 Hydrodynamics		
Minimise impacts on sanctuary values from human-induced changes to local hydrodynamics.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, and allow natural processes to continue.	No impacts.	The OPEP takes into accounts risks to the open ocean and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve knowledge of marine ecological communities, flora and fauna and threatening processes to improve management, protection and appreciation.	No impacts.	No impacts.
4.5 Landscape and seascape		
Protect landscape and seascape values.	No impacts.	The OPEP takes into accounts risks to the open ocean and prioritises actions to reduce the spread and extent of hydrocarbons.

Minimise the visual impact of signs, infrastructure and management activities associated with the sanctuary.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the sanctuary.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the planning area in support of Victorian marine pest management arrangements.		No impacts.
Implement national or Victoria-wide control arrangements as they relate to the sanctuary.		No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous places and objects from interference or damaging activities.	No impacts.	No impacts.
Support the views of the Traditional Owners in managing the sanctuary.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve and protect places of historical significance.	No impacts.	No impacts.
Encourage learning and understanding about the historical heritage of the sanctuary.		
6.1 Information, interpretation and education		
Promote and encourage visitors' discovery, enjoyment and appreciation of the park and sanctuaries' natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for marine national parks and marine sanctuaries and management practices.	No impacts.	No impacts.
6.2 Access		
Support and manage the provision of appropriate and safe access to the sanctuary.	No impacts.	No impacts.
6.3 Recreational boating and surface water sports		
Provide for boating activities in the sanctuary consistent with management objectives.	No impacts.	No impacts.
6.4 Diving and snorkelling		

Provide opportunities for diving and snorkelling that are consistent with the protection of sanctuary values.	No impacts.	No impacts.
6.5 Tourism services		
Provide opportunities for and encourage provision of external tourism services while minimising impacts on natural and cultural values of the sanctuary.	No impacts.	No impacts.
6.6 Public safety		
Promote awareness of safety issues and risks, and safe practices, in use of the sanctuary.	No impacts.	No impacts.
Cooperate with emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Minimise the impact on sanctuary values of authorised uses.	No impacts.	No impacts.
Manage authorised uses in accordance with legislation.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Effectively communicate the location of the sanctuary boundaries.	No impacts.	No impacts.
Minimise impact on sanctuary values from adjacent developments.	No impacts.	No impacts.
8.1 Community awareness		
Increase community awareness and understanding of the sanctuary’s values and management activities.	No impacts.	No impacts.
Build a common vision and sense of shared custodianship for the sanctuary in community groups and individuals.	No impacts.	No impacts.
8.2 Community participation		
Support and encourage the whole community, including community groups and volunteers to contribute their knowledge, skills and enthusiasm to the sanctuary’s management.	No impacts.	No impacts.

Inform and strengthen management with cultural lore of the Traditional owners.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance sanctuary management by collaborating with other agencies to ensure appropriate consideration to sanctuary values in planning and implementing activities that relate to the sanctuary.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Mornington Peninsula National Park Management Plan (Parks Victoria, 1998)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	4% probability of low threshold exposure 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
3.1 Geological and landform features		
Minimise impacts from visitors on sensitive geological features.	No impacts.	No impacts.
Protect significant dune systems	No impacts.	No impacts.
Provide opportunities for appropriate research, appreciation and education of geological and geomorphological sites and processes.	No impacts.	No impacts.
Allow natural environmental processes to continue with minimum disturbance.	No impacts.	No impacts.
Protect significant historical sites and structures from coastal erosion.	No impacts.	No impacts.
3.2 Vegetation		
Conserve native plant communities in their natural condition and maintain and enhance habitat diversity while allowing natural environmental processes to continue	No impacts.	No impacts.
Improve knowledge of flora in the Park and associated management requirements.	No impacts.	No impacts.
Provide special protection for significant plant species and communities.	No impacts.	No impacts.
3.3 Fauna		
Conserve native fauna species and maintain the integrity of their habitats.	No impacts.	No impacts.
Provide special protection for significant fauna.	No impacts.	No impacts.
Protect genetic diversity of native populations and maintain habitat diversity.	No impacts.	No impacts.
3.4 Landscape		
Protect and preserve the landscape values of the Park in areas of scenic quality and viewer interest, especially along the coastal section.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.

3.5 Cultural Heritage		
Protect all Aboriginal archaeological sites.	No impacts.	No impacts.
Interpret the Aboriginal cultural heritage values of the Park.	No impacts.	No impacts.
Conserve significant features and landscapes of historic and cultural significance.	No impacts.	No impacts.
Interpret the cultural values of the Park, especially at Point Nepean, assisting visitors to gain an understanding and appreciation of past activities in the Park	No impacts.	No impacts.
4.1 Fire Management		
Protect human life, property and park values from injury by fire.	No impacts.	No impacts.
Improve knowledge of the ecological effects of lack of fire on coastal vegetation.	No impacts.	No impacts.
Maintain fire regimes appropriate to the conservation of native flora and fauna.	No impacts.	No impacts.
Minimise the adverse effects of all fires and fire suppression methods on park values.	No impacts.	No impacts.
4.2 Pest plants and animals, and diseases		
Control, and where possible eradicate, pest plants and animals in the Park.	No impacts.	No impacts.
Protect the Park from other threats and diseases, in particular Cinnamon Fungus and new infestations of non-indigenous species.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Minimise the impact of control programs on native flora and fauna.	No impacts.	No impacts.
4.3 Soil conservation		
Prevent and control soil erosion and dune destabilisation from visitor and management activities and adjoining activities.	No impacts.	No impacts.
5.1 Park visitors		
Provide a wider choice of quality visitor opportunities and experiences.	No impacts.	No impacts.

Develop a more detailed understanding of current and potential visitors	No impacts.	No impacts.
Provide for visitors in accordance with the above overview of future management for visitors.	No impacts.	No impacts.
Provide a hierarchy of orientation, interpretation and visitor support facilities across the Park.	No impacts.	No impacts.
Ensure that visitor use has minimal impact on the Park and park values.	No impacts.	No impacts.
Increase awareness of the Park and experiences available to visitors, by creating distinctively imaged precincts and opportunities within the Park.	No impacts.	No impacts.
5.2 Marketing		
Ensure that the Park is marketed as one of Victoria's icon parks.	No impacts.	No impacts.
Market the Park as a 'standalone attraction' and in conjunction with other related natural and cultural attractions.	No impacts.	No impacts.
Target international, interstate and other appropriate market segments in marketing and promotion of the Park.	No impacts.	No impacts.
5.3.1 Visitor orientation		
Provide motivational and tour planning information to visitors before they undertake their visit to the Park.	No impacts.	No impacts.
Orientate the independent car-based traveller to the Park in relation to Park features	No impacts.	No impacts.
Inform visitors of appropriate codes of behaviour before and during their visit and provide key safety messages	No impacts.	No impacts.
5.3.2 Interpretation and education		
Enhance visitor understanding and enjoyment of the Park through the provision of interpretative information.	No impacts.	No impacts.
5.4.1 Day use areas		
Upgrade and maintain day visitor facilities that enhance visitor enjoyment and are consistent with protecting park values.	No impacts.	No impacts.
Provide and maintain facilities suitable for persons with limited mobility.	No impacts.	No impacts.

5.4.2 Major attractions		
Develop the Cape Schanck precinct as a key destination providing quality facilities and services compatible with the area's high natural and cultural values.	No impacts.	No impacts.
5.4.3 Vehicle access		
Provide and maintain an appropriate network of sign-posted roads, tracks and car parking facilities for visitor use and management purposes.	No impacts.	No impacts.
Minimise the impacts of vehicles on the Park's values.	No impacts.	No impacts.
5.4.4 Walking		
Maintain and improve the existing walking track system to provide a range of walking opportunities while protecting park values.	No impacts.	No impacts.
Increase use and enjoyment of the track system	No impacts.	No impacts.
5.4.5 Camping		
Protect Park resources and ensure visitor safety.	No impacts.	No impacts.
Provide for basic walk-in camping	No impacts.	No impacts.
5.4.6 Beach-going, surfing and fishing		
Provide for a range of beach-related and water-based activities while protecting park values.	No impacts.	No impacts.
Ensure that visitors are aware of major hazards along the coast.	No impacts.	No impacts.
5.4.7 Horse riding		
Provide opportunities for both commercial and recreational horse riders without compromising other Park management objectives.	No impacts.	No impacts.
Minimise any environmental impacts caused by horse riding.	No impacts.	No impacts.
5.4.8 Cycling		

Provide cycling access to the Park and improve opportunities for on-road cycling at Point Nepean.	No impacts.	No impacts.
5.4.9 Hang gliding and paragliding		
Provide for hang gliding and paragliding consistent with management objectives.	No impacts.	No impacts.
5.4.10 Fossicking		
Protect park values from damage by fossicking	No impacts.	No impacts.
5.4.11 Dogs		
Minimise the impacts of dogs on park values and visitor experiences	No impacts.	No impacts.
5.5 Commercial tourism operations		
Encourage commercial nature and culture-based tourism services consistent with park management objectives.	No impacts.	No impacts.
Complement other tourism opportunities and activities on the Peninsula	No impacts.	No impacts.
5.6 Public safety		
Warn visitors about the Park's risks.	No impacts.	No impacts.
Promote and encourage safe practices among staff and visitors to the Park	No impacts.	No impacts.
Minimise exposure of visitors to the Park's coastal hazards.	No impacts.	No impacts.
Comply with Parks Victoria guidelines on risk management	No impacts.	No impacts.

6.1 Friends and volunteers		
Encourage and maintain volunteer involvement in managing the Park.	No impacts.	No impacts.
6.2 Community awareness and Park neighbours		
Increase community awareness of management activities undertaken in the Park.	No impacts.	No impacts.
Create a positive image of the Park.	No impacts.	No impacts.
Encourage conservation and sound land management and recreation practices on private land adjoining the Park.	No impacts.	No impacts.
6.3 Schools and other education		
Ensure that the Park's unique attributes and opportunities for education are incorporated in the state-wide schools curriculum program.	No impacts.	No impacts.
Promote the Park as a venue for school visits.	No impacts.	No impacts.
Provide appropriate resource materials to support the schools program and other educators.	No impacts.	No impacts.
7.1.1 Public utilities and occupancies		
Provide for the appropriate continuing use of existing public utilities and occupancies in the Park.	No impacts.	No impacts.
Minimise the impacts of the construction, maintenance and operation of utility installations on the Park.	No impacts.	No impacts.
7.1.2 Apiculture		
Minimise the potential effect of apiculture on park values.	No impacts.	No impacts.

7.1.3 Major Events		
Provide opportunities for special events consistent with Park management objectives.	No impacts.	No impacts.
7.2 Boundaries and adjacent land uses		
Encourage co-operation with adjoining landholders in the protection of the Park.	No impacts.	No impacts.
Minimise conflicts between park values and surrounding land use.	No impacts.	No impacts.
Ensure that key identified areas are considered for addition to the Park as opportunities for acquisition or inclusion arise.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Mushroom Reef Marine Sanctuary Management Plan (Parks Victoria, 2007)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and geomorphological features		
Protect the geological and geomorphological features of the sanctuary from the impacts of human activity.	No impacts.	No impacts.
Increase knowledge of the geological and geomorphological significance of the sanctuary.	No impacts.	No impacts.
4.2 Catchment and water quality		
Protect and maintain water quality within the sanctuary to ensure that sanctuary values are protected.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise the impact of threatening processes from catchment-derived activities.	No impacts.	No impacts.
4.3 Hydrodynamics		
Minimise the impacts on sanctuary values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
Increase knowledge of the way in which local hydrodynamic processes, especially wave refraction, influence the intertidal structures within the sanctuary.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, and allow natural processes to continue.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve knowledge of marine ecological communities, flora and fauna and threatening processes to improve management, protection and appreciation.	No impacts.	No impacts.
4.5 Landscape and seascape		

Protect landscape and seascape values within the sanctuary, including the natural beauty and character.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise visual impacts on the seascape and landscape of management activities and any future developments.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the park.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the sanctuary in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the sanctuary.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.
Support the views of the Traditional Owners in managing the sanctuary.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve places of historic significance.	No impacts.	No impacts.
Encourage learning and understanding about historic heritage of the sanctuary.	No impacts.	No impacts.
6.1 Information, interpretation and education		
Promote and encourage visitors to discover, enjoy and appreciate the sanctuary's natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for the sanctuary and the sanctuary's management practices.	No impacts.	No impacts.

6.2 Access		
Facilitate access to the sanctuary while minimising the impact on natural and cultural values of the sanctuary and abutting natural areas.	No impacts.	No impacts.
6.3 Intertidal activities		
Encourage the exploration and enjoyment of intertidal platform habitats within the sanctuary while minimising impacts on natural and cultural values.	No impacts.	No impacts.
6.4 Diving and snorkelling		
Encourage snorkelling and diving activities that are for enjoyment and understanding of the sanctuary and have minimal impact on natural or cultural values.	No impacts.	No impacts.
6.5 Dog walking		
Protect natural and cultural values, and visitor enjoyment from the impacts of dogs.	No impacts.	No impacts.
6.6 Other activities		
Permit activities, including the landing of hang gliders and paragliders in the sanctuary that have minimal impact on natural or cultural values and the enjoyment of other visitors.	No impacts.	No impacts.
6.7 Tourism services		
Encourage the promotion and interpretation of the sanctuary and its values by licensed tour operators in a manner consistent with the aims for the sanctuary and visitor safety.	No impacts.	No impacts.
6.8 Public Safety		
Promote visitor safety and awareness of safety issues and risks within the sanctuary associated with access and use.	No impacts.	No impacts.
Promote and observe safe practices, and cooperate with emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Manage authorised uses in accordance with the National Parks Act and minimise their impact on sanctuary values.	No impacts.	No impacts.

7.2 Boundaries and adjacent uses		
Minimise impacts on sanctuary values from adjacent uses and developments.	No impacts.	No impacts.
8.1 Community awareness		
Increase the community's awareness and understanding of the sanctuary's values and management activities.	No impacts.	No impacts.
Build a sense of shared ownership and custodianship for the sanctuary in community groups and individuals.	No impacts.	No impacts.
8.2 Community participation		
Encourage and support the whole community, particularly Traditional Owners, in undertaking projects that contribute to or complement sanctuary programs.	No impacts.	No impacts.
Inform, enrich and strengthen the sanctuary's management with the community's tradition, knowledge, experience, skills and enthusiasm, particularly that of the Traditional Owners.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance sanctuary management by collaborating with other agencies to ensure they give appropriate consideration to sanctuary values in planning and implementing activities that relate to the sanctuary but for which they are responsible.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of Flinders Foreshore Reserve Coastal Management Plan (URS, 2008)

The following information summarises the risk to the park from the spill scenarios.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
1. Natural Environment		
Manage erosion on the Flinders Foreshore	No impacts.	No impacts.
Enhance views out to Western Port for all users	No impacts.	No impacts.
Protect the intertidal zone from damage caused by vehicles	No impacts.	No impacts.
Protect and manage terrestrial flora and fauna values within the Flinders Foreshore Reserve	No impacts.	No impacts.
Protect and manage marine ecological values	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Protect the EPBC listed syngnathids colonies and their environment	No impacts.	No impacts.
Protect the seagrass beds offshore of Flinders and other environmental values	No impacts.	No impacts.
Protect marine ecological values and EPBC listed marine species	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise factors contributing to climate change	No impacts.	No impacts.
Continue with the practice of retaining seaweed on Flinders Foreshore	No impacts.	No impacts.
Manage dogs on the Flinders Foreshore to protect environmental values	No impacts.	No impacts.
Understand and prepare for any potential future changes in use and management arrangements to West Head	No impacts.	No impacts.

Manage commercial vessel refuelling to minimise impact on other users and the environment	No impacts.	No impacts.
2. Cultural Heritage		
Monitor and protect Aboriginal values and sites of significance within the Flinders Foreshore precinct	No impacts.	No impacts.
Protect European Cultural Heritage within the Flinders Foreshore and Pier precinct	No impacts.	No impacts.
Develop an historic walk to recognise historic sites on Flinders Foreshore	No impacts.	No impacts.
3. Built Environment		
Upgrade Flinders Pier to meet user needs and maintain marine ecological values, heritage values and safety standards	No impacts.	No impacts.
Identify and provide locations for overflow parking in close proximity to Flinders Foreshore for use during peak times	No impacts.	No impacts.
Provide a carpark on the Flinders Foreshore for commercial use	No impacts.	No impacts.
Upgrade the existing septic systems at Flinders Yacht Club and foreshore toilet blocks	No impacts.	No impacts.
Investigate the need for additional swing moorings surrounding Flinders Pier	No impacts.	No impacts.
Maintenance of Cable Station walk	No impacts.	No impacts.
Provide additional picnic facilities on Flinders Foreshore to meet public demand	No impacts.	No impacts.
Maintenance of existing infrastructure, and new infrastructure to be designed to be in character with the surrounding environment	No impacts.	No impacts.
Monitor existing use of the Flinders boat ramp	No impacts.	No impacts.
Improve the amenity and visual appearance of the open space area adjacent to the slipway	No impacts.	No impacts.
Repair broken fencing	No impacts.	No impacts.

Improve efficiency of car parking	No impacts.	No impacts.
4. Access		
Ensure foreshore access is appropriately designed, results in minimal environmental impact, and access links are rationalised	No impacts.	No impacts.
Improve the entrance to Flinders Foreshore and the visual connection with Bass Street	No impacts.	No impacts.
Maintain access to the Flinders Yacht Club building	No impacts.	No impacts.
Improve pedestrian access from Bass Street to Flinders Pier	No impacts.	No impacts.
Where possible, improve disabled access at key locations on Flinders Foreshore	No impacts.	No impacts.
Create a pedestrian link on the foreshore reserve between The Esplanade and Spindrift Avenue	No impacts.	No impacts.
Improve the standard of pedestrian access of Dodds Creek access track	No impacts.	No impacts.
Formalise the existing circuit walk and promote for use.	No impacts.	No impacts.
Provide a new pedestrian link between the Flinders Foreshore Reserve and the Mornington Peninsula National Park precinct	No impacts.	No impacts.
Maintain pedestrian access along Right-of-Way	No impacts.	No impacts.
5. Maintenance and Public Risk		
Identify and address maintenance issues on the foreshore to minimise public risk	No impacts.	No impacts.
Review the current waste management collection cycle and ensure it meets waste management needs for the foreshore	No impacts.	No impacts.
Separate pedestrian and vehicle movements within Flinders car park to improve public safety	No impacts.	No impacts.

Minimise risk of fire occurrence	No impacts.	No impacts.
Manage unstable cliff/slope environment	No impacts.	No impacts.
6. Community Awareness and Involvement		
Develop local ownership and assistance with the management of Flinders Foreshore Reserve.	No impacts.	No impacts.
Coordinate communication between MPS and the Flinders community	No impacts.	No impacts.
Orientation of visitors to the Flinders Foreshore Reserve and co-ordinated signage.	No impacts.	No impacts.

Assessment of Sequoia MSS against the stated aims of the Phillip Island Nature Parks Management Plan (Phillip Island Nature Parks, 2018)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	1% probability of low threshold exposure at 0-10 m below sea surface.
Entrained hydrocarbons:	3% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provides an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
1. Conservation Excellence		
Building resilience in little penguin, seabird and Australian fur seal populations through research-led conservation programs.	No impact.	No impact.
Investing in habitat restoration and developing innovative wildlife protection solutions.	No impact.	No impact.
Enhancing Phillip Island as a safe haven for wildlife through identifying and controlling threats.	No impact.	No impact.
Engaging young people in conservation challenges through education at schools and across all Nature Parks sites.	No impact.	No impact.
Establish a Research Centre to increase awareness of our programs and create new opportunities.	No impact.	No impact.
Revolutionise oiled wildlife rehabilitation practices through the live application of magnetic cleaning technology.	No impact.	No impact.
Work with key partners to develop a plan for the management of native threatened wildlife with priority given to the strategic re-introduction of species to Phillip Island.	No impact.	No impact.
Utilise our research to influence marine and fisheries policy.	No impact.	No impact.
Implement conservation campaigns that inspire our visitors and community to take action.	No impact.	No impact.
Strengthen partnerships with key conservation and scientific organisations to influence global seabird conservation efforts.	No impact.	No impact.
Develop an understanding of the Caring for Country practices of Aboriginal and Torres Strait Islander Peoples and establish partnerships to help integrate these practices on Phillip Island.	No impact.	No impact.
Work with Parks Victoria and other key agencies to help establish Victorian Island Arks.	No impact.	No impact.

Partner with Bass Coast Shire Council and our community to eliminate the impact of cats on native fauna.	No impact.	No impact.
2. Extraordinary Visitor Experiences		
Partnering with organisations to deliver new and engaging experiences that meet our conservation objectives.	No impact.	No impact.
Building a Penguin Parade visitor centre that represents a world class ecotourism attraction.	No impact.	No impact.
Maintaining market leadership as an International Tourism destination.	No impact.	No impact.
Managing and interpreting the natural and cultural history of Nature Parks sites.	No impact.	No impact.
Develop more intimate and tailored tourism experiences that meet the changing needs of our visitors.	No impact.	No impact.
Establish penguin viewing experiences that complement the new world class Penguin Parade visitor centre.	No impact.	No impact.
Enhance the daytime use of the Summerland Peninsula and its spectacular coastline through the creation and promotion of walking and cycling experiences that improve access for all. (Summerland Peninsula Infrastructure and Procurement Master Plan)	No impact.	No impact.
Work with Traditional Custodians and the Aboriginal and Torres Strait Islander Community to develop and deliver authentic cultural experiences.	No impact.	No impact.
Create new and diverse volunteer opportunities to double volunteer participation across the Nature Parks.	No impact.	No impact.
Strengthen our visitors' connection with the natural environment to influence behaviour change and improve environmental outcomes.	No impact.	No impact.
Plan for the future of the Koala Reserve and its valued wildlife to provide more diverse and engaging experiences that complement our conservation values.	No impact.	No impact.
Increase visitation to Churchill Island through new visitor experiences and events that showcase the heritage precinct.	No impact.	No impact.
Advocate for increased accommodation options on Phillip Island to grow overnight group visitation and visitor yield.	No impact.	No impact.

3. Community Partnerships		
Developing respectful partnerships with Phillip Island's Traditional Custodians and wider Aboriginal and Torres Strait Islander Community	No impact.	No impact.
Enabling opportunities for community engagement such as the Community and Environment Advisory Committee and Community Open Day.	No impact.	No impact.
Investing in quality infrastructure at beach access areas that is sympathetic to the surrounding environment and promotes access for all.	No impact.	No impact.
Establish a new site to make the Nature Parks more visible and accessible to our community.	No impact.	No impact.
Utilise new technology to connect with the local community to deliver on our clear conservation, ecotourism and reconciliation objectives	No impact.	No impact.
Partner with Bass Coast Shire Council and Destination Phillip Island to implement the Phillip Island and San Remo Visitor Economy Strategy and foster a collaborative approach to environmental and tourism planning.	No impact.	No impact.
Collaborate with our community and key partners to establish Phillip Island as an accredited ecotourism destination (Global Sustainable Tourism Certification program).	No impact.	No impact.
Promote how to live with wildlife throughout our community to build a greater affiliation with nature.	No impact.	No impact.
Work with key partners to improve walking and cycling links on Phillip Island which will enhance the Island's liveability and people's connection with nature.	No impact.	No impact.
4. Sustainable Future		
Maintaining financial stability through growth in premium visitor experiences and improved visitation throughout shoulder periods.	No impact.	No impact.
Driving visitors to Phillip Island through its promotion as a must see wildlife destination to key international and domestic markets.	No impact.	No impact.
Align our commercial activities to our renewed commitment to environmental sustainability whilst maintaining overall financial return.	No impact.	No impact.
Commit to becoming a carbon neutral organisation by 2030.	No impact.	No impact.

Transition all sites to be waste and water neutral.	No impact.	No impact.
Improve the Nature Parks' sustainability credentials by expanding our Ecotourism Accreditation and seeking to join a carbon neutral accreditation program.	No impact.	No impact.
Build funding support for our conservation outcomes through philanthropic and corporate partnerships, grants and other funding opportunities.	No impact.	No impact.
5. Agile Organisation, Inspired People		
Fostering a safe and inclusive culture for all of our team, volunteers, contractors, community and visitors.	No impact.	No impact.
Developing our passionate, empowered and valued team.	No impact.	No impact.
Strengthen our global networks to enhance innovation in product development and conservation.	No impact.	No impact.
Embed a deep respect and understanding of Aboriginal and Torres Strait Islander Peoples' cultural values and protocols across our organisation.	No impact.	No impact.
Review our values to align with the organisation's conservation and sustainability ambitions.	No impact.	No impact.
Create collaborative work spaces for our team that encourage interaction and allow everyone to move easily across all sites.	No impact.	No impact.
Use technology to ensure business efficiencies, improve environmental outcomes and build collaboration.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated aims of the Beware Reef Marine Sanctuary Management Plan (Parks Victoria, 2006)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours.	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	3% probability of low threshold exposure to entrained hydrocarbons at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine and non-routine activities against management aims	Assessment of impacts of MDO spill against objectives
4.1 Geological and geomorphological features		
Allow natural geological and geomorphological processes to continue without human interference.	No impacts.	No impacts.
Provide opportunities for appropriate research, appreciation and education in relation to geological and landform features.	No impacts.	No impacts.
4.2 Catchment and water quality		
Ensure the integration of planning and management for the sanctuary and the adjacent catchment, including Cape Conran Coastal Park.	No impacts.	No impacts.
Maintain a high quality of water within the sanctuary and surrounding waters to ensure that natural biological and physical processes can occur.	No impacts.	The OPEP takes into accounts risks to the open ocean and prioritises actions to reduce the spread and extent of oil on the sea surface.
Minimise impacts of threatening processes from activities in the catchment.	No impacts.	No impacts.
4.3 Hydrodynamics		
Minimise impacts on sanctuary values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna and allow natural processes to continue.	No impacts.	The OPEP takes into accounts risks to the open ocean and prioritises actions to reduce the spread and extent of oil on the sea surface.
Improve knowledge of marine ecological communities, flora and fauna and threatening processes to aid management, protection and appreciation.	No impacts.	No impacts.

Management Aims	Assessment of impacts of routine and non-routine activities against management aims	Assessment of impacts of MDO spill against objectives
4.5 Landscape and seascape		
Preserve and protect landscape and seascape values of the sanctuary, including the natural character, aesthetic qualities and values of significance to Indigenous communities.	No impacts.	The OPEP takes into accounts risks to the open ocean and prioritises actions to reduce the spread and extent of oil on the sea surface.
Minimise the visual impact of developments and management activities, including those adjacent to the sanctuary.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the sanctuary.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the sanctuary in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the sanctuary.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.
Nurture Indigenous cultural lore relating to the sanctuary.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve places of historic and cultural significance.	No impacts.	No impacts.
Encourage learning and understanding of the historic heritage of the sanctuary.	No impacts.	No impacts.
6.1 Information, interpretation and education		

Management Aims	Assessment of impacts of routine and non-routine activities against management aims	Assessment of impacts of MDO spill against objectives
Promote and encourage visitors to discover, enjoy and appreciate the sanctuary's natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for the sanctuary and sanctuary management practices.	No impacts.	No impacts.
Foster relevant collaborative education projects with other organisations or groups delivering environmental education in the East Gippsland area.	No impacts.	No impacts.
Provide opportunities for people to learn about and understand the cultural and spiritual significance of the sanctuary to Indigenous people.	No impacts.	No impacts.
6.2 Access		
Provide for the use and enjoyment of the sanctuary by visitors, while protecting the sanctuary's natural and cultural values.	No impacts.	No impacts.
6.3 Recreational boating and surface water sports		
Allow for a range of recreational boating activities, surface water sports and marine mammal observation while protecting natural, cultural and recreational values.	No impacts.	No impacts.
Promote safe boating and water safety within the sanctuary.	No impacts.	No impacts.
6.4 Diving and snorkelling		
Provide opportunities for diving and snorkelling in the sanctuary while protecting natural and cultural values.	No impacts.	No impacts.
6.5 Other activities		
Monitor and minimise the impact of helicopters and aircraft on natural and cultural values.	No impacts.	No impacts.
Minimise impacts of dogs on the natural and cultural values of the sanctuary.	No impacts.	No impacts.
6.6 Tourism services		

Management Aims	Assessment of impacts of routine and non-routine activities against management aims	Assessment of impacts of MDO spill against objectives
Encourage the provision of appropriate tourism services, while minimising impacts on the natural and cultural values of the sanctuary.	No impacts.	No impacts.
6.7 Public safety		
Promote visitor safety and awareness of safety issues and risks within the sanctuary.	No impacts.	No impacts.
Promote and observe safe practices, and support emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Manage authorised uses and permitted activities in accordance with the National Parks Act and minimise their impact on sanctuary values.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Ensure the integration of management with adjoining waters and nearby land as appropriate, consistent with the protection of natural and cultural values.	No impacts.	No impacts.
Effectively communicate the location of sanctuary boundaries.	No impacts.	No impacts.
8.1 Community awareness		
Increase the community's awareness and understanding of the sanctuary's values and management activities.	No impacts.	No impacts.
Build a sense of shared ownership and custodianship for the sanctuary among community groups and individuals.	No impacts.	No impacts.
8.2 Community participation		
Support and encourage the active participation of community groups and volunteers in protection, conservation and monitoring projects to enhance management of the sanctuary.	No impacts.	No impacts.
8.3 Agency partnerships		

Management Aims	Assessment of impacts of routine and non-routine activities against management aims	Assessment of impacts of MDO spill against objectives
Enhance sanctuary management by collaborating with other agencies to ensure they give appropriate consideration to sanctuary values in planning and implementing activities that may relate to the sanctuary.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the French Island National Park Management Plan (Parks Victoria, 1998)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
3.1 Geological and landform features		
Protect the outstanding geomorphological and geological features, and maintain the natural processes and functioning of the natural aquatic ecosystems.	No impacts.	No impacts.
Provide for the appreciation and study of the physical features and associated geomorphological processes.	No impacts.	No impacts.
3.2 Marine and intertidal environment		
Protect and maintain the quality of the marine and intertidal environment in the Park, in conjunction with adjacent waters.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
3.3 Vegetation		
Conserve the indigenous vegetation communities in their natural condition, and maintain natural ecological processes.	No impacts.	No impacts.
Rehabilitate disturbed areas and provide special protection and management to maintain and/or enhance genetic and species diversity	No impacts.	No impacts.
Provide for appropriate research and appreciation of the flora which involves minimal disturbance to the environment.	No impacts.	No impacts.
3.4 Fauna		
Ensure the conservation of indigenous terrestrial, freshwater and marine fauna.	No impacts.	No impacts.
Maintain the terrestrial and aquatic ecosystems in healthy condition	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.

Meet international commitments of the Ramsar Convention and the JAMBA and CAMBA agreements for protection of waterfowl and migratory wading birds.	No impacts.	No impacts.
Provide for appropriate research and appreciation of wildlife, which involves minimal disturbance.	No impacts.	No impacts.
3.5 Landscape		
Protect the landscape and minimise impacts on natural values, particularly as seen from major viewing points.	No impacts.	No impacts.
3.6 Cultural heritage		
Preserve and protect archaeological and historic sites and features of significance, and where appropriate interpret particular features.	No impacts.	No impacts.
Improve understanding of the historic and cultural values and their significance.	No impacts.	No impacts.
3.7 UNESCO Biosphere Reserves		
Investigate creation of a Biosphere Reserve incorporating the planning area and surrounding Western Port area.	No impacts.	No impacts.
4.1 Fire management		
Protect life, property and Park values from injury by fire.	No impacts.	No impacts.
Minimise the adverse effects of fires and fire suppression methods.	No impacts.	No impacts.
Develop and maintain fire regimes appropriate to the conservation of indigenous flora and fauna.	No impacts.	No impacts.
4.2 Pest plants and animal, and diseases		
Control, and where possible eradicate, pest plants and animals using methods having minimal adverse impact on the Park.	No impacts.	No impacts.
Minimise opportunities for new pests and diseases becoming established, particularly the fox and Cinnamon Fungus.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.

4.3 Soil conservation		
Prevent and control soil degradation, and rehabilitate degraded areas.	No impacts.	No impacts.
5.1 Park visitors		
Provide for visitors in accordance with the above overview of future management.	No impacts.	No impacts.
Ensure minimal impact on the Park from visitor activities.	No impacts.	No impacts.
5.2.1 Vehicle access		
Continue support for the French Island Access Strategy.	No impacts.	No impacts.
Maintain an appropriate network of roads and tracks in the Park, primarily for management and emergency purposes.	No impacts.	No impacts.
Encourage visitors to use this network for walking and cycling.	No impacts.	No impacts.
Minimise the impact of vehicle use on the Park's natural and cultural values.	No impacts.	No impacts.
5.2.2 Day use areas		
Establish and maintain high standard but low-key day visitor facilities which enhance visitor enjoyment and are consistent with protecting Park values.	No impacts.	No impacts.
Where practicable, provide facilities suitable for visitors with limited mobility.	No impacts.	No impacts.
5.2.3 Camping		
Provide opportunities for accessible and remote camping experiences with limited facilities in attractive settings, while minimising impacts on park values.	No impacts.	No impacts.
5.2.4. Walking		
Increase the range of bushwalking opportunities in the Park while minimising impacts on park values.	No impacts.	No impacts.
5.2.5 Horse riding		
Minimise any environmental impacts caused by horse riding.	No impacts.	No impacts.
Minimise conflict between horse riders and other Park users	No impacts.	No impacts.

5.2.6 Cycling		
Provide access for cycling while minimising environmental damage and conflicts with other recreation activities.	No impacts.	No impacts.
5.2.7 Fishing		
Provide opportunities in marine waters for fishing and bait collecting where it is consistent with the protection of park values.	No impacts.	No impacts.
5.2.8 Boating		
Provide opportunities for boating in the Park while minimising the environmental impact of the activity on sensitive shoreline areas.	No impacts.	No impacts.
5.2.9 Orienteering, regaining and competitive events		
Do not provide for these activities in the Park.	No impacts.	No impacts.
5.3 Visitor information, interpretation and education		
Orientate visitors to the Park and its features.	No impacts.	No impacts.
Enhance visitors' appreciation of the Park and provoke interest in the area's natural and cultural environment.	No impacts.	No impacts.
5.4 Commercial tourism operations		
Encourage commercial tourism services to be provided, consistent with park management objectives	No impacts.	No impacts.
Monitor tourist use of the Park to ensure that impacts are not detrimental.	No impacts.	No impacts.
5.5 Public safety		
Promote public safety in the use of the Park.	No impacts.	No impacts.
Ensure that procedures are in place to assist in emergency situations.	No impacts.	No impacts.
6.1 Friends and volunteers		

Assist volunteer groups to undertake appropriate management tasks in the Park.	No impacts.	No impacts.
6.2 Community awareness and Park neighbours		
Increase awareness and knowledge of the Park, and maintain good relations within local communities.	No impacts.	No impacts.
Co-operate with landholders outside the Park in the protection of both private property and public land from fire, pests and other hazards.	No impacts.	No impacts.
Encourage conservation and sound land management practices on private land adjoining the Park.	No impacts.	No impacts.
6.3 Schools, education and special interest groups		
Promote the educational value of the Park to schools, tertiary institutions and special interest groups.	No impacts.	No impacts.
Encourage participation in park monitoring and research programs.	No impacts.	No impacts.
7.1.1 Landholder access from the sea		
Provide access for landholder boats while minimising environmental damage to the Park.	No impacts.	No impacts.
7.1.2 Apiculture		
Minimise the adverse effects of apiculture on park values.	No impacts.	No impacts.
7.1.3 Other uses		
Ensure appropriate use and authorisation of public utilities.	No impacts.	No impacts.
Allow appropriate uses in the Park when alternative sites are not available, subject to minimal impacts.	No impacts.	No impacts.
7.2 Boundaries and adjacent land use		

Minimise conflicts between park values and neighbouring land use.	No impacts.	No impacts.
7.3 Park office and depot		
Efficiently co-ordinate administration, supervision and operations functions associated with the management of the Park.	No impacts.	No impacts.
Minimise the impact of operations on the Park's landscape.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Port Phillip Bay Environmental Management Plan (DELWP, 2017)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours.	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	2% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Climate change and resilience planning		
Work with Aboriginal groups to improve understanding of Aboriginal cultural values and interests in the Bay and support connections to Country	No impacts.	No impacts.
Develop and deliver programs to inspire greater appreciation of the Bay's values	No impacts.	No impacts.
Build understanding of management responsibilities and programs for the Bay and its catchment	No impacts.	No impacts.
Build capacity and knowledge within community and industry networks	No impacts.	No impacts.
Empower the broader community to get more actively involved in caring for the Bay	No impacts.	No impacts.
Support stronger partnerships across community, industry and government to ensure aims and outcomes are aligned	No impacts.	No impacts.
Effectively maintain existing stormwater infrastructure and programs to mitigate loads to the Bay, or secure via equivalent means	No impacts.	No impacts.
Prevent increases in nutrients loads from wastewater systems and, where practicable, reduce loads of other pollutants	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Ensure all urban and rural land use effectively controls impacts from stormwater and runoff, and that controls are in place to manage increases in loads	No impacts.	No impacts.
Establish a baseline estimate of the volume of litter entering the Bay, and support clean up activities	No impacts.	No impacts.
Support capability and capacity building programs that target litter prevention, including reduction of microplastics	No impacts.	No impacts.

Identify and prioritise litter sources and pathways, and take actions to prevent litter entering the Bay	Control measures to mitigate marine debris are contained in the EP.	No impacts.
Improve understanding of links between pathogen concentrations and human health risks for swimming and consumption of shellfish	No impacts.	No impacts.
Adopt a risk-based approach to mitigate sources of pathogens found in the Bay	No impacts.	No impacts.
Improve monitoring and reporting to better detect and communicate human health risks from pathogens	No impacts.	No impacts.
Monitor indicator species and key habitats at priority locations	No impacts.	No impacts.
Improve understanding of ecological processes, threats and pressures	No impacts.	No impacts.
Improve overall extent and condition of the Bay's natural ecosystems	No impacts.	No impacts.
Prevent introduction and dispersal of marine pests	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Monitor priority locations for early detection of marine pest introductions	No impacts.	No impacts.
Respond rapidly to new introductions of marine pests	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Kilcunda Foreshore Reserve Management Plan (Bass Coast Shire Council, 2016)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	3% probability of low threshold exposure.
Shoreline contact:	No contact.

The table on the following page provides an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
1. Management		
Ensure ongoing sustainable and efficient management of the Kilcunda Foreshore Reserve and engage community involvement in management activities.	No impact.	No impact.
2. Recreation		
Maintain and improve facilities and amenities within the Kilcunda Foreshore Reserve to enable continued safe recreational use and enjoyment of the foreshore.	No impact.	No impact.
3. Protection of the Environment		
Protect and enhance native vegetation, threatened species and coastal habitats within the Kilcunda Foreshore Reserve and improve community knowledge of key values.	No impact.	No impact.
4. Fire Management		
The Kilcunda Foreshore Reserve will be managed to minimise fire risk in accordance with the Kilcunda Foreshore Reserve Fire Protection Plan.	No impact.	No impact.
5. Cultural Heritage		
Protect cultural and heritage values throughout the Kilcunda Foreshore Reserve.	No impact.	No impact.
6. Coastal Erosion		
Coastal erosions within the Kilcunda Foreshore Reserve will be managed to minimise impacts to infrastructure assets and natural values, whilst working with natural coastal processes.	No impact.	No impact.
7. Climate Change		
Monitoring and plan for the potential impacts of climate change for all development and improvement activities or proposals within the Kilcunda Foreshore Reserve.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated aims of the Bunurong Marine National Park, Bunurong Marine Park, Bunurong Coastal Reserve and Kilcunda-Harmers Haven Coastal Reserve Management Plan
(Parks Victoria, 2006)

The following information summarises the risk to the park from the spill scenario.

Parks:	**Bunurong Marine National Park**	**Bunurong Marine Park**	**Kilcunda-Harmers Haven Coastal Reserve**
373 m^3 surface release of MDO over 6 Hours			
Sea surface:	No contact.	1% probability of low threshold exposure at sea surface.	No contact.
Dissolved hydrocarbons:	1% probability of low threshold exposure to dissolved hydrocarbons 0-10 m below sea surface.	No contact.	No contact.
Entrained hydrocarbons:	2% probability of low threshold and 1% probability of high threshold exposure to entrained hydrocarbons 0-10 m below sea surface.	3% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.	No contact.
Shoreline contact:	No contact.	No contact.	No contact.

The table on the following pages provides an assessment of routine and non-routine operations against the management aims of the parks.

Management Aims	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
4.1 Landscape and seascape		
Preserve and protect the landscape and seascape values of the planning area, particularly the natural character and places of high scenic quality and areas of significance to the indigenous community.	No impacts.	No impacts.
Minimise the impact of developments and management activities on the planning area's landscape values.	No impacts.	No impacts.
4.2 Geological and geomorphological features		
Protect geological and geomorphological features of the planning area and minimise impacts from management activities and visitor use.	No impacts.	No impacts.
Allow natural geological and geomorphological processes to continue with minimal human interference.	No impacts.	No impacts.
Provide opportunities for appropriate research into, appreciation of, and education about the geological and geomorphological features of the planning area.	No impacts.	No impacts.
4.3 Catchment and water quality		
Ensure the integration of future planning and management between the planning area and adjacent catchment.	No impacts.	No impacts.
Maintain a high quality of water within the planning area and surrounding waters to ensure that natural biological and physical processes can occur.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise impacts of threatening processes from catchment-sourced activities.	No impacts.	No impact.
4.4 Hydrodynamics		
Allow natural hydrodynamic processes to continue without human interference.	No impacts.	No impacts.

Minimise impacts on planning area values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
4.5 Marine habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, particularly threatened species.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Increase knowledge of marine ecological communities, flora and fauna to aid management, protection and appreciation.	No impacts.	No impacts.
Increase knowledge of key threatening processes to marine ecological communities, flora and fauna, to limit impacts.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the planning area.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the planning area in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the planning area.	No impacts.	No impacts.
4.7 Terrestrial flora		
Maintain the floristic structure and diversity of vegetation communities, and protect them from threatening processes.	No impacts.	No impacts.
Increase knowledge of the planning area’s vegetation communities and species, particularly its threatened species, to aid management, protection and appreciation.	No impacts.	No impacts.
4.8 Terrestrial fauna		
Protect and preserve indigenous fauna and faunal habitats from visitor use and management activities, and maintain genetic diversity.	No impacts.	No impacts.

Increase knowledge of the planning area's fauna species and habitats, particularly threatened species, to aid management, protection and appreciation.	No impacts.	No impacts.
4.9 Terrestrial pests		
Control, and where possible eradicate, non-indigenous plants, animals and diseases.	No impacts.	No impacts.
Minimise the potential for the introduction and spread of pest plants and animals and diseases.	No impacts.	No impacts.
Minimise the impact of control programs on native flora and fauna species.	No impacts.	No impacts.
Restore native vegetation in areas where weeds have been controlled or eradicated.	No impacts.	No impacts.
4.10 Soil conservation		
Prevent and control soil degradation, and rehabilitate areas affected by soil degradation caused by visitor and management activities.	No impacts.	No impacts.
4.11 Fire management		
Protect planning area values from the deleterious effects of wildfire or inappropriate fire regimes.	No impacts.	No impacts.
Cooperate with relevant agencies and land managers in the protection of human life, neighbouring properties and assets.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage, including places and objects, from interference or damaging activities.	No impacts.	No impacts.
Nurture Indigenous cultural lore relating to the planning area.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve places and values of historic and cultural significance within the planning area.	No impacts.	No impacts.
Increase learning about and appreciation of the historic heritage of the planning area.	No impacts.	No impacts.
6.1 Information, interpretation and education		

Promote and encourage visitors' discovery, enjoyment and appreciation of the planning area's natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for parks and management practices.	No impacts.	No impacts.
Provide opportunities to learn about and understand the cultural and spiritual significance of the planning area to the Indigenous community.	No impacts.	No impacts.
6.2 Access		
Provide and maintain appropriate access to the planning area for visitor use and management purposes.	No impacts.	No impacts.
Minimise the impact of access on natural and cultural values of the planning area.	No impacts.	No impacts.
6.3 Visitor site activities		
Establish and maintain visitor facilities that enhance visitor enjoyment and are consistent with the protection of planning area values.	No impacts.	No impacts.
6.4 Recreational boating and associated facilities		
Provide opportunities for recreational boating and appropriate surface water sports while protecting natural and cultural values.	No impacts.	No impacts.
Promote safe boating and water safety within the planning area.	No impacts.	No impacts.
6.5 Diving and snorkelling		
Provide opportunities for diving and snorkelling in the planning area while protecting natural and cultural values.	No impacts.	No impacts.
6.6 Swimming, surfing and shore-based activities		
Provide opportunities for appropriate shore-based recreation within the planning area, while minimising impacts on the natural and cultural values.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
6.7 Dog walking		

Provide opportunities for dog walking in appropriate areas of the planning area, while protecting park and reserve values and the experience of visitors.	No impacts.	No impacts.
6.8 Horse riding		
Minimise conflicts with recreational activities, threats to visitor safety and natural values within the planning area.	No impacts.	No impacts.
6.9 Hang gliding		
Protect visitors and values in the planning area from impacts of hang gliding and paragliding within the planning area.	No impacts.	No impacts.
6.10 Recreational fishing		
Provide opportunities for sustainable recreational fishing while minimising impacts to natural and cultural values.	No impacts.	No impacts.
6.11 Tourism services		
Provide opportunities for and encourage provision of external tourism services while minimising impacts on natural and cultural values of the planning area.	No impacts.	No impacts.
6.12 Public Safety		
Promote visitor safety and awareness of safety issues and risks within the planning area associated with access and use.	No impacts.	No impacts.
Promote and observe safe practices and cooperate with emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Manage authorised uses in accordance with relevant legislation, and minimise their impact on the planning area's values.	No impacts.	No impacts.
7.2 Occasional uses		
Manage uses and permitted activities in accordance with relevant legislation, and minimise their impacts on the planning area's values.	No impacts.	No impacts.
7.3 Boundaries and adjacent uses		
Minimise impacts on planning area values from adjacent uses and developments.	No impacts.	No impacts.

Ensure the integration of management with adjoining land and waters in accordance with principles for ecologically sustainable development.	No impacts.	No impacts.
Effectively communicate the location of Marine National Park and other planning area boundaries.	No impacts.	No impacts.
8.1 Community awareness		
Build a shared sense of ownership and custodianship for the planning area among community groups and individuals.	No impacts.	No impacts.
Increase community awareness and understanding of the values and management activities of the planning area.	No impacts.	No impacts.
8.2 Community participation		
Support and encourage community groups and volunteers to assist actively in the area's management by participating and by contributing their knowledge and skills.	No impacts.	No impacts.
Encourage tertiary students to undertake volunteer work experience and research that is consistent with aims for the planning area.	No impacts.	No impacts.
Inform, enrich and strengthen the planning area's management with the community's traditions and customs, especially Traditional Owner's cultural lore.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance management by collaborating with other agencies to ensure that they give appropriate consideration to natural and cultural values in planning and implementing activities that relate to the planning area.	No impacts.	No impacts.

Assessment of BassGas operations against the stated aims of the Cape Liptrap Coastal Park Management Plan (Parks Victoria, 2003)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	5% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	1% probability of low threshold exposure to shoreline loading.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and landform features		
Manage sites of geological and geomorphological significance to allow public access and interpretation.	No impact.	No impact.
4.2 Rivers and Catchments		
Maintain water quality in the park's catchments.	No impact.	No impact.
4.3 Vegetation		
Manage ecosystems to ensure the protection of indigenous flora species and vegetation communities, particularly significant species and communities.	No impact.	No impact.
Improve knowledge about the conservation of natural values with minimal disturbance to the environment.	No impact.	No impact.
4.4 Fauna		
Ensure the preservation and protection of indigenous fauna.	No impact.	No impact.
Manage park ecosystems to provide for the long-term protection and preservation of significant communities, habitats and species.	No impact.	No impact.
Improve knowledge about the conservation of fauna and their habitat requirements.	No impact.	No impact.
4.5 Landscape		
Minimise the visual intrusions on natural landscape within the park, especially from major viewing points.	No impact.	No impact.
Where possible, remove or shield undesirable visual intrusions.	No impact.	No impact.
4.6 Fire Management		
Protect life, property and park values from damage by fire.	No impact.	No impact.
Suppress wildfires in a manner appropriate to seasonal conditions, with the objective of minimising impacts on park values.	No impact.	No impact.

Sustain the vigour, diversity and successional development of the park's plant and animal communities by ecological burning on the basis of current and future knowledge.	No impact.	No impact.
4.7 Pest plants and animals		
Eradicate or control pest plant and animal species using methods that minimise disturbance to natural systems and park values.	No impact.	No impact.
Restore native vegetation to areas where weeds have been removed.	No impact.	No impact.
4.8 Soil Conservation		
Prevent and control soil degradation caused by visitor and management activities	No impact.	No impact.
Rehabilitate sites where unnatural soil degradation has occurred.	No impact.	No impact.
Protect important economic, cultural and natural assets from soil erosion.	No impact.	No impact.
4.9 Aboriginal Cultural Heritage		
Preserve and protect features of Aboriginal cultural and archaeological significance.	No impact.	No impact.
Provide opportunities for people to learn about and understand the park's Aboriginal cultural values.	No impact.	No impact.
4.10 Post-settlement Cultural Heritage		
Preserve and protect features of cultural, archaeological and historical significance.	No impact.	No impact.
Provide opportunities for people to learn about and understand the park's historic and cultural values.	No impact.	No impact.
5.1 Information, interpretation and education		
Encourage visitors' discovery, enjoyment and appreciation of the park's natural and cultural values.	No impact.	No impact.
Orientate visitors in relation to park features.	No impact.	No impact.
Inform visitors of appropriate behaviour during their park visit.	No impact.	No impact.
Provide high-quality interpretive and educational opportunities to promote an understanding and appreciation of the park's values.	No impact.	No impact.

5.2 Access		
Maintain roads and tracks to standards consistent with management aims.	No impact.	No impact.
5.3 Day Visits		
Establish and maintain day visitor facilities that enhance visitor enjoyment of the park and are consistent with protecting park values.	No impact.	No impact.
Improve visitor facilities and raise the profile of the park as a day visitor destination.	No impact.	No impact.
5.4 Camping		
Provide opportunities for a range of camping experiences while minimising impacts on park values.	No impact.	No impact.
5.5 Boating		
Support the Walkerville Foreshore Committee of Management in providing basic boat launching facilities at Walkerville North.	No impact.	No impact.
5.6 Fishing		
Provide opportunities for recreational fishing while minimising the impacts on park values.	No impact.	No impact.
5.7 Bushwalking		
Provide a variety of high-quality walking opportunities within the park, while minimising impacts on park values.	No impact.	No impact.
5.8 Horse Riding		
Provide opportunities for horse riding while minimising this activity's adverse environmental effects and conflicts with other users.	No impact.	No impact.
5.9 Cycling		
Provide access for cycling, and at the same time minimise the environmental impact of cycling and the conflict with other recreational activities.	No impact.	No impact.

5.10 Dogs		
Provide for dogs in certain areas of the park, consistent with protecting park values and the experience of visitors.	No impact.	No impact.
5.11 Hang-gliding and Paragliding		
Provide opportunities for hang-gliding and paragliding while minimising the impact on park values and other uses.	No impact.	No impact.
5.12 Fossicking		
Provide an opportunity for gemstone collecting in the park, while ensuring that the impact on environmental values and other visitors is minimised.	No impact.	No impact.
5.13 Commercial Services		
Provide opportunities for commercial tourism and the touring public while minimising environmental impacts and effects on other visitors.	No impact.	No impact.
5.14 Public Safety		
Promote safe visitor use of the park.	No impact.	No impact.
Ensure that park management has adequate capacity to respond to emergency situations.	No impact.	No impact.
6.1 Friends and Volunteers		
Provide opportunities for and encourage the participation of groups and volunteers in protection, conservation and maintenance projects to enhance the management of the park.	No impact.	No impact.
Provide opportunities for and encourage tertiary students to undertake volunteer work experience and research consistent with park management aims.	No impact.	No impact.
6.2 Community Awareness and Park Neighbours		
Increase community awareness of park management activities, including prescribed burning, pest plant and animal control and visitor management activities.	No impact.	No impact.

Encourage conservation and sound land management practices on private land adjacent to the park.	No impact.	No impact.
7.1 Authorised Uses		
Manage public utilities and authorised uses in accordance with the National Parks Act, to minimise their impacts on the parks natural and scenic values.	No impact.	No impact.
Protect water quality in the park and provide for appropriate use of water resources.	No impact.	No impact.
7.2 Boundaries and Adjacent Uses		
Accurately define park boundaries on the ground.	No impact.	No impact.
Ensure adequate planning controls for adjoining land developments are in place.	No impact.	No impact.
Co-operate with adjacent landowners to protect both private and park areas from fire, pests and other hazards.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated aims of the Wilsons Promontory Marine National Park, Marine Park and Marine Reserve Management Plan (Parks Victoria, 2006).

The following information summarises the risk to the parks from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	1% probability of low threshold exposure at sea surface.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	8% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	1% probability of low threshold and 1% probability of moderate threshold exposure to shoreline loading.

The table on the following pages provides an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and geomorphological features		
Identify geological and geomorphological features of the planning area and protect them from potentially damaging human activities	No impacts.	No impacts.
Allow natural geological and geomorphological processes to continue without human interference.	No impacts.	No impacts.
Provide opportunities for appropriate research into, appreciation of, and education about geological and geomorphological features.	No impacts.	No impacts.
4.2 Catchment and water quality		
Ensure the integration of future planning and management for the planning area and adjacent catchment.	No impacts.	No impacts.
Maintain a high quality of water within the planning area and surrounding waters to ensure that natural biological and physical processes can occur.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise the impacts on water quality within the planning area from activities within the catchment.	No impacts.	
4.3 Hydrodynamics		
Allow natural hydrodynamic processes to continue without human interference.	No impacts.	No impacts.
Minimise impacts on planning area values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, particularly threatened species.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.

Increase knowledge of marine ecological communities, flora and fauna to aid management, protection and appreciation.	No impacts.	No impacts.
Increase knowledge of key threatening processes to marine ecological communities, flora and fauna, to limit impacts.	No impacts.	No impacts.
4.5 Landscape and seascape		
Preserve and protect the landscape and seascape values of the park, including the natural character, aesthetic qualities and values of significance to Indigenous communities.	No impacts.	No impacts.
Minimise the visual impact of developments and management activities, including those adjacent to the park.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pasts by human activities, and their subsequent establishment in the planning area.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters	No impacts.
Establish arrangements for the detection of new incursions within the planning area in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the planning area.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.
Nurture Indigenous cultural lore relating to the planning area.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve and protect places and values of historic significance associated with maritime exploration, commercial exploitation, coastal trading and navigation	No impacts.	No impacts.
Encourage learning and understanding about the historic heritage of the planning area, particularly as they relate to the historic theme 'Shipping along the Coast'.	No impacts.	No impacts.

6.1 Information, interpretation and education		
Promote and encourage visitors' discovery, enjoyment and appreciation of the natural and cultural values of the planning area in a safe and appropriate manner through information, education and interpretation.	No impacts.	No impacts.
Encourage public support for the planning area and management practices.	No impacts.	No impacts.
Provide opportunities to learn about and understand the cultural and spiritual significance of the planning area to the Traditional Owners.	No impacts.	No impacts.
Promote an awareness of past European cultural activities in the park.	No impacts.	No impacts.
6.2 Access		
Provide for the use and enjoyment of the planning area.	No impacts.	No impacts.
Minimise the impact of access on natural and cultural values of the planning area	No impacts.	No impacts.
6.3 Recreational boating and surface water sports		
Provide opportunities for recreational boating and appropriate surface water sports while protecting natural and cultural values	No impacts.	No impacts.
Promote safe boating and water safety within the planning area.	No impacts.	No impacts.
Provide opportunities for marine mammal observation while ensuring their long-term protection.	No impacts.	No impacts.
6.4 Diving and snorkelling		
Provide opportunities for diving and snorkelling in the planning area while protecting natural and cultural values.	No impacts.	No impacts.
6.5 Swimming and shore-based activities		
Provide for appropriate shore-based activities while protecting natural and cultural values.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
6.6 Recreational fishing		

Provide opportunities for sustainable recreational fishing while minimising impacts on the marine park and marine reserve.	No impacts.	No impacts.
6.7 Tourism services		
Encourage the provision of appropriate tourism services to improve the quality and range of recreational experiences available to visitors.	No impacts.	No impacts.
Ensure that licensed tour operators recognise and respect the natural and cultural values of the planning area, including Indigenous cultural heritage values.	No impacts.	No impacts.
6.8 Aircraft		
Monitor and minimise the impact of fixed wing aircraft and helicopters on the natural values of the planning area.	No impacts.	No impacts.
6.9 Public Safety		
Promote visitor safety and awareness of safety issues and risks within the planning area associated with access and use.	No impacts.	No impacts.
Promote and observe safe practices, and cooperate with emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Manage authorised uses and permitted activities in accordance with the National Parks Act, and minimise their impact on park values.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Ensure the integration of management of the planning area with adjoining land and waters in accordance with principles for ecologically sustainable development.	No impacts.	No impacts.
Ensure that necessary boundaries are clearly identifiable.	No impacts.	No impacts.
Minimise confusion by simplifying land tenure in the planning area.	No impacts.	No impacts.
8.1 Community awareness		
Build a shared sense of ownership and custodianship for the planning area in community groups and individuals.	No impacts.	No impacts.
Increase the community's awareness and understanding of the planning area's values, management activities and catchment impacts.	No impacts.	No impacts.
8.2 Community participation		

Support and encourage the active participation of community groups and volunteers in protection, conservation and monitoring projects to enhance management of the planning area.	No impacts.	No impacts.
Provide opportunities for, and encourage, tertiary students to undertake volunteer work experience and research consistent with aims for the planning area.	No impacts.	No impacts.
Inform, enrich and strengthen the planning area's management with the community's tradition and customs, especially the Traditional Owner's cultural lore.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance management of the planning area by collaborating with other agencies to ensure that they give appropriate consideration to park values in planning and implementing activities that relate to the planning area.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Point Addis Marine National Park, Point Danger Marine Sanctuary and Eagle Rock Sanctuary Management Plan
(Parks Victoria, 2005)

The following information summarises the risk to the parks from the spill scenario.

373 m^3 surface release of MDO over 6 hours.			
Parks:	**Point Addis MNP**	**Point Danger MS**	**Eagle Rock MS**
Sea surface:	1% probability of low threshold exposure at sea surface.	No contact.	
Entrained hydrocarbons:	7% probability of low threshold exposure and 1% probability of high threshold exposure to entrained hydrocarbons 0-10 m below sea surface.	1% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.	6% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.
Dissolved hydrocarbons:	1% probability of low threshold exposure to dissolved hydrocarbons 0-10 m below sea surface.	No contact.	
Shoreline contact:	No contact.	No contact.	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the parks.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and geomorphological features		
Protect significant and fragile geological and seabed features in the park and sanctuaries.	No impact.	No impact.
4.2 Catchment and water quality		
Minimise the impact of threatening processes derived from the catchment, estuaries and other watercourses.	No impact.	No impact.
Maintain water quality in the park and sanctuaries.	No impact.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Prevent and minimise the impact of pollution on park and sanctuary values.	No impact.	
4.3 Hydrodynamics		
Minimise impacts on park and sanctuary values from human-induced changes to local hydrodynamics.	No impact.	No impact.
4.4 Habitats and communities		
Protect natural habitats, ecological communities and indigenous flora and fauna in the park and sanctuaries.	No impact.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve knowledge of the park and sanctuaries, including habitats, indigenous species and threatening processes.	No impact.	No impact.
4.5 Landscape and seascape		
Protect landscape and seascape values.	No impact.	No impact.
Minimise the visual impact of signs, infrastructure and management activities associated with the parks and sanctuaries.	No impact.	No impact.
4.6 Marine pests		

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Minimise the risk of introduction by human activities, and subsequent establishment of, marine pests in the park and sanctuaries.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impact.
Establish arrangements for the detection of new incursions within the planning area in support of Victorian marine pest management arrangements.	No impact.	No impact.
Implement national or Victoria-wide control arrangements as they relate to the planning area.	No impact.	No impact.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural values from interference or damaging activities.	No impact.	No impact.
Nurture Indigenous cultural lore relating to the park and sanctuaries.	No impact.	No impact.
5.2 Maritime and other cultural heritage		
Protect significant maritime and other cultural places, objects and places associated with the park and sanctuaries.	No impact.	No impact.
Increase awareness of the maritime and other cultural values of the park and sanctuaries.	No impact.	No impact.
6.1 Information, interpretation and education		
Promote and encourage visitors' discovery, enjoyment and appreciation of the park and sanctuaries' natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impact.	No impact.
Encourage public support for parks and park management practices.	No impact.	No impact.
Promote an awareness of Indigenous culture.	No impact.	No impact.
6.2 Access		
Support and manage the provision of appropriate and safe access to the park and sanctuaries.	No impact.	No impact.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
6.3 Recreational boating and surface water sports		
Provide for boating activities in the park and sanctuaries consistent with management objectives.	No impact.	No impact.
6.4 Diving and snorkelling		
Provide opportunities for diving and snorkelling that are consistent with the protection of the values of the park and sanctuaries.	No impact.	No impact.
6.5 Swimming and shore-based activities		
Provide opportunities for appropriate shore-based recreation activities that are consistent with the protection of park and sanctuary values.	No impact.	No impact.
6.6 Dogs and horses		
Provide opportunities for walking dogs where compatible with the protection of natural values.	No impact.	No impact.
Minimise conflicts with other visitors and impacts on park and sanctuary values from dogs and horses.	No impact.	No impact.
6.7 Surfing		
Provide opportunities for surfing that are consistent with the protection of park and sanctuary values.	No impact.	No impact.
6.8 Hang-gliding, para-gliding and other aircraft		
Provide for landing of hang-gliders and para-gliders where safe and appropriate.	No impact.	No impact.
Minimise the disturbing effects of aircraft on park and sanctuary visitors.	No impact.	No impact.
6.9 Events		
Manage surfing and other events in accordance with the National Parks Act and regulations and minimise their impact on park and sanctuary values.	No impact.	No impact.
6.10 Tourism services		

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Encourage the provision of appropriate commercial visitor services while minimising impacts on natural and cultural values.	No impact.	No impact.
6.11 Public safety		
Promote visitor safety and awareness of safety issues and risks within the park and sanctuaries associated with access and use.	No impact.	No impact.
Promote and observe safe practices, and cooperate with emergency services.	No impact.	No impact.
7.1 Authorised uses		
Manage authorised uses and permitted activities in accordance with the National Parks Act.	No impact.	No impact.
Minimise the impact of authorised uses and permitted activities on park and sanctuary values.	No impact.	No impact.
7.2 Boundaries and adjacent uses		
Effectively communicate the location of the park and sanctuary boundaries.	No impact.	No impact.
Participate in planning processes that could affect park and sanctuary values.	No impact.	No impact.
8.1 Community awareness		
Increase community awareness and understanding of park and sanctuary values and management activities.	No impact.	No impact.
Build a sense of shared ownership and custodianship for the park and sanctuaries among community groups and individuals.	No impact.	No impact.
8.2 Community participation		
Support and encourage community groups and volunteers to actively assist in the management of the park and sanctuaries.	No impact.	No impact.
Inform and strengthen management with cultural lore of the Traditional owners.	No impact.	No impact.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
8.3 Agency partnerships		
Enhance park and sanctuary management by collaborating with other agencies to ensure they give appropriate consideration to park values in planning and implementing activities that relate to the park and sanctuaries.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated aims of the Twelve Apostles Marine National Park and the Arches Marine Sanctuary Management Plan
(Parks Victoria, 2006)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours.	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	2% probability of low threshold exposure to entrained hydrocarbons at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

<table>
<tr><th>Management Aims</th><th>Assessment of impacts of routine activities against management aims</th><th>Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives</th></tr>
<tr><td>Protect significant and fragile geological and seabed features in the park and sanctuary.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Minimise the impact of threatening processes derived from the catchment, estuaries and other watercourses.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Maintain water quality in the park and sanctuary.</td><td>No impact.</td><td rowspan="2">The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.</td></tr>
<tr><td>Prevent and minimise the impact of pollution on park and sanctuary values.</td><td>No impact.</td></tr>
<tr><td>Minimise impacts on park and sanctuary values from human-induced changes to local hydrodynamic processes.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Protect natural habitats, ecological communities and indigenous flora and fauna in the park and sanctuary.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Improve knowledge of the park and sanctuary, including habitats, indigenous species and threatening processes.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Protect landscape and seascape values associated with the park and sanctuary.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Minimise the visual impact of signs, infrastructure and management activities associated with the park and sanctuary.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Minimise the risk of introduction by human activity, and subsequent establishment, of marine pests in the park and sanctuary.</td><td>The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.</td><td>No impact.</td></tr>
<tr><td>Establish arrangements for the detection of new incursions within the park and sanctuary in support of Victorian marine pest management arrangements.</td><td>No impact.</td><td>No impact.</td></tr>
<tr><td>Implement national or Victoria-wide control arrangements as they relate to the park and sanctuary.</td><td>No impact.</td><td>No impact.</td></tr>
</table>

Protect Indigenous places and objects from interference or damage.	No impact.	No impact.
Nurture Indigenous cultural lore and customs relating to the park and sanctuary.	No impact.	No impact.
Conserve places of cultural significance.	No impact.	No impact.
Encourage learning and understanding about the historic heritage of the park and sanctuary.	No impact.	No impact.
Promote and encourage visitors to discover, enjoy and appreciate the natural and cultural values of the park and sanctuary in a safe and appropriate manner through information, interpretation and education.	No impact.	No impact.
Encourage public support for parks and park management practices.	No impact.	No impact.
Support and manage the provision of appropriate and safe access to the park and sanctuary.	No impact.	No impact.
Provide for boating activities in the park and sanctuary consistent with management objectives.	No impact.	No impact.
Provide opportunities for diving and snorkelling that are consistent with the protection of park and sanctuary values.	No impact.	No impact.
Provide opportunities for appropriate shore-based recreation activities that are consistent with the protection of park and sanctuary values.	No impact.	No impact.
Minimise the impact of dogs and horses on the park and sanctuary.	No impact.	No impact.
Minimise the impact of aircraft on wildlife and visitor experiences in the park and sanctuary.	No impact.	No impact.
Encourage the provision by external providers of tourism services that accord with the provisions of the National Parks Act.	No impact.	No impact.
Promote visitor safety and awareness of safety issues and risks in the sanctuary associated with access and use.	No impact.	No impact.
Promote and observe safe practices, and cooperate with emergency response agencies.	No impact.	No impact.
Minimise the impact on park/sanctuary values of authorised uses.	No impact.	No impact.
Manage authorised uses consistent with legislation.	No impact.	No impact.

Effectively communicate the location of park and sanctuary boundaries.	No impact.	No impact.
Minimise impacts on park values from adjacent developments.	No impact.	No impact.
Increase knowledge of the relationships between the park and sanctuary and industry.	No impact.	No impact.
Increase the community’s awareness and understanding of the park’s and sanctuary’s values, and management activities in them.	No impact.	No impact.
Build a sense of shared ownership and custodianship for the park and sanctuary among community groups and individuals.	No impact.	No impact.
Support and encourage community groups and volunteers to actively assist in the park and sanctuary management by participating and contributing their knowledge and skills.	No impact.	No impact.
Inform, enrich and strengthen the park and sanctuary management with the community’s cultural aspirations and customs, especially relevant Indigenous cultural lore.	No impact.	No impact.
Enhance management of the park and sanctuary by collaborating with other agencies to ensure that they give appropriate consideration to park and sanctuary values in planning and implementing activities that relate to the planning area.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated aims of the Cape Conran Coastal Park Management Plan (Parks Victoria, 2005)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and landform features		
Provide for the protection of geological and geomorphological features of scientific or landscape interest, or cultural significance.	No impacts.	No impacts.
Minimise disturbances to geomorphological processes or features.	No impacts.	No impacts.
Provide for study, education and appreciation of geological and landform features and coastal geomorphological processes.	No impacts.	No impacts.
4.2 Rivers and catchments		
Protect and maintain the integrity of streams and catchments within the park.	No impacts.	No impacts.
Minimise the impact of management and visitor activities on rivers and catchments in the park.	No impacts.	No impacts.
4.3 Vegetation		
Conserve native plant communities and maintain genetic diversity.	No impacts.	No impacts.
Enhance the long-term survival of threatened and significant plant species and communities.	No impacts.	No impacts.
Provide for scientific investigation relating to conservation of flora and biodiversity.	No impacts.	No impacts.
4.4 Fauna		
Protect indigenous fauna.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Maintain genetic diversity of fauna communities.	No impacts.	No impacts.

Enhance the long-term survival prospects of threatened or significant faunal species and populations.	No impacts.	No impacts.
4.5 Landscape		
Protect the natural landscape, particularly places of special significance to the Traditional Owners, interest to visitors, or high scenic quality.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise visual impacts on the landscape and remove or ameliorate undesirable visual intrusions.	No impacts.	No impacts.
4.6 Fire Management		
Protect human life, property and park values from injury by fire.	No impacts.	No impacts.
Maintain fire regimes appropriate to the conservation of native flora and fauna.	No impacts.	No impacts.
Minimise the adverse effects of all fires and fire suppression methods on park values.	No impacts.	No impacts.
4.7 Pest plants and animals, and diseases		
Eradicate or control pest plants and animals using methods which minimise disturbance to natural systems and effects on park values.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Restore native vegetation to areas where weeds have been removed.	No impacts.	No impacts.
Minimise the spread of any Phytophthora in the park.	No impacts.	No impacts.
4.8 Soil conservation		
Prevent and control soil degradation caused by visitor or management activities and restore disturbed sites, avoiding damage to natural and cultural values.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.

Nurture Indigenous cultural lore relating to the park.	No impacts.	No impacts.
5.2 Historic cultural heritage		
Protect and conserve historic cultural places.	No impacts.	No impacts.
Provide opportunities for people to learn about and understand the historic and cultural values of the park.	No impacts.	No impacts.
6.1 Visitor information, interpretation and education		
Encourage visitors to discover, enjoy and appreciate the park's natural and cultural values.	No impacts.	No impacts.
Orientate visitors in relation to park features.	No impacts.	No impacts.
Inform visitors of appropriate behaviour during their park visit.	No impacts.	No impacts.
Improve visitor satisfaction and promote sustainable visitor use of the park.	No impacts.	No impacts.
Provide a range of high-quality interpretation and education opportunities to promote understanding and appreciation of the park's values.	No impacts.	No impacts.
Promote Indigenous heritage values and reconciliation through a range of tourism, interpretive, information and education mediums.	No impacts.	No impacts.
6.2 Vehicular access		
Provide an appropriate level of vehicle access to visitor nodes for bush and scenic driving and for park management purposes.	No impacts.	No impacts.
Minimise the impact of road and track management and vehicle use on the park's natural and cultural values.		
6.3 Day visits		
Provide day visitor facilities that enhance visitors' enjoyment of the park and are consistent with protecting park values.	No impacts.	No impacts.
Protect areas critical to wildlife from disturbance by day visitors.	No impacts.	No impacts.
Address hygiene and environmental issues associated with a lack of appropriate facilities at key day-visitor destinations.	No impacts.	No impacts.
6.4 Camping		

Provide opportunities to meet current market needs for a range of camping experiences while minimising impacts on park values.	No impacts.	No impacts.
Maintain the bush setting camping experience of the Banksia Bluff campground.	No impacts.	No impacts.
6.5 Roofed accommodation		
Maintain the integrity of the natural setting of the site.	No impacts.	No impacts.
Continue to provide roofed accommodation to cater for a broad range of user groups.	No impacts.	No impacts.
6.6 Boating		
Provide opportunities for boating whilst minimising associated impacts on park values and conflict with other visitors.	No impacts.	No impacts.
Continue to provide access for ocean boat launching at West Cape.	No impacts.	No impacts.
Encourage safe boating within and from the park.	No impacts.	No impacts.
6.7 Fishing		
Provide opportunities for recreational fishing and bait collection in accordance with aims for the park.	No impacts.	No impacts.
6.8 Bushwalking		
Provide a variety of high-quality walking opportunities within the park, while minimising impacts on park values.	No impacts.	No impacts.
Facilitate improved walking access to the park from neighbouring townships.	No impacts.	No impacts.
6.9 Hunting		
Provide opportunities for duck hunting on the lake at Sydenham Inlet while minimising its impact on park values.	No impacts.	No impacts.
6.10 Dogs		

Permit dogs in specified areas of the park, while protecting park values and the experience of visitors.	No impacts.	No impacts.
6.11 Horse riding		
Provide opportunities for horse riding while minimising impacts on park values and protecting the experience and safety of other visitors.	No impacts.	No impacts.
6.12 Cycling		
Provide a range of cycling opportunities within the park while minimising impacts on park values and protecting the experience and safety of other park visitors.	No impacts.	No impacts.
6.13 Tourism services		
Encourage the provision of appropriate licensed services to improve the quality and range of recreational experiences available in the park.	No impacts.	No impacts.
Minimise impacts of licensed operations on park values and the experiences of other visitors.	No impacts.	No impacts.
6.14 Public safety		
Promote safe visitor use of the park.	No impacts.	No impacts.
Ensure that park management has adequate capacity to respond to emergency situations.	No impacts.	No impacts.
7.1 Authorised uses		
Minimise the impacts of authorised occupations and activities on the park, visitors and other users.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Minimise the adverse impacts on the park of activities occurring outside the park boundaries.	No impacts.	No impacts.
Minimise conflicts between park management activities and adjoining land use.	No impacts.	No impacts.

8.1 Community awareness		
Build a sense of custodianship for the park among community groups and individuals.	No impacts.	No impacts.
Increase public awareness of the park’s values, regulations and management activities.	No impacts.	No impacts.
8.2 Community participation		
Inform, enrich and strengthen park management with the community’s heritage, knowledge, skills and enthusiasm.	No impacts.	No impacts.
8.3 Agency partnerships		
Collaborate with other agencies on matters of mutual interest towards obtaining the best possible outcomes for the park and its values.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Point Hicks Marine National Park Management Plan (Parks Victoria, 2006)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and geomorphological features		
Allow natural geological and geomorphological processes to continue without human interference.	No impacts.	No impacts.
Provide opportunities for appropriate research, appreciation and education in relation to geological and geomorphological features.	No impacts.	No impacts.
4.2 Catchment and water quality		
Ensure the integration of planning and management for the park, Croajingolong National Park, Point Hicks Lighthouse Reserve and nearby public and freehold land.	No impacts.	No impacts.
Maintain a high quality of water within the park and surrounding waters to ensure that natural biological and physical processes can occur.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise impacts of threatening processes from activities in the catchment.	No impacts.	No impacts.
4.3 Hydrodynamics		
Minimise impacts on park values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, and allow natural processes to continue.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve knowledge of marine ecological communities, flora and fauna and threatening processes to aid management, protection and appreciation.	No impacts.	No impacts.
4.5 Landscape and seascape		

Avoid any development on the coastal side of dunes and contain new works to inland inlets and rivers to ensure that the coastline retains its rugged non-developed wilderness character.	No impacts.	No impacts.
This area is of outstanding scenic quality and requires special landscape protection to ensure that development does not impact on landscape values.	No impacts.	No impacts.
Preserve and protect landscape and seascape values of the park, including the natural character, aesthetic qualities and values of significance to Indigenous communities.	No impacts.	No impacts.
Minimise the visual impact of developments and management activities, including those adjacent to the park.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the park.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the park in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the park.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.
Nurture Indigenous cultural lore relating to the park.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve places of historic and cultural significance.	No impacts.	No impacts.
Encourage learning about and understanding of the historic heritage of the park.	No impacts.	No impacts.
6.1 Information, interpretation and education		

Promote and encourage visitors to discover, enjoy and appreciate the park's natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for the park and park management practices.	No impacts.	No impacts.
Foster relevant collaborative education projects with other organisations or groups delivering environmental education in the East Gippsland area.	No impacts.	No impacts.
Provide opportunities for people to learn about and understand the cultural and spiritual significance of the park to Indigenous people.	No impacts.	No impacts.
6.2 Access		
Provide for the use and enjoyment of the park by visitors, while protecting the park's natural and cultural values.	No impacts.	No impacts.
6.3 Recreational boating and surface water sports		
Allow for a range of recreational boating activities, surface water sports and marine mammal observation while protecting natural, cultural and other recreational values.	No impacts.	No impacts.
Promote safe boating and water safety within the park.	No impacts.	No impacts.
6.4 Diving and snorkelling		
Provide opportunities for diving and snorkelling in the park while protecting natural and cultural values.	No impacts.	No impacts.
6.5 Swimming and shore-based activities		
Provide for appropriate shore-based activities while minimising impacts to sensitive natural and cultural values within the park and the adjacent Croajingolong National Park and Point Hicks Lighthouse Reserve.	No impacts.	No impacts.
6.6 Other activities		
Monitor and minimise the impact of helicopters and aircraft on natural and cultural values.	No impacts.	No impacts.
Minimise impacts of dogs on the natural and cultural values of the park.	No impacts.	No impacts.
6.7 Tourism services		

Encourage the provision of appropriate tourism services, while minimising impacts on the natural and cultural values of the park.	No impacts.	No impacts.
6.8 Public safety		
Promote visitor safety and awareness of safety issues and risks within the park.	No impacts.	No impacts.
Promote and observe safe practices, and cooperate with emergency services.	No impacts.	No impacts.
7.1 Authorised uses		
Manage authorised uses and permitted activities in accordance with the National Parks Act, and minimise their impact on park values.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Ensure the integration of management with adjoining land and waters, consistent with the protection of remote and wilderness values.	No impacts.	No impacts.
Effectively communicate the location of park boundaries.	No impacts.	No impacts.
8.1 Community awareness		
Increase the community's awareness and understanding of the park's values and management activities.	No impacts.	No impacts.
Build a sense of shared ownership and custodianship for the park among community groups and individuals.	No impacts.	No impacts.
8.2 Community participation		
Support and encourage the active participation of community groups and volunteers in protection, conservation and monitoring projects to enhance management of the park.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance park management by collaborating with other agencies to ensure that they give appropriate consideration to park values in planning and implementing activities that may relate to the park.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Croajingolong National Park Management Plan (Parks Victoria, 1996)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	1% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
3.1 Geological and landform features		
Protect areas of geological and geomorphological interest.	No impacts.	No impacts.
Provide opportunities for appropriate research, appreciation and education of geological and geomorphological sites and processes.	No impacts.	No impacts.
Maintain the functioning of natural aquatic ecosystems in inlets throughout the Park.	No impacts.	No impacts.
3.2 Rivers and catchments		
Protect and maintain the integrity of catchments within the Park.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Protect and enhance the conservation and recreation values of all rivers in the Park.	No impacts.	No impacts.
3.3 Vegetation		
Protect native plant communities in their natural condition, and maintain genetic diversity.	No impacts.	No impacts.
Enhance the long-term survival prospects of threatened or significant plant species or communities.	No impacts.	No impacts.
3.4 Fauna		
Protect native animal communities, and maintain genetic diversity.	No impacts.	No impacts.
Enhance the long-term survival prospects of threatened or significant faunal species and populations.	No impacts.	No impacts.
3.5 Landscape		
Protect and enhance landscape values.	No impacts.	No impacts.
3.6 Cultural heritage		

Identify, protect, and where appropriate interpret, Koori sites.	No impacts.	No impacts.
Promote further investigations into Koori history and culture	No impacts.	No impacts.
Encourage Koori involvement in the management of sites within the Park.	No impacts.	No impacts.
Identify and conserve sites and artefacts of European historical interest and significance.	No impacts.	No impacts.
Improve knowledge and understanding of history in the Park and the effects of past land use.	No impacts.	No impacts.
4.1 Fire management		
Protect life, property and Park values from injury by fire.	No impacts.	No impacts.
Minimise the adverse effects of fires and fire suppression methods.	No impacts.	No impacts.
Maintain fire regimes appropriate to the conservation of native flora and fauna.	No impacts.	No impacts.
4.2 Pest plants and animal, and diseases		
Control, and where possible eradicate, pest plants and animals in the Park.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Minimise the impact of control programs on native flora and fauna.	No impacts.	No impacts.
Protect the Park from threats and diseases, in particular Cinnamon Fungus.	No impacts.	No impacts.
5.1 Park visitors		
Provide for visitors in accordance with the above overview of future management for visitors.	No impacts.	No impacts.
5.2.1 Vehicle access		
Provide and maintain an access network for visitor enjoyment, management purposes and private property access	No impacts.	No impacts.

Minimise the impact of vehicle and track management on the Park's natural and cultural values.	No impacts.	No impacts.
5.2.2 Day visits		
Establish and maintain high standard but low-key day visitor facilities which enhance visitor enjoyment and are consistent with protecting Park values.	No impacts.	No impacts.
5.2.3 Camping		
Provide opportunities for a variety of camping experiences in keeping with the Park's unspoilt and remote character while minimising impacts on Park values.	No impacts.	No impacts.
5.2.4. Bushwalking		
Provide a range of opportunities for walking, while minimising impacts on Park values.	No impacts.	No impacts.
Promote the walking track network as a significant nature-based opportunity within the Park	No impacts.	No impacts.
5.2.5 Fishing		
Provide opportunities for fishing including bait collection and intertidal collecting, where it is consistent with the protection of Park values.	No impacts.	No impacts.
5.2.6 Boating		
Provide opportunities for boating in the Park, where appropriate.	No impacts.	No impacts.
5.2.7 Jetties		
Provide for appropriate boating access to and use of Park inlets and waterways.	No impacts.	No impacts.
5.2.8 Canoeing and sea kayaking		
Provide for the use of Park inlets and waterways for canoeing and kayaking.	No impacts.	No impacts.
5.2.9 Other activities		
Provide for a range of other recreational activities, as appropriate.	No impacts.	No impacts.
5.3 Visitor information, interpretation and education		

Enhance visitor appreciation and visitors enjoyment of the natural and cultural features of the Park, and the value of national parks generally.	No impacts.	No impacts.
Increase public awareness of management activities including fuel reduction burning, pest plant and animal control, the conservation of threatened species, natural and cultural features and the impacts of people on the Park.	No impacts.	No impacts.
5.4 Commercial tourism operations		
Provide for tourism activities based on the Park's remote and unspoilt character - its distinctive quality and competitive advantage.	No impacts.	No impacts.
Provide opportunities for sustainable, high quality adventure and nature-based experiences.	No impacts.	No impacts.
Support and complement broader tourism opportunities and activities in the region.	No impacts.	No impacts.
5.5 Public safety		
Promote and encourage safe practices among visitors and staff.	No impacts.	No impacts.
6.1 Friends and volunteers		
Assist volunteer groups to undertake appropriate management tasks in the Park.	No impacts.	No impacts.
6.2 Community awareness and Park neighbours		
Increase public awareness of management activities, including fuel reduction burning, pest plant and animal control, and the conservation of threatened species.	No impacts.	No impacts.
Encourage conservation and sound land management practices on private land adjoining the Park.	No impacts.	No impacts.
7.1.1 Commercial fishing		
Phase commercial fishing out of the Tamboon Inlet in accordance with the government-approved LCC recommendation.	No impacts.	No impacts.
7.1.2 Apiculture		

Allow apiculture in the Park in accordance with LCC recommendations and NRE guidelines.	No impacts.	No impacts.
7.1.3 Gravel extraction		
Minimise the environmental and visual impacts of gravel extraction operations.	No impacts.	No impacts.
Provide material for road maintenance in the Park where this has only minimal impact on the Park	No impacts.	No impacts.
7.1.4 Public utilities		
Minimise the impact of public utilities on the Park.	No impacts.	No impacts.
Ensure appropriate use and licensing of existing and any proposed new public utilities in the Park.	No impacts.	No impacts.
7.1.5 Training exercises		
Allow appropriate training exercises by the Defence Forces, Emergency Services and other groups.	No impacts.	No impacts.
7.1.6 Pollution and water quality		
Reduce pollution in the Park from point source discharges and recreational use.	No impacts.	No impacts.
Ensure an effective oil and chemical spill response.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
7.2 Boundaries and adjacent land use		
Enhance the collective values and cooperative management of the Park, the proposed Cape Conran Coastal Park and Nadgee Nature Reserve (NSW).	No impacts.	No impacts.

Minimise impacts on Park values from surrounding land use, including timber harvesting in adjacent State forest	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Cape Howe Marine National Park Management Plan (Parks Victoria, 2006)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	3% probability of low threshold exposure at 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
4.1 Geological and geomorphological features		
Allow natural geological and geomorphological processes to continue without human interference.	No impacts.	No impacts.
Provide opportunities for appropriate research, appreciation of, and education about geological and landform features.	No impacts.	No impacts.
4.2 Catchment and water quality		
Ensure the integration of planning and management for the park and adjacent Croajingolong National Park and nearby public and private land.	No impacts.	No impacts.
Maintain a high quality of water within the park and surrounding waters to ensure that natural biological and physical processes can occur.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Minimise impacts of threatening processes from activities in the catchment.	No impacts.	No impacts.
4.3 Hydrodynamics		
Minimise impacts on park values from human-induced changes to local hydrodynamic processes.	No impacts.	No impacts.
4.4 Habitats and communities		
Protect marine ecological communities and indigenous flora and fauna, and allow natural processes to continue.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Improve knowledge of marine ecological communities, flora and fauna and threatening processes to aid management, protection and appreciation.	No impacts.	No impacts.
4.5 Landscape and seascape		

Preserve and protect landscape and seascape values of the park, including the natural character, aesthetic qualities and values of significance to Indigenous communities.	No impacts.	No impacts.
Minimise the visual impact of developments and management activities, including those adjacent to the park.	No impacts.	No impacts.
4.6 Marine pests		
Minimise the risk of introduction of marine pests by human activities, and their subsequent establishment in the park.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Establish arrangements for the detection of new incursions within the park in support of Victorian marine pest management arrangements.	No impacts.	No impacts.
Implement national or Victoria-wide control arrangements as they relate to the park.	No impacts.	No impacts.
5.1 Indigenous cultural heritage		
Protect Indigenous cultural heritage from interference or damaging activities.	No impacts.	No impacts.
Nurture Indigenous cultural lore relating to the park.	No impacts.	No impacts.
5.2 Maritime and other cultural heritage		
Conserve places of historic and cultural significance.	No impacts.	No impacts.
Encourage learning about and understanding of the historic heritage of the park.	No impacts.	No impacts.
6.1 Information, interpretation and education		
Promote and encourage visitors to discover, enjoy and appreciate the park's natural and cultural values in a safe and appropriate manner through information, interpretation and education.	No impacts.	No impacts.
Encourage public support for the park and park management practices.	No impacts.	No impacts.
Foster relevant collaborative education projects with other organisations or groups delivering environmental education in the East Gippsland area.	No impacts.	No impacts.

Provide opportunities for people to learn about and understand the cultural and spiritual significance of the park to Indigenous people.	No impacts.	No impacts.
6.2 Access		
Provide for the use and enjoyment of the park by visitors, while protecting the park's natural and cultural values.	No impacts.	No impacts.
6.3 Recreational boating and surface water sports		
Allow for a range of recreational boating activities, surface water sports and marine mammal viewing while protecting natural, cultural and recreational values.	No impacts.	No impacts.
Promote safe boating and water safety within the park.	No impacts.	No impacts.
6.4 Diving and snorkelling		
Provide opportunities for diving and snorkelling in the park, while protecting natural and cultural values.	No impacts.	No impacts.
6.5 Swimming and shore-based activities		
Provide for appropriate shore-based activities while minimising impacts to sensitive natural and cultural values within the park and the adjacent Cape Howe Wilderness Zone of Croajingolong National Park.	No impacts.	No impacts.
6.6 Other activities		
Monitor and minimise the impact of helicopters and aircraft on natural and cultural values.	No impacts.	No impacts.
Minimise impacts of dogs on the natural and cultural values of the park.	No impacts.	No impacts.
6.7 Tourism services		
Encourage the provision of appropriate tourism services, while minimising impacts on the natural and cultural values of the park.	No impacts.	No impacts.
6.8 Public safety		
Promote visitor safety and awareness of safety issues and risks within the park.	No impacts.	No impacts.
Promote and observe safe practices, and cooperate with emergency services.	No impacts.	No impacts.

7.1 Authorised uses		
Manage authorised uses and permitted activities in accordance with the National Parks Act, and minimise their impact on park values.	No impacts.	No impacts.
7.2 Boundaries and adjacent uses		
Ensure the integration of management with adjoining land and waters, consistent with the protection of remote and wilderness values.	No impacts.	No impacts.
Effectively communicate the location of park boundaries.	No impacts.	No impacts.
8.1 Community awareness		
Increase the community's awareness and understanding of the park's values and management activities.	No impacts.	No impacts.
Build a sense of shared ownership and custodianship for the park among community groups and individuals.	No impacts.	No impacts.
8.2 Community participation		
Support and encourage the active participation of community groups and volunteers in protection, conservation and monitoring projects to enhance management of the park.	No impacts.	No impacts.
8.3 Agency partnerships		
Enhance park management by collaborating with other agencies to ensure that they give appropriate consideration to park values in planning and implementing activities that may relate to the park.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Arthur-Pieman Conservation Area Management Plan (Parks and Wildlife Service, 2002)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	2% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
3.2 Geodiversity		
Preserve and maintain geodiversity.	No impacts.	No impacts.
Preserve and maintain significant geoconservation sites.	No impacts.	No impacts.
Maintain the natural rates and magnitudes of change in earth processes.	No impacts.	No impacts.
Minimise harmful impacts on geoconservation sites.	No impacts.	No impacts.
3.3 Landscape and wilderness		
Sustain naturalness and a lack of recent human disturbance.	No impacts.	No impacts.
Preserve a sense of tranquillity for visitors.	No impacts.	No impacts.
Maintain the perception of isolation from settlement and human activities.	No impacts.	No impacts.
Retain the character of the reserve as a living landscape much as it is today.	No impacts.	No impacts.
3.4 Water quality		
Maintain or enhance aquatic ecosystems.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Maintain or enhance recreational water quality.	No impacts.	No impacts.
3.5 Aboriginal values		
Identify and record sites and landscapes of Aboriginal heritage.	No impacts.	No impacts.
Protect and conserve Aboriginal heritage.	No impacts.	No impacts.

Where possible enlist the assistance of the wider community in collaboration with Aboriginal groups to assist in properly managing and protecting the sites.	No impacts.	No impacts.
Interpret Aboriginal heritage to assist in educating the wider community about the importance of the Aboriginal sites along the coast.	No impacts.	No impacts.
Facilitate and enrich Aboriginal community use of the area, its resources and its educational opportunities.	No impacts.	No impacts.
3.6 Historical heritage		
Identify and record historic heritage sites in the reserve.	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Protect and conserve all remaining significant heritage fabric and features.	No impacts.	No impacts.
Consult with the community on management changes.	No impacts.	No impacts.
Maintain the integrity and authenticity of structural and other historic remains and movable heritage.	No impacts.	No impacts.
Present and interpret historic heritage.	No impacts.	No impacts.
Exclude intrusive development and activity.	No impacts.	No impacts.
3.7 Flora		
Conserve and maintain natural diversity and natural ecosystems.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Victorian waters.	No impacts.
Conserve and protect threatened flora species.	No impacts.	No impacts.
Conserve and protect plant communities of high conservation value.	No impacts.	No impacts.
Maintain natural processes.	No impacts.	No impacts.

Minimise harmful impacts on reserve vegetation.	No impacts.	No impacts.
Prevent, contain or eradicate weeds threatening native vegetation.	No impacts.	No impacts.
3.8 Fauna		
Ensure threatened fauna species are protected.	No impacts.	No impacts.
Maintain viable populations of indigenous species of fauna throughout their natural range..	No impacts.	No impacts.
Maintain the diversity of natural habitats of indigenous fauna.	No impacts.	No impacts.
Eradicate introduced species where this is feasible and warranted by the damage being caused.	No impacts.	No impacts.
Control and manage introduced species where eradication is not possible or warranted.	The EP contains control measures aimed to minimise the risk of introducing marine pests to Tasmanian waters.	
4.1 Fire Management		
To protect people from wildfires.	No impacts.	No impacts.
To protect buildings, facilities and visitor, belongings from wildfires.	No impacts.	No impacts.
To prevent wildfires burning onto neighbouring properties.	No impacts.	No impacts.
To protect those natural and cultural assets that will be damaged by wildfire.	No impacts.	No impacts.
Maintain peat soils.	No impacts.	No impacts.
Maintain the diversity of plant and animal communities.	No impacts.	No impacts.
4.2 *Phytophthora* protection		
Limit the spread of *Phytophthora cinnamomi* in the reserve	No impacts.	No impacts.
Educate the community in Phytophthora prevention hygiene measures	No impacts.	No impacts.

4.3 Reserve boundaries		
Provide, where possible, for ecological boundaries.	No impacts.	No impacts.
Provide boundaries that are clearly justifiable from a management perspective.	No impacts.	No impacts.
Simplify and clarify boundaries.	No impacts.	No impacts.
4.4 Assessing and approving development		
To ensure that decisions related to proposed developments or activities reflect the management objectives of this plan.	No impacts.	No impacts.
To ensure that sound processes exist for the assessment of potential impacts of proposed developments and activities (including scientific and management activities).	No impacts.	No impacts.
5.1 Stock agistment		
Clear demonstration of sustainability	No impacts.	No impacts.
Protection of natural and cultural heritage sites and landscapes	No impacts.	No impacts.
Financial neutrality for the Crown	No impacts.	No impacts.
Protection for the Crown from any liability under the provisions of the Animal Welfare Act	No impacts.	No impacts.
Presentation, where appropriate, of traditional practices for the benefit of visitors and the local community	No impacts.	No impacts.
5.2 Electricity generation potential		
Allow for wind resource investigation subject to appropriate conditions to protect the environment.	No impacts.	No impacts.
Any further development of the wind resource will be subject to the preparation of a full environmental impact assessment process that includes community review.	No impacts.	No impacts.
5.3 Mineral resources		
To ensure that exploration or any subsequent extraction and rehabilitation are undertaken in accordance with best practice to provide maximum environmental protection.	No impacts.	No impacts.

5.4 Leases and licences		
Allow for a range of activities while protecting and conserving natural and cultural values.	No impacts.	No impacts.
5.5 Commercial fishing infrastructure		
To develop protocols and codes of conduct with and for commercial fishers which identify best practice in environmental management of shore-based activities, and which reward compliance.	No impacts.	No impacts.
To minimise any adverse impacts commercial fishing infrastructure may have on the conservation area.	No impacts.	No impacts.
To develop ways of interpreting the social and economic contribution of those commercial fishers based in the Arthur-Pieman Conservation Area, with particular reference to the growing tourism market.	No impacts.	No impacts.
5.6 Development works including visitor services		
Provide for development or resource utilisation in identified locations;	No impacts.	No impacts.
Minimise their impacts on conservation area values;	No impacts.	No impacts.
Protect and conserve tourism and recreational values;	No impacts.	No impacts.
Foster public confidence in developments and resource utilisation;	No impacts.	No impacts.
Ensure that all developments or works are ecologically sustainable.	No impacts.	No impacts.
6.1 Camping		
Provide for the unique recreational experiences provided by camping in the APCA in such a way as to minimise the impact on social, environmental and cultural values;	No impacts.	No impacts.
Work with the local community and the community of users to address the environmental impacts of free-range camping	No impacts.	No impacts.
6.2 Shacks		
Conform with the conclusions of the shack categorisation process being undertaken by the Department of Primary Industries, Water and Environment.	No impacts.	No impacts.

6.3 On-road access		
Define a set of roads that will be used by the public and that can be maintained;	No impacts.	No impacts.
Develop protocols for management of roads in keeping with the Reserve Management Code of Practice (under development)	No impacts.	No impacts.
Develop information for visitors and locals on appropriate use of roads	No impacts.	No impacts.
Develop partnerships with users providing for management of roads and tracks	No impacts.	No impacts.
6.4 Vehicles used off-road		
Provide for responsible, low-impact experiences within the reserve	No impacts.	No impacts.
Recognise the contribution to responsible use that can be made by clubs	No impacts.	No impacts.
Develop a system that is enforceable	No impacts.	No impacts.
Minimise conflicts with other recreational activities	No impacts.	No impacts.
Minimise conflicts with conservation of the natural and cultural values of the conservation area	No impacts.	No impacts.
6.5 Walking		
Identify and, subject to resources, develop and promote walking opportunities in the Arthur–Pieman which enable visitors to appreciate the special natural and cultural values of the area	No impacts.	No impacts.
Provide relevant information about settings and develop protocols between different recreational groups so that recreational users can make informed choices about the location and character of the recreational experience they seek	No impacts.	No impacts.
6.6 Family pets		
Permit dogs into parts of the conservation area under conditions that ensure they create minimal disturbance to wildlife and visitors.	No impacts.	No impacts.
6.7 Hunting		
Continue to allow sustainable hunting in parts of the conservation area.	No impacts.	No impacts.

6.8 Horse access		
Provide for controlled horse riding in the conservation area so as to minimise environmental damage and conflicts with other users.	No impacts.	No impacts.
6.9 Air access		
Allow the continued use of Balfour airstrip and to control other aircraft landings by permit.	No impacts.	No impacts.
6.10 Tourism		
Facilitate development of the regional economy through encouraging tourism based on and consistent with the maintenance of reserve values.	No impacts.	No impacts.
6.11 Interpretation and education		
Concentrate on developing a partnership with the Aboriginal community to develop strategies for revealing the richness of the Aboriginal heritage values in the reserve	No impacts.	No impacts.
Reveal through interpretation the richness of wilderness and National Estate values	No impacts.	No impacts.
Reveal through interpretation some of the richness of the European history of the area, particularly the association of the area with cattle grazing	No impacts.	No impacts.
Inform visitors of minimal impact practices and approaches to minimise adverse impact on other users	No impacts.	No impacts.
Interpret the geomorphic and biological diversity of the region	No impacts.	No impacts.
6.12 Enterprise unit		
Initiate an enterprise unit based on the implementation of a userpays system for the provision of common services in the Arthur– Pieman region and to oversee subsequent financial management.	No impacts.	No impacts.
Provide upgraded and enhanced visitor facilities through revenues generated	No impacts.	No impacts.
7.1 Community support		
Develop community appreciation of and support for reserve values;	No impacts.	No impacts.
Promote a positive image of the reserve and its benefit to the community	No impacts.	No impacts.

Involve the local and broader community in reserve management partnerships	No impacts.	No impacts.
7.2 Working with neighbours		
Take account of concerns of neighbours in managing the conservation area.	No impacts.	No impacts.
Encourage conservation and sound land management practices on lands adjoining the conservation area.	No impacts.	No impacts.
Co-ordinate protective works between the conservation area and surrounding land.	No impacts.	No impacts.
7.3 Management options & community involvement		
To achieve an appropriate level of public involvement in management of the conservation area consistent with the principles outlined above.	No impacts.	No impacts.
To achieve community ownership through involvement in policy development, planning and on ground management.	No impacts.	No impacts.
To increase the efficiency of management by encouraging community groups to take responsibility for managing their particular activities in the conservation area.	No impacts.	No impacts.
8.1 Monitoring and research		
Improve the inventory and understanding of natural features and processes;	No impacts.	No impacts.
Improve the inventory and understanding of cultural features;	No impacts.	No impacts.
Use the reserve as a scientific reference area;	No impacts.	No impacts.
Encourage socio-anthropological studies to understand the significance of the APCA to the north-west and Tasmanian community;	No impacts.	No impacts.
Monitor the natural rates and magnitudes of change;	No impacts.	No impacts.
Improve knowledge and understanding of visitor behaviour in the reserve;	No impacts.	No impacts.
Assess impacts of and long-term cumulative changes caused by development or use of the reserve;	No impacts.	No impacts.
Assess and improve management of the reserve.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated objectives of the Nadgee Nature Reserve Plan of Management (NSW National Parks and Wildlife Service, 2003)

The following information summarises the risk to the park from the spill scenarios.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	2% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management objectives of the park.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Protection of the reserve as a largely undisturbed sample of the landforms and plant and animal communities of the far south coast;	No impacts.	No impacts.
Maintenance of populations of the rare, threatened and biogeographically significant plant and animal species which occur in the reserve, and protection of rare vegetation types	No impacts.	No impacts.
Protection of high-water quality in the estuaries and elsewhere within the reserve	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Provision of opportunities for appropriate scientific research;	No impacts.	No impacts.
Provision of opportunities for low key day use in the northern section of the Nature Reserve and for self-reliant recreation under permit in the Wilderness Area	No impacts.	No impacts.
Promotion of community awareness of the significant conservation values of the reserve	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated objectives of the Small Bass Strait Island Reserves Management Plan (Parks and Wildlife Service, 2000)

The following Nature Reserves relevant to the activity are assessed under the Management Plan:

- *Rodondo Island; and*
- *Albatross Island;*

The following information summarises the risk to the parks from the spill scenario.

Islands:	**Rodondo Island**	**Albatross Island**
373 m^3 surface release of MDO over 6 hours		
Sea surface:	No contact.	No contact.
Dissolved hydrocarbons:	No contact.	No contact.
Entrained hydrocarbons:	7% probability of low threshold exposure.	4% probability of low threshold exposure.
Shoreline contact:	No contact.	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management objectives of the Plan.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conserve natural biological diversity	No impacts.	No impacts.
Conserve geological diversity	No impacts.	No impacts.
Preserve the quality of water and protect catchments	No impacts.	The OPEP takes into accounts risks to protected areas and prioritises actions to reduce the spread and extent of hydrocarbons.
Conserve sites or areas of cultural significance	No impacts.	No impacts.
Encourage education based on the purposes of reservation and the natural or cultural values of the nature reserve or both	No impacts.	No impacts.
Encourage research, particularly that which furthers the purposes of reservation	No impacts.	No impacts.
Protect the nature reserve against, and rehabilitate the nature reserve following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the nature reserve's natural and cultural values and on assets within and adjacent to the nature reserve	The EP contains control measures aimed to minimise the risk of introducing marine pests to Tasmanian waters.	No impacts.
Encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purposes of reservation and the other management	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Kent Group National Park (Terrestrial Portion) Management Plan (Parks and Wildlife Service Tasmania, 2005)

The following information summarises the risk to the park from the spill scenario.

373 m^3 surface release of MDO over 6 hours	
Sea surface:	No contact.
Dissolved hydrocarbons:	No contact.
Entrained hydrocarbons:	2% probability of low threshold exposure to entrained hydrocarbons 0-10 m below sea surface.
Shoreline contact:	No contact.

The table on the following pages provide an assessment of routine and non-routine operations against the management aims of the park.

Management Aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
2.1 Geodiversity		
Preserve and maintain sites of geoconservation significance and geodiversity.	No impacts.	No impacts.
2.2 Natural and Cultural Landscape Values		
Preserve a sense of a simple, lonely and isolated settlement focussed on the task of maritime safety.	No impacts.	No impacts.
2.4 Flora		
Conserve and maintain natural diversity and natural ecosystems.	No impacts.	No impacts.
2.5 Fauna		
Protect threatened fauna species and their habitat.	No impacts.	No impacts.
2.6 Aboriginal Heritage		
In cooperation with the Aboriginal community, protect and conserve Aboriginal heritage.	No impacts.	No impacts.
2.7 Historic Heritage		
Conserve the Deal Island Lightstation, protecting and conserving its conservation significance, with controlled adaption to encourage tenancy and viability.	No impacts.	No impacts.
Present and interpret historic heritage.	No impacts.	No impacts.
3.1 Fire Management		
Protect the historic assets.	No impacts.	No impacts.
3.2 Rehabilitation		
Prevent erosion and rehabilitate badly damaged areas.	No impacts.	No impacts.

3.3 Weeds and Diseases		
Control or eradicate weed species.	No impacts.	No impacts.
3.4 Introduced Fauna		
Eradicate introduced species where this is feasible and warranted by the damage being caused.	No impacts.	No impacts.
6.1 Management of the National Park		
Ensure any co-management partnership struck with the Crown is being conducted in a way that is consistent with this plan and the broader public interest.	No impacts.	No impacts.

Appendix 2

Assessment of activity against the objectives of Commonwealth-listed threatened species Conservation Advice and Recovery Plans in the spill EMBA

Assessment of the Sequoia MSS against the stated aims of the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPC, 2011)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the recovery plan.

Criteria to measure performance of the Plan against the objective	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Specific Objectives		
Research and monitoring of the biology, ecology and population dynamics of albatrosses and giant petrels breeding within Australian jurisdiction is sufficient to understand conservation status and to implement effective and efficient conservation measures.	No impacts.	No impacts.
Land-based threats to the survival and breeding success of albatrosses and giant petrels breeding within areas under Australian jurisdiction are quantified and reduced.	No impacts.	No impacts.
Marine-based threats to the survival and breeding success of albatrosses and giant petrels foraging in waters under Australian jurisdiction are quantified and reduced.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Fishers are educated and public awareness is raised on the threats to albatrosses and giant petrels.	No impacts.	No impacts.
Substantial involvement in the promotion and development of improved and, ultimately, favourable conservation status of albatrosses and giant petrels globally in international conservation and fishing fora is maintained.	No impacts.	No impacts.
Actions to achieve specific objectives		
Research and monitoring of the biology, ecology and population dynamics of albatrosses and giant petrels breeding within Australian jurisdiction is sufficient to understand conservation status and to implement effective and efficient conservation measures.	No impacts.	No impacts.

Quantify and reduce land-based threats to the survival and breeding parameters of albatrosses and giant petrels breeding within areas under Australian jurisdiction.	No impacts.	No impacts.
Quantify and reduce marine-based threats to the survival and breeding parameters of albatrosses and giant petrels foraging in waters under Australian jurisdiction.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Educate fishers and promote public awareness of the threats to albatrosses and giant-petrels.	No impacts.	No impacts.
Achieve substantial progress towards global conservation of albatrosses and giant petrels in international conservation and fishing fora.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Approved Conservation Advice for the Blue Petrel (*Halobaena caerulea*).
(TSSC, 2015)

The following table provides an assessment of routine and non-routine operations against the management aims of the conservation advice.

Stated management aims	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Conservation and Management Actions		
Continue to manage Macquarie Island and its surrounds in such a way that human disturbance is minimised.	No impacts.	No impacts.
Continue strict quarantine management practices for Macquarie Island to reduce the risk of any invasive species (re)establishing on the island.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Continue monitoring the species, and if decreases become evident in the population, identify potential causes and adapt management actions as required.	No impacts.	No impacts.
Include monitoring for blue petrels in monitoring programs occurring on Macquarie Island to detect any future breeding occurrences	No impacts.	No impacts.
Information and Research Priorities		
Monitor breeding population size and success on Macquarie Island offshore rock stacks.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Approved Conservation Advice for the Soft-plumaged petrel (*Pterodroma Mollis*) (TSSC, 2015)</u>

The following table provides an assessment of routine and non-routine operations against the management aims of the conservation advice.

Stated management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Continue to manage Maatsuyker and Macquarie Island in such a way that human disturbance is minimised.	No impacts.	No impacts.
Continue strict quarantine management practices for Maatsuyker and Macquarie Island to reduce the risk of any invasive species (re)establishing on the islands.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Continue to monitor population numbers on Maatsuyker Island.	No impacts.	No impacts.
Include monitoring for soft-plumaged petrels in monitoring programs occurring on Macquarie Island to detect any breeding occurrences.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Gould's Petrel (*Pterodroma leucoptera leucoptera)* Recovery Plan (DEC, 2006)

The following table provides an assessment of routine and non-routine operations against the management aims of the plan.

Stated objectives of the recovery plan	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
To identify and manage the threats operating at sites where the subspecies occur.	No impacts.	No impacts.
To establish and maintain a translocated second colony at Boondelbah Island.	No impacts.	No impacts.
To raise awareness of the subspecies with the local community and involve volunteers in the recovery program.	No impacts.	No impacts.
To promote research and continue monitoring that will assist with the management of the subspecies.	No impacts.	No impacts.
To co-ordinate recovery actions through a recovery team and annual reporting on Recovery Plan implementation.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Australian painted-snipe (*Rostratula australis*) (DSEWPC, 2013)</u>

The following table provides an assessment of routine and non-routine operations against the management aims of the conservation advice.

Regional Priority Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Habitat Loss, Disturbance and Modification		
Develop management guidelines for breeding and non-breeding habitat.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Ensure there is no disturbance in areas where the species is known to breed, excluding necessary actions to manage the conservation of the species.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Control access routes to suitably constrain public access to existing and future breeding sites on public land.	No impacts.	No impacts.
Suitably control and manage access on private land and other land tenure.	No impacts.	No impacts.
Minimise adverse impacts from land use at known sites.	No impacts.	No impacts.
Manage any changes to hydrology that may result in changes to water table levels, run-off, salinity, algal blooms, sedimentation or pollution.	No impacts.	No impacts.
Manage any disruptions to water flows.	No impacts.	No impacts.

Regional Priority Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate/secure inclusion in reserve tenure if possible.	No impacts.	No impacts.
Manage any other known, potential or emerging threats including inappropriate fire regimes and coastal port/infrastructure development.	No impacts.	No impacts.
Invasive Weeds		
Implement the Parkinsonia (*Parkinsonia aculeata*) Strategic Plan (Commonwealth of Australia, 2000) for the control of this species within the range of the Australian painted snipe.	No impacts.	No impacts.
Identify and remove weeds in wetland areas that could become a threat to the Australian painted snipe, using appropriate methods.	No impacts.	No impacts.
Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the Australian painted snipe	No impacts.	No impacts.
Trampling, Browsing or Grazing		
Develop and implement a stock management plan for roadside verges and travelling stock routes which include swamps, marshes or wetlands.	No impacts.	No impacts.
If livestock grazing occurs in known Australian painted snips habitats, ensure land owners/managers use an appropriate management regime and density that does not detrimentally affect Australian painted snipe nesting.	No impacts.	No impacts.
If appropriate, manage total grazing pressure at important breeding sites through exclusion fencing or other barriers.	No impacts.	No impacts.
Animal Predation or Competition		

Regional Priority Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Implement the national threat abatement plans for the European red fox (DEWHA, 2008a) and feral cats (DEWHA, 2008b) to control the adverse impacts of foxes (*Vulpes vulpes*) and cats (*Felis catus*) in the species' range.	No impacts.	No impacts.
Continue baiting to control population numbers of feral animals.	No impacts.	No impacts.
Fire		
Develop and implement a suitable fire management strategy for the habitat of the Australian painted snipe.	No impacts.	No impacts.
Conservation Information		
Raise awareness of the Australian painted snipe within the local community and the importance of reporting observations to BirdLife Australia, using fact sheets and/or brochures.	No impacts.	No impacts.
Advertise and encourage use of Australian painted snipe survey techniques and survey forms (Birds Australia, 2012).	No impacts.	No impacts.
Organise field days with industry and interest groups to raise awareness and share information on the species. These groups may include natural resource management groups, catchment management authorities, Indigenous groups, conservation organisations, local and state governments, and private landholders.	No impacts.	No impacts.
Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.	No impacts.	No impacts.
Raise awareness of banded individuals (see BirdLife Australia, 2012) to increase the likelihood of re-sighting and reporting.	No impacts.	No impacts.
Facilitate the exchange of information between interested parties, including sightings, research and management approaches.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Bar-tailed Godwit (northern Siberian) (*Limosa lapponica menzbieri*)
(TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the management aims of the conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites.	No impacts.	No impacts.
Protect important habitat in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Advocate for the creation and restoration of foraging and roosting sites.	No impacts.	No impacts.
Incorporate requirements for bar-tailed godwit (northern Siberian) into coastal planning and management.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
		prioritises action to control the spread and extent of hydrocarbons.
Manage important sites to identify, control and reduce the spread of invasive species.	The EP puts in place control measures to reduce the risk of biofouling and introduction of invasive marine species.	No impacts.
Manage disturbance at important sites which are subject to anthropogenic disturbance when bar-tailed godwit (northern Siberian) are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Survey and Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Information and Research Priorities		
Undertake work to more precisely assess bar-tailed godwit (northern Siberian) life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of bar-tailed godwit (northern Siberian) on key migratory staging sites, and non-breeding sites to the in south-east Asia.	No impacts.	No impacts.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Curlew Sandpiper (*Calidris ferruginea*) (DoE, 2016)

The following table provides an assessment of routine and non-routine operations against the management aims of this conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
International Objectives		
Achieve a stable or increasing population.	No impacts.	No impacts.
Maintain and enhance important habitat.	No impacts.	No impacts.
Disturbance at key roosting and feeding sites reduced.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Australian Objectives		
Achieve a stable or increasing population.	No impacts.	No impacts.
Maintain and enhance important habitat.	No impacts.	No impacts.
Disturbance at key roosting and feeding sites reduced.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Raise awareness of curlew sandpiper within the local community.	No impacts.	No impacts.
Conservation and Management Actions		

<table>
<tr><th>Conservation Actions</th><th>Assessment of impacts of routine activities against management aims</th><th>Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives</th></tr>
<tr><td>Work with governments along the East Asian – Australasian Flyway to prevent destruction of key migratory staging sites.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Support initiatives to protect and manage key staging sites of curlew sandpiper.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Manage important sites to identify, control and reduce the spread of invasive species.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Maintain and improve protection of roosting and feeding sites in Australia.</td><td>No impacts.</td><td rowspan="3">The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.</td></tr>
<tr><td>Incorporate requirements for curlew sandpiper into coastal planning and management.</td><td>No impacts.</td></tr>
<tr><td>Manage disturbance at important sites when curlew sandpipers are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary beach closures.</td><td>No impacts.</td></tr>
<tr><td colspan="3">Monitoring Priorities</td></tr>
<tr><td>Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td colspan="3">Information and Research Priorities</td></tr>
<tr><td>More precisely assess curlew sandpiper population size, distribution and ecological requirements particularly across northern Australia.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Improve knowledge about dependence of curlew sandpiper on key migratory staging sites, and wintering sites to the north of Australia.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Improve knowledge about threatening processes including the impacts of disturbance.</td><td>No impacts.</td><td>No impacts.</td></tr>
</table>

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Eastern Curlew (*Numenius madagascariensis*) (DoE, 2015)

The following table provides an assessment of routine and non-routine operations against the primary conservation objectives of the advice.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
International Objectives		
Achieve a stable or increasing population.	No impacts.	No impacts.
Maintain and enhance important habitat.	No impacts.	No impacts.
Reduce disturbance at key roosting and feeding sites.	No impacts.	No impacts.
Australian Objectives		
Achieve a stable or increasing population.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Maintain and enhance important habitat.	No impacts.	
Reduce disturbance at key roosting and feeding sites.	No impacts.	
Raise awareness of eastern curlew within the local community.	No impacts.	No impacts.
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key migratory staging sites.	No impacts.	No impacts.
Develop and implement an International Single Species Action Plan for eastern curlew with all range states.	No impacts.	No impacts.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
		prioritises action to control the spread and extent of hydrocarbons.
Incorporate requirements for eastern curlews into coastal planning and management.	No impacts.	No impacts.
Manage important sites to identify, control and reduce the spread of invasive species.	No impacts.	No impacts.
Manage disturbance at important sites when eastern curlews are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia	No impacts.	No impacts.
Information and Research Priorities		
More precisely assess eastern curlew life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of eastern curlew on key migratory staging sites, and wintering sites to the north of Australia.	No impacts.	No impacts.
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Eastern Curlew (*Numenius madagascariensis*) (DoE, 2015)

The following table provides an assessment of routine and non-routine operations against the primary conservation objectives of the advice.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
International Objectives		
Achieve a stable or increasing population.	No impacts.	No impacts.
Maintain and enhance important habitat.	No impacts.	No impacts.
Reduce disturbance at key roosting and feeding sites.	No impacts.	No impacts.
Australian Objectives		
Achieve a stable or increasing population.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Maintain and enhance important habitat.	No impacts.	
Reduce disturbance at key roosting and feeding sites.	No impacts.	
Raise awareness of eastern curlew within the local community.	No impacts.	No impacts.
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key migratory staging sites.	No impacts.	No impacts.
Develop and implement an International Single Species Action Plan for eastern curlew with all range states.	No impacts.	No impacts.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
		prioritises action to control the spread and extent of hydrocarbons.
Incorporate requirements for eastern curlews into coastal planning and management.	No impacts.	No impacts.
Manage important sites to identify, control and reduce the spread of invasive species.	No impacts.	No impacts.
Manage disturbance at important sites when eastern curlews are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia	No impacts.	No impacts.
Information and Research Priorities		
More precisely assess eastern curlew life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of eastern curlew on key migratory staging sites, and wintering sites to the north of Australia.	No impacts.	No impacts.
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Southern Fairy Prion (*Pachyptila tutur subantarctica*) (TSSC, 2015)</u>

The following table provides an assessment of routine and non-routine operations against the management aims of this conservation advice.

Conservations Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Continue to manage Macquarie Island and its surrounds in such a way that human disturbance is minimised.	No impacts.	No impacts.
Continue strict quarantine management practices for Macquarie Island and surrounding rock stacks to reduce the risk of any invasive species (re)establishing on the island.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Continue to monitor the species, and if decreases become evident in the population, identify potential causes and adapt management actions as required.	No impacts.	No impacts.
Information and Research Priorities		
Continue to monitor breeding population size and success on Macquarie Island offshore rock stacks, including Bishop and Clerk Islands.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Fairy Tern (*Sternula nereis nereis*) (DSEWPC, 2011)

The following table provides an assessment of routine and non-routine operations against the management aims of the conservation advice.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Regional Priority Actions		
Habitat Loss, Disturbance and Modification		
Monitor the progress of recovery (using a variety of methods such as survey and banding programs, video surveillance of breeding colonies and maintaining a central breeding and sightings database), including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Identify populations of high conservation priority.	No impacts.	No impacts.
Manage any changes to hydrology that may result in changes to tide levels, increase salinity or pollution.	No impacts.	No impacts.
Manage any disruptions to water flows in wetland areas such as the Coorong in South Australia.	No impacts.	No impacts.
Introduce recreational codes of conduct and license commercial tourism operations utilising the subspecies' habitat.	No impacts.	No impacts.
Animal Predation or Competition		
Develop and implement a management plan for the control or eradication of foxes, dogs, cats and Black Rats where the species is found.	No impacts.	No impacts.
Establish programs to discourage gulls (such as Silver Gulls) competing with Fairy Terns. Examples of activities could include: education programs to raise awareness of the problems of feeding gulls and; minimising night time lighting from oil and gas rigs near the subspecies' habitat to reduce night time feeding opportunities for Silver Gulls.	No impacts.	No impacts.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Local Priority Actions		
Habitat Loss, Disturbance and Modification		
Use nest protection measures to safeguard nests from extreme weather/tides, including sandbagging and nest relocation.	No impacts.	No impacts.
Control access routes to suitably constrain public access to known sites on public and private land.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons. The impacts related to coastal oil spill clean-up activities will be carefully managed to avoid feeding, roosting or nesting birds.
Reduce disturbance during the breeding season from human recreation such as the use of off road vehicles and predation by domestic dogs, using signage and/ or fencing where appropriate. The use of signage can restrict access to the site as well as raise awareness of the sites ecological importance.	No impacts.	
Ensure appropriate oil-spill contingency plans are in place for the subspecies' breeding sites which are vulnerable to oil spills, such as the breeding colonies in Victoria.	No impacts.	
Weed Control		
Remove weeds which could become a threat to the Fairy Tern, using appropriate methods outside the breeding season.	No impacts.	No impacts.
Manage sites to prevent introduction of invasive weeds, which could become a threat to the Fairy Tern, using appropriate methods.	No impacts.	No impacts.
Animal Predation		
Control introduced pests such as foxes, dogs, cats and Black Rats, using a variety of methods such as trapping and 1080 baiting.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Great Knot (*Calidris tenuirstris*) (TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites.	No impacts.	No impacts.
Protect important habitat in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Advocate for the creation and restoration of foraging and roosting sites.	No impacts.	No impacts.
Incorporate requirements for great knot into coastal planning and management.	No impacts.	The OPEP takes into account beaches of importance to

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
		coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Manage important sites to identify, control and reduce the spread of invasive species.	The EP puts in place control measures to reduce the risk of biofouling and introduction of invasive marine species.	No impacts.
Manage disturbance at important sites which are subject to anthropogenic disturbance when great knots are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Survey and Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Information and Research Priorities		
Undertake work to more precisely assess great knot life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of great knot on key migratory staging sites, and non-breeding sites to the in south-east Asia.	No impacts.	No impacts.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Greater Sand Plover (*Charadrius leschenaultii*) (TSSC, 2016)</u>

The following table provides an assessment of routine and non-routine operations against the conservation actions of the conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites.	No impacts.	No impacts.
Protect important habitat in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Advocate for the creation and restoration of foraging and roosting sites.	No impacts.	No impacts.
Incorporate requirements for greater sand plover into coastal planning and management.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
		spread and extent of hydrocarbons.
Manage important sites to identify, control and reduce the spread of invasive species.	The EP puts in place control measures to reduce the risk of biofouling and introduction of invasive marine species.	No impacts.
Manage disturbance at important sites which are subject to anthropogenic disturbance when greater sand plovers are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Survey and Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Information and Research Priorities		
Undertake work to more precisely assess greater sand plover life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of greater sand plover on key migratory staging sites, and non-breeding sites to the in south-east Asia.	No impacts.	No impacts.
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Hooded Plover (*Thinornis rubricollis rubricollis)* (DoE, 2014)

The following table provides an assessment of routine and non-routine operations against the recovery and impact avoidance guidance of this conservation advice.

Recovery and Impact avoidance guidance	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Primary Conservation Objectives		
1. Achieve stable numbers of adults in the population, and maintain a stable number of occupied and active breeding territories.	No impacts.	No impacts.
2. Improve breeding success, namely increase fledgling rates (which is a combination of improving egg and chick survival rates), via: a. reducing the destruction of nests and chicks, and the disturbance of breeding pairs, by human and human-related activities. b. reducing predation by feral animals and overabundant native predators.	No impacts.	No impacts.
3. Maintain, enhance and restore habitat, and integrate the subspecies' needs into coastal planning.	No impacts.	No impacts.
Information and Research Priorities		
1. Determine demographic trends including population size, breeding success, and status and trends in breeding populations.	No impacts.	No impacts.
2. Determine levels of nest predation and breeding success, in areas with and without predator and stock control programs.	No impacts.	No impacts.
3. Identify the causes of chick mortality, and factors which may mediate chick survival rates.	No impacts.	No impacts.
4. Identify habitat availability and risk of habitat loss due to weed invasion, rising sea levels and dune morphology changes, via:	No impacts.	No impacts.

Recovery and Impact avoidance guidance	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
a) incorporating coastal weed mapping data into a single data set. b) utilising SmartLine for all population assessments; this maps coastal geomorphology and can indicate areas of coasts which are vulnerable to erosion and other weather/climate impacts. c) integrating coastal weed, geomorphology and hooded plover (eastern) nesting territory data, in order to provide an assessment of threats from invasive weeds and erosion.		
5. For each breeding site/beach, assess the relative impacts of different threats and the likelihood of threat management measures being successful, so that beaches can be prioritised for management.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
6. Monitor the breeding and abundance of hooded plovers on an ongoing basis, ensuring that survey methods and data reporting are standardised as much as possible.	No impacts.	No impacts.
7. Undertake a population viability analysis to set breeding success targets for recovery programs.	No impacts.	No impacts.
Management Actions Required		
1. Manage the use of (and access to) key beaches for recreation when plovers are breeding – e.g. discourage or prohibit vehicle access, horse riding and dogs from beaches; implement temporary beach closures; erect fencing to prevent people entering.	No impacts.	No impacts.
2. Adequately police beaches to ensure compliance with regulations, especially those relating to dog walking, and undertake a review of existing regulations to assess whether there is room for improvement.	No impacts.	No impacts.

Recovery and Impact avoidance guidance	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
3. Educate the public in research, monitoring, management and advocacy efforts.	No impacts.	No impacts.
4. Incorporate requirements for the hooded plover into coastal planning and management, and erosion control activities, including: a) limiting levels of urban development within the coastal zone. b) adopting evidence-based best practice. c) consulting with relevant state and local government departments, research organisations, and community organisations.	No impacts.	No impacts.
5. Construct fencing to prevent livestock entering beaches.	No impacts.	No impacts.
6. Implement predator control programs for invasive species where necessary.	No impacts.	No impacts.
7. Evaluate the efficacy of management techniques such as the use of chick shelters, predator controls, mechanisms to alter human behaviour on beaches, habitat restoration and maintenance, and identify areas for improvement.	No impacts.	No impacts.
8. Further develop methods for reducing or controlling rates of colonisation by invasive plants and rehabilitating dunes colonised by invasive plants, and establish trials to recover habitat degraded by marram grass (*Ammophila arenaria*).	No impacts.	No impacts.
9. Prepare oil spill response plans to ensure effective rehabilitation of oiled birds.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons. The impacts related to coastal oil spill clean-up activities will be carefully managed to avoid feeding, roosting or nesting birds.

Recovery and Impact avoidance guidance	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
10. Reduce in-shore marine debris, including educating fishers and the public to properly dispose of fishing lines.	No impacts.	No impacts.
11. As a last resort, investigate control options for native predators such as ravens, magpies, currawongs and silver gulls, if their impacts are threatening a population and human activities cannot be sufficiently reduced to mitigate their impacts.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Lesser Sand Plover (*Charadrius mongolus*) (TSSC, 2016)</u>

The following table provides an assessment of routine and non-routine operations against the conservation actions of this conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key breeding and migratory staging sites.	No impacts.	No impacts.
Protect important habitat in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Advocate for the creation and restoration of foraging and roosting sites.	No impacts.	No impacts.
Incorporate requirements for lesser sand plover into coastal planning and management.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Manage important sites to identify, control and reduce the spread of invasive species.	The EP puts in place control measures to reduce the risk of biofouling and introduction of invasive marine species.	No impacts.
Manage disturbance at important sites which are subject to anthropogenic disturbance when lesser sand plovers are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Survey and Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia.	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.
Information and Research Priorities		
Undertake work to more precisely assess lesser sand plover life history, population size, distribution and ecological requirements particularly across northern Australia.	No impacts.	No impacts.
Improve knowledge about dependence of greater sand plover on key migratory staging sites, and non-breeding sites to the in south-east Asia.	No impacts.	No impacts.
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the National Recovery Plan for the Orange-bellied Parrot (*Neophema chrysogaster*) (DELWP, 2016)</u>

The following table provides an assessment of routine and non-routine operations against the primary conservation objectives of the plan.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
To achieve a stable or increasing population in the wild within five years.		
Increase breeding output in the wild.	No impacts.	No impacts.
Increase survival in the wild.	No impacts.	No impacts.
Maintain wild behaviours.	No impacts.	No impacts.
To increase the capacity of the captive population, both to support future releases of captive-bred birds to the wild and to provide a secure long-term insurance population.		
Increase the size of the captive population as quickly as possible.	No impacts.	No impacts.
Manage genetics of the captive population.	No impacts.	No impacts.
Manage the wild and captive populations as a metapopulation.	No impacts.	No impacts.
To protect and enhance habitat to maintain, and support growth of, the wild population.		
Maintain the extent of habitat throughout the breeding and non-breeding range.	No impacts.	No impacts.
Increase the extent of high quality of habitat throughout the breeding and nonbreeding range.	No impacts.	No impacts.
To ensure effective adaptive implementation of the plan.		
Obtain and analyse key information required to measure and improve implementation to achieve the primary objectives.	No impacts.	No impacts.
Employ sound procedures for managing, reviewing and reporting on progress to ensure effective adaptive management.	No impacts.	No impacts.
Secure delivery partners and sufficient funding to ensure very high and high priority actions are implemented.	No impacts.	No impacts.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Foster and maintain relationships with key individuals, organisations and the broader community.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Red Knot (*Calidris canutus*) (TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Work with governments along the East Asian – Australasian Flyway to prevent destruction of key migratory staging sites.	No impacts.	No impacts.
Protect important habitat in Australia.	No impacts.	No impacts.
Support initiatives to improve habitat management at key sites.	No impacts.	No impacts.
Maintain and improve protection of roosting and feeding sites in Australia.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.
Incorporate requirements for red knot into coastal planning and management.	No impacts.	
Advocate for the creation and restoration of foraging and roosting sites in Australia.	No impacts.	No impacts.
Manage important sites to identify, control and reduce the spread of invasive species.	No impacts.	No impacts.
Manage disturbance at important sites which are subject to anthropogenic disturbance when red knot are present – e.g. discourage or prohibit vehicle access, horse riding and dogs on beaches, implement temporary site closures.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Enhance existing migratory shorebird population monitoring programmes, particularly to improve coverage across northern Australia	No impacts.	No impacts.
Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.	No impacts.	No impacts.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Information and Research Priorities		
Undertake work to more precisely assess red knot life history, population size, distribution and ecological requirements.	No impacts.	No impacts.
Improve knowledge about dependence of red knot on key migratory staging sites, and nonbreeding sites in south-east Asia.	No impacts.	No impacts.
Improve knowledge about threatening processes including the impacts of disturbance and hunting.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Swift Parrot (*Lathamus discolor*) (TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the conservation objectives of the conservation advice.

Primary Conservation Objectives	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Conservation and Management Priorities		
Review and update management prescriptions for swift parrots for use in the Forest Practices System and Local Government land use planning and approvals processes across the breeding and non-breeding range of swift parrots.	No impacts.	No impacts.
Revise and update forestry prescriptions to reflect the most recent habitat information available in Victoria and New South Wales.	No impacts.	No impacts.
Develop and implement strategies to reduce predation from sugar gliders when circumstances require.	No impacts.	No impacts.
Consider installing nesting boxes suitable for swift parrots in areas of low sugar glider predation to enhance swift parrot breeding success	No impacts.	No impacts.
Continue to raise public awareness of the risks of collisions and how these can be minimised, targeting known high risk areas such as the greater Hobart, Melbourne and Western Sydney areas, and the central coast region of New South Wales (Wyong, Gosford, Lake Macquarie and Penrith Local Government areas).	No impacts.	No impacts.
Encourage and support the protection, conservation management and restoration of swift parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects.	No impacts.	No impacts.
Develop and implement a Disease Risk Assessment for swift parrots.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Develop an effective population monitoring program.	No impacts.	No impacts.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Undertake monitoring of breeding locations on an annual basis to develop a better understanding of breeding success; the extent and number of important breeding areas; and the relative importance of non-aggregated breeding behaviour.	No impacts.	No impacts.
Establish a process for the coordination of volunteer surveys throughout breeding habitats to complement the existing mainland monitoring program.	No impacts.	No impacts.
Maintain coordination of the existing long-term volunteer monitoring throughout mainland habitats.	No impacts.	No impacts.
Information and Research Priorities		
Prioritise conservation actions across the species range.	No impacts.	No impacts.
Identify and map movement patterns and foraging and nesting habitat throughout the breeding range.	No impacts.	No impacts.
Establish habitat phenology data collection in existing research and monitoring studies, analyse findings and incorporate into the recovery program.	No impacts.	No impacts.
Establish and maintain a database for all reported injuries and deaths.	No impacts.	No impacts.
Monitor the incidence of competition from aggressive honeyeaters, as well as introduced birds and invertebrates, for nesting and foraging resources.	No impacts.	No impacts.
Undertake research on breeding success, survival and mortality, as well as genetic structure, to provide insight into currently unknown population regulation parameters.	No impacts.	No impacts.
Update the PVA using data obtained from the above research to provide a greater understanding of the dynamics and long-term viability of the population.	No impacts.	No impacts.
Investigate the potential impact of climate change on the swift parrot and its habitat.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Management Plan for the Blue Whale (*Balaenoptera musculus*) 2015-2025 (DoE, 2015)

The following table provides an assessment of routine and non-routine operations against the conservation objectives of the plan.

Primary Conservation Objectives	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Interim Recovery Objectives		
The conservation status of blue whale populations is assessed using cost effective and robust methodology.	No impacts.	No impacts.
The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described.	No impacts.	No impacts.
Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place.	No impacts.	No impacts.
Anthropogenic threats are demonstrably minimised.	Mitigation measures relevant to the blue whale are listed in the EP.	Mitigation measures relevant to the blue whale are listed in the EP.
Assess and Address Threats		
Maintain and improve existing legal and management protection.	No impacts.	No impacts.
Assess and addressing anthropogenic noise.	EPBC Act Policy 2.1 requirements will be implemented during the activity. The survey design considers the presence of blue whales. Other mitigation measures relevant to the blue whale are listed in the EP.	No impacts.
Understand impacts of climate variability and change.	No impacts.	No impacts.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Minimise vessel collisions.	Vessel collision guidelines are implemented.	Vessel collision guidelines will be implemented.
Enable and Measure Recovery		
Measure and monitor population recovery.	No impacts.	No impacts.
Investigate population structure.	No impacts.	No impacts.
Describe spatial and temporal distribution and define biologically important habitat.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Advice for the Humpback Whale (*Megaptera novaeangliae*) (TSSC, 2015)

The following table provides an assessment of routine and non-routine operations against the conservation and management actions of the conservation advice.

Conservation and Management Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Maintain and improve existing legal and management protection		
Continue or improve existing legislative management actions under the EPBC Act, including the Australian Whale Sanctuary provisions.	No impacts.	No impacts.
Australia should maintain its position on promoting high levels of protection for humpback whales in all relevant international agreements including the IWC, Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Convention on the Conservation of Migratory Species of Wild Animals (CMS), fisheries related agreements, and the Antarctic Treaty Consultative Meetings (ATCM).	No impacts.	No impacts.
Understanding impacts of climate variability and change		
Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica.	No impacts.	No impacts.
Assessing and addressing anthropogenic noise; shipping, industrial and seismic surveys		
All seismic surveys must be undertaken consistently with the EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales. Should a survey be undertaken in or near a calving, resting, foraging area, or a confined migratory pathway then Part B. Additional Management Procedures must also be applied.	No impacts.	No impacts.
For actions involving acoustic impacts (example pile driving, explosives) on humpback whale calving, resting, feeding areas, or confined migratory pathways site specific acoustic modelling should be undertaken (including cumulative noise impacts).	EPBC Act Policy 2.1 requirements will be	No impacts.

Conservation and Management Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Should acoustic impacts on humpback calving, resting, foraging areas, or confined migratory pathways be identified a noise management plan should be developed.	implemented during the activity.	No impacts.
Addressing infrastructure and coastal development impacts		
Environmental assessment processes must ensure that existing information about coastal habitat requirements of humpback whales, environmental suitability of coastal locations, historic high use and emerging areas are taken into consideration.	The EP takes into consideration the existing information regarding humpback whales.	No impacts.
Environmental assessment and approval processes must ensure that the impacts of coastal development on humpback whales are addressed and minimised. Mitigation and management measures for the construction stage and the ongoing operational impacts are to be included in any plans of management. Significant residual impacts must be offset.	No impacts.	No impacts.
Reducing commercial fishing entanglements		
Commonwealth and state governments with the pot and set net fishing industries to develop and implement codes of conduct to minimise interactions between commercial fishers and humpback whales.	No impacts.	No impacts.
Investigate alternative fishing techniques and technologies to reduce the risk of entanglement.	No impacts.	No impacts.
Minimising vessel collisions		
Develop a national vessel strike strategy that investigates the risk of vessel strikes on humpback whales and also identifies potential mitigation measures to reduce the risk of collision.	No impacts.	No impacts.
Maximise the likelihood that all vessel strike incidents are reported in the National Ship Strike Database. All cetaceans are protected in Commonwealth waters and, the EPBC Act requires that all collisions with whales in Commonwealth waters are reported.	Vessel collision guidelines are implemented.	Vessel collision guidelines are implemented.

Conservation and Management Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Vessel collisions can be submitted to the National Ship Strike Database at https://data.marinemammals.gov.au/report/shipstrike		
Ensure the risk of vessel strike on humpback whales is considered when assessing actions that increase vessel traffic in areas where humpback whales occur and, if required appropriate mitigation measures are implemented to reduce the risk of vessel strike.	Vessel collision guidelines are implemented.	Vessel collision guidelines are implemented.
Enhance education programs to inform vessel operators of best practice behaviours and regulations for interacting with humpback whales.	No impacts.	No impacts.
Measuring and monitoring population recovery		
Continue long-term monitoring of east and west coast populations at appropriate multi-annual intervals to quantify rates of population increase, abundance, migratory interchange and population structure	No impacts.	No impacts.
Information and research priorities		
Assess impacts of increasing anthropogenic threats and undertake a risk assessment to determine the increased exposure of these expanding populations to entanglement, ship strike and acoustic noise.	EPBC Act Policy 2.1 requirements will be implemented during the activity. The survey design considers the presence of humpback whales. Other mitigation measures relevant to the blue whale are listed in the EP.	No impacts.
Expand genetic analyses to better define population structure and extent of interchange between subpopulations. In particular the genetic structure of the east coast population and interchange with Pacific humpback whale populations.	No impacts.	No impacts.

Conservation and Management Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Assess the impact of whale watching on humpback whales detailing the benefits and negatives of human interactions and the potential for cumulative impacts on the species as they migrate along the coast.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Conservation Management Plan for the Southern Right Whale (*Eubalaena australis*) 2011-2021 (DSEWPC, 2012)

The following table provides an assessment of routine and non-routine operations against the primary conservation objectives of the plan.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Interim Recovery Objectives		
Demonstrate that the number of southern right whales occurring off south-west Australia (nominally south-west Australian population) is increasing at or near the maximum biological rate.	No impacts.	No impacts.
Demonstrate that the number of southern right whales occurring off south-east Australia (nominally south-east Australian population) is showing signs of increase.	No impacts.	No impacts.
The nature and degree of difference between the south-eastern and south-western Australian populations of southern right whales is clearly understood.	No impacts.	No impacts.
Current levels of legal and management protection for southern right whales are maintained or improved and an appropriate adaptive management regime is in place.	No impacts.	No impacts.
Anthropogenic threats are demonstrably minimised.	Mitigation measures relevant to the southern right whale are listed in the EP.	Mitigation measures relevant to the southern right whale are listed in the EP.
Assess and Address Threats		
Maintain and improve existing legal and management protection.	No impacts.	No impacts.
Assess and address anthropogenic noise (shipping, industrial and seismic).	EPBC Act Policy 2.1 requirements will be implemented during the activity.	No impacts.

Primary Conservation Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Reduce commercial fishing entanglements.	No impacts.	No impacts.
Impacts of climate variability and change.	No impacts.	No impacts.
Address vessel collisions.	Vessel collision guidelines are implemented.	Vessel collision guidelines will be implemented.
Address infrastructure and coastal development impacts.	No impacts.	No impacts.
Measure Recovery		
Measure and monitor population recovery	No impacts.	No impacts.
Investigate the two-population model	No impacts.	No impacts.
Understand offshore distribution and migration	No impacts.	No impacts.
Characterise behaviour and movements	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Approved Conservation Advice for the Fin Whale (*Balaenoptera physalus*) (TSSC, 2015)

The following table provides an assessment of routine and non-routine operations against the management aims of the plan.

Stated management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Continue or improve existing legislative management actions under the Environment Protection and Biodiversity Act 1999, including the Australian Whale Sanctuary provisions.	No impacts.	No impacts.
Australia should maintain its position on promoting high levels of protection for Fin whales in all relevant international agreements including the International Whaling Commission (IWC), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Convention on the Conservation of Migratory Species of Wild Animals (CMS), fisheries related agreements, and the Antarctic Treaty Consultative Meetings (ATCM).	No impacts.	No impacts.
Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica.	No impacts.	No impacts.
Once the spatial and temporal distribution (including biologically important areas) of fin whales is further defined an assessment of the impacts of increasing anthropogenic noise (including from seismic surveys, port expansion, and coastal development) should be undertaken on this species.	EPBC Act Policy 2.1 requirements will be implemented during the activity.	No impacts.
If required, additional management measures should be developed and implemented to ensure the ongoing recovery of Fin whales.	No impacts.	No impacts.
Develop a national vessel strike strategy that investigates the risk of vessel strikes on Fin Whales and also identifies potential mitigation measures.	No impacts.	No impacts.
Ensure all vessel strike incidents are reported in the National Vessel Strike Database.	Vessel collision guidelines are implemented.	Vessel collision guidelines are implemented.

Stated management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Information and Research Priorities		
Determine population abundance, trends and population structure for Fin whales, and establish a long-term monitoring program in Australian waters.	No impacts.	No impacts.
Describe the spatial and temporal distribution of Fin Whales and further define biologically important areas (feeding and breeding), and migratory routes within Australian and Antarctic waters.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the Approved Conservation Advice for the Sei Whale (*Balaenoptera borealis*) (TSSC, 2015)</u>

The following table provides an assessment of routine and non-routine operations against the management aims of the plan.

Management aims	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Conservation and Management Actions		
Continue or improve existing legislative management actions under the Environment Protection and Biodiversity Act 1999, including the Australian Whale Sanctuary provisions.	No impacts.	No impacts.
Australia should maintain its position on promoting high levels of protection for sei whales in all relevant international agreements including the International Whaling Commission (IWC), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Convention on the Conservation of Migratory Species of Wild Animals (CMS), fisheries related agreements, and the Antarctic Treaty Consultative Meetings (ATCM).	No impacts.	No impacts.
Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica.	No impacts.	No impacts.
Once the spatial and temporal distribution (including biologically important areas) of sei whales is further defined an assessment of the impacts of increasing anthropogenic noise (including from seismic surveys, port expansion, and coastal development) should be undertaken on this species.	EPBC Act Policy 2.1 requirements will be implemented during the activity.	No impacts.
If required, additional management measures should be developed and implemented to ensure the ongoing recovery of sei whales.	No impacts.	No impacts.
Develop a national vessel strike strategy that investigates the risk of vessel strikes on Sei Whales and also identifies potential mitigation measures.	No impacts.	No impacts.
Ensure all vessel strike incidents are reported in the National Vessel Strike Database.	Vessel collision guidelines are implemented.	Vessel collision guidelines are implemented.

Management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Information and Research Priorities		
Determine population abundance, trends and population structure for sei whales, and establish a long-term monitoring program in Australian waters.	No impacts.	No impacts.
Describe the spatial and temporal distribution of Sei Whales and further define biologically important areas (feeding and breeding), and migratory routes within Australian and Antarctic waters.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Approved Conservation Advice for the Subantarctic fur seal (*Arctocephalus tropicalis*) (TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the plan.

Management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Active Mitigation of Threats		
Continue high levels of protection for subantarctic fur-seals in important breeding, foraging and haul-out sites. Ensure Macquarie Island/Heard Island management and fisheries management plans include reference to seal monitoring and protection.	No impact.	No impact.
Continue, and where necessary adapt, management actions to reduce disturbance and pollution/marine debris impacts on subantarctic fur-seals and their important breeding, resting and foraging habitats.	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impact.
Improve data collection and reporting of fisheries interactions throughout the seals' foraging ranges. Including improving species identification; expanding data collected by observers (photos/samples from mortalities); utilising deep sea observation systems (e.g. cameras) to observe underwater interactions.	No impact.	No impact.
Survey and Monitoring Priorities		
Resume long-term annual monitoring at Macquarie Island, and prioritise surveys of the population at Heard Island, to better quantify abundance, pup production and population trends, movements, hybridisation rates and population structure.	No impact.	No impact.
Expand surveys to better define the finescale distribution and breeding interactions among species, population and annual pup abundance, and movements of individuals.	No impact.	No impact.
Investigate new survey technologies (e.g. use of drones) that may provide an opportunity to increase knowledge of population data on remote islands (taking into account local weather conditions).	No impact.	No impact.
Information and Research Priorities		

Management aims	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Improve understanding of the potential for climate and oceanographic change, and associated seawater temperature rises, to affect fur-seal food resources and reproductive success	No impact.	No impact.
Improve understanding of the potential risks of fisheries interactions, and potential prey depletion to affect the recovery and growth rates of populations. This should include analysis of logbook data and any reported interactions between Macquarie Island/Heard Island fisheries and seals.	No impact.	No impact.
Assess the impacts of disturbance, pollution and associated risks of disease on the health status of subantarctic fur seals.	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impact.
Analyse the occurrence and characteristics of marine debris (including micro-plastics) on remote sub-Antarctic islands and associated impacts on seal species.	No impact.	No impact.
Assess the effectiveness of fisheries closures near colonies and other management actions in reducing potential impacts of fisheries on these fur-seals.	No impact.	No impact.
Expand genetic research to monitor changes in hybridisation rates and gene flow through immigration, in order to identify the extent to which populations might be partially maintained by extralimital populations.	No impact.	No impact.
Improve understanding of diet, foraging ecology, and life history parameters (including predation on pup cohort) controlling population growth, and determine the generation length for Australian populations.	No impact.	No impact.
Expand research to better understand key foraging habitats for subantarctic fur-seals and potential changes resulting from increased sea surface temperatures.	No impact.	No impact.
Investigate the efficacy of using remote survey techniques such as satellite imagery for census counts on remote islands	No impact.	No impact.

Assessment of the Sequoia MSS against the stated actions of the Conservation Advice for the Southern Elephant Seal (*Mirounga leonine*) (TSSC, 2016c)

The following table provides an assessment of routine and non-routine operations against the management actions of the advice.

Management actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Continue high levels of protection for the southern elephant seal in important breeding, foraging and haul-out sites. Ensure Macquarie Island/Heard Island management plans include reference to monitoring and protection for the species.	No impacts.	No impacts.
Continue, and where necessary adapt, management actions to reduce disturbance and pollution/marine debris impacts on southern elephant seals and their important breeding, foraging and resting habitats	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impacts.
Improve data collection and reporting of fisheries interactions (including entanglements) throughout the southern elephant seals' foraging ranges. This could incorporate improving species identification; expanding data collected by observers (photos/samples from mortalities); utilising deep-sea observation systems (e.g. cameras) to observe underwater interactions.	No impacts.	No impacts.
Continue long-term population and demographic monitoring at Macquarie Island, and prioritise surveys of the population at Heard Island, to better quantify current abundance, pup production, movements and population trends	No impacts.	No impacts.
Expand surveys to better define distribution patterns and movements of individuals between breeding colonies and key foraging areas and potential dispersal to Antarctica and other subantarctic islands	No impacts.	No impacts.
Investigate new survey technologies (e.g. use of drones) that may provide an opportunity to increase knowledge of population data on remote islands (taking into account local weather conditions).	No impacts.	No impacts.
Improve knowledge of climate and oceanographic variability, including El Niño events, that affect southern elephant seal foraging and reproductive success.	No impacts.	No impacts.

Improve understanding of the potential risks of fisheries interactions with the species. Including analysis of logbook data and any reported interactions between Macquarie Island/Heard Island fisheries and southern elephant seals.	No impacts.	No impacts.
Assess the impacts of disturbance, pollution and associated risks of disease on the health status of southern elephant seals.	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impacts.
Analysis of the occurrence and characteristics of marine debris (including micro-plastics) on remote sub-Antarctic islands and associated impacts on southern elephant seals.	No impacts.	No impacts.
Assess the effectiveness of fisheries management and monitoring in reducing potential impacts of fisheries on southern elephant seals	No impacts.	No impacts.
Expand research to better understand key foraging areas for southern elephant seals and changes resulting from climate and oceanographic variability and El Niño events	No impacts.	No impacts.
Improve understanding of diet and foraging ecology, and improve understanding of life history parameters controlling population growth and determine generation time for the Heard Island population of southern elephant seals	No impacts.	No impacts.
Investigate the efficacy of using remote survey techniques such as satellite imagery for census counts on remote islands	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Recovery Plan for the Australian Sea-lion (*Neophoca cinerea*) (TSSC, 2016)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the conservation advice.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Implement appropriate management measures (monitoring, management response, compliance and review), such that incidental bycatch in the gillnet sector of the following commercial fisheries does not threaten any colony or sub-population of Australian sea lion: • The Gillnet, Hook and Trap sector of the SESSF. • The South Australian Marine Scalefish Fishery. • The West Coast Demersal Gillnet and Demersal Longline (interim) Managed Fishery. • The Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery.	No impacts.	No impacts.
Implement appropriate management measures (monitoring, management response, compliance and review) in the South Australian Rock Lobster Fishery and Western Australian Rock Lobster Fishery such that incidental bycatch does not threaten any colony or sub-population of Australian sea lion.	No impacts.	No impacts.
Implement management controls in other fisheries (commercial, recreational and Indigenous) that have impacts on Australian sea lions by: • Identifying any impacting fisheries. • Implementing mitigation strategies for impacts on Australian sea lions in those fisheries where necessary.	No impacts.	No impacts.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Monitor the cumulative impact of fisheries on Australian sea lions including: • bycatch • prey depletion • restriction in habitat availability • entanglement in active (not discarded) fishing gear.	No impacts.	No impacts.
Identify the sources of marine debris having an impact on Australian sea lion populations	No impacts.	No impacts.
Assess the impacts of marine debris on Australian sea lion populations	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impacts.
Develop and implement measures to mitigate the impacts of marine debris on Australian sea lion populations, noting the linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life.	The EP contains control measures aimed to minimise the risk of pollution and litter to waters.	No impacts.
Investigate the nature, extent and consequence of interactions between Australian sea lions and aquaculture activities and mitigate any impacts (e.g. restrictions in habitat availability).	No impacts.	No impacts.
Improve the understanding of—and where necessary mitigate—the threat posed to Australian sea lion populations by illegal killings, vessel strike, pollution and oil spills. Actions to include: • Develop protocols for collection of biological samples and ensure that a portion of each sample (including those already collected) is centrally archived. • Collect data on direct killings and confirmed vessel strikes.	No impacts.	The OPEP takes into account beaches of importance to coastal bird species and prioritises action to control the spread and extent of hydrocarbons.

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
• Implement jurisdictional oil spill response strategies as required.		
Improve understanding of the threat and importance of health related factors to Australian sea lion populations by: • developing protocols for collection of biological samples and ensuring that a portion of each sample (including those already collected) is centrally archived • undertaking research to better understand pup mortality due to disease and the variance between seasons and colonies • undertaking research on the effect of providing a broad spectrum treatment to kill parasites and whether this affects pup mortality • analysing the impacts of the bioaccumulation of toxins on the health of Australian sea lions.	No impacts.	No impacts.
Develop and implement measures to mitigate the impact of any significant factors affecting the health of Australian sea lion populations.	No impacts.	No impacts.
Monitor and mitigate cumulative impacts of human interactions on Australian sea lion colonies.	No impacts.	No impacts.
Develop and provide information for tourists and tourism operators to promote an understanding of Australian sea lion conservation issues and to emphasise the importance of minimising disturbance of Australian sea lion colonies during visits.	No impacts.	No impacts.
Develop and apply a quantitative framework to assess the population status and potential recovery of the Australian sea lion across its range. • Ensure sufficient and effective abundance and distribution monitoring is in place to adequately understand population size and trends at representative sites across the range of the Australian sea lion, including at the fringes of the species' range.	No impacts.	No impacts.

<table>
<tr><th>Conservation Actions</th><th>Assessment of impacts of routine activities against management aims</th><th>Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives</th></tr>
<tr><td>Assess and facilitate the continuation of population demographic surveys at Seal Bay in South Australia.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Improve the information base on behavioural ecology, trophic interactions and foraging ecology — particularly in areas important to the survival of the species — and at scales relevant to human activities that can be managed. Actions include:
improve knowledge of foraging range at a colony level to help determine the spatial overlap with commercial fisheries
better determine the key ecological characteristics of preferred foraging sites
determine the drivers for variance in pup production and mortality across seasons (including apparent seasonal cycles)
undertake dive and tracking studies in Western Australia to help determine specific foraging patterns and requirements.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Improve the information base on population structures of the Australian sea lion. This should include finer scale structuring, utilising genetic techniques and morphological studies, where data of such scale might improve practical management options. Actions include:
opportunistically undertaking further research on population structure. Using genetic techniques on current and opportunistically gathered biological material to determine the extent of male and female dispersal
using genetic and morphological data to determine any sub-speciation of Australian sea lion populations throughout their range.</td><td>No impacts.</td><td>No impacts.</td></tr>
<tr><td>Improve understanding of juvenile dispersal and foraging behaviours by:
undertaking research on juvenile (2–4 year olds) dispersal and foraging patterns</td><td>No impacts.</td><td>No impacts.</td></tr>
</table>

Conservation Actions	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
• assessing dive depths of juveniles, with a focus on assessing the need to include Australian sea lion exclusion spikes on pots in deep water (> 20 m).		
Assess the indirect impacts of fishing on Australian sea lion populations by conducting research. Research should include: • determining the impact of fishing on prey species of Australian sea lions • assessing the impact of fishing gear on preferred habitat of Australian sea lions.	No impacts.	No impacts.
Provide advice, education and support to fishers, community members, local governments and regional natural resource management organisations by measures including: • ensuring that the Recovery Plan for the Australian Sea Lion is publicly available in electronic format • ensuring online information regarding the recovery plan is relevant and up-to-date • promoting the recovery plan to target groups, such as commercial and recreational fishers and tour group operators • conducting presentations and workshops, where appropriate • involving community groups and tour operators in research and monitoring programs, where practical.	No impacts.	No impacts.
Consult relevant Indigenous organisations within the species' range regarding the implementation of the Recovery Plan for the Australian Sea Lion.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Recovery Plan for Marine Turtles in Australia (DoEE, 2017).

The following table provides an assessment of routine and non-routine operations against the management targets of the plan.

Conservation management targets	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Domestic and international legislation and other agreements that support the recovery of Australian marine turtles are maintained, and, where possible, strengthened.	No impacts.	No impacts.
Robust scientific information is available and used to support decision making.	No impacts.	No impacts.
The sustainable management of marine turtles by Aboriginal and Torres Strait Islander communities and ranger groups to maintain long-term cultural, spiritual and economic associations with marine turtles is supported.	No impacts.	No impacts.
The capacity of programs throughout northern Australia to conduct effective monitoring, management and research of marine turtles at nesting beaches and feeding grounds is maintained and increased.	No impacts.	No impacts.
Robust and adaptive management regimes that lead to a reduction in anthropogenic threats to marine turtles and their habitats are in place.	No impacts.	No impacts.
Threat mitigation strategies are supported by high quality information.	No impacts.	No impacts.
Effective monitoring programs are implemented and maintained at index beaches and foraging areas for each of the six species.	No impacts.	No impacts.
Measures of success identified for each stock are achieved within the life of the plan.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated management actions of the Recovery Plan for the Grey Nurse Shark (*Carcharias Taurus*) (DoE, 2014)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the plan.

Management Objectives	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
1. Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters.		
Monitor and re-survey grey nurse shark populations to assess population trends and dynamics, including estimates of population growth and mortality.	No impact.	No impact.
Develop monitoring protocols and establish a national database to record data collected on grey nurse sharks, to assist with population monitoring.	No impact.	No impact.
Evaluate the use of and develop new population models, using reliable data sets as they are collected, to reassess changes in extinction risks.	No impact.	No impact.
2. Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.		
Monitor the bycatch and mortality of grey nurse sharks in relevant fisheries (all interactions are recorded) and report annually to DoE.	No impact.	No impact.
Ensure that fisheries management plans/ strategies or other documentation reviewed for accreditation under the EPBC Act contain actions consistent with the recovery of the grey nurse shark (where relevant), including reduction of bycatch and recording of all interactions.	No impact.	No impact.
Conduct research to quantify post-release mortality rates of grey nurse sharks caught incidentally in commercial fisheries.	No impact.	No impact.
Ensure appropriate controls are implemented in important habitat sites to reduce the risk of grey nurse shark interaction with commercial fishing gear.	No impact.	No impact.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Identify and classify commercial fishing gear that has, or could potentially, interact with grey nurse sharks to inform the development of management arrangements to mitigate interactions.	No impact.	No impact.
3. Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.		
Develop mechanisms and protocols that facilitate reporting by recreational fishers of interactions with grey nurse sharks. Mechanisms chosen should foster the understanding that any reported interaction will be received without prejudice.	No impact.	No impact.
Encourage recreational fishers (and spear fishers) to utilise the sighting program to report and provide, where possible, photographic evidence of sightings and interactions with grey nurse sharks. Requested information from fishers should include estimated number, size and weight of sharks, as well as site location and depth.	No impact.	No impact.
Undertake research into grey nurse shark interactions with recreational fishing gear/ methods to inform the development of risk mitigation strategies such as spatial, temporal or methods-based restrictions.	No impact.	No impact.
Quantify (through monitoring, reports and, where necessary, estimations of grey nurse shark bycatch) mortality and non-lethal interactions in recreational fishing sectors and report annually to DoE.	No impact.	No impact.
4. Where practicable, minimise the impact of shark control activities on the grey nurse shark.		
Shark control programs to continue to report catches annually to the state governments.	No impact.	No impact.
Maintain review processes by state governments of the effect of shark control programs on the grey nurse shark.	No impact.	No impact.
Continue to evaluate alternatives to shark meshing/drumlining, where bycatch levels are high, including the use of non-lethal methods or alternate strategies.	No impact.	No impact.

Management Objectives	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Establish and implement uniform minimum standards for the continued biological, pathological, genetic, toxicological and other post-mortem data recording and sampling of grey nurse sharks caught in shark control programs, using well established protocols. Develop a national database to collect this information (link to action 4.1).	No impact.	No impact.
Develop a photo-tagging program for grey nurse sharks caught and released in shark control programs, in conjunction with existing programs.	No impact.	No impact.
5. Investigate and manage the impact of ecotourism on the grey nurse shark.		
Review and assess the effectiveness of voluntary and regulated diving arrangements, in relation to viewing grey nurse sharks in their natural habitat, to ensure associated impacts continue to be minimised. Promote a consistent approach, where possible, among sites and across jurisdictions.	No impact.	No impact.
Ensure that any new, non-scuba diving related tourist operations aimed at viewing grey nurse sharks have effective management arrangements to minimise impacts.	No impact.	No impact.
6. Manage the impact of aquarium collection on the grey nurse shark.		
Moratorium on the removal of grey nurse sharks from the wild.	No impact.	No impact.
Ensure consistent management protocols are developed and put in place for all existing captive grey nurse shark programs to ensure individuals are appropriately managed. Determine whether it is feasible and appropriate for management protocols to enable captive breeding and investigate survivorship in captivity, to maintain a sustainable captive population without further collection from the wild.	No impact.	No impact.
Develop and contribute to conservation-oriented education programs in those commercial aquaria with captive grey nurse sharks on display.	No impact.	No impact.
7. Improve understanding of the threat of pollution and disease to the grey nurse shark.		

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Review and assess the potential threat of introduced species, pathogens and pollutants. Work undertaken under this action should be linked to action 4.4 on grey nurse shark post-mortem data recording and sampling.	No impact.	No impact.
8. Continue to identify and protect habitat critical to the survival of the grey nurse shark and reduce the impact of threatening processes in these areas.		
Continue research to locate habitat critical to the survival of the grey nurse shark, including pupping, nursery and foraging areas.	No impact.	No impact.
Review the level and spatial extent of protection measures at key aggregation sites to ensure appropriate levels of protection, and a consistent approach to the designation and implementation of protective measures, are applied.	No impact.	No impact.
Use Biologically Important Areas (BIA) to help inform the development of appropriate conservation measures, including through the application of advice in the marine bioregional plans on the types of actions which are likely to have a significant impact on the species and updating such conservation measures as new information becomes available.	No impact.	No impact.
Update and refine information on existing biologically important areas (BIAs) identified as part of the marine bioregional plans, and seek to identify new BIAs as information from research and other processes becomes available.	No impact.	No impact.
Monitor grey nurse shark occupancy and utilisation of key aggregation sites.	No impact.	No impact.
9. Continue to develop and implement research programs to support the conservation of the grey nurse shark.		
Collect, analyse and disseminate age, growth, reproduction, survival, mortality and diet information to further improve understanding of the population dynamics and habitat requirements of the grey nurse shark.	No impact.	No impact.
Continue to collect and analyse biological material for toxicology research and genetic analysis (for example to determine the stock structure, inbreeding depression,	No impact.	No impact.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
population boundaries and abundance), improve coordination of reporting and sampling programs and coordinate the collation of results and the storage of collected genetic, biological and toxicological material (Link to Action 7.1).		
Examine habitat use, ontogeny and regional connectivity across life history stages through the use of tagging technologies, including acoustic listening station networks, satellite tagging and photo identification.	No impact.	No impact.
10. Promote community education and awareness in relation to grey nurse shark conservation and management.		
Update DoE's grey nurse shark recovery plan web page to reflect the most current information on the grey nurse shark. Ensure the web page is presented in a form that is easily understood by the public and is linked to the relevant website(s) of other jurisdictions with an interest in conservation of grey nurse sharks.	No impact.	No impact.
Strengthen awareness of, and encourage compliance with, the requirement to report grey nurse shark bycatch and mortality in commercial fisheries and recreational and charter fishing operations.	No impact.	No impact.
Assess and evaluate effectiveness of prior or current education and awareness programs to identify alternative methods or improve efficacy.	No impact.	No impact.
Encourage community involvement in collaborative research, monitoring and education.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated management actions of the Approved Conservation Advice for the Black rockcod (*Epinephelus daemelii*) (DSEWPC, 2012)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the plan.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Research Priorities		
Research into the reproductive biology of black cod.	No impact.	No impact.
Research into the ecology and movements of larval and juvenile black cod.	No impact.	No impact.
Coordinated regular assessments of numbers and trends in black cod populations along the NSW coastline, including surveys for juveniles in areas where adult black cod are currently absent.	No impact.	No impact.
Further research into the relative impacts of by-catch of black cod by commercial fishers and recreational line fishers, including release of specimens suffering barotrauma.	No impact.	No impact.
Research into the extent of illegal fishing, particularly spearfishing.	No impact.	No impact.
Collection and analysis of more samples to confirm genetic connectivity between black cod populations along the NSW coastline and Elizabeth and Middleton Reefs.	No impact.	No impact.
Conservation and Recovery		
Monitor known black cod populations to identify key threats.	No impact.	No impact.
Monitor the progress of recovery in black cod numbers, including the effectiveness of management actions and the need to adapt them if necessary.	No impact.	No impact.
Increase enforcement of fishing regulations.	No impact.	No impact.

Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Increase monitoring of Marine Protected Areas where black cod occur.	No impact.	No impact.
Consider a complete closure to fishing in the Elizabeth and Middleton Reefs Marine National Nature Reserve to protect the high conservation value black cod populations that occurs there.	No impact.	No impact.
Implement protocols that ensure that illegally caught black cod that are seized by authorities, and are not releasable, are utilised for research into the species' biology, particularly age and sexual maturity.	No impact.	No impact.
Erect information signs, with colour illustrations of black cod and information on how to release fish, in locations where incidental captures of juvenile or adult black cod regularly occur.	No impact.	No impact.
Conservation Information		
Raise awareness of black cod within the local community and particularly fishing groups.	No impact.	No impact.

Assessment of the Sequoia MSS against the stated management actions of the Approved Conservation Advice for the Whale shark (*Rhincodon typus*) (TSSC, 2015)

The following table provides an assessment of routine and non-routine operations against the conservation actions of the plan.

Management Action	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Conservation and Management Actions		
Minimise offshore developments and transit time of large vessels in areas close to marine features likely to correlate with whale shark aggregations (Ningaloo Reef, Christmas Island and the Coral Sea) and along the northward migration route that follows the northern Western Australian coastline along the 200 m isobath (as set out in the Conservation Values Atlas, DotE, 2014).	No impacts.	No impacts.
Management of all domestic tourism industry interactions with whale sharks in accordance with the Western Australian 'Whale Shark Management with particular reference to Ningaloo Reef' Wildlife Management Program No. 57.	No impacts.	No impacts.
Continued advocacy of threat mitigation actions for whale sharks in international fora including, but not limited to, regional fishery management organisations.	No impacts.	No impacts.
Support for the development of eco-tourism industries in areas where traditional hunting of whale sharks occurs.	No impacts.	No impacts.
Survey and Monitoring Priorities		
Monitoring of the Ningaloo Reef, Christmas Island and Coral Sea aggregations, and collation and dissemination of data to support analysis of population trajectory.	No impacts.	No impacts.
Habitat critical to the survival of whale sharks in waters off Christmas Island further assessed and mapped.	No impacts.	No impacts.
Further research on migration routes for whale sharks from Ningaloo Reef to Christmas Island.	No impacts.	No impacts.
Information and Research Priorities		

Management Action	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Develop greater scientific certainty around migration, habitat use, emerging threats, and population trends in Australian waters.	No impacts.	No impacts.
Assess the impacts of offshore installations and associated environmental changes (light spill, chronic noise, changed water temperature, localised nutrient levels) on whale sharks and mitigation options for these impacts.	No impacts.	No impacts.
Conduct further research into the impacts of boat strike on whale sharks to determine the significance of the threat. Consider possible mitigation actions (collision avoidance systems) if required.	No impacts.	No impacts.
Assess environmental variables that determine whale shark presence. These can then be used to provide advice to shipping to help avoid boat strike.	No impacts.	No impacts.
Consider the implications of climate change on whale shark distribution in Australian waters (possibly through the Range Extension Database Mapping Project [REDMAP]).	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated management actions of the National Recovery Plan for the Australian Grayling (*Prototroctes maraena*)</u>

<u>(TSSC, 2015)</u>

The following table provides an assessment of routine and non-routine operations against the conservation actions of the plan.

Management Action	**Assessment of impacts of routine activities against management aims**	**Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives**
Identify important populations of Australian grayling.	No impacts.	No impacts.
Protect and restore habitat for Australian grayling.	No impacts.	No impacts.
Investigate important life history attributes t acquire targeted information for management.	No impacts.	No impacts.
Investigate and manage threats to populations and habitats.	No impacts.	No impacts.
Increase awareness of Australian grayling conservation with resource managers and the public.	No impacts.	No impacts.

<u>Assessment of the Sequoia MSS against the stated aims of the National Recovery Plan for the Dwarf Galaxias (*Galaxiella pusilla*) (DSE, 2010)</u>

The following table provides an assessment of routine and non-routine operations against the management aims of the plan.

Primary conservation objectives of the National Recovery Plan	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Determine the distribution and abundance of the Dwarf Galaxias.	No impacts.	No impacts.
Determine the genetic and taxonomic status of Dwarf Galaxias populations.	No impacts.	No impacts.
Determine Dwarf Galaxias habitat characteristics and requirements.	No impacts.	No impacts.
Identify and manage potentially threatening processes impacting on Dwarf galaxias conservation.	No impacts.	No impacts.
Protect key populations across the range of the Dwarf galaxias.	No impacts.	No impacts.
Determine population trends at key sights.	No impacts.	No impacts.
Investigate key aspects of biology and ecology of the Dwarf galaxias.	No impacts.	No impacts.
Establish a captive breeding population of Dwarf galaxias.	No impacts.	No impacts.
Establish new populations of Dwarf galaxias.	No impacts.	No impacts.
Increase awareness and involvement.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the National Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPC, 2013)

The following table provides an assessment of routine and non-routine operations against the primary conservation objectives of the plan.

Conservation and Management Objectives	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Develop and apply quantitative measures to assess population trends and any recovery of the white shark in Australian waters and monitor population trends.	No impacts.	No impacts.
Quantify and minimise the impact of commercial fishing, including aquaculture, on the white shark through incidental (illegal and/or accidental) take, throughout its range in Australian waters.	No impacts.	No impacts.
Quantify and minimise the impact of recreational fishing on the white shark through incidental (illegal and/or accidental) take, throughout its range in Australian waters.	No impacts.	No impacts.
Where practicable, minimise the impact of shark control activities on the white shark.	No impacts.	No impacts.
Investigate and manage (and where necessary reduce) the impact of tourism on the white shark.	No impacts.	No impacts.
Quantify and minimise the impact of international trade in white shark products through implementation of CITES provisions.	No impacts.	No impacts.
Continue to identify and protect habitat critical to the survival of the white shark and minimise the impact of threatening processes within these areas.	No impacts.	No impacts.
Continue to develop and implement relevant research programs to support the conservation of the white shark.	No impacts.	No impacts.
Promote community education and awareness in relation to white shark conservation and management.	No impacts.	No impacts.
Encourage the development of regional partnerships to enhance the conservation and management of the white shark across national and international jurisdictions.	No impacts.	No impacts.

Assessment of the Sequoia MSS against the stated aims of the Recovery Plan for Three Handfish Species (DoE, 2015).

Note: Only the spotted handfish (Brachionichthys hirsutus) and Ziebell's handfish (Brachiopsilus ziebelli) are relevant to the activity. The red handfish ( ) has not been recorded in database searches for the activity.

The following table provides an assessment of routine and non-routine operations against the management targets of the advice.

Conservation management targets	Assessment of impacts of routine activities against management aims	Assessment of impacts of Level 2 or 3 hydrocarbon spill against objectives
Improve knowledge of spotted handfish spawning triggers.	No impacts.	No impacts.
Consider options for improving the spawning success of red and Ziebell's handfish.	No impacts.	No impacts.
Assess the effects of artificial spawning habitat on spotted handfish reproductive output.	No impacts.	No impacts.
Design and implement a long-term artificial spawning habitat program and deploy artificial spawning habitat at additional sites to increase the spawning success of spotted handfish.	No impacts.	No impacts.
Develop appropriate decision support tools and species-specific referral guidelines for coastal/marine developments.	No impacts.	No impacts.
Assess red and Ziebell's handfish for listing under the *Tasmanian Threatened Species Protection* Act	No impacts.	No impacts.
Design and implement a program to reduce the impacts of traditional boat moorings on spotted handfish habitat.	No impacts.	No impacts.
Conduct a public awareness campaign on environmental impacts of traditional boat moorings.	No impacts.	No impacts.
Develop Population Response Models for all handfish species.	No impacts.	No impacts.
Design a conservation breeding strategy for spotted handfish.	No impacts.	No impacts.

Implement the conservation breeding strategy for spotted handfish.	No impacts.	No impacts.
Build a photographic database to identify individual fish observed for all handfish species.	No impacts.	No impacts.
Increase understanding of population dynamics (pop size, age/size classes, dispersal rate) for all handfish species.	No impacts.	No impacts.
Conduct surveys within the known, likely and historical ranges of all handfish species to improve knowledge of the current distribution of each species.	No impacts.	No impacts.
Design an ongoing monitoring program for all handfish species.	No impacts.	No impacts.
Conduct regular, ongoing monitoring to determine population trends, at all known and newly identified sites, for all handfish species.	No impacts.	No impacts.
Develop methods for assessing habitat integrity for all handfish species	No impacts.	No impacts.
Map available habitat and identify threats to habitat for all handfish species.	No impacts.	No impacts.
Improve understanding of potential threats impacting upon survival of all handfish species.	No impacts.	No impacts.
Consider options for improving habitat quality, mitigating key threats, or increasing protection within known habitat for all handfish species.	No impacts.	No impacts.
Support current work to improve water quality in the Derwent Estuary.	No impacts.	No impacts.
Encourage future investigation into potential control options for invasive Northern Pacific seastars (*A. amurensis*).	No impacts.	No impacts.
Develop and implement a broad strategy to raise awareness and educate the general public about conservation for all handfish species.	No impacts.	No impacts.
Develop and implement a targeted strategy to promote the use of citizen science in relation to conservation for all handfish species.	No impacts.	No impacts.

Appendix 3

Stakeholder correspondence

(provided to NOPSEMA separately as sensitive information under Regulation 9(8) of the OPGGS(E))

Appendix 4

Stakeholder flyers

Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00001

Project Summary | August 2020

ConocoPhillips Australia is planning to undertake a three-dimensional (3D) marine seismic survey (the Sequoia 3D seismic survey) in Exploration Permit T/49P to enable assessment of the natural gas reservoirs in the eastern offshore Otway Basin. The permit is located in waters west of Tasmania's King Island.

In order to undertake the seismic survey, ConocoPhillips Australia is required to submit an Environment Plan (EP) to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment. Only once NOPSEMA has accepted the EP can the seismic survey commence. It is anticipated that the seismic survey will be acquired in 2021. ConocoPhillips Australia has an 80 percent interest and operatorship of T/49P though a farmout agreement with 3D Oil Limited.

About ConocoPhillips

ConocoPhillips is a global exploration and production company with operations and activities in 17 countries. We explore for, develop and produce crude oil and natural gas. A commitment to safety, operating excellence and environmental stewardship guide our operations.

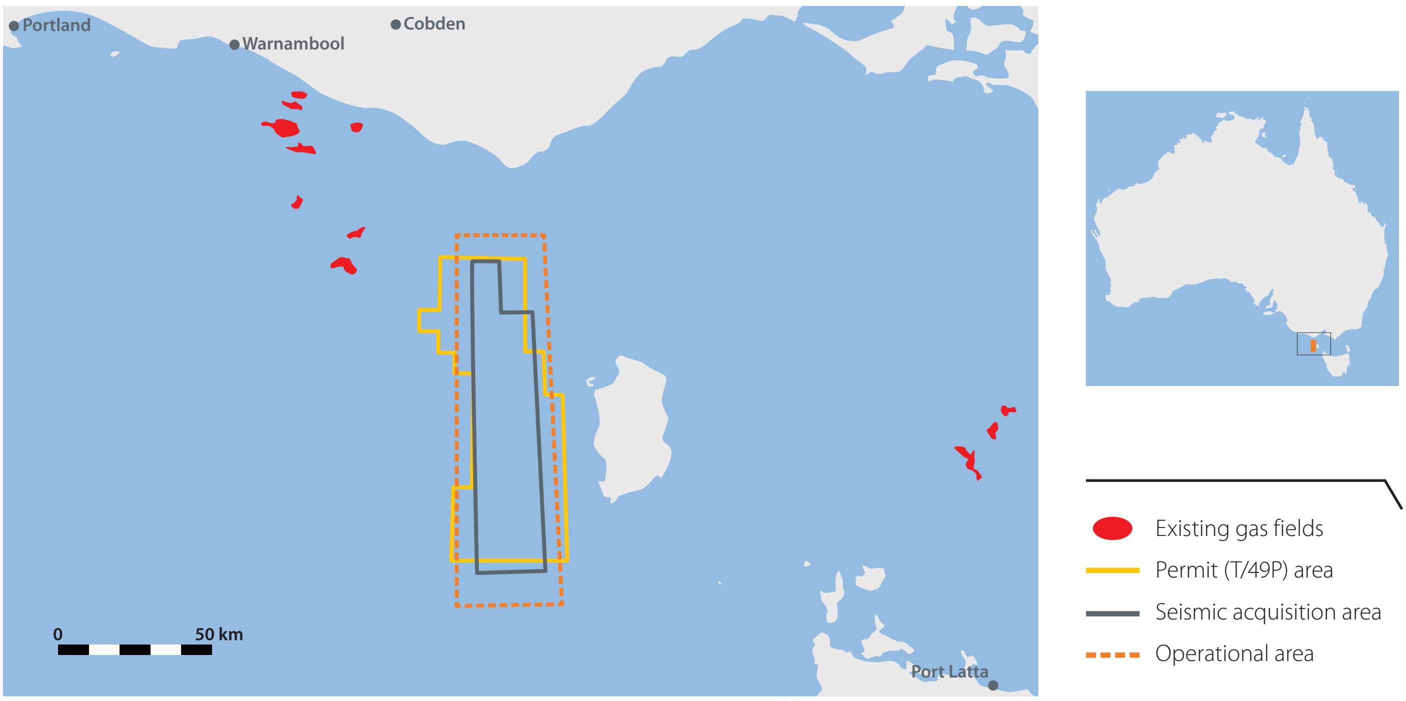
Delivering resources safely around the globe

17
Countries with operations and activities

ConocoPhillips Australia was established almost two decades ago. Headquartered in Brisbane, Queensland, we are a 37.5 percent shareholder in Australia Pacific LNG and operate the LNG facility on Curtis Island. We are also pursuing exploration opportunities in Australia. We have a proud track record for safety and environmental performance and draw from a global knowledge set to explore for, develop and produce oil and gas for our domestic and global customers.

Location

The permit T/49P is in the eastern offshore Otway Basin, 14 km (7.5 nm) west of King Island at its closest point. While the permit covers an area of 4,960 km^2, the proposed Sequoia 3D seismic survey will cover an area of approximately 2,840km^2 with a total operational area of approximately 6,500 km^2.



Sequoia 3D Seismic Survey

ConocoPhillips

Timing

It is anticipated the survey will take approximately 60 days and be carried out in the second half of 2021. The timing of the survey will be confirmed after consultation with stakeholders, appropriate regulatory approvals are received and confirmation of vessel availability. ConocoPhillips Australia is cognisant of the approved EP that 3D Oil Limited obtained in 2019 for its proposed Dorrigo seismic survey, and will incorporate learnings from that approvals process when determining the window of opportunity to acquire the survey that balances ecological and socio-economic sensitivities.

How

ConocoPhillips Australia intends to use ConocoPhillips' proprietary Compressive Seismic Imaging (CSI) technology to acquire the Sequoia 3D seismic survey. CSI technology acquires a clearer resolution of rock formations below the Earth's surface from fewer samples.

A 3D marine seismic survey using CSI technology is undertaken in a similar way to a conventionally acquired 3D marine seismic survey. A seismic survey vessel will tow an acoustic source and hydrophone receivers. The acoustic source transmits sound waves into the geological structures beneath the seabed, which reflect the sound signals to the hydrophone receivers.

The acoustic source transmits these sound waves at points identified using the CSI technology along each grid line. Once acquired, high performance computing is used to process the data which is then analysed by geophysicists to create a 3D map of the subsea structures to identify potential natural gas reservoirs.

Consultation

ConocoPhillips Australia understands the importance of thorough, meaningful and ongoing consultation with stakeholders. We undertake stakeholder engagement under a set of guiding principles as part of the way we do business as well as meet our regulatory commitments. Initial consultation will enable us to understand different stakeholder opinions, interests and activities that may be relevant, or need to be taken into account when preparing the EP and designing controls to avoid, minimise or mitigate for impacts and risks.

Stakeholder consultation and feedback will be a key element alongside technical and environmental assessments as the EP is prepared for submission.

This flyer introduces you to ConocoPhillips Australia and the Sequoia 3D seismic survey. Additional information will be provided as the survey design progresses.

Please note that under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, all records of stakeholder correspondence, including emails, phone calls and meetings, are required to be submitted to NOPSEMA with the EP.

COVID-19 travel restrictions

The global COVID-19 pandemic and associated travel restrictions will impact ConocoPhillips Australia's ability to undertake face-to-face consultation for the foreseeable future. Whilst travelling to undertake face-to-face consultation is not currently possible, ConocoPhillips Australia still intends to undertake virtual engagement during this time. As restrictions ease, face-to-face consultation will be used.

Contact us

ConocoPhillips Australia seeks to understand different stakeholder opinions, interests and activities that may be relevant, or need to be taken into account when preparing the EP for the Sequoia 3D seismic survey. You are invited to provide feedback, request a meeting and ask questions on the proposed Sequoia 3D seismic survey by contacting us in one of the following ways:

E sequoia@conocophillips.com

P 07 3182 7122

conocophillips.com.au

Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00002

Proposed Survey Area Summary | September 2020

To progress the development of the Environment Plan, ConocoPhillips Australia has refined the area of the proposed Sequoia 3D marine seismic survey in Exploration Permit T/49P. The area is compromised of an operational area and a seismic acquisition area.

Operational Area

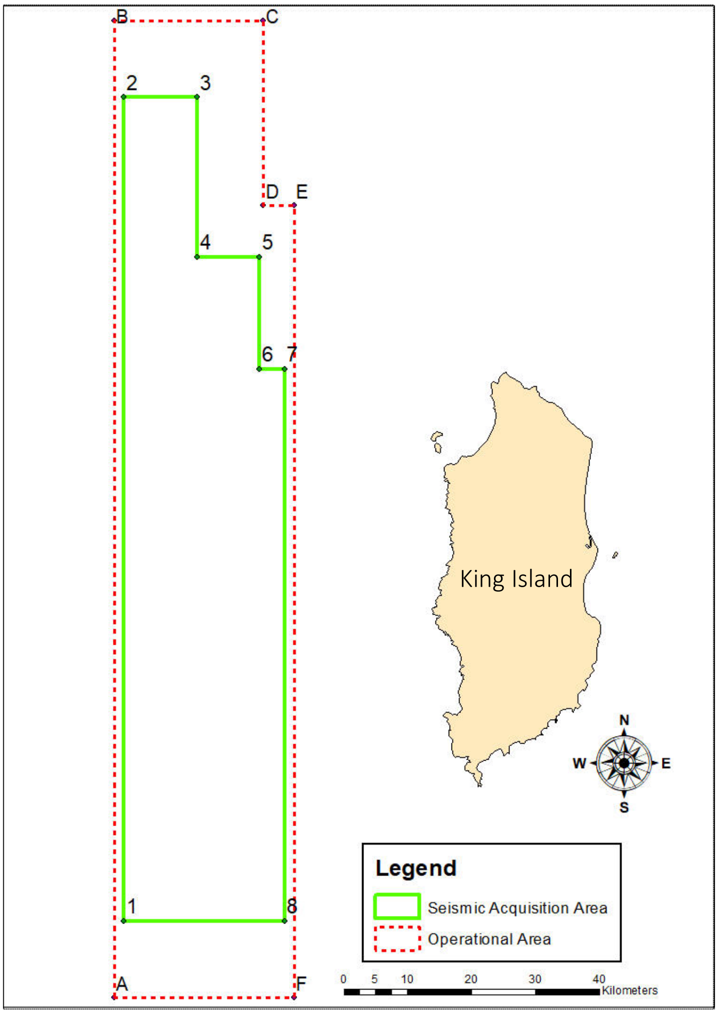
The operational area is the outer boundary of where the seismic vessel will operate and is required for activities such as vessel turnaround.Unless there is an emergency, the seismic vessel will remain within this area during the seismic program.

Seismic Acquisition Area

The seismic acquisition area is the area where seismic will be acquired. Seismic sources and receivers will only be active in this area.

Vertex	Latitude (D,M,S)	Longitude (D,M,S)
Operational Area		
A	40° 28' 31.82" S	143° 15' 54.00" E
B	39° 05' 52.85" S	143° 13' 12.91" E
C	39° 05' 33.17" S	143° 29' 26.23" E
D	39° 21' 09.79" S	143° 29' 59.41" E
E	39° 21' 06.07" S	143° 32' 50.56" E
F	40° 28' 07.30" S	143° 35' 20.83" E
Seismic Acquisition Area		
1	40° 22' 1.68" S	143° 16' 44.52" E
2	39° 12' 20.64" S	143° 14' 27.64" E
3	39° 12' 11.14" S	143° 22' 26.74" E
4	39° 25' 41.42" S	143° 22' 54.19" E
5	39° 25' 32.86" S	143° 29' 42.47" E
6	39° 35' 1.96" S	143° 30' 2.85" E
7	39° 34' 58.38" S	143° 32' 47.44" E
8	40° 21' 39.26" S	143° 34' 32.05" E

GDA94, MGA Zone 54



Contact Us

You are invited to contact us regarding the Sequoia 3D seismic survey in one of the following ways.

E sequoia@conocophillips.com P 07 3182 7122 www.conocophillips.com.au

Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00003

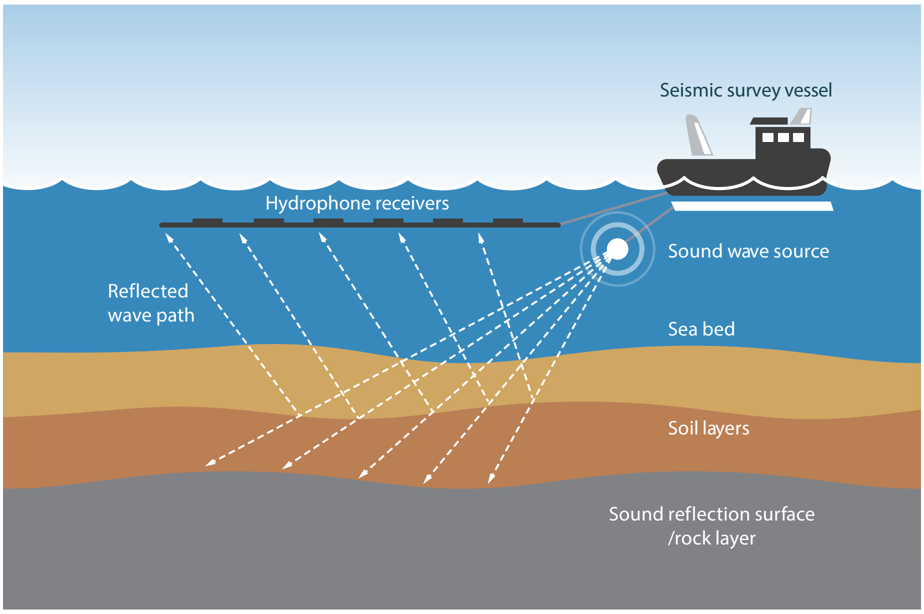
How we will undertake a 3D seismic survey | September 2020

ConocoPhillips Australia is planning to undertake a three-dimensional (3D) marine seismic survey (the Sequoia 3D seismic survey) in Exploration Permit T/49P in waters 14km (7.5nm) west of Tasmania's King Island. The survey will use ConocoPhillips' proprietary Compressive Seismic Imaging (CSI) Technology which acquires similar information to conventional seismic but with fewer samples and in less time.

Marine seismic surveys

A marine seismic survey is used for initial exploration for oil and gas and is essential for identifying geological features that could contain oil or gas deposits. A seismic survey vessel will tow an acoustic source and hydrophone receivers with the vessel sending sound waves into the rock layers beneath the sea floor and recording the time it takes for each wave to bounce back, as well as measuring the strength of each returning wave.

Once acquired, high performance computing is used to process the data which is then analysed by geophysicists to create a 3D map of the subsea structures to identify potential natural gas reservoirs.



About CSI Technology

ConocoPhillips developed Compressive Seismic Imaging (CSI) technology for marine seismic surveys on the back of our long history and global experience with seismic acquisition. The technology has been successfully used and proven across our global operations, including Australia, over the last decade. Our proprietary CSI Technology generates the same information as conventional seismic surveying, however, processing of the CSI acquired data results in a higher resolution product.

To obtain the same higher resolution data set using conventional methods would require the seismic acquisition vessel to be in the water towing a greater number of streamers for a longer period of time. ConocoPhillips's CSI approach therefore significantly reduces the duration, risk and impact of the seismic acquisition program.

Further due to CSI's higher quality data, subsurface uncertainty is potentially reduced when compared with conventional seismic techniques. This has the potential to reduce the number of future seismic surveys required for the development of a gas project in the area.

How will we use CSI?

For the Sequoia 3D Seismic Survey ConocoPhillips Australia will use a marine seismic vessel towing 14 approximately 6km longstreamers with a non-uniform distribution behind the vessel.

At the defined non-uniform intervals, the acoustic source will transmit sound waves into the geological structures beneath the seabed, which reflect the sound signals to the hydrophone receivers. We will then process the data using our CSI processing techniques to generate a data set that is much higher resolution than what could be acquired using conventional methods.

Sequoia 3D Seismic Survey

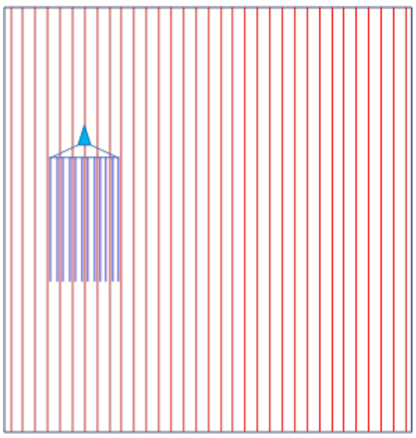
ConocoPhillips

How does CSI work?

CSI applies compressive sensing technology which is a mathematical sampling theory first used by the medical industry to speed up imaging processes such as MRIs. CSI enables geophysicists to reconstruct a higher quality, more accurate picture with less data compared to conventional seismic technology.

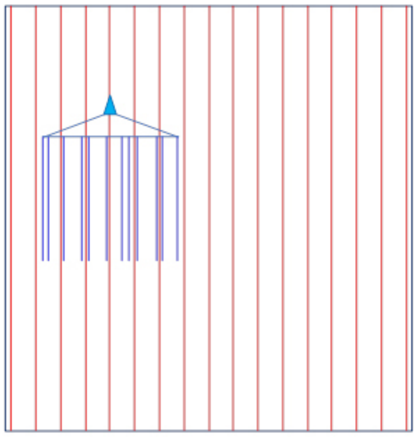
As shown on the diagram below instead of uniform sampling, which involves data gathered from a regular dense grid, CSI uses algorithm processes to achieve a fuller picture and improved outcomes from non-uniform or irregular grid with less data collection points.

Conventional Survey



Conventional Survey: 2x number of sail lines, 2x number of sources, ~2x longer to acquire. More effort, more time.

CSI Survey



CSI Survey: Half as much effort and time for same quality as conventional survey.

Understanding how CSI Technology works

If several people in a room were talking at once, the CSI algorithm would use sensing devices to listen to low-definition random samples of the voices making up the entire conversation. The CSI algorithm would be able to use those random low-definition samples to reconstruct the recording to a high-definition recording of the complete conversation.

How is CSI more efficient?

During CSI data processing the data acquired is reconstructed to look like it was acquired with twice as many streamers than deployed. This is due to the streamers being deployed in a non-uniform pattern rather than a regular pattern. Using ConocoPhillips's proprietary CSI processing we are able to use the data acquired from the non-uniform streamers to reconstruct a higher resolution data set that looks like it was acquired with twice as many streamers spaced much closer together.

Comparing technologies

If we compare CSI technology to conventional acquisition and processing technology to obtain a similarly sized survey and obtain the same high resolution data, a conventional survey design would require the seismic acquisition vessel to be in T/49P for longer while sailing a greater distance.

	CSI Technology	Conventional Technology
Indicative Survey Size	2840km^2	2840km^2
Indicative Survey Duration	60 days	98 days
Indicative timing	Sept – Oct 2021	Aug – Oct 2021
Number of streamers	14	16
Indicative Distance Travelled (sail line kms)	5,700 km	10,000 km

Contact Us

ConocoPhillips Australia seeks to understand different stakeholder opinions, interests and activities that may be relevant, or need to be taken into account when preparing the Environmental Plan for the Sequoia 3D seismic survey. You are invited to provide feedback, request a meeting and ask questions on the proposed Sequoia 3D seismic survey by contacting us in one of the following ways:

E sequoia@conocophillips.com P 07 3182 7122 www.conocophillips.com.au

ABU2-000-EX-R01-D-00004

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.

What are the vessel MDO spill modelling results?

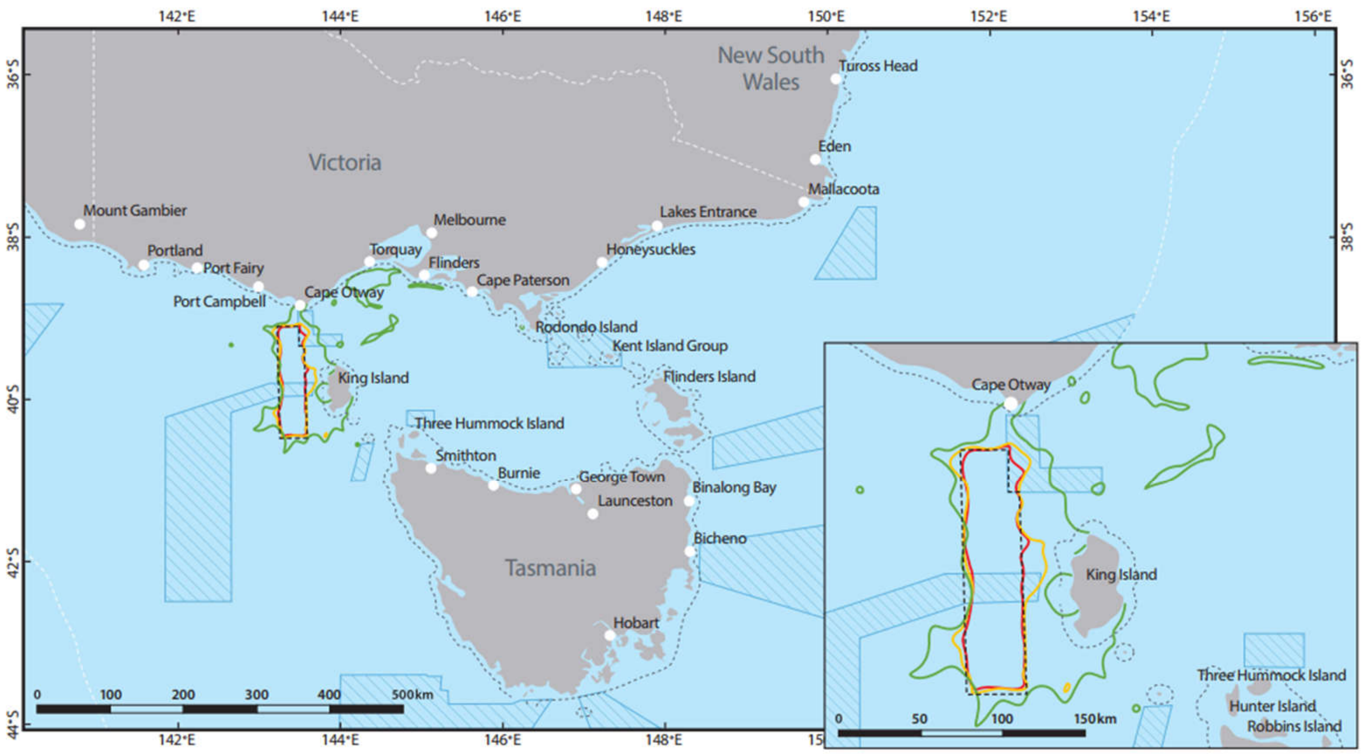
In the extremely rare event that a spill of MDO occurred, the following maps outline the potential exposures. It's important to note that the three stochastic exposure maps identify the amalgamation of the 100 modelled simulations and not the result of a single spill simulation.

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.



Annual conditions
Zones of potential floating oil exposure

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.

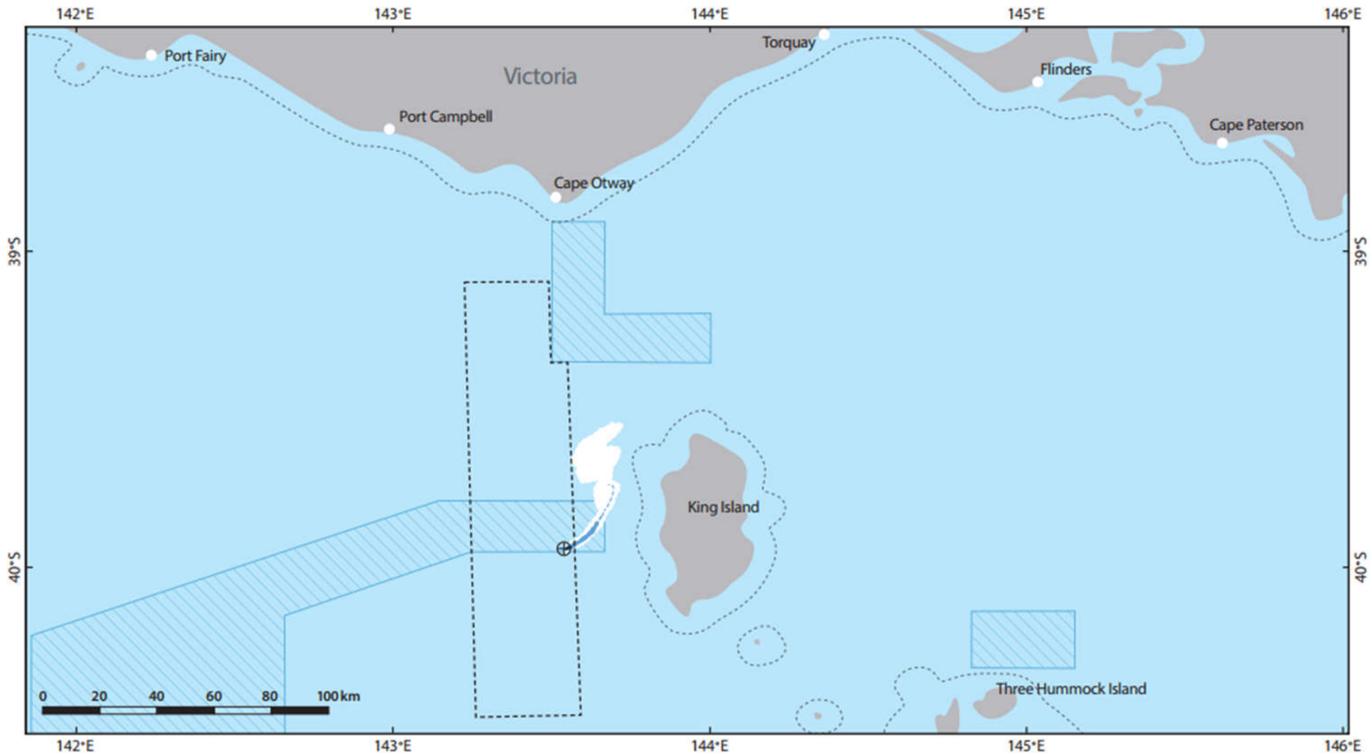
Sequoia 3D Seismic Survey

ConocoPhillips

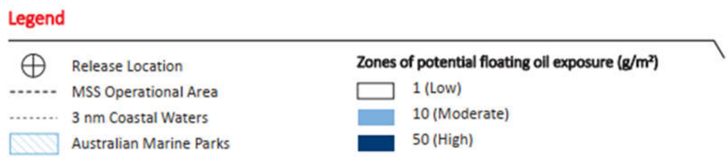
Largest Area of Floating MDO

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.



Deterministic - Largest area of floating oil
Zones of potential floating oil exposure



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.

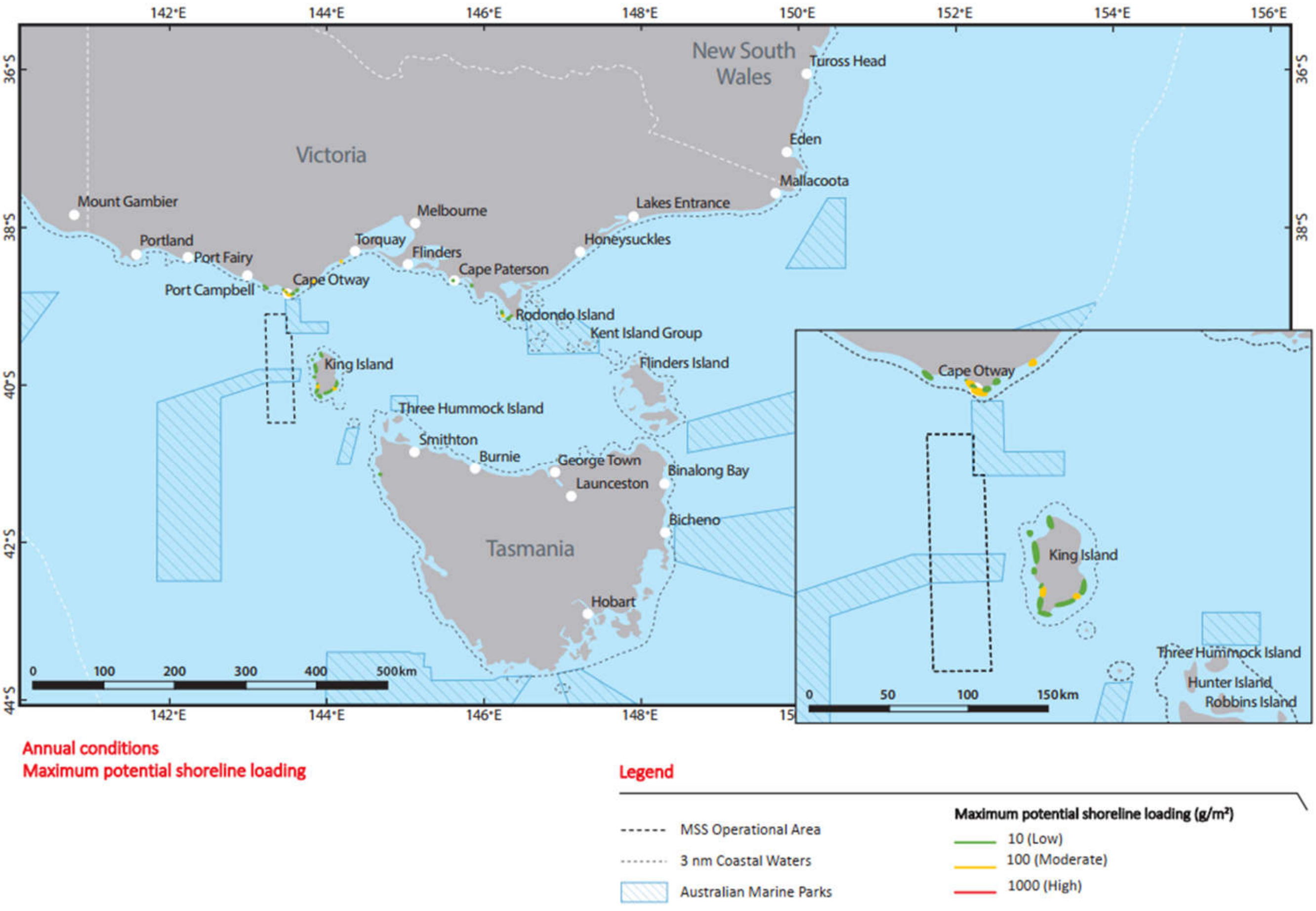
Although a seismic vessel has a fuel tank volume of ~2000 m^3 ConocoPhillips Australia has undertaken MDO spill modelling on a volume of 373 m^3 . This is because the seismic vessels have multiple, separate tanks, with externally located tanks averaging 373 m^3 .

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.



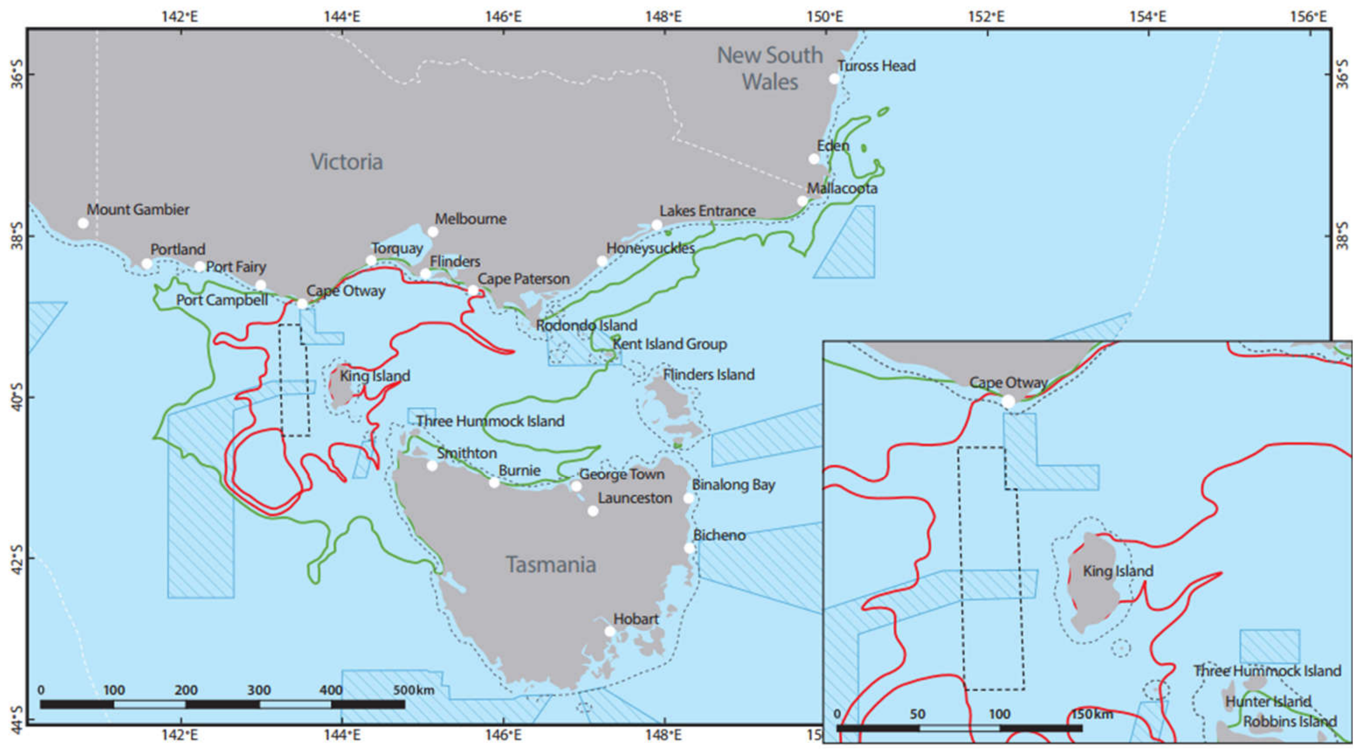
Exposure level	Threshold (g/m^2)	Description of potential impact
Low	10	Exposure at this level is unlikely to affect species but would be visible and detectable by instrumentation and may cause a range of socio-economic effects, like the temporary closure of beaches
Moderate	100*	Exposure at this level 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.



Annual conditions
Zones of potential instantaneous entrained hydrocarbon exposure in the 0-10m depth layer

Legend

- MSS Operational Area
- 3 nm Coastal Waters
- Australian Marine Parks

Zones of potential entrained hydrocarbon exposure (ppb)

- 10 (Low)
- 100 (High)

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.

Sequoia 3D Seismic Survey

ConocoPhillips

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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Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00005

Underwater Sound Modelling and Controls | October 2020

ConocoPhillips Australia has commissioned independent experts in underwater acoustic modelling and monitoring to undertake underwater sound modelling as part of the development of the Sequoia 3D marine seismic survey (MSS) Environment Plan (EP). Underwater sound modelling is used to predict underwater sound levels expected to be produced by the Sequoia 3D MSS and the distances to effects on various marine fauna groups. This information sheet presents the results of the modelling undertaken to support the Sequoia 3D MSS in Exploration Permit T/49P.

What is the sound generated by marine seismic activities?

Marine seismic surveys involve the use of seismic source arrays that produce high intensity, low frequency air pulses. Sound is produced at regular intervals with the pulses directed primarily towards the seafloor. However, sound will also radiate at angles close to horizontal potentially spreading sound over long distances. The weakening of sound with distance is influenced by bathymetry, seabed composition and oceanographic properties such as temperature and salinity.

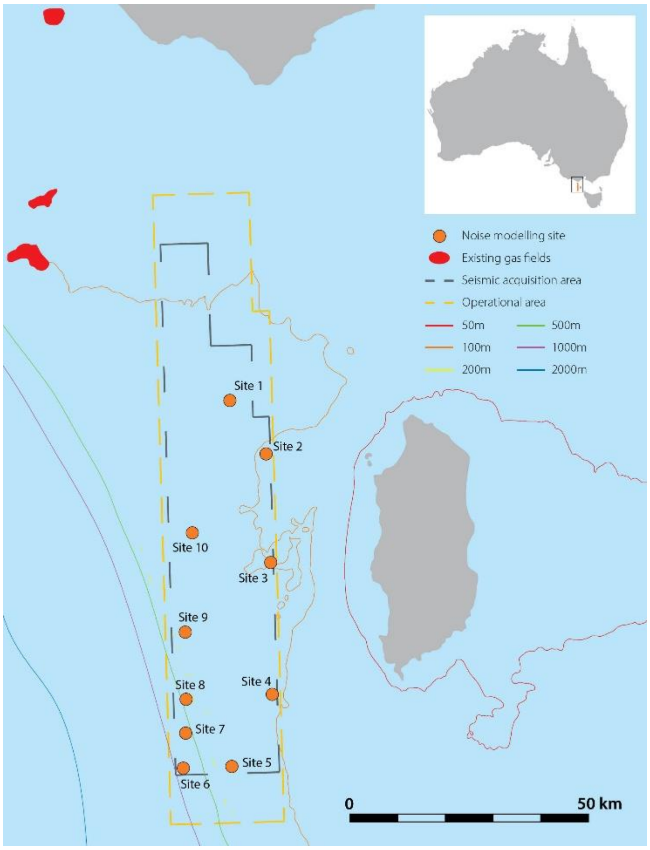
ConocoPhillips Australia has been working with geophysicists, environmental scientists, and seismic vessel contractors to ensure the sound levels from acoustic pulses are kept as low as possible while still meeting our survey objectives. Through this work, the acoustic source proposed for use is a 3,480 cubic inch array, which is a similar size to other marine seismic surveys recently undertaken in Australia.

What was the modelling approach?

Ten underwater sound modelling sites were selected, representative of the different water depths within the survey area. Two scenarios representing 24 hours of operation were considered to determine the accumulated sound levels (for relevant receptors).

How were the modelling sites chosen?

The survey lines were extracted from a nominal acquisition plan for the survey, and selected as they are representative of the range of bathymetry within the survey acquisition area along the continental shelf edge and continental slope that is relevant to Biologically Important Areas (BIAs) for pygmy blue whales and for southern right whales, as well as other key sensitive areas in the region, including the West Tasmanian canyons key environmental feature.



Sequoia 3D Seismic Survey

ConocoPhillips

How does the proposed seismic survey impact marine life?

ConocoPhillips Australia has used guidelines developed from the best scientific evidence available to inform the EP and continues to keep abreast of all research being released.

There have been numerous studies on the effects of underwater sound on marine receptors with a range of effects identified. Marine seismic surveys in Australia are well regulated and there is Australian and international guidance available for managing potential impacts to sound-sensitive marine fauna.

Sound-sensitive fauna, like whales, fish, seals, and invertebrates (e.g., rock lobsters and giant crabs) are identified as residing in or migrating through the survey area. There is potential for the Sequoia 3D MSS to impact this fauna. The research indicates that these results are generally temporary and localised.

The EP will present the environment impact assessment for each receptor group based on the most relevant thresholds using the latest science.

Understanding the acquisition window
While we expect to be acquiring seismic over a 60-day window, we will be recording seismic data using the seismic acoustic pulses for approximately 30 days. The 60-day window allows for downtime associated with bad weather and/or environmental restrictions such as the presence of whales.

Maximum horizontal distances for species in the water column

The table below outlines the maximum horizontal distance to noise effect criteria from the seismic sound pulse for single-impulse (PK) modelled sites and cumulative modelled sites for pelagic fauna.

The modelling predictions presented in the table represent the variation in results for the 10 modelling sites, which range in water depths from 69 m to 798 m. It is important to note that in accordance with the requirements of the various criteria, only the furthest distance to reach threshold criteria is reported, regardless of whether this is in the water column or seabed, single pulse or 24-h exposure.

Fauna group	Behavioural	Injury or Impairment			Mortality/ potential mortality	Notes
		Temporary Threshold Shift (TTS)	Permanent Threshold Shift (PTS)	Recoverable injury		
Plankton	*	*	*	*	210 m	There are no scientifically accepted criteria for injury or behaviour to model against.
Cephalopods (octopus & squid)	3.66 km	*	*	*	*	The behavioural threshold reported here is that at which inking has been observed. For this survey, it is predicted that the maximum distance in which this may occur is 3.66 km from the sound source. No other metrics for effect are currently available.

Maximum horizontal distances for species in the water column continued

Fauna group	Behavioural	Injury or Impairment			Mortality/ potential mortality	Notes
		Temporary Threshold Shift (TTS)	Permanent Threshold Shift (PTS)	Recoverable injury		
Cetaceans – low frequency (LFC) (e.g., blue, humpback, southern right whales)	11.1 km	56.6 km[µ]	1.18 km	*	*	The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixedposition. More realistically, marine mammals would not stay in the same location for 24 hours, but rather a shorter period, depending upon their behaviour and the proximity and movements of the source. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either PTS or TTS) if it remained in that location for 24 hours.
Cetaceans – mid-frequency (MFC) (e.g., dolphins)		80 m	<20 m	*	*	
Cetaceans – high-frequency (HFC) (e.g., Kogia)		620 m	340 m	*	*	
Fur-seals (otarrid pinnipeds)	5.4 km	80 m	<20 m	*	*	Refer to Notes for low and mid-frequency cetaceans on the accumulation of SEL.
Turtles	1.66 - 5.43 km[±]	500 m	80 m	*	*	There is limited information on turtle hearing. Refer to Notes for low and mid-frequency cetaceans on the accumulation of SEL. Turtles are likely to be presentonly as vagrants in and around the survey area.

Maximum horizontal distances for species in the water column continued

<table>
<tr><th rowspan="2">Fauna group</th><th rowspan="2">Behavioural</th><th colspan="3">Injury or Impairment</th><th rowspan="2">Mortality/ potential mortality</th><th rowspan="2">Notes</th></tr>
<tr><th>Temporary Threshold Shift (TTS)</th><th>Permanent Threshold Shift (PTS)</th><th>Recoverable injury</th></tr>
<tr><td>Fish
(with no swim bladders, including sharks)</td><td>Near^ – high risk
Intermediate ^ –moderate risk
Far^ – low risk</td><td>2.55 km</td><td>*</td><td>80 m</td><td>81 m</td><td>Mortality is likely only within very close distance to the sound source (up to 70 m in the water column and 80 m at the seabed), noting that studies to date have not demonstrated mortality of adult fish. Distances to mortality or recoverable injury from 24 hrs of cumulative impact reduce to a distance of 80 m (and are not triggered for fish living near the seabed).</td></tr>
<tr><td>Fish
(with swim bladders, involved and not involved in hearing)</td><td>Near – high risk
Intermediate – moderate to high risk
Far – low to moderate risk</td><td rowspan="2">2.55 km</td><td rowspan="2">*</td><td rowspan="2">170 m</td><td rowspan="2">170 m</td><td rowspan="2">Distance to recoverable injury (e.g., loss of sensory hair cells) is 170 m in the water column.
Many fish species sense sound pressure through gas-filled chambers called swim bladders. Mortality is likely only within very close distance to the sound source (up to 170 m in the water column), noting that studies to date havenot demonstrated mortality ofadult fish. Distances to mortality or recoverable injury from 24 hrs of cumulative exposure reduce to a distance of 80 m (and are not triggered for fish living near the seabed), noting that fish in the survey area are unlikely to remain within 80 m of the moving sound source for a continuous period of 24 hours.</td></tr>
<tr><td>Fish eggs and larvae</td><td>Near – moderate risk
Intermediate – low risk
Far – low risk</td></tr>
</table>

In accordance with the requirements of the various criteria, only the furthest distance to reach threshold criteria is reported, regardless of whether this is in the water column or seabed, single pulse or 24-hour exposure.

** No exposure criteria is available to measure against.*

^ Near = tens of metres, intermediate = hundreds of metres, far = thousands of metres.

± Depending on the exposure criteria applied.

µ Noting that the MSS will be acquired when these whales are not present in the region.

Maximum horizontal distances for benthic invertebrate species

The below table outlines maximum horizontal distance to particle motion exposure for benthic invertebrates.

Fauna group	Behavioural	TTS	PTS	Risk of recoverable injury	No effect	Assessment
Sponges and coral	*	*	*	*	4 m	The threshold adopted is the distance to no impacts, that is, beyond 4 m from the centre of the array, directly below the source, there is no impact to sponges or corals.
Crustaceans (giant crab, rock lobster)	*	*	*	414 m	*	The threshold adopted here is a pseudo-threshold in so far as a scientifically agreed threshold has yet to be decided. The maximum distance to effect of 138-414 m (depending on water depth) is based on comparison against the sound pressure noted as causing damage to mechano-sensory systems (but not mortality).
Bivalves (scallops)	*	*	*	*	214 m	The various thresholds adopted here are pseudo-thresholds in so far as a scientifically agreed threshold has yet to be decided. The maximum distance to effect of 138-214 m (depending on water depth) is based on comparison to the results of various studies on scallops in 2016, 2017 and 2019 noted as resulting in chronic effects that could result in mortality in the weeks and months following exposure.

** No formal or defined exposure criteria is available to measure against*

Sequoia 3D Seismic Survey

ConocoPhillips

How will ConocoPhillips Australia reduce the impact of underwater sound?

ConocoPhillips Australia will put in place a range of controls to minimise the risks of underwater sound to marine life to as low as reasonably practical. The controls are listed in the table here and will be refined as the survey planning and the EP preparation progress.

Control Category	Controls
Compliance with regulation	The survey will be conducted in compliance with EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales: Industry Guidelines.
Survey Timing	The survey will be acquired in the months that have the least impact to sensitive receptors such as commercial fisheries (e.g. rock lobster and giant crab) and sensitive fauna (e.g. pygmy blue whale migration and foraging). The window of least impact to most species is in the September to October timeframe. That is why we are applying for the August to October timeframe with a preference for a 60-day window in September to October for seismic acquisition.
Survey Design	The survey will use the lowest sound pressure to achieve the desired data quality.
	The survey will optimise its operational area to reduce the area of impact.
	The survey will use ConocoPhillips CSI Technology, which significantly reduces the duration of seismic activity compared to conventional methods. More information on the CSI Technology can be found on our website.
	The extent of the survey area is designed to reduce the likelihood of having to return to acquire more data at a later time.
Operational Controls	The survey will limit the number of days where seismic is actively acquired.
	Two dedicated trained and experienced marine fauna observers will be stationed on the survey vessel for the duration of the survey
	Survey and support vessel crews will be inducted to ensure they are aware of the EPBC Guideline 2.1 requirements and methodologies to undertake visual assessment for marine fauna species.
	Operations will include : • A.3.1: Pre-startup visual observation • A.3.2: Soft-start procedures • A.3.3: Start-up delay procedures • A.3.4: Operational procedures (shut-down on line turns) • A.3.5: Stop work procedures • A.3.6: Night-time and low visibility procedures.
	There will be no discharge of the acoustic source outside the survey operational area.
	In the event of another survey operating at the same time, procedures will be in place to ensure that a minimum 40 km separation is maintained between seismic surveys

Detailed Information

Detailed information on the Sequoia 3D MSS underwater sound modelling and controls will be available in the Environment Plan.

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Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00006

Project Update | October 2020

ConocoPhillips Australia is planning to undertake a three-dimensional (3D) marine seismic survey (the Sequoia 3D seismic survey) in Exploration Permit T/49P to enable assessment of the natural gas reservoirs in the eastern offshore Otway Basin. The permit is located in waters west of Tasmania’s King Island.

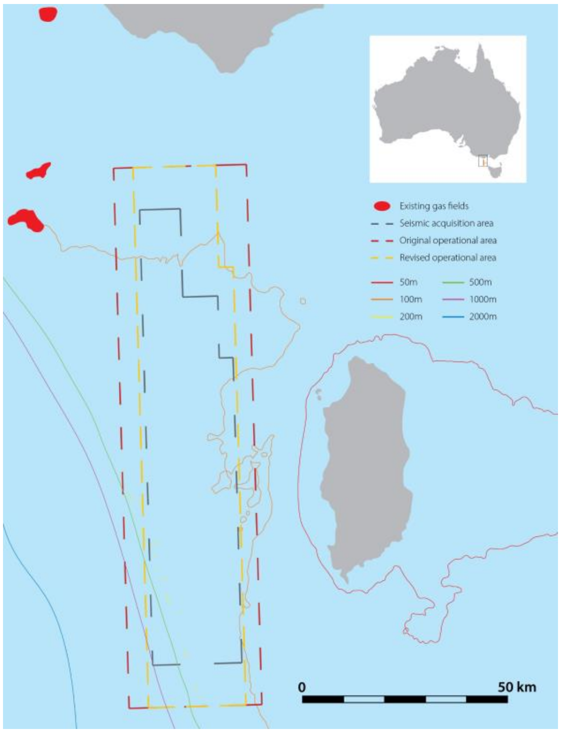
This is the second project update information sheet. Detailed factsheets on topics suchas CSI Technology, Noise Modelling and Spill Modelling are also available.

Changes to the Operational Area

Through ongoing consultation with stakeholders to progress the development of the Environment Plan, ConocoPhillips Australia has reduced the operational area of the Sequoia 3D seismic survey from 6500km^2 to 4090km^2 .

The operational area is slightly larger than the acquisition area as it allows for vessels to turnaround. The reduction in the operational area has resulted in a:

- 27 per cent reduction of Victorian fishing grids affected.
- 19 per cent reduction of Tasmanian Rock lobster grids affected.
- Complete avoidance of the Apollo Marine Park.



Marine Diesel Oil Spill Modelling

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.
Modelling demonstrated that, in the unlikely event of a MDO spill from a seismic vessel:

- There would be minimal entrained oil within the water column
- Low levels of floating oil had the potential to reach a range of sensitive receptors
- Low to moderate levels of oil had the potential to reach Kind Island and Cape Otway.

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.

Sequoia 3D Seismic Survey

ConocoPhillips

Noise Modelling

ConocoPhillips Australia has commissioned independent experts in underwater acoustic modelling and monitoring to undertake underwater sound modelling as part of the development of the Sequoia 3D marine seismic survey Environment Plan (EP). Underwater sound modelling is used to predict underwater sound levels expected to be produced by the Sequoia 3D marine seismic survey sound source and the distances to effects on marine fauna.

Modelling demonstrated that:

- Sound-sensitive fauna, like whales, fish, seals, and invertebrates (e.g., rock lobsters and giant crabs) are identified as residing in or migrating through the survey area.
- There is potential for the Sequoia 3D MSS to impact this fauna. The research indicates that these results are generally temporary and localised.

More information on noise and marine diesel oil modelling is available at:
www.conocophillips.com.au/what-we-do/otway-basin/

Controls ConocoPhillips Australia will put in place to reduce impacts

Based on the science available to us, we will apply controls to reduce the risks and minimise acoustic disturbance to marine life to as low as reasonably practicable. These include:

- Acquiring seismic in the months that have least impact commercially and environmentally. That is why we are applying for the August to October timeframe with a preference for a 60 day window in September to October for seismic acquisition on T/49P.
- Reducing the operational area. We have reduced the operational area from 6500km^2 to 4090km^2.
- Using our CSI Technology which significantly reduces the duration we are acquiring seismic (vs conventional methods). The Dorrigo EP as approved by NOPSEMA was approximately 25 days of acquisition for 1580km^2, we are proposing approximately 30 days of acquisition for 2840km^2.
- Limiting the number of days we are actively acquiring seismic. While we expect to be acquiring seismic over a 60-day window, we will be recording seismic data using the seismic acoustic pulses for approximately 30 days. We allow time for vessel movements and a buffer in case of bad weather and/or environmental restrictions such as the presence of whales.
- Implementing EPBC Act requirements, including:
    - Soft-start procedures- This involves turning on the acoustic pulses at low power and gradually increasing the output.
    - Precaution and Shutdown zones – to minimise potential impact on whale species.
- Using the lowest sound pressure to achieve the desired data quality.
- Designing a survey in such a way reduces the likelihood of having to return to acquire more data and increases our knowledge of the subsurface which could lower the amount of wells that may be drilled.

Contact us

ConocoPhillips invites you to provide feedback, request a meeting and ask questions on the proposed Sequoia seismic survey by contacting us in any one of the following ways:

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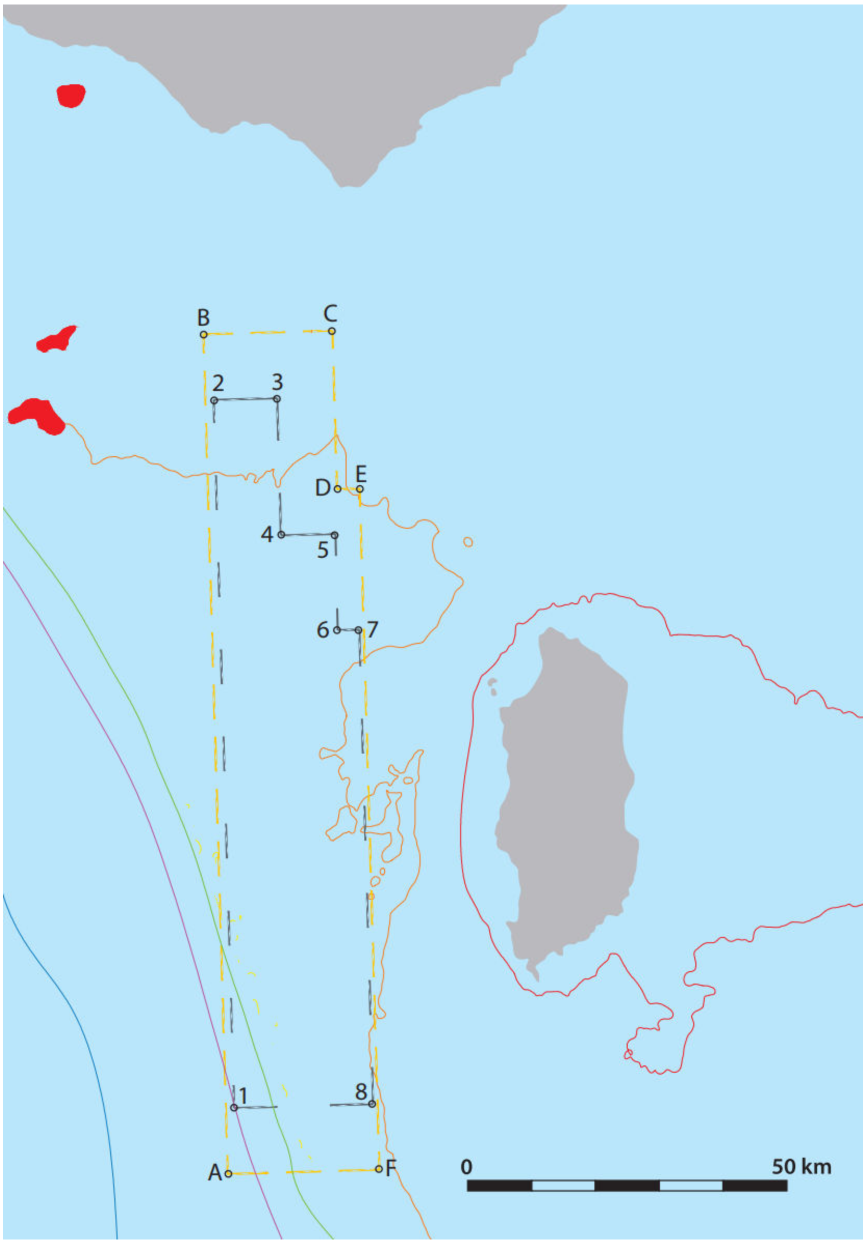
Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00007

Proposed Survey Area Summary | September 2020



Existing gas fields
Seismic acquisition area
(Revised) Operational area

50m
100m
200m
500m
1000m
2000m

Vertex	Degrees, Min, Sec	
	Latitude	Longitude
Operational Area		
A	40° 28′ 31.82″ S	143° 15′ 54.00″ E
B	39° 05′ 52.85″ S	143° 13′ 12.91″ E
C	39° 05′ 33.17″ S	143° 29′ 26.23″ E
D	39° 21′ 09.79″ S	143° 29′ 59.41″ E
E	39° 21′ 06.07″ S	143° 32′ 50.56″ E
F	40° 28′ 07.30″ S	143° 35′ 20.83″ E
Seismic Acquisition Area		
1	40° 22′ 1.68″ S	143° 16′ 44.52″ E
2	39° 12′ 20.64″ S	143° 14′ 27.64″ E
3	39° 12′ 11.14″ S	143° 22′ 26.74″ E
4	39° 25′ 41.42″ S	143° 22′ 54.19″ E
5	39° 25′ 32.86″ S	143° 29′ 42.47″ E
6	39° 35′ 1.96″ S	143° 30′ 2.85″ E
7	39° 34′ 58.38″ S	143° 32′ 47.44″ E
8	40° 21′ 39.26″ S	143° 34′ 32.05″ E

Contact us

You are invited to provide feedback, request a meeting and ask questions on the proposed Sequoia 3D seismic survey by contacting us in one of the following ways:

E sequoia@conocophillips.com **P** 07 3182 7122 **conocophillips.com.au**

Sequoia 3D Seismic Survey

ConocoPhillips

ABU2-000-EX-R01-D-00008

Project Update | February 2021

ConocoPhillips Australia is planning to undertake a three-dimensional (3D) marine seismic survey (the Sequoia 3D seismic survey) in Exploration Permit T/49P to enable assessment of the natural gas reservoirs in the eastern offshore Otway Basin. The permit is located in waters west of Tasmania's King Island.

Since the last project update regarding the proposed Sequoia 3D marine seismic survey, ConocoPhillips Australia has continued to consult with relevant stakeholders and the Environment Plan was available for public comment by NOPSEMA.

Changes to the seismic acquisition area

In considering feedback from relevant stakeholders and based on submissions received during the public comment period we have opted to add an additional control to the proposed Sequoia 3D marine seismic survey.

The new control will be to excise the giant crab habitat in the south west region of the survey area from the seismic acquisition area (see Figure 1). Based on the Department of Environment and Energy's 2014 assessment of the Tasmanian Giant Crab fishery, most harvesting of giant crab occurs at depths between 140 and 300 metres. Based on the available research, additional acoustic modelling has been undertaken to calculate the 'distance to no effect' to the fishery, as a result an additional excise buffer of approximately 450m has been applied either side of the fishery. As such, we will be removing the giant crab habitat within the canyon area in the south west of the survey from the acquisition area, reducing the acquisition area to approximately 2700km^2.

This is in addition to the reduction of the original operational area. In late 2020, based on stakeholder feedback received during Environment Plan development, we reduced the operational area from 6500km^2 to 4090km^2 which resulted in: 27% reduction in Victorian fishing grids, 19% reduction in Tasmanian rock lobster grids and complete avoidance of the Apollo Marine Park.

Timing

Our primary control is to acquire seismic in the months that have least impact commercially and environmentally which is why we are seeking approval in the Environment Plan to undertake the seismic acquisition in the August to October 2021 timeframe. The seismic activity is forecast to take 60 days which incorporates allowances for downtime related to weather and other operational constraints.

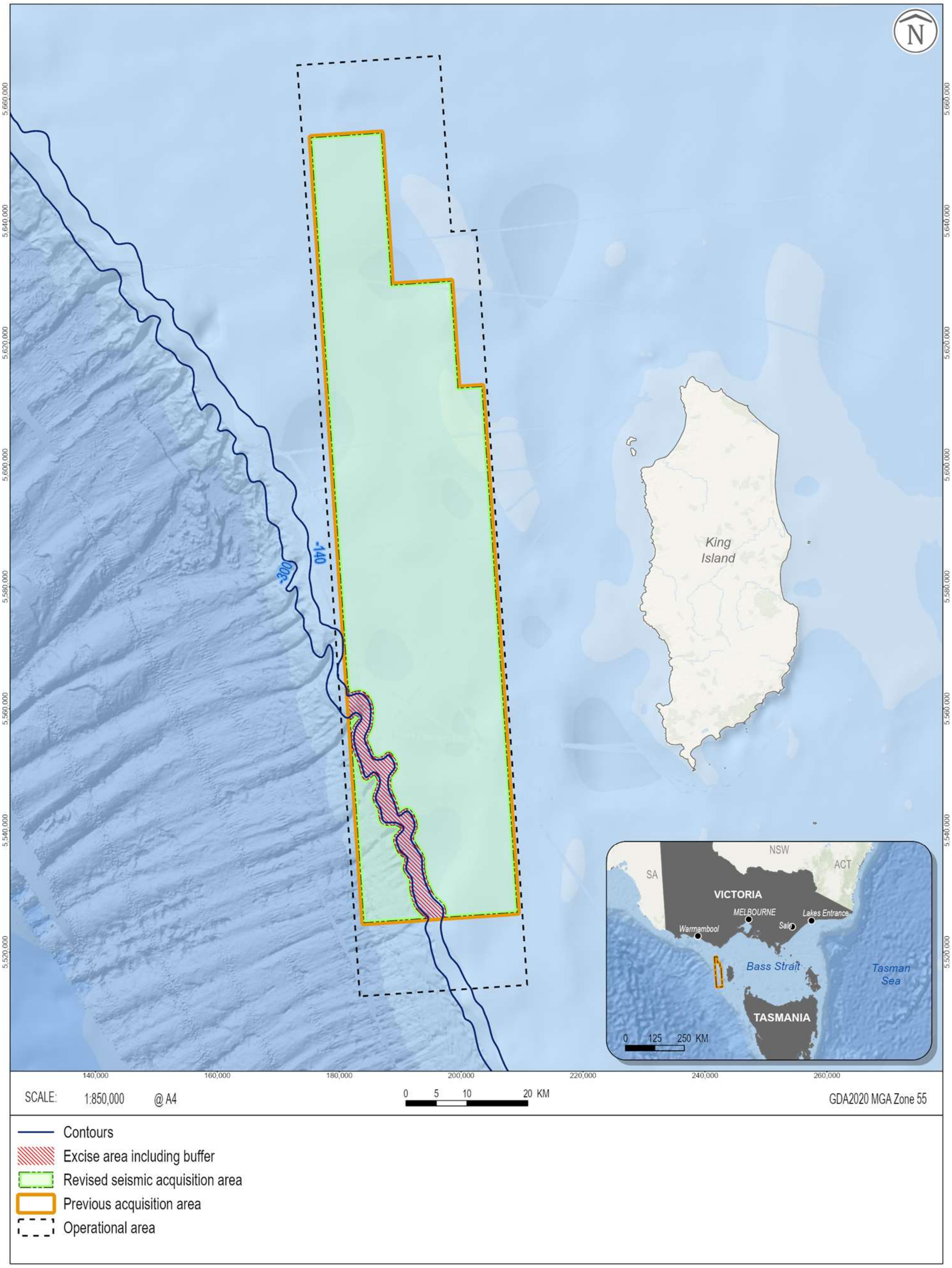


Figure 1.. Revised Sequoia 3D marine seismic survey map

Sequoia 3D Seismic Survey

ConocoPhillips

Frequently asked questions

What approvals are required by the Government?

Prior to commencing any activity, ConocoPhillips Australia must submit an Environment Plan to the offshore regulator, NOPSEMA, for approval under the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

What is the purpose of an Environment Plan and what does it include?

The purpose of the Environment Plan is to describe the impacts and risks of the proposed activity, assess them and determine whether they are acceptable and are as low as reasonably practicable. The Environment Plan must also include a description of the existing environment and the proposed activity, an evaluation of the impacts and risks associated with the activities, environmental performance outcomes and standards, implementation strategy, and reporting requirements.

Why do you have to do a seismic survey?

Acquiring seismic and the subsequent interpretation of it is a necessary step in the process of delineating potential oil and gas reserves in the offshore environment. Geologists and geophysicists use this data to identify the location of potential oil and gas reserves and to allow appropriate positioning of any potential drilling locations. As acquisition of this type is a necessary step in the appropriate, efficient and safe delineation of oil and gas resources, exploration titles (like T/49P) often have work commitments attached to them that must be fulfilled for a company to retain tenure over that area. T/49P has a regulatory requirement to undertake a marine seismic survey to fulfill the title's work program commitments.

Can you ensure the seismic survey won't have an impact on marine life?

Based on current and available science the proposed activity will have minimal impact on marine life and we have been careful to implement controls to reduce this risk to as low as reasonably practicable. You can read more on our evaluation of the environmental risks and our controls in our Environment Plan: https://info.nopsema.gov.au/environment_plans/524/show_public

Why have you chosen August to October to undertake a marine seismic survey?

Acquiring seismic in the months that have the least impact commercially and environmentally is a control we can apply to reduce the risks and minimise acoustic disturbance to marine life to as low as reasonably practicable. The window of least impact is August to October. This is based on the research available to us on the activities of all fishing industries (including Tasmanian and Victorian Rock Lobster, Tasmanian and Victorian Giant Crab and other fish including the Southern Bluefin Tuna), whales and other important marine life.

How long will the seismic activity take?

We expect the entire seismic activity to take approximately 60-days to complete. This estimate incorporates all operations required to conduct the survey, including arrival and deployment, downtime due to weather events, downtime due to whale sightings, unforeseen operational constraints, actual seismic acquisition, equipment retrieval and demobilisation. A three month period (August to October) allows for uncertainty in this estimate of operational duration. It is important to note that we expect to only be acquiring data and actively using the sound sources for approximately 30 days within this estimate.

Sequoia 3D Seismic Survey

ConocoPhillips

Frequently asked questions continued

Why are you resurveying an area where seismic data has already been acquired?

The vast majority of the Sequoia 3D marine seismic survey is being acquired where no 3D seismic has been acquired in the past. We understand the fishing industry's concerns about repeated marine seismic surveys in the one area. To date, a 3D marine seismic survey has been acquired over a small proportion of the T/49P permit in 2014 called the Flanagan 3D. Some 2D seismic data has been acquired over part of the survey area, however, the bulk of this data was acquired between 1960s and the early 2000s.

2D data represents discrete widely spaced lines (in the case of the T/49P area = ~2-5km spacing) of seismic data that is not able to be used for detailed assessment of the subsurface and eventual drilling well placement. 3D seismic data allows a near complete picture of the subsurface which in turn allows appropriate assessment and well placement.

The proposed Sequoia 3D marine seismic survey will partly overlap with the Flanagan 3D only so the two seismic surveys can be joined together to provide a complete picture of the area.

Why don't oil and gas companies share seismic data to reduce resurveying?

Titleholders of petroleum titles in Commonwealth waters of Australia are required to submit all proprietary seismic data acquired to the regulators (NOPTA) within 18 months of the acquisition date. The regulator will make this freely accessible to everyone three years after the date of acquisition.

About ConocoPhillips

ConocoPhillips is a global exploration and production company with operations and activities in 17 countries. We explore for, develop and produce crude oil and natural gas. A commitment to safety, operating excellence and environmental stewardship guide our operations.

ConocoPhillips Australia was established almost two decades ago. Headquartered in Brisbane, Queensland, we are a 37.5 percent shareholder in Australia Pacific LNG and operate the LNG facility on Curtis Island. We are also pursuing exploration opportunities in Australia. We have a proud track record for safety and environmental performance and draw from a global knowledge set to explore for, develop and produce oil and gas for our domestic and global customers.

Contact us

If you would like to ask questions, provide feedback or request a meeting about the proposed Sequoia seismic survey contact ConocoPhillips Australia in any one of the following ways:

E sequoia@conocophillips.com

T 07 3182 7122

W www.conocophillips.com.au

Appendix 5

ConocoPhillips Australia’s survey to fishers

ConocoPhillips Australia

1. Do you fish in the T/49P permit area?

YES ○ NO ○

   a. If yes, approximately how much of your operation is conducted in this area?

2. Would you be directly impacted by a marine seismic survey being undertaken in T/49P?

YES ○ NO ○

   a. If yes, approximately how much of your annual catch is caught in this area?

3. What are your key concerns about ConocoPhillips Australia undertaking a 3D marine seismic survey in T/49P?

<u>Appendix 6</u>

SETFIA fishing report

Update to ConocoPhillips
on the
Project Sequoia Marine Seismic Survey

Prepared by the

South East Trawl Fishing Industry Association

29 October 2020 Version4.0

DISCLAIMER

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1. EXECUTIVE SUMMARY

Preamble:

1. ConocoPhillips Australia SH1 Pty Ltd (COP Sequoia) proposes to undertake a three-dimensional (3D) Marine Seismic Survey (MSS) west of King Island in exploration permit T/49P called Project *Sequoia* (Figure 1).
2. Access to this permit was previously granted to 3D Oil. 3D Oil engaged SETFIA (the South East Trawl Fishing Industry Association) to prepare a fisheries report for their MSS called Project *Dorrigo* in August 2018, which described the data from fisheries that overlapped with the MSS area using data to end calendar year 2017.
3. COP *Sequoia* has since taken over operations in T/49P from 3D Oil (who remains a joint-venture partner) and have modified (slightly reduced) the proposed MSS area.
4. COP *Sequoia* engaged SETFIA to update the summary table (Table 2) and executive summary of the previous report based on the modified operational area and the most recent (but also historical) fishing catch and effort data.
5. Although now smaller, the Project *Sequoia* operational area extends further north into Victoria's jurisdiction than the proposed Dorrigo MSS did.

Limitations:

The data in this report provides information on the fisheries and sectors that operate in and around the MSS operational area, and an assessment of the overlap of the MSS operational area and these fisheries with respect to catches and value. The collection of fisheries catch and effort data is not necessarily designed to provide information to relatively fine spatial scales. Thus, for the purposes of this report, there are a number of limitations, including:

- The Victorian and Tasmanian fisheries use a system of relatively large "reporting grids" to record the spatial extent of commercial fishing catch and effort. As a result, the methods used to calculate the overlap with Victorian and Tasmanian fisheries may over-estimates the catch and revenue attributed to the MSS operational area.
- The location of otter trawl effort is reported as a start set location and end set (or haul) position. While vessel monitoring systems (VMS) track the actual path of each shot, VMS data are not made publicly available. The only way to "capture" a tow path from the logbook data is to draw a line between the start and end points. From our experience otter trawlers often tow in a straight line along the depth contour. The shelf break in the south-west corner of the area of operation does run in an approximately straight line in a NNW to SSE direction (Figure 4). Given the above, overlap with Commonwealth fishing operations were included if any part of straight line drawn between the start and end points crossed the MSS area.
- Overall, the "*potential impact'* of the MSS operational area is calculated as the overlap of those areas with the landed commercial catch (and estimated revenue) taken within that same area (see Figure 1) by both state and Commonwealth fisheries. Based on the two points above, our estimates of the "potential impact" may not equate to the "actual impact" on catches and revenue, and are likely to be overestimated.
- In the previous report for Project *Dorrigo*, Tasmania issued data in 1-degree blocks rather than their smaller reporting grids, increasing the overestimation of catch and effort, while

for this Project *Sequoia* data request, data was only filtered for the overlapping reporting grids. This adds to the potential to overestimate the reported catch and revenue of MSS overlap with Tasmanian fisheries.

- Inshore species caught by the Tasmanian Scalefish Fishery generally inhabit waters shallower than the MSS area. Thus, most fishing in the Scalefish Fishery is unlikely to overlap with the MSS operational area. The exception is for holders of a Rock Lobster licence that also have a wrasse fishing licence. The two species of wrasse caught, Purple Wrasse (*Notolabrus fucicola*) and Bluethroat Wrasse (*Notolabrus tetricus*), are typically associated with shallow reefs but can inhabit wasters down to 90 m and 160 m respectively. However, this fishery sells live fish, and to reduce the chance of death through barotrauma, the fishery mainly operates in shallow water.
- Fish prices were updated with minor increases and decreases. Crab and lobster (pre-Covid) prices increased by 15% in the more recent report.
- Generally, methods used in this report present a more accurate representation of the potential impact to fisheries than the previous report for Project *Dorrigo*. See more details in the section titled "Variance between the 2020 Sequoia and 2018 Dorrigo report".

Findings:

The MSS operational area (Figure 1) overlaps with fisheries across three management jurisdictions:

A. Commonwealth – managed by the Australian Fisheries Management Authority (AFMA);

B. Tasmania – managed by the Department of Primary Industries, Parks, Water and Environment (DPIPWE) Sea Fishing & Aquaculture; and,

C. Victoria – managed by the Victorian Fisheries Authority (VFA).

There are eight fisheries that would, to some extent, be potentially impacted by Project Sequoia. This report determines and ranks the magnitude of impact by gross fishery revenue and estimated catch within the operational area (Table 2) and also indicates the seasonality for each fishery. By order of potential annual impact these are:

1. Victorian Rock Lobster Fishery (Victoria) - revenue of $1,280,000, catch of 13.0 t or 5.2% of the fishery's total annual catch ($641,000 based on beach prices during the Covid-19 pandemic). Catches of Southern Rock Lobster by the Victorian Rock Lobster Fishery (for the whole State) are generally highest from December to January or February (Figure 7);

2. Tasmanian Giant Crab Fishery (Tasmania) - revenue of $737,063, catch of 7.4 t or 39% of the fishery's total annual catch ($553,000 based on beach prices during the Covid-19 pandemic). Seasonal data for the operational area cannot be provided to maintain confidentiality, however catches across the entire Fishery are highest during January to March (Figure 8);

3. SESSF Commonwealth Trawl Sector (SESSF, Commonwealth) - revenue of $322,000, catch of 79 t or 1% of the fishery's total annual revenue. Otter trawl catch from the MSS operational area is highest in March and November and lowest in June, April and December (Figure 9);

4. Tasmanian Rock Lobster Fishery (Tasmania) - revenue of $238,154, catch of 2.4 t or less than 1% of the fishery's total annual catch ($119,077 based on beach prices during the Covid-19 pandemic); Seasonal data cannot be provided to maintain confidentiality, however looking at the State-wide data (Figure 10), most catch in the fishery is taken during December to April;
5. Victorian Giant Crab Fishery - revenue of $161,000, catch of 2.4 t or 16.3% of the fishery's total annual catch ($121,000 based on beach prices during the Covid-19 pandemic);
6. SESSF GHaT Shark Gillnet sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF, Commonwealth) - revenue of $38,900, catch of 6.3 t or 1% of the fishery's total annual revenue.
7. SESSF Commonwealth Scalefish and Shark Hook sectors (SESSF, Commonwealth) - revenue of $37,200, catch of 5.2 t or <1% of the fishery's total annual revenue.

Variance between the 2020 Sequoia and 2018 Dorrigo report:

The value of impact **increased** by $179,000 in the most recent analysis. Significant changes included:

- Commonwealth data (three GHaT fisheries and CTS Trawl) increased because of the method used to filter catch and effort data. The previous report (*Dorrigo*) filtered data to retain recorded data with either a start or end point that was within the area of operation. This method misses fishing effort that starts and ends outside of the area of operation, but that travelled through it. Examination of maps of effort revealed that there was significant effort on the shelf break that passed through the area of operation. To capture these records, a straight line was drawn between start and end points, and data was filtered to retain records that in any way overlapped the area of operation. The use of straight lines joining start and end points was appropriate given they generally follow the depth contours, and depth contours in this area are relatively straight in a south-south-east to north-north-west direction.
- Victorian Rock lobster (250% increase) and Victorian giant crab (794% increase) catch impacts both increased significantly due to the modified MSS operational area that extends further into Victorian fisheries jurisdiction.
- Tasmanian giant crab data increased 54% because the data provided for Project *Dorrigo* was aggregated by 1-degree block. One of those blocks contained data from less than 5 vessels and so was confidential and therefore the catch from that area was not reported. For Project *Sequoia*, data was provided at a finer spatial scale, and then aggregated across all overlapping grids. This enabled inclusion of catch that was confidential in the Project *Dorrigo* report. The increase is mostly due to the inclusion of catch from that area in this report.
- Tasmanian rock lobster data decreased 84% because the data provided for Project *Dorrigo* was provided in blocks larger than the reporting grids, and so overestimated the catch. Data included in this report comprises only reporting grids requested.
- Data presented in this report presents a more accurate representation of the potential impact to fisheries than the previous report for Project *Dorrigo*.

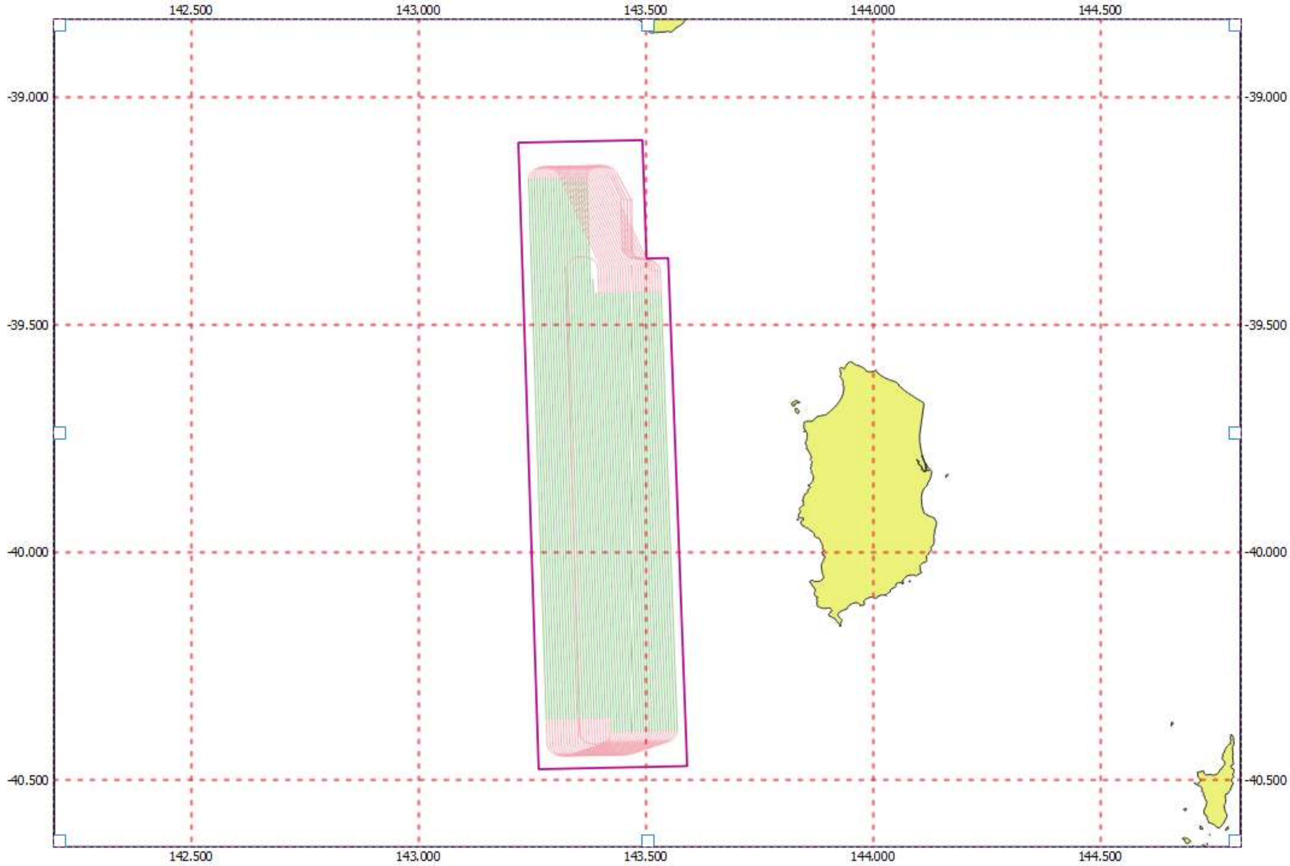

Figure 1. The Project Sequoia tow lines (green lines) and operational area (purple outline).

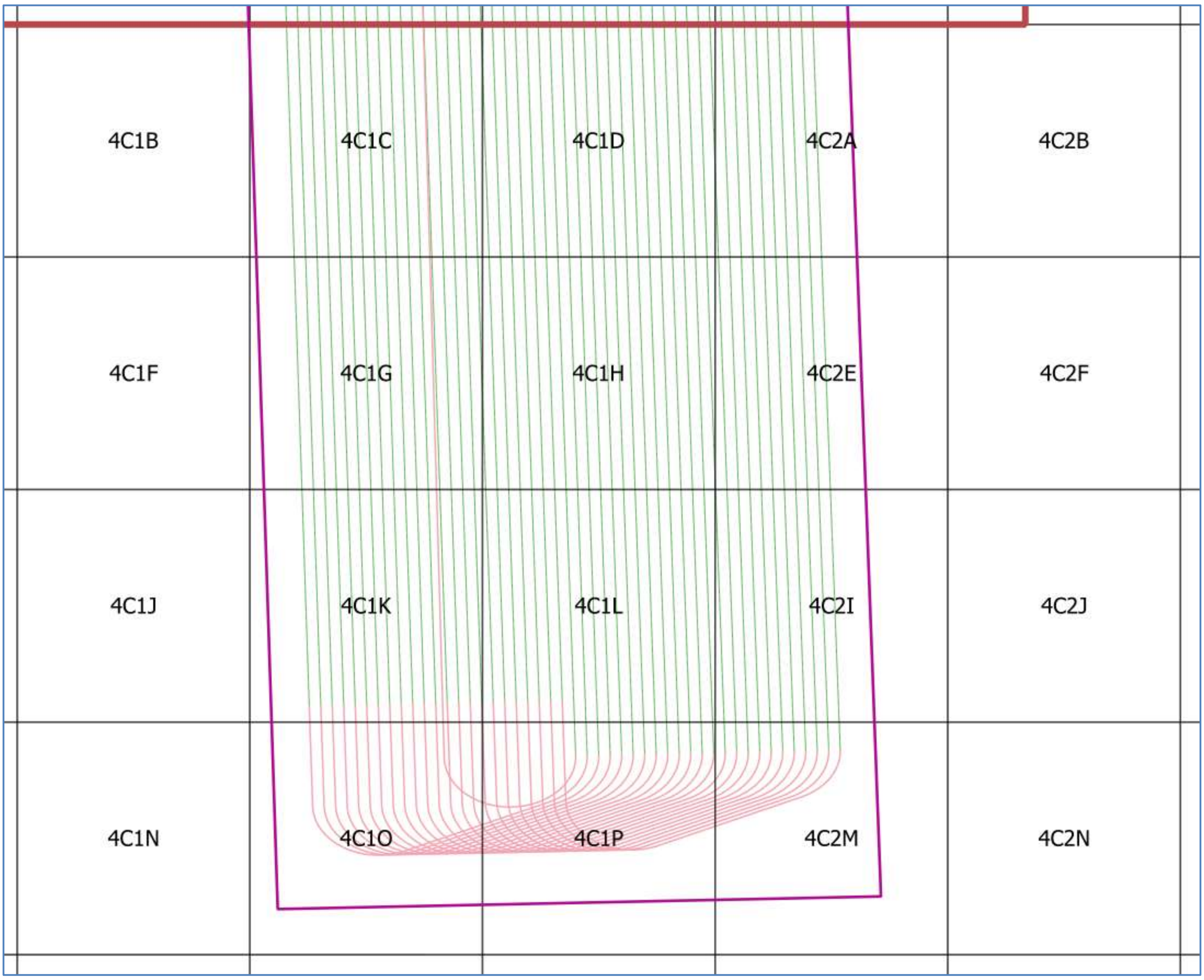

Figure 2. The Project Sequoia tow lines (green lines) and operational area (purple outline) and overlapping Tasmanian reporting grids.

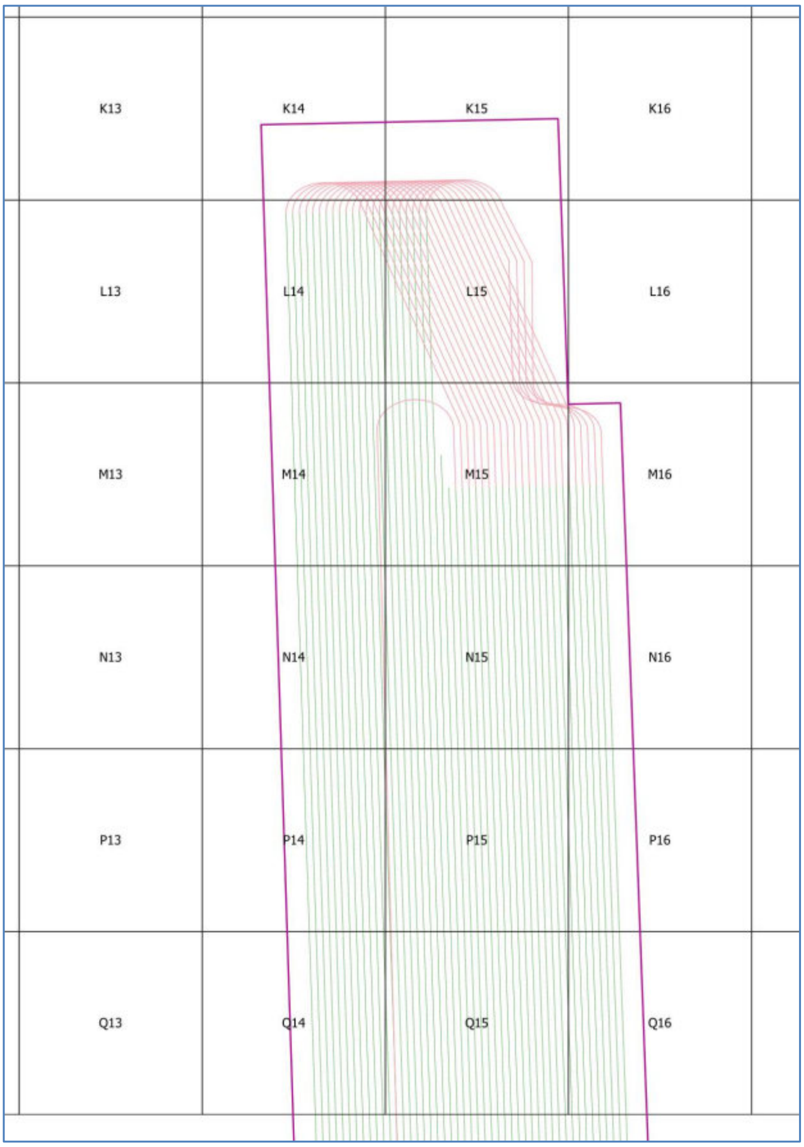

Figure 3. The Project Sequoia tow lines (green lines) and operational area (purple outline) and overlapping Victorian reporting grids.

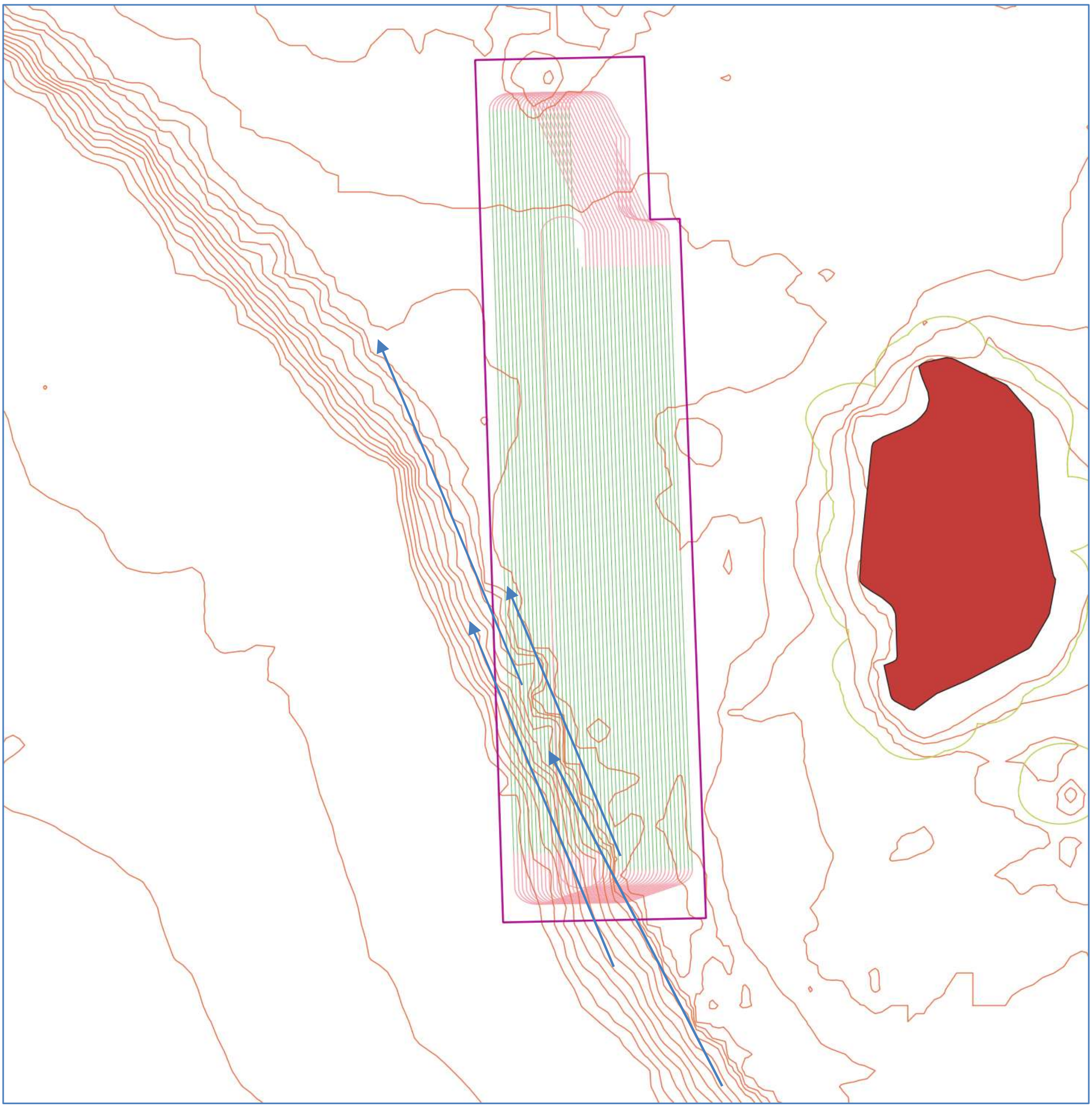

Figure 4. The Project Sequoia tow lines (green lines) and operational area (purple outline) showing examples of trawl effort that were retained by the data filter (blue arrows).

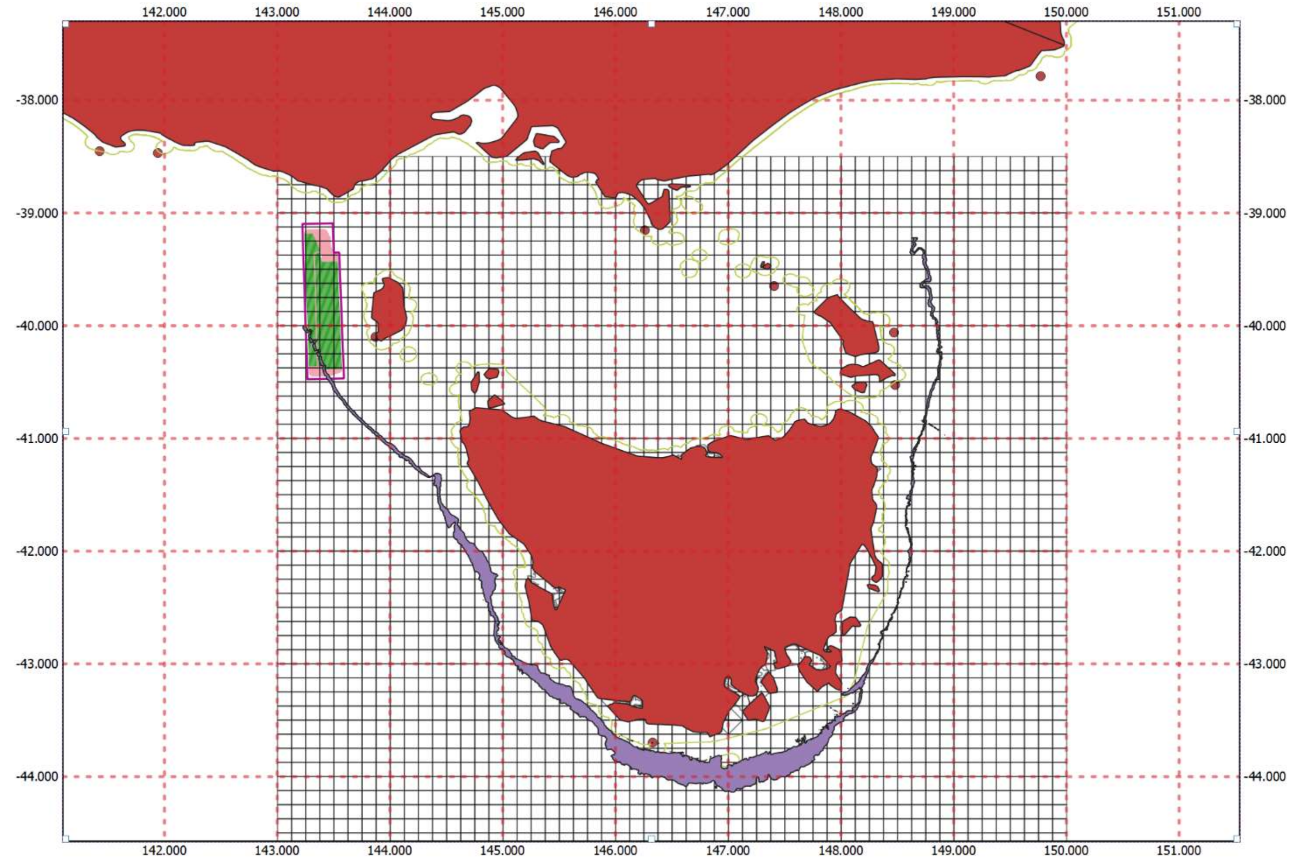

Figure 5. Tasmanian Giant Crab habitat in relation to the area of operation.

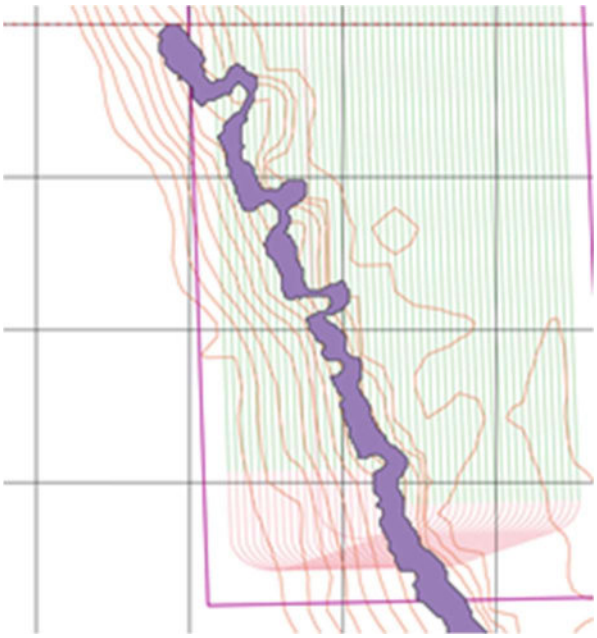

Figure 6. Reporting grids that overlap with Giant Crab habitat in relation to the area of operation.

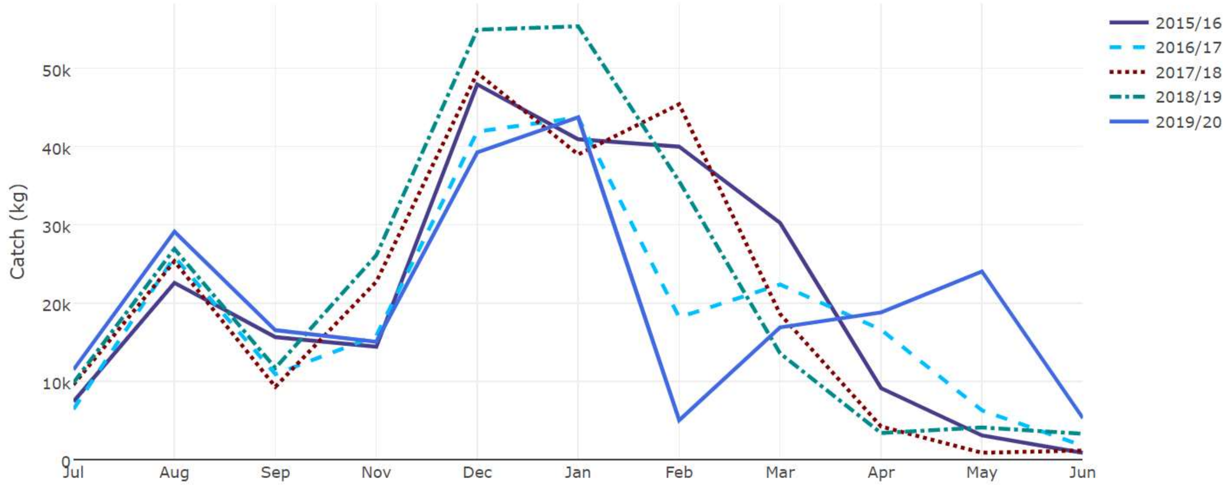

Figure 7. Monthly catch of Southern Rock Lobster by the Victorian Rock Lobster Fishery by year in the western zone[1].

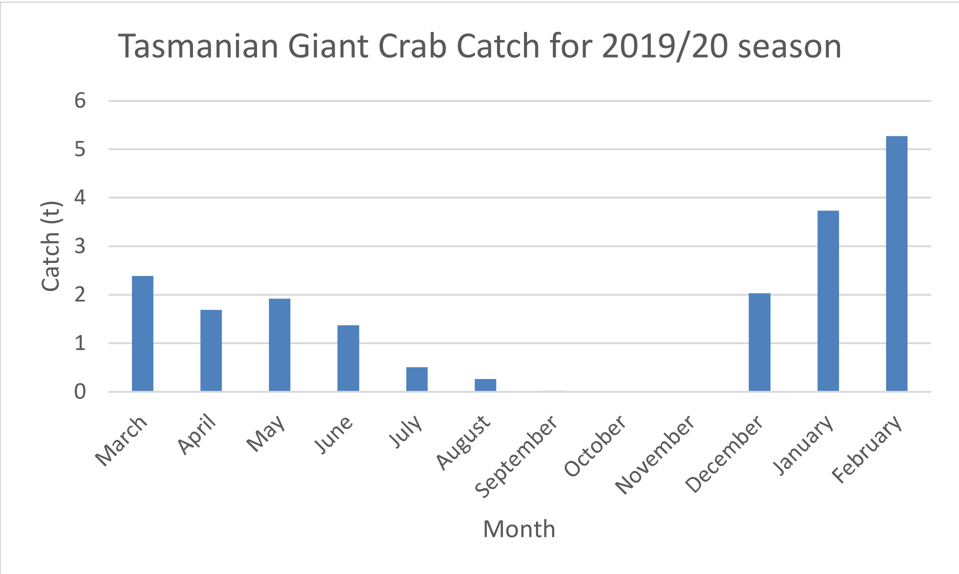

Figure 8. Monthly catch of Giant Crab by the Tasmanian Giant Crab Fishery for 2019/20[2].

1 https://vfa.vic.gov.au/commercial-fishing/rock-lobster/interactive-stock-assessment-report/western-zone
2 https://dpipwe.tas.gov.au/sea-fishing-aquaculture/commercial-fishing/giant-crab-fishery/giant-crab-catch

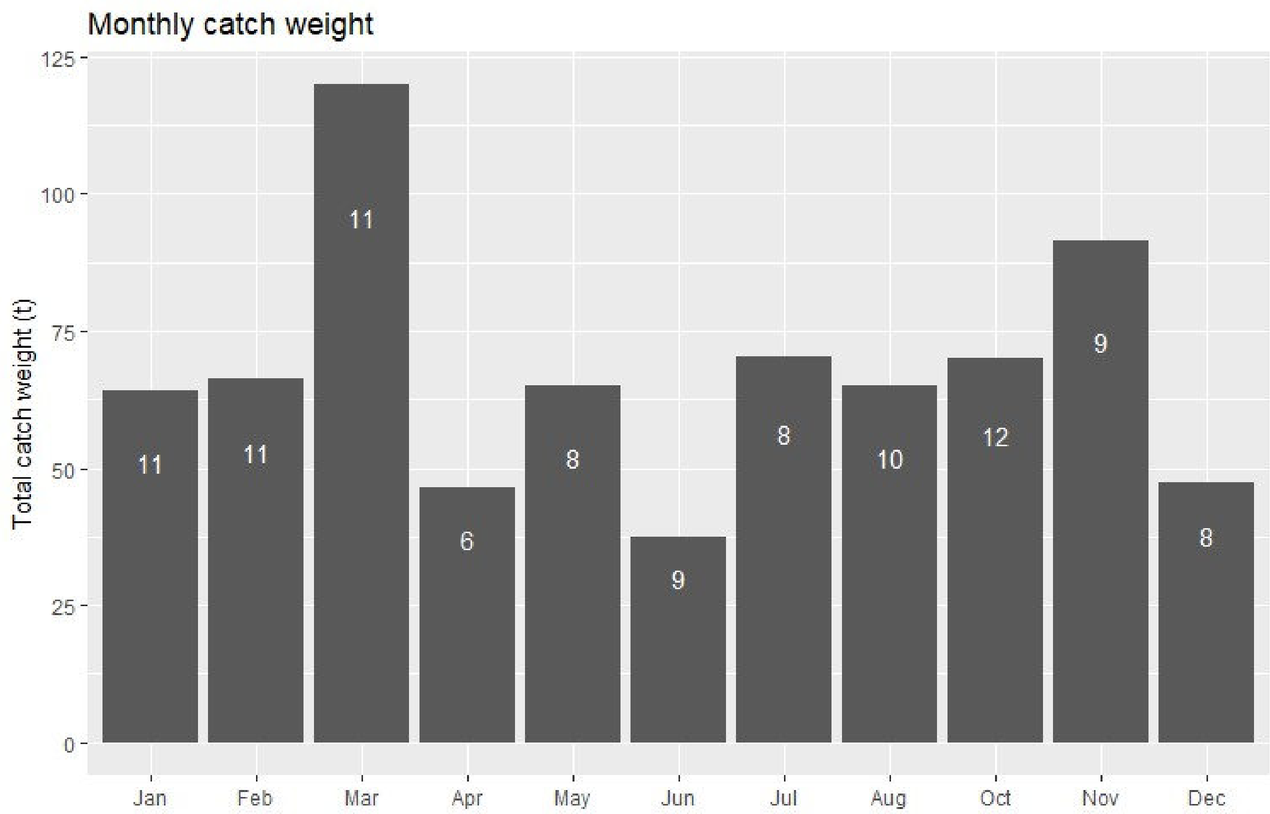

Figure 9. Monthly total catch by otter trawl in the operation area from July 2010 to Jun 2020.

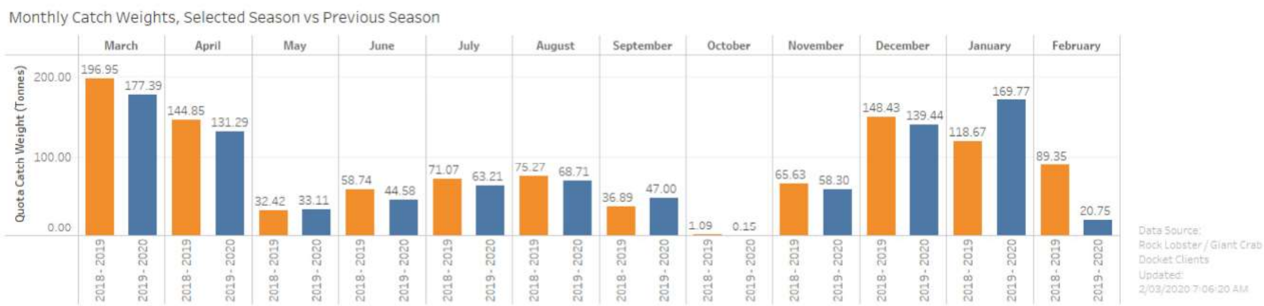

Figure 10. Monthly catch of Southern Rock Lobster by the Tasmanian Rock Lobster Fishery by year[3].

Table 1. Seasonality of fisheries showing seasonal closures (red), low to medium effort (orange) and high effort (green)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Victorian Rock Lobster												
Tasmanian Gant Crab												
CTS otterboard trawl												
Tasmanian rock lobster fishery												
Vic giant crab		C	o n	f i	d e	n t	i a	l				

[3] https://dpipwe.tas.gov.au/sea-fishing-aquaculture/commercial-fishing/rock-lobster-fishery/rock-lobster-catch

Table 2 Summary of affected fisheries (some figures rounded)

Fishery (by impact)	Effort (footprint)	Jurisdiction	10 yr. average catch in Operational area	Fishery TAC 2019	Fishery catch most recent year	% of catch potentially impacted by Operational area	Annual average revenue potentially impacted (Covid reduced prices)
			tonnes	tonnes	tonnes	%	($000's)
			A	B	C	D=A/C	=A*price
Vic rock lobster (western)	Recent	Victoria (VFA)	13.0[4]	245[5]	245[2]	5.2%	$1,280[6] ($641[7])
Tasmanian giant crab fishery	Some over last decade	Tasmania (DPIPWE)	7.4	22.6	19	39%	$737[8] ($553[9])
CTS otterboard trawl	Recent	Commonwealth (AFMA)	79	≈ 19,268[10]	7,714[11]	1%	$322
Tasmanian rock lobster fishery	Some over last decade	Tasmania (DPIPWE)	2.4	1,051	961	<1%	$238[12] ($119[13])
Vic giant crab	Recent	Victoria (VFA)	1.6[14]	10.5[15]	9.8[16]	16.3%	$161[17] ($121[18])
GHaT shark gillnet	Recent	Commonwealth (AFMA)	6.3	2,522[19]	1,789[20]	1%	$39
GHaT shark hook	Recent	Commonwealth (AFMA)	5.2				$37
GHaT scalefish hook	Recent	Commonwealth (AFMA)		≈ 19,268[21]	740[22]	<1%	
TOTAL			**115**	**23,119**	**11,478**	**<1%**	**$2,814 ($1,708)**

[4] Data provided by VFA (does not include 2014/2015 data which was missing due to confidentiality issues)
[5] 2018/2019 TACC for the Western Zone https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-srl-year
[6] Based on $100/kg for Rock Lobster and $10.5/kg for Octopus bycatch
[7] Based on the price during the Covid-19 pandemic - $50/kg and $10.5/kg for Octopus bycatch
[8] Based on industry estimate of $100/kg
[9] Based on industry estimate of $75/kg during the Covid-19 pandemic. Beach prices were not as affected by the pandemic as Southern Rock Lobster
[10] Combined 2018-19 total for 27 SESSF fish stocks mostly caught by the CTS
[11] Total 2018-19 CTS and Scalefish Hook catch minus Scalefish hook catch. 8,454 t-740 t from https://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status/trawl-scalefish-hook-sectors#91-description-of-the-fishery
[12] Based on $100/kg for Rock Lobster
[13] Based on the price during the Covid-19 pandemic - $50/kg
[14] This is the average "overestimation" of Giant Crab catch from the area of interest calculated by subtracting catch by the Rock Lobster Fishery from catch by asll fisheries in the area of interest. This catch will include some other species including Velvet Crab from the Commercial Permit issued for that species, Banded Ling, Southern Rock Lobster, School Shark and Striped Trumpeter from the Giant Crab Fishery and Conger Eel, Unspecified Eel, Leatherjacket, Gummy Shark, School Shark, Snapper, Striped Trumpeter and Unspecified Wrasse from the Rock Lobster Fishery. It is likely that this overestimation is close to the actual weight as byproduct in the Giant Crab Fishery is considered "negligible" (https://www.environment.gov.au/system/files/pages/b676dcfc-7165-4fbd-812b-013c75357b4c/files/assessment-2016.pdf), and by-product in the Rock Lobster Fishery is considered "low" (https://www.environment.gov.au/system/files/pages/41d461ff-6187-4ffd-ba73-bbc39dcd4334/files/vic-rlf-assessment-2016.pdf)
[15] 2018/2019 https://vfa.vic.gov.au/commercial-fishing/commercial-fish-production#fp-srl-year
[16] 2018/2019 https://vfa.vic.gov.au/__data/assets/pdf_file/0004/596866/FINAL_GC_ASSESS_1819.pdf
[17] Based on industry estimate of $100/kg
[18] Based on industry estimate of $75/kg during the Covid-19 pandemic. Beach prices were not as affected by the pandemic as Southern Rock Lobster
[19] School shark and gummy quota 2017/18
[20] https://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status/shark-gillnet-shark-hook-sectors#121-description-of-the-fishery
[21] Combined 2018-19 total for 27 SESSF fish stocks mostly caught by the CTS
[22] 2018/2019 https://vfa.vic.gov.au/__data/assets/pdf_file/0004/596866/FINAL_GC_ASSESS_1819.pdf

Appendix 7

SIV Consultation Report

(provided to NOPSEMA separately as sensitive information under Regulation 9(8) of the OPGGS(E))

Appendix 8

TSIC members' responses

(provided to NOPSEMA separately as sensitive information under Regulation 9(8) of the OPGGS(E))

Appendix 9

SIC/TSIC Mining, Gas and Petroleum Consultation Policy

POLICY IN RELATION TO MINING, GAS AND PETROLUEM SECTOR CONSULTATION WITH THE PROFESSIONAL SEAFOOD INDUSTRY

Definitions

Professional seafood industry	The professional fishing, harvesting, aquaculture, processing, wholesaling, retailing and exportation sectors of the Australian seafood industry, as represented by a seafood peak body.
Proponent or Title holder	The mining, gas and/or petroleum company proposing an activity within the marine environment.
Consultation:	An appropriate and meaningful form of engagement, consultation and collaboration between title holders and the professional seafood industry.
Seafood peak body	Recognised state based seafood bodies who represent the professional seafood industry, namely Seafood Industry Victoria (SIV) and the Tasmanian Seafood Industry Council (TSIC)

Background

Each Australian State has a seafood or fishing peak body (e.g. Seafood Industry Victoria – SIV; the Tasmanian Seafood Industry Council - TSIC). Seafood peak bodies represent a diverse range of memberships, which may include professional fishing, harvesting, aquaculture, processing, wholesaling, retailing and exportation of seafood.

Seafood peak bodies and the professional seafood industry is accustomed to operating within a multi-user environment and negotiating with other user groups for access to the marine resource. The industry supports the open and multi-user nature of State and Commonwealth waters.

In recent years, there has been an increased interest from mining, gas and petroleum companies to conduct a range of activities, in particular seismic surveys, within the marine environment. This has bought with it an increasing demand on the professional seafood industry to partake in consultation with mining, gas and petroleum activity proponents. This increasing demand for consultation is stretching the resources of seafood peak bodies and initiating a level of consultation fatigue. Furthermore, recent scientific reports[1] identify there are impacts on fisheries resources from exposure to seismic activities and the environment upon which they rely. This potential impact on the professional seafood industry operations is of significant concern.

[1] http://www.frdc.com.au/project?id=585
https://www.nature.com/articles/s41559-017-0195

When titleholders propose operations that would preclude existing users from fully exercising their rights and interests, the professional seafood industry will ensure concerns and interests are recognised and compensated accordingly. This includes the exclusive use of waters for activities such as establishment of safety zones around key infrastructures, and exclusion areas around seismic activities.

Future allocation of access to marine areas to titleholders, whether exclusive or not, should only be granted when there is an understanding of all impacts on professional seafood industry operations and the environment on which the sector depends on. All environmental plans and impact assessments must entail a full review of the risks and impacts of that particular allocation or acquisition area on the rights, operations and needs of intersecting and adjacent professional seafood industry interests. It should be obvious that this involves more than just articulation of historical catch data for key species.

Issues arise when titleholder projects impact on the marine environment to the detriment of professional seafood operations. Impacts may be short term, such as temporary displacement (construction or seismic activities) and other impacts may be long term, such as when the environmental effects of a project are of such magnitude that professional seafood operations are no longer viable or stock status is impacted.

Recent scientific reports[2] clearly identify the potential for longer term impacts on commercially targeted species and broader ecosystem services.

Adequate and consistent consultation practices must be carried out according to the principle that pre-existing users should be properly engaged and the identified risks and issues mitigated. Should there be potential negative impacts on professional seafood operations, there should be payment of compensation by the titleholders to the impacted party/s.

This Policy provides a background to the issue and a clear policy statement outlining the Australian professional seafood industry's position around all future mining, gas and petroleum activities within the marine jurisdiction. This Policy provides a clear and transparent process for all future titleholder consultation with the professional seafood industry, which would form the minimum consultation standard for all future mining, gas and petroleum activity within the marine environment.

[2] http://www.frdc.com.au/project?id=585
https://www.nature.com/articles/s41559-017-0195

Key Policy Principles

1. The professional seafood industry is a major impacted sector when mining, gas and petroleum activities, particularly seismic activities, are conducted in the marine environment.

2. The titleholder or proponent has an obligation to properly engage with relevant seafood organisations, in particular seafood peak bodies such as SIV and TSIC. Consultation must aim to identify potential issues and risks, and to mitigate any risk to ALARP (as low as reasonably possible).

3. The most efficient way to undertake these consultations and negotiations is with a co-ordinated program run through existing seafood peak body's and their established network connections (eg: Tasmanian Seafood Industry Council and Seafood Industry Victoria). Titleholders who deal with individual fishers and smaller association bodies may tick the consultation process box, but in reality will only deliver out of context 'direct contact' and create 'consultation fatigue'.

4. The cost of running a coordinated Consultation Program should be solely met by the Titleholders who give rise for the need of this service. This must include financial contribution to seafood peak bodies for the considerable time already expected of them during any consultation period. It needs to be noted that Titleholders who engage consultants to undertake engagement on their behalf may be helping themselves but are NOT alleviating the burden of consultation, investigation and negotiation on seafood peak bodies or individual industry participants. It is also important to note that seafood peak bodies and other seafood representatives are currently not funded to undertake the burden of consultation that supports Titleholders operations and the benefits they derive from these operations (namely financial).

5. The overarching process would be as follows;
    a. Once a titleholder identifies the jurisdictions (States and/or Commonwealth) in which they will be operating, they make 'first contact' with the seafood industry through the relevant seafood peak body (eg: SIV, TSIC). Information should be sent through to the seafood peak body. This should be done well in advance of the first briefing session with the peak body/s.

    b. The first briefing session should discuss the approach and scope of a **Consultation Plan**. This will be informed by where and when the proposed activity is going to take place and on that basis, which industry sectors are likely to be impacted and what pre-existing opportunities for industry engagement might be available. Engagement platforms may include broadcast materials like the PROFISH (SIV) newsletter and the Tasmanian Seafood Industry News Magazine; sector-specific newsletters and/or already planned Industry forums such as TACC forums or Port Visits.

    c. The peak body then provides a costed proposal (on behalf of Industry) to deliver the agreed **Consultation Plan** to meet the Titleholders and industry needs and to ensure Industry members are fairly treated.

6. Where a Titleholder has failed to engage in meaningful consultation with the professional seafood industry, seafood peak bodies shall seek to have regulatory approvals deferred for those project proposals that may significantly impact upon the interests of the professional seafood industry.

The Consultation Process

An increasing number of mining, gas and petroleum related developments overlap with professional seafood interests. State based seafood peak bodies find it challenging to engage with and respond to the ever increasing proposals being put forward by titleholders. At present, the levels of consultation employed by titleholders is inconsistent and often inadequate. Furthermore, seafood peak bodies are not compensated for the significant time and effort required for such consultation.

It is not sufficient for proponents of major developments to expect seafood peak bodies, or those fishers affected, to have the responsibility and dedicate the time required to investigate and review complex environmental reports. These reports may not even address the interests of professional fishers, or the links between their activities and the environment.

Seafood peak bodies are resource poor, and are not able, nor willing, to engage with each Titleholder and provide them with a list of contacts within the professional seafood industry. Subsequently, there is an impasse in the ability of each titleholder in their consultation, hence why we have developed this policy.

It is the view of the signatories of this Policy that the decision making process for mining, gas and petroleum project proposals must require proponents to demonstrate that their consultation and negotiation strategies engage appropriately with the professional seafood industry. This consultation process must address and where possible mitigate environmental and access issues.

The duty to consult lies solely with the titleholder. To achieve meaningful consultation titleholders must utilise appropriate two-way communication methods and techniques as the provision of information alone does not constitute appropriate and meaningful consultation.

An indicative Consultation Plan blueprint (up to publication / approval of the EP) is provided in the tables below. This shows that most titleholder consultations would require in the order of **30 days** time from seafood peak bodies. It needs noting that seafood peak bodies currently provide this service with no financial compensation, a situation we will not accept into the future**.**

Pre-activity planning and review of EP

Scoping	Review materials provided by Titleholder to identify what the proposed activity is, where it is happening and when. This will inform identification of potentially impacted sectors and likely issues and risks. This step assumes that all technical, eg modelling, work has been independently peer reviewed. If this is not the case then there will be an additional cost to get this review completed. This is a quality control step that Titleholders should undertake as a matter of course. **[5 days]**
Planning	Identify individuals and businesses in the potentially impacted sectors and make arrangements to qualify the nature of that potential impact. This will take into account that impacts could be short term, e.g. displacement of fishing effort and removal of access to fishing grounds and/or long term, e.g. damage to the flora and fauna within the marine environment and disturbance to ecosystem function. This would include the development of a communication and engagement plan for the individuals and businesses identified. **[5 days]**
Engagement	Execution of the communication and engagement plan in order to qualify the potential impacts. This would likely involve multiple meetings (possibly port visits) and also liaison with the state based regulators and research institutes to get certified fishing history statistics as required to support any subsequent negotiations. This would vary depending on size and nature of activity, number of fisheries, but time has been estimated based on engagement efforts and other costs associated with the Crowes Foot survey in Victoria. **[10 days+]**
Negotiation	On behalf of seafood individuals and businesses who have a qualified impact, develop a framework to mitigate risk and facilitate negotiations to ensure professional seafood industry members are fairly treated. [**5 days**].
EP Review	In cases where issues and/or risks were identified that may not have required negotiation / compensation for individuals or businesses, but rather changes to how the planned activity was going to be undertaken (eg, equipment used, paths taken, timeframes adjusted, etc), these will be reflected within a reviewed EP. In turn, this will require the seafood peak body review the updated proposed activity plans. **[5 days].**

Monitoring & Review (during and after completion of the activity)

(Indicative effort for an activity with 'moderate' compliance is in the order of **8 days)**

During the Activity	There is a role for seafood peak bodies in monitoring the activity and communicating with fishers on progress, issues and/or any changes in plans. This will require the seafood peak body to be on standby for discussions during the proposed activity. [In the order of **1 – 7 days of planned activity**].
After the Activity	On completion of the activity it is expected that there will be reports on compliance by the Titleholder of activity actually undertaken and 'groundtruthing' what actually happened as compared to what may have been modelled or assumed during the risk evaluation process in preparing the EP. For example, sound modelling is done prior to a survey. This is monitored during the survey for actual effect and then this should be reviewed to see if the impacts were greater than expected. This was actually the case for the Crowes Foot survey with compensation adjusted after the planned activity as the impacts were greater than originally expected. [Depending on levels of compliance / post-event findings **5 – 10 days**].

Policy created 19 April 2018

Policy review date 19 April 2023

Signatories

Johnathon Davey
Executive Director SIV

Julian Harrington
Chief Executive TSIC

Appendix 10

EPBC Act Protected Matters Search Tool database results

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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Coordinates

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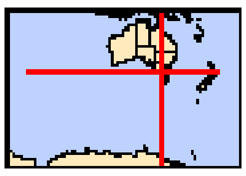

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	3
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	98
Listed Migratory Species:	76

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	2
Listed Marine Species:	123
Whales and Other Cetaceans:	32
Critical Habitats:	1
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	7

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	87
Regional Forest Agreements:	3
Invasive Species:	48
Nationally Important Wetlands:	9
Key Ecological Features (Marine)	3

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Indigenous		
Western Tasmania Aboriginal Cultural Landscape	TAS	Listed place
Historic		
Point Nepean Defence Sites and Quarantine Station Area	VIC	Listed place
Quarantine Station and Surrounds	VIC	Within listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Corner inlet	Within 10km of Ramsar
Lavinia	Within Ramsar site
Port phillip bay (western shoreline) and bellarine peninsula	Within Ramsar site
Western port	Within Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Acanthiza pusilla archibaldi		
King Island Brown Thornbill, Brown Thornbill (King Island) [59430]	Endangered	Species or species habitat likely to occur within area
Acanthornis magna greeniana		
King Island Scrubtit, Scrubtit (King Island) [82329]	Critically Endangered	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Platycercus caledonicus brownii Green Rosella (King Island) [67041]	Vulnerable	Species or species habitat known to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Strepera fuliginosa colei Black Currawong (King Island) [67113]	Vulnerable	Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area

Name	Status	Type of Presence
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Hooded Plover (eastern), Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Breeding known to occur within area
Crustaceans		
Astacopsis gouldi Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Oreisplanus munionga larana Marrawah Skipper, Alpine Sedge Skipper, Alpine Skipper [77747]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (Tasmanian population)		
Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Perameles gunnii gunnii		
Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat likely to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys fumeus		
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
Plants		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Caladenia caudata		
Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat likely to occur within area
Caladenia dienema		
Windswept Spider-orchid [64858]	Endangered	Species or species habitat known to occur within area
Caladenia orientalis		
Eastern Spider Orchid [83410]	Endangered	Species or species habitat may occur within area
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Corunastylis brachystachya		
Short-spiked Midge-orchid [76410]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Diuris lanceolata Snake Orchid [10231]	Endangered	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Hypolepis distans Scrambling Ground-fern [2148]	Endangered	Species or species habitat likely to occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat known to occur within area
Prasophyllum atratum Three Hummock Leek-orchid [82677]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum favonium Western Leek-orchid [64949]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum pulchellum Pretty Leek-orchid [64953]	Critically Endangered	Species or species habitat may occur within area
Prasophyllum secutum Northern Leek-orchid [64954]	Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat known to occur within area
Pterostylis rubenachii Arthur River Greenhood [64536]	Endangered	Species or species habitat likely to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - TRAINING CENTRE (Norris Barracks) - Portsea

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Cape Wickham Lighthouse	TAS	Listed place
Gabo Island Lighthouse	VIC	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Larus dominicanus Kelp Gull [809]		Breeding known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Morus capensis Cape Gannet [59569]		Breeding known to occur within area
Morus serrator Australasian Gannet [1020]		Breeding known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Pelecanoides urinatrix Common Diving-Petrel [1018]		Breeding known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area

Name	Threatened	Type of Presence
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
[Histiogamphelus briggsii](#) Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
[Histiogamphelus cristatus](#) Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
[Hypselognathus rostratus](#) Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
[Kaupus costatus](#) Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
[Kimblaeus bassensis](#) Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
[Leptoichthys fistularius](#) Brushtail Pipefish [66248]		Species or species habitat may occur within area
[Lissocampus caudalis](#) Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
[Lissocampus runa](#) Javelin Pipefish [66251]		Species or species habitat may occur within area
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat may occur within area
[Mitotichthys mollisoni](#) Mollison's Pipefish [66260]		Species or species habitat may occur within area
[Mitotichthys semistriatus](#) Halfbanded Pipefish [66261]		Species or species habitat may occur within area
[Mitotichthys tuckeri](#) Tucker's Pipefish [66262]		Species or species habitat may occur within area
[Notiocampus ruber](#) Red Pipefish [66265]		Species or species habitat may occur within area
[Phycodurus eques](#) Leafy Seadragon [66267]		Species or species habitat may occur within area
[Phyllopteryx taeniolatus](#) Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
[Pugnaso curtirostris](#) Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
[Solegnathus robustus](#) Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
[Solegnathus spinosissimus](#) Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area

Name	Status	Type of Presence
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Critical Habitats [Resource Information]

Name	Type of Presence
Thalassarche cauta (Shy Albatross) - Albatross Island, The Mewstone, Pedra Branca	Listed Critical Habitat

Australian Marine Parks [Resource Information]

Name	Label
Apollo	Multiple Use Zone (IUCN VI)
Beagle	Multiple Use Zone (IUCN VI)
Boags	Multiple Use Zone (IUCN VI)
East Gippsland	Multiple Use Zone (IUCN VI)
Franklin	Multiple Use Zone (IUCN VI)
Zeehan	Multiple Use Zone (IUCN VI)
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Albatross Island	TAS
Anser Island	VIC
Arthur-Pieman	TAS
Badger Box Creek	TAS
Bird Island	TAS
Black Pyramid Rock	TAS
Bull Rock	TAS
Cape Wickham	TAS
Cape Wickham	TAS
Cataraqui Point	TAS
Christmas Island	TAS
City of Melbourne Bay	TAS
Colliers Forest Reserve	TAS
Colliers Swamp	TAS
Cone Islet	TAS
Councillor Island	TAS
Counsel Hill	TAS
Currie Lightkeepers Residence	TAS
Curtis Island	TAS
Deep Lagoons	TAS
Devils Tower	TAS
Disappointment Bay	TAS
East Moncoeur Island	TAS
Eldorado	TAS
Four Mile Beach	TAS
Gentle Annie	TAS
Harbour Islets	TAS
Henderson Islets	TAS
Highfield	TAS
Hogan Group	TAS
Hunter Island	TAS
Kentford Forest	TAS
Kentford Forest	TAS
Kentford Road	TAS
King Island	TAS
Lake Flannigan	TAS
Lavinia	TAS
Lily Lagoon	TAS
Little Trefoil	TAS
Loorana	TAS
Lymwood	TAS
Lyons Cottage	TAS
Millwood Road	TAS
Muddy Lagoon	TAS
Nares Rocks	TAS
New Year Island	TAS
North East Islet	TAS
Nugara	TAS
Pegarah	TAS
Pegarah Forest	TAS
Penguin Islet	TAS
Petrel Islands	TAS
Phillip Island Nature Park	VIC
Point Nepean	VIC
Porky Beach	TAS
Red Hut Point	TAS
Red Hut Road #1	TAS
Reekara	TAS
Reekara Road #1	TAS
Reekara Road #2	TAS
Reid Rocks	TAS
Rodondo Island	TAS
Sandfly Beach	TAS

Name	State
Sea Elephant	TAS
Sea Elephant Bootlace	TAS
Sea Elephant River	TAS
Seacrow Islet	TAS
Seal Rocks	TAS
Seal Rocks	TAS
Slaves Bay	TAS
Stack Island	TAS
Stanley	TAS
Stokes Point	TAS
Sugarloaf Rock	TAS
Tambar	TAS
Tathams Lagoon	TAS
Tatlows Beach	TAS
The Doughboys	TAS
The Nut	TAS
Three Hummock Island	TAS
Ventnor B.R.	VIC
West Moncoeur Island	TAS
West Point	TAS
Wicks Road Nugara	TAS
Wilsons Promontory	VIC
Wilsons Promontory Islands	VIC
Yambacoona	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
East Gippsland RFA	Victoria
Gippsland RFA	Victoria
Tasmania RFA	Tasmania

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Callipepla californica California Quail [59451]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Meleagris gallopavo Wild Turkey [64380]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pavo cristatus Indian Peafowl, Peacock [919]		Species or species habitat likely to occur within area
Phasianus colchicus Common Pheasant [920]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area

Name	Status	Type of Presence
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Bungaree Lagoon	TAS
Lake Flannigan	TAS
Lavinia Nature Reserve	TAS
Mud Islands	VIC
Pearshape Lagoon 1	TAS
Pearshape Lagoon 2	TAS
Pearshape Lagoon 3	TAS
Pearshape Lagoon 4	TAS
Western Port	VIC

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Big Horseshoe Canyon	South-east
Upwelling East of Eden	South-east
West Tasmania Canyons	South-east

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-38.873832 143.531239,-38.873832 143.531239,-38.693988 143.871815,-38.505094 144.102528,-38.376018 144.289296,-38.332942 144.509022,-38.289839 144.640858,-38.255339 144.750721,-38.246711 144.816639,-38.332942 144.805653,-38.307083 144.739735,-38.315704 144.673817,-38.341559 144.684803,-38.419069 144.78368,-38.530882 144.915516,-38.505094 145.02538,-38.462095 145.069325,-38.419069 145.168202,-38.444888 145.201161,-38.530882 145.146229,-38.530882 145.267079,-38.582429 145.311024,-38.599603 145.475819,-38.685413 145.530751,-38.702563 145.640614,-38.676837 145.706532,-38.728279 145.794422,-38.822494 145.86034,-38.933679 145.882313,-38.942225 145.948231,-38.908037 146.014149,-38.848168 146.091053,-38.916585 146.200917,-39.027623 146.255848,-39.121441 146.277821,-39.164045 146.398671,-39.121441 146.662342,-38.856724 147.013905,-38.608189 147.332508,-38.436282 147.848866,-38.272591 148.25536,-37.900767 148.639881,-37.822705 148.760731,-37.822705 149.046376,-37.831382 149.277089,-37.779301 149.595692,-37.675027 149.716542,-37.588021 149.848378,-37.527055 150.024159,-37.317653 150.123036,-37.107666 150.232899,-36.976128 150.419667,-37.055078 150.474598,-37.683722 150.430653,-38.065295 149.969227,-38.548068 149.112294,-38.873832 148.156483,-39.189595 147.409413,-39.393659 147.255604,-39.461548 147.420399,-39.546316 147.475331,-39.81688 146.673329,-40.035932 145.805409,-40.296192 145.673573,-40.5638 146.156971,-40.630536 146.673329,-40.813715 146.882069,-41.02955 146.497547,-41.054408 146.113026,-40.963214 145.838368,-40.813715 145.464833,-40.747163 145.080311,-40.605518 144.90453,-40.655545 144.673817,-40.863586 144.651844,-41.012972 144.607899,-41.228156 144.662831,-41.442633 144.750721,-41.639986 144.860585,-41.787605 144.981434,-41.877649 145.036366,-42.114432 145.146229,-42.252826 145.146229,-42.431474 145.223133,-42.431474 145.124256,-42.407143 144.684803,-42.277217 144.047596,-42.008397 143.37743,-41.541385 141.960194,-41.070976 140.993397,-40.086382 140.960438,-39.393659 141.773426,-38.959312 141.564686,-38.711136 141.487782,-38.659681 141.619618,-38.693988 142.355702,-38.813935 143.16869,-38.873832 143.531239

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Canberra City ACT 2601 Australia
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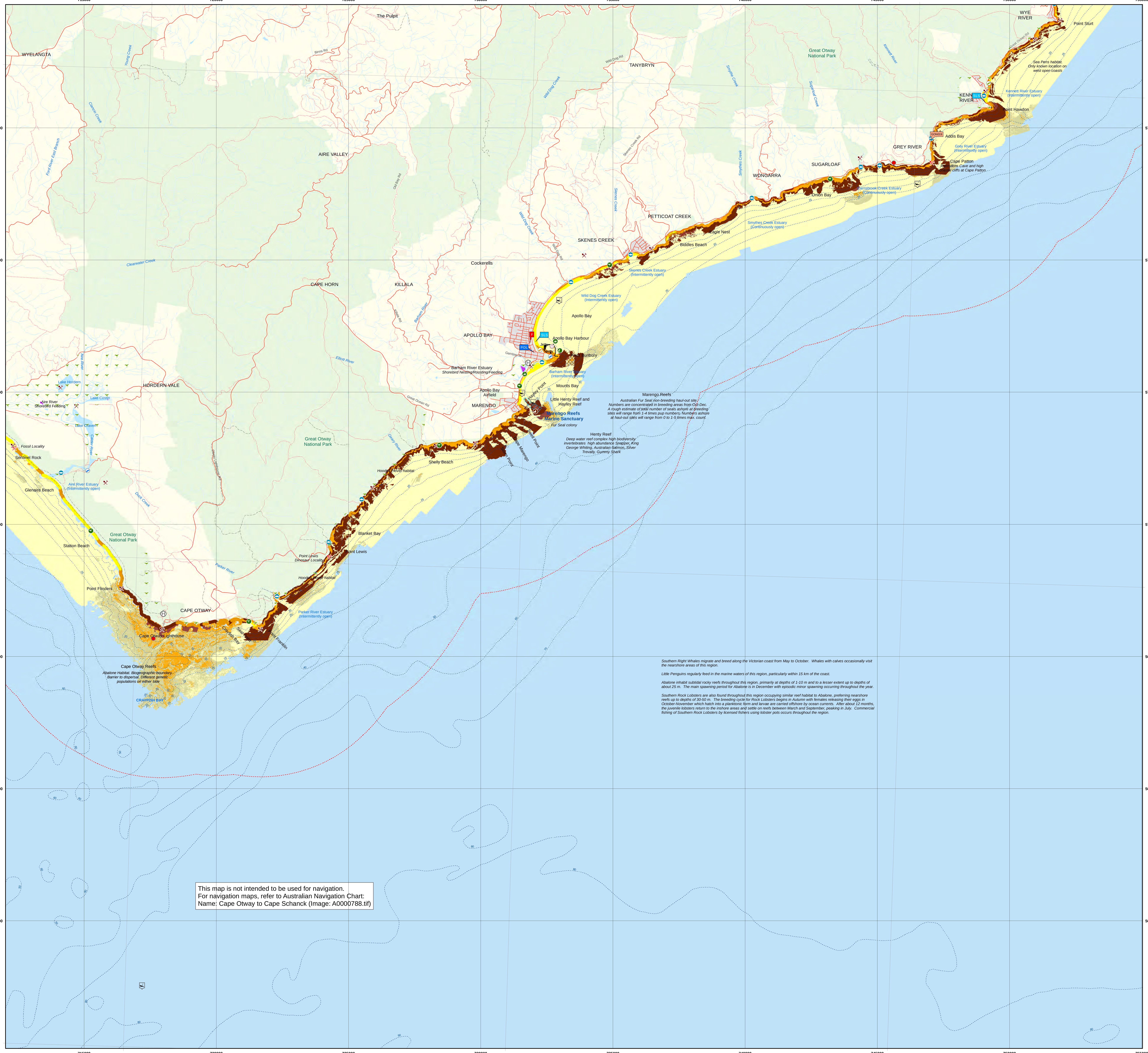
Appendix 11

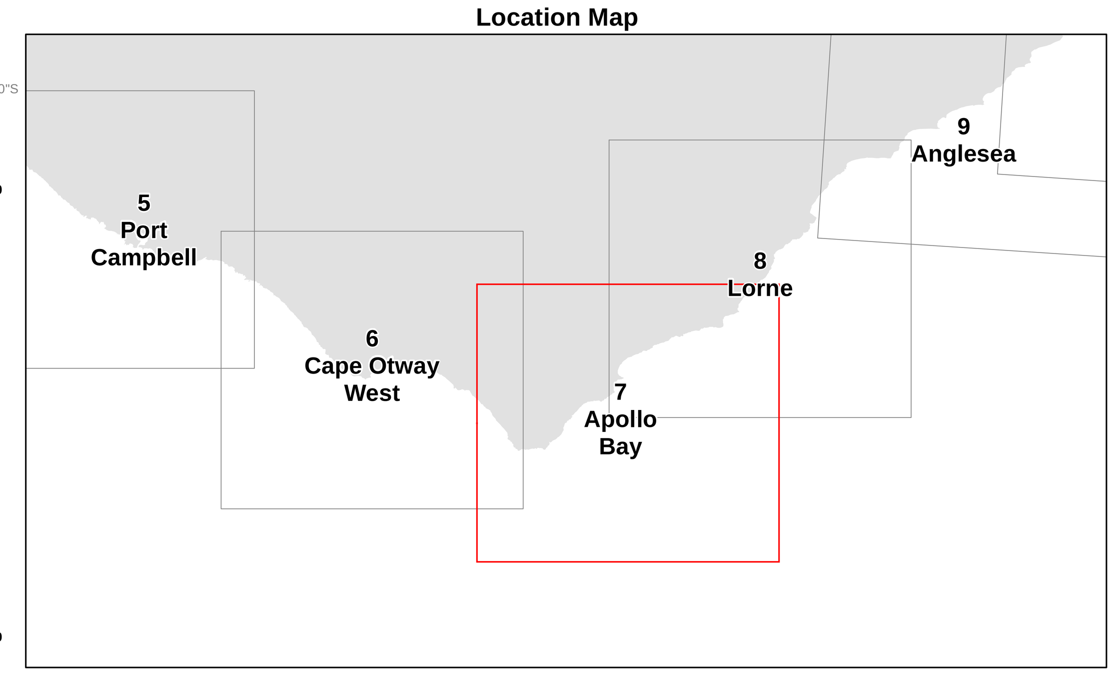
Oil Spill Response Atlas (OSRA) maps of the Victorian coast within the spill EMBA



07 Apollo Bay

Oil Spill Response Atlas Map

Location Map



Legend

- Fire Station
- Lifesaving Club
- Police Station
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Little Penguin colonies
- Hooded Plover
- Shorebird Roosting Sites
- Common Bent-wing Bat
- Shorebird Habitats
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- BOM Observation Station
- Victoria - 3nm Boundary
- Coastal Protection Structure
- Shipwrecks

Geological Sites

- International, National Significance
- Regional, State, Unknown Significance
- Bathymetry
- Watercourse

Roads

- Other Roads
- Tracks
- Walking Path
- Marine National Park/Sanctuary

Inter-tidal Vegetation

- Saltmarsh

Corangamite Marine Substrate

- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment

Shoreline Habitat Type

- Artificial Shoreline
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types

- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment
- Water Body
- Swamp
- Parks and Reserves

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Scale 1:50,000

0 2 4 6 8 10 Km

Acknowledgement
This map was produced with support from the Department of Environment and Primary Industries, the National Plan for Maritime Environmental Emergencies.

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 54
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

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Australian Maritime Safety Authority

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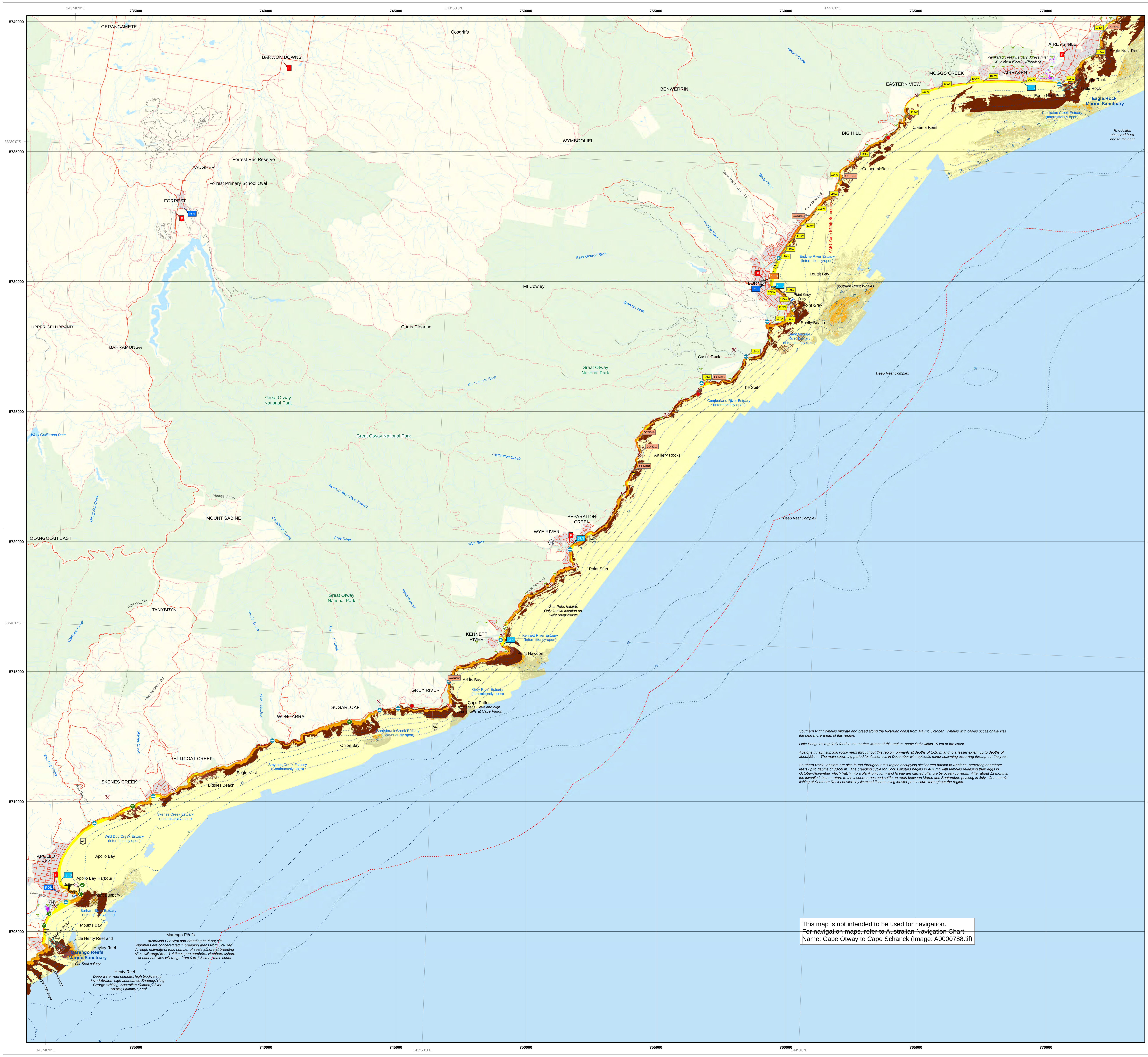
08 Lorne
Oil Spill Response Atlas Map



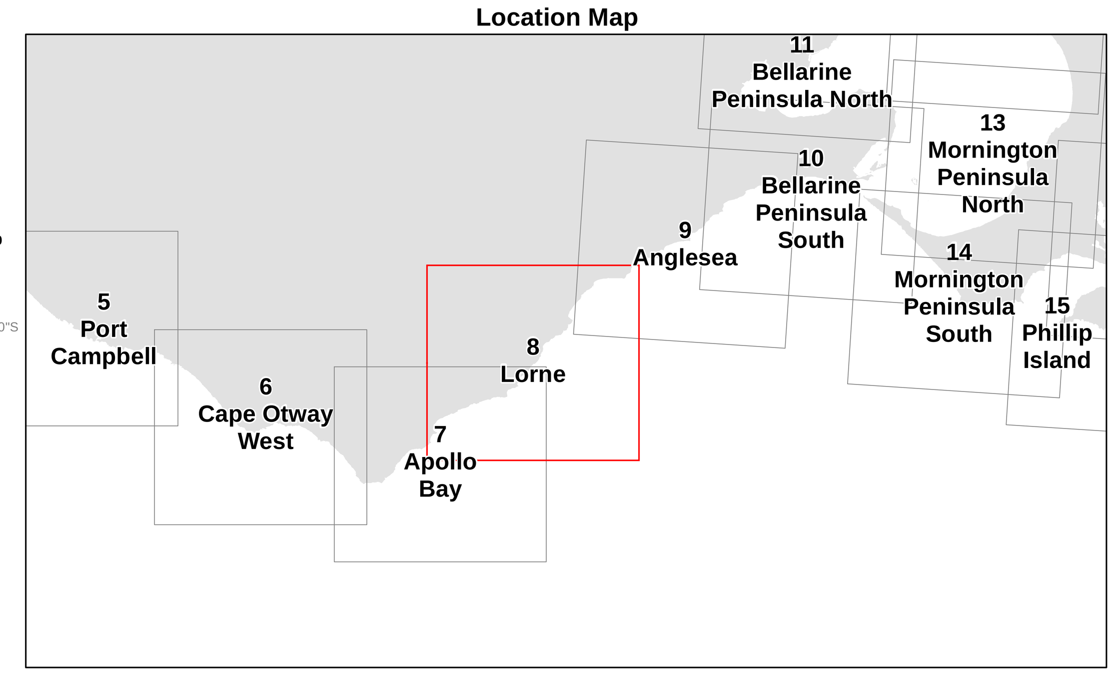
Southern Right Whales migrate and breed along the Victorian coast from May to October. Whales with calves occasionally visit the nearshore areas of this region.

Little Penguins regularly feed in the marine waters of this region, particularly within 15 km of the coast.

Abalone inhabit subtidal rocky reefs throughout this region, primarily at depths of 1-10 m and to a lesser extent up to depths of about 25 m. The main spawning period for Abalone is in December with episodic minor spawning occurring throughout the year.

Southern Rock Lobsters are also found throughout this region occupying similar reef habitat to Abalone, preferring nearshore reefs up to depths of 30-50 m. The breeding cycle for Rock Lobsters begins in Autumn with females releasing their eggs in October-November which hatch into a planktonic form and larvae are carried offshore by ocean currents. After about 12 months, the juvenile lobsters return to the inshore areas and settle on reefs between March and September, peaking in July. Commercial fishing of Southern Rock Lobsters by licensed fishers using lobster pots occurs throughout the region.

Location Map



Legend

- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Little Penguin colonies
- Hooded Plover
- Shorebird Roosting Sites
- Common Bent-wing Bat
- Shorebird Habitats
- River Entrance - Intermittently Open
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- BOM Observation Station
- Navigation Aids
- Victoria - 3nm Boundary
- Coastal Protection Structure
- Shipwrecks

Geological Sites
- International, National Significance
- Regional, State, Unknown Significance
- Bathymetry
- Watercourse

Roads
- Other Roads
- Tracks
- Walking Path
- Marine National Park/Sanctuary

Inter-tidal Vegetation
- Saltmarsh

Corangamite Marine Substrate
- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment

Shoreline Habitat Type
- Artificial Shoreline
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types
- Intertidal Mud-Sand Flat
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Sand Dunes
- Slumping Cliff
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment
- Water Body
- Swamp
- Parks and Reserves

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Scale 1:50,000

0 2 4 6 8 10 Km

Acknowledgement
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Map Grid of Australia
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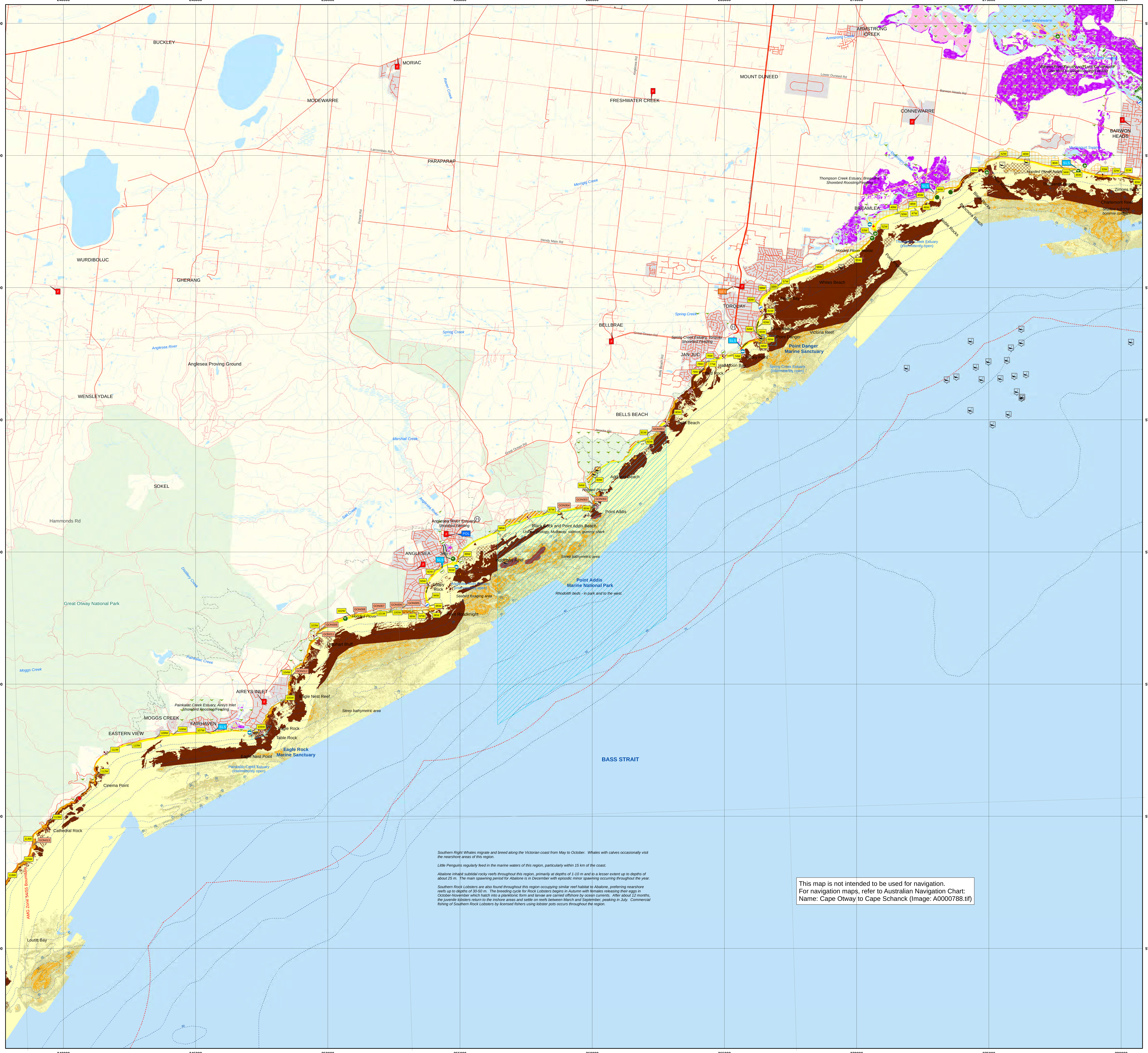
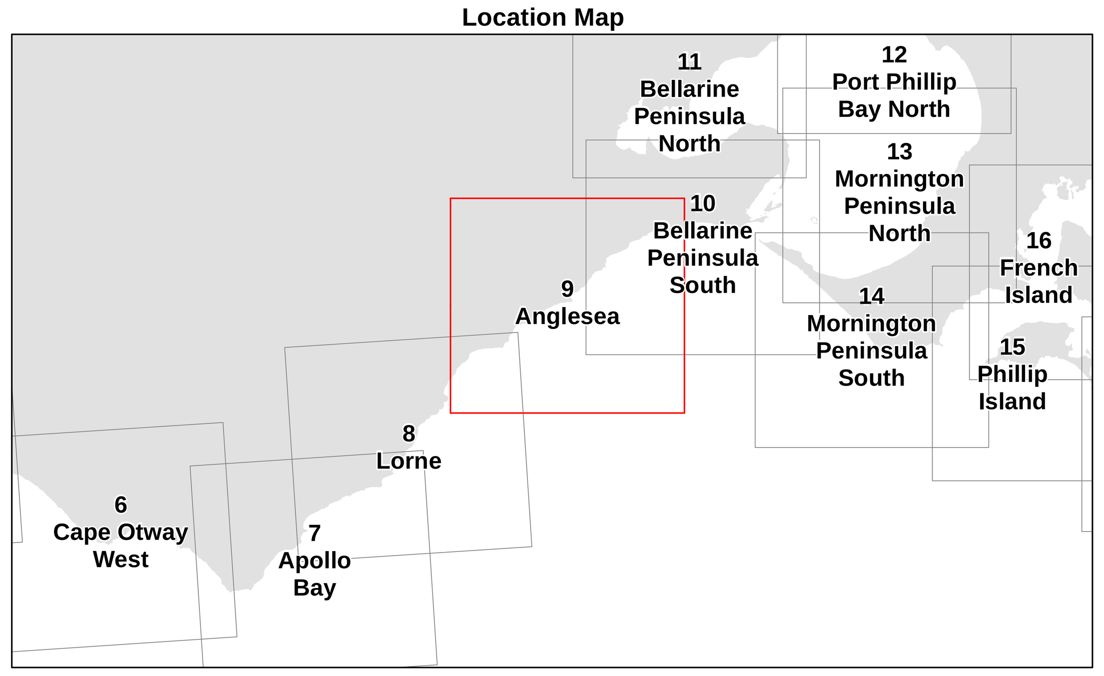
09 Anglesea
Oil Spill Response Atlas Map



Location Map



Legend

- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Hooded Plover
- Shorebird Roosting Sites
- Tern Nesting Sites
- Common Bent-wing Bat
- Shorebird Habitats
- River Entrance - Intermittently Open
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- BOM Observation Station
- Navigation Aids
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary
- Coastal Protection Structure
- Oil/Gas Pipeline
- Shipwrecks

Geological Sites
- Regional, State, Unknown Significance
- Bathymetry
- Watercourse

Roads
- Highway
- Other Roads
- Tracks
- Walking Path
- Marine National Park/Sanctuary

Inter-tidal Vegetation
- Saltmarsh
- Mangrove

Corangamite Marine Substrate
- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment

Shoreline Habitat Type
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types
- Freshwater Swamp
- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Sand Dunes
- Slumping Cliff
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment
- Water Body
- Swamp
- Parks and Reserves

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Scale 1:50,000

0 2 4 6 8 10 Km

N W E S

Acknowledgement
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Map Grid of Australia
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GDA

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Victoria

Australian Government
Australian Maritime Safety Authority

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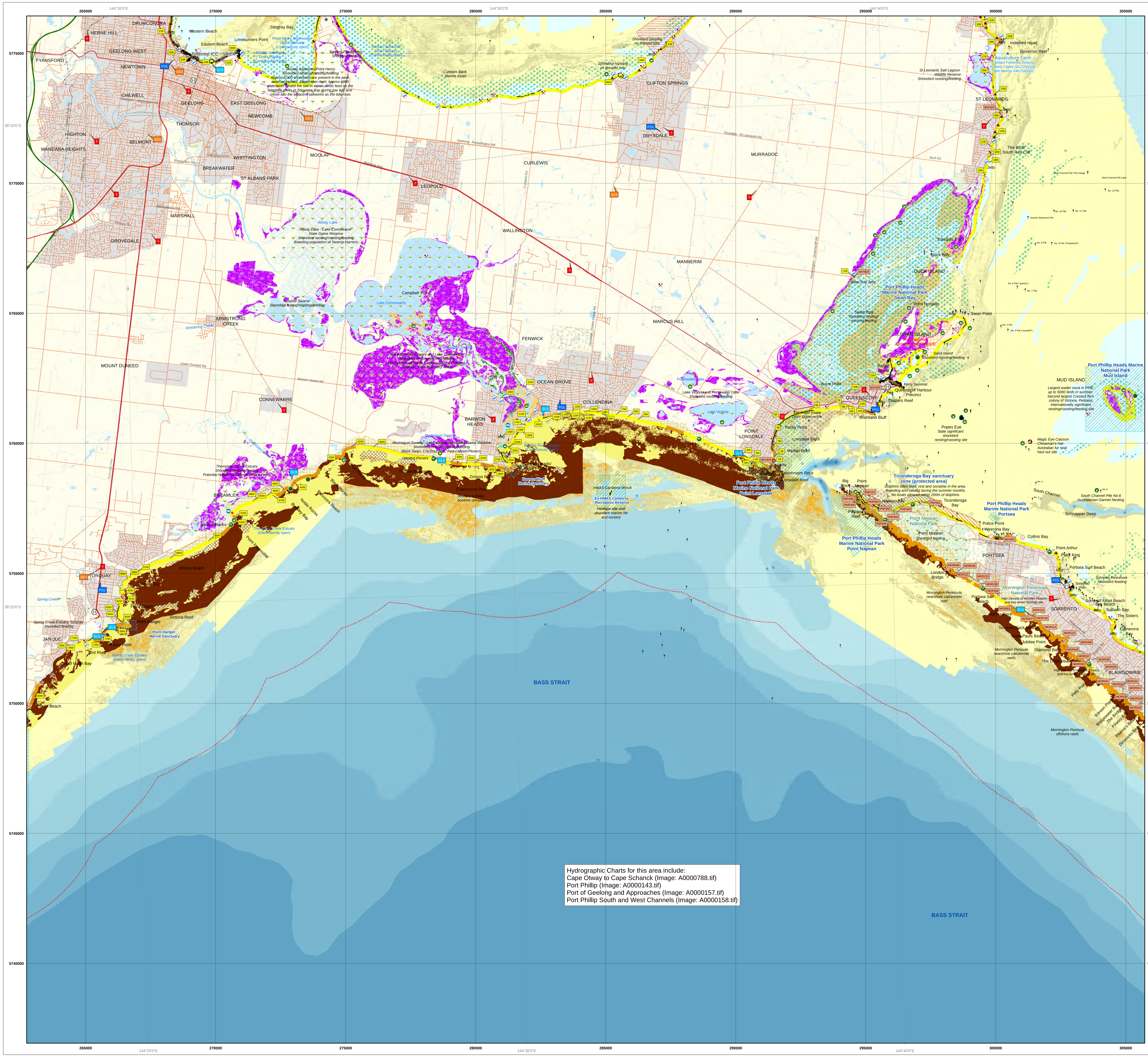
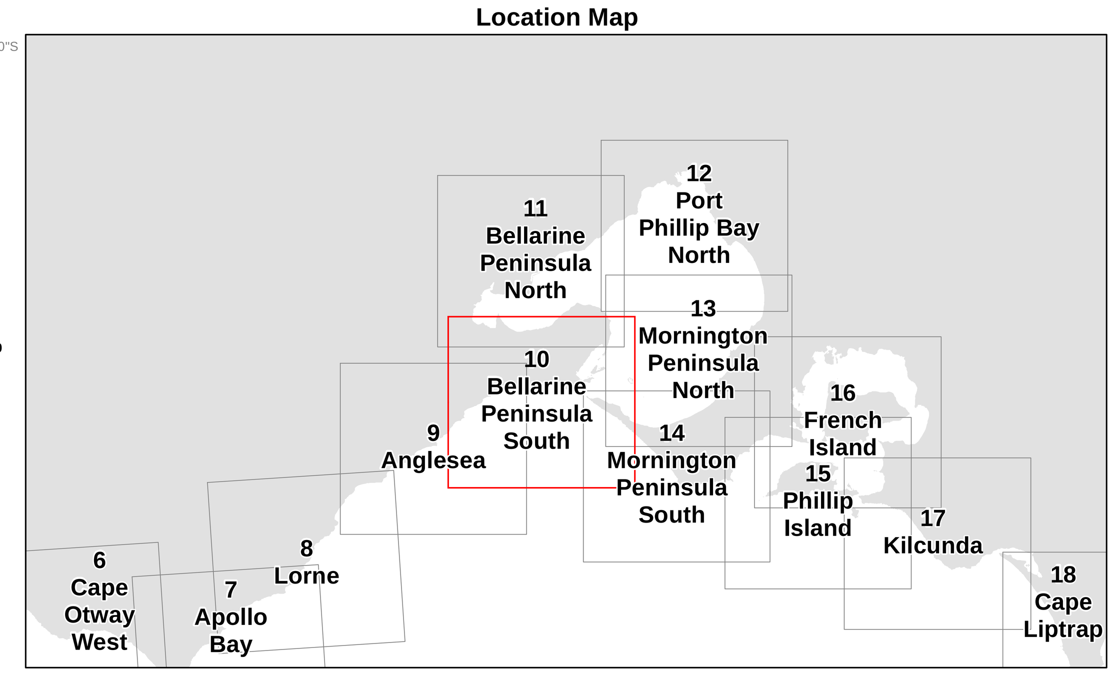
10 Bellarine Peninsula South Oil Spill Response Map



Location Map



Legend

- Helipads
- Potential ICC Locations
- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Dolphin Habitat
- Australasian Gannet Nesting Sites
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Common Bent-wing Bat Roost
- Aquaculture License Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- River Entrance - Sluice Gate
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Navigation Aids
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary
- Saltwater intake
- Saltwater intake/outlet
- Saltwater outlet
- Stormwater Drain Outlets
- Oil/Gas Facility
- Oil/Gas Pipeline

Geological Sites

- Regional, State, Unknown Significance

- Freeway
- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Aquaculture Reserve
- Marine Mammals Protected Area
- Marine Special Management Area
- Marine National Park/Sanctuary
- EX-HMAS Canberra Rec Reserve

Aquatic Vegetation

- Amphibolis
- Macroalgae
- Other Seagrass

Inter-tidal Vegetation

- Saltmarsh
- Mangrove

Shoreline Habitat Type

- Artificial Shoreline
- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Corangamite Marine Substrate

- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment

Coastal Types

- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

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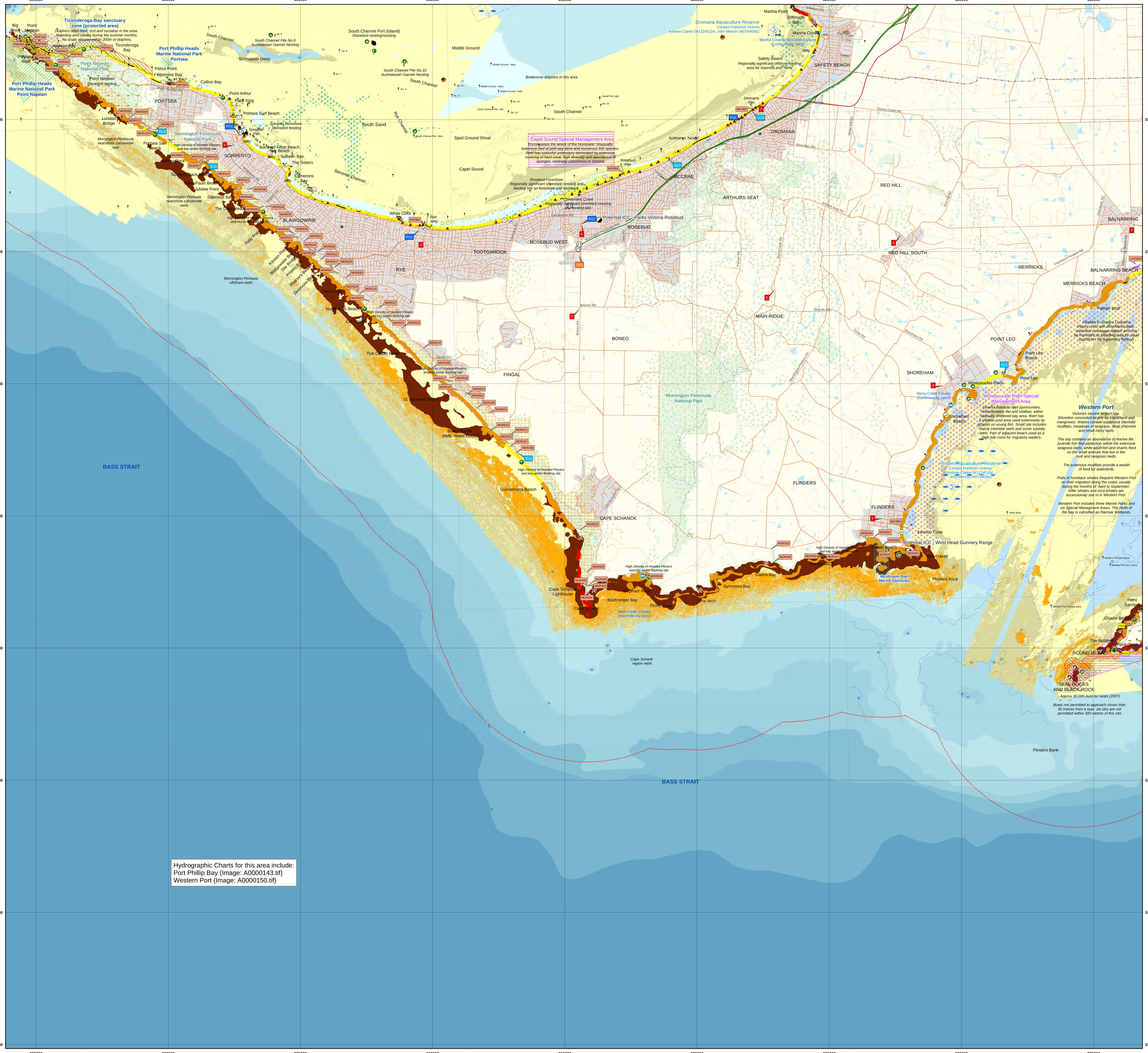
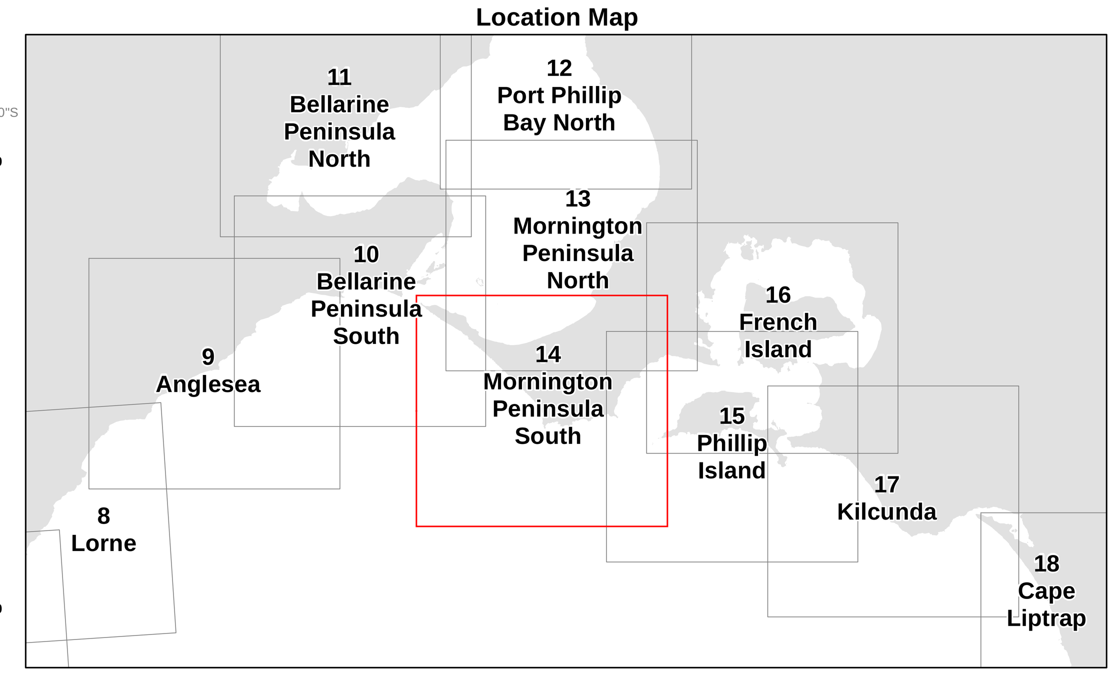
14 Mornington Peninsula South Oil Spill Response Map



Location Map



Legend

- Helipads
- Potential ICC Locations
- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Little Penguin Colonies
- Dolphin Habitat
- Australasian Gannet Nesting Sites
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Common Bent-wing Bat Roost
- Aquaculture License Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Navigation Aids
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary
- Stormwater Drain Outlets
- Oil/Gas Facility
- Oil/Gas Pipeline

Geological Sites

- International, National Significance
- Regional, State, Unknown Significance
- Western Port Bathymetry 25k

- Freeway
- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Aquaculture Reserve
- Marine Mammals Protected Area
- Marine Special Management Area
- Marine National Park/Sanctuary

Aquatic Vegetation

- Amphibolis
- Macroalgae
- Other Seagrass

Inter-tidal Vegetation

- Saltmarsh

Shoreline Habitat Type

- Artificial Shoreline
- Intertidal Shore Platform
- Mixed Cobble/Shingle Beach/Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types

- Cobble/Shingle Beach
- Intertidal Sand Flat
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate
- Water Body
- Sewage Pond
- Tree Cover
- Parks and Reserves

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

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Map Grid of Australia
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Projection: Transverse Mercator (UTM)
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Scale
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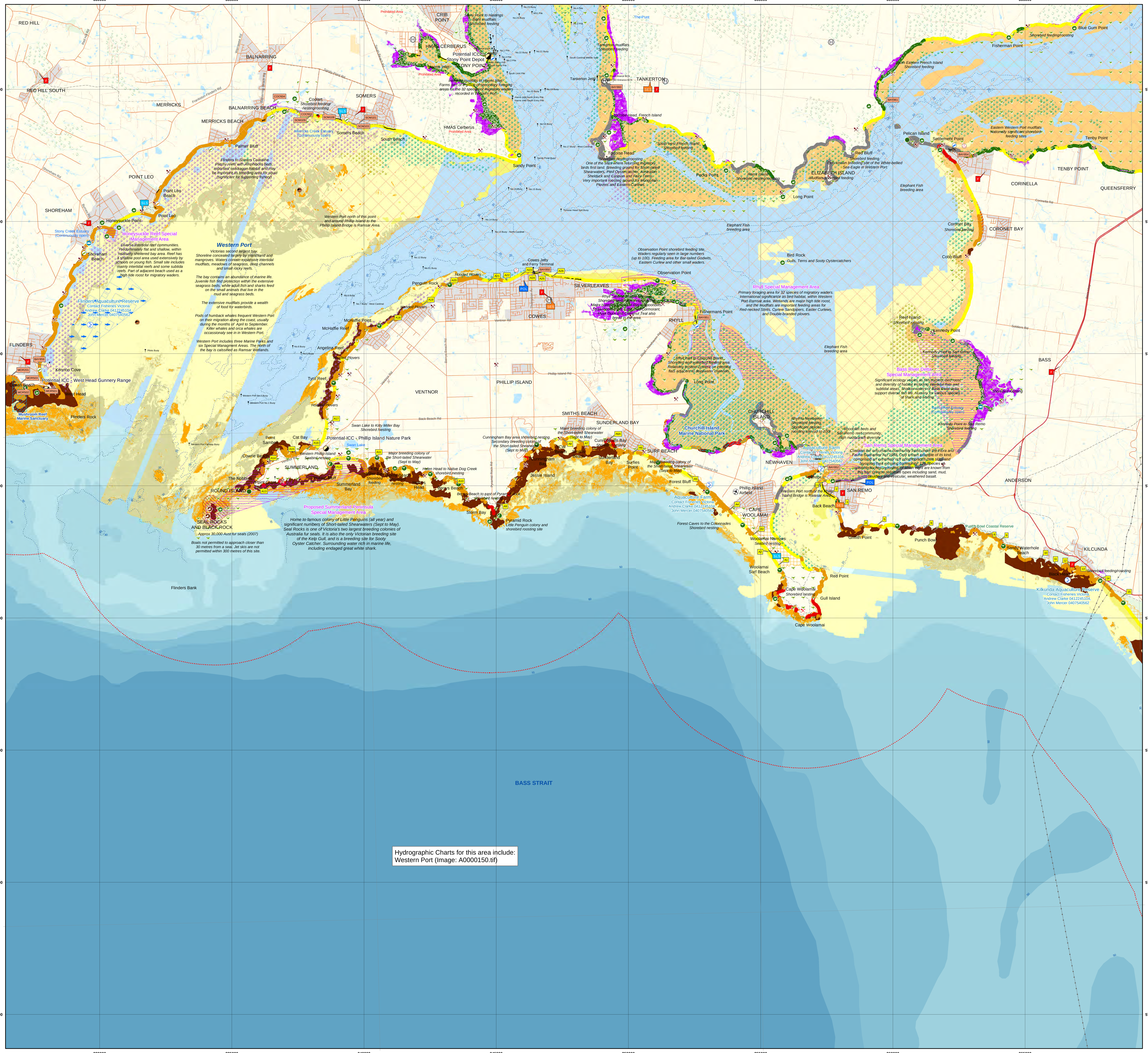
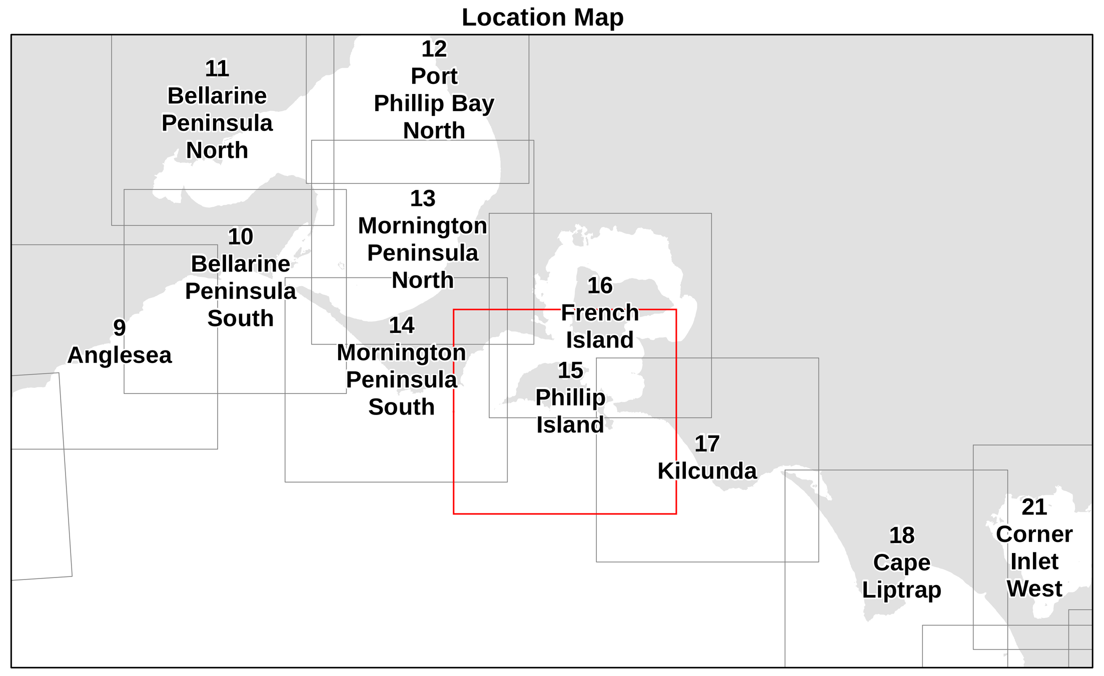
15 Phillip Island

Oil Spill Response Map



Location Map



Legend

- Helipads
- Airports and Airfields
- Potential ICC Locations
- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Little Penguin Colonies
- Dolphin Habitat
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Aquaculture License Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Navigation Aids
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary
- Oil/Gas Pipeline

Geological Sites

- International, National Significance
- Regional, State, Unknown Significance
- Western Port Bathymetry 25k

- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Aquaculture Reserve
- Marine Mammals Protected Area
- Marine Special Management Area
- Marine National Park/Sanctuary

Aquatic Vegetation

- Amphibolis
- Macroalgae
- Other Seagrass

Inter-tidal Vegetation

- Saltmarsh
- Mangrove
- Western Port Rhodolith Beds

Shoreline Habitat Type

- Artificial Shoreline
- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Shore Platform
- Mangroves
- Mixed Cobble/Shingle Beach/Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types

- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate
- Water Body
- Swamp
- Sewage Pond
- Tree Cover
- Parks and Reserves

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale
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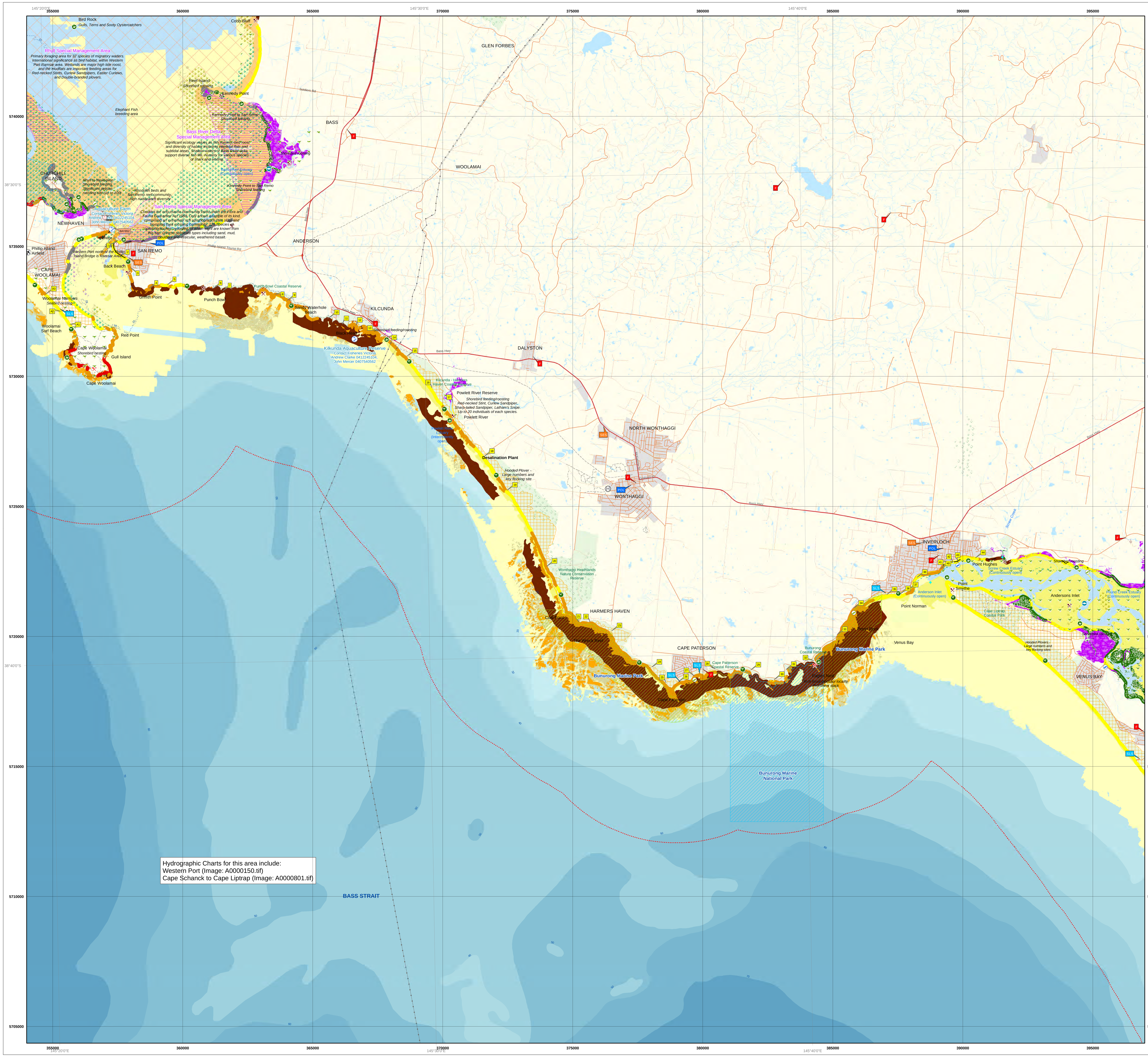
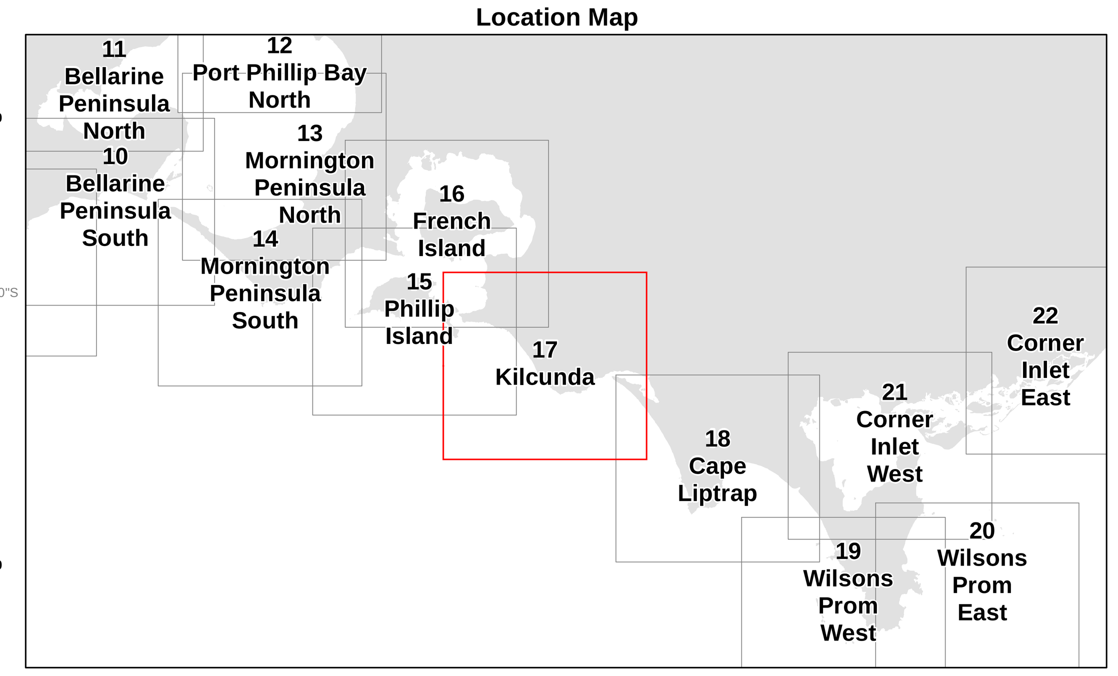
17 Kilcunda
Oil Spill Response Map



Location Map



Legend

- Helipads
- Airports and Airfields
- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Aquaculture License Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Beach Emergency Signs
- ESTA Emergency Markers
- Boat Launch
- Boat Ramp
- Boat Slipway
- Boat Mooring
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary
- Oil/Gas Pipeline

Geological Sites

- International, National Significance
- Regional, State, Unknown Significance
- Western Port Bathymetry 25k

- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Marine Special Management Area
- Marine National Park/Sanctuary
- Other Marine Park

Aquatic Vegetation

- Amphibolis
- Macroalgae
- Other Seagrass

Inter-tidal Vegetation

- Saltmarsh
- Mangrove
- Western Port Rhodolith Beds

Shoreline Habitat Type

- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Shore Platform
- Mangroves
- Mixed Cobble/Shingle Beach/Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types

- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale
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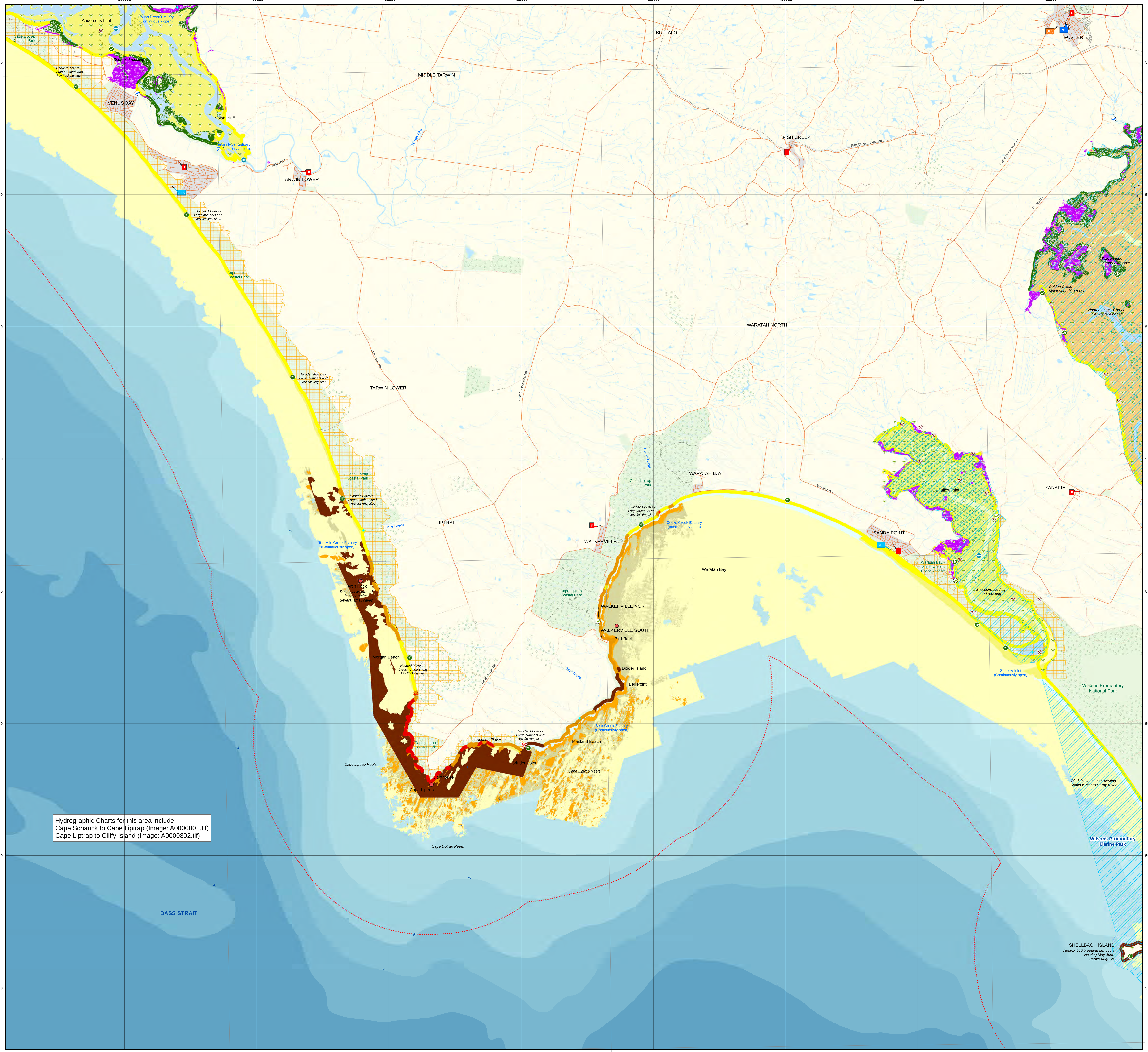
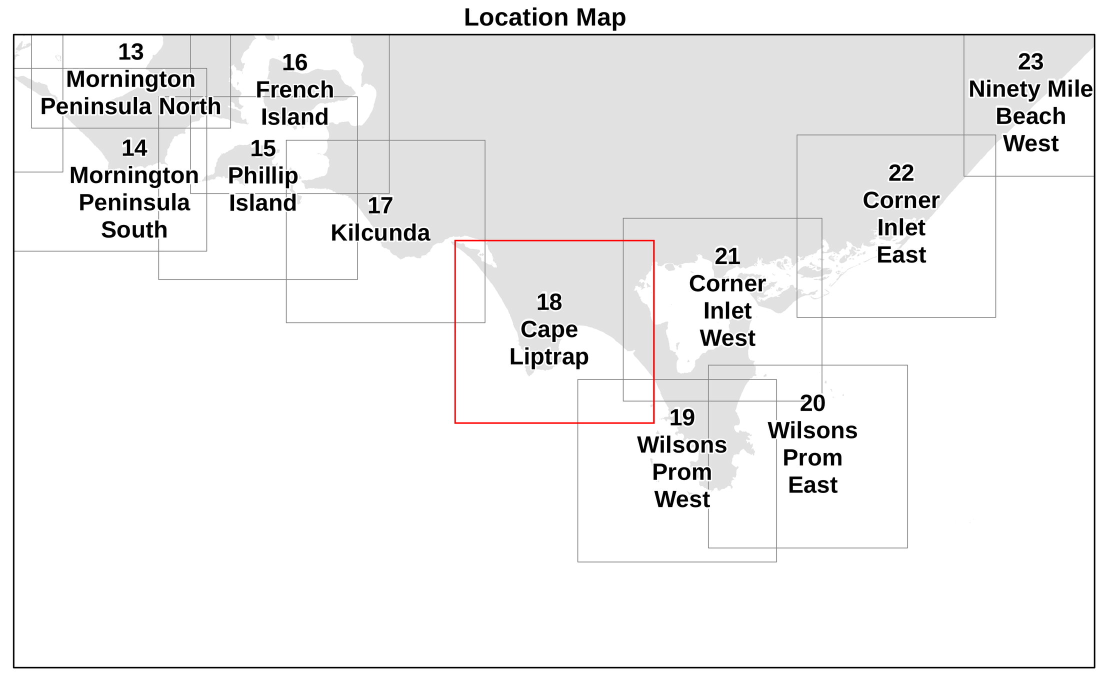
18 Cape Liptrap
Oil Spill Response Map



Location Map



Legend

- Helipads
- Fire Station
- Lifesaving Club
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Little Penguin Colonies
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Common Bent-wing Bat Roost
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Boat Launch
- Boat Ramp
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Coastal Ramsar Sites in Victoria
- Victoria - 3nm Boundary

Geological Sites
- International, National Significance
- Regional, State, Unknown Significance

- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Marine National Park/Sanctuary

Aquatic Vegetation
- Macroalgae
- Other Seagrass

Inter-tidal Vegetation
- Saltmarsh
- Mangrove

Shoreline Habitat Type
- Intertidal Mud-Sand Flat
- Intertidal Shore Platform
- Mangroves
- Mixed Cobble/Shingle Beach/Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

Coastal Types
- Cobble/Shingle Beach
- Intertidal Mud-Sand Flat
- Intertidal Sand Flat
- Intertidal Shore Platform
- Sand Beach
- Sand Dunes
- Steep Shoreline (rocky cliffs/embankments)
- Subtidal Rocky Reef
- Subtidal Sandy Substrate
- Water Body
- Swamp
- Sewage Pond
- Tree Cover
- Parks and Reserves

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

Scale 1:50,000

COORDINATES SYSTEM
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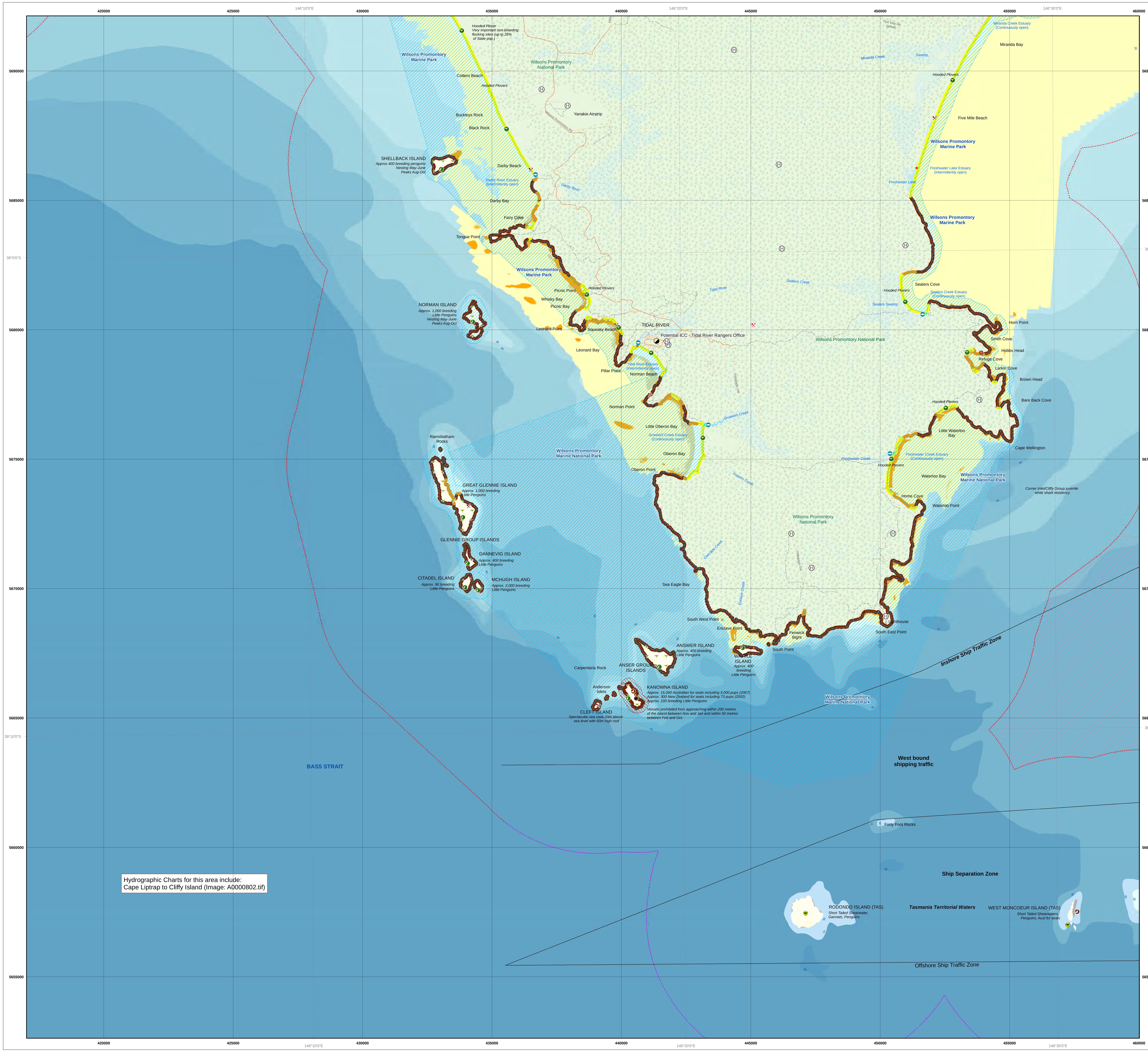
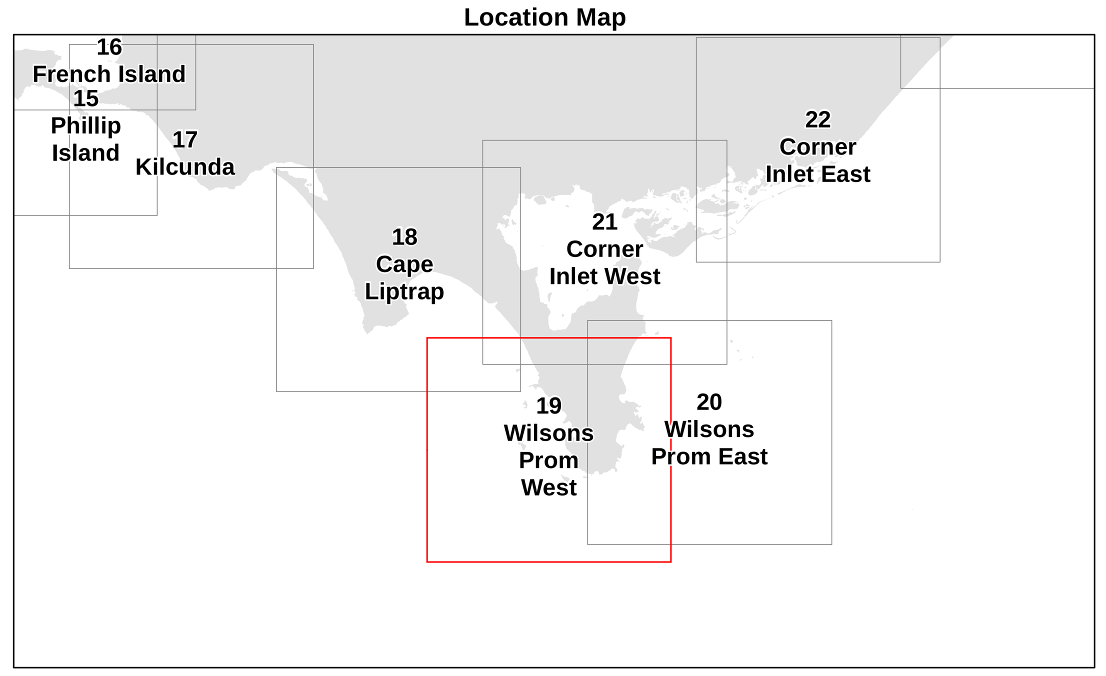
19 Wilsons Prom West Oil Spill Response Map



Location Map



Legend

- Helipads
- Potential ICC Locations
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- NZ Fur Seal Colonies
- Little Penguin Colonies
- Hooded Plover Habitat
- Common Bent-wing Bat Roost
- Short-tailed Shearwater
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Boat Launch
- BOM Observation Station
- Tasmania - 3nm Boundary
- Victoria - 3nm Boundary

Geological Sites
- International, National Significance
- Regional, State, Unknown Significance

- Other Roads
- Tracks
- Walking Path
- Watercourse
- Marine Mammals Protected Area
- Commonwealth Marine Reserve
- Marine National Park/Sanctuary

Shoreline Habitat Type
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale 1:50,000

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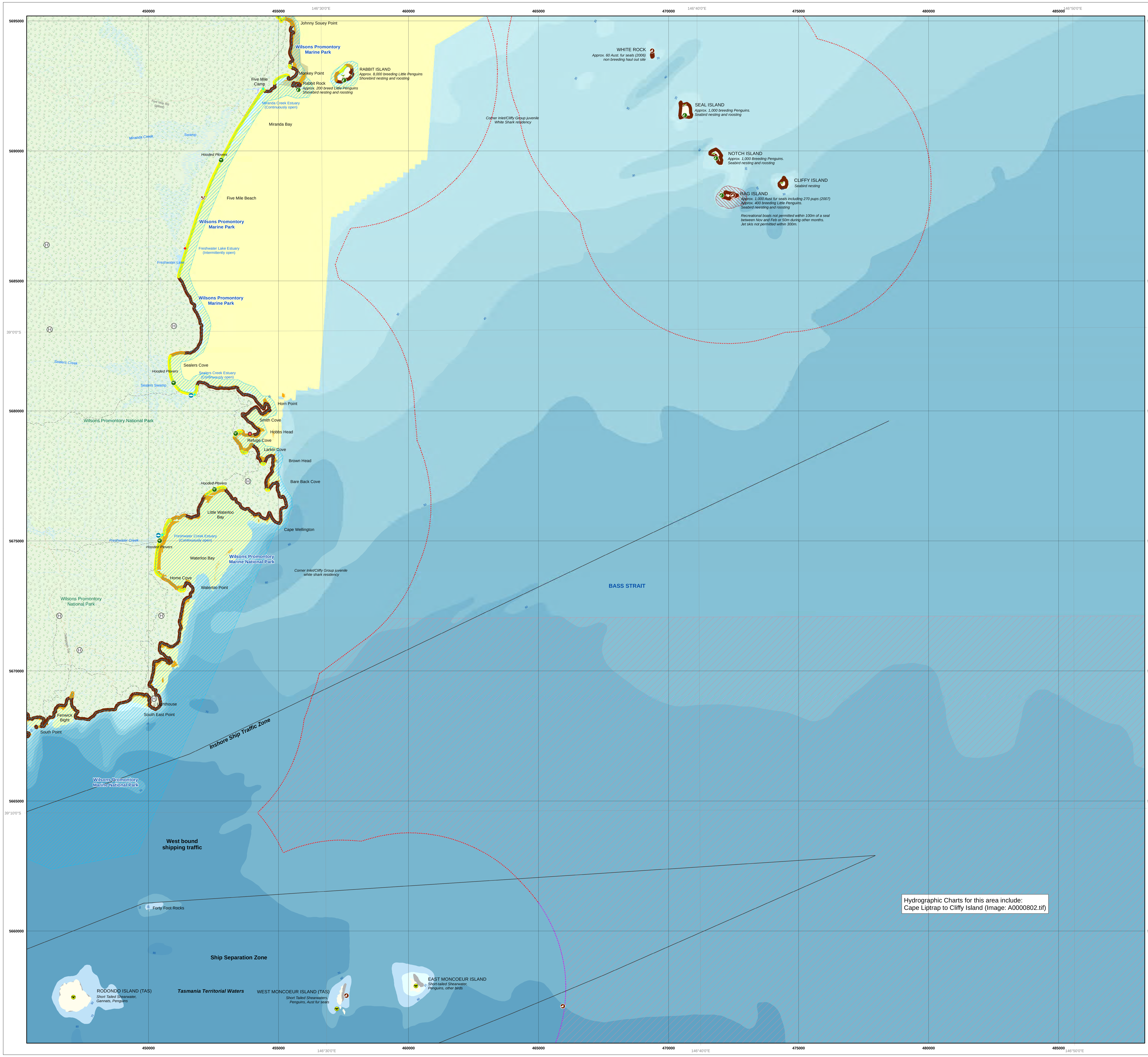
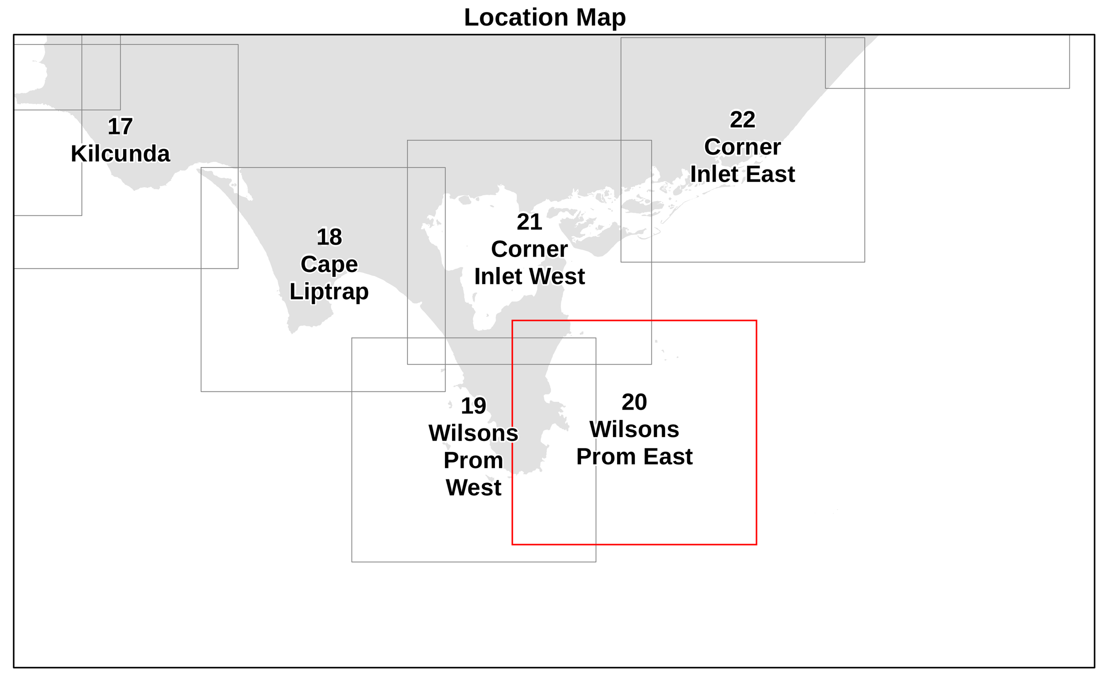


20 Wilsons Prom East
Oil Spill Response Map



Legend

- Helipads
- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- Little Penguin Colonies
- Hooded Plover Habitat
- Common Bent-wing Bat Roost
- Short-tailed Shearwater
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- BOM Observation Station
- Tasmania - 3nm Boundary
- Victoria - 3nm Boundary

Geological Sites

- Regional, State, Unknown Significance

- Tracks
- Walking Path
- Watercourse
- Marine Mammals Protected Area
- Commonwealth Marine Reserve
- Marine National Park/Sanctuary

Inter-tidal Vegetation

- Saltmarsh

Shoreline Habitat Type

- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates

- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
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Datum: GDA 1994 (AHD)

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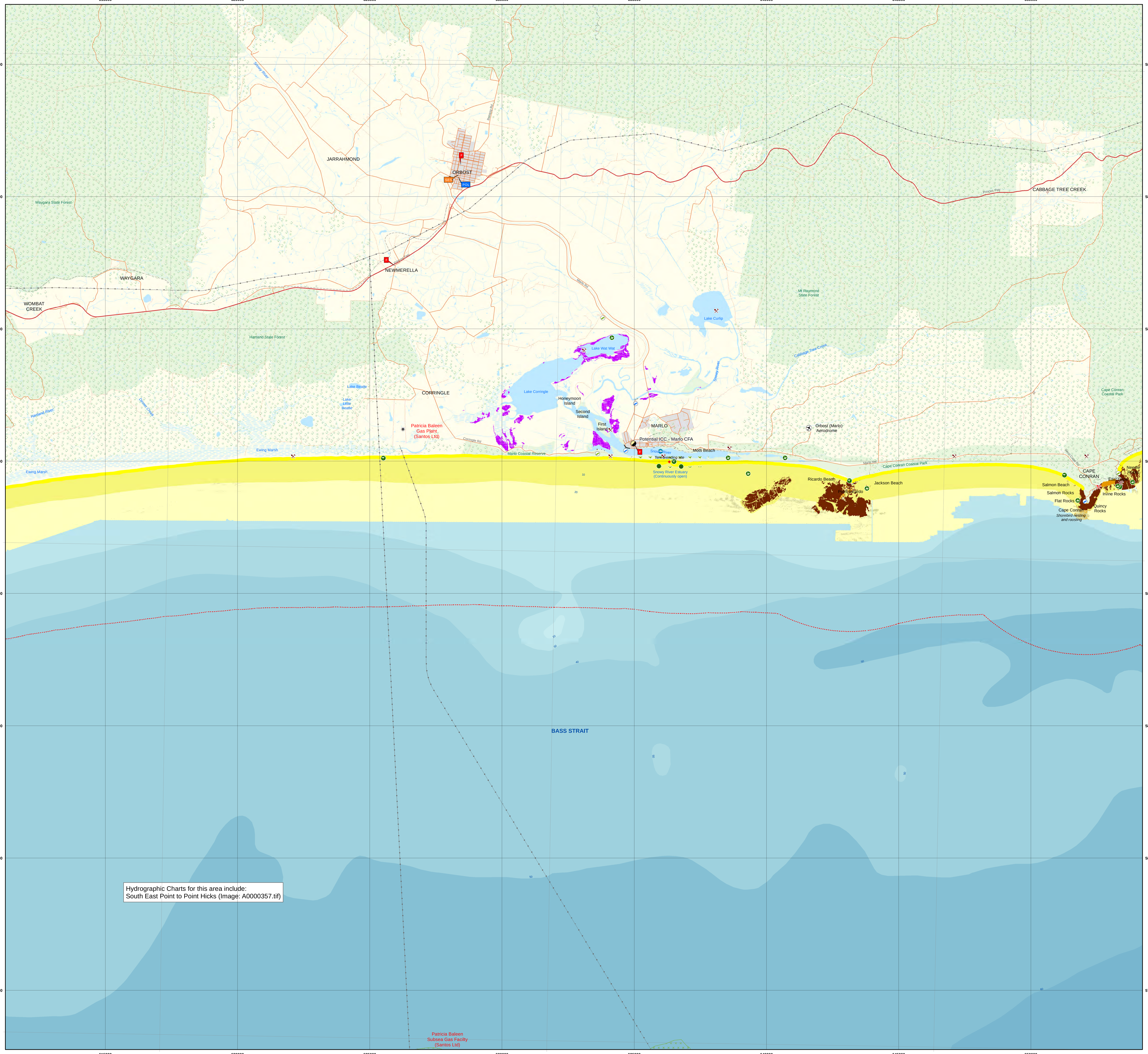
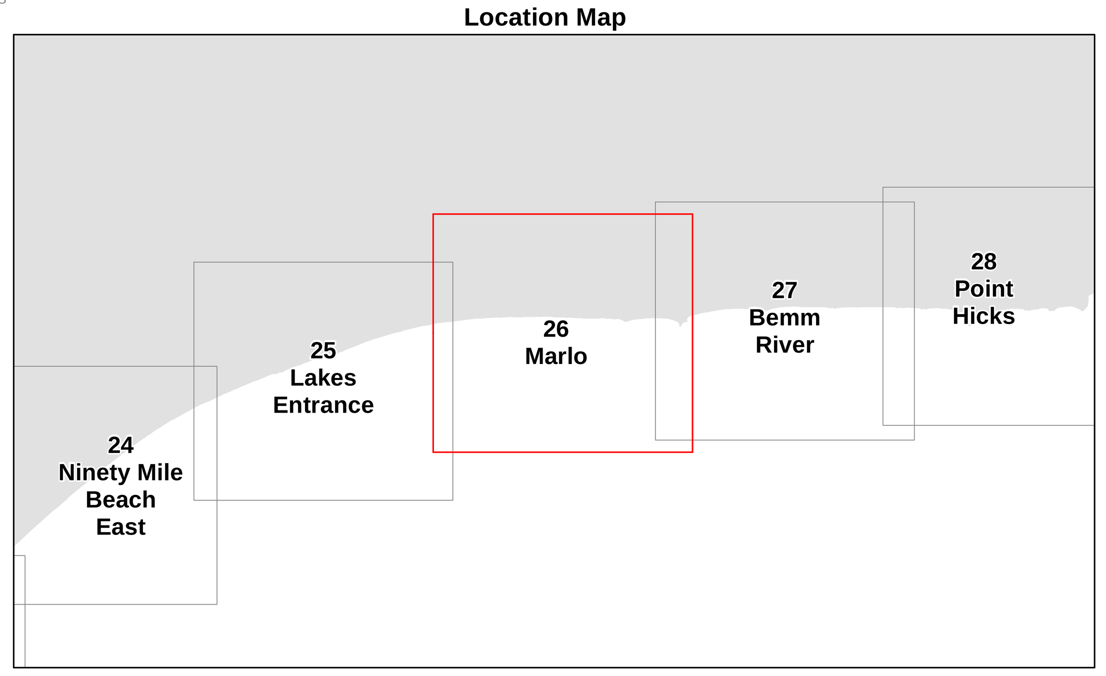
26 Marlo
Oil Spill Response Map



Location Map



Legend

- Helipads
- Airports and Airfields
- Potential ICC Locations
- Fire Station
- Police Station
- SES Unit
- Estuarine Fish Habitats
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Coastal Bird Habitat
- River Entrance - Intermittently Open
- Boat Launch
- Boat Ramp
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Victoria - 3nm Boundary
- Oil/Gas Facility
- Oil/Gas Pipeline

Geological Sites
- International, National Significance
- Regional, State, Unknown Significance

- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse

Inter-tidal Vegetation
- Saltmarsh

Shoreline Habitat Type
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

East Gippsland Marine Substrate
- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment
- Water Body
- Swamp
- Sewage Pond
- Tree Cover
- Parks and Reserves
- Offshore Gas Field

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale
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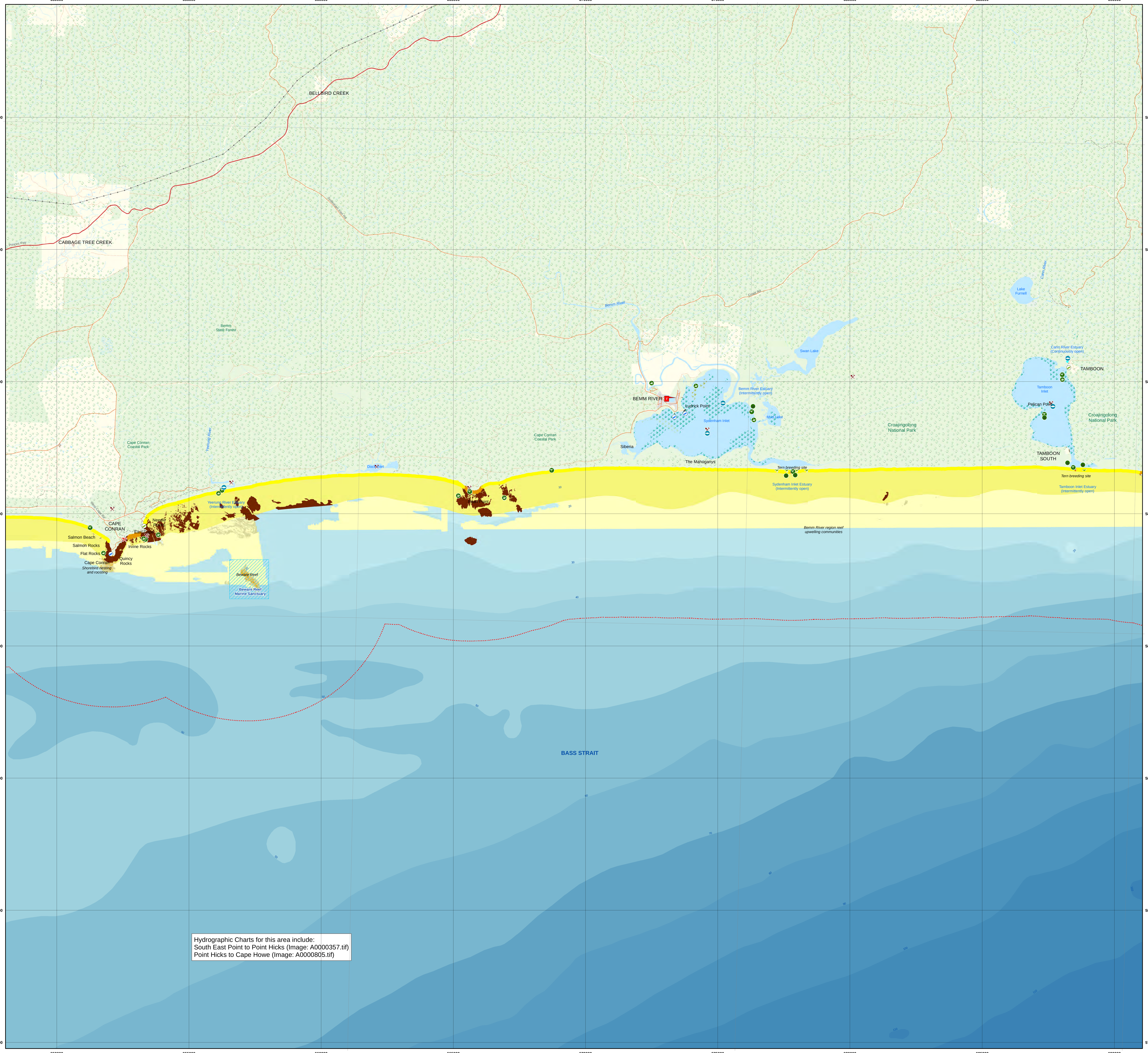
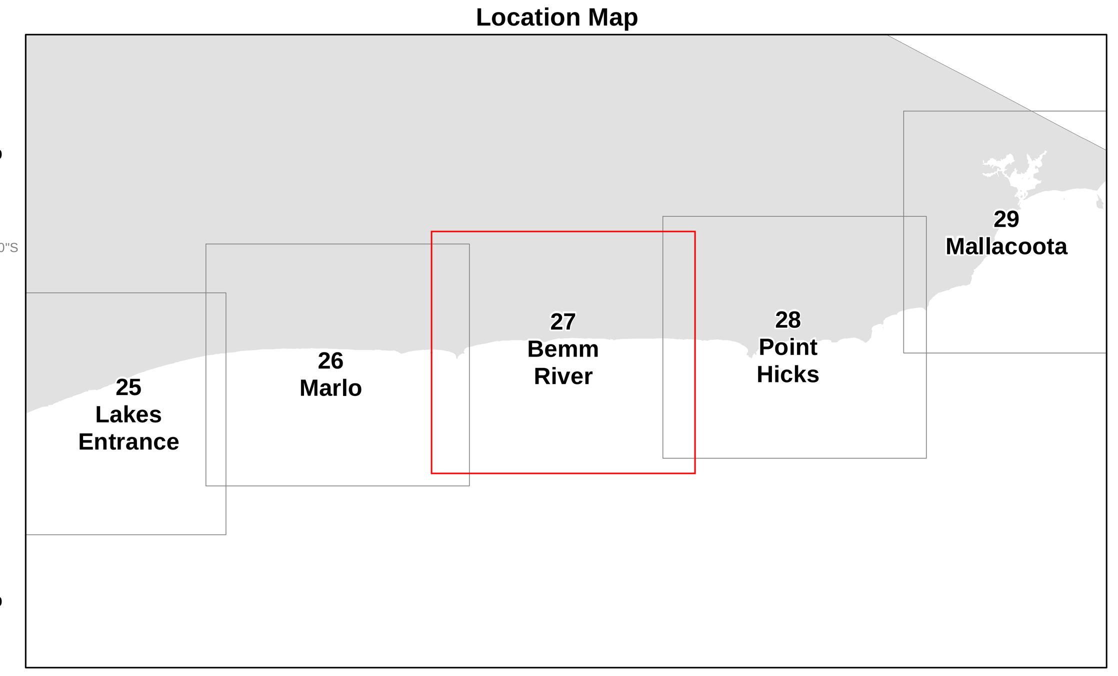
27 Bemm River
Oil Spill Response Map



Location Map



Legend

- Fire Station
- Estuarine Fish Habitats
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Boat Launch
- Boat Ramp
- Breakwater
- Pier, Jetty, Wharf
- BOM Observation Station
- Victoria - 3nm Boundary
- Oil/Gas Pipeline

Geological Sites
- International, National Significance
- Regional, State, Unknown Significance

- Highway
- Other Roads
- Tracks
- Walking Path
- Watercourse
- Marine National Park/Sanctuary

Aquatic Vegetation
- Macroalgae
- Other Seagrass
- Submerged Aquatic Vegetation

Shoreline Habitat Type
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

East Gippsland Marine Substrate
- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale
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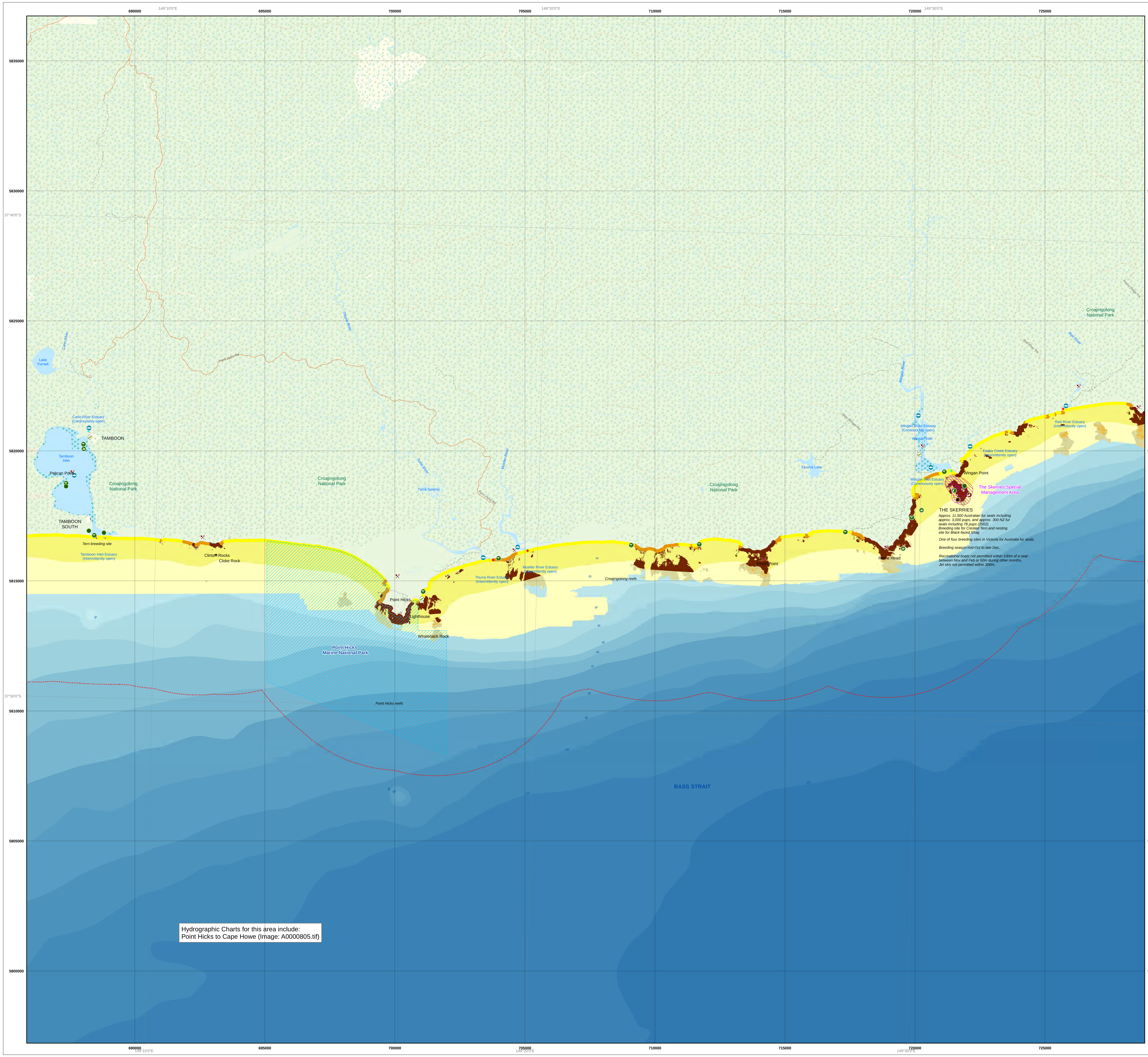
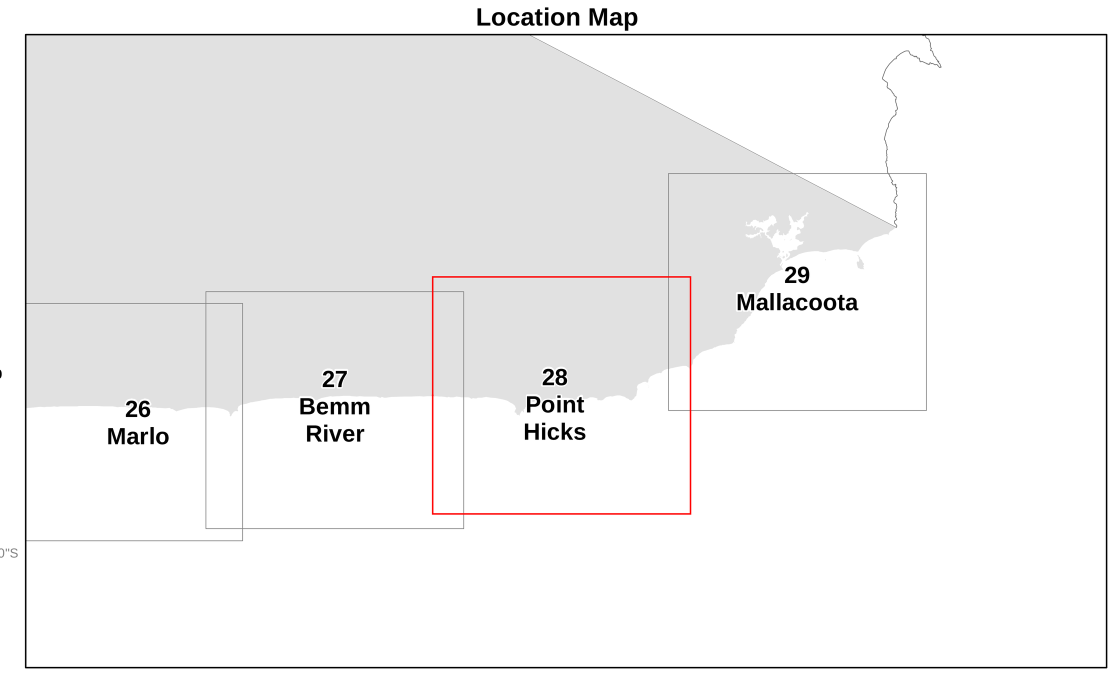
28 Point Hicks
Oil Spill Response Map



Location Map



Legend

- Estuarine Fish Habitats
- Australian Fur Seal Colonies
- NZ Fur Seal Colonies
- Little Penguin Colonies
- Hooded Plover Habitat
- Shorebird Roosting Sites
- Tern Nesting Sites
- Coastal Bird Habitat
- River Entrance - Continuously Open
- River Entrance - Intermittently Open
- Boat Launch
- Pier, Jetty, Wharf
- BOM Observation Station
- Victoria - 3nm Boundary

Geological Sites
- Regional, State, Unknown Significance

- Other Roads
- Tracks
- Walking Path
- Watercourse
- Marine Mammals Protected Area
- Marine Special Management Area
- Marine National Park/Sanctuary

Aquatic Vegetation
- Other Seagrass

Shoreline Habitat Type
- Intertidal Shore Platform
- Mixed Sand Beach/Shore Platform
- Sand Beach

East Gippsland Marine Substrate
- Reef
- Reef - patchy
- Rock platform
- Sand beach
- Sediment
- Water Body
- Swamp
- Tree Cover
- Parks and Reserves

LiDAR Substrates
- Reef
- Reef/Sediment
- Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
Datum: GDA 1994 (AHD)

Scale
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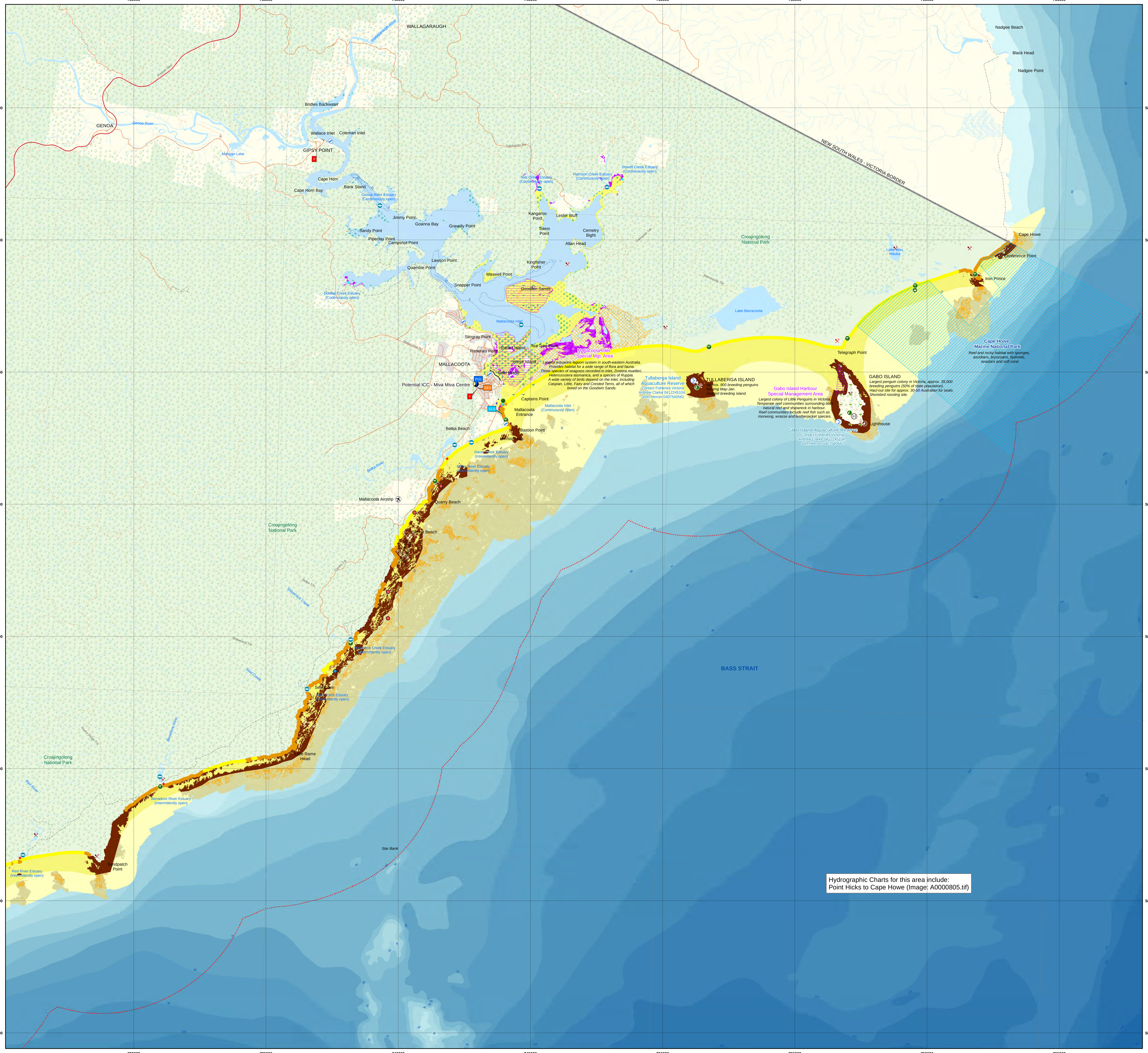
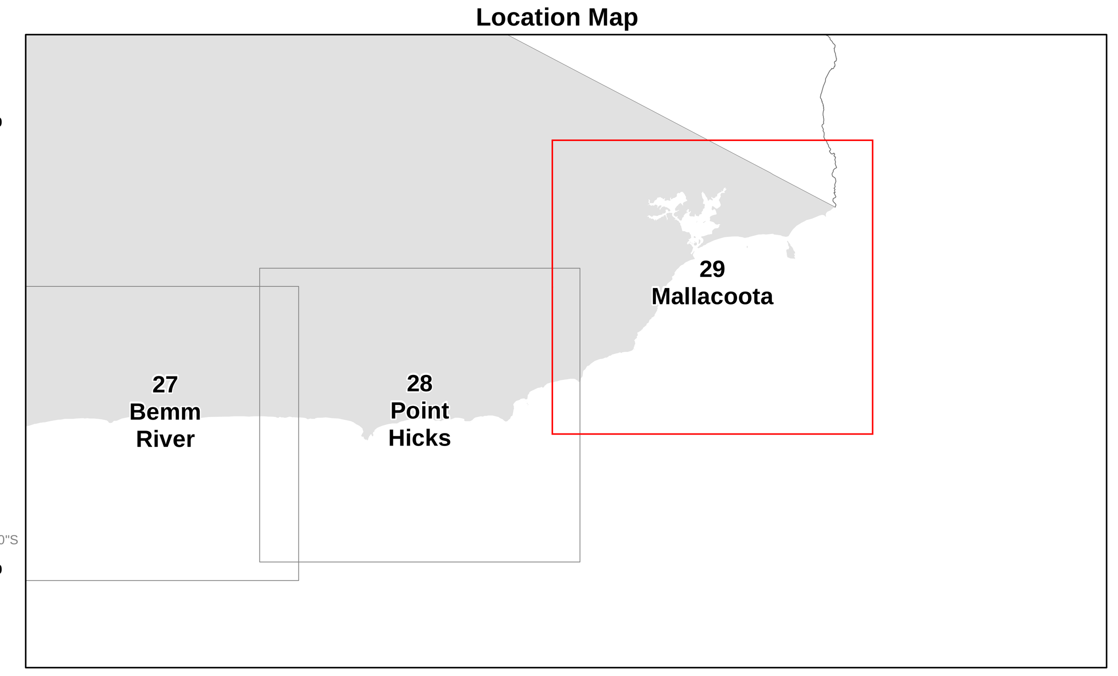


29 Mallacoota
Oil Spill Response Map

Location Map



Legend

Helipads
Airports and Airfields
Potential ICC Locations
Fire Station
Lifesaving Club
Police Station
SES Unit
Estuarine Fish Habitats
Australian Fur Seal Colonies
Little Penguin Colonies
Hooded Plover Habitat
Shorebird Roosting Sites
Tern Nesting Sites
Common Bent-wing Bat Roost
Eastern Horseshoe Bat Roost
Aquaculture License Sites
Coastal Bird Habitat
River Entrance - Continuously Open
River Entrance - Intermittently Open
Boat Launch
Boat Ramp
Boat Mooring
Breakwater
Pier, Jetty, Wharf
BOM Observation Station
Victoria - 3nm Boundary

Geological Sites
International, National Significance
Regional, State, Unknown Significance

Highway
Other Roads
Tracks
Walking Path
Watercourse
Marine Special Management Area
Marine National Park/Sanctuary

Aquatic Vegetation
Other Seagrass
Submerged Aquatic Vegetation

Inter-tidal Vegetation
Saltmarsh

Shoreline Habitat Type
Intertidal Shore Platform
Mixed Sand Beach/Shore Platform
Sand Beach

Mallacoota Coastal Types
Intertidal Sand Flat
Intertidal Shore Platform
Sand Beach
Sand Dunes
Subtidal Sandy Substrate

East Gippsland Marine Substrate
Reef
Reef - patchy
Rock platform
Sand beach
Sand flat/Rock platform
Sediment
Water Body
Swamp
Sewage Pond
Tree Cover
Parks and Reserves

LiDAR Substrates
Reef
Reef/Sediment
Sediment

Note: Symbols on the map for biological resources (bird and mammal species) are indicative of the resource being in the general vicinity only

Map not suitable for navigation purposes

0 2 4 6 8 10 Km

COORDINATES SYSTEM
Map Grid of Australia
GDA 1994 MGA Zone 55
Projection: Transverse Mercator (UTM)
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Appendix 12

Atlas of Living Australia (ALA) database results

Atlas of Living Australia (ALA) records for the ConocoPhilips Sequoia 3D MSS spill EMBA		
Scientific Name	Common Name	Status
Phylum: ANNELIDA		
Class: Oligochaeta (earthworms and acquatic worms)		
Diporochaeta (Vesiculodrilus) gippslandica		
Notoscolex montiskosciuskoi		
Smithsonidrilus assimilis		
Class: Polychaeta (bristle worms)		
Aglaophamus australiensis		
Amaeana trilobata		
Amblyosyllis enigmatica		
Amphicorina brevicollaris		
Amphiglena mediterranea		
Amphinome rostrata		
Aonides oxycephala		
Aphrodita australis	Southern Sea Mouse	
Aphrodita kulmaris		
Aphrogenia margaritacea		
Arabella iricolor		
Arichlidon hanneloreae		
Aricidea fauveli		
Armandia intermedia		
Augeneria verdis		
Australonereis ehlersi	Squirt Worm	
Australonuphis parateres	Giant Beach Worm, Redhead, Bungum Bluey or Slimy	
Australonuphis teres	Adults - Kingworm; Juveniles - Stumpy, Standard Beach Worm	
Australospio trifida		
Baffinia biseriata		
Barantolla lepte		
Boccardia chilensis		
Branchiomma nigromaculata		
Capitella capitata		
Carazziella hirsutiseta		
Carazziella victoriensis		
Caulleriella tricapillata		
Ceratocephale setosa		
Ceratonereis australis		
Ceratonereis mirabilis		
Ceratonereis perkinsi		
Ceratonereis singularis		
Chaetopterus variopedatus	Parchment Tube Worm	
Cirriformia capensis		
Cirriformia filigera		
Cirriformia tentaculata		
Clavadoce dorsolobata		
Dexiospira steueri		
Diopatra dentata	Plumed Worm, Shaggy Parchment Tube Worm	
Dipolydora flava		
Dipolydora socialis		
Dorvillea australiensis		
Ephesiella australiensis		
Euchone limnicola		
Euchone variabilis		
Euclymene trinalis		

Eumida fuscolutata		
Eumida sanguinea		
Eunice aphroditois	Aphrodite Worm	
Eunice australis		
Eunice bassensis		
Eunice laticeps		
Eunice torresiensis		
Eunice tubifex		
Eunoe etheridgei		
Euphione squamosa		
Euphrosine longesetosa		
Eupolymnia koorangia	Medusa Tube Worm	
Euthalenessa fimbriata		
Exogone africana		
Exogone heterosetoides		
Exogone heterosetosa		
Exogone patriciae		
Ficopomatus uschakovi		
Galeolaria caespitosa	Intertidal Tube Worm, Dense Aggregations Are Called Sydney	
Galeolaria hystrix		
Glycera americana		
Glycera lapidum		
Glycera onomichiensis		
Glycera tesselata		
Glycera tridactyla		
Goniadides falcigera		
Harmothoe charlottae		
Harmothoe praeclara		
Harmothoe waahli		
Hauchiella tribullata		
Heteromastus filiformis		
Hirsutonuphis intermedia		
Hyalinoecia tubicola		
Hydroides amri		
Hyperhalosydna striata		
Idanthyrsus australiensis		
Isolda pulchella		
Laetmonice producta		
Lanassa ocellata		
Lanice bidewa		
Lanicides fascia		
Lanicides tribranchiata		
Lanicola lobata		
Laonice quadridentata		
Leitoscoloplos bifurcatus		
Leitoscoloplos bilobatus		
Leodamas cylindrifer		
Leodamas dendrocirris		
Leodamas johnstonei		
Lepidonotus carinulatus		
Lepidonotus glaucus		
Lepidonotus jacksoni		
Lepidonotus melanogrammus	Dark-Marked Scale Worm	
Lepidonotus purpureus		
Leptoecia vivipara		
Lobochesis bibrancha		

Longicarpus modestus		
Lumbrineris setosa		
Lumbrineris tetraura		
Lygdamis giardi		
Lysidice ninetta		
Lysidice unicornis		
Lysilla bilobata		
Lysilla jennacubinae		
Magelona dakini		
Malacoceros divisus		
Malacoceros tripartitus		
Malmgreniella phillipensis		
Marphysa mullawa		
Mediomastus australiensis		
Mesochaetopterus minutus		
Mooreonuphis wilsoni		
Murrindisyllis kooromundroola		
Myxicola infundibulum		
Naineris australis		
Neanthes bassi		
Neanthes biseriata		
Neanthes cricognatha		
Neanthes flindersi		
Neanthes isolata		
Neanthes kerguelensis		
Neanthes tasmani		
Neanthes vaalii		
Neodexiospira brasiliensis		
Neodexiospira pseudocorrugata		
Neovermilia globula		
Nephtys inornata		
Nephtys longipes		
Nereiphylla castanea		
Nereis apalie		
Nereis bifida		
Nereis cockburnensis		
Nereis denhamensis		
Nereis heirissonensis		
Nereis maxillodentata		
Nereis triangularis		
Nicolea amnis		
Nicon maculata		
Nothria abyssia		
Nothria otsuchiensis		
Notomastus estuarius		
Notomastus torquatus		
Octobranchus myunus		
Odontosyllis polycera		
Oenone fulgida		
Orthoprionospio cirriformia		
Owenia australis		
Oxydromus angustifrons		
Oxydromus microantennatus		
Palola siciliensis		
Paradiopatra imajimai		
Paradiopatra longicappa		

Paradiopatra piccola		
Paradiopatra variabilis		
Paraehlersia ehlersiaeformis		
Paralepidonotus ampulliferus		
Paraprionospio coora		
Parasabella aberrans		
Pareurythoe chilensis		
Pectinaria antipoda		
Perinereis akuna		
Perinereis amblyodonta		
Perinereis barbara		
Perinereis nuntia		
Perinereis vallata		
Perinereis variodentata		
Phyllodoce duplex		
Phyllodoce longipes		
Phyllodoce madeirensis		
Phyllodoce malmgreni		
Phyllodoce novaehollandiae	Green Paddle Worm	
Phylo felix		
Pista australis		
Pista trunca		
Pista violacea		
Platynereis antipoda		
Platynereis australis		
Podarkeopsis galangaui		
Polycirrus octoseta		
Polycirrus paucidens		
Polycirrus porcata		
Polycirrus tesselatus		
Polydora haswelli		
Polydora woodwicki		
Polygordius kiarama		
Polyophthalmus pictus		
Pomatoceros taeniata		
Potaspina australiensis		
Prionospio aucklandica		
Prionospio cirrifera		
Prionospio coorilla		
Prionospio dubia		
Prionospio kirrae		
Prionospio kulin		
Prionospio multicristata		
Prionospio multipinnulata		
Prionospio nirripa		
Prionospio pilkena		
Prionospio tatura		
Prionospio tridentata		
Prionospio wambiri		
Prionospio yuriel		
Proceraea filiformis		
Prosphaerosyllis longipapillata		
Protocirrineris chrysoderma		
Pseudopolydora kempi		
Pseudopolydora paucibranchiata	Elkhorn Slough Spionid	
Pseudopotamilla monoculata		

Reteterebella aloba		
Rullieriella monoechinata		
Sabella spallanzanii	European Fan Worm	
Sabellastarte australiensis		
Sabellastarte indica	Southern Fan Worm, Feather-Duster Worm, Magnificent Bande	
Salmacina australis		
Salvatoria koorineclavata		
Scalibregma inflatum		
Schistomeringos loveni		
Scoloplos cylindrifer		
Scoloplos normalis		
Scoloplos simplex		
Serpula crenata		
Serpula hartmanae		
Serpula jukesii		
Serpula rubens		
Sigalion bandaeensis		
Simplisetia aequisetis	Squirt Worm	
Simplisetia amphidonta		
Simplisetia turveyi		
Sphaerephesia hutchingsae		
Sphaerodoropsis megatuberculata		
Spio blakei		
Spiophanes japonicum		
Spiophanes wigleyi		
Spirobranchus cariniferus		
Spirobranchus latiscapus		
Spirobranchus polytrema		
Spirobranchus pseudopolytremus		
Spirobranchus taeniatus		
Spirobranchus tetraceros		
Streblosoma acymatum		
Streblosoma minutum		
Subadyte albanyensis		
Syllis picta		
Synelmis knoxi		
Terebella pappus		
Terebella tantabiddycreekensis		
Terebellides kowinka		
Terebellides mundora		
Terebellides narribri		
Terebellides woolawa		
Thelepus australiensis		
Thelepus boja		
Thelepus brevicauda		
Thelepus extensus		
Thelepus plagiostoma		
Thormora argus		
Trichobranchus bunnabus		
Trichobranchus gooreekis		
Trypanosyllis taeniaeformis		
Trypanosyllis zebra		
Typosyllis armillaris		
Typosyllis hyalina		
Websterinereis foli		
Phylum: ARTHROPODA		

Phylum: ARTHROPODA		
Class: Branchiopoda (fairy shrimp, clam shrimp)		
Evadne nordmanni		
Evadne spinifera		
Penilia avirostris		
Podon intermedius		
Pseudevadne tergestina		
Class: Malacostraca (crabs, lobsters, shrimp, krill, amphipods)		
Abyssianira bathyalis		
Acanthephyra quadrispinosa		
Acanthomunna bettongia		
Acanthomunna lagorchestes		
Acanthomunna macropus		
Acanthonotozomopsis duplocoxa		
Accalathura gigas		
Achaeus curvirostris		
Actaea peronii	Thorn-Legged Crab	
Actumnus setifer	Short-Haired Crab	
Acutigebia simsoni	Sand-Borer	
Aega angustata		
Aega cyclops		
Aega serripes		
Aegaeon lacazei		
Aegapheles alazon		
Aegapheles alozon		
Aegapheles trulla		
Aegapheles warna		
Aenigmathura lactanea		
Aetiopedes gracilis		
Agathotanais spinipoda		
Alainopasiphaea australis		
Allodiastylis acanthodes		
Allodiastylis johnstoni		
Allodiastylis tenuipes		
Allorchestes compressus		
Allosergestes sargassi		
Alope orientalis	Bald Shrimp	
Alpheopsis trispinosa		
Alpheus australosulcatus		
Alpheus euphrosyne	Nymph Snapping Shrimp	
Alpheus hailstonei		
Alpheus parasocialis		
Alpheus richardsoni		
Alpheus socialis	Smooth Pistol Prawn	
Alpheus villosus	Hairy Pistol Prawn	
Amakusanthura correa		
Amakusanthura olearia		
Amarinus laevis		
Amarinus paralacustris		
Amaryllis brevicornis		
Amaryllis carrascoi		
Amaryllis keablei		
Amaryllis macrophthalma		
Amaryllis philatelica	Red Amphipod	
Ambicholestes (Ambicholestes) poorei		
Ambicholestes (Australolestes) berentsae		

Ampelisca australis		
Ampelisca dimboola		
Ampelisca euroa		
Ampelisca jingera		
Ampelisca toora		
Amphoroidea angustata		
Ampithoe merimbula		
Ampithoe ngana		
Ampithoe ulladulla		
Anamixis tangaroa		
Anamixis yarrega		
Anchisquilloides mcneilli	Mcneill's Mantis-Shrimp	
Andaniexis elinae		
Andaniotes abyssorum		
Andaniotes wallaroo		
Antarctus mawsoni		
Antiplotanais actuarius		
Aora hebes		
Aora hircosa		
Aora maculata		
Aora mortoni		
Apanthura drosera		
Apanthura isotoma		
Apanthura mirbelia		
Apanthura styphelia		
Apanthura xanthorrhoea		
Apanthuropsis richea		
Apocorophium acutum		
Apocuma australiense		
Apseudes abditospina		
Apseudes atuini		
Apseudes poorei		
Apseudes quasimodo		
Apseudopsis tuski		
Araleptochelia macrostonyx		
Araphura doutagalla		
Araphura pygmothymos		
Araphura yarra		
Araphuroides batmania		
Arcitalitrus bassianus		
Areopaguristes tuberculatus	Friendly Hermit Crab	
Arhaphuroides stabastris		
Aristaeomorpha foliacea	Red Prawn	
Aristaeopsis edwardsiana	Giant Scarlet Prawn	
Aristias eden		
Aristias gomoni		
Aristias otway		
Aristias poorei		
Ascionana bassiana		
Ascionana curvifrons		
Ascionana notaedorsalis		
Astacopsis gouldi	Tasmanian giant freshwater crafish	EPBC Act - Threatened
Athelges ankistron		
Australatya striolata	Riffle Shrimp	
Australerythrops paradicei		
Australomysis incisa		

Austrarcturella brychia		
Austrarcturella callosa		
Austrarcturella cava		
Austrarcturella hirsuta		
Austrarcturella macrokola		
Austrarcturella oculata		
Austrochaetilia capeli		
Austrodromidia australis	Southern Sponge Crab	
Austrodromidia insignis	Adorned Sponge Crab	
Austrodromidia octodentata	Bristled Sponge Crab	
Austrogammarus smithi		
Austroleucon levis		
Austrosquilla osculans	Slender Mantis-Shrimp	
Axiogynodiastylis rochfordi		
Bamarooka bathycephala		
Bamarooka endota		
Basserolis franklinae		
Bassoleptochelia verro		
Bathycopea typhlops		
Bathynomus kapala		
Bathypaguropsis yaldwyni		
Bathypoma enigma		
Bathytanais bathybrotes		
Bathytanais fragilis		
Bathytanais parageios		
Bellidilia laevis	Smooth Pebble Crab	
Bellidilia undecimspinosa	Large Pebble Crab	
Bellorchestia marmorata		
Bellorchestia pravidactyla		
Belura pillara		
Bemlos aequimanus		
Bemlos australis		
Bemlos dolichomanus		
Bemlos ephippium		
Benthosphaera arkoola		
Biffarius arenosus	Sand Ghost Shrimp	
Biffarius limosus		
Bigelowina phalangium		
Birubius babaneekus		
Birubius cartoo		
Birubius gambodeni		
Birubius heislersi		
Birubius kokorus		
Birubius lowannus		
Birubius maamus		
Birubius maldus		
Birubius mayamayi		
Birubius muldarpus		
Birubius myallus		
Birubius nammuldus		
Birubius panamunus		
Birubius quearus		
Birubius yandus		
Birubius yorlunus		
Booralana bathynella		
Booranus tikeri		

Booranus wangoorus		
Booranus weemus		
Bountiana norfolcensis		
Brachynotus spinosus	Little Shore Crab	
Brolgus millinus		
Brolgus tattersalli		
Brucerolis victoriensis		
Bullowanthura pambula		
Bumeralius buchalius		
Byblis bega		
Byblis mildura		
Byblis tinamba		
Bythiopagurus macrocolus		
Caecognathia branchyponera		
Caecognathia diacamma		
Caecognathia gnamptogenys		
Caecognathia huberia		
Caecognathia leptanilla		
Caecognathia pustulosa		
Caecognathia trachymesopus		
Calcinus dapsiles		
Campylaspis aspera		
Campylaspis pustulosa		
Campylaspis roscida		
Campylaspis thetidis		
Campylaspis uniplicata		
Campylonotus rathbunae	Sabre Prawn	
Caprella danilevskii		
Caprella equilibra		
Caprella scaura		
Carcinus maenas	European Green Crab	
Cassidinella akania		
Cassidinella incisa		
Cephaloecetes enigmaticus		
Cephalophoxoides bassi		
Cephalophoxoides burleus		
Cephalophoxoides kukathus		
Cephalophoxoides rupullus		
Ceradocus circe		
Ceradocus ramsayi		
Ceradocus rubromaculatus		
Ceradocus serratus		
Ceratocephalus grayanus		
Ceratothoa banksii		
Ceratothoa imbricata		
Cerceis ovata		
Chaceon bicolor	Eastern Crystal Crab	
Charybdis (Charybdis) feriata	Coral Crab	
Charybdis (Charybdis) hellerii		
Cheirimedon adentatus		
Cheirimedon chevreuxi		
Cheirimedon danai		
Cheirimedon hendrycksi		
Cheirimedon norna		
Cheirimedon posidonia		
Cheirimedon rodondo		

Cheirimedon thirroul		
Cheirimedon towamba		
Cheirimedon truncatus		
Cheirimedon velia		
Cheirocratus bassi		
Cheirocratus praedens		
Chlorotocella spinicaudus	Slender-Beaked Shrimp	
Chlorotocus novaezealandiae		
Cilicaea crassicaudata		
Cilicaea curtispina		
Cilicaea hystrix		
Cilicaea tenuicaudata		
Cilicaeopsis whiteleggei		
Cimmerius bacescui		
Cirolana australiense		
Cirolana halei		
Cirolana similis		
Cirolana victoriae		
Clepidecrella colliboi		
Clepidecrella ira		
Collettea cylindratoides		
Conicostoma karta		
Contrarimesus franklinae		
Crenarctus crenatus		
Cruranthura furneauxi		
Cruranthura peroni		
Cryptodromia incisa		
Ctenocheles collini		
Cubaris sulcifrons		
Cyathura hakea		
Cyclaspis bovis		
Cyclaspis usitata		
Cyclograpsus audouinii	Smooth Shore Crab	
Cyclograpsus granulosus		
Cymadusa elegantis		
Cymadusa munnu		
Cymadusa setosa		
Cymodoce bidentata		
Cymodoce coronata		
Cymodoce gaimardii		
Cymodoce haswelli		
Cymonomus delli		
Cyproidea ornata		
Cyrtomaia maccullochi	Slender-Handed Spider Crab	
Dagnaudus petterdi	Antlered Crab	
Dardanus arrosor	Striated Hermit Crab	
Davusia glabra		
Dayus acanthus		
Dayus makrokolosus		
Dayus pharocheradus		
Dendrotion onychogalea		
Dendrotion peradorcus		
Dendrotion petrogale		
Dendrotion thylogale		
Deosergestes corniculum		
Deosergestes disjunctus		

Deto marina		
Dicoides areolata		
Dicoides brevidactylum		
Dicoides fletti		
Dicoides micron		
Dicoides minusculus		
Dicoides occidentalis		
Dicoides verminaris		
Dimorphostylis colefaxi		
Dimorphostylis cottoni		
Dimorphostylis inauspicata		
Dimorphostylis subaculeata		
Diogenes custos		
Diogenes senex		
Discias brownae		
Dodecas decacentrum		
Dodecas tasmaniensis		
Dorhynchus ramusculus	Slender Spider Crab	
Drummondia corinellae		
Drummondia marlo		
Drummondia tridentata		
Dulichiella australis		
Dumea latipes	Velvet Crab	
Ebalia crassipes	Semi-Smooth Pebble Crab	
Ebalia dentifrons		
Ebalia intermedia	Smooth Pebble Crab	
Ebalia tuberculosa	Nut-Crab	
Echinolatus bullatus		
Echinolatus poorei		
Echinomunna horrida		
Echinopleura cephalomagna		
Eiconaxius mallacoota		
Elaphognathia ferox		
Elaphognathia froygattella		
Elasmopus bollonsi		
Elasmopus rapax		
Elasmopus yunde		
Elpeddo kaikai		
Elthusa raynaudii		
Endevoura inusitata		
Endevoura mirabilis		
Endevoura prodigium		
Engaeus australis		
Engaeus cunicularius		
Engaeus fossor		
Engaeus lengana		
Engaeus mallacoota		
Engaeus orientalis		
Engaeus phyllocercus		
Ensayara laetum		
Eogynodiastylis aganaktikos		
Eogynodiastylis paeminosa		

Epikopais poorei		
Epikopais waringa		
Epipedonana profunda		
Eplumula australiensis		
Ericthonius coxacanthus		
Ericthonius forbesii		
Ericthonius pugnax		
Eualus pectiniformis		
Euastacus bidawalus		
Euastacus brachythorax		
Euastacus neodiversus	South Gippsland Spiny Cray	
Euastacus yanga	Variable Spiny Cray	
Euidotea bakeri		
Euidotea halei		
Euidotea peronii		
Euidotea stricta		
Eupasiphae gilesii		
Euphausia lucens		
Euphausia similis		
Euphausia spinifera		
Eupilumnus laciniatus		
Eurydice acuticauda		
Eurydice binda		
Eurylana arcuata		
Eurythenes thurstoni		
Eusergestes arcticus		
Eusiroides monoculoides		
Exocerceis nasuta		
Exoediceroides maculosus		
Exoediceros fossor		
Exosphaeroma alveola		
Figorella angulosa		
Figorella formosa		
Figorella tasmanica		
Fultodromia spinifera		
Gabophlias olono		
Galathea australiensis	Striated Craylet	
Galathella bassiana		
Galearctus rapanus		
Galearctus umbilicatus		
Gammarella berringar		
Gammaropsis (Gammaropsis) persetosus		
Gammaropsis (Gammaropsis) thomsoni		
Gardinerosergia kensleyi		
Gennadas gilchristi		
Gennadas scutatus		
Gheegerus garbaius		
Gibbagnathia europalothrix		
Glabropilumnus dispar		
Glyphocuma dentatum		
Glyphocuma inaequalis		
Gnathia calamitosa		

Gnathia calmani		
Gnathia camponotus		
Gnathia epopostruma		
Gnathia mystrium		
Gnathia notostigma		
Gnathia prolasius		
Gnathia stigmacros		
Gnathiphimedia sexdentata		
Gondogeneia microdeuteropa		
Gonodactylus smithii		
Guernea (Guernea) endota		
Guernea (Guernea) gelane		
Guinusia chabrus	Cleft-Fronted Shore Crab	
Gynodiastylis anasillos		
Gynodiastylis insolitaseta		
Gynodiastylis megasiphon		
Gynodiastylis polita		
Gynodiastylis robusta		
Gynodiastylis sierra		
Gynodiastylis similis		
Gynodiastylis strumosa		
Gynodiastylis subtilis		
Gynodiastylis truncatifrons		
Hadrosquilla edgari		
Halearcturus serrulatus		
Halicarcinus ovatus	Three-Pronged Flat Spider Crab	
Halimede ochtodes		
Haliophasma blandfordia		
Haliophasma canale		
Haliophasma cribense		
Haliophasma cycneum		
Haliophasma swainsonia		
Haliophasma templetonia		
Haliophasma yarra		
Haliporoides sibogae	Royal Red Prawn	
Hamatipeda sima		
Hamimaera hamigera		
Haplocheira barbimana		
Haplodendron buzwilsoni		
Haplostylus dakini		
Haplostylus indicus		
Haplostylus robustus		
Haswellia carnea		
Haswellia juxtacarnea		
Heloecius cordiformis	Semaphore Crab	
Helograpsus haswellianus	Haswell's Shore Crab	
Hemilamprops diversus		
Hemilamprops pellucidus		
Hemisquilla australiensis		
Hermesorchestia alastairi		
Heterocarpus sibogae	White Carid Prawn	
Heteromysis (Heteromysis) tasmanica		

Heteropilumnus fimbriatus	Bearded Crab	
Heteroserolis australiensis		
Heteroserolis elongata		
Heteroserolis longicaudata		
Heteroserolis pallida		
Heteroserolis tuberculata		
Hippolyte australiensis	Southern Weed Shrimp	
Hippolyte caradina		
Hippolyte ventricosa		
Hippomedon geelongi		
Hippomedon rodericki		
Hippomedon tourville		
Hircella cornigera		
Hirondellea kapala		
Hoho carteta		
Homola orientalis		
Hymenosoma hodgkini		
Ianiropsis alanmillari		
Ianthopsis franklinae		
Ianthopsis kimblae		
Ibacus alticrenatus	Whitetail Bug	
Ibacus novemdentatus	Western Balmain Bug	
Ibacus peronii	Balmain Bug	
Icilius australis		
Icilius danae		
Icilius punctatus		
Inconnivus billibunteri		
Indoapseudes macabre		
Ingolfiella bassiana		
Iphimedia ambigua		
Iphimedia discreta		
Iphimedia lisae		
Iphimedia oetkeri		
Iphiplateia whiteleggei		
Ischnomesus tasmanensis		
Isocladus laevis		
Janaira platyoura		
Jasus edwardsii	Southern Rock Lobster	
Joeropsis bicarinata		
Kalliapseudes obtusifrons		
Kapalana durraween		
Kapalana maia		
Keratroides rex		
Keratroides vulgaris		
Kerguelenia euroka		
Kerguelenia kanowna		
Kerguelenica petrescui		
Kontiloleucon australiensis		
Kulgaphoxus borralus		
Labraxeudes heliodiscus		
Lamarckdromia globosa	Fringed Sponge Crab	
Laomedia healyi	Pink Mangrove Lobster	

Laphystiopsis zomerysis		
Latreutes compressus	Green Prawn	
Leipsuropus parasiticus		
Leontocaris amplectipes		
Lepidepecreella nellae		
Leptanthura boweni		
Leptanthura diemenensis		
Leptanthura flindersi		
Leptanthura kapala		
Leptanthura murrayi		
Leptochela (Leptochela) robusta		
Leptochela (Leptochela) sydniensis	Sydney Comb Shrimp	
Leptochelia billambi		
Leptochelia occiporta		
Leptograpsodes octodentatus	Burrowing Shore Crab	
Leptograpsus variegatus		
Leptomithrax gaimardii	Great Spider Crab	
Leptomithrax sternocostulatus	Ribbed Spider Crab	
Leptomithrax tuberculatus		
Leptomithrax waitei		
Leucothoe assimilis		
Leucothoe boolpooli		
Leucothoe commensalis		
Leucothoe ctenochasma		
Leucothoe diemenensis		
Leucothoe gooweera		
Leucothoe tarte		
Levinebalia maria		
Ligia (Nesoligia) australiensis		
Liljeborgia aequabilis		
Liljeborgia dubia		
Limnoporeia kalduke		
Limnoporeia kingi		
Limnoporeia maranowe		
Limnoporeia ungamale		
Limnoporeia wakkine		
Limnoria glaucinosa		
Limnoria nonsegnis		
Limnoria quadripunctata		
Limnoria rugosissima		
Limnoria tripunctata		
Linguimaera everardensis		
Linguimaera kellissa		
Linguimaera leo		
Linguimaera schickelae		
Linguimaera tias		
Liocarcinus corrugatus		
Liocarcinus strigilis	Dwarf Swimmer Crab	
Lipkius holthuisi		
Lithodes longispina		
Litocheira bispinosa	Two-Spined Slender-Clawed Crab	
Litogynodiastylis alata		

Litogynodiastylis ambigua		
Litogynodiastylis brevipes		
Litogynodiastylis charadra		
Litogynodiastylis concava		
Litogynodiastylis crenagloba		
Litogynodiastylis echinata		
Litogynodiastylis gongyla		
Litogynodiastylis lumacaudata		
Litogynodiastylis microornata		
Litogynodiastylis ornata		
Litogynodiastylis poorei		
Litogynodiastylis serrata		
Litogynodiastylis trachyphasis		
Litogynodiastylis tumida		
Lomis hirta	Hairy Stone Crab	
Lophopagurus (Lophopagurus) nanus	Dwarf Hermit Crab	
Lophopagurus lacertosus		
Lucifer hanseni		
Lucifer typus		
Lycaea pachypoda		
Lycaea pulex		
Lyreidus tridentatus	Frog Crab	
Lysmata morelandi		
Macrobrachium australiense	Freshwater Prawn	
Macrolabrum sarda		
Macrolabrum tangaroa		
Mallacoota diemenensis		
Mallacoota euroka		
Mallacoota kameruka		
Mallacoota subcarinata		
Maricoccus brucei		
Megametope rotundifrons	Smooth-Forehead Crab	
Melicertus latisulcatus	Western King Prawn	
Melicertus plebejus	Eastern King Prawn	
Melita festiva		
Melita matilda		
Melita ophiocola		
Melita plumulosa		
Memana sarda		
Merhippolyte chacei		
Merocryptus lambriformis		
Mesanthura astelia		
Mesanthura dianella		
Mesanthura stypandra		
Metacarcinus novaezelandiae	Pie-Crust Crab	
Metaceradocus micramphopus		
Metacrangon spinidorsalis		
Metadromia wilsoni		
Metapenaeus bennettae	Greentail Prawn	
Metapenaeus macleayi	Eastern School Prawn	
Metapseudes wilsoni		
Metopoides pollex		

Michelaxiopsis australiensis		
Microhalimus deflexifrons		
Mictyris longicarpus		
Mictyris platycheles		
Miersiella haswelli		
Monocorophium acherusicum		
Monocorophium sextonae		
Monodgnathia colobostruma		
Munida chydaea		
Munida endeavourae		
Munida gregaria		
Munida haswelli	Long-Armed Craylet	
Munida isos		
Munidopsis comarge		
Munidopsis tasmaniae		
Mysidella australiana		
Nannastacus gibbosus		
Narapheonoides mullaya		
Nasutoplax rostratus	Beaked Flat Spider Crab	
Natatolana arrama		
Natatolana brucei		
Natatolana bulba		
Natatolana corpulenta		
Natatolana femina		
Natatolana gorung		
Natatolana kahiba		
Natatolana laewilla		
Natatolana longispina		
Natatolana matong		
Natatolana nammuldi		
Natatolana pellucida		
Natatolana sinuosa		
Natatolana thurar		
Natatolana vieta		
Natatolana woodjonesi		
Natatolana wowine		
Nauticaris marionis		
Naxia aries	Ramshorn Crab	
Naxia aurita	Golden Decorator Crab	
Naxia tumida	Little Decorator Crab	
Neastacilla attenuata		
Neastacilla coonabooloo		
Neastacilla deducta		
Neastacilla inaequispinosa		
Neastacilla kanowna		
Neastacilla macilenta		
Neastacilla monoseta		
Neastacilla sheardi		
Neastacilla yuriel		
Nectocarcinus integrifrons	Rough Rock Crab	
Nectocarcinus tuberculosus	Velvet Crab	
Nematocarcinus longirostris		

Nematoscelis megalops		
Nematoscelis microps		
Neolithodes flindersi		
Neopilumnoplax nieli		
Neotanais noelietaiti		
Nerocila orbignyi		
Normanion whoi		
Notomithrax minor	Small Decorator Crab	
Notomithrax ursus		
Notopais minya		
Notorchestia australis		
Notorchestia quadrimana		
Notostomus auriculatus		
Nototropis homochir		
Nuuanu mokari		
Nyctiphanes australis		
Ochlesis morgani		
Ocosingo yatala		
Ocypode cordimanus	Smooth-Handed Ghost Crab	
Oediceroides ornatus		
Oncopagurus indicus		
Oplophorus novaezeelandiae		
Oplophorus spinosus		
Orchestiella neambulans		
Ourozeuktes bopyroides		
Ovalipes australiensis	Common Sand Crab	
Ovalipes molleri		
Oxinasphaera aylostera		
Oxinasphaera bispinosa		
Oxinasphaera bisubula		
Oxinasphaera matucana		
Oxinasphaera parodia		
Oxinasphaera poorei		
Oxinasphaera tuberculosa		
Ozius deplanatus		
Ozius truncatus	Reef Crab	
Pachygrapsus laevimanus		
Pachynus denticulatum		
Pagurapseudes kimbla		
Pagurapseudes spinipes		
Pagurapseudes victoriae		
Paguristes aciculus		
Paguristes brevirostris	Southern Hermit Crab	
Paguristes frontalis	Common Hermit Crab	
Paguristes longisetosus		
Paguristes pugil	Boxer Hermit Crab	
Paguristes squamosus		
Paguristes sulcatus	Hairy-Legged Hermit Crab	
Paguristes tuberculatus	Friendly Hermit Crab	
Pagurixus handrecki		
Pagurixus jerviensis		
Pagurus sinuatus		

Pakistanapseudes bassi		
Pakistanapseudes taylorae		
Palaemon affinis	Tarawera	
Palaemon intermedius	Striped Shrimp	
Palaemon litoreus	Shore Shrimp	
Palaemon serenus	Rock-Pool Shrimp	
Palaemonetes atrinubes		
Panathura baudini		
Paracalliope australis		
Paracalliope lowryi		
Paracalliope vicinus		
Paracassidina anasilla		
Paracassidina pectinata		
Paracassidina petala		
Paracassidina wurrook		
Paracerceis sculpta		
Paracorophium excavatum		
Paradesmosoma australis		
Paradexamine churinga		
Paradexamine dandaloo		
Paradexamine echuca		
Paradexamine frinsdorfi		
Paradexamine lanacoura		
Paradexamine linga		
Paradexamine moorhousei		
Paradexamine pacifica		
Paradexamine quarallia		
Paradexamine thadalee		
Paradicoides megadactylus		
Paradoxapseudes attenuata		
Paradoxapseudes bassoprofundo		
Paradoxapseudes paneacis		
Paragiopagurus diogenes		
Paragrapsus gaimardii	Common Shore Crab	
Paragrapsus laevis		
Paragrapsus quadridentatus		
Paraleucothoe novaehollandiae		
Paralysianopsis pomona		
Paramesopodopsis rufa		
Paranchialina angusta		
Paranthura acacia		
Paranthura ciliata		
Paranthura epacris		
Paranthura grevillea		
Paranthura senecio		
Paranthura telopea		
Paraorides unistilus		
Parapagurus bouvieri		
Parapagurus latimanus		
Parapasiphae sulcatifrons		
Parapontophilus junceus		
Paraproto spinosa		

Paraproto tasmaniensis		
Parasergestes armatus		
Parasesarma erythodactylum		
Paratanais malignus		
Paratanais tanyherpes		
Paratanais vetinari		
Parathelges aniculi		
Paratya australiensis	Australian Paratya	
Paratyphlotanais colouros		
Parawaldeckia dilkera		
Parawaldeckia stebbingi		
Parawaldeckia stephenseni		
Parelasmopus poorei		
Parelasmopus sowpigensis		
Parharpinia villosa		
Paridotea munda		
Paridotea ungulata		
Parschisturella martrudan		
Parschisturella medora		
Pasiphaea berentsae		
Pedinura flindersia		
Pentaceration bassiana		
Pentaceration globopleonis		
Pentaceration lancifera		
Pentaceration megalomos		
Pentaceration simplex		
Pentaceration spinosissima		
Pentacheles laevis		
Pentacheles validus		
Pereionotus thomsoni		
Petrarctus demani		
Petrocheles australiensis	Spiny Porcelain Crab	
Philocheras obliquus		
Philocheras poorei		
Philocheras victoriensis		
Photosella charlotteae		
Photosella miersi		
Phylladiorhynchus pusillus	Little Craylet	
Pilumnopeus serratifrons	Smooth-Handed Crab	
Pilumnus acer	Long-Spined Hairy Crab	
Pilumnus australis		
Pilumnus etheridgei		
Pilumnus fissifrons	Tasselled Crab	
Pilumnus kingstoni	Downy Crab	
Pilumnus monilifera	Bearded Hairy Crab	
Pilumnus rufopunctatus	Red-Spotted Hairy Crab	
Pilumnus tomentosus	Common Hairy Crab	
Pinnotheres hickmani		
Pisidia dispar	Little Porcelain Crab	
Plagusia chabrus		
Plakarthrium australiense		
Planes major		

Platyischnopus mirabilis		
Plesionika edwardsii		
Plesionika martia		
Plymophiloscia ulverstonensis		
Podocerus akanthius		
Podocerus dentatus		
Podocerus hystrix		
Podocerus tamoshanta		
Podocerus vulgaris		
Podocerus wanganui		
Podoprionides akantha		
Politolana dasyprion		
Polycheria antarctica		
Polyonyx transversus	Polished Porcelain Crab	
Porcellanopagurus tridentatus		
Porcellio scaber		
Portunus armatus	Blue Swimmer Crab	
Portunus pelagicus	Asian Sand Crab	
Portunus sanguinolentus	Three-Spotted Crab	
Prismatopus spatulifer		
Procampylaspis sordida		
Processa australiensis	Odd-Footed Shrimp	
Procyphocaris indurata		
Propagurus deprofundis		
Propagurus haigae		
Protohyale loorea		
Protohyale maroubrae		
Protohyale rubra		
Protorchestia ceduna		
Pseudambasia lochi		
Pseudambasia sheardi		
Pseudidothea hoplites		
Pseudo vanhoeffeni		
Pseudoarchaeocuma bacescui		
Pseudobathytanais gibberosus		
Pseudocarcinus gigas	Giant Crab	
Pseudolana concinna		
Pseudolana towrae		
Pseudomesus satanus		
Pseudopaguristes laurentae		
Pseudopetalophthalmus australis		
Pseudoprotomima grandimana		
Pseudowhiteleggia typica		
Ptilohyale crassicornis		
Pugiodactylus syntomos		
Pycnoplax meridionalis		
Pycnoplax victoriensis		
Pylocheles mortensenii		
Pylopaguropsis zebra		
Pyromaia tuberculata		
Quadrimaera viridis		
Quasimodia barnardi		

Ranina ranina	Spanner Crab	
Remexudes toompani		
Rhinoecetes albomaculosus		
Rhinoecetes brevirostris		
Rhinoecetes coclearis		
Rhinoecetes dinoceros		
Rhinoecetes meridianus		
Rhopalophthalmus dakini		
Rhynchocinetes australis		
Rhynchocinetes balssi		
Rhynchocinetes serratus	Hinged-Beaked Prawn	
Rochinia fultoni		
Rochinia mosaica	Little Thornback Crab	
Sagmariasus verreauxi	Eastern Rock Lobster	
Saltipedis floccus		
Saltipedis nugoris		
Sancho platynotus		
Sandrothoe distans		
Scaphojoeropsis multicarinata		
Schisturella rosa		
Scylla serrata	Giant Mud Crab	
Sergestes atlanticus		
Sergia potens		
Sergia prehensilis		
Sergia scintillans		
Serolina acaste		
Serolina clarella		
Serolina delaria		
Serolina eugeniae		
Serolina granularia		
Serolina minuta		
Serolina nepea		
Sheardella kapala		
Sheardia antennata		
Shoemakerella barnardi		
Sicafodia stylos		
Sicyonia australiensis		
Similipedia diarris		
Siriella australis		
Siriella bassi		
Siriella vincenti		
Sophrosyne integricauda		
Sophrosyne peartae		
Sophrosyne rodondo		
Sphaeroma quoianum		
Spiculonana bathyalis		
Stegidotea pinnata		
Stegidotea scabra		
Stegocephaloides gunnae		
Stegocephaloides tucki		
Stegosoladidus complex		
Stenetrium adrianae		

Stenetrium armatum		
Stenothoe aucklandicus		
Stenothoe miersi		
Stenothoe valida		
Stephonyx pirloti		
Sternostylus rogeri		
Stimdromia lamellata		
Stimdromia lateralis	Ridged Sponge Crab	
Strigopagurus elongatus		
Strigopagurus strigimanus	Red Hermit Crab	
Stylocheiron abbreviatum		
Stylomesus sarsi		
Stylopandalus richardi		
Sunamphitoe lehae		
Sympagurus burkenroadi	Commensal Hermit Crab	
Sympagurus dimorphus		
Synalpheus tumidomanus		
Syncassidina aestuaria		
Syndexamine runde		
Synidotea grisea		
Synidotea keablei		
Syrrhoe semiserrata		
Syrrhoe serrima		
Systellaspis debilis		
Talorchestia diemenensis		
Tanaissus giraffa		
Tasmanoplax latifrons	Southern Sentinel Crab	
Tasmanorchestia annulata		
Tasmarcturus lewisi		
Tasmarcturus simplicissimus		
Tenagomysis australis		
Tenagomysis tasmaniae		
Teratomaia richardsoni		
Tethygeneia nalgo		
Tethygeneia waminda		
Tethygonium quadricuspis		
Tetradeion quatro		
Thaumastognathia orectognathus		
Themisto gaudichaudii		
Thrombasia umina		
Thysanopoda obtusifrons		
Tickalerus birubi		
Tipimegus dinjerrus		
Tipimegus kangulun		
Tipimegus thalerus		
Tomituka doowi		
Tottungus tungus		
Transorchestia marlo		
Trichopeltarion wardi		
Trizocheles spinosus		
Trypaea australiensis	Australian Ghost Shrimp	
Tryphosella betka		
Tryphosella camela		
Tryphosella cooee		

Tryphosella fortescue		
Tryphosella rodondo		
Tryphosella sorell		
Tryphosites colmani		
Tryphosites psittacus		
Tuldarus barinius		
Tuldarus cangellus		
Tymolus similis		
Typhlotanais herthio		
Ulakanthura crassicornis		
Ulakanthura lara		
Ulakanthura marlee		
Ulakanthura namoo		
Ulladulla selje		
Upogebia australiensis		
Upogebia dromana	Dromana Mud Shrimp	
Urohaustorius gunni		
Urohaustorius halei		
Urohaustorius merkanius		
Urohaustorius metungi		
Urohaustorius parnggius		
Urohaustorius perkeus		
Urohaustorius pulcus		
Urohaustorius urungari		
Urohaustorius wingaro		
Uromunna brevicornis		
Uroptychus australis		
Uroptychus flindersi		
Uroptychus gracilimanus		
Uroptychus latus		
Uroptychus subsolanus		
Urothoides kurrawa		
Urothoides mabingi		
Urothoides makoo		
Urothoides mammarta		
Urothoides odernae		
Urothoides waminoa		
Vallorchestia dispar		
Victoriasquilla poorei		
Victoriopisa australiensis		
Waldeckia australiensis		
Waldeckia nitens		
Whiteleggia multicarinata		
Whiteleggia stephensoni		
Whoia victoriensis		
Xanthias elegans		
Xenocheira fasciata		
Xenosella coxospinosa		
Zimmeriana longirostris		
Zuzara venosa		
Class: Ostracoda (seed shrimp)		
Alphasarsiella altrix		
Alternochelata lizardensis		
Archasterope altrix		
Archasterope verax		
Asteropterygion magnum		

Azygocypridina lowryi		
Chelicopia pertinex		
Cymbicopia cervix		
Cypridinodes wyvillethomsoni		
Eusarsiella edax		
Eusarsiella fallomagna		
Eusarsiella iayx		
Harbansus felix		
Harbansus tenax		
Homasterope trebax		
Leuroleberis mackenziei		
Macrocypridina castanea		
Metavargula calix		
Metavargula procax		
Paradoloria mordax		
Paradoloria tryx		
Parasterope lux		
Parasterope physinx		
Parasterope sequax		
Philomedes ptyx		
Philomedes thorax		
Pseudodoloria plax		
Quadracythere obtusalata		
Skogsbergia vivax		
Spinacopia rex		
Spinacopia syrinx		
Thaumatoconcha pix		
Vargula dentata		
Vargula fugax		
Vargula hex		
Vargula psydrax		
Vargula stranx		
Vargula trifax		
Vargula vix		
Xandarasterope trux		
Xenoleberis bex		
Class: Pycnogonida (sea spiders)		
Achelia assimilis		
Achelia variabilis		
Ammothea (Ammothea) magniceps		
Ammothea (Lecythorhynchus) ovatoides		
Anoplodactylus pycnosoma		
Anoplodactylus tubiferus		
Ascorhynchus minutum		
Austrodecus staplesi		
Bamberene dorsospinum		
Callipallene micracantha		
Callipallene micrantha		
Colossendeis macerrima		
Meridionale ambigua		
Meridionale inflata		
Nymphon aequidigitatum		
Nymphon bunyipi		
Nymphon novaehollandiae		
Nymphon singulare		
Nymphopsis acinacispinatus		

Oropallene minor		
Pallenopsis gippslandiae		
Pallenopsis macneilli		
Parapallene australiensis		
Parapallene avida		
Pseudopallene watsonae		
Pycnogonum occa		
Pycnogonum tuberculatum		
Stylopallene cheilorhynchus		
Stylopallene tubirostris		
Tanystylum hooperi		
Tanystylum orbiculare		
Phylum: BRACHIOPODA		
Class: Rhynchonellata		
Anakinetica cumingii		
Argyrotheca mayi		
Aulites brazieri		
Cancellothyris hedleyi		
Cryptopora gnomon		
Jaffaia jaffaensis		
Magadinella mineuri		
Magellania flavescens		
Megerlina lamarckiana		
Parakinetica stewarti		
Pirothyris vercoi		
Phylum: BRYOZOA		
Class: Gymnolaemata (sessile bryozoans)		
Adeona cellulosa		
Adeona grisea		
Adeonellopsis foliacea		
Adeonellopsis parvipuncta		
Adeonellopsis portmarina		
Aetea anguina		
Amathia wilsoni		
Amphiblestrum umbonatum		
Arachnopusia perforata		
Arachnopusia unicornis		
Beania magellanica		
Biflustra perfragilis		
Bracebridgia pyriformis		
Bugula dentata		
Bugula neritina		
Bugula robusta		
Bugularia dissimilis		
Bugulina flabellata		
Bugulina stolonifera		
Caberea dichotoma		
Caberea lata		
Calpidium ornatum		
Calyptotheca anceps		
Calyptotheca inclusa		
Calyptotheca triangula		
Calyptotheca variolosa		
Canda arachnoides		

Canda filifera		
Carbasea pisciformis		
Catenicella elegans		
Cellaria tenuirostris		
Celleporaria bispinata		
Celleporaria foliata		
Celleporaria fusca		
Celleporaria hastigera		
Celleporina platalea		
Claviporella imperforata		
Conescharellina biarmata		
Conescharellina cognata		
Conescharellina obscura		
Conescharellina pustulosa		
Cornucopina grandis		
Cornucopina tuba		
Cornuticella cornuta		
Costaticella hastata		
Crassimarginatella papulifera		
Cribricellina rufa		
Cryptosula pallasiana		
Cyclicopora longipora		
Dimetopia cornuta		
Euthyroides episcopalis		
Fenestrulina candida		
Flabellopora umbonata		
Gregarinidra serrata		
Hincksinoflustra denticulata		
Hippothoa divaricata		
Licornia cyclostoma		
Lunularia capulus		
Margaretta barbata		
Membranipora membranacea		
Menipea roborata		
Nellia simplex		
Orthoscuticella margaritacea		
Orthoscuticella ventricosa		
Otionellina auricula		
Otionellina minuta		
Otionellina squamosa		
Paracribricellina cribraria		
Parastichopora vanna		
Parkermavella punctigera		
Parmularia obliqua		
Petralia undata		
Porina gracilis		
Reteporella aurantiaca		
Reteporella fissa		
Reteporella granulata		
Reteporella porcellana		
Reteporellina babelensis		
Reteporellina sagitta		
Schizoporella errata		
Scuticella plagiostoma		
Selenaria exasperans		
Selenaria parapunctata		

Selenaria varians		
Selenariopsis gabrieli		
Sphaeropora oliva		
Steginoporella truncata		
Tetraplaria wilsoni		
Tricellaria occidentalis		
Tricellaria porteri		
Triphyllozoon floribundum		
Triphyllozoon moniliferum		
Triphyllozoon munitum		
Watersipora subovoidea		
Watersipora subtorquata		
Zeuglopora lanceolata		
Class: Stenolaemata (sessile bryozoans)		
Densipora corrugata		
Hornera foliacea		
Hornera ramosa		
Hornera robusta		
Tubulipora pulchra		
Phylum: CHAETOGNATHA		
Flaccisagitta enflata		
Phylum: CHORDATA		
Class: Actinopterygii (ray-finned fish)		
Abalistes filamentosus	Hairfin Triggerfish	
Abalistes stellatus	Starry Triggerfish	
Abudefduf sexfasciatus	Scissortail Sergeant	
Abudefduf sordidus	Blackspot Sergeant	
Abudefduf vaigiensis	Indo-Pacific Sergeant	
Acanthaluteres spilomelanurus	Bridled Leatherjacket	
Acanthaluteres vittiger	Toothbrush Leatherjacket	
Acanthistius cinctus	Yellowbanded Wirrah	
Acanthistius ocellatus	Eastern Wirrah	
Acanthopagrus australis	Yellowfin Bream	
Acanthopagrus butcheri	Black Bream	
Acanthopagrus pacificus	Pikey Bream	
Acanthurus dussumieri	Pencil Surgeonfish	
Acanthurus nigrofuscus	Dusky Surgeonfish	
Acanthurus triostegus	Convict Surgeonfish	
Achoerodus gouldii	Western Blue Groper	
Achoerodus viridis	Eastern Blue Groper	
Aetapcus maculatus	Warty Prowfish	
Afurcagobius tamarensis	Tamar Goby	
Alabes bathys	Deepwater Shore-Eel	
Alabes dorsalis	Common Shore Eel	
Alabes hoesei	Dwarf Shore Eel	
Alabes obtusirostris	Pugnose Shore Eel	
Alabes parvula	Pygmy Shore Eel	
Alabes scotti	Scott's Shore Eel	
Aldrichetta forsteri	Yelloweye Mullet	
Alectis ciliaris	Pennantfish	
Alepisaurus ferox	Longnose Lancetfish	
Alepocephalus australis	Smallscale Slickhead	
Allocyttus niger	Black Oreodory	
Allocyttus verrucosus	Warty Oreodory	

Allomycterus pilatus	Australian Burrfish	
Ambassis jacksoniensis	Port Jackson Glassfish	
Ambassis marianus	Estuary Glassfish	
Ammotretis lituratus	Spotted Flounder	
Ammotretis macrolepis	Largescale Flounder	
Ammotretis rostratus	Longsnout Flounder	
Anacanthus barbatus	Bearded Leatherjacket	
Anampses caeruleopunctatus	Diamond Wrasse	
Anguilla australis	Southern Shortfin Eel	
Anguilla reinhardtii	Longfin Eel	
Anoplocapros inermis	Eastern Smooth Boxfish	
Anoplocapros lenticularis	Whitebarred Boxfish	
Anoplogaster cornuta	Fangtooth	
Antennarius striatus	Striate Anglerfish	
Antigonia rhomboidea	Rhomboid Deepsea Boarfish	
Antimora rostrata	Violet Cod	
Antipodocottus elegans	Dwarf Sculpin	
Aplodactylus arctidens	Marblefish	
Aplodactylus lophodon	Rock Cale	
Apopterygion alta	Tasselled Threefin	
Aracana aurita	Shaw's Cowfish	
Aracana ornata	Ornate Cowfish	
Arenigobius bifrenatus	Bridled Goby	
Arenigobius frenatus	Halfbridled Goby	
Argentina australiae	Silverside	
Argentina elongata		
Argyropelecus aculeatus	Lovely Hatchetfish	
Argyropelecus gigas	Giant Hatchetfish	
Argyropelecus hemigymnus	Halfnaked Hatchetfish	
Argyropelecus sladeni	Lowcrest Hatchetfish	
Argyrosomus japonicus	Mulloway	
Ariosoma anago	Darkfin Conger	
Ariosoma mauritianum	Blunt-Tooth Conger	
Arnoglossus bassensis	Bass Strait Flounder	
Arnoglossus muelleri	Mueller's Flounder	
Arothron firmamentum	Starry Toadfish	
Arothron manilensis	Narrowlined Puffer	
Arothron stellatus	Starry Puffer	
Arrhamphus sclerolepis	Snubnose Garfish	
Arripis georgianus	Australian Herring	
Arripis trutta	Eastern Australian Salmon	
Arripis truttaceus	Western Australian Salmon	
Aseraggodes lenisquamis	Peppered Sole	
Aspasmogaster costata	Pink Clingfish	
Aspasmogaster liorhynchus	Smoothsnout Clingfish	
Aspasmogaster tasmaniensis	Tasmanian Clingfish	
Astronesthes boulengeri	Boulenger's Snaggletooth	
Atherinason hepsetoides	Smallscale Hardyhead	
Atherinomorus vaigiensis	Common Hardyhead	
Atherinosoma elongatum	Elongate Hardyhead	
Atherinosoma microstoma	Smallmouth Hardyhead	
Atractoscion aequidens	Teraglin	
Atypichthys strigatus	Mado	
Austrolabrus maculatus	Blackspotted Wrasse	
Auxis thazard	Frigate Mackerel	
Avocettina acuticeps	Southern Snipe Eel	

Avocettina infans	Avocet Snipe Eel	
Azygopus pinnifasciatus	Banded-Fin Flounder	
Barbourisia rufa	Redvelvet Whalefish	
Bassanago bulbiceps	Swollenhead Conger	
Bassanago hirsutus	Deepsea Conger	
Bathygadus cottoides	Codhead Rat Tail	
Bathygadus furvescens	Blackfin Rat Tail	
Bathygobius cocosensis	Cocos Frillgoby	
Bathylagus antarcticus	Antarctic Deepsea Smelt	
Bathysauroides gigas	Pale Deepsea Lizardfish	
Bathysauropsis gracilis	Black Deepsea Lizardfish	
Bathysaurus ferox	Deepsea Lizardfish	
Benthodesmus elongatus	Slender Frostfish	
Benthosema suborbitale	Dimple Lanternfish	
Beryx decadactylus	Imperador	
Beryx splendens	Alfonsino	
Bodianus flavifrons	Masked Pigfish	
Bodianus flavipinnis	Yellowfin Pigfish	
Bodianus unimaculatus	Eastern Pigfish	
Bodianus vulpinus	Western Pigfish	
Borostomias antarcticus	Antarctic Snaggletooth	
Bovichtus angustifrons	Dragonet	
Bovichtus variegatus		
Brachaluteres jacksonianus	Southern Pygmy Leatherjacket	
Brachionichthys australis	Australian Handfish	
Brachionichthys hirsutus	Spotted Handfish	EPBC Act - Threatened
Brachiopsilus dossenus	Humpback Handfish	
Brachiopsilus ziebelli	Actaeon Handfish	EPBC Act - Threatened
Brachirus nigra	Black Sole	
Brachynectes fasciatus	Barred Threefin	
Brama australis	Southern Ray's Bream	
Brama brama	Ray's Bream	
Branchiostegus wardi	Pink Tilefish	
Brotulotaenia crassa	Violet Cusk	
Caelorinchus aspercephalus		
Caelorinchus parvifasciatus		
Caesioperca lepidoptera	Butterfly Perch	
Caesioperca rasor	Barber Perch	
Callanthias allporti	Rosy Perch	
Callanthias australis	Splendid Perch	
Callogobius depressus	Flathead Goby	
Callogobius mucosus	Sculptured Goby	
Cantherhines pardalis	Honeycomb Leatherjacket	
Caprodon longimanus	Longfin Perch	
Capropygia unistriata	Spiny Boxfish	
Carassius auratus	Goldfish	
Caristius meridionalis		
Cataetyx niki	Brown Brotula	
Centriscops humerosus	Banded Bellowsfish	
Centroberyx affinis	Redfish	
Centroberyx australis	Yelloweye Redfish	
Centroberyx gerrardi	Bight Redfish	
Centroberyx lineatus	Swallowtail	
Centrolophus niger	Rudderfish	
Centropogon australis	Eastern Fortescue	
Cephalopholis cyanostigma	Bluespotted Rockcod	

Cephalopholis leopardus	Leopard Rockcod	
Cepola australis	Australian Bandfish	
Ceratias tentaculatus	Southern Seadevil	
Ceratoscopelus warmingii	Warming's Lanternfish	
Cetonurus globiceps	Globehead Whiptail	
Cetoscarus ocellatus	Bicolour Parrotfish	
Chaetodon auriga	Threadfin Butterflyfish	
Chaetodon guentheri	Gunther's Butterflyfish	
Chaetodon vagabundus	Vagabond Butterflyfish	
Champsodon nudivittis	Nakedband Gaper	
Chanos chanos	Milkfish	
Chascanopsetta lugubris	Pelican Flounder	
Chauliodus sloani	Sloane's Viperfish	
Chaunax endeavouri	Furry Coffinfish	
Chaunax penicillatus	Pencil Coffinfish	
Cheilodactylus fuscus	Red Morwong	
Cheilodactylus nigripes	Magpie Perch	
Cheilodactylus spectabilis	Banded Morwong	
Cheilodactylus vestitus	Crested Morwong	
Chelidonichthys kumu	Red Gurnard	
Chiasmodon microcephalus	Black Swallower	
Chironemus georgianus	Western Kelpfish	
Chironemus maculosus	Silver Spot	
Chironemus marmoratus	Eastern Kelpfish	
Chromis hypsilepis	Onespot Puller	
Chrysiptera rollandi	Bluehead Demoiselle	
Chrysophrys auratus	Snapper	
Cleidopus gloriamaris	Australian Pineapplefish	
Cnidoglanis macrocephalus	Estuary Cobbler	
Cochleoceps bassensis	Broadhead Clingfish	
Cochleoceps orientalis	Eastern Cleaner Clingfish	
Cochleoceps spatula	Spadenose Clingfish	
Coelorinchus acanthiger	Spottyface Whiptail	
Coelorinchus amydrozosterus	Faintbanded Whiptail	
Coelorinchus australis	Southern Whiptail	
Coelorinchus fasciatus	Banded Whiptail	
Coelorinchus gormani	Little Whiptail	
Coelorinchus innotabilis	Notable Whiptail	
Coelorinchus kaiyomaru	Kaiyomaru Whiptail	
Coelorinchus kermadecus	Kermadec Whiptail	
Coelorinchus lasti	Roughsnout Whiptail	
Coelorinchus matamua	Blueband Whiptail	
Coelorinchus maurofasciatus	Falseband Whiptail	
Coelorinchus mirus	Gargoyle Fish	
Coelorinchus trachycarus	Rough-Head Whiptail	
Conger monganius	Eastern Conger	
Conger verreauxi	Southern Conger	
Conger wilsoni	Eastern Conger	
Contusus brevicaudus	Prickly Toadfish	
Contusus richei	Barred Toadfish	
Cookeolus japonicus	Longfin Bigeye	
Coris picta	Comb Wrasse	
Coryphaena hippurus	Mahi Mahi	
Coryphaenoides dossenus	Humpback Whiptail	
Coryphaenoides mcmillani	Mcmillan's Whiptail	
Coryphaenoides murrayi	Abyssal Whiptail	

Coryphaenoides rudis	Bighead Whiptail	
Coryphaenoides serrulatus	Serrulate Whiptail	
Coryphaenoides striaturus	Striate Whiptail	
Coryphaenoides subserrulatus	Longray Whiptail	
Crapatalus munroi	Pink Sandfish	
Creedia haswelli	Slender Sandburrower	
Creocele cardinalis	Broad Clingfish	
Cristiceps argyropleura	Silverside Weedfish	
Cristiceps aurantiacus	Yellow Crested Weedfish	
Cristiceps australis	Southern Crested Weedfish	
Cryptocentroides gobioides	Crested Oystergoby	
Cryptopsaras couesii	Triplewart Seadevil	
Cyclothone braueri	Brauer's Bristlemouth	
Cyclothone microdon	Smalltooth Bristlemouth	
Cyclothone pallida	Tanned Bristlemouth	
Cyclothone pseudopallida	Slender Bristlemouth	
Cyprinus carpio	European Carp	
Cyttus australis	Silver Dory	
Cyttus novaezealandiae	New Zealand Dory	
Cyttus traversi	King Dory	
Dactylophora nigricans	Dusky Morwong	
Dactyloptena orientalis	Purple Flying Gurnard	
Dannevigia tusca	Tusk	
Decapterus macrosoma	Slender Scad	
Decapterus russelli	Indian Scad	
Derichthys serpentinus	Deepwater Neck Eel	
Dermatopsis hoesei	Hoese's Mudbrotula	
Dermatopsis macrodon	Eastern Yellow Blindfish	
Diaphus danae	Dana Lanternfish	
Diaphus hudsoni	Hudson's Lanternfish	
Diaphus kapalae	Kapala Lanternfish	
Diaphus meadi	Mead's Lanternfish	
Diaphus metopoclampus	Bluntnose Lanternfish	
Diaphus ostenfeldi	Ostenfeld's Lanternfish	
Diaphus termophilus	Warmwater Lanternfish	
Diastobranchus capensis	Basketwork Eel	
Dicotylichthys punctulatus	Threebar Porcupinefish	
Dinolestes lewini	Longfin Pike	
Diodon nicthemerus	Globefish	
Diogenichthys atlanticus	Atlantic Lanternfish	
Diplophos rebainsi	Rebains' Portholefish	
Diretmichthys parini	Black Spinyfin	
Diretmus argenteus	Discfish	
Dotalabrus aurantiacus	Castelnau's Wrasse	
Echinophryne crassispina	Prickly Anglerfish	
Echinophryne reynoldsi	Sponge Anglerfish	
Echiodon rendahli	Messmate Fish	
Eeyorius hutchinsi	Finetooth Beardie	
Electrona risso	Risso's Lanternfish	
Electrona subaspera	Rough Lanternfish	
Emmelichthys nitidus	Redbait	
Engraulis australis	Australian Anchovy	
Enigmapercis reducta	Broad Duckbill	
Enneapterygius atrogulare	Ringscale Threefin	
Enneapterygius rufopileus	Blackcheek Threefin	
Enoplosus armatus	Old Wife	

Eocallionymus papilio	Painted Stinkfish	
Epigonus denticulatus	White Deepsea Cardinalfish	
Epigonus lenimen	Bigeye Deepsea Cardinalfish	
Epigonus robustus	Robust Deepsea Cardinalfish	
Epigonus telescopus	Black Deepsea Cardinalfish	
Epinephelus daemelii	Black Rockcod	EPBC Act - Threatened
Eubalichthys bucephalus	Black Reef Leatherjacket	
Eubalichthys gunnii	Gunn's Leatherjacket	
Eubalichthys mosaicus	Mosaic Leatherjacket	
Euclichthys polynemus	Eucla Cod	
Eupetrichthys angustipes	Snakeskin Wrasse	
Eurypharynx pelecanoides	Pelican Eel	
Euthynnus affinis	Mackerel Tuna	
Favonigobius exquisitus	Exquisite Sandgoby	
Favonigobius lateralis	Southern Longfin Goby	
Favonigobius lentiginosus	Eastern Longfin Goby	
Fistularia commersonii	Smooth Flutemouth	
Fistularia petimba	Rough Flutemouth	
Foetorepus calauropomus	Common Stinkfish	
Foetorepus phasis	Longray Stinkfish	
Gadopsis bispinosus	Twospine Blackfish	
Gadopsis marmoratus	River Blackfish	
Gaidropsarus novaezelandiae		
Galaxias auratus	Golden Galaxias	EPBC Act - Threatened
Galaxias brevipinnis	Climbing Galaxias	
Galaxias maculatus	Common Galaxias	
Galaxias olidus	Mountain Galaxias	
Galaxias parvus	Swamp Galaxias	EPBC Act - Threatened
Galaxias truttaceus	Trout Galaxias	
Gambusia dominicensis	Dominican Gambusia	
Gambusia holbrooki	Eastern Gambusia	
Gasterochisma melampus	Butterfly Mackerel	
Genypterus blacodes	Pink Ling	
Genypterus tigerinus	Rock Ling	
Gephyroberyx darwinii	Darwin's Roughy	
Gerres erythrourus	Short Silverbiddy	
Gerres subfasciatus	Common Silverbiddy	
Girella cyanea	Blue Drummer	
Girella elevata	Rock Blackfish	
Girella tricuspidata	Luderick	
Girella zebra	Zebrafish	
Glaucosoma scapulare	Pearl Perch	
Glyptauchen panduratus	Goblinfish	
Gnathanacanthus goetzeei	Red Velvetfish	
Gnathophis habenatus		
Gnathophis longicauda	Little Conger	
Gnathophis macroporis	Largepore Conger	
Gnathophis nasutus	Bignose Conger	
Gnathophis umbrellabia	Umbrella Conger	
Gobiomorphus australis	Striped Gudgeon	
Gobiomorphus coxii	Cox's Gudgeon	
Gobiopterus semivestitus	Glassgoby	
Gonorynchus greyi	Beaked Salmon	
Grammicolepis brachiusculus	Thorny Tinselfish	
Guttigadus globiceps	Fathead Cod	
Gymnapistes marmoratus	Soldier	

Gymnoscopelus bolini		
Gymnoscopelus piabilis	Southern Blacktip Lanternfish	
Gymnothorax obesus	Speckled Moray	
Gymnothorax prasinus	Green Moray	
Gymnothorax prionodon	Sawtooth Moray	
Halargyreus johnsonii	Slender Cod	
Haletta semifasciata	Blue Weed Whiting	
Halichoeres nebulosus	Cloud Wrasse	
Halieutaea brevicauda	Shortfin Seabat	
Halieutaea stellata	Starry Seabat	
Halosauropsis macrochir	Black Halosaur	
Halosaurus pectoralis	Australian Halosaur	
Haplomacrourus nudirostris	Nakedsnout Whiptail	
Helicolenus barathri	Bigeye Ocean Perch	
Helicolenus percoides	Reef Ocean Perch	
Hemiramphus far	Blackbarred Garfish	
Herklotsichthys castelnaui	Southern Herring	
Heteroclinus eckloniae	Kelp Weedfish	
Heteroclinus heptaeolus	Ogilby's Weedfish	
Heteroclinus johnstoni	Johnston's Weedfish	
Heteroclinus kuiteri	Kuiter's Weedfish	
Heteroclinus macrophthalmus	Large-Eye Weedfish	
Heteroclinus nasutus	Largenose Weedfish	
Heteroclinus perspicillatus	Common Weedfish	
Heteroclinus puellarum	Little Weedfish	
Heteroclinus roseus	Rosy Weedfish	
Heteroclinus tristis	Longnose Weedfish	
Heteroclinus whiteleggii	Banded Weedfish	
Heteroclinus wilsoni	Wilson's Weedfish	
Heteroscarus acroptilus	Rainbow Cale	
Himantolophus appelii	Prickly Footballfish	
Himantolophus stewarti		
Hime curtirostris	Shortsnout Threadsail	
Hippocampus abdominalis	Bigbelly Seahorse	
Hippocampus minotaur	Bullneck Seahorse	
Histiogamphelus briggsii	Crested Pipefish	
Histrio histrio	Sargassum Fish	
Holtbyrnia laticauda	Tusked Tubeshoulder	
Hoplichthys citrinus	Lemon Ghost Flathead	
Hoplichthys haswelli	Deepsea Flathead	
Hoplostethus atlanticus	Orange Roughy	EPBC Act - Threatened
Hoplostethus gigas	Giant Sawbelly	
Hoplostethus mediterraneus	Blacktip Sawbelly	
Howella brodiei	Southern Pelagic Bass	
Howella sherborni	Sherborn's Pelagic Bass	
Hygophum hanseni	Hansen's Lanternfish	
Hygophum hygomii	Hygom's Lanternfish	
Hygophum proximum	Firefly Lanternfish	
Hymenogadus gracilis	Delicate Whiptail	
Hyperlophus vittatus	Sandy Sprat	
Hyperoglyphe antarctica	Blue-Eye Trevalla	
Hypoplectrodes annulatus	Blackbanded Seaperch	
Hypoplectrodes maccullochi	Halfbanded Seaperch	
Hypoplectrodes nigroruber	Banded Seaperch	
Hyporhamphus australis	Eastern Sea Garfish	
Hyporhamphus melanochir	Southern Garfish	

Hyporhamphus regularis	River Garfish	
Hyporthodus ergastularius	Banded Rockcod	
Hyporthodus septemfasciatus	Convict Grouper	
Hypseleotris compressa	Empire Gudgeon	
Ichthyscopus barbatus	Fringe Stargazer	
Ichthyscopus spinosus	Spiny Stargazer	
Idiacanthus atlanticus	Common Black Dragonfish	
Idiacanthus fasciola	Serpent Black Dragonfish	
Idiolophorhynchus andriashevi	Pineapple Whiptail	
Ilyophis blachei		
Ilyophis brunneus	Muddy Arrowtooth Eel	
Kathetostoma canaster	Speckled Stargazer	
Kathetostoma laeve	Common Stargazer	
Katsuwonus pelamis	Skipjack Tuna	
Kestratherina esox	Pikehead Hardyhead	
Kimblaeus bassensis	Trawl Pipefish	
Kopua kuiteri	Deepwater Clingfish	
Kuiterichthys furcipilis	Rough Anglerfish	
Kuronezumia leonis	Snubnose Whiptail	
Kyphosus sydneyanus	Silver Drummer	
Labroides dimidiatus	Common Cleanerfish	
Lactoria cornuta	Longhorn Cowfish	
Lactoria diaphana	Roundbelly Cowfish	
Lactoria fornasini	Thornback Cowfish	
Lagocephalus cheesemanii	Cheeseman's Puffer	
Lagocephalus lagocephalus	Ocean Puffer	
Lagocephalus sceleratus	Silver Toadfish	
Lagocephalus spadiceus	Brownback Toadfish	
Lampadena notialis	Notal Lanternfish	
Lampanyctodes hectoris	Hector's Lanternfish	
Lampanyctus alatus	Winged Lanternfish	
Lampanyctus australis	Austral Lanternfish	
Lampanyctus intricarius	Intricate Lanternfish	
Lampanyctus nobilis	Noble Lanternfish	
Lampanyctus pusillus	Pygmy Lanternfish	
Lampichthys procerus	Blackhead Lanternfish	
Lampris guttatus		
Latridopsis forsteri	Bastard Trumpeter	
Latris lineata	Striped Trumpeter	
Latropiscis purpurissatus	Sergeant Baker	
Lepidion microcephalus	Smallhead Cod	
Lepidion schmidti	Schmidt's Cod	
Lepidoblennius haplodactylus	Eastern Jumping Blenny	
Lepidoperca pulchella	Eastern Orange Perch	
Lepidoperca tasmanica	Tasmanian Perch	
Lepidopus caudatus	Frostfish	
Lepidorhynchus denticulatus	Toothed Whiptail	
Lepidotrigla argus	Eye Gurnard	
Lepidotrigla grandis	Little Red Gurnard	
Lepidotrigla modesta	Cocky Gurnard	
Lepidotrigla mulhalli	Roundsnout Gurnard	
Lepidotrigla papilio	Spiny Gurnard	
Lepidotrigla vanessa	Butterfly Gurnard	
Leptatherina presbyteroides	Silver Fish	
Lestidium nudum	Naked Barracudina	
Lesueurina platycephala	Flathead Sandfish	

Lethrinus genivittatus	Threadfin Emperor	
Lissocampus runa	Javelin Pipefish	
Liza argentea	Goldspot Mullet	
Lobianchia dofleini	Doflein's Lanternfish	
Lophiomus setigerus	Broadhead Goosefish	
Lophonectes gallus	Crested Flounder	
Lophotus capellei		
Lotella rhacina	Largetooth Beardie	
Lucigadus nigromaculatus	Blackspot Whiptail	
Lutjanus argentimaculatus	Mangrove Jack	
Luvarus imperialis	Louvar	
Maccullochella peelii	Murray Cod	EPBC Act - Threatened
Macquaria australasica	Macquarie Perch	EPBC Act - Threatened
Macquaria colonorum	Estuary Perch	
Macquaria novemaculeata	Australian Bass	
Macroparalepis macrogeneion	Longfin Barracudina	
Macroramphosus gracilis	Little Bellowsfish	
Macroramphosus scolopax	Common Bellowsfish	
Macrourus carinatus	Ridgescale Whiptail	
Macruronus novaezelandiae	Blue Grenadier	
Malacosteus australis	Southern Stoplight Loosejaw	
Malacosteus niger	Black Loosejaw	
Malvoliophis pinguis	Halfband Snake Eel	
Maurolicus australis	Pennant Pearlside	
Maxillicosta meridianus	Southern Gurnard Perch	
Maxillicosta whitleyi	Whitley's Gurnard Perch	
Mecaenichthys immaculatus	Immaculate Damsel	
Melamphaes longivelis	Eyebrow Bigscale	
Melanocetus johnsonii	Humpback Blackdevil	
Melanolagus bericoides	Bigscale Deepsea Smelt	
Melanonus gracilis	Pelagic Cod	
Melanonus zugmayeri	Arrowtail Cod	
Melanostigma gelatinosum	Limp Eelpout	
Merluccius australis	Southern Hake	
Mesovagus antipodum	Black Whiptail	
Metelectrona herwigi	Herwig Lanternfish	
Meuschenia australis	Brownstriped Leatherjacket	
Meuschenia flavolineata	Yellowstriped Leatherjacket	
Meuschenia freycineti	Sixspine Leatherjacket	
Meuschenia hippocrepis	Horseshoe Leatherjacket	
Meuschenia scaber	Velvet Leatherjacket	
Meuschenia trachylepis	Yellowfin Leatherjacket	
Meuschenia venusta	Stars-And-Stripes Leatherjacket	
Microcanthus strigatus	Stripey	
Mola mola	Ocean Sunfish	
Monacanthus chinensis	Fanbelly Leatherjacket	
Monodactylus argenteus	Diamondfish	
Monopterus albus	Belut	
Moolgarda buchanani	Bluetail Mullet	
Mora moro	Ribaldo	
Mugil cephalus	Sea Mullet	
Mugilogobius platynotus	Flatback Mangrovegoby	
Muraenesox bagio	Common Pike Eel	
Muraenolepis orangiensis	Patagonian Moray Cod	
Myctophum phengodes	Bright Lanternfish	
Myxus elongatus	Sand Mullet	

Nannobrachium atrum	Dusky Lanternfish	
Nannoperca australis	Southern Pygmy Perch	
Naso unicornis	Bluespine Unicornfish	
Naucrates ductor	Pilotfish	
Nelusetta ayraud	Ocean Jacket	
Nelusetta ayraudi		
Nemadactylus douglasii	Grey Morwong	
Nemadactylus macroptera	Jackass Morwong	
Nemadactylus valenciennesi	Blue Morwong	
Nemichthys curvirostris	Boxer Snipe Eel	
Neoachiropsetta milfordi	Armless Deepsea Flounder	
Neoarius graeffei	Blue Catfish	
Neobythites pallidus	Pale Cusk	
Neocaristius heemstrai		
Neochanna cleaveri	Tasmanian Mudfish	
Neocyttus rhomboidalis	Spikey Oreodory	
Neoodax balteatus	Little Weed Whiting	
Neoscopelus macrolepidotus	Largescale Neoscopelid	
Neosebastes incisipinnis	Incised Gurnard Perch	
Neosebastes nigropunctatus	Blackspotted Gurnard Perch	
Neosebastes occidentalis	Orangebanded Gurnard Perch	
Neosebastes pandus	Bighead Gurnard Perch	
Neosebastes scorpaenoides	Common Gurnard Perch	
Neosebastes thetidis	Thetis Fish	
Nesogobius greeni	Twin-Barred Goby	
Nesogobius hinsbyi	Hinsby's Goby	
Nesogobius maccullochi	Girdled Goby	
Nesogobius pulchellus	Sailfin Goby	
Nezumia coheni	Cohen's Whiptail	
Nezumia kapala	Kapala Whiptail	
Nezumia soela	Soela Whiptail	
Normichthys yahganorum	Tubeshoulder	
Notacanthus chemnitzii	Cosmopolitan Spineback	
Notacanthus sexspinis	Southern Spineback	
Notesthes robusta	Bullrout	
Notolabrus fucicola	Purple Wrasse	
Notolabrus gymnogenis	Crimsonband Wrasse	
Notolabrus inscriptus	Inscribed Wrasse	
Notolabrus parilus	Brownspotted Wrasse	
Notolabrus tetricus	Bluethroat Wrasse	
Notophycis marginata	Forkbeard Cod	
Notopogon lilliei	Crested Bellowsfish	
Notopogon xenosoma	Orange Bellowsfish	
Odontomacrurus murrayi	Largefang Whiptail	
Olisthops cyanomelas	Herring Cale	
Omegophora armilla	Ringed Toadfish	
Oncorhynchus mykiss	Rainbow Trout	
Oneirodes kreffti	Krefft's Dreamer	
Oneirodes plagionema		
Ophichthus alleni	Allen's Snake Eel	
Ophiclinops varius	Variegated Snake Blenny	
Ophiclinus gracilis	Blackback Snake Blenny	
Ophiclinus ningulus	Variable Snake Blenny	
Ophisternon candidum	Blind Cave Eel	EPBC Act - Threatened
Ophisurus serpens	Serpent Eel	
Ophthalmolepis lineolata	Southern Maori Wrasse	

Oplegnathus woodwardi	Knifejaw	
Opostomias micripnus	Obese Dragonfish	
Optivus agastos	Violet Roughy	
Optivus elongatus		
Oreosoma atlanticum	Oxeye Oreodory	
Ostichthys japonicus	Giant Squirrelfish	
Otolithes ruber	Silver Teraglin	
Parablennius intermedius	Horned Blenny	
Parablennius tasmanianus	Tasmanian Blenny	
Paragalaxias dissimilis	Shannon Galaxias	EPBC Act - Threatened
Paraliparis anthracinus	Coalskin Snailfish	
Paraliparis ater	Sooty Snailfish	
Paraliparis auriculatus	Smallcheek Snailfish	
Paraliparis brunneus	Brown Snailfish	
Paraliparis costatus	Black Ribbed Snailfish	
Paraliparis delphis	Dolphin Snailfish	
Paraliparis impariporus	Unipore Snailfish	
Paraliparis labiatus	Biglip Snailfish	
Paraliparis piceus	Tarred Snailfish	
Paraliparis tasmaniensis	Tasmanian Snailfish	
Paramonacanthus filicauda	Threadfin Leatherjacket	
Parapercis allporti	Barred Grubfish	
Parapercis binivirgata	Redbanded Grubfish	
Parapercis ramsayi	Spotted Grubfish	
Paraplagusia bilineata	Lemon Tongue Sole	
Paraplesiops alisonae	Alison's Blue Devil	
Paraplesiops bleekeri	Eastern Blue Devil	
Parapriacanthus elongatus	Elongate Bullseye	
Paratrachichthys macleayi	Sandpaper Fish	
Paratrachichthys trailli		
Paraulopus nigripinnis	Blacktip Cucumberfish	
Parazanclistius hutchinsi	Short Boarfish	
Parequula melbournensis	Silverbelly	
Parika scaber		
Paristiopterus gallipavo	Yellowspotted Boarfish	
Paristiopterus labiosus	Giant Boarfish	
Parkraemeria ornata	Ornate Sand-Diving Goby	
Parma microlepis	White-Ear	
Parma unifasciata	Girdled Scalyfin	
Parma victoriae	Scalyfin	
Parupeneus chrysopleuron	Rosy Goatfish	
Parupeneus spilurus	Blacksaddle Goatfish	
Parvicrepis parvipinnis	Smallfin Clingfish	
Pegasus lancifer	Sculptured Seamoth	
Pelates quadrilineatus	Fourline Striped Grunter	
Pelates sexlineatus	Eastern Striped Grunter	
Pempheris affinis	Blacktip Bullseye	
Pempheris compressa	Smallscale Bullseye	
Pempheris multiradiata	Bigscale Bullseye	
Pentaceropsis recurvirostris	Longsnout Boarfish	
Pentaceros decacanthus	Bigspine Boarfish	
Perca fluviatilis	Redfin	
Persparsia kopua	Spangled Tubeshoulder	
Petroscirtes lupus	Brown Sabretooth Blenny	
Pezichthys amplispinus	Cockatoo Handfish	
Pezichthys eltanini	Eltanin Handfish	

Philypnodon grandiceps	Flathead Gudgeon	
Philypnodon macrostomus	Dwarf Flathead Gudgeon	
Phosichthys argenteus	Silver Lightfish	
Phyllophryne scortea	Whitespotted Anglerfish	
Phyllopteryx taeniolatus	Common Seadragon	
Physiculus luminosa	Luminous Cod	
Pictilabrus laticlavius	Senator Wrasse	
Plagiogeneion macrolepis	Bigscale Rubyfish	
Plagiogeneion rubiginosum	Cosmopolitan Rubyfish	
Plagiotremus rhinorhynchos	Bluestriped Fangblenny	
Plagiotremus tapeinosoma	Piano Fangblenny	
Platyberyx andriashevi		
Platycephalus aurimaculatus	Toothy Flathead	
Platycephalus bassensis	Southern Sand Flathead	
Platycephalus caeruleopunctatus	Bluespotted Flathead	
Platycephalus conatus	Deepwater Flathead	
Platycephalus endrachtensis	Northern Sand Flathead	
Platycephalus fuscus	Dusky Flathead	
Platycephalus grandispinis	Longspine Flathead	
Platycephalus laevigatus	Rock Flathead	
Platycephalus marmoratus	Marbled Flathead	
Platycephalus richardsoni	Tiger Flathead	
Platycephalus speculator	Southern Bluespotted Flathead	
Plectranthias maculicauda	Spot-Tail Perchlet	
Pleuroscopus pseudodorsalis	Scaled Stargazer	
Polyipnus aquavitus	Aquavit Hatchetfish	
Polyipnus ruggeri	Rugby Hatchetfish	
Polyipnus tridentifer	Threespine Hatchetfish	
Polymetme corythaeola	Rendezvous Fish	
Polymetme illustris	Brilliant Lightfish	
Polymixia busakhini	Busakhin's Beardfish	
Polyprion americanus	Bass Groper	
Polyprion oxygeneios	Hapuku	
Pomacentrus coelestis	Neon Damsel	
Pomatomus saltatrix	Tailor	
Poromitra atlantica	Crested Bigscale	
Potamalosa richmondia	Freshwater Herring	
Priacanthus macracanthus	Spotted Bigeye	
Priolepis pallidicincta	Palebarred Reefgoby	
Prionurus microlepidotus	Australian Sawtail	
Prototroctes maraena	Australian Grayling	EPBC Act - Threatened
Psednos whitleyi	Bigcheek Snailfish	
Psenes pellucidus	Blackrag	
Psenopsis humerosa	Blackspot Butterfish	
Pseudanthias squamipinnis	Orange Basslet	
Pseudaphritis urvillii	Congolli	
Pseudocaranx dentex	Silver Trevally	
Pseudocaranx georgianus	Silver Trevally	
Pseudocaranx wrighti	Skipjack Trevally	
Pseudocyttus maculatus	Smooth Oreodory	
Pseudogobius olorum	Bluespot Goby	
Pseudogobius poicilosoma	Northern Fatnose Goby	
Pseudolabrus biserialis	Redband Wrasse	
Pseudolabrus luculentus	Luculent Wrasse	
Pseudolabrus rubicundus	Rosy Wrasse	
Pseudomugil signifer	Pacific Blue Eye	

Pseudopentaceros richardsoni	Pelagic Armourhead	
Pseudophycis bachus	Red Cod	
Pseudophycis barbata	Bearded Rock Cod	
Pseudophycis breviuscula	Bastard Red Cod	
Pseudorhombus argus	Peacock Flounder	
Pseudorhombus arsius	Largetooth Flounder	
Pseudorhombus jenynsii	Smalltooth Flounder	
Psychrolutes marcidus	Smooth-Head Blobfish	
Pterycombus petersii	Prickly Fanfish	
Pterygotrigla andertoni	Painted Latchet	
Pterygotrigla elicryste	Dwarf Gurnard	
Pterygotrigla polyommata	Latchet	
Pugnaso curtirostris	Pugnose Pipefish	
Rachycentron canadum	Cobia	
Ratabulus diversidens	Freespine Flathead	
Redigobius macrostoma	Largemouth Goby	
Regalecus glesne	Oarfish	
Reicheltia halsteadi	Halstead's Toadfish	
Repomucenus calcaratus	Spotted Dragonet	
Retropinna semoni	Australian Smelt	
Rexea antefurcata	Longfin Gemfish	
Rexea solandri	Gemfish	
Rhabdosargus sarba	Tarwhine	
Rhombosolea tapirina	Greenback Flounder	
Rondeletia loricata	Common Redmouth Whalefish	
Rosenblattia robusta	Stout Cardinalfish	
Rouleina attrita	Softskin Slickhead	
Rouleina eucla	Eucla Slickhead	
Rouleina squamilatera	Sparkling Slickhead	
Ruvettus pretiosus	Oilfish	
Salmo trutta	Brown Trout	
Sarda australis	Australian Bonito	
Sardinops sagax	Australian Sardine	
Saurida filamentosa	Threadfin Saury	
Saurida undosquamis	Largescale Saury	
Saurida wanieso	Wanieso Saury	
Schedophilus huttoni	New Zealand Ruffe	
Scobinichthys granulatus	Rough Leatherjacket	
Scolecenchelys australis	Shortfin Worm Eel	
Scolecenchelys breviceps	Shorthead Worm Eel	
Scolecenchelys castlei	Deepwater Big-Eye Worm Eel	
Scomber australasicus	Blue Mackerel	
Scomberesox saurus	King Gar	
Scomberoides lysan	Lesser Queenfish	
Scomberomorus commerson	Spanish Mackerel	
Scomberomorus munroi	Spotted Mackerel	
Scopeloberyx microlepis	Southern Bigscale	
Scopelogadus beanii	Bean's Bigscale	
Scopelogadus mizolepis	Ragged Bigscale	
Scopelopsis multipunctatus	Multispot Lanternfish	
Scopelosaurus ahlstromi	Ahlstrom's Waryfish	
Scopelosaurus meadi	Blackring Waryfish	
Scorpaena cardinalis	Cook's Scorpionfish	
Scorpaena jacksoniensis	Eastern Red Scorpionfish	
Scorpaena neglecta		
Scorpaena papillosa	Southern Red Scorpionfish	

Scorpis aequipinnis	Sea Sweep	
Scorpis lineolata	Silver Sweep	
Selenotoca multifasciata	Striped Scat	
Seriola hippos	Samsonfish	
Seriola lalandi	Yellowtail Kingfish	
Seriolella brama	Blue Warehou	EPBC Act - Threatened
Seriolella caerulea	White Warehou	
Seriolella punctata	Silver Warehou	
Serrivomer beanii	Bean's Sawtooth Eel	
Siganus fuscescens	Black Rabbitfish	
Siganus virgatus	Doublebar Rabbitfish	
Sigmops bathyphilus	Deepsea Fangjaw	
Sillaginodes punctatus	King George Whiting	
Sillago bassensis	Southern School Whiting	
Sillago burra	Western Trumpeter Whiting	
Sillago ciliata	Sand Whiting	
Sillago flindersi	Eastern School Whiting	
Sillago lutea	Mud Whiting	
Sillago maculata	Trumpeter Whiting	
Sillago robusta	Stout Whiting	
Simenchelys parasitica	Snubnose Eel	
Sio nordenskjoldii	Nordenskjold's Bigscale	
Siphamia cephalotes	Wood's Siphonfish	
Siphonognathus attenuatus	Slender Weed Whiting	
Siphonognathus beddomei	Pencil Weed Whiting	
Siphonognathus caninis	Sharpnose Weed Whiting	
Siphonognathus radiatus	Longray Weed Whiting	
Siphonognathus tanyourus	Longtail Weed Whiting	
Solegnathus robustus	Robust Pipehorse	
Solegnathus spinosissimus	Spiny Pipehorse	
Sphoeroides pachygaster	Balloonfish	
Sphyraena acutipinnis	Sharpfin Barracuda	
Sphyraena novaehollandiae	Snook	
Sphyraena waitii		
Spratelloides robustus	Blue Sprat	
Stemonosudis macrura	Sharpchin Barracudina	
Sternoptyx obscura		
Sternoptyx pseudobscura	Highlight Hatchetfish	
Sternoptyx pseudodiaphana	False Oblique Hatchetfish	
Stethojulis interrupta	Brokenline Wrasse	
Sticharium dorsale	Slender Snake Blenny	
Stigmatopora argus	Spotted Pipefish	
Stigmatopora nigra	Widebody Pipefish	
Stipecampus cristatus	Ringback Pipefish	
Stomias boa	Boa Scaly Dragonfish	
Sudis hyalina		
Symbolophorus barnardi	Barnard's Lanternfish	
Synaphobranchus brevidorsalis	Shortfin Cut-Throat Eel	
Synclidopus macleayanus	Narrowbanded Sole	
Synodus variegatus	Variegated Lizardfish	
Talismania longifilis	Longtail Slickhead	
Taratretis derwentensis	Derwent Flounder	
Tasmanogobius lasti	Scary's Tasmangoby	
Tetractenos glaber	Smooth Toadfish	
Tetractenos hamiltoni	Common Toadfish	
Tetragonurus cuvieri	Smalleye Squaretail	

Tetrosomus reipublicae	Smallspine Turretfish	
Thalasseleotris adela	Cryptic Sea Gudgeon	
Thalassoma amblycephalus	Bluehead Wrasse	
Thamnaconus degeni	Bluefin Leatherjacket	
Thunnus alalunga	Albacore	
Thunnus albacares	Yellowfin Tuna	
Thunnus maccoyii	Southern Bluefin Tuna	EPBC Act - Threatened
Thymichthys verrucosus	Warty Handfish	
Thyrsites atun	Barracouta	
Thyrsitoides marleyi	Black Snoek	
Tilodon sexfasciatus	Moonlighter	
Torquigener altipinnis	Highfin Toadfish	
Torquigener pleurogramma	Weeping Toadfish	
Trachichthys australis	Southern Roughy	
Trachinocephalus myops		
Trachinops caudimaculatus	Southern Hulafish	
Trachinops taeniatus	Eastern Hulafish	
Trachipterus jacksonensis	Southern Ribbonfish	
Trachonurus gagates	Velvet Whiptail	
Trachurus declivis	Common Jack Mackerel	
Trachurus murphyi	Peruvian Jack Mackerel	
Trachurus novaezelandiae	Yellowtail Scad	
Trachyrincus longirostris	Unicorn Whiptail	
Trachyscorpia carnomagula	Deepsea Scorpionfish	
Trachyscorpia eschmeyeri	Deepsea Ocean Perch	
Trachystoma petardi	Pinkeye Mullet	
Trianectes bucephalus	Bighead Threefin	
Trichiurus lepturus	Largehead Hairtail	
Trigonolampa miriceps	Threelight Dragonfish	
Trinorfolkia clarkei	Clark's Threefin	
Trinorfolkia incisa	Notched Threefin	
Tripterophycis gilchristi	Chiseltooth Grenadier Cod	
Tubbia stewarti	Seamount Rudderfish	
Tubbia tasmanica	Tasmanian Rudderfish	
Tylosurus gavialoides	Stout Longtom	
Upeneichthys lineatus	Bluestriped Goatfish	
Upeneichthys vlamingii	Bluespotted Goatfish	
Upeneus torres	Japanese Goatfish	
Urocampus carinirostris	Hairy Pipefish	
Valenciennellus tripunctulatus	Constellationfish	
Vanacampus margaritifer	Mother-Of-Pearl Pipefish	
Vanacampus phillipi	Port Phillip Pipefish	
Verilus anomalus	Threespine Cardinalfish	
Vincentia conspersa	Southern Cardinalfish	
Vinciguerria attenuata	Slender Lightfish	
Vinciguerria nimbaria	Narooma Lightfish	
Xenocephalus armatus	Bulldog Stargazer	
Xenodermichthys copei	Bluntsnout Slickhead	
Xiphasia setifer	Hairtail Blenny	
Xiphias gladius	Swordfish	
Zanclistius elevatus	Blackspot Boarfish	
Zanclus cornutus	Moorish Idol	
Zebrias scalaris	Manyband Sole	
Zenopsis nebulosa	Mirror Dory	
Zeus faber	John Dory	
Class: Appendicularia (free-swimming planktonic tunicates)		

Fritillaria pellucida		
Oikopleura albicans		
Oikopleura longicauda		
Class: Ascidiacea (sea squirts)		
Adagnesia venusta		
Anadistoma attenuatum		
Aplidium amorphatum		
Aplidium coniferum		
Aplidium depressum		
Aplidium laticum		
Aplidium longithorax		
Aplidium robustum		
Aplidium solidum		
Ascidia challengeri		
Ascidia scaevola		
Ascidia sydneiensis		
Ascidia thompsoni		
Ascidiella aspersa		
Atriolum irregulare		
Botrylloides anceps		
Botrylloides leachii		
Botrylloides magnicoecus		
Botrylloides perspicuus		
Botryllus schlosseri	Sea Daisies	
Botryllus stewartensis		
Brevicollus tuberatus		
Clavelina australis		
Clavelina cylindrica		
Cnemidocarpa aculeata		
Cnemidocarpa pedata		
Cnemidocarpa radicosa		
Cnemidocarpa tripartita		
Ctenyura tortuosa		
Didemnum augusti		
Didemnum crescente		
Didemnum incanum		
Didemnum moseleyi		
Didemnum patulum		
Didemnum spadix		
Diplosoma listerianum		
Diplosoma velatum		
Distaplia florida		
Dumus areniferus		
Eudistoma globosum		
Eudistoma maculosum		
Eudistoma sabulosum		
Eugyra millimetra		
Eugyra molguloides		
Halocynthia dumosa		
Hartmeyeria formosa		
Herdmania fimbriae		
Herdmania grandis		
Herdmania momus		
Hypodistoma mirabile		
Leptoclinides exiguus		
Leptoclinides seminudus		

Leptoclinides sulawesi		
Microcosmus planus		
Microcosmus stoloniferus		
Microgastra granosa		
Molgula ficus		
Molgula malvinensis		
Molgula mollis		
Molgula mortenseni		
Molgula rima		
Oculinaria australis		
Pareugyrioides exigua		
Plurella elongata		
Polyandrocarpa lapidosa		
Polyandrocarpa watsonia		
Polycarpa flava		
Polycarpa molguloides		
Polycarpa obscura		
Polycarpa papillata		
Polycarpa pedunculata		
Polycarpa plenovata		
Polycarpa rigida		
Polycarpa thelyphanes		
Polycarpa tinctor		
Polycarpa viridis		
Polycitor giganteus		
Polyclinum marsupiale		
Polysyncraton reticulum		
Polysyncraton scorteum		
Polysyncraton tegetum		
Pseudodiazona claviformis		
Pyura abradata		
Pyura arenosa		
Pyura australis	Sea Tulips	
Pyura fissa		
Pyura gibbosa		
Pyura irregularis		
Pyura littoralis		
Pyura molguloides		
Pyura pachydermatina		
Pyura praeputialis	Cunjuvoi	
Pyura spinifera		
Pyura stolonifera	Cunjevoi	
Pyura tasmanensis		
Rhopalaea meridionalis		
Ritterella pedunculata		
Sidneioides tamaramae		
Sigillina fantasiana		
Sigillina grandissima		
Sigillina nigra		
Stolonica australis		
Stolonica diptycha		
Styela plicata		
Sycozoa cerebriformis		
Sycozoa murrayi		
Sycozoa pulchra		
Sycozoa sigillinoides		

Synoicum citrum		
Synoicum obscurum		
Tridemnum titanium		
Class: Aves (birds) (blue = shorebird/seabird)		
Acanthagenys rufogularis	Spiny-Cheeked Honeyeater	
Acanthiza (Acanthiza) apicalis	Inland Thornbill	
Acanthiza (Acanthiza) ewingii	Tasmanian Thornbill	
Acanthiza (Acanthiza) katherina	Mountain Thornbill	
Acanthiza (Acanthiza) pusilla	Brown Thornbill	
Acanthiza (Geobasileus) chrysorrhoa	Yellow-Rumped Thornbill	
Acanthiza (Geobasileus) reguloides	Buff-Rumped Thornbill	
Acanthiza (Subacanthiza) lineata	Striated Thornbill	
Acanthiza (Subacanthiza) nana	Yellow Thornbill	
Acanthorhynchus superciliosus	Western Spinebill	
Acanthorhynchus tenuirostris	Eastern Spinebill	
Acanthornis magna	Scrubtit	
Accipiter (Leucospiza) fasciatus	Brown Goshawk	
Accipiter (Leucospiza) novaehollandiae	Grey Goshawk	
Accipiter (Paraspizias) cirrocephalus	Collared Sparrowhawk	
Acridotheres tristis	Common Myna	
Acrocephalus (Acrocephalus) australis	Australian Reed Warbler	
Actitis hypoleucos	Common Sandpiper	
Aegotheles (Aegotheles) cristatus	Australian Owlet-Nightjar	
Ailuroedus crassirostris	Green Catbird	
Alauda arvensis	Eurasian Skylark	
Alectura lathami	Australian Brush-Turkey	
Alisterus scapularis	Australian King-Parrot	
Anas (Anas) platyrhynchos	Mallard	
Anas (Anas) superciliosa	Pacific Black Duck	
Anas (Nettion) castanea	Chestnut Teal	
Anas (Nettion) gracilis	Grey Teal	
Anas (Spatula) rhynchotis	Australasian Shoveler	
Anhinga melanogaster	Darter	
Anhinga novaehollandiae	Australasian Darter	
Anous stolidus	Common Noddy	
Anser anser		
Anseranas semipalmata	Magpie Goose	
Anthochaera (Anellobia) chrysoptera	Little Wattlebird	
Anthochaera (Anellobia) lunulata	Western Wattlebird	
Anthochaera (Anthochaera) carunculata	Red Wattlebird	
Anthochaera (Anthochaera) paradoxa	Yellow Wattlebird	
Anthochaera (Xanthomyza) phrygia	Regent Honeyeater	EPBC Act - Threatened
Anthus (Anthus) novaeseelandiae	Australian Pipit	
Aphelocephala leucopsis	Southern Whiteface	
Apus (Apus) pacificus	Fork-Tailed Swift	
Aquila (Uroaetus) audax	Wedge-Tailed Eagle	
Ardea (Ardea) pacifica	White-Necked Heron	
Ardea (Bubulcus) ibis	Cattle Egret	
Ardea (Casmerodius) modesta	Eastern Great Egret	
Ardea (Mesophoyx) intermedia	Intermediate Egret	
Ardea alba	Baluun	
Ardenna bulleri	Buller's Shearwater	
Ardenna carneipes	Flesh-Footed Shearwater	
Ardenna grisea	Sooty Shearwater	
Ardenna pacifica	Wedge-Tailed Shearwater	
Ardenna tenuirostris	Short-Tailed Shearwater	

Arenaria interpres	Turnstone	
Artamus (Angroyan) cinereus	Black-Faced Woodswallow	
Artamus (Angroyan) cyanopterus	Dusky Woodswallow	
Artamus (Artamus) leucorynchus	White-Breasted Woodswallow	
Artamus (Campbellornis) personatus	Masked Woodswallow	
Artamus (Campbellornis) superciliosus	White-Browed Woodswallow	
Aythya (Nyroca) australis	Hardhead	
Biziura lobata	Musk Duck	
Botaurus poiciloptilus	Australasian Bittern	EPBC Act - Threatened
Burhinus (Burhinus) grallarius	Bush Stone-Curlew	
Butorides striatus	Striated Heron	
Cacatua (Cacatua) galerita	Sulphur-Crested Cockatoo	
Cacatua (Licmetis) sanguinea	Little Corella	
Cacatua (Licmetis) tenuirostris	Long-Billed Corella	
Cacomantis (Cacomantis) variolosus	Brush Cuckoo	
Cacomantis (Vidgenia) flabelliformis	Fan-Tailed Cuckoo	
Cacomantis (Vidgenia) pallidus	Pallid Cuckoo	
Calamanthus fuliginosus	Striated Fieldwren	
Calamanthus pyrrhopygius	Chestnut-Rumped Heathwren	
Calidris (Calidris) canutus	Red Knot	EPBC Act - Threatened
Calidris (Calidris) tenuirostris	Great Knot	EPBC Act - Threatened
Calidris (Crocethia) alba	Sanderling	
Calidris (Ereunetes) ruficollis	Red-Necked Stint	
Calidris (Erolia) acuminata	Sharp-Tailed Sandpiper	
Calidris (Erolia) ferruginea	Curlew Sandpiper	EPBC Act - Threatened
Caligavis chrysops	Yellow-Faced Honeyeater	
Callipepla (Lophortyx) californica	California Quail	
Callocephalon fimbriatum	Gang-Gang Cockatoo	
Calonectris leucomelas	Streaked Shearwater	
Calyptorhynchus (Calyptorhynchus) banks	Red-Tailed Black Cockatoo	
Calyptorhynchus (Calyptorhynchus) lathan	Glossy Black-Cockatoo	
Calyptorhynchus (Zanda) funereus	Yellow-Tailed Black-Cockatoo	
Carduelis carduelis	Goldfinch	
Carduelis chloris	Greenfinch	
Catharacta skua	Great Skua	
Cereopsis novaehollandiae	Cape Barren Goose	
Ceyx azureus	Azure Kingfisher	
Chalcites basalis	Horsfield's Bronze-Cuckoo	
Chalcites lucidus	Shining Bronze-Cuckoo	
Chalcites minutillus	Little Bronze-Cuckoo	
Chalcites osculans	Black-Eared Cuckoo	
Chalcophaps indica	Emerald Dove	
Charadrius (Charadrius) bicinctus	Double-Banded Plover	
Charadrius (Charadrius) leschenaultii	Greater Sand Plover	EPBC Act - Threatened
Charadrius (Charadrius) mongolus	Lesser Sand Plover	EPBC Act - Threatened
Charadrius (Charadrius) ruficapillus	Red-Capped Dotterel	
Charadrius hiaticula	Ringed Plover	
Chenonetta jubata	Australian Wood Duck	
Cheramoeca leucosterna	White-Backed Swallow	
Chlidonias (Chlidonias) leucopterus	White-Winged Black Tern	
Chlidonias (Pelodes) hybrida	Whiskered Tern	
Chloris chloris	European Greenfinch	
Chroicocephalus novaehollandiae	Silver Gull	
Chrysococcyx lucidus	Shining Cuckoo	
Chthonicola sagittata	Speckled Warbler	
Cincloramphus (Cincloramphus) cruralis	Brown Songlark	

Cincloramphus (Maclennania) mathewsi	Rufous Songlark	
Cinclosoma (Cinclosoma) punctatum	Spotted Quail-Thrush	
Circus approximans	Swamp Harrier	
Circus assimilis	Spotted Harrier	
Cisticola (Cisticola) exilis	Golden-Headed Cisticola	
Cladorhynchus leucocephalus	Banded Stilt	
Climacteris (Climacteris) picumnus	Brown Treecreeper	
Climacteris (Climacterobates) affinis	White-Browed Treecreeper	
Climacteris (Climacterobates) erythrops	Red-Browed Treecreeper	
Colluricincla (Colluricincla) harmonica	Grey Shrike-Thrush	
Columba (Columba) livia	Rock Dove	
Columba (Janthoenas) leucomela	White-Headed Pigeon	
Coracina (Coracina) novaehollandiae	Black-Faced Cuckoo-Shrike	
Coracina (Coracina) papuensis	White-Bellied Cuckoo-Shrike	
Coracina (Edolisoma) tenuirostris	Cicadabird	
Corcorax melanorhamphos	White-Winged Chough	
Cormobates leucophaea	White-Throated Treecreeper	
Corvus coronoides	Australian Raven	
Corvus mellori	Little Raven	
Corvus tasmanicus	Forest Raven	
Coturnix (Coturnix) pectoralis	Stubble Quail	
Coturnix (Synoicus) ypsilophora	Brown Quail	
Coturnix novaezelandiae	New Zealand Quail	
Cracticus nigrogularis	Pied Butcherbird	
Cracticus torquatus	Grey Butcherbird	
Cygnus (Chenopis) atratus	Black Swan	
Cygnus (Cygnus) olor	Mute Swan	
Dacelo (Dacelo) novaeguineae	Kookaburra	
Daphoenositta (Neositta) chrysoptera	Varied Sittella	
Daption capense	Cape Petrel	
Dasyornis (Dasyornis) brachypterus	Eastern Bristlebird	EPBC Act - Threatened
Dasyornis (Maccoyornis) broadbenti	Rufous Bristlebird	
Dendrocygna (Leptotarsis) eytoni	Plumed Whistling-Duck	
Dicaeum (Dicaeum) hirundinaceum	Mistletoebird	
Dicrurus bracteatus	Spangled Drongo	
Diomedea epomophora	Southern Royal Albatross	EPBC Act - Threatened
Diomedea exulans	Wandering Albatross	EPBC Act - Threatened
Diomedea gibsoni	Gibson's Albatross	
Diomedea sanfordi	Northern Royal Albatross	EPBC Act - Threatened
Dromaius ater	King Island Emu	EPBC Act - Threatened
Dromaius novaehollandiae	Emu	
Egretta alba	Great Egret	
Egretta garzetta	Little Egret	
Egretta novaehollandiae	White-Faced Heron	
Egretta sacra	Eastern Reef Egret	
Elanus axillaris	Black-Shouldered Kite	
Elanus scriptus	Letter-Winged Kite	
Elseyornis melanops	Black-Fronted Dotterel	
Eolophus roseicapilla	Galah	
Eopsaltria (Eopsaltria) australis	Eastern Yellow Robin	
Ephippiorhynchus (Ephippiorhynchus) asia	Black-Necked Stork	
Epthianura (Epthianura) albifrons	White-Fronted Chat	
Epthianura (Parepthianura) tricolor	Crimson Chat	
Erythrogonys cinctus	Red-Kneed Dotterel	
Esacus magnirostris	Beach Stone-Curlew	
Esacus neglectus	Beach Stone-Curlew	

Eudynamys orientalis	Pacific Koel	
Eudyptes chrysocome	Rockhopper Penguin	
Eudyptes chrysolophus	Macaroni Penguin	
Eudyptes pachyrhynchus	Fiordland Penguin	
Eudyptes sclateri	Erect-Crested Penguin	
Eudyptula minor	Little Penguin	
Eurostopodus (Eurostopodus) mystacalis	White-Throated Nightjar	
Eurystomus orientalis	Eastern Broad-Billed Roller	
Excalfactoria chinensis	King Quail	
Falco (Falco) longipennis	Australian Hobby	
Falco (Hierofalco) hypoleucos	Grey Falcon	
Falco (Hierofalco) peregrinus	Peregrine Falcon	
Falco (Hierofalco) subniger	Black Falcon	
Falco (Ieracidea) berigora	Brown Falcon	
Falco (Tinnunculus) cenchroides	Nankeen Kestrel	
Falcunculus frontatus	Crested Shrike-Tit	
Fregata ariel	Lesser Frigatebird	
Fregetta grallaria	White-Bellied Storm-Petrel	
Fregetta tropica	Black-Bellied Storm-Petrel	
Fulica atra	Eurasian Coot	
Fulmarus glacialoides	Southern Fulmar	
Gallinago (Gallinago) hardwickii	Latham's Snipe	
Gallinula (Gallinula) tenebrosa	Dusky Moorhen	
Gallirallus philippensis		
Gallus gallus	Red Junglefowl	
Garrodia nereis	Grey-Backed Storm-Petrel	
Gavicalis virescens	Singing Honeyeater	
Gelochelidon nilotica	Gull-Billed Tern	
Geopelia cuneata	Diamond Dove	
Geopelia striata	Peaceful Dove	
Gerygone mouki	Brown Gerygone	
Gerygone olivacea	White-Throated Gerygone	
Gliciphila melanops	Tawny-Crowned Honeyeater	
Glossopsitta concinna	Musk Lorikeet	
Grallina cyanoleuca	Magpie-Lark	
Grantiella picta	Painted Honeyeater	EPBC Act - Threatened
Gymnorhina tibicen	Australian Magpie	
Haematopus fuliginosus	Sooty Oystercatcher	
Haematopus longirostris	Pied Oystercatcher	
Haliaeetus (Pontoaetus) leucogaster	White-Bellied Sea-Eagle	
Haliastur indus	Brahminy Kite	
Haliastur sphenurus	Whistling Kite	
Halobaena caerulea	Blue Petrel	EPBC Act - Threatened
Hieraaetus (Hieraaetus) morphnoides	Little Eagle	
Himantopus himantopus	Pied Stilt	
Hirundapus caudacutus	White-Throated Needletail	EPBC Act - Threatened
Hirundo (Hirundo) neoxena	Welcome Swallow	
Hydroprogne caspia	Caspian Tern	
Hypotaenidia philippensis	Buff-Banded Rail	
Ixobrychus dubius	Australian Little Bittern	
Ixobrychus flavicollis	Black Bittern	
Ixobrychus minutus	Little Bittern	
Lalage (Lalage) sueurii	White-Winged Triller	
Larus (Larus) dominicanus	Kelp Gull	
Larus (Larus) pacificus	Pacific Gull	
Lathamus discolor	Swift Parrot	EPBC Act - Threatened

Leucosarcia melanoleuca	Wonga Pigeon	
Lewinia pectoralis	Lewin's Rail	
Lichenostomus melanops	Yellow-Tufted Honeyeater	
Lichmera (Lichmera) indistincta	Brown Honeyeater	
Limicola falcinellus	Broad-Billed Sandpiper	
Limosa lapponica	Bar-Tailed Godwit	
Limosa limosa	Black-Tailed Godwit	
Lophoictinia isura	Square-Tailed Kite	
Lopholaimus antarcticus	Topknot Pigeon	
Lugensa brevirostris	Kerguelen Petrel	
Macronectes giganteus	Southern Giant-Petrel	EPBC Act - Threatened
Macronectes halli	Northern Giant-Petrel	EPBC Act - Threatened
Macropygia (Macropygia) phasianella	Brown Cuckoo-Dove	
Malacorhynchus membranaceus	Pink-Eared Duck	
Malurus (Leggeornis) lamberti	Variegated Fairy-Wren	
Malurus (Malurus) cyaneus	Superb Fairy-Wren	
Manorina (Manorina) melanophrys	Bell Miner	
Manorina (Myzantha) melanocephala	Noisy Miner	
Megalurus gramineus	Little Grassbird	
Megalurus timoriensis	Tawny Grassbird	
Melanodryas (Amaurodryas) vittata	Dusky Robin	
Melanodryas (Melanodryas) cucullata	Hooded Robin	
Meleagris gallopavo	Wild Turkey	
Meliphaga (Meliphaga) lewinii	Lewin's Honeyeater	
Melithreptus (Eidopsarus) brevirostris	Brown-Headed Honeyeater	
Melithreptus (Eidopsarus) gularis	Black-Chinned Honeyeater	
Melithreptus (Eidopsarus) validirostris	Strong-Billed Honeyeater	
Melithreptus (Melithreptus) affinis	Black-Headed Honeyeater	
Melithreptus (Melithreptus) albogularis	White-Throated Honeyeater	
Melithreptus (Melithreptus) lunatus	White-Naped Honeyeater	
Melopsittacus undulatus	Budgerigar	
Menura (Harriwhitea) alberti	Albert's Lyrebird	
Menura (Menura) novaehollandiae	Superb Lyrebird	
Merops (Merops) ornatus	Rainbow Bee-Eater	
Microcarbo melanoleucos	Little Pied Cormorant	
Microeca (Microeca) fascinans	Jacky Winter	
Milvus migrans	Black Kite	
Mirafra (Mirafra) javanica	Horsfield's Bushlark	
Monarcha (Monarcha) melanopsis	Black-Faced Monarch	
Morus serrator	Australasian Gannet	
Motacilla (Motacilla) alba	White Wagtail	
Myiagra (Myiagra) cyanoleuca	Satin Flycatcher	
Myiagra (Myiagra) rubecula	Leaden Flycatcher	
Myiagra (Seisura) inquieta	Restless Flycatcher	
Myzomela (Myzomela) sanguinolenta	Scarlet Honeyeater	
Neochmia (Aegintha) temporalis	Red-Browed Finch	
Neophema (Neonanodes) chrysogaster	Orange-Bellied Parrot	EPBC Act - Threatened
Neophema (Neonanodes) chrysostoma	Blue-Winged Parrot	
Neophema (Neophema) pulchella	Turquoise Parrot	
Nesoptilotis flavicollis	Yellow-Throated Honeyeater	
Nesoptilotis leucotis	White-Eared Honeyeater	
Ninox (Hieracoglaux) connivens	Barking Owl	
Ninox (Ninox) novaeseelandiae	Southern Boobook	
Ninox (Rhabdoglaux) strenua	Powerful Owl	
Numenius (Mesoscolopax) minutus	Little Curlew	
Numenius (Numenius) madagascariensis	Eastern Curlew	EPBC Act - Threatened

Numenius (Phaeopus) phaeopus	Whimbrel	
Numida meleagris	Helmeted Guineafowl	
Nycticorax caledonicus	Nankeen Night-Heron	
Nymphicus hollandicus	Cockatiel	
Oceanites oceanicus	Wilson's Storm-Petrel	
Ocyphaps lophotes	Crested Pigeon	
Onychoprion fuscata	Sooty Tern	
Oreoica gutturalis	Crested Bellbird	
Oriolus (Mimeta) sagittatus	Olive-Backed Oriole	
Orthonyx temminckii	Australian Logrunner	
Oxyura australis	Blue-Billed Duck	
Pachycephala (Alisterornis) rufiventris	Rufous Whistler	
Pachycephala (Pachycephala) pectoralis	Golden Whistler	
Pachycephala (Timixos) olivacea	Olive Whistler	
Pachyptila belcheri	Slender-Billed Prion	
Pachyptila crassirostris	Fulmar Prion	
Pachyptila desolata	Antarctic Prion	
Pachyptila salvini	Salvin's Prion	
Pachyptila turtur	Fairy Prion	
Pachyptila vittata	Broad-Billed Prion	
Pandion cristatus	Eastern Osprey	
Pandion haliaetus	Osprey	
Pardalotus (Pardalotinus) striatus	Striated Pardalote	
Pardalotus (Pardalotus) punctatus	Spotted Pardalote	
Pardalotus (Pardalotus) quadragintus	Forty-Spotted Pardalote	EPBC Act - Threatened
Parvipsitta porphyrocephala	Purple-Crowned Lorikeet	
Parvipsitta pusilla	Little Lorikeet	
Passer (Passer) domesticus	House Sparrow	
Passer (Passer) montanus	Eurasian Tree Sparrow	
Pavo cristatus	Indian Peafowl	
Pelagodroma marina	White-Faced Storm-Petrel	
Pelecanoides urinatrix	Common Diving-Petrel	
Pelecanus conspicillatus	Australian Pelican	
Petrochelidon (Hylochelidon) nigricans	Tree Martin	
Petrochelidon (Petrochelidon) ariel	Fairy Martin	
Petroica (Erythrodryas) rodinogaster	Pink Robin	
Petroica (Erythrodryas) rosea	Rose Robin	
Petroica (Littlera) phoenicea	Flame Robin	
Petroica (Petroica) boodang	Scarlet Robin	
Petroica (Petroica) goodenovii	Red-Capped Robin	
Petroica (Petroica) multicolor	Pacific Robin	EPBC Act - Threatened
Pezoporus wallicus	Eastern Ground Parrot	
Phaethon lepturus	White-Tailed Tropicbird	
Phaethon rubricauda	Red-Tailed Tropicbird	
Phalacrocorax (Anacarbo) fuscescens	Black-Faced Cormorant	
Phalacrocorax (Phalacrocorax) carbo	Great Cormorant	
Phalacrocorax (Phalacrocorax) sulcirostris	Little Black Cormorant	
Phalacrocorax (Phalacrocorax) varius	Pied Cormorant	
Phalacrocorax melanoleucos	Little Pied Cormorant	
Phalacrocorax melanoleucos	Birribangga	
Phaps (Phaps) chalcoptera	Common Bronzewing	
Phaps (Phaps) elegans	Brush Bronzewing	
Phasianus colchicus	Common Pheasant	
Philemon (Microphilemon) citreogularis	Little Friarbird	
Philemon (Tropidorhynchus) corniculatus	Noisy Friarbird	
Phoebetria fusca	Sooty Albatross	EPBC Act - Threatened

Phoebetria palpebrata	Light-Mantled Sooty Albatross	
Phylidonyris (Meliornis) niger	White-Cheeked Honeyeater	
Phylidonyris (Meliornis) novaehollandiae	New Holland Honeyeater	
Phylidonyris (Phylidonyris) pyrrhoptera	Crescent Honeyeater	
Platalea (Platalea) regia	Royal Spoonbill	
Platalea (Platibis) flavipes	Yellow-Billed Spoonbill	
Platycercus (Platycercus) caledonicus	Green Rosella	
Platycercus (Platycercus) elegans	Crimson Rosella	
Platycercus (Violania) eximius	Eastern Rosella	
Plectorhyncha lanceolata	Striped Honeyeater	
Plegadis falcinellus	Glossy Ibis	
Pluvialis dominica		
Pluvialis fulva	Pacific Golden Plover	
Pluvialis squatarola	Grey Plover	
Podargus strigoides	Tawny Frogmouth	
Podiceps cristatus	Great Crested Grebe	
Poliocephalus poliocephalus	Hoary-Headed Grebe	
Pomatostomus (Morganornis) ruficeps	Chestnut-Crowned Babbler	
Porphyrio (Porphyrio) porphyrio	Purple Swamphen	
Porzana (Porzana) fluminea	Australian Spotted Crake	
Porzana (Porzana) pusilla	Baillon's Crake	
Porzana (Porzana) tabuensis	Spotless Crake	
Procellaria (Adamastor) cinerea	Grey Petrel	
Procellaria (Procellaria) aequinoctialis	White-Chinned Petrel	
Procellaria (Procellaria) parkinsoni	Black Petrel	
Procellaria (Procellaria) westlandica	Westland Petrel	
Psephotus (Psephotus) haematonotus	Red-Rumped Parrot	
Psophodes (Psophodes) olivaceus	Eastern Whipbird	
Pterodroma (Cookilaria) leucoptera	Gould's Petrel	
Pterodroma (Cookilaria) nigripennis	Black-Winged Petrel	
Pterodroma (Pterodroma) lessonii	White-Headed Petrel	
Pterodroma (Pterodroma) macroptera	Great-Winged Petrel	
Pterodroma (Pterodroma) solandri	Providence Petrel	
Pterodroma cookii	Cook's Petrel	
Pterodroma inexpectata	Mottled Petrel	
Pterodroma mollis	Soft-Plumaged Petrel	EPBC Act - Threatened
Ptilinopus (Ptilinopus) regina	Rose-Crowned Fruit-Dove	
Ptilinopus (Ptilinopus) superbus	Superb Fruit-Dove	
Ptilonorhynchus violaceus	Satin Bowerbird	
Ptilotula fusca	Fuscous Honeyeater	
Ptilotula ornata	Yellow-Plumed Honeyeater	
Ptilotula penicillata	White-Plumed Honeyeater	
Puffinus (Puffinus) assimilis	Little Shearwater	
Puffinus (Puffinus) gavia	Fluttering Shearwater	
Puffinus (Puffinus) huttoni	Hutton's Shearwater	
Puffinus griseus		
Puffinus tenuirostris		
Puffinus tenuirostris	Short-Tailed Shearwater	
Pycnoptilus floccosus	Pilotbird	
Recurvirostra novaehollandiae	Red-Necked Avocet	
Rhipidura (Howeavis) rufifrons	Rufous Fantail	
Rhipidura (Rhipidura) albiscapa	Grey Fantail	
Rhipidura (Rhipidura) fuliginosa	Grey Fantail	
Rhipidura (Sauloprocta) leucophrys	Willie Wagtail	
Rostratula australis	Australian Painted Snipe	EPBC Act - Threatened
Scythrops novaehollandiae	Channel-Billed Cuckoo	

Sericornis (Arfakornis) magnirostra	Large-Billed Scrubwren	
Sericornis (Sericornis) citreogularis	Yellow-Throated Scrubwren	
Sericornis (Sericornis) frontalis	White-Browed Scrubwren	
Sericornis (Sericornis) humilis	Tasmanian Scrubwren	
Smicrornis brevirostris	Weebill	
Sphecotheres vieilloti	Australasian Figbird	
Stagonopleura (Stagonopleura) guttata	Diamond Firetail	
Stagonopleura (Zonaeginthus) bella	Beautiful Firetail	
Stercorarius antarcticus	Brown Skua	
Stercorarius longicaudus	Long-Tailed Jaeger	
Stercorarius maccormicki	South Polar Skua	
Stercorarius parasiticus	Arctic Jaeger	
Stercorarius pomarinus	Pomarine Jaeger	
Sterna (Sterna) hirundo	Common Tern	
Sterna (Sterna) paradisaea	Arctic Tern	
Sterna (Sterna) striata	White-Fronted Tern	
Sternula albifrons	Little Tern	
Sternula nereis	Fairy Tern	
Stictonetta naevosa	Freckled Duck	
Stipiturus malachurus	Southern Emu-Wren	
Stizoptera bichenovii	Double-Barred Finch	
Strepera (Neostrepera) versicolor	Grey Currawong	
Strepera (Strepera) fuliginosa	Black Currawong	
Strepera (Strepera) graculina	Pied Currawong	
Streptopelia (Spilopelia) chinensis	Spotted Turtle-Dove	
Sturnus (Sturnus) vulgaris	Starling	
Sula leucogaster	Brown Booby	
Sula sula	Red-Footed Booby	
Symposiachrus trivirgatus	Spectacled Monarch	
Tachybaptus novaehollandiae	Australasian Grebe	
Tadorna (Casarca) tadornoides	Australian Shelduck	
Thalassarche bulleri	Buller's Albatross	EPBC Act - Threatened
Thalassarche carteri	Indian Yellow-Nosed Albatross	EPBC Act - Threatened
Thalassarche cauta	Shy Albatross	
Thalassarche chlororhynchos	Yellow-Nosed Albatross	
Thalassarche chrysostoma	Grey-Headed Albatross	EPBC Act - Threatened
Thalassarche impavida	Campbell Albatross	EPBC Act - Threatened
Thalassarche melanophris	Black-Browed Albatross	EPBC Act - Threatened
Thalassarche salvini	Salvin's Albatross	EPBC Act - Threatened
Thalassarche steadi	White-Capped Albatross	EPBC Act - Threatened
Thalasseus bengalensis	Lesser Crested Tern	
Thalasseus bergii	Crested Tern	
Thalassoica antarctica	Antarctic Petrel	
Thinornis cucullatus	Hooded Plover	
Threskiornis moluccus	Australian White Ibis	
Threskiornis spinicollis	Straw-Necked Ibis	
Todiramphus (Todiramphus) sanctus	Sacred Kingfisher	
Tregellasia capito	Pale-Yellow Robin	
Tribonyx mortierii	Tasmanian Native-Hen	
Tribonyx ventralis	Black-Tailed Native-Hen	
Trichoglossus chlorolepidotus	Scaly-Breasted Lorikeet	
Trichoglossus haematodus	Rainbow Lorikeet	
Tringa (Glottis) nebularia	Greenshank	
Tringa (Heteroscelus) brevipes	Grey-Tailed Tattler	
Tringa (Rhyacophilus) glareola	Wood Sandpiper	
Tringa (Rhyacophilus) stagnatilis	Marsh Sandpiper	

Tringa (Totanus) totanus	Common Redshank	
Turdus merula	Blackbird	
Turnix (Alphaturnia) velox	Little Button-Quail	
Turnix (Austroturnix) varius	Painted Button-Quail	
Tyto (Megastrix) novaehollandiae	Masked Owl	
Tyto (Megastrix) tenebricosa	Sooty Owl	
Tyto (Tyto) javanica	Eastern Barn Owl	
Tyto alba	Barn Owl	
Vanellus (Lobipluvia) miles	Masked Lapwing	
Vanellus (Lobivanellus) tricolor	Banded Lapwing	
Xenus cinereus	Terek Sandpiper	
Zoothera (Zoothera) lunulata	Bassian Thrush	
Zosterops lateralis	Silvereye	
Class: Chondrichthyes (cartilaginous fish - sharks, skates, rays)		
Alopias vulpinus	Thresher Shark	
Amblyraja hyperborea	Boreal Skate	
Apristurus ampliceps	Roughskin Catshark	
Apristurus australis	Pinocchio Catshark	
Apristurus melanoasper	Fleshynose Catshark	
Apristurus pinguis	Bulldog Catshark	
Aptychotrema rostrata	Eastern Shovelnose Ray	
Aptychotrema vincentiana	Western Shovelnose Ray	
Asymbolus analis	Grey Spotted Catshark	
Asymbolus rubiginosus	Orange Spotted Catshark	
Asymbolus vincenti	Gulf Catshark	
Bathytoshia brevicaudata	Smooth Stingray	
Bathytoshia lata	Black Stingray	
Callorhinchus milii	Elephantfish	
Carcharhinus brachyurus	Bronze Whaler	
Carcharhinus limbatus	Common Blacktip Shark	
Carcharhinus obscurus	Dusky Whaler	
Carcharias taurus	Greynurse Shark	
Carcharodon carcharias	White Shark	EPBC Act - Threatened
Centrophorus harrissoni	Harrisson's Dogfish	EPBC Act - Threatened
Centrophorus moluccensis	Endeavour Dogfish	
Centrophorus squamosus	Leafscale Gulper Shark	
Centrophorus zeehaani	Southern Dogfish	EPBC Act - Threatened
Centroscymnus coelolepis	Portuguese Dogfish	
Centroscymnus owstonii	Owston's Dogfish	
Centroselachus crepidater	Golden Dogfish	
Cephaloscyllium albipinnum	Whitefin Swellhark	
Cephaloscyllium isabellum		
Cephaloscyllium laticeps	Draughtboard Shark	
Cephaloscyllium variegatum	Northern Draughtboard Shark	
Cetorhinus maximus	Basking Shark	
Chimaera fulva	Southern Chimaera	
Chimaera lignaria	Giant Chimaera	
Chimaera macrospina	Longspine Chimaera	
Chimaera ogilbyi	Ogilby's Ghostshark	
Chlamydoselachus anguineus	Frill Shark	
Dalatias licha	Black Shark	
Deania calceus	Brier Shark	
Deania quadrispinosa	Longsnout Dogfish	
Dentiraja australis	Sydney Skate	
Dentiraja cerva	Whitespotted Skate	
Dentiraja confusa	Longnose Skate	

Dentiraja lemprieri	Thornback Skate	
Dipturus acrobelus	Deepwater Skate	
Dipturus canutus	Grey Skate	
Dipturus grahami	Graham's Skate	
Dipturus gudgeri	Bight Skate	
Echinorhinus cookei	Prickly Shark	
Etmopterus baxteri	Southern Lanternshark	
Etmopterus granulosus	Southern Lanternshark	
Etmopterus lucifer	Blackbelly Lanternshark	
Etmopterus pusillus	Slender Lanternshark	
Etmopterus unicolor	Bristled Lanternshark	
Figaro boardmani	Sawtail Catshark	
Furgaleus macki	Whiskery Shark	
Galeocerdo cuvier	Tiger Shark	
Galeorhinus galeus	School Shark	EPBC Act - Threatened
Harriotta raleighana	Bigspine Spookfish	
Hemitrygon fluviorum	Estuary Stingray	
Heptranchias perlo	Sharpnose Sevengill Shark	
Heterodontus galeatus	Crested Hornshark	
Heterodontus portusjacksoni	Port Jackson Shark	
Hydrolagus homonycteris	Black Whitefin	
Hypnos monopterygius	Coffin Ray	
Irolita waitii	Southern Round Skate	
Isurus oxyrinchus	Shortfin Mako	
Lamna nasus	Porbeagle	
Mitsukurina owstoni	Goblin Shark	
Mustelus antarcticus	Gummy Shark	
Myliobatis tenuicaudatus	Southern Eagle Ray	
Narcine tasmaniensis	Tasmanian Numbfish	
Narcinops tasmaniensis	Tasmanian Numbfish	
Negaprion acutidens	Lemon Shark	
Notoraja azurea	Blue Skate	
Notorynchus cepedianus	Broadnose Shark	
Odontaspis ferox	Sandtiger Shark	
Orectolobus halei	Gulf Wobbegong	
Orectolobus maculatus	Spotted Wobbegong	
Orectolobus ornatus	Banded Wobbegong	
Oxynotus bruniensis	Prickly Dogfish	
Parascyllium collare	Collar Carpetshark	
Parascyllium ferrugineum	Rusty Carpetshark	
Parascyllium variolatum	Varied Carpetshark	
Pastinachus ater	Cowtail Stingray	
Pavoraja nitida	Peacock Skate	
Prionace glauca	Blue Shark	
Pristiophorus cirratus	Common Sawshark	
Pristiophorus nudipinnis	Southern Sawshark	
Proscymnodon plunketi	Plunket's Dogfish	
Rajella challengeri	Challenger Skate	
Rhinobatos sainsburyi	Goldeneye Shovelnose Ray	
Rhinochimaera pacifica	Pacific Spookfish	
Sphyrna lewini	Scalloped Hammerhead	EPBC Act - Threatened
Sphyrna zygaena	Smooth Hammerhead	
Spiniraja whitleyi	Melbourne Skate	
Squalus acanthias	Whitespotted Dogfish	
Squalus chloroculus	Greeneye Spurdog	
Squalus megalops	Spikey Dogfish	

Squalus mitsukurii		
Squatina albipunctata	Eastern Angelshark	
Squatina australis	Australian Angelshark	
Tetronarce nobiliana	Short-Tail Torpedo Ray	
Torpedo macneilli	Short-Tail Torpedo Ray	
Trygonoptera imitata	Eastern Shovelnose Stingaree	
Trygonoptera mucosa	Western Shovelnose Stingaree	
Trygonoptera testacea	Common Stingaree	
Trygonorrhina dumerilii	Southern Fiddler Ray	
Trygonorrhina fasciata	Eastern Fiddler Ray	
Urolophus bucculentus	Sandyback Stingaree	
Urolophus cruciatus	Banded Stingaree	
Urolophus flavomosaicus	Patchwork Stingaree	
Urolophus gigas	Spotted Stingaree	
Urolophus kapalensis	Kapala Stingaree	
Urolophus paucimaculatus	Sparsely-Spotted Stingaree	
Urolophus piperatus	Coral Sea Stingaree	
Urolophus sufflavus	Yellowback Stingaree	
Urolophus viridis	Greenback Stingaree	
Class: Mammalia (mammals, marine mammals)		
Acrobates pygmaeus	Feathertail Glider	
Antechinus agilis	Agile Antechinus	
Antechinus flavipes	Yellow-Footed Antechinus	
Antechinus mimetes		
Antechinus minimus	Swamp Antechinus	
Antechinus stuartii	Brown Antechinus	
Antechinus swainsonii	Dusky Antechinus	
Arctocephalus forsteri	New Zealand Fur-Seal	
Arctocephalus gazella	Antarctic Fur-Seal	
Arctocephalus pusillus	Australian Fur-Seal	
Austronomus australis	White-Striped Freetail-Bat	
Axis porcinus	Hog Deer	
Balaenoptera acutorostrata	Minke Whale	
Balaenoptera borealis	Sei Whale	EPBC Act - Threatened
Balaenoptera edeni	Bryde's Whale	
Balaenoptera musculus	Blue Whale	EPBC Act - Threatened
Balaenoptera physalus	Fin Whale	EPBC Act - Threatened
Bos (Bos) taurus	European Cattle	
Canis familiaris	Dingo	
Canis lupus		
Caperea marginata	Pygmy Right Whale	
Cercartetus nanus	Eastern Pygmy-Possum	
Cervus unicolor	Sambar	
Chalinolobus gouldii	Gould's Wattled Bat	
Chalinolobus morio	Chocolate Wattled Bat	
Dama dama	Fallow Deer	
Dasyurus maculatus	Bindjulang	
Dasyurus viverrinus	Luaner	EPBC Act - Threatened
Delphinus delphis	Common Dolphin	
Dugong dugon	Dugong	
Equus (Equus) caballus	Horse	
Eubalaena australis	Southern Right Whale	EPBC Act - Threatened
Falsistrellus tasmaniensis	Eastern False Pipistrelle	
Felis catus	Cat	
Globicephala melas	Long-Finned Pilot Whale	
Hydromys chrysogaster	Water-Rat	

Hydrurga leptonyx	Leopard Seal	
Hyperoodon planifrons	Southern Bottlenose Whale	
Isoodon obesulus	Southern Brown Bandicoot	
Kogia breviceps	Pygmy Sperm Whale	
Lepus capensis	Brown Hare	
Macropus giganteus	Eastern Grey Kangaroo	
Macropus rufogriseus		
Mastacomys fuscus	Broad-Toothed Rat	
Megaptera novaeangliae	Humpback Whale	EPBC Act - Threatened
Mesoplodon bowdoini	Andrews' Beaked Whale	
Mesoplodon grayi	Gray's Beaked Whale	
Mesoplodon hectori	Hector's Beaked Whale	
Mesoplodon layardii	Strap-Toothed Beaked Whale	
Micronomus norfolkensis	Eastern Freetail-Bat	
Miniopterus orianae	Northern Bentwing-Bat	
Mirounga leonina	Southern Elephant Seal	EPBC Act - Threatened
Mus musculus	House Mouse	
Myotis macropus	Southern Myotis	
Neophoca cinerea	Australian Sea-Lion	EPBC Act - Threatened
Notamacropus rufogriseus	Red-Necked Wallaby	
Nyctophilus geoffroyi	Lesser Long-Eared Bat	
Nyctophilus gouldi	Gould's Long-Eared Bat	
Nyctophilus sherrini	Tasmanian Long-Eared Bat	
Orcinus orca	Killer Whale	
Ornithorhynchus anatinus	Platypus	
Oryctolagus cuniculus	Rabbit	
Osphranter robustus	Common Wallaroo	
Ovis aries	Dhimba	
Ozimops planiceps	South-Eastern Free-Tailed Bat	
Ozimops ridei	Ride's Free-Tailed Bat	
Perameles gunnii	Eastern Barred Bandicoot	
Perameles nasuta		
Petauroides volans	Greater Glider	EPBC Act - Threatened
Petaurus australis	Yellow-Bellied Glider	
Petaurus breviceps	Sugar Glider	
Petaurus norfolcensis	Squirrel Glider	
Phascogale tapoatafa	Brush-Tailed Phascogale	
Phascolarctos cinereus	Koala	
Phoniscus papuensis	Golden-Tipped Bat	
Physeter macrocephalus	Sperm Whale	
Potorous longipes	Long-Footed Potoroo	EPBC Act - Threatened
Potorous tridactylus	Long-Nosed Potoroo	
Pseudocheirus peregrinus	Common Ringtail Possum	
Pseudomys fumeus	Konoom	EPBC Act - Threatened
Pseudorca crassidens	False Killer Whale	
Pteropus alecto	Black Flying-Fox	
Pteropus poliocephalus	Grey-Headed Flying-Fox	EPBC Act - Threatened
Pteropus scapulatus	Little Red Flying-Fox	
Rattus fuscipes	Bush Rat	
Rattus lutreolus	Swamp Rat	
Rattus norvegicus	Brown Rat	
Rattus rattus	Black Rat	
Rhinolophus megaphyllus	Eastern Horseshoe-Bat	
Saccolaimus flaviventris	Yellow-Bellied Sheathtail-Bat	
Sarcophilus harrisii	Tasmanian Devil	EPBC Act - Threatened
Scoteanax rueppellii	Greater Broad-Nosed Bat	

Scotorepens orion	Eastern Broad-Nosed Bat	
Sminthopsis leucopus	White-Footed Dunnart	
Stenella coeruleoalba	Striped Dolphin	
Steno bredanensis	Rough-Toothed Dolphin	
Sus scrofa	Pig	
Tachyglossus aculeatus	Short-Beaked Echidna	
Tasmacetus shepherdi	Tasman Beaked Whale	
Thylogale billardierii	Tasmanian Pademelon	
Trichosurus caninus	Mountain Brushtail Possum	
Trichosurus cunninghami	Mountain Brushtail Possum	
Trichosurus vulpecula	Common Brushtail Possum	
Tursiops aduncus	Indian Ocean Bottlenose Dolphin	
Tursiops truncatus	Bottlenose Dolphin	
Vespadelus darlingtoni	Large Forest Bat	
Vespadelus regulus	Southern Forest Bat	
Vespadelus vulturnus	Little Forest Bat	
Vombatus ursinus	Bare-Nosed Wombat	
Vulpes vulpes	Fox	
Wallabia bicolor	Swamp Wallaby	
Ziphius cavirostris	Cuvier's Beaked Whale	
Class: Reptilia (turtles)		
Acanthophis antarcticus	Common Death Adder	
Acritoscincus duperreyi	Eastern Three-Lined Skink	
Amphibolurus muricatus	Jacky Lizard	
Anepischetosia maccoyi	Highlands Forest-Skink	
Anilios nigrescens	Blackish Blind Snake	
Austrelaps ramsayi	Highland Copperhead	
Austrelaps superbus	Lowland Copperhead	
Boiga irregularis	Brown Tree Snake	
Caretta caretta	Loggerhead Turtle	EPBC Act - Threatened
Carinascincus coventryi	Southern Forest Cool-Skink	
Carinascincus metallicus	Metallic Cool-Skink	
Carinascincus ocellatus	Ocellated Skink	
Carinascincus pretiosus	Agile Cool-Skink	
Chelodina (Chelodina) longicollis	Eastern Long-Necked Turtle	
Chelonia mydas	Green Turtle	EPBC Act - Threatened
Christinus marmoratus	Marbled Gecko	
Concinnia tenuis	Barred-Sided Skink	
Crocodylus porosus	Saltwater Crocodile	
Cryptophis nigrescens	Eastern Small-Eyed Snake	
Ctenotus taeniolatus	Copper-Tailed Skink	
Cyclodomorphus michaeli	Mainland She-Oak Skink	
Dermochelys coriacea	Leathery Turtle	EPBC Act - Threatened
Drysdalia coronoides	White-Lipped Snake	
Drysdalia rhodogaster	Mustard-Bellied Snake	
Egernia saxatilis	Black Rock Skink	
Emydura macquarii	Murray Turtle	
Eretmochelys imbricata	Hawksbill Turtle	EPBC Act - Threatened
Eulamprus heatwolei	Yellow-Bellied Water-Skink	
Eulamprus quoyii	Eastern Water-Skink	
Eulamprus tympanum	Southern Water-Skink	
Fordonia leucobalia	White-Bellied Mangrove Snake	
Hydrophis platurus		
Intellagama lesueurii	Water Dragon	
Lampropholis delicata	Dark-Flecked Garden Sunskink	
Lampropholis guichenoti	Pale-Flecked Garden Sunskink	

Lerista bougainvillii	South-Eastern Slider	
Liopholis whitii	White's Skink	
Lissolepis coventryi	Eastern Mourning Skink	
Morelia spilota	Carpet Python	
Notechis scutatus	Tiger Snake	
Parasuta flagellum	Little Whip Snake	
Phyllurus platurus	Broad-Tailed Gecko	
Pseudechis guttatus	Spotted Black Snake	
Pseudechis porphyriacus	Red-Bellied Black Snake	
Pseudemoia entrecasteauxii	Tussock Cool-Skink	
Pseudemoia pagenstecheri	Tussock Skink	
Pseudemoia spenceri	Trunk-Climbing Cool-Skink	
Pseudonaja textilis	Eastern Brown Snake	
Pygopus lepidopodus	Common Scaly-Foot	
Rankinia diemensis	Mountain Dragon	
Saproscincus mustelinus	Weasel Skink	
Tiliqua nigrolutea	Blotched Blue-Tongue	
Tiliqua rugosa	Shingle-Back	
Tiliqua scincoides	Eastern Blue-Tongue	
Varanus gouldii	Gould's Goanna	
Varanus varius	Lace Monitor	
Class: Thaliacea		
Ihlea magalhanica		
Pyrosoma atlanticum		
Salpa fusiformis		
Soestia zonaria		
Thalia democratica		
Phylum: CNIDARIA		
Class: Anthozoa (sea anemones, corals, sea pens)		
Actinia tenebrosa	Waratah Anemone	
Anthopleura aureoradiata		
Anthothoe albocincta		
Aulactinia veratra		
Aulocyathus recidivus		
Balanophyllia (Balanophyllia) bairdiana	Coral	
Boloceroides mcmurrichi		
Caryophyllia (Caryophyllia) diomedeae		
Caryophyllia (Caryophyllia) planilamellata		
Corynactis australis		
Culicia australiensis		
Deltocyathus magnificus		
Desmophyllum dianthus		
Drifa erecta		
Drifa gaboensis		
Drifa watsonae		
Dunocyathus parasiticus		
Enallopsammia rostrata		
Epiactis australiensis		
Epizoanthus sabulosum		
Erythropodium hicksoni		
Flabellum (Flabellum) australe	Freeliving Solitary Corals	
Flabellum (Flabellum) pavoninum		
Flabellum (Flabellum) transversale		
Flabellum (Ulocyathus) hoffmeisteri		
Flabellum (Ulocyathus) tuthilli		

Fungiacyathus (Bathyactis) turbinolioides		
Funiculina quadrangularis		
Gyrophyllum sibogae		
Holcotrochus crenulatus		
Holcotrochus scriptus		
Isanemonia australis		
Jasminisis zebra		
Madrepora oculata		
Mopsella zimmeri		
Notophyllia etheridgi		
Oulactis muscosa		
Phlyctenactis tuberculosa	Wandering Anemone	
Phlyctenanthus australis	Mulberry Anemone	
Placotrochides scaphula		
Platytrochus hastatus		
Plesiastrea versipora		
Primnoella australasiae	Seawhip	
Primnoella grandisquamis		
Pseudoplumarella thetis		
Pteronisis echinaxis		
Pteronisis incerta		
Pteronisis oliganema		
Pteronisis plumacea		
Pteronisis whiteleggei		
Rhizotrochus tuberculatus		
Sarcoptilus grandis		
Solenosmilia variabilis		
Sphaerokodisis flabellum		
Sphaerokodisis tenuis		
Sphenopus marsupialis		
Stephanocyathus (Stephanocyathus) platypus		
Zignisis repens		
Class: Hydrozoa (cnidarians)		
Aequorea macrodactyla		
Aglaophenia divaricata		
Aglaura hemistoma		
Amphisbetia minima		
Amphisbetia operculata		
Clytia gracilis		
Clytia hemisphaerica		
Clytia paulensis		
Dictyocladium reticulatum		
Ectopleura crocea		
Eudendrium aylingae		
Eudendrium balei		
Eudendrium generale		
Eudendrium terranovae		
Gymnangium longirostre		
Gymnangium superbum		
Halecium beanii		
Halecium delicatulum		
Halicornopsis elegans		
Halopteris campanula		
Halopteris glutinosa		
Hebella scandens		
Hydractinia betkensis		

Hydrodendron armatum		
Monotheca flexuosa		
Nemertesia procumbens		
Obelia dichotoma		
Obelia longissima		
Opercularella humilis		
Orthopyxis caliculata		
Parascyphus simplex		
Phialella quadrata		
Porpita porpita	Blue Button	
Pycnotheca mirabilis		
Pycnotheca producta		
Ralpharia magnifica		
Sertularella robusta		
Sertularia geminata		
Sertularia tenuis		
Silicularia rosea		
Solanderia fusca		
Stephanohelia praecipua		
Stereotheca elongata		
Symplectoscyphus subdichotomus		
Synthecium elegans		
Velella velella	By-The-Wind Sailor	
Class: Scyphozoa (jellyfish)		
Atolla wyvillei		
Aurelia aurita	Moon Jellyfish	
Catostylus mosaicus	Blue Blubber	
Chrysaora wurlerra	Tiger Sea Nettle	
Cyanea annaskala		
Cyanea capillata		
Pelagia noctiluca	Mauve Stinger	
Phyllorhiza punctata	Brown Jellyfish	
Phylum: ECHINODERMATA		
Class: Asteroidea (starfish)		
Allostichaster palmula		
Allostichaster polyplax		
Allostichaster regularis		
Aquilonastra scobinata	Seastar	
Asterodiscides truncatus	Seastar	
Astropecten vappa		
Astrostole scabra	Seven-Arm Seastar	
Benthopecten munidae		
Bollonaster pectinatus		
Ceramaster patagonicus		
Chaetaster moorei	Seastar	
Coronaster volsellatus		
Coscinasterias calamaria		
Coscinasterias muricata	Eleven-Arm Seastar	
Cosmasterias dyscrita		
Crossaster multispinus		
Ctenodiscus orientalis	Starfish	
Dipsacaster magnificus		
Echinaster arcystatus		
Fromia polypora		
Henricia compacta		

Henricia obesa		
Henricia sufflata		
Hippasteria trojana		
Luidia australiae		
Luidia neozelanica		
Mediaster arcuatus	Seastar	
Mediaster australiensis	Starfish	
Meridiastra atyphoida		
Meridiastra calcar	Eight-Arm Seastar	
Meridiastra fissura		
Meridiastra gunnii		
Meridiastra medius	Seastar	
Meridiastra nigranota		
Meridiastra oriens		
Milteliphaster spinosus	Seastar	
Nectria macrobrachia		
Nectria multispina		
Nectria ocellata		
Nectria ocellifera	Seastar	
Nectria pedicelligera	Seastar	
Nectria wilsoni		
Nectriaster monacanthus	Starfish	
Novodinia australis	Seastar	
Nymphaster moebii		
Odontaster benhami	Seastar	
Odontaster penicillatus	Starfish	
Odontohenricia endeavouri		
Paranepanthia grandis		
Parvulastra exigua		
Pentagonaster duebeni		
Perissasterias monacantha		
Perissasterias polyacantha	Starfish	
Petricia vernicina		
Plectaster decanus		
Pseudarchaster abernethyi		
Pseudarchaster boardmani		
Pseudarchaster garricki		
Pseudonepanthia troughtoni	Seastar	
Pseudophidiaster rhysus	Starfish	
Psilaster acuminatus		
Pteraster tetracanthus	Starfish	
Radiaster gracilis		
Sclerasterias dubia		
Smilasterias irregularis		
Smilasterias multipara		
Solaster notophrynus		
Solaster torulatus		
Tosia australis		
Tosia magnifica	Magnificent Biscuit Seastar	
Tosia neossia		
Uniophora granifera	Rough Seastar	
Uniophora nuda		
Zoroaster macracantha		
Crinoidea (sea lilies, feather stars)		
Antedon incommoda		
Antedon loveni		

Aporometra paedophora		
Aporometra wilsoni		
Austrometra thetidis		
Cenolia benhami		
Cenolia spanoschistum		
Cenolia tasmaniae		
Cenolia trichoptera		
Comanthus trichoptera		
Comatulella brachiolata		
Endoxocrinus sibogae		
Metacrinus cyaneus		
Metacrinus levii		
Oxycomanthus plectrophorum		
Phrynocrinus nudus	Stalked Crinoid	
Ptilometra australis		
Ptilometra macronema	Crinoid	
Class: Echinoidea (sea urchins)		
Aceste ovata		
Amblypneustes elevatus		
Amblypneustes grandis		
Amblypneustes ovum		
Amblypneustes pallidus		
Araeosoma thetidis		
Brissus agassizii		
Centrostephanus rodgersii	Longspined Sea Urchin	
Clypeaster australasiae		
Clypeaster virescens		
Dermechinus horridus	Sea Urchin	
Echinocardium cordatum		
Echinocyamus platytatus		
Echinometra mathaei	Burrowing Sea Urchin	
Echinus multidentatus		
Eupatagus valenciennesii		
Fibularia nutriens		
Fibularia plateia		
Goniocidaris impressa		
Goniocidaris parasol	Sea Urchin	
Goniocidaris sibogae		
Goniocidaris tubaria	Sea Urchin	
Heliocidaris bajulus		
Heliocidaris erythrogramma	Shortspined Sea Urchin	
Heliocidaris tuberculata	Red Sea Urchin	
Heterobrissus gigas	Heart Urchin	
Histocidaris australiae		
Histocidaris elegans		
Holopneustes inflatus		
Holopneustes porosissimus	Red-Spined Sea Urchin	
Holopneustes purpurascens	Sea Urchin	
Lovenia elongata		
Microcyphus annulatus		
Microcyphus compsus		
Microcyphus zigzag	Sea Urchin	
Pachycentrotus australiae		
Paramaretia peloria		
Peronella peronii		
Phyllacanthus imperialis		

Phyllacanthus irregularis		
Phyllacanthus parvispinus		
Spatangus lutkeni		
Stylocidaris conferta	Sea Urchin	
Tripneustes gratilla	Collector Sea Urchin	
Class: Holothuroidea (sea cucumbers)		
Actinopyga mauritiana	Surf Redfish (Sea Cucumber)	
Archedota lapidea		
Australostichopus mollis	Brownmottled Sea Cucumber	
Bathyplotes moseleyi		
Bathyplotes natans		
Bathyplotes sulcatus		
Chiridota gigas		
Cucuvitrum rowei		
Echinocucumis hispida		
Elpidia theeli		
Laetmogone fimbriata		
Laetmogone violacea	Holothurian	
Leptosynapta dolabrifera		
Lipotrapeza vestiens		
Molpadia andamanensis		
Molpadia musculus		
Molpadiodemas involutus		
Neoamphicyclus lividus		
Neoamphicyclus materiae		
Neoamphicyclus mutans	Sea Cucumber	
Pannychia moseleyi		
Paracaudina chilensis		
Phyllophorella notialis		
Plesiocolochirus ignava		
Prototrochus staplesi		
Pseudostichopus hyalegerus		
Pseudostichopus mollis		
Pseudostichopus peripatus		
Psolidiella nigra	Sea Cucumber	
Psolidium oloughlini		
Rowedota allani		
Rowedota shepherdi	Sea Cucumber	
Scoliorhapis theeli		
Squamocnus aureoruber		
Staurothyone inconspicua		
Thyone joshuai		
Thyonidiella kungi		
Trachythyone candida	Holothurian	
Zygothuria lactea		
Class: Ophiuroidea (brittle stars)		
Amphiophiura turgida		
Amphiophiura urbana		
Amphioplus (Amphichilus) ochroleuca		
Amphipholis squamata	Brooding Brittle Star	
Amphistigma minuta		
Amphiura (Amphiura) constricta		
Amphiura (Amphiura) dolia		
Amphiura (Amphiura) latisquama		
Amphiura (Amphiura) magellanica		
Amphiura (Amphiura) magnisquama	Brittlestar	

Amphiura (Amphiura) micra	Ophiuroid	
Amphiura (Amphiura) poecila		
Asteronyx loveni		
Asteroporpa (Asteroporpa) australiensis		
Astrobrachion constrictum		
Astrosierra amblyconus		
Astrothorax waitei	Ophiuroid	
Astrothrombus rugosus		
Bathypectinura heros		
Clarkcoma australis		
Clarkcoma bollonsi		
Clarkcoma canaliculata		
Clarkcoma pulchra		
Conocladus australis	Southern Basketstar	
Gorgonocephalus dolichodactylus		
Gorgonocephalus pustulatum		
Haplophiura gymnopora		
Ophiacantha alternata		
Ophiacantha brachygnatha		
Ophiacantha clavigera		
Ophiacantha fidelis		
Ophiacantha heterotyla		
Ophiacantha rosea	Ophiuroid	
Ophiacantha yaldwyni	Ophiuroid	
Ophiactis abyssicola		
Ophiactis hirta		
Ophiactis macrolepidota		
Ophiactis plana	Ophiuroid	
Ophiactis profundi		
Ophiactis resiliens		
Ophiactis tricolor		
Ophiarachnella ramsayi		
Ophiobyrsa rudis		
Ophiocamax applicatus		
Ophiocentrus pilosus		
Ophiochiton fastigatus		
Ophiochiton lentus		
Ophiocreas oedipus		
Ophiocreas sibogae		
Ophiocrossota multispina		
Ophiocten cryptum		
Ophioleuce regulare	Brittlestar	
Ophiomastus tegulitius		
Ophiomisidium flabellum		
Ophiomisidium irene		
Ophiomitrella conferta	Brittlestar	
Ophiomusium incertum		
Ophiomusium lymani		
Ophiomyces grandis		
Ophiomyxa australis	Brittlestar	
Ophionereis novaezelandiae		
Ophionereis schayeri		
Ophiopeza cylindrica		
Ophiophthalmus relictus		
Ophioplax lamellosa		
Ophiopleura inermis		

Ophioplinthaca plicata		
Ophioplinthaca rudis		
Ophioplocus bispinosus		
Ophiopsammus angusta		
Ophiopsammus assimilis		
Ophiothrix (Ophiothrix) aristulata		
Ophiothrix (Ophiothrix) caespitosa		
Ophiothrix (Ophiothrix) ciliaris		
Ophiothrix (Placophiothrix) spongicola		
Ophiozonella bispinosa		
Ophiozonella media		
Ophiura (Ophiura) flagellata	Ophiuroid	
Ophiura (Ophiura) kinbergi		
Ophiura (Ophiura) ooplax		
Ophiura (Ophiura) palliata		
Ophiura (Ophiuroglypha) irrorata		
Ophiura (Ophiuroglypha) jejuna		
Ophiura (Ophiuroglypha) rugosa		
Ophiurothamnus clausa		
Phylum: MOLLUSCA		
Class: Bivalvia (bivalves - mussels, scallops, oysters, cocles, clams)		
Abra exigua	Small Semele	
Abranda modestina		
Acar botanica		
Acar squamosa		
Acrosterigma cygnorum	Oblique Southern Cockle	
Ambuscintilla praemium		
Amygdalum lineum		
Amygdalum striatum	Translucent Mussel	
Anadara (Anadara) trapezia	Sydney Cockle	
Anapella cycladea		
Anomia trigonopsis	Jingle Shell	
Antigona persimilis		
Arca reticulata	Reticulated Ark	
Arcuatula glaberrima		
Arcuatula senhousia	Asian Mussel	
Arthritica semen		
Atactodea cuneata	Round Wedge Shell	
Atactodea erycinaea		
Atrina (Atrina) tasmanica	Tasmanian Razor Shell	
Austrocardiella trifoliata		
Austromactra contraria	Contrary Mactra	
Austromactra rufescens	Reddish Mactra	
Bankia australis	Bankia or Many-Coned Shipworm	
Bankia carinata		
Barbatia (Barbatia) pistachia	Banded Ark	
Barnea (Anchomasa) obturamentum	Tongue-Shaped Angel's Wing	
Barnea (Barnea) australasiae		
Bassina (Bassina) jacksoni	Jackson's Bassina	
Bassina (Bassina) pachyphylla	Faint-Frilled Venus Shell	
Bassina (Callanaitis) disjecta	Wedding Cake Venus	
Basterotia subalata		
Bathyarca (Microcuculaea) perversidens	Little Cowl Shell	
Bathycardita raouli		
Benthocardiella burtonae		

Borniola lepida		
Borniola radiata		
Brachidontes erosus	Beaked Mussel	
Brachidontes rostratus	Beaked Mussel	
Cadella semen		
Callista (Striacallista) diemenensis	Tasmanian Venus	
Cardiolucina crassilirata	Densely Striated Lucina	
Cardita aviculina		
Cardita crassicosta	Thick-Ribbed Cardita	
Cardita variegata		
Carditella jaffaensis		
Carditellona angasi	Angas' Carditella	
Carditellopsis elegantula	Elegant Carditella	
Cavatidens omissus		
Centrocardita cf. hirasei		
Centrocardita rosulenta		
Chama pacifica	Large Pacific Chama	
Chama ruderalis		
Channelaxinus adelaideanus		
Chioneryx cardioides	Much-Striated Venus	
Circomphalus disjecta	Wedding-Cake Cockle	
Cleidothaerus albidus	White Cleidothaerus	
Codakia rugifera	Wrinkled Codakia	
Condylocardia cometa		
Condylocardia limaeformis		
Condylocardia notoaustralis		
Condylocardia pectinata		
Condylocardia rectangularis		
Condylocuna projecta		
Corbicula (Corbiculina) australis		
Corbula smithiana		
Corbula tunicata	Swollen Little Basket Shell	
Cosa fimbriata		
Cosa pectinata		
Cosa tatei		
Crassostrea gigas	Pacific Oyster	
Cratis cuboides		
Ctena tatei		
Cuna concentrica		
Cuna delta		
Cuna navicula		
Cuna saza		
Cunanax compressa		
Cunanax crassidentata		
Cunanax subradiata		
Cuspidaria angasi		
Cuspidaria erma		
Cuspidaria exarata	Spout-Like Cuspidaria	
Cuspidaria latesulcata		
Cyamium communis		
Cyclocardia calva		
Cyclocardia delicata		
Cyclochlamys favus		
Cyclopecten kapalae		
Delectopecten alcocki		
Delectopecten fosterianus		

Destacar metella		
Dianadema multangularis	Multi-Angled Tube Shell	
Diplodonta (Zemysina) tasmanica	Tasmanian Globe Shell	
Divalucina cumingi	V-Marked Lucina	
Donax (Plebidonax) deltoides	Pipi	
Dosinia (Asa) caerulea	Surf Clam	
Dosinia (Bonartemis) victoriae		
Dosinia (Dosinella) grata		
Dosinia (Fallartemis) sculpta	Sculptured Dosinia	
Dosinia crocea		
Electroma papilionacea		
Electroma virens		
Ennucula astricta	Astricta Nut Shell	
Ennucula dilecta		
Ennucula obliqua	Subdilecta Nut Shell	
Epicodakia consettiana		
Epicodakia perobliqua		
Equichlamys bifrons	Queen Scallop	
Escalima murrayi		
Eucrassatella kingicola	King Island Crassatella	
Eumarcia fumigata	Shining Venus Shell	
Exosiperna scapha	Little Boat Mussel	
Felaniella (Zemysia) globularis	Inflated Globe Shell	
Fluviolanatus subtortus		
Fulvia (Fulvia) tenuicostata	Common Southern Cockle	
Gaimardia rostellata		
Gaimardia tasmanica		
Gari (Gari) modesta	Modest Sunshine Shell	
Gari (Psammobia) kenyoniana	Kenyon's Sunset Shell	
Gari (Psammobia) livida	Purple Sunset Shell	
Gibbomodiola albicostus	Narrow Horse Mussel	
Glauconome radiata		
Glycymeris (Glycymeris) grayana	Shiny Dog Cockle	
Glycymeris (Glycymeris) holoserica	Holosericus Dog Cockle	
Glycymeris (Glycymeris) radians	Common Dog Cockle	
Glycymeris (Glycymeris) striatularis	Striated Dog Cockle	
Glycymeris (Tucetilla) mayi		
Gomphina undulosa	Waved Venus	
Gouldiopa australis		
Gregariella barbata	Hairy Three-Area Mussel	
Hemidonax dactylus		
Hiatella australis	Australian Rock-Borer	
Hiatula alba		
Hiatula biradiata	Double-Rayed Sunset Clam	
Humphreyia strangei	Strange's Watering-Pot Shell	
Hunkydora australica		
Hyridella (Hyridella) australis	The Southern Freshwater Mussel	
Hyridella (Hyridella) depressa	The Knife-Shaped Mussel	
Irus (Irus) carditoides	White Irus	
Irus (Irus) crenatus	Boring Venus Shell	
Irus (Irus) cumingii		
Irus (Notirus) exoticus		
Katelysia peronii	Sand Cockle	
Katelysia rhytiphora	Ridged Venus	
Katelysia scalarina	Sand Cockle	
Kellia jacksoniana		

Kellia rotunda		
Kelliella tasmanensis		
Kyrina rubiginosa		
Lasaea australis	Australian Lasaea	
Laternula (Laternula) attenuata		
Laternula (Laternula) creccina	Creccina Lantern Shell	
Laternula (Laternula) gracilis		
Laternula (Laternula) tasmanica		
Lima (Lima) nimbifer		
Lima (Lima) vulgaris	File Shell	
Limaria (Limaria) basilanica		
Limaria (Platilimaria) orientalis	Oriental File Shell	
Limatula (Stabilima) iredalei		
Limatula (Stabilima) strangei	Strange's File Shell	
Limea (Gemellima) austrina		
Limea (Gemellima) parvula		
Limopsis (Glycilima) penelevis		
Limopsis (Senectidens) eucosmus		
Limopsis (Versipella) soboles		
Limopsis (Versipella) tenisoni	Tenison's False Dog Cockle	
Lissarca picta		
Lissarca rhomboidalis	Rhomboid Lissarca	
Lissarca rubricata		
Lucinoma euclia		
Lutraria rhynchaena	Otter's Shell	
Lyrodus medilobata		
Lyrodus pedicellatus		
Macomona deltoidalis	Triangular Tellin	
Mactra (Mactra) australis	Southern Trough Shell	
Mactra (Mactra) eximia	Pretty Trough Shell	
Mactra (Mactra) pura	Pure Trough Shell	
Mactra (Nannomactra) jacksonensis	Jackson's Trough Shell	
Mactrotoma antecedens	Oval-Shaped Trough Shell	
Mactrotoma explanata	Parkes's Trough Shell	
Magallana gigas	Pacific Oyster	
Melliteryx acupuncta	Punctured Lepton	
Mendicula memorata		
Merisca margaritina		
Mesopeplum fenestratum	Windowed Fan Shell	
Micropolia ovalis		
Mimachlamys asperrima	Doughboy Scallop	
Modiolatus victoriae	Victoria's Horse Mussel	
Modiolus areolatus	Broad Horse Mussel	
Modiolus peronianus		
Monia (Monia) zelandica	Saddle Oyster Jingle Shell	
Monia (Tenuimonia) deliciosa		
Musculium (Sphaerinova) quirindi		
Musculus (Modiolarca) cumingianus	Three-Area Mussel	
Musculus (Modiolarca) impactus		
Musculus (Musculus) alganus		
Musculus (Musculus) nanus	Three Area Mussel	
Myadora albida		
Myadora antipodum		
Myadora brevis		
Myadora complexa		
Myadora crassa		

Myadora pandoriformis		
Myadora rotundata		
Myadora royana		
Myadoropsis elongata		
Myllita (Myllita) auriculata		
Myllita (Myllita) calva		
Myllita (Myllita) deshayesi	Deshayes' Myllita	
Myllita (Myllita) tasmanica	Tasmanian Myllita	
Myochama anomioides		
Myochama anomoides		
Myochama strangei		
Myochama tasmanica		
Myrtea botanica		
Mysella angasiana		
Mysella anomola		
Mysella concentrica		
Mysella donaciformis		
Mysella dromanaensis		
Mysella lactea		
Mysella ovata		
Mysella vitrea		
Mytilus edulis		
Mytilus galloprovincialis	Blue Mussel	
Mytilus planulatus	Edible Mussel	
Nemocardium bechei		
Neolepton antipodum		
Neolepton planiliratum		
Neotrigonia gemma		
Neotrigonia margaritacea	Common Brooch Shell	
Neotrigonia uniophora	Northern Trigonia	
Notocallista disrupta	Disrupta Venus Shell	
Notocallista kingii	Strawberry Cockle	
Notochlamys hexactes		
Notopaphia grisea		
Nucula (Nucula) pusilla	Hedley's Nut Shell	
Numella adamsi		
Offadesma angasi		
Ostrea angasi	Native Oyster	
Ovacuna atkinsoni	Atkinson's Cuna	
Pandora (Frenamya) aversus		
Panopea australis	Australian Gaper	
Paphia (Paphia) crassisulca		
Paphies (Amesodesma) elongata	Elongate Little Wedge Shell or Shining Wedge Shell	
Paratapes undulatus		
Parvamussium thetidis	Thetis Saucer Scallop	
Pecten fumatus	Commercial Scallop	
Pharaonella perna		
Philobrya crenatulifera		
Philobrya rubra		
Phragmorisma watsoni		
Pileatona compressa		
Pillucina pisidium		
Pinctada imbricata	Pearl Oyster	
Pisidium (Euglesa) etheridgei		
Pisidium (Euglesa) tasmanicum		
Placamen placidum	Placid Frilled Venus	

Plectodon brazieri		
Poroleda spathula	Spathula Nut Shell	
Poromya illevis		
Pratulum thetidis	Thetis Cockle	
Propeamussium maorium		
Propecuna obliquissima		
Propeleda (Propeleda) ensicula	Ensicula Elongate Nut Shell	
Proxichione materna		
Pseudamussium challengeri		
Pseudarcopagia botanica		
Pulvinites exempla		
Purpurocardia amabilis		
Purpurocardia bimaculata		
Purpurocardia cavatica		
Purpurocardia purpurata		
Reloncavia mactroides		
Rhinoclama alta		
Saccella crassa	Crassa Elongated Shell	
Saccella dohrni	Dohrn's Elegant Nut Shell	
Saccella verconis		
Saccostrea cucullata		
Salaputium fulvidum	Rose Crassatella	
Salaputium micrum		
Saltocuna particula		
Samacar strabo		
Scaeochlamys livida	Scaly Scallop or Fan-Shell	
Scintilla strangei	Angas's Solecardia	
Scintillula solida		
Semelangulus tenuiliratus	Fine-Ridged Tellen	
Semipallium aktinos	Shagreened Fan Shell	
Solamen recens	Boat Mussel	
Solamen spectabilis		
Solecurtus quaeritus		
Solemya (Austrosolemya) australis	The Solemya	
Solemya (Solemyarina) velesiana	Little Solemya	
Solen vaginoides	Chinaman's Fingernail	
Spenglerichaena apertissima		
Spinosipella deshayesiana		
Spisula trigonella	Trigonal Mactra	
Spondylus tenellus	Scarlet Thorny Oyster	
Sunetta (Sunemeroe) vaginalis		
Talabrica aurora	Rayed Crassatella	
Talochlamys pulleineana		
Tapes conspersus	The Tapestry Shell/Turgid Tapes	
Tawera gallinula	Feathered Venerid	
Tawera lagopus	Feather Cockle	
Tellinides margaritinus		
Tellinota albinella	Little White Tellen	
Teredo bartschi		
Teredo navalis	Teredo Ship-Worm	
Theora lubrica		
Thracia (Eximiothracia) angasiana	Jackson's Thracia	
Thracia (Eximiothracia) lincolnensis		
Thracia (Eximiothracia) speciosa	Beautiful Thracia	
Thracia (Eximiothracia) stutchburyi		
Thracidora arenosa		

Thraciopsis angustata		
Thraciopsis elongata		
Thraciopsis peroniana		
Timoclea scabra	Rough Venus	
Trichomya hirsuta	Hairy Mussel	
Tucetona flabellata	Fan-Like Dog Cockle	
Tucetona gealei	Nodulose Dog Cockle	
Varotoga cryptozoica		
Venerupis (Paphirus) anomala	Little Bean Tapes	
Venerupis (Ruditapes) galactites	Milky Tapes	
Veprichlamys perillustris		
Vermitexta garrardi		
Verticordia tasmanica		
Vimentum dilectum		
Vulsella ovata	Sponge Fingerclam	
Vulsella vulsella	Sponge Fingerclam	
Wallucina assimilis		
Warrana cessens		
Warrana comma		
Warrana dielasma		
Warrana edentata		
Warrana lunata		
Warrana pellucida		
Xenostrobus inconstans	Variable Brown Mussel	
Xenostrobus pulex	Little Black Horse Mussel	
Xenostrobus securis	Little Brown Mussel	
Zenatina victoriae	Victorian Trough Shell	
Class: Cephalopoda (squid, octopus, cuttlefish, nautilus)		
Abraliopsis gilchristi		
Ancistrocheirus lesueuri	Sharpear Enope Squid	
Architeuthis dux	Giant Squid	
Argonauta argo	Greater Argonaut	
Argonauta nodosus	Tuberculated Argonaut	
Austrorossia australis		
Brachioteuthis riisei	Common Arm Squid	
Chiroteuthis veranyi		
Cranchia scabra		
Enoploteuthis galaxias		
Eucleoteuthis luminosa		
Euprymna tasmanica	Southern Dumpling Squid	
Grimpella thaumastocheir	Velvet Octopus	
Hapalochlaena fasciata	Blue-Lined Octopus	
Hapalochlaena maculosa	Southern Blue-Ringed Octopus	
Heteroteuthis (Stephanoteuthis) serventyi		
Histioteuthis atlantica		
Histioteuthis bonnellii		
Histioteuthis meleagroteuthis		
Histioteuthis miranda		
Idioteuthis cordiformis		
Lepidoteuthis grimaldii		
Lycoteuthis lorigera		
Mastigoteuthis cordiformis		
Megalocranchia abyssicola		
Moroteuthis ingens		
Neorossia leptodons		
Nototodarus gouldi	Gould's Squid	

Octopus australis	Southern Octopus	
Octopus berrima	Southern Keeled Octopus	
Octopus maorum	Maori Octopus	
Octopus pallidus	Pale Octopus	
Octopus superciliosus	Frilled Pygmy Octopus	
Octopus tetricus	Gloomy Octopus	
Octopus warringa	Club Pygmy Octopus	
Ocythoe tuberculata	Football Octopus	
Onykia ingens		
Onykia robsoni		
Opisthoteuthis persephone		
Pholidoteuthis massyae		
Pinnoctopus cordiformis		
Pterygioteuthis gemmata		
Pterygioteuthis giardi		
Pyroteuthis margaritifera		
Sepia apama	Giant Cuttlefish	
Sepia braggi	Bragg's Cuttlefish	
Sepia cultrata	Knifebone Cuttlefish	
Sepia grahami	Ken's Cuttlefish	
Sepia hedleyi	King Cuttlefish	
Sepia mestus	Reaper Cuttlefish	
Sepia novaehollandiae		
Sepia plangon	Mourning Cuttlefish	
Sepia rozella	Rosecone Cuttlefish	
Sepiadarium austrinum	Southern Bottletail Squid	
Sepioloidea lineolata	Pinstripe Bottletail Squid	
Sepioteuthis australis	Southern Calamari	
Spirula spirula	Rams-Horn Squid	
Stigmatoteuthis hoylei		
Taningia danae		
Teuthowenia pellucida		
Todarodes filippovae	Southern Ocean Arrow Squid	
Xipholeptos notoides	Southern Pygmy Squid	
Class: Gastropoda (sea snails, nudibranchs)		
Acirsa morchi		
Aclophoropsis festiva		
Aclophoropsis maculosa	Splashed Sinistral Creeper	
Acteon fructuosus		
Acteon retusus		
Actinocyclus actinochilus		
Adamnestia arachis		
Adelphotectonica reevei	Reeve's Sundial	
Aesopus australis		
Aesopus cassandra		
Aesopus jaffaensis		
Aesopus pallidulus		
Aesopus plurisulcatus		
Aesopus solidus		
Afrolittorina acutispira	Periwinkle	
Afrolittorina praetermissa	Checked Australwink	
Agatha angusta		
Agatha australis		
Agatha convexa		
Agatha manifesta		
Agatha petterdi		

Agnewia tritoniformis	Common Small Purple	
Akera soluta		
Alaba monile		
Alaba pulchra		
Alaginella gatliffi		
Alaginella geminata		
Alaginella malina		
Alaginella ochracea		
Alaginella vercoi		
Alcyna kingensis		
Alexania globula		
Allocharopa tarravillensis		
Alvania (Alvania) fasciata		
Alvania (Alvania) hedleyi		
Alvania (Alvania) novarensis		
Alvania (Alvania) strangei		
Alvania (Linemera) filocincta		
Alvania (Linemera) suprasculpta		
Alvania (Linemera) thouinensis		
Alvania (Linemera) verconiana		
Amalda edithae	Edith's Ancilla	
Amalda marginata	Marginate Ancilla	
Amalda monilifera	Necklace Ancilla	
Amalda oblonga		
Amalda petterdi		
Amblychilepas crucis		
Amblychilepas javanicensis	Javan Keyhole Limpet	
Amblychilepas nigrita	Calloused Keyhole Limpet	
Amblychilepas oblonga	Oblong Keyhole Limpet	
Amblychilepas omicron	Crumpled Keyhole Limpet	
Amoria hunteri	Marbled Volute	
Amoria undulata	Wavy Volute	
Amoria zebra	Zebra Volute	
Amphithalamus (Amphithalamus) incidata		
Amphithalamus (Amphithalamus) jacksoni		
Amphithalamus (Amphithalamus) obesus		
Amphithalamus (Amphithalamus) pyramis		
Anabathron (Anabathron) contabulatum		
Anabathron (Anabathron) lene		
Anabathron (Scrobs) luteofuscus		
Anabathron (Scrobs) pluteus		
Anabathron (Scrobs) scrobiculator		
Anachis atkinsoni		
Anachis beachportensis		
Anachis cominellaeformis		
Anatoma tobeyoides		
Anatrophon sarmentosus		
Ancillista velesiana	Girdled Ancilla	
Angaria australis	The Southern Delphinula	
Anteaeolidiella foulisi		
Antephalium semigranosum	Half-Grained Helmet	
Antisabia erma		
Antisabia foliacea		
Aphelodoris greeni		
Aphelodoris lawsae		
Aphelodoris rossquicki		

Aphelodoris varia		
Apicalia brazieri	Brazier's Stilifer	
Apicalia inflata		
Apispiralia albocincta		
Apispiralia maxima		
Aplysia juliana		
Aplysia parvula		
Aplysia sydneyensis		
Architectonica perspectiva	Perspective Sundial	
Argalista fugitiva		
Argalista kingensis		
Argalista rosea		
Argobuccinum pustulosum		
Argobuccinum tumidum		
Arion ater		
Arion intermedius	Hedgehog Slug	
Ascorhis tasmanica		
Asmunda ambulatia		
Asperdaphne (Asperdaphne) desalesii		
Asperdaphne (Asperdaphne) esperanza		
Asperdaphne (Asperdaphne) sculptilis		
Asperdaphne (Asperdaphne) tasmanica		
Asperdaphne (Aspertilla) legrandi		
Astele ciliaris		
Astele rubiginosa		
Astele subcarinatum	Subcarinate Astele	
Astelena scitulum	Elegant Top Shell	
Asteracmea illibrata	Plain Limpet	
Asteracmea stowae	Stow's Limpet	
Astralium aureum	Golden Small Star	
Astralium pileolum	Frilled Star	
Astralium squamiferum	Scaly Star Shell	
Astralium tentoriformis	Tent Star Shell	
Astralium tentoriiforme		
Atagema albata		
Ataxocerithium applenum		
Ataxocerithium serotinum	Square-Mouthed Creeper	
Attenuata praetornatilis		
Attenuata schoutanica		
Attenuata wilsonensis		
Austraeolis ornata		
Australaria australasia	Tulip Shell	
Australaria fusiformis		
Austrocarina recta		
Austrochloritis abrotonus	Bermagui Bristle Snail	
Austrochloritis brevipila	Dorrigo Bristle Snail	
Austrocochlea brevis		
Austrocochlea constricta	Torr's Southern Periwinkle	
Austrocochlea porcata		
Austrocylichna exigua		
Austrodrillia beraudiana		
Austrodrillia saxea		
Austroginella formicula		
Austroginella johnstoni	Johnston's Margin Shell	
Austroginella muscaria	Fly-Like Margin Shell	
Austroginella tasmanica	Tasmanian Margin Shell	

Austroharpa (Palamharpa) exquisita	Exquisite Harp	
Austroharpa (Palamharpa) punctata	Spotted Harp	
Austroliotia australis	Southern Wheel Shell	
Austroliotia botanica		
Austroliotia densilineata	Close Lined Austroliotia	
Austroliotia subquadrata	The Squared Munditia	
Austrolittorina antipodum		
Austrolittorina unifasciata	Periwinkle	
Austromitra analogica		
Austromitra bellapicta		
Austromitra legrandi		
Austromitra schomburgki		
Austromitra scita		
Austromitra tasmanica		
Austropeplea tomentosa		
Austropusilla (Austropusilla) hilum		
Austropyrgus conicus		
Austropyrgus nitidus		
Austropyrgus ora		
Austropyrgus rectoides		
Austropyrgus rectus		
Austropyrgus tathraensis		
Austropyrgus turbatus		
Austrorhytida capillacea	Common Southern Carnivorous Snail	
Austrorhytida glaciamans	Koscuiszko Carnivorous Snail	
Austrorhytida lamproides	Keeled Carnivorous Snail	
Austrorissopsis consobrina		
Austrorissopsis maccoyi		
Austrosassia parkinsonia		
Austrosassia ponderi		
Austrotriton bassi		
Austrotriton epitrema		
Austrotriton mimetica		
Austrotriton subdistortus		
Austroturris steira		
Babelomurex (Babelomurex) lischkeanus	Southern Pagoda	
Badepigrus badia		
Badepigrus protractus		
Badepigrus pupoideus		
Balanetta baylii		
Bankivia fasciata	Banded or Silver Kelp	
Bathytoma (Micantapex) agnata		
Bathytoma hecatorguia		
Batillaria australis	Australian Mud Whelk	
Bedeva baileyana	Bailey's Dog Winkle	
Bedeva paivae		
Bedeva vinosa	Wine-Coloured Purple	
Belaturricula dissimilis		
Bellastraea aurea		
Belloliva leucozona	White-Zoned Rice Shell	
Belloliva triticea	Wheat-Grain Shell	
Belomitra challengeri		
Bembicium auratum	Gold-Mouthed Top Shell	
Bembicium melanostomum	Common Conniwink	
Bembicium nanum	Striped-Mouth Conniwink	
Benthofascis biconica		

Benthofascis pseudobiconica		
Benthofascis sarcinula		
Benthoxystus columnarius	Column Trophon	
Benthoxystus petterdi		
Berthelinia typica		
Berthella medietas		
Berthellina citrina		
Biuve fulvipunctata		
Bonhamaropa kershawi	Kershawâ€™S Pinwheel Snail	
Bornella hermanni		
Bornella stellifer		
Bostrycapulus pritzkeri		
Botelloides bassianus		
Botelloides sulcatus		
Bouchetriphora pallida		
Brookesena columnaria		
Brookula angeli		
Brookula crebresculpta		
Brookula denselaminata		
Brookula finesia		
Brookula nepeanensis		
Buccipagoda kengrahami		
Bulla angasi		
Bulla quoyii		
Bullina lineata		
Bursatella leachii		
Cabestana spengleri	Spengler's Triton	
Cabestana tabulata	Waterhouse's Triton	
Cacozeliana granarium		
Cacozeliana icarus		
Caecum (Caecum) amputatum		
Caldukia affinis		
Calliostoma (Fautor) allporti	Allport Top Shell	
Calliostoma (Fautor) armillatum	Jewelled Top Shell	
Calliostoma (Fautor) comptum		
Calliostoma (Fautor) excultum		
Calliostoma (Fautor) hedleyi	Hedley's Top Shell	
Calliostoma (Fautor) legrandi		
Callodix solida		
Calopia imitata		
Calthalotia fragum	Comtesse's Top Shell	
Calthalotia indistincta		
Calyptraea calyptraeformis	Shelf Limpet	
Candidula intersecta		
Cantharidella picturata		
Cantharidella tiberiana		
Capulus danieli		
Capulus sycophanta		
Caryodes dufresnii		
Cassidula (Cassidula) zonata		
Cassis fimbriata	Fimbriate Helmet	
Cavolinia tridentata		
Cavolinia uncinata		
Cellana solida	Solid Patellid Limpet	
Cellana tramoserica	Common Limpet	
Ceratosoma amoenum		

Ceratosoma brevicaudatum	Short-Tailed Nudibranch	
Cerithium balteatum		
Cerithium coralium		
Cerithium dialeucum		
Charisma arenacea	Sandy Charisma	
Charisma compacta		
Charisma josephi	Joseph's Charisma	
Charonia lampas	Red Triton Shell	
Cheirodonta labiata		
Chelidonura hirundinina		
Chicoreus (Triplex) damicornis	Long-Horned Murex	
Chicoreus (Triplex) denudatus	Fronded Murex	
Chicoreus (Triplex) territus	The Terrified Murex	
Chloritobadistes victoriae		
Chlorodiloma adelaidae	Adelaide Periwinkle	
Chlorodiloma odontis	Meshed Periwinkle	
Chromodoris ambigua		
Chromodoris cf. tasmaniensis		
Chromodoris epicuria		
Chromodoris hunterae		
Chromodoris loringi		
Chromodoris tasmaniensis		
Chromodoris thompsoni		
Chrysallida henni		
Chrysallida lucida		
Chrysallida mayii		
Cinctiuga diaphana		
Cingulina pulchra		
Cingulina spina		
Circulus harriettae		
Cirsonella carinata		
Cirsonella reflecta		
Cirsonella weldii	Stout Shiny Liotia	
Cirsotrema martyr		
Clanculus aloysii		
Clanculus brunneus		
Clanculus dunkeri	Top Shell	
Clanculus flagellatus		
Clanculus floridus	Florid Clanculus	
Clanculus limbatus	Keeled Clanculus	
Clanculus maugeri	Mauger's Clanuculus Shell	
Clanculus philippi	The Besprinkled Clanculus	
Clanculus plebejus	Clanculus	
Clanculus undatoides		
Clanculus undatus		
Clio pyramidata		
Cocculinella coercita		
Coenaculum minutulum		
Colpospira (Acutospira) accisa		
Colpospira (Acutospira) atkinsoni		
Colpospira (Acutospira) yarramundi		
Colpospira (Colpospira) cordismei		
Colpospira (Colpospira) curialis		
Colpospira (Colpospira) decoramen		
Colpospira (Colpospira) runcinata		
Colpospira (Colpospira) sinuata		

Colpospira (Colpospira) translucida		
Colpospira (Colpospira) wollumbi		
Colpospira (Ctenocolpus) australis		
Colpospira (Ctenocolpus) guillaumei		
Colpospira (Platycolpus) circumligata		
Colpospira (Platycolpus) quadrata	Quadrate Screw Shell	
Colpospira guilleaumei		
Columbarium hedleyi	Hedley's Columbaria	
Columbarium spinicinctum	Spindle Pagoda	
Cominella (Cominella) acutinodosa	Nodoluse Cominella	
Cominella (Cominella) eburnea	Ribbed Cominella	
Cominella (Cominella) lineolata	Lineated Cominella	
Cominella filicea		
Conasprella (Endemoconus) howelli		
Conasprella (Parviconus) rutila	Fiery-Red Cone	
Conassiminea studderti		
Conuber conicus	Conical Sand Snail	
Conuber controversa		
Conuber melastomus		
Conuber sordidus	Sordid Moon Snail	
Conus (Austroconus) clarus	Segrave'sp. Cone	
Conus (Floraconus) anemone	Rawhide Cone	
Conus (Floraconus) papilliferus	Papal Cone	
Conus (Gastridium) geographus	The Geographer Cone	
Conus (Plicaustraconus) angasi	Reference Cone	
Conus (Virroconus) coronatus	The Crowned Cone	
Coralliophila nodosa		
Coralliophila sertata		
Coralliophila wilsoni		
Cornirostra pellucida		
Cornu aspersum		
Cosmetalepas concatenatus	Pitted Keyhole Limpet	
Costatophora granifera		
Coxiella (Coxiella) striata		
Crassitoniella erratica		
Crassitoniella flammea		
Cratena lineata		
Crepidula aculeata	Slipper Limpet	
Crepidula immersa	Southern Slipper Limpet	
Creseis virgula		
Cronia (Cronia) aurantiaca	Oyster Drill	
Crossea concinna		
Cryptassiminea buccinoides		
Cryptassiminea tasmanica		
Cumia adjuncta		
Cumia bednalli	Bednall's Colubraria	
Cumia mestayerae	Whelk	
Cumia schoutanicus		
Cupidoliva nympha	Nymph Rice Shell	
Curveulima cornuta		
Cycloscala hyalina		
Cylichna thetidis		
Cylichnatys campanula		
Cylindriscala distincta		
Cyllene royana		
Cymatiella columnaria		

Cymatiella eburnea	The Ivory Triton	
Cymatiella sexcostata		
Cymatiella verrucosa	Little Southern Triton	
Cymbiola magnifica	Magnificent Volute	
Cystiscus alternans		
Cystiscus angasi	Angas's Margin Shell	
Cystiscus connectans		
Cystiscus cratericula		
Cystiscus freycineti		
Cystiscus halli		
Cystiscus minutissima	Minute Margin Shell	
Cystiscus multidentatus		
Cystiscus obesulus		
Cystiscus problematica		
Cystiscus subauriculata		
Cystopelta astra	Snowy Mountains Humpback Snail	
Cystopelta petterdi		
Daphnella (Daphnella) botanica	Botanic Turrid	
Dendrodoris fumata		
Dendrodoris nigra		
Dendropoma nucleocostatum		
Dentherona (Kannaropa) subrugosa		
Dentimargo allporti		
Dentimargo dentiens		
Dentimargo gabrieli		
Dentimargo jaffa		
Dentimargo kemblensis	Orange Banded Margin Shell	
Dentimargo lodderae		
Dentimargo mayii	May's Margin Shell	
Dentimitrella austrina		
Dentimitrella axiaerata		
Dentimitrella intexta		
Dentimitrella leucostoma		
Dentimitrella lincolnensis	Port Lincoln Dove Shell	
Dentimitrella menkeana	Menke's Dove Shell	
Dentimitrella semiconvexa	Semiconvexa Dove Shell	
Dentimitrella tayloriana		
Dentimitrella tenuis	Russet-Brown Dove Shell	
Dermomurex (Dermomurex) goldsteini	Goldstein's Trophon	
Deroceras reticulatum	Grey Field Slug	
Diacavolinia longirostris		
Diacria trispinosa		
Diala megapicalis		
Diala suturalis		
Diaphana brazieri		
Dicathais orbita	The Interwoven Purpura	
Diffalaba opiniosa		
Digidentis arbuta		
Digidentis perplexa		
Diloma aethiops		
Diloma concamerata	Wavy Top	
Diodora lineata	Latticed Keyhole Limpet	
Diversidoris sulphurea		
Dolabella auricularia		
Dolabrifera brazieri		
Dolicholatirus spiceri	Sapphire Spindle Shell	

Dolicrossea labiata		
Domiporta strangei		
Doriopsilla carneola		
Duplicaria kieneri		
Duplicaria ustulata	Scorched Auger	
Eatoniella (Albosabula) pellucida		
Eatoniella (Eatoniella) atrella		
Eatoniella (Eatoniella) atropurpurea		
Eatoniella (Eatoniella) depressa		
Eatoniella (Eatoniella) exigua		
Eatoniella (Eatoniella) fulva		
Eatoniella (Eatoniella) galbinia		
Eatoniella (Eatoniella) melanochroma		
Eatoniella (Eatoniella) puniceolinea		
Eatoniella (Eatoniella) shepherdi		
Eatonina (Coriandria) fulvicolumella		
Eatonina (Eatonina) condita		
Eatonina (Eatonina) hutchingsae		
Eatonina (Eatonina) rubrilabiata		
Ellatrivia merces	Common Southern Bean Cowry	
Elsothera funerea	Grim Reaper Pinwheel Snail	
Elsothera sericatula	Chocolate-Streaked Pinwheel Snail	
Elysia australis		
Elysia maoria		
Emarginula (Emarginula) candida	Shining-White Emarginula	
Emarginula (Emarginula) curvamen		
Emarginula (Emarginula) gabensis		
Emarginula (Emarginula) superba		
Emarginula (Subzeidora) devota		
Emarginula dilecta		
Emblanda emblematica		
Emozamia licina	Southern Trophon	
Enatimene simplex		
Engina australis		
Eoacmaea calamus		
Epideira candida		
Epideira carinata		
Epideira gabensis		
Epideira hedleyi	Striated Turrid	
Epideira jaffaensis		
Epideira philipineri		
Epideira quoyi		
Epideira torquata		
Epidirella xanthophaes		
Epigrus columnaria		
Epigrus cylindracea		
Epigrus dissimilis		
Epitonium (Epitonium) bellicosum		
Epitonium (Hyaloscala) jukesiana		
Epitonium (Hyaloscala) philippinarum		
Epitonium (Laeviscala) tacitum		
Epitonium (Lamelliscala) godfreyi		
Epitonium (Lamelliscala) minorum		
Epitonium (Mazescala) thrasys		
Epitonium (Papyriscala) tenellum		
Epitonium (Parviscala) coretum		

Epitonium fabia		
Ericusa papillosa	Papillose Volute	
Ericusa sowerbyi	Sowerby's Volute	
Ethminolia probabilis		
Ethminolia vitiliginea	Depressed Top Shell	
Etrema (Etrema) bicolor		
Etrema (Etrema) denseplicata		
Etrema (Etrema) kitcheni		
Etrema (Etrema) levicosta		
Etrema (Etremopa) nassoides		
Eucithara pagoda		
Eudaronia jaffaensis		
Eulima acutissima		
Eulima augur		
Eulima broadbentae		
Eulima joshuana		
Eulima lodderae		
Eulima petterdi		
Eulitoma nitens		
Eunaticina umbilicata		
Euplica bidentata		
Euplica scripta	Lettered Dove	
Eurytrochus strangei	Strange's Little Top Shell	
Euterebra assecla	Deep-Water Auger	
Euterebra tristis		
Eutriphora armillata		
Eutriphora cana		
Eutriphora tricolor		
Exomilopsis spica		
Exomilus cancellatus		
Exomilus dyscritos		
Exomilus telescopialis		
Fascinus typicus		
Favartia (Murexiella) brazieri	Brazier's Murex	
Fax (Fax) tabidus		
Fax (Fax) tenuicostatus		
Fax (Scaeofax) grandior		
Fax (Scaeofax) molleri		
Ferrissia (Pettancylus) petterdi		
Ferrissia (Pettancylus) tasmanicus		
Filodrillia delicatula		
Filodrillia haswelli		
Filodrillia mucronata		
Filodrillia ordinata		
Filodrillia stadialis		
Filodrillia tricarinata		
Filodrillia trophonoides		
Filodrillia vitrea		
Fiona pinnata		
Flabellina rubrolineata		
Fossarina (Fossarina) patula		
Fossarina (Fossarina) petterdi	Petterd's Top Shell	
Fossarina (Minopa) legrandi	Legrand's Top Shell	
Fossarus sydneyensis		
Friginatica beddomei		
Fusceulima castanea		

Fusceulima flava		
Fusceulima jacksonensis		
Fusceulima perexigua		
Fusinus (Fusinus) annae		
Fusinus (Fusinus) australis	Southern Spindle	
Fusinus (Fusinus) novaehollandiae	New Holland Spindle	
Fusinus (Propefusus) pyrulatus	Waved Spindle	
Fusitriton magellanicus		
Gastrocopta pedicula	Weakly Toothed Pupasnail	
Gatliffena fenestrata		
Gazameda gunnii	Gunn's Screw Shell	
Gazameda iredalei	Cross-Barred Screw Shell	
Gazameda tasmanica		
Gemixystus laminatus	Frilled Gemixystus	
Gemixystus polyphyllius		
Gemixystus recurvatus	Recurved Benthoxystus	
Gemixystus rhodanos		
Gemixystus segmentatus		
Gergovia exigua		
Gibberula agapeta		
Gibberula diplostreptus		
Gibberula pulchella		
Gibberula subbulbosa	Toothed Margin Shell	
Glacidorbis rusticus		
Glaucus atlanticus		
Glaucus marginatus		
Glossodoris angasi		
Glyphostoma alliteratum		
Glyptophysa (Glyptophysa) gibbosa		
Glyptozaria opulenta	Opulent Screw Shell	
Goniobranchus tasmaniensis		
Granata imbricata	Wide-Mouth Ear-Shell	
Granulifusus kiranus		
Granulina elliottae		
Granulina nympha		
Graphicomassa peroniana		
Graphis infans		
Graphis pellucida		
Guraleus australis		
Guraleus brazieri		
Guraleus cuspis		
Guraleus delicatulus		
Guraleus fascinus		
Guraleus flaccidus		
Guraleus fossa		
Guraleus incrusta		
Guraleus pictus		
Guraleus tasmanicus		
Guraleus tasmantis		
Gymnodoris alba		
Gyraulus (Gyraulus) meridionalis		
Gyraulus (Pygmanisus) scottianus		
Gyroscala lamellosa	Perplexing Ladder Shell	
Haliotis brazieri	Brazier's Ear Shell	
Haliotis coccoradiata	Scarlet-Rayed Ear Shell	
Haliotis laevigata	Greenlip Abalone	

Haliotis rubra	Warty Ear Shell	
Haliotis scalaris	Ridged Ear Shell	
Haminoea maugeansis		
Haminoea ovalis		
Hastula brazieri		
Haurakia imitator		
Haurakia novarensis		
Hebeulima inusta		
Hebeulima kilcundae		
Hedleytriphora basimacula		
Hedleytriphora fasciata		
Hedleytriphora scitula		
Heliacus (Torinista) hyperionis		
Helicarion cuvieri		
Helicarion mastersi	Royal Semi-Slug	
Heliconoides inflatus		
Herpetopoma aspersus	Pearled Euchelus or Top Shell	
Herpetopoma fenestrata		
Herpetopoma hamiltoni	Spotted Bead Shell	
Herpetopoma scabriuscula	Scurfy Bead Shell	
Hiloa variabilis		
Hinea brasiliana	Yellow-Coated Clusterwink/Jockiwink	
Hinemoa ligata		
Hinemoa suprasculpta		
Hipponix australis	Horse Hoof Limpet	
Hipponix conica	Conical Horse-Hoof / Bonnet Limpet	
Hoplodoris nodulosa		
Hydatina albocincta		
Hydatina physis		
Hydrococcus brazieri		
Hydroginella columnaria		
Hydroginella mixta		
Hydroginella tridentata		
Hypermastus coxi		
Hypermastus mucronatus		
Hypselodoris bennetti		
Hypselodoris obscura		
Icuncula torcularis		
Icuncula zodiacus		
Ilbia ilbi		
Incisura remota		
Inella innotabilis		
Inella spina		
Inglisella etheridgei		
Iphitus neozelanicus		
Isara badia		
Isara carbonaria	Black Mitre	
Isara glabra	Glabra Mitre	
Isodaphne garrardi		
Isotriphora amethystina		
Isotriphora disjuncta		
Isotriphora nivea		
Isotriphora simulata		
Isotriphora tasmanica		
Isotriphora vercoi		
Janthina exigua	Globose Violet Snail	

Janthina globosa		
Janthina janthina	Common Violet Sea Snail	
Jorunna cf. pantherina		
Jorunna hartleyi		
Jorunna pantherina		
Jorunna ramicola		
Koloonella harrissoni		
Koloonella moniliformis		
Laevilitorina (Laevilitorina) bruniensis		
Laevilitorina (Laevilitorina) mariae		
Laevilitorina (Macquariella) kingensis		
Lamellaria australis		
Lamellaria ophione		
Laomavix collisi	Collis' Pinhead Snail	
Lehmannia nyctelia	Striped Field Slug	
Leiopyrga lineolaris	Lined Kelp Shell	
Leiopyrga octona		
Leuconopsis inermis		
Leuconopsis pellucidus		
Leucosyrinx pikei		
Leucotina casta		
Leucotina micra		
Liloa brevis		
Limacina lesueurii		
Limax maximus	Leopard Slug	
Linopyrga portseaensis		
Liocarinia disjuncta		
Liotella annulata		
Liotella compacta		
Liotella johnstoni		
Liotella kilcundae		
Liotella petalifera		
Liotella pulcherrima		
Liotella vercoi		
Lironoba australis		
Lironoba layardi		
Lironoba unilirata		
Lissotesta inscripta		
Lissotesta micra		
Litozamia brazieri	Brazier's Trophon	
Litozamia rudolphi		
Littoraria luteola		
Livonia mammilla	False Bailer Shell	
Livonia roadnightae	Roadnight's Volute	
Lodderena minima	Minute Liotia	
Lodderia lodderae	Lodder's Liotia	
Lottia mixta		
Lucerapex casearia		
Lucidestea atkinsoni		
Lucidestea nitens		
Lunella (Ninella) torquatus	Rough Turban Shell	
Lunella (Subninella) undulatus	Wavy Periwinkle	
Lymnaea stagnalis		
Lyria (Mitraelyria) mitraeformis	Lyre Shell	
Macrophallikoropa belli	Bell's Pinwheel Snail	
Macroschisma tasmaniae	Posterior Keyhole Limpet	

Macrozafra legrandi		
Macteola anomala	Beaded Turrid	
Madrella sanguinea		
Magilaoma penolensis	Penola Pinhead Snail	
Magnosinister hedleyi		
Malluvium devotus		
Maoricolpus roseus	New Zealand Screw Shell	
Maoricrypta immersa	Slipper Limpet	
Maoritomella dilecta	Beloved Turrid	
Maoritomella foliacea		
Mariaglaja inornata		
Mariaglaja sandrana		
Marinula xanthostoma		
Marita bella		
Marita compta		
Marita inornata		
Marita insculpta		
Marita tumida		
Mathilda decorata		
Megastomia angasi		
Megastomia subcarina		
Melanella augur		
Melanella inflata		
Melanella tenisoni		
Melicerona listeri		
Meredithena dandenongensis	Dandenong Ranges Pinwheel Snail	
Merelina cancellata		
Merelina cheilostoma		
Merelina elegans		
Merelina gracilis		
Merelina hirta		
Merica purpuriformis		
Meridolum gulosum	Illawarra Forest Snail	
Meridolum jervisensis	Jervis Bay Forest Snail	
Mesoginella altilabra		
Mesoginella caducocincta		
Mesoginella consobrina		
Mesoginella inconspicua		
Mesoginella olivella		
Mesoginella punicea		
Mesoginella pygmaeoides		
Mesoginella schoutanica		
Mesoginella sinapi		
Mesoginella stilla		
Mesoginella strangei		
Mesoginella translucida	Translucent Margin Shell	
Mesoginella turbinata	Turbinate Margin Shell	
Mesoginella victoriae		
Microcarina surgerea		
Microcolus dunkeri		
Microdiscula charopa		
Microdryas iravadioides		
Microdryas janjucensis		
Microgenia edwini		
Microsveltia haswelli		
Microsveltia patricia		

Microsveltia recessa		
Microvoluta australis		
Microvoluta miranda		
Microvoluta royana		
Milax gagates	Jet Slug	
Minolops arata		
Minolops pulcherrima		
Miselaoma weldii	Weld's Pinhead Snail	
Mitraguraleus mitralis		
Mitrella bicincta		
Mitrella dictua		
Mitrella legrandi		
Mitrella pulla		
Mitrella vincta		
Mitromorpha alba		
Mitromorpha angusta		
Mitromorpha axiscalpta		
Mitromorpha bassiana		
Mitromorpha columnaria		
Mitromorpha costifera		
Mitromorpha macphersonae		
Mitromorpha paucilirata		
Mitromorpha paula		
Mitromorpha proles		
Mnestia arachis		
Monetaria annulus	Ring Cowrie	
Monetaria caputserpentis		
Monophorus angasi	Angas's Triphora	
Monophorus nigrofuscus		
Monoplex exaratus	Ploughed Triton	
Monoplex parthenopeus	Hairy Whelk	
Montfortia subemarginata	Margin Notch Limpet	
Montfortula rugosa	Rough Notch Limpet	
Morula (Morula) uva	Cluster Purple	
Mulathena fordei		
Munditia mayana	May's Munditia	
Munditia tasmanica	Tasmanian Liotia	
Murchisonella anabathron		
Murdochella macrina		
Murexsul planiliratus	Fimbriate Murex	
Myosotella myosotis		
Mysticoncha wilsoni	Wilson's Lamellaria	
Nannamoria amicula		
Nanula tasmanica		
Naria erosa		
Naria labrolineata		
Naricava angasi		
Naricava angulata		
Naricava vincentiana		
Narvaliscala dorysa	Wentletrap	
Nassarius (Alectrion) glans	Acorn Dog Whelk	
Nassarius (Hima) mobilis		
Nassarius (Niotha) nigellus	Tasmanian Dog Whelk	
Nassarius (Niotha) pauperatus	Poor Dog Whelk	
Nassarius (Plicarcularia) jonasii	Jonas's Dog Whelk	
Nassarius (Zeuxis) pyrrhus	Banded Nassarius	

Natica buriasiensis		
Natica sticta	Spotted Sand Shell	
Natica subcostata		
Nebularia eremitarum	Brown Mottled Mitre	
Neodoris chrysoderma		
Nepotilla aculeata		
Nepotilla bathentoma		
Nepotilla carinata		
Nepotilla diaphana		
Nepotilla excavata		
Nepotilla fenestrata		
Nepotilla lamellosa		
Nepotilla microscopica		
Nepotilla mimica		
Nepotilla minuta		
Nepotilla serrata		
Nerita (Lisanerita) atramentosa	Black Nerite/Periwinkle	
Nerita (Lisanerita) melanotragus		
Nerita (Ritena) costata	Costate Nerite or Hoi Nam Prik	
Neverita aulacoglossa		
Neverita didyma		
Nevia spirata	Spirate Cross-Barred Shell	
Nipponatys tumidus		
Nitor circumcinctus	Illawarra Glass-Snail	
Nodilittorina pyramidalis	Periwinkle	
Notadusta punctata		
Notoacmea alta		
Notoacmea corrodenda		
Notoacmea flammea		
Notoacmea mayi		
Notoacmea petterdi	Petterd's Limpet	
Notocochlis subcostata		
Notocypraea angustata	Brown Cowry	
Notocypraea comptoni	Compton's Cowry	
Notocypraea declivis	Speckled Cowry	
Notocypraea dissecta		
Notocypraea piperita	Peppered Cowry	
Notocypraea pulicaria	Flea-Spotted Cowry	
Notocypraea subcarnea		
Notogibbula bicarinata	Cox's Top Shell	
Notogibbula lehmanni	Many Coloured Top Shell	
Notogibbula preissiana	Twin Keeled Top Shell	
Nototriphora regina		
Nototriphora vestita		
Noumea closeorum		
Noumea haliclona		
Noumea sulphurea		
Nozeba topaziaca		
Obesula albovittata		
Obesula mamillata		
Odostomia angasi		
Odostomia deplexa		
Odostomia metcalfei		
Okenia mija		
Ollaphon molorthus		
Onchidella nigricans		

Onchidella patelloides		
Onchidina australis		
Onchidoris maugeansis		
Onoba (Onoba) agnewi		
Onoba (Onoba) multilirata		
Onoba (Ovirissoa) perpolita		
Onoba (Ovirissoa) rubicunda		
Onoba (Ovirissoa) tiara		
Onoba (Subestea) australiae		
Onoba (Subestea) supracostata		
Onoba hebes		
Opalia australis	Australian Ladder Shell	
Opalia ballinensis		
Opalia granosa	Granose Wentletrap	
Ophicardelus ornatus		
Ophicardelus sulcatus		
Orbitestella bastowi		
Orbitestella decorata		
Oreomava cannfluviatilus	White Rippled Pinwheel Snail	
Oreomava johnstoni		
Oreomava otwayensis		
Ovaginella ovulum	Ovulum Margin Shell	
Ovaginella pisum		
Oxychilus alliarius	Garlic Snail	
Oxychilus cellarius	Cellar Snail	
Oxychilus draparnaudi	Draparnaud's Glass-Snail	
Oxymeris albida		
Paliolla cooki		
Paracuneus immaculatus		
Paracuneus kemblensis		
Paradoris dubia		
Paradrillia coriorudis		
Paradrillia coxi	Cox's Turrid	
Paradrillia garrardi		
Paradrillia metcalfei		
Paradrillia pilazona		
Paradrillia suavis		
Paradrillia torquata		
Paralaoma caputspinulae	Prickle Pinhead Snail	
Paralaoma servilis		
Paramontana fusca		
Paramontana mayana		
Paramontana modesta		
Paramontana rufozonata		
Paraoncidium chameleon		
Parastrophia (Parastrophia) cygnicollis		
Parviterebra brazieri		
Parviterebra trilineata	Three Lined Auger	
Patelloida alticostata	Tall-Ribbed Limpet	
Patelloida insignis	Maltese Cross Limpet	
Patelloida latistrigata		
Patelloida mimula		
Patelloida mufria	White Ridged Limpet	
Patelloida saccharina	Northern Star Limpet	
Patelloida victoriana		
Peculator porphyria		

Peculator verconis		
Pedicamista coesus		
Pedicularia pacifica		
Pelycidion xanthias		
Penion mandarinus	Waite's Buccinum Whelk	
Penion maximus	Whelk	
Petaloconchus caperatus		
Phallomedusa austrina		
Phallomedusa solida		
Phasianella angasi		
Phasianella australis	Australian Pheasant or Painted Lady	
Phasianella variegata	Variegated Pheasant	
Phasianella ventricosa	Common Pheasant	
Phasianotrochus apicinus	Pointed Kelp Shell	
Phasianotrochus bellulus	Necklace Weed Shell	
Phasianotrochus eximius	Kelp Shell	
Phasianotrochus irisodontes	Kelp Shells	
Phasianotrochus rutilus	Pink Tipped Kelp Shell	
Phenacolepas calva		
Philine angasi		
Philinopsis speciosa		
Philinopsis taronga		
Philippia lutea	Yellow Sundial	
Phos (Phos) senticosus	Pacific Phos	
Phycothais botanica		
Phycothais reticulata	Net Lepsiella	
Phyllocoma (Galfridus) speciosa	Pettard's Galfridus	
Phyllodesmium serratum		
Physa acuta		
Pilaflexis regularis		
Pisinna albizona		
Pisinna approxima		
Pisinna bicolor		
Pisinna castella		
Pisinna circumlabra		
Pisinna columnaria		
Pisinna costata		
Pisinna dubitabilis		
Pisinna flindersii		
Pisinna frauenfeldi		
Pisinna kershawi		
Pisinna megastoma		
Pisinna nitida		
Pisinna oblata		
Pisinna olivacea		
Pisinna tasmanica		
Pisinna tumida		
Pisinna varicifera		
Pisinna vincula		
Placida cremoniana		
Placida dendritica		
Plesiotrochus monachus	Monk Creeper	
Pleurobranchaea maculata		
Pleurobranchus albiguttatus		
Pleurobranchus peronii		
Pleuroloba quoyi		

Pleurotomella brenchleyi		
Pleurotomella bullata		
Pleurotomella rugosa		
Pleurotomella sepulta		
Pleurotomella spicula		
Plocamopherus imperialis		
Polinices (Glossaulax) aulacoglossa		
Polinices (Glossaulax) didyma	Bladder Moon Snail	
Polinices (Glossaulax) incei	Ince's Sand Snail	
Polinices catenoides		
Pollia bednalli		
Polycera capensis	Nudibranch	
Pommerhelix mastersi	Merimbula Woodland Snail	
Potamopyrgus antipodarum		
Powellisetia simillima		
Prietocella barbara	Small Pointed Snail	
Prolesophanta dyeri	Dyer's Carnivorous Snail	
Propebela costatus		
Propebela emina		
Propebela howelli		
Propebela kingensis		
Propebela subitus		
Propefusus undulatus		
Propescala translucida		
Propilidium tasmanicum		
Proterato denticulata		
Prothalotia lehmanni	Lesueur's Top Shell	
Prothalotia pulcherrimus	Crimson Lip Weed Shell	
Prototyphis angasi	Angas' Murex	
Pseudamycla dermestoidea		
Pseudamycla miltostoma		
Pseudestea pyramidatus		
Pseudoliotia micans		
Pseudopisinna gregaria		
Pseudorissoina capiticava		
Pseudorissoina tasmanica		
Pseudoskenella depressa		
Pseudostomatella decolorata		
Psilaxis oxytropis		
Pteraeolidia ianthina		
Pterochelus duffusi	Duffuse Murex	
Pterochelus triformis	Murex Shell	
Pterotrachea kingicola		
Pugillaria stowae		
Pugnus parvus		
Puncturella (Cranopsis) corolla	The Crown Puncturella	
Puncturella (Puncturella) demissa		
Puncturella (Puncturella) harrissoni	Harrison's Slot Limpet	
Pupa affinis		
Pupa tragulata		
Pusillina (Haurakia) angulata		
Pusillina (Haurakia) discrepans		
Putilla porcellana		
Pyrazus ebeninus	Hercules Club Whelk	
Pyreneola fulgida		
Pyreneola lurida		

Pyrgulina kreffti		
Pyrgulina pascoei		
Quasimitra solida	Solid Mitre	
Ranella australasia	Australian Triton	
Reticunassa compacta		
Reticunassa paupera	Poor Dog Whelk	
Retizafra calva		
Retizafra multicostata		
Retizafra plexa		
Retusa amphizosta		
Retusa atkinsoni		
Retusa iredaleana		
Retusa pelyx		
Retusa protumida		
Retusa pygmaea		
Ringicula australis		
Ringicula dolaris		
Ringicula grandinosa		
Ringicula semisculpta		
Rissoella (Jeffreysiella) fretterae		
Rissoella (Jeffreysiella) secunda		
Rissoella (Jeffreysiella) wilfredi		
Rissoella (Jeffreysilla) confusa		
Rissoella (Rissoella) fallax		
Rissoella (Zelaxitas) micra		
Rissoina (Rissoina) angasii		
Rissoina (Rissoina) cretacea		
Rissoina (Rissoina) elegantula		
Rissoina (Rissoina) fasciata		
Rissoina (Rissoina) ferruginea		
Rissoina (Rissoina) gertrudis		
Rissoina (Rissoina) iredalei		
Rissoina (Rissoina) nielseni		
Rissoina (Rissoina) nivea		
Rissoina (Rissoina) rhyllensis		
Rissoina (Rissoina) royana		
Rissoina (Rissoina) vincentiana		
Rissopsetia maccoyi		
Rissopsetia maoria		
Rixa watsoni		
Rolandiella umbilicata	Umbilicated Murex	
Roseomitra strangei		
Rostanga calumus		
Sabia conica		
Sabinella munita		
Sabinella schoutanica		
Sagaminopteron ornatum		
Sagenotriphora ampulla		
Salinator fragilis		
Salinator rhamphidia		
Sassia bassi	Bass's Triton	
Sassia epitrema		
Sassia garrardi		
Sassia kampyla		
Sassia parkinsonia	Parkinson's Triton	
Sassia petulans		

Sassia subdistorta	Somewhat-Distorted Triton	
Scalenostoma lodderae	Petterd's Stilifer	
Scelidoropa officeri	Circular Head Pinwheel Snail	
Scelidoropa tamarensis	Tamar River Pinwheel Snail	
Scissurella cyprina	Venus Slit Shell	
Scrinium brazieri		
Scrinium furtivum		
Scutellastra chapmani	Chapman's Limpet	
Scutellastra peronii	Scaly Limpet	
Scutus (Scutus) antipodes	Duck's Bill or Shield Shell	
Seila albosutura		
Seila crocea		
Seila insignis		
Seila magna		
Seilarex turritelliformis		
Semicassis (Semicassis) angasi	Angas' Bonnet	
Semicassis (Semicassis) labiata	Lipped Bonnet	
Semicassis (Semicassis) pyrum	Spotted Helmet	
Semicassis (Semicassis) royana	Hedley's Helmet	
Semicassis (Semicassis) sophia	Sophia's Helmet	
Semicassis (Semicassis) thomsoni	Thomson's Helmet	
Serrata mustelina		
Sigapatella hedleyi		
Sinezona beddomei	Beddome Slit Shell	
Sinezona pacifica		
Sinum zonale		
Sinutor incertum	Uncertain Top Shell	
Siphonaria diemenensis	Air-Breathing Limpet	
Siphonaria funiculata	Air-Breathing Limpet	
Siphonaria tasmanica		
Siphonaria zelandica	Air-Breathing Limpet	
Siphonochelus (Siphonochelus) syringianu	Piped Cyphonochelus	
Sirius badius		
Skenella castanea		
Skenella voorwindei		
Smaragdia (Smaragdella) souverbiana	Beautiful Neritina, Little Nerite	
Socienna apicicostata		
Socienna trisculpta		
Solatisonax injussa		
Spectamen epithecus		
Spectamen philippensis		
Specula turbonilloides		
Splendrillia eburnea		
Splendrillia lygdina		
Splendrillia nenia		
Splendrillia subviridis		
Splendrillia woodsi		
Stenacapha hamiltoni		
Stomatella impertusa	False Ear Shell	
Strangesta gawleri	Gawler Carnivorous Snail	
Styliferina translucida		
Styliola subula		
Succinea (Succinea) australis		
Sukashitrochus atkinsoni	Atkinson Slit Shell	
Sukashitrochus pulcher	Beautiful Slit Shell	
Sulcerato lachryma	Erato Cowry	

Suterilla julieae		
Sydaphera anxifer		
Sydaphera granosa	Granose Cross-Barred Shell	
Sydaphera lactea		
Sydaphera undulata	Waved Cross-Barred Shell	
Synthopsis exilis		
Syphonota geographica		
Syrnola angasi		
Syrnola aurantiaca		
Syrnola tasmanica		
Syrnola tincta		
Tambja cf. verconis		
Tambja verconis		
Tanea euzona	Painted Sand Snail	
Tanea luculenta		
Tanea sagittata		
Taranis mayi		
Tasmaphena ruga	Coarse-Ribbed Carnivorous Snail	
Tasmaphena sinclairi	Sinclair's Carnivorous Snail	
Tasmathera ricei	Riceâ€™S Pinwheel Snail	
Tasmatica schoutanica		
Tasmeuthria clarkei		
Tasmeuthria kingicola		
Tatea huonensis		
Tatea rufilabris		
Tayuva lilacina		
Tectonatica shorehami	Shoreham Sand Shell	
Teinostoma (Callomphala) lucida	Bright Liotia	
Teleochilus royanus		
Tenagodus australis	Australian Worm Shell	
Tenagodus weldii		
Tenguella marginalba	Mulberry Whelk	
Terebra lauretanae		
Teretriphora spica		
Thalotia conica	Conical Top Shell	
Theba pisana	White Italian Snail	
Thordisa verrucosa		
Thorunna perplexa		
Thryasona diemenensis		
Thylacodes sipho		
Tiberia bifasciata		
Tonna tankervillii		
Tonna tetracotula	Deep-Water Tun	
Tornatina apicina		
Tornatina exserta		
Trapania brunnea		
Tricolia rosea	Rosy Pheasant	
Trimusculus conica		
Tritia burchardi	Burchard's Dog Whelk	
Tritia ephamilla		
Trivellona excelsa		
Trivia merces		
Trivirostra edgari		
Trocholaoma parvissima	Tiny Pinhead Snail	
Truncatella scalarina		
Truncatella vincentiana		

Tubercliopsis dannevigi		
Tugali cicatricosa	Scar False Limpet	
Tugali parmophoidea	Flat Notched Limpet	
Turbo (Carswellena) gruneri	Turban Shell	
Turbo (Lunatica) militaris	Smooth Turban Shell	
Turbo (Marmarostoma) cepoides	Onion Turban Shell	
Turbonilla acicularis		
Turbonilla beddomei		
Turbonilla fusca		
Turbonilla gravis		
Turbonilla hedleyi		
Turbonilla hofmani		
Turbonilla mariae		
Turbonilla propingua		
Turbonilla scalpidens		
Turbonilla vana		
Turrella gracilis		
Turrella granulosissima		
Turrella letourneuxiana		
Turrella morologus		
Turrella subcostata		
Turrella tenuilirata		
Turriplicifer australis		
Turritriton labiosus	Wide-Lipped Triton	
Tylodina corticalis		
Tylospira scutulata	Ostrich Foot Shell	
Typhis (Typhis) phillipensis	Smoke Shell	
Typhlomangelia corona		
Umbilia hesitata	Wonder Cowry	
Umbraculum umbraculum		
Vacerrena kesteveni		
Vaceuchelus profundior		
Vanikoro cancellata		
Vanikoro expansa		
Vanikoro helicoidea		
Vanikoro sigaretiformis		
Vercomaris pergradata		
Verconia haliclona		
Vexillum (Costellaria) acromiale		
Vexitomina radulaeformis		
Victaphanta compacta	Otway Black Snail	
Victaphanta lampra	North Tasmanian Carnivorous Snail	
Vitellidelos helmsiana	Snowy Mountains Carnivorous Snail	
Vitreolina commensalis		
Volutomitra obscura	Magpie Mitre	
Volvarina hedleyi		
Volvulella rostrata		
Williamia radiata		
Xenophora (Xenophora) peroniana	Peronian Carrier Shell or Shell Collector	
Xenophora (Xenophora) solarioides		
Zaclys semilaevis		
Zafra columnaria		
Zafra smithi		
Zeacumantus diemenensis		
Zeacumantus plumbeus		
Zeadmete kulanda		

Zella beddomei		
Zemira australis	Australian Zemira	
Class: Polyplacophora (chitons)		
Acanthochitona bednalli		
Acanthochitona coxi		
Acanthochitona gatliffi		
Acanthochitona granostriata		
Acanthochitona kimberi		
Acanthochitona pilsbryi		
Acanthochitona retrojecta		
Acanthochitona sueurii		
Callistochiton antiquus		
Callochiton crocinus		
Callochiton mayi		
Craspedoplax variabilis		
Cryptoplax mystica		
Cryptoplax striata		
Ischnochiton (Autochiton) torri		
Ischnochiton (Haploplax) lentiginosus		
Ischnochiton (Haploplax) smaragdinus		
Ischnochiton (Heterozona) cariosus		
Ischnochiton (Heterozona) fruticosus		
Ischnochiton (Heterozona) subviridis		
Ischnochiton (Ischnochiton) carinulatus		
Ischnochiton (Ischnochiton) elongatus		
Ischnochiton (Ischnochiton) falcatus		
Ischnochiton (Ischnochiton) lineolatus		
Ischnochiton (Ischnochiton) variegatus		
Ischnochiton (Ischnochiton) versicolor		
Ischnochiton (Ischnoradsia) australis		
Ischnochiton fructicosus		
Leptochiton (Leptochiton) badius		
Leptochiton (Leptochiton) matthewsianus		
Leptoplax wilsoni		
Lorica volvox		
Notoplax costata		
Notoplax mayi		
Notoplax rubrostrata		
Notoplax speciosa		
Onithochiton quercinus		
Plaxiphora (Fremblya) matthewsi		
Plaxiphora (Plaxiphora) albida		
Rhyssoplax calliozona		
Rhyssoplax diaphora		
Rhyssoplax jugosa		
Subterenochiton gabrieli		
Sypharochiton pelliserpentis		
Class: Scaphopoda (tusk shells)		
Cadulus occiduus		
Cadulus simillimus		
Cadulus vincentianus		
Calliodentalium crocinum		
Compressidens platyceras		
Entalina dorsicostata		
Episiphon bordaensis		
Episiphon virgula		

Fissidentalium ponderi		
Fustiaria caesura		
Gadila bordaensis		
Gadila spreta		
Laevidentalium erectum		
Laevidentalium lubricatum		
Paradentalium francisense		
Paradentalium hemileuron		
Paradentalium octopleuron		
Polyschides gibbosus		
Phylum: NEMATODA		
Class: Dorylaimea (nematods)		
Capillaria ornamentata		
Eucoleus gastricus		
Eucoleus longiductus		
Eucoleus plumosus		
Eucoleus pseudoplumosus		
Xiphinema radicicola		
Class: Chromadorea (nematods)		
Achlysiella magniglans		
Achlysiella trilineata		
Breinlia (Breinlia) pseudocheiri		
Caloosia nudata		
Hemicriconemoides minor		
Morulaimus whitei		
Ogma (Pateracephalanema) imbricatum		
Ophidascaris robertsi		
Scutellonema insulare		
Xenocriconemella macrodorus		
Phylum: NEMERTEA		
Class: Nemertinea (ribbon worms)		
Baseodiscus delineatus		
Quasilineus lucidoculatus		
Phylum: PLATYHELMINTHES		
Class: Rhabditophora (flat worms)		
Australopacifica howitti		
Caenoplana coerulea		
Cestoplana rubrocincta		
Echinoplana celerrima		
Fletchamia sugdeni		
Notoplana australis		
Temnohaswellia comes		
Class: Trematoda (flat worms)		
Amphicreadium denspeniculus		
Ankistromeces mariae		
Athesmioides aiolos		
Brachylaima simile		
Brachylaima walterae		
Cableia pudica		
Cephalolepidapedon warehou		
Dasyurotrema mascomai		
Dicrocoelium antechini		

Dolichoperoides macalpini		
Elytrophalloides oatesi		
Monostephanostomum manteri		
Neodiplostomum intermedius		
Neodiplostomum spratti		
Opechona kahawai		
Postlepidapedon quintum		
Proenenterum ericotylum		
Proenenterum isocotylum		
Pseudocreadium aubreyi		
Pseudocreadium maturini		
Sanguinicola maritimus		
Weketrema hawaiiense		
Phylum: PORIFERA		
Class: Demospongiae (sponges)		
Callyspongia (Callyspongia) bilamellata		
Callyspongia (Callyspongia) ramosa		
Callyspongia (Callyspongia) spiculifera		
Callyspongia (Callyspongia) toxifera		
Callyspongia (Cladochalina) diffusa		
Carteriospongia vermicularis		
Chelonaplysilla violacea		
Chondropsis kirki		
Ciocalypta massalis		
Clathria (Axosuberites) canaliculata		
Clathria (Axosuberites) cylindrica		
Clathria (Axosuberites) thetidis		
Clathria (Clathria) transiens		
Clathria (Thalysias) cactiformis		
Clathria (Wilsonella) australiensis		
Craniella stewarti		
Dactylia varia		
Darwinella australiensis		
Dendrilla cactos		
Dendrilla rosea		
Dragmacidon clathriforme		
Echinoclathria axinelloides		
Holopsamma favus		
Holopsamma laminaefavosa		
Lissodendoryx (Lissodendoryx) isodictyalis		
Microtylostylifer anomalus		
Phorbas tenacior		
Phoriospongia carcinophila		
Psammocinia halmiformis		
Psammoclema bitextum		
Psammoclema densum		
Psammoclema goniodes		
Radiospongilla sceptroides		
Rhopaloeides odorabile		
Sigmaxinella hipposiderus		
Sigmosceptrella fibrosa		
Spheciospongia areolata		
Strepsichordaia caliciformis		
Strongylacidon stelliderma		
Suberites flabellatus		

Tedania (Tedania) anhelans		
Tethya bergquistae		
Tethya ingalli		
Thorectandra choanoides		
Class: Calcarea (sponges)		
Leucettusa imperfecta		
Leucettusa haeckeliana		
Phylum: SIPUNCULA		
Class: Phascolosomatidea (peanut worms)		
Phascolosoma (Phascolosoma) noduliferum		
Phascolosoma (Phascolosoma) annulatum		
Class: Sipunculidea		
Nephasoma (Nephasoma) schuettei		
Themiste (Lagenopsis) minor		
Sipunculus (Austrosiphon) mundanus		

Appendix 13

Victorian Biodiversity Atlas (VBA) database results

VICTORIAN BIODIVERSITY ATLAS - Sequoia 3D MSS EMBA			
Status	**Scientific Name**	**Common Name**	**Count of Sightings**
		Shorebirds	
	Apus pacificus	Fork-tailed Swift	25
vu	Arenaria interpres	Ruddy Turnstone	164
vu	Actitis hypoleucos	Common Sandpiper	46
	Calidris acuminata	Sharp-tailed Sandpiper	110
nt	Calidris alba	Sanderling	19
EN en	Calidris canutus	Red Knot	22
CR en L	Calidris ferruginea	Curlew Sandpiper	153
nt	Calidris melanotos	Pectoral Sandpiper	4
	Calidris ruficollis	Red-necked Stint	270
CR en L	Calidris tenuirostris	Great Knot	9
	Charadrius bicinctus	Double-banded Plover	150
VU cr	Charadrius leschenaultii	Greater Sand Plover	7
EN cr	Charadrius mongolus	Lesser Sand Plover	19
	Charadrius ruficapillus	Red-capped Plover	350
nt	Chlidonias hybrida	Whiskered Tern	14
nt	Chlidonias leucopterus	White-winged Black Tern	3
	Cladorhynchus leucocephalus	Banded Stilt	7
en L	Egretta garzetta	Little Egret	34
	Egretta sacra	Eastern Reef Egret	27
	Erythrogonys cinctus	Red-kneed Dotterel	15
	Esacus magnirostris	Beach Stone-curlew	14
	Eudyptes chrysocome	Rockhopper Penguin	3
	Eudyptes pachyrhynchus	Fiordland Penguin	6
	Eudyptes sclateri	Erect-crested Penguin	1
	Eudyptula minor	Little Penguin	523
en L	Gelochelidon macrotarsa	Australian Gull-billed Tern	9
nt	Haematopus fuliginosus	Sooty Oystercatcher	564
	Haematopus longirostris	Pied Oystercatcher	311
	Himantopus leucocephalus	Pied Stilt	39
	Larus dominicanus	Kelp Gull	96
nt	Larus pacificus	Pacific Gull	1306
CR en L	Lathamus discolor	Swift Parrot	16
	Limicola falcinellus	Broad-billed Sandpiper	1
VU	Limosa lapponica	Bar-tailed Godwit	59
vu	Limosa limosa	Black-tailed Godwit	7
	Microcarbo melanoleucos	Little Pied Cormorant	719
CR vu L	Numenius madagascariensis	Eastern Curlew	199
	Numenius minutus	Little Curlew	3
vu	Numenius phaeopus	Whimbrel	25
	Pelecanus conspicillatus	Australian Pelican	241
vu	Pluvialis fulva	Pacific Golden Plover	31
en	Pluvialis squatarola	Grey Plover	16

EN cr L	Rostratula australis	Australian Painted-snipe	13
	Spheniscus magellanicus	Magellanic Penguin	2
	Sterna hirundo	Common Tern	19
	Sterna paradisaea	Arctic Tern	6
nt	Sterna striata	White-fronted Tern	133
vu L	Sternula albifrons	Little Tern	44
VU en L	Sternula nereis	Fairy Tern	56
	Thalasseus bergii	Crested Tern	669
VU vu L	Thinornis cucullatus	Hooded Plover	1539
	Vanellus miles	Masked Lapwing	988
	Vanellus tricolor	Banded Lapwing	44
Seabirds			
	Aphrodroma brevirostris	Kerguelen Petrel	6
	Ardenna bulleri	Buller's Shearwater	2
	Ardenna carneipes	Flesh-footed Shearwater	10
	Ardenna grisea	Sooty Shearwater	26
	Ardenna pacifica	Wedge-tailed Shearwater	7
	Ardenna tenuirostris	Short-tailed Shearwater	357
	Chroicocephalus novaehollandiae	Silver Gull	1311
	Daption capense	Cape Petrel	29
VU vu L	Diomedea epomophora	Southern Royal Albatross	134
VU en L	Diomedea exulans	Wandering Albatross	276
	Fregata minor	Great Frigatebird	1
	Fulmarus glacialoides	Southern Fulmar	14
	Garrodia nereis	Grey-backed Storm-Petrel	2
en L	Gelochelidon macrotarsa	Australian Gull-billed Tern	9
vu L	Haliaeetus leucogaster	White-bellied Sea-Eagle	216
	Halobaena caerulea	Blue Petrel	15
EN vu L	Macronectes giganteus	Southern Giant-Petrel	53
VU nt L	Macronectes halli	Northern Giant-Petrel	144
	Macronectes spp.	Giant-Petrel species	17
	Morus serrator	Australasian Gannet	397
	Oceanites oceanicus	Wilson's Storm-Petrel	13
	Pachyptila belcheri	Slender-billed Prion	19
	Pachyptila crassirostris	Fulmar Prion	5
	Pachyptila desolata	Antarctic Prion	12
	Pachyptila salvini	Salvin's Prion	11
vu	Pachyptila turtur	Fairy Prion	231
	Pachyptila vittata	Broad-billed Prion	1
	Pagodroma nivea	Snow Petrel	1
	Pandion cristatus	Eastern Osprey	4
vu	Pelagodroma marina	White-faced Storm-Petrel	116
nt	Pelecanoides urinatrix	Common Diving-Petrel	104
	Phalacrocorax carbo	Great Cormorant	498
nt	Phalacrocorax fuscescens	Black-faced Cormorant	294
	Phalacrocorax sulcirostris	Little Black Cormorant	303
nt	Phalacrocorax varius	Pied Cormorant	408
VU L	Phoebetria fusca	Sooty Albatross	6

L	Phoebetria palpebrata	Light-mantled Sooty Albatross	1
	Procellaria aequinoctialis	White-chinned Petrel	3
	Procellaria cinerea	Grey Petrel	1
	Pterodroma inexpectata	Mottled Petrel	4
	Pterodroma lessonii	White-headed Petrel	20
EN	Pterodroma leucoptera	Gould's Petrel	3
	Pterodroma macroptera	Great-winged Petrel	21
	Pterodroma solandri	Providence Petrel	7
	Puffinus assimilis	Little Shearwater	5
	Puffinus gavia	Fluttering Shearwater	92
	Puffinus huttoni	Hutton's Shearwater	11
	Recurvirostra novaehollandiae	Red-necked Avocet	6
	Stercorarius antarcticus	Great Skua	27
	Stercorarius longicaudus	Long-tailed Jaeger	4
	Stercorarius parasiticus	Arctic Jaeger	46
	Stercorarius pomarinus	Pomarine Jaeger	16
VU L	Thalassarche bulleri	Buller's Albatross	4
VU vu L	Thalassarche carteri	Indian Yellow-nosed Albatross	217
VU vu L	Thalassarche cauta	Shy Albatross	176
EN vu L	Thalassarche chrysostoma	Grey-headed Albatross	46
VU vu	Thalassarche melanophris	Black-browed Albatross	479
Crustaceans			
	Cyclograpsus granulosus	Purple-mottled Shore Crab	1
	fam. Paguridae gen. Pagurid	Hermit Crabs	7
	Guinusia chabrus	Cleft-fronted Shore Crab	55
	Paragrapsus gaimardii	Red-spotted Shore Crab	2
	Paratya australiensis	Common Freshwater Shrimp	3
	Sagmariasus verreauxi	Eastern Rock Lobster	3
	Strigopagurus strigimanus	Stridulating Hermit Crab	5
Marine reptiles			
VU	Chelonia mydas	Green Turtle	1
EN cr L	Dermochelys coriacea	Leathery Turtle	8
VU	Eretmochelys imbricata	Hawksbill Turtle	1
EN cr L	Dermochelys coriacea	Leathery Turtle	8
Marine mammals			
X	Arctocephalus pusillus doriferus	Australian Fur Seal	50
vu	Arctophoca forsteri	Long-nosed Fur Seal	22
EN	Arctophoca tropicalis	Subantarctic Fur Seal	2
	Balaenoptera acutorostrata	Common Minke Whale	2
VU dd	Balaenoptera borealis schlegelii	Southern Sei Whale	1
EN cr L	Balaenoptera musculus	Blue Whale	32
	Delphinus delphis	Short-beaked Common Dolphin	11
EN cr L	Eubalaena australis	Southern Right Whale	70
	Globicephala melas	Long-finned Pilot Whale	3
	Hydrurga leptonyx	Leopard Seal	28
	Kogia breviceps	Pygmy Sperm Whale	1
*	Lepus europaeus	European Brown Hare	3
	Lobodon carcinophagus	Crabeater Seal	1

VU vu L	Megaptera novaeangliae australis	Southern Humpback Whale	64
	Mesoplodon layardi	Strap-toothed Whale	2
VU	Mirounga leonina	Southern Elephant Seal	3
VU	Neophoca cinerea	Sea-lion	3
	Orcinus orca	Killer Whale	35
en L	Tursiops australis	Burrunan Dolphin	7
	Tursiops truncatus	Common Bottle-nosed dolphin	14
Marine Invertebrates			
	Apsolidium densum	Sea Cucumber 5251	1
	Argobuccinum tumidum	Flag Triton	2
*	Argyranthemum frutescens subsp. frutescens	Marguerite	2
*	Arisarum vulgare subsp. vulgare	Common Arisarum	1
	Arrhenechthites mixtus	Purple Fireweed	1
	Astralium tentoriformis	Common Tent Shell	17
	Austrocochlea constricta	Common Periwinkle	84
	Austrocochlea odontis	Checkered Periwinkle	2
	Austrocochlea porcata	Common Periwinkle	2
vu L	Bassethullia glypta	Chiton 5254	1
	Bembicium melanostomum	Common Conniwink	32
	Bembicium nanum	Striped-mouth Conniwink	68
	Brachidontes rostratus	Beaked Mussel	4
	Cabestana spengleri	Spengler's Triton	22
	Cabestana tabulata	Ploughed Triton	2
	Calliostoma (Fautor) armillatum	Jewelled Top Shell	3
	Catomerus polymerus	Surf Barnacle	3
	Cellana tramoserica	Common Limpet	49
	Cenolia tasmaniae	Feather star	4
	Cenolia trichoptera	Feather star	34
	Centrostephanus rodgersii	Black Sea Urchin	47
	Charonia lampas	Australian Red Triton	1
	Chromodoris tinctoria	Sea Slug	2
	Chthamalus antennatus	Six-plated Barnacle	8
	Cominella (Cominella) lineolata	Lineated Buccinum Whelk	12
	Coscinasterias muricata	Eleven-armed Seastar	3
	Echinaster arcystatus	Seastar	19
	Fromia polypora	Seastar	1
	Galeolaria caespitosa	tube worm	12
	Haliotis laevigata	Green-lip Abalone	8
	Haliotis rubra	Black-lip Abalone	265
	Haliotis scalaris	Ridged Ear Shell	4
	Heliocidaris erythrogramma	Sea urchin	58
	Hypselodoris bennetti	Sea slug	4
	Jasus edwardsii	Red Rock Lobster	32
	Lepsiella (Lepsiella) vinosa	Grape Lepsithais	65
	Lunella (Subninella) undulatus	Common Warrener	109
	Meridiastra calcar	Eight-armed Cushion Star	1
	Meridiastra gunnii	Seastar	35
	Mitra (Mitra) glabra	Glabra Mitre Shell	1

	Montfortula rugosa	Cap-shaped False Limpet	9
	Nectria macrobrachia	Seastar	16
	Nectria multispina	Seastar	12
	Nectria ocellata	Seastar	25
	Nerita (Lisanerita) atramentosa	Black Crow Sea Snail	40
	Nodilittorina unifasciata	Banded Periwinkle	2
	Notoacmea mayi	limpet	11
	Notocypraea angustata	Brown Cowry	1
	Octopus maorum	Maori Octopus	1
	Onchidella patelloides		2
*	Onopordum acanthium subsp. acanthium	Scotch Thistle	1
	Opercularia aspera	Coarse Stinkweed	8
	Opercularia hispida	Hairy Stinkweed	2
	Opercularia varia	Variable Stinkweed	8
	Parvulastra exigua	Five-armed Cushion Star	35
	Patelloida alticostata	Tall-ribbed Limpet	8
	Patelloida insignis	Maltese Cross Limpet	1
	Patelloida latistrigata		3
	Penion mandarinus	Waite's Buccinum Whelk	1
	Pentagonaster duebeni	Vermillion Seastar	5
	Petricia vernicina	Velvet Seastar	9
	Phasianella australis	Australian Pheasant Shell	1
	Phasianella ventricosa	Common Pheasant Shell	2
	Phasianotrochus eximius	Kelp Shell	1
	phy. Mollusca cla. Gastropoda	Gastropods	17
	phy. Mollusca cla. Polyplacophora	Chitons	2
	Phyllacanthus parvispinus	Sea urchin	1
	Plectaster decanus	Seastar	1
	Pleuroploca australasia	Australian Horse Conch	25
	Pseudonepanthia troughtoni	Seastar	11
	Ranella australasia	Australian Triton	4
	Sagaminopteron ornatum	bubble snail	3
	Scutellastra chapmani	Chapman's Limpet	2
	Scutus (Scutus) antipodes	Boat Shell	18
	Siphonaria diemenensis		31
	Siphonaria spp.	False Limpets	38
	subc. Opisthobranchia ord. Nudibranchia	Nudibranchs	1
	Tambja verconis	Sea slug	1
	Tosia australis	Biscuit Star	29
	Tosia magnifica	Biscuit Star	1
	Uniophora granifera	Five-armed Seastar	1
	Xenostrobus pulex	Little Black Horse Mussel	18
Fish			
	Acanthaluteres vittiger	Toothbrush Leatherjacket	14
	Acanthopagrus butcheri	Black Bream	1
	Achoerodus viridis	Eastern Blue Groper	8
	Aetapcus maculatus	Warty Prowfish	2
	Anguilla australis	Southern Shortfin Eel	8

	Anguilla reinhardtii	Longfin Eel	3
	Aplodactylus arctidens	Marblefish	19
	Aplodactylus lophodon		34
	Aracana aurita	Shaw's Cowfish	5
	Aracana ornata	Ornate Cowfish	2
	Atherinosoma microstoma	Smallmouthed Hardyhead	2
	Atypichthys strigatus	Mado	68
	Cephaloscyllium laticeps	Draughtboard Shark	1
	Cheilodactylus fuscus	Red Morwong	2
	Cheilodactylus nigripes	Magpie Perch	38
	Cheilodactylus spectabilis	Banded Morwong	39
	Chironemus marmoratus	Eastern Kelpfish	13
	Chromis hypsilepis	Onespot Puller	15
	Contusus brevicaudus	Prickly Toadfish	1
*	Cyprinus carpio	European Carp	2
	Dactylophora nigricans	Dusky Morwong	14
	Dasyatis brevicaudata	Smooth Stingray	1
	Dinolestes lewini	Longfin Pike	40
	Diodon nicthemerus	Globefish	17
	Dotalabrus aurantiacus		2
	Enoplosus armatus	Old Wife	18
	Eubalichthys bucephalus	Black Reef Leatherjacket	4
	Eubalichthys mosaicus	Mosaic Leatherjacket	2
	fam. Eleotridae gen. Philypnodon	Flat-headed Gudgeons	2
	Galaxias brevipinnis	Climbing Galaxias	1
	Galaxias maculatus	Common Galaxias	10
	Galaxias ornatus	Ornate Galaxias	1
	Galaxias truttaceus	Spotted Galaxias	4
*	Gambusia holbrooki	Eastern Gambusia	1
	Girella elevata	Rock Blackfish	4
	Girella tricuspidata	Luderick	7
	Girella zebra	Zebra fish	33
	Heteroclinus johnstoni	Johnston's Weedfish	1
	Heterodontus portusjacksoni	Port Jackson Shark	2
	Kyphosus sydneyanus	Silver Drummer	10
	Latridopsis forsteri	Bastard Trumpeter	5
	Lotella rhacina		2
	Meuschenia flavolineata	Yellowstriped Leatherjacket	18
	Meuschenia freycineti	Sixspine Leatherjacket	59
	Meuschenia galii	Blue-lined Leatherjacket	2
	Meuschenia hippocrepis	Horse-shoe leatherjacket	24
	Mugil cephalus	Sea Mullet	2
	Nemadactylus douglasi		1
	Notolabrus fucicola	Purple Wrasse	82
	Notolabrus gymnogenis	Crimsonband Wrasse	4
	Notolabrus tetricus	Blue Throated Wrasse	132
	Olisthops cyanomelas	Herring Cale	95
	Ophthalmolepis lineolatus	Southern Maori Wrasse	21

	Orectolobus maculatus	Wobbegong	1
	Osteichthyes spp.	Bony fish	5
	Parablennius tasmanianus	Tasmanian Blenny	1
	Parascyllium variolatum	Varied Catshark	11
*	Paraserianthes lophantha subsp. lophantha	Cape Wattle	1
	Parequula melbournensis	Silverbelly	1
	Parma microlepis	White-ear	45
	Parma victoriae	Scalyfin	57
	Pempheris multiradiata		4
	Pentaceropsis recurvirostris	Longsnout boarfish	2
*	Perca fluviatilis	Redfin	1
	Percalates colonorum	Estuary Perch	1
X	Percalates novemaculeatus	Australian Bass	3
	Philypnodon grandiceps	Flatheaded Gudgeon	3
	Philypnodon macrostomus	Dwarf Flatheaded Gudgeon	11
	Phyllopteryx taeniolatus	Common Seadragon	1
	Pseudaphritis urvillii	Tupong	2
	Pseudocaranx georgianus	Silver Trevally	4
	Pseudogobius sp. 9	Eastern Bluespot Goby	1
	Pseudolabrus mortonii	Rosy Wrasse	1
	Pseudophycis bachus	Red Rock Cod	1
	Retropinna semoni	Australian Smelt	3
	Retropinna sp. 2	Eastern Australian Smelt	2
	Scorpaena papillosa	Southern Red Scorpionfish	1
	Scorpis aequipinnis	Sea Sweep	43
	Scorpis lineolata	Silver Sweep	23
	Sepia apama	Giant Cuttlefish	2
	Sepioteuthis australis	Southern Calamari Squid	1
	Siphonognathus beddomei	Pencil Weed Whiting	1
	Sphyraena novaehollandiae	Snook	5
	supo. Decapodiformes ord. Teuthida	Squids	1
	Tetractenos glaber	Smooth Toadfish	7
NT L	Thunnus maccoyii	Southern Bluefin Tuna	1
	Tilodon sexfasciatus	Moonlighter	3
	Trachinops caudimaculatus	Southern Hulafish	3
	Trachinops taeniatus	Eastern Hulafish	8
	Trachurus novaezelandiae	Yellowtail Scad	12
	Trinorfolkia clarkei	Clarks Threefin	1
	Upeneichthys vlamingii	Bluespotted Goatfish	19
	Urolophus paucimaculatus	Sparsely-spotted Stingaree	1
Echinoderms			
	Aulactinia veratra	Anemone	19
	Holopneustes inflatus	Seagrass Sea Urchin	3
	Holopneustes porossimus	Sea urchin	5
	Oulactis muscosa	anemone	2
Marine Flora			
	Acrocarpia paniculata	Brown algae	210
	Acrotylus australis		6

	Actinia tenebrosa	Waratah Anemone	11
	Algae Algal turf		57
	Algae spp.	Algae	6
k	Amphibolis antarctica	Sea Nymph	2
	Amphiroa anceps		141
	Amphiroa gracilis		1
	Apjohnia laetevirens	Green algae	1
	Areschougia congesta		5
	Areschougia spp.	Red Algae	1
	Arthrocardia wardii		37
	Asparagopsis armata		1
	Ballia callitricha		51
	Botryocladia sonderi		1
	Bovichtus angustifrons		3
	Callophycus laxus		2
	Callophyllis lambertii		15
	Callophyllis rangiferina		20
	Camontagnea oxyclada		1
	Carpoglossum confluens	Brown algae	9
	Carpomitra costata	Brown algae	33
	Caulerpa brownii	Green algae	58
	Caulerpa cactoides	Green algae	1
	Caulerpa flexilis	Green algae	7
	Caulerpa flexilis var. muelleri	Green algae	32
	Caulerpa geminata	Green algae	2
	Caulerpa hodkinsoniae	Green algae	1
	Caulerpa longifolia	Green algae	5
	Caulerpa scalpelliformis	Green algae	3
	Caulerpa simpliciuscula	Green algae	16
	Caulocystis cephalornithos	Brown algae	17
	Chaetomorpha coliformis	Green algae	2
	Chaetomorpha spp.	Green Algae	8
	Champia spp.	Red Algae	3
	Cheilosporum sagittatum		142
	Chlanidophora microphylla	brown alga	7
	Cladostephus spongiosus	Brown algae	8
	Codium galeatum	Green algae	13
	Codium pomoides	Green Algae	9
	Codium spp.	Green Algae	1
	Colpomenia peregrina	Brown algae	10
	Corallina officinalis		44
	Corallinaceae spp.	Coralline Algae	552
	Curdiea angustata		5
	Cystophora monilifera	Brown Algae	35
	Cystophora moniliformis	Brown Algae	126
	Cystophora platylobium		36
	Cystophora retorta	Brown Algae	129
	Cystophora retroflexa	Brown Algae	117

	Cystophora siliquosa	Brown Algae	1
	Cystophora subfarcinata	Brown Algae	2
	Delisea pulchra		31
	Dictyopteris acrostichoides	Brown algae	1
	Dictyopteris muelleri	Brown algae	3
	Dictyota dichotoma	Brown algae	20
	Dictyota diemensis	Brown algae	3
	Dillwynia cinerascens s.l.	Grey Parrot-pea	1
	Dillwynia glaberrima	Smooth Parrot-pea	34
	Dillwynia sericea	Showy Parrot-pea	4
	Dillwynia sericea subsp. 1 (Southern Victoria)	Rough Parrot-pea	9
	Echinothamnion hystrix		2
	Ecklonia radiata	Brown algae	142
	Enteromorpha spp.	Tubular Green Alga	8
	Erythroclonium muelleri		2
	Erythroclonium sonderi		1
	Erythrymenia minuta		14
	Euptilota articulata		12
	fam. Dasyaceae gen. Dasya	Red Algae	1
	fam. Dictyotaceae gen. Padina		7
	fam. Gracilariaceae gen. Gracilaria	Red Algae	1
	fam. Rivulariaceae gen. Rivularia	Filamentous Cyanobacteria	8
	fam. Scytosiphonaceae gen. Colpomenia	Brown Algae	1
	Galaxaura marginata	Red Algae	10
	Gelidium asperum		17
	Gelidium australe		6
	Gelidium spp.	Red Algae	1
	Gloiosaccion brownii		2
	Halopteris spp.	Brown Algae	144
	Hemineura frondosa		11
r	Heterozostera nigricaulis	Australian Grass-wrack	1
	Homoeostrichus sinclairii	Brown algae	15
	Hymenocladia chondricola		1
	Hypnea ramentacea		11
	Jania rosea		377
	Laurencia elata		4
	Laurencia filiformis		4
	Laurencia spp.	Red Algae	4
	Lenormandia marginata		2
	Lobophora variegata	Brown algae	4
	Lobospira bicuspidata	Brown algae	22
	Macrocystis pyrifera	Brown algae	161
	Melanthalia concinna		1
	Melanthalia obtusata		10
	Metagoniolithon radiatum		131
	Mychodea acanthymenia		1
	Myriophyllum amphibium	Broad Water-milfoil	2
	Myriophyllum propinquum s.l.	Water Milfoil	1

	Myriophyllum simulans	Amphibious Water-milfoil	1
	Myriophyllum spp.	Water Milfoil	4
	Nizymenia australis		4
	Notheia anomala	Brown algae	4
	ord. Ceramiales fam. Ceramiaceae	Red Algae	1
	Perithalia caudata	Brown algae	31
	Peyssonnelia novaehollandiae		1
	Peyssonneliaceae spp.	Red Algae	10
	Phacelocarpus peperocarpus		68
	Phaeophyceae spp.	Brown Algae	15
	Phyllospora comosa	Brown algae	440
	Phyllotricha decipiens	Brown algae	1
	Phyllotricha verruculosum	Brown algae	12
	Plocamium angustum		84
	Plocamium cartilagineum		5
	Plocamium dilatatum		54
	Plocamium leptophyllum		4
	Plocamium mertensii		9
	Plocamium pressianum		13
	Pterocladia lucida		14
	Pterocladiella capillacea		9
	Ptilonia australasica		17
	Rhodopeltis australis		5
	Rhodophyta other thallose red algae	Red Algae	62
	Rhodophyta spp.	Red Algae	5
	Rhodymenia australis		28
	Rhodymenia linearis		33
	Rhodymenia obtusa		4
	Rhodymenia spp.	Red Algae	1
	Rhodymenia wilsonii		2
	Rugulopteryx okamurae	Brown algae	1
	Sargassum fallax	Brown Algae	16
	Sargassum spinuligerum	Brown Algae	5
	Sargassum spp.	Brown Algae	95
	Sargassum vestitum	Brown Algae	16
	Seirococcus axillaris	Brown algae	80
	Sonderopelta coriacea		4
	subf. Phormidioideae gen. Symploca	Cyanobacteria	6
	Ulva spp.		63
	Xiphophora chondrophylla	Brown algae	50
	Zonaria angustata	Brown algae	8
	Zonaria crenata	Brown algae	6
	Zonaria spiralis	Brown algae	28
	Zonaria spp.	Brown Algae	3
	Zonaria turneriana	Brown algae	76
	Zostera muelleri	Dwarf Grass-wrack	1

Appendix 14

Shorebirds 2020 database results

Shorebirds 2020 database extract for the EMBA - sorted by species

Scientific Name	Common Name	Count
Actitis hypoleucos	Common Sandpiper	86
Ardea alba	Great Egret	1,293
Ardea intermedia	Intermediate Egret	17
Ardenna tenuirostris	Short-tailed Shearwater	35
Arenaria interpres	Ruddy Turnstone	1,263
Botaurus poiciloptilus	Australasian Bittern	12
Bubulcus ibis	Cattle Egret	52
Calidris acuminata	Sharp-tailed Sandpiper	1,706
Calidris alba	Sanderling	240
Calidris canutus	Red Knot	771
Calidris ferruginea	Curlew Sandpiper	2,422
Calidris melanotos	Pectoral Sandpiper	56
Calidris minuta	Little Stint	1
Calidris pugnax	Ruff	15
Calidris ruficollis	Red-necked Stint	4,334
Calidris subminuta	Long-toed Stint	4
Calidris subruficollis	Buff-breasted Sandpiper	2
Calidris tenuirostris	Great Knot	183
Charadrius bicinctus	Double-banded Plover	1,810
Charadrius leschenaultii	Greater Sand Plover	54
Charadrius mongolus	Lesser Sand Plover	223
Charadrius ruficapillus	Red-capped Plover	4,047
Chlidonias hybrida	Whiskered Tern	195
Chlidonias leucopterus	White-winged Black Tern	14
Chroicocephalus novaehollandiae	Silver Gull	3,738
Cladorhynchus leucocephalus	Banded Stilt	17
Cladorhynchus leucocephalus	Banded Stilt	334
Egretta garzetta	Little Egret	378
Egretta sacra	Eastern Reef Egret	5
Elseyornis melanops	Black-fronted Dotterel	453
Erythrogonys cinctus	Red-kneed Dotterel	322
Esacus magnirostris	Beach Stone-curlew	3
Eudyptula minor	Little Penguin	29
Gallinago hardwickii	Latham's Snipe	264
Gelochelidon macrotarsa	Australian Gull-billed Tern	104
Gelochelidon nilotica	Common Gull-billed Tern	14
Haematopus finschi	South Island Pied Oystercatcher	2
Haematopus fuliginosus	Sooty Oystercatcher	1,696
Haematopus longirostris	Australian Pied Oystercatcher	4,470
Haliaeetus leucogaster	White-bellied Sea-Eagle	256
Himantopus leucocephalus	Black-winged Stilt	1,016
Hirundapus caudacutus	White-throated Needletail	1
Hydroprogne caspia	Caspian Tern	1,460
Larus dominicanus	Kelp Gull	3
Larus pacificus	Pacific Gull	2,731
Limosa haemastica	Hudsonian Godwit	3
Limosa lapponica	Bar-tailed Godwit	1,320
Limosa limosa	Black-tailed Godwit	130
Microcarbo melanoleucos	Little Pied Cormorant	2,624
Morus serrator	Australasian Gannet	135
Neophema chrysogaster	Orange-bellied Parrot	2
Numenius madagascariensis	Eastern Curlew	2,389
Numenius phaeopus	Whimbrel	459

Pachyptila turtur	Fairy Prion	1
Pandion haliaetus	Osprey	3
Pelagodroma marina	White-faced Storm-Petrel	1
Pelecanus conspicillatus	Australian Pelican	2,221
Phalacrocorax fuscescens	Black-faced Cormorant	123
Phalacrocorax sulcirostris	Little Black Cormorant	1,281
Phalacrocorax varius	Pied Cormorant	1,641
Pluvialis fulva	Pacific Golden Plover	838
Pluvialis squatarola	Grey Plover	388
Puffinus gavia	Fluttering Shearwater	4
Recurvirostra novaehollandiae	Red-necked Avocet	596
Rostratula australis	Australian Painted Snipe	5
Stercorarius parasiticus	Arctic Jaeger	5
Sterna hirundo	Common Tern	59
Sterna striata	White-fronted Tern	2
Sternula albifrons	Little Tern	212
Sternula nereis	Fairy Tern	491
Thalasseus bergii	Crested Tern	1,973
Thinornis cucullatus	Hooded Plover	731
Tringa brevipes	Grey-tailed Tattler	388
Tringa glareola	Wood Sandpiper	32
Tringa nebularia	Common Greenshank	2,086
Tringa stagnatilis	Marsh Sandpiper	281
Vanellus miles	Masked Lapwing	5,825
Vanellus tricolor	Banded Lapwing	50
Xenus cinereus	Terek Sandpiper	180

Shorebird region search areas:
- Jake Smith Lake
- Seaspray
- Gippsland Lakes
- Lake Tyers
- Snowy River Estuary
- Mallacoota Inlet

Appendix 15

Underwater sound transmission loss modelling report

Sequoia 3D Marine Seismic Survey

Acoustic Modelling for Assessing Marine Fauna Sound Exposures

Submitted to:

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Disclaimer:

The results presented herein are relevant within the specific context described in this report. They could be misinterpreted if not considered in the light of all the information contained in this report. Accordingly, if information from this report is used in documents released to the public or to regulatory bodies, such documents must clearly cite the original report, which shall be made readily available to the recipients in integral and unedited form.

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Executive Summary

JASCO Applied Sciences (JASCO) performed a numerical estimation study of underwater sound levels associated with the proposed Sequoia 3D Marine Seismic Survey (MSS) to assist in understanding the potential acoustic effect on receptors including marine mammals, fish, sea turtles and invertebrates. The Sequoia 3D MSS is proposed by ConocoPhillips Australia SH1 Pty Ltd (ConocoPhillips Australia). Modelling considered a 3480 cubic inch (in^3) seismic source in a dual source configuration (18.75 m inter pulse interval), towed at 6 m depth behind a single vessel.

A specialised airgun array source model was used to predict the acoustic signature of the seismic source, and complementary underwater acoustic propagation models were used in conjunction with the modelled array signature to estimate sound levels over a large area around the source. Single-impulse sound fields were predicted at eleven sites within the survey acquisition area. The water depths at the modelled sites ranged between 61 and 798 m. Accumulated sound exposure fields were predicted for two representative scenarios for likely operations within the survey area over 24 hours.

The modelling methodology considered source directivity and range-dependent environmental properties in each location assessed. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p), zero-to-peak pressure levels (PK, L_{pk}), peak-to-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$), particle acceleration (peak magnitude), and either single-impulse (i.e., per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria. A conservative sound speed profile that would be most supportive of sound propagation conditions for the period of the survey was defined and applied to all modelling.

The sound footprints are highly directional, and while the maximum distances to criteria are presented in the summary, this distance may not be relevant to receptors or areas of interest in a specific direction. For example, the distances to SPL thresholds for behavioural response in marine mammals, and behavioural response and disturbance in turtles are typically greater for the shallower sites, then those close to the continental shelf. However, the orientation of the source is also key, as the array has a pronounced directivity pattern, with greater distances to sound levels in the broadside direction (perpendicular to the tow direction) as compared to the endfire direction (along the tow direction).

The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. Where the corresponding SEL_{24h} radii are larger than those for peak pressure criteria, they often represent an unlikely worst-case scenario. More realistically, marine mammals, fish and sea turtles would not stay in the same location for 24 hours (especially in the absence of location-specific habitat, such as reef), but rather a shorter period, depending upon their behaviour and the proximity and movements of the source. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either permanent threshold shift (PTS) or temporary threshold shift (TTS)) if it remained in that location for 24 hours.

The analysis considered the distances away from the seismic source at which several effects criteria or relevant sound levels were reached. The results are summarised over page for the representative single-impulse sites and accumulated SEL scenarios in Tables 1–4. The impact criteria for impairment of marine mammals, fish and sea turtles use dual metrics (PK and SEL_{24h}), and the longest distance associated with either metric is required to be applied, and thus is presented in this summary.

Marine mammals

Table 1. Maximum (R_{max}) horizontal distances (in km) from modelled sites or within SEL_{24h} modelled scenarios to behavioural response, TTS and PTS thresholds for marine mammals (maximum-over-depth).

Hearing group	Modelled distance (in km) to effect threshold (R_{max})		
	Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
Low-frequency (LF) cetaceans	11.1	56.6	1.18
Mid-frequency cetaceans		0.08	-
High-frequency cetaceans		0.62	0.34
Phocid pinnipeds in water		0.72	0.08
Otariid pinnipeds in water		0.08	–

[1] Noise exposure criteria: NOAA (2019)
[2] Noise exposure criteria: NMFS (2018a)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Sea turtles

Table 2. Maximum (R_{max}) horizontal distances (in km) from modelled sites or within SEL_{24h} modelled scenarios to behavioural response, TTS and PTS thresholds for sea turtles (maximum-over-depth).

Hearing group	Modelled distance (in km) to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Turtles	1.66	5.43	0.50	0.08

[1] Noise exposure criteria: NSF (2011)
[2] Noise exposure criteria: McCauley et al. (2000a)
[3] Noise exposure criteria: Finneran et al. (2017)

Fish, fish eggs, and fish larvae

This modelling study assessed the ranges for quantitative criteria based on Popper et al. (2014) and considered both PK (seafloor and water column) and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:

- Fish without a swim bladder (also appropriate for sharks in the absence of other information)
- Fish with a swim bladder that do not use it for hearing
- Fish that use their swim bladders for hearing
- Fish eggs and fish larvae

Table 3. Summary of maximum fish, fish eggs, and larvae injury and TTS onset distances for single impulse and SEL_{24h} modelled scenarios, maximum-over-depth.

<table>
<tr><th rowspan="2">Relevant hearing group</th><th rowspan="2">Effect criteria</th><th colspan="2">Scenario 1</th><th colspan="2">Scenario 2</th></tr>
<tr><th>Metric associated with longest distance to criteria</th><th>R_{max} (km)</th><th>Metric associated with longest distance to criteria</th><th>R_{max} (km)</th></tr>
<tr><td rowspan="2">Fish:
No swim bladder</td><td>Injury</td><td>SEL_{24h}</td><td>0.08</td><td>SEL_{24h}</td><td>0.08</td></tr>
<tr><td>TTS</td><td>SEL_{24h}</td><td>2.55</td><td>SEL_{24h}</td><td>2.52</td></tr>
<tr><td rowspan="2">Fish:
Swim bladder not involved in hearing and Swim bladder involved in hearing</td><td>Injury</td><td>PK</td><td>0.17</td><td>PK</td><td>0.13</td></tr>
<tr><td>TTS</td><td>SEL_{24h}</td><td>2.55</td><td>SEL_{24h}</td><td>2.52</td></tr>
<tr><td>Fish eggs, and larvae</td><td>Injury</td><td>PK</td><td>0.17</td><td>PK</td><td>0.13</td></tr>
</table>

Table 4. Summary of maximum fish TTS onset distances for SEL_{24h} modelled scenarios, seafloor receptors.

<table>
<tr><th rowspan="2">Relevant hearing group</th><th rowspan="2">Effect criteria</th><th colspan="2">Scenario 1</th><th colspan="2">Scenario 2</th></tr>
<tr><th>Metric associated with longest distance to criteria</th><th>R_{max} (km)</th><th>Metric associated with longest distance to criteria</th><th>R_{max} (km)</th></tr>
<tr><td>Fish:
No swim bladder</td><td rowspan="3">TTS</td><td rowspan="3">SEL_{24h}</td><td rowspan="3">2.36</td><td rowspan="3">SEL_{24h}</td><td rowspan="3">2.40</td></tr>
<tr><td>Fish:
Swim bladder not involved in hearing and Swim bladder involved in hearing</td></tr>
<tr><td>Fish eggs, and larvae</td></tr>
</table>

Invertebrates, Sponges, Coral, and Plankton

To assist with assessing the potential effects on these receptors, the following were determined:

- Crustaceans (lobster and crab): The sound level of 202 dB re 1 µPa PK-PK from Payne et al. (2008) was considered for seafloor sound levels; the sound level was reached at ranges between 0.324 and 0.414 km depending on the modelled site.
- Bivalves: The distance where a particle acceleration of 37.57 ms^{-2} at the seafloor could occur was determined for comparing to results presented in Day et al. (2016a). The maximum distance to this particle acceleration level was 1.5 m for the two considered sites.

- Sponges and coral: the PK sound level at the seafloor directly underneath the seismic source was estimated at all modelled sites and compared to the sound level of 226 dB re 1 µPa PK for sponges and corals (Heyward et al. 2018); it was reached at 4 m from a single modelled site.
- Octopus and squid: The maximum (R_{max}) and 95% ($R_{95\%}$) distances to the sound level of 162 dB re 1 µPa²·s from Fewtrell and McCauley (2012) associated with inking, and referred to as a startle response threshold, was estimated to be 3.34 and 2.14 km respectively.

1. Introduction

JASCO Applied Sciences (JASCO) performed a numerical estimation study of underwater sound levels associated with the proposed Sequoia 3D Marine Seismic Survey (MSS) to assist in understanding the potential acoustic effect on receptors including marine mammals, fish, sea turtles, octopus and squid, benthic invertebrates, plankton, sponges and corals. The Sequoia 3D MSS is proposed by ConocoPhillips Australia SH1 Pty Ltd (ConocoPhillips Australia).

JASCO's specialised Airgun Array Source Model (AASM) was used to predict acoustic signatures and spectra for two comparable arrays under initial consideration for the Sequoia 3D MSS. The total volumes of each array were 3440 cubic inches (in^3) and 3480 in^3. AASM accounts for individual airgun volumes, airgun bubble interactions, and array geometry to yield accurate source predictions.

Complementary underwater acoustic propagation models were used in conjunction with the selected array signature to estimate sound levels considering environmental effects. Single-impulse sound fields were predicted at eleven defined locations within the potential survey area, and an accumulated sound exposure field was predicted for two representative scenarios for survey operations over 24 h (Section 2). A conservative sound speed profile that would be most supportive of sound propagation conditions for the potential survey period was defined and applied throughout.

The modelling methodology considered source directivity and range-dependent environmental properties. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p), zero-to-peak pressure levels (PK, L_{pk}), peak-to-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$), particle acceleration (peak magnitude), and either single-impulse (i.e., per-pulse) or accumulated sound exposure levels (SEL, L_E) as appropriate for different, species specific noise effect sound levels, guidelines and thresholds.

Section 3 explains the metrics used to represent underwater acoustic fields and the effect criteria considered. Section 4 details the methodology for predicting the source levels and modelling the sound propagation, including the specifications of the seismic source and all environmental parameters the propagation models require. Section 5 presents the results, which are then discussed and summarised in Section 6.

2. Modelling Scenarios

Eleven standalone single impulse sites and two scenarios for survey operations over 24 hours to assess accumulated SEL were modelled. The locations of all modelled sites are listed in Table 5, with all sites and the acquisition lines shown in Figure 1 along with the survey boundaries. Based on input from ConocoPhillips Australia, the modelling assumed that a survey vessel sailed along survey lines at ~4.5 knots, with an impulse interval of 18.75 m.

The single impulse sites and the accumulated SEL scenarios were selected based on the proposed survey line plan option where the survey will be acquired along survey lines orientated either 0 or 180°. The locations of the single impulse sites considered the entire line along with the seismic source would be operational at full-power, including run-outs sections of lines. Therefore, some single impulse modelling sites and sections of the considered acquisition lines for each 24 h SEL scenario are outside the Full Fold Area, but within the Acquisition Area (defined as the area where the seismic source can be operated at full power). The selected locations are considered representative of the range of water depths that will be covered during the Sequoia 3D MSS and the potential sound propagation characteristics that may arise during survey acquisition. The line scenarios were selected to incorporate both potential acquisition line orientations (referred to as either 0 or 180°), and the offshore and inshore sections of the Acquisition Area, to aid in the assessment of sound levels within the Biologically Important Area (BIAs), Key Ecological Features (KEFs) and Australian Marine Parks (AMPs) within the region, along with the Waterwitch Reef Abalone Research Area (WRARA).

Both accumulated SEL scenarios consisted of one full line and one partial line during a 24-hour period and included 9 472 seismic impulses. During line turns, the seismic source was not operating. It is computationally prohibitive to perform sound propagation modelling for every seismic impulse. Therefore, a subset of seismic impulse locations was selected based on the variation in environmental properties within the entire survey area. For this study, 10 locations were considered sufficient to represent the variation in sound propagation along the modelled survey lines; their selection was mainly based on the variation in water depth within the survey area. The modelled sound fields at these 10 single impulse sites were transposed along the survey lines to model the scenarios' SEL_{24h} sound fields (see Appendix C.3). An eleventh location (Site A) was chosen to represent the shallowest point within the Acquisition Area. This location was used to calculate single impulse metrics at the seafloor for impacts to fish and benthic fauna.

Table 5. Location details for the single impulse modelled sites and associated SEL_{24h} scenario.

Relevant SEL_{24} Scenario	Site	Latitude (°S)	Longitude (°E)	MGA Zone 54, GDA1994		Water depth (m)	Tow direction (°)
				X (m)	Y (m)		
1	1	39° 32' 59.4733"	143° 26' 19.3794"	709541	5619362	103	0/180
	2	39° 40' 06.7164"	143° 32' 16.2022"	717686	5605953	69	
	3	39° 54' 02.2895"	143° 33' 26.1863"	718617	5580140	102	
	4	40° 11' 11.5813"	143° 34' 04.2856"	718606	5548375	115	
1 & 2	5	40° 20' 36.9605"	143° 27' 16.1199"	708470	5531214	118	
2	6	40° 20' 56.8961"	143° 19' 04.1966"	696847	5530912	798	
	7	40° 16' 21.1050"	143° 19' 34.8480"	697794	5539398	606	
	8	40° 12' 07.4725"	143° 19' 28.5108"	697849	5547223	299	
	9	40° 03' 08.4701"	143° 19' 17.8496"	698031	5563850	125	
	10	39° 50' 12.3846"	143° 20' 18.0476"	700085	5587743	106	
N/A	A†	39° 40' 07.2803"	143° 31' 43.9395"	716917	5605957	61	N/A

†Shallowest location within Acquisition Area, only seafloor receptors assessed via VSTACK.

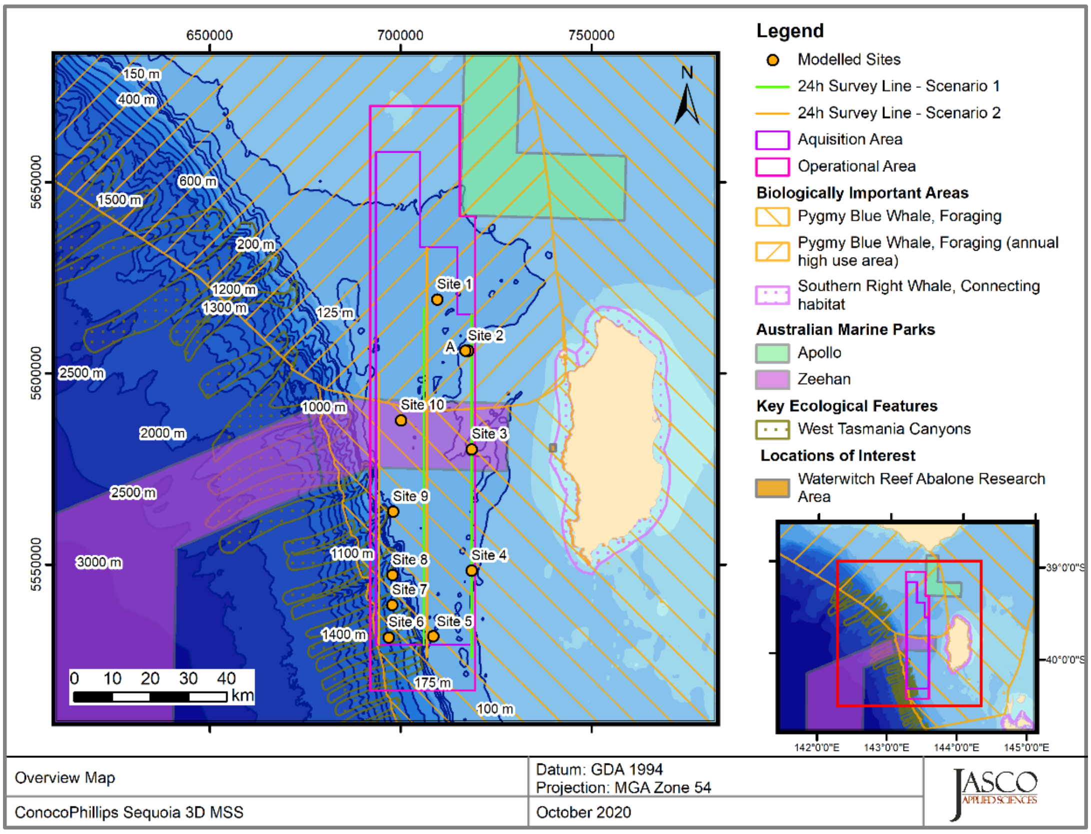

Figure 1. Overview of the modelled sites, acquisition lines, and features for the Sequoia 3D MSS.

3. Noise Effect Criteria

The perceived loudness of sound, especially impulsive noise such as from seismic airguns, is not generally proportional to the instantaneous acoustic pressure. Rather, perceived loudness depends on the pulse rise-time and duration, and the frequency content. Several sound level metrics, such as PK, SPL, and SEL, are commonly used to evaluate noise and its effects on marine life (Appendix A). The period of accumulation associated with SEL is defined, with this report referencing either a “per pulse” assessment or over 24 h. Appropriate subscripts indicate any applied frequency weighting; unweighted SEL is defined as required. The acoustic metrics in this report reflect the updated ISO standard for acoustic terminology, ISO/DIS 18405:2017 (2017).

Whether acoustic exposure levels might injure, impair or disturb marine fauna is an active research topic. Since 2007, several expert groups have developed SEL-based assessment approaches for evaluating auditory injury and impairment, with key works including Southall et al. (2007), Finneran and Jenkins (2012), Popper et al. (2014), United States National Marine Fisheries Service (NMFS 2018a) and Southall et al. (2019). The number of studies that have investigated the level of behavioural disturbance to marine fauna by anthropogenic sound has also increased substantially.

The following thresholds, guidelines and sound levels for this study were chosen because they represent the best available science, and sound levels presented in literature for fauna with no defined thresholds:

1. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24h}$) from the U.S. National Oceanic and Atmospheric Administration (NOAA) Technical Guidance (NMFS 2018a) for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) in marine mammals.
2. Marine mammal behavioural threshold based on the current NOAA (2019) criterion for marine mammals of 160 dB re 1 µPa (SPL; L_p) for impulsive sound sources.
3. Sound exposure guidelines for fish, fish eggs and larvae (including plankton) (Popper et al. 2014).
4. Peak pressure levels (PK; L_{pk}) and frequency-weighted accumulated sound exposure levels (SEL; $L_{E,24h}$) from Finneran et al. (2017) for the onset of PTS and TTS in turtles.
5. Sea turtle behavioural response threshold of 166 dB re 1 µPa (SPL; L_p) (NSF 2011), as applied by the US NMFS, along with a sound level associated with behavioural disturbance 175 dB re 1 µPa (SPL; L_p) (McCauley et al. 2000b, 2000a).
6. Peak-peak pressure levels (PK-PK; $L_{pk\text{-}pk}$) at the seafloor to help assess effects of noise on crustaceans through comparing to results in Day et al. (2016a), Day et al. (2019), Day et al. (2016b), Day et al. (2017) and Payne et al. (2008).
7. For comparison to published literature, a no effect sound level for sponges and corals of 226 dB re 1 µPa (PK; L_{pk}) is reported for comparing to Heyward et al. (2018).
8. An squid/octopus startle (inking) response sound level of 162 dB re 1 µPa^{2}s per-pulse SEL (L_E) (Fewtrell and McCauley 2012).
9. An SPL human health assessment threshold of 145 dB re 1 µPa (SPL; L_p) for sound exposure to people swimming and diving derived from Parvin (2005), and considering Ainslie (2008).

Additionally, to assess the size of the low-power zone required under the Australian Environment Protection and Biodiversity Conservation (EPBC) Act Policy Statement 2.1, Department of the Environment, Water, Heritage and the Arts (DEWHA 2008), the distance to an unweighted per-pulse SEL of 160 dB re 1 µPa^2·s (SEL; L_E) is reported.

The following sections (Sections 3.1–3.5, along with Appendix A.4 and A.6), expand on the thresholds, guidelines and sound levels for marine mammals, fish, fish eggs, fish larvae, sea turtles, benthic invertebrates and humans.

3.1. Marine Mammals

There are two categories of auditory threshold shifts or hearing loss: PTS, a physical injury to an animal's hearing organs; and TTS, a temporary reduction in an animal's hearing sensitivity as the result of receptor hair cells in the cochlea becoming fatigued.

To help assess the potential for the possible injury and hearing sensitivity changes in marine mammals, this report applies the criteria recommended by NMFS (2018a), considering both PTS and TTS, which are numerically identical to Southall et al. (2019). These criteria, along with the applied behavioural criteria (NOAA 2019), are summarised in Table 6, with descriptions included in Appendix A.4.1 (auditory impairment) and Appendix A.4.2 (behavioural response), with frequency weighting explained in Appendix A.5.

Table 6. Unweighted SPL, SEL_{24h}, and PK thresholds for acoustic effects on marine mammals.

Hearing group	NOAA (2019)	NMFS (2018a)			
	Behaviour	PTS onset thresholds* (received level)		TTS onset thresholds* (received level)	
	SPL (L_p; dB re 1 µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa²·s)	PK (L_{pk}; dB re 1 µPa)
Low-frequency cetaceans	160	183	219	168	213
Mid-frequency cetaceans		185	230	170	224
High-frequency cetaceans		155	202	140	196
Phocid pinnipeds in water		185	218	170	212
Otariid pinnipeds in water		203	232	188	226

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
L_p–denotes sound pressure level period and has a reference value of 1 µPa.
L_{pk}, flat–peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa.
L_E - denotes cumulative sound exposure over a 24-hour period and has a reference value of 1 µPa²s.
Subscripts indicate the designated marine mammal auditory weighting.

3.2. Fish, Fish Eggs, and Fish Larvae

In 2006, the Working Group on the Effects of Sound on Fish and Turtles was formed to continue developing noise exposure criteria for fish and turtles, work begun by a panel convened by NOAA two years earlier. The resulting guidelines included specific thresholds for different levels of effects and for different groups of species (Popper et al. 2014). These guidelines defined quantitative thresholds for three types of immediate effects:

- Mortality, including injury leading to death.
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma.
- TTS.

Masking and behavioural effects can be assessed qualitatively, by assessing relative risk rather than by specific sound level thresholds. However, as these depend upon activity-based subjective ranges, these effects are not addressed in this report and are included in Table 7 for completeness only. Because the presence or absence of a swim bladder has a role in hearing, fish's susceptibility to injury from noise exposure varies depending on the species and the presence and possible role of a swim bladder in hearing. Thus, different guidelines were proposed for fish without a swim bladder (also appropriate for sharks and applied to whale sharks in the absence of other information), fish with a swim bladder not used for hearing, and fish that use their swim bladders for hearing. Turtles, fish eggs, and fish larvae are considered separately. Table 7 lists relevant effects thresholds from Popper et al. (2014).

The SEL metric integrates noise intensity over some period of exposure. Because the period of integration for regulatory assessments is not well defined for sounds that do not have a clear start or end time, or for very long-lasting exposures, it is required to define a time. Popper et al. (2014) recommend applying a standard period, where this is either defined as a justified fixed period or the duration of the activity; however, Popper et al. (2014) also included caveats about how long the fish will be exposed because they can move (or remain in location) and so can the source. Popper et al. (2014) summarises that in all TTS studies considered, fish that showed TTS recovered to normal hearing levels within 18–24 hours. Due to this, a period of accumulation of 24 hours has been applied in this study for SEL, which is similar to that applied for marine mammals in NMFS (2016, 2018a).

Additional information is provided in Appended A.6.

Table 7. Guidelines for seismic noise exposure for fish, adapted from Popper et al. (2014).

Type of animal	Mortality and Potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	>219 dB SEL_{24h} or >213 dB PK	>216 dB SEL_{24h} or >213 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	210 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	>>186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or >207 dB PK	203 dB SEL_{24h} or >207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae (relevant to plankton)	>210 dB SEL_{24h} or >207 dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Notes: Peak sound level (PK) dB re 1 µPa; SEL_{24h} dB re 1µPa^2·s. All criteria are presented as sound pressure, even for fish without swim bladders, since no data for particle motion exist. Relative risk (high, moderate, or low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

3.3. Sea Turtles

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Popper et al. (2014) suggested thresholds for onset of mortal injury (including PTS) and mortality for sea turtles and, in absence of taxon-specific information, adopted the levels for fish that do not hear well (suggesting that this likely would be conservative for sea turtles).

Finneran et al. (2017) presented revised thresholds for sea turtle injury and hearing impairment (TTS and PTS). Their rationale is that sea turtles have best sensitivity at low frequencies and are known to have poor auditory sensitivity (Bartol and Ketten 2006, Dow Piniak et al. 2012). Accordingly, TTS and PTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al. 2014).

McCauley et al. (2000b) observed the behavioural response of caged sea turtles—green (*Chelonia mydas*) and loggerhead (*Caretta caretta*)—to an approaching seismic airgun. For received levels above 166 dB re 1 µPa (SPL), the sea turtles increased their swimming activity and above

175 dB re 1 µPa they began to behave erratically, which was interpreted as an agitated state. The 166 dB re 1 µPa level has been used as the threshold level for a behavioural disturbance response by NMFS and applied in the Arctic Programmatic Environment Impact Statement (PEIS) (NSF 2011). In addition the 175 dB re 1 µPa level from McCauley et al. (2000b) is recommended as a criterion for behavioural disturbance. The Recovery Plan for Marine Turtles in Australia (Department of the Environment and Energy et al. 2017) acknowledges the 166 dB re1 µPa SPL reported by McCauley et al. (2000b) as the level that may result in a behavioural response to marine turtles. These thresholds are shown in Table 8.

Table 8. Acoustic effects of impulsive noise on sea turtles: Unweighted SPL, SEL_{24h}, and PK thresholds

Effect type	Criterion	SPL (L_p; dB re 1 µPa)	Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa^2·s)	PK (L_{pk}; dB re 1 µPa)
Behavioural response	NSF (2011)	166	NA	
Behavioural disturbance	McCauley et al. (2000a)	175		
PTS onset thresholds* (received level)	Finneran et al. (2017)	NA	204	232
TTS onset thresholds* (received level)			189	226

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS and TTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
L_p denotes sound pressure level period and has a reference value of 1 µPa.
$L_{pk,flat}$ denotes peak sound pressure is flat weighted or unweighted and has a reference value of 1 µPa.
L_E denotes cumulative sound exposure over a 24 h period and has a reference value of 1 µPa^{2}s.

3.4. Invertebrates

3.4.1. Benthic Invertebrates (crustaceans and bivalves)

Research is ongoing into the relationship between sound and its effects on crustaceans (lobster and crabs) and bivalves, including the relevant metrics for both effect and impact. Available literature suggests particle motion, rather than sound pressure, is a more important factor for crustacean and bivalve hearing. Water depth, seabed material, and seismic source size are related to the particle motion levels at the seafloor, with larger arrays and shallower water being related to higher particle motion levels, more likely relevant to effects on crustaceans and bivalves, while the reverse is true in deeper water.

At the seafloor interface, crustaceans and bivalves are subject to particle motion stimuli from several acoustic or acoustically induced waves. These include the particle motion associated with an impinging sound pressure wave in the water column (the incident, reflected, and transmitted portions), substrate acoustic waves, and interface waves of the Scholte type. However, it is unclear which aspect(s) of these waves is/are most relevant to the animals, either when they normally sense the environment or their physiological responses to loud sounds so there is not enough information to establish similar criteria and thresholds as done for marine mammals and fish. Including recent research, such as Day et al. (2016b) and Morris et al. (2018), current literature does not clearly define an appropriate metric or identify relevant levels (pressure or particle motion) for an assessment for potential effect. This includes the consideration of what particle motion levels lead to a behavioural response, or mortality. Therefore, at this stage, authoritative thresholds to inform the impact assessment are not available. However, levels can be determined for pressure metrics presented in literature to assist the assessment.

The pressure and acceleration examples provided in Day et al. (2016a)(Figures 11 and 12) indicate that the acceleration and pressure signals occurred simultaneously, which was interpreted as an indication that the waterborne sounds were responsible for the accelerations measured by the geophones. For clarity, it is important to distinguish that the acceleration from waterborne sound energy is *not* ground roll, which Day et al. (2016a) correctly define as the sound that propagates along the interface at a speed lower than the shear wave speed of the sediment. However, the report subsequently uses ground roll for all further discussions of particle acceleration. While Day et al. (2016a) discuss that they chose the simplest measure of ground roll, it should have been referring to as 'the acceleration from waterborne sound energy', or 'waterborne acceleration' for short.

For crustaceans (lobster and crab), a PK-PK sound level of 202 dB re 1 µPa (Payne et al. 2008) is considered to be associated with no impact, and it is therefore applied in this assessment. Additionally for context, the maximum PK-PK sound levels measured during the passes of the 150 in^3 airgun (209–213 dB re 1 µPa) and reported in Day et al. (2016a), Day et al. (2016b), and Day et al. (2019), are also included.

For scallops (and bivalves), PK-PK sound levels of 212 and 213 dB re 1 µPa are presented to allow comparison to the maximum sound levels measured in Day et al. (2016a) (also reported in Day et al. (2017)) during the passes of the 150 in^3 airgun (reported in Table 7 of Day et al. (2016a)).

Literature does not present a sound level associated with no impact, and as particle motion is the more relevant metric, particle acceleration from the seismic source has been presented for comparing the results in Table 7 of Day et al. (2016a). The maximum particle acceleration assessed for scallops was 37.57 ms^{-2}.

3.4.2. Plankton

To assess impacts to plankton, there are only a few studies to base threshold criteria on. Popper et al. (2014) cites many of the references and studies on potential impacts of noise emissions on fish eggs and larvae prior to 2014. Results presented in Day et al. (2016b) for embryonic lobsters and Fields et al. (2019) for copepods align with those presented in Popper et al. (2014), which is that mortality and sub-lethal injury are limited to within tens of metres of seismic sources. Additionally, the Popper et al. (2014) criteria (Table 7), are extrapolated from simulated pile driving signals which have a more rapid rise time and greater potential for trauma than pulses from a seismic source.

Other research, such as McCauley et al. (2017), has indicated the potential for effects at longer range, however Fields et al. (2019) noted that it was difficult to reconcile the high mortality reported by McCauley et al. (2017) with the low mortalities reported in the greater previous body of earlier research and their experiment. They recommended further research into whether it is the sound pulse itself (i.e. the energy, peak pressures, or particle acceleration), the (turbulent) fluid flow occurring more slowly (i.e. not related to the sound pulse), or other effects such as the bubble cloud that which might cause higher mortality near the seismic source.

3.4.3. Octopus and Squid

There are no reported studies regarding the response of octopus to airgun signals, however the responses of squid were investigated by Fewtrell and McCauley (2012). The authors conducted a number of experiments and examined the received per-pulse SEL for caged squid. They found that in one trial, where the received level of the first airgun impulse was 162 dB re 1 $\mu Pa^2 \cdot s$, the squid inked. This response was not observed again within this trial, however the authors stated that it was unknown if this was due to depleted ink reserves or habituation. In two other trials, the initial received levels were lower (132 and 146 dB re 1 $\mu Pa^2 \cdot s$ per-pulse SEL), and although the received levels did exceed 162 dB re 1 $\mu Pa^2 s$, no inking behaviour was observed. The authors hypothesised that the results also suggest that a gradual increase in received levels and prior exposure to air gun impulses decreases the severity of the alarm responses in this species. This aligns with findings of general habituation in response to predators in squid (Long et al. 1989). Recent work (Jones et al. 2020) supports these findings as well, indicating potential rapid, short-term habituation by squid to impulsive noise, however, similar response rates were seen 24 h later, which indicated that squid might re-sensitise to the noise.

The results presented in by Fewtrell and McCauley (2012) were stated by the authors to be preliminary, and while they stated that while it is possible that noise levels greater than 147 dB re 1 $\mu Pa^2 \cdot s$ are required to induce avoidance behaviour, the level associated with inking, of 162 dB re 1 $\mu Pa^2 \cdot s$ per-pulse SEL, has been considered as a startle response level for both squid and octopus.

3.5. Human health assessment threshold

Underwater, the human ear is about 20 dB less sensitive than it is in air at low frequencies (20 Hz), increasing to 40 dB at mid-frequencies (less than 1 kHz), and increasing to 70–80 dB less sensitive at higher frequencies (Parvin 1998). Divers who wear neoprene hoods have even higher hearing thresholds (lower sensitivity) above 500 Hz because the hood material absorbs high-frequency sounds (Sims et al. 1999). Exposure studies related to divers have typically focused on military sonar exposure, with little information on seismic surveys, and as such care is required when considering thresholds for recreational divers and swimmers, particularly for impulsive sounds such as seismic surveys (Ainslie 2008).

The auditory threshold of hearing under water was lowest at 1 kHz (70 dB re 1 μPa SPL) and increased for lower and higher frequencies to around 120 dB re 1 μPa at 20 Hz and at 20 kHz (Parvin 1998). Fothergill et al. (2000) and Fothergill et al. (2001) conducted controlled acoustic exposure experiments on military divers under fully controlled conditions at a US Ocean Simulation Facility and an US Open water test facility; in all tests, the diver were covered with soft or hard shell dive suits and their position and distance relative to sound source, signal characteristics and received levels were controlled and documented (Pestorius et al. 2009). A total of 89 male Navy divers were exposed to pure tone signals and sweeps between 160-320 Hz at SPLs up to 160 dB re 1 μPa. The divers were exposed to these sounds over 100 seconds at depths from 10 to 40 metres. The divers rated the sounds on a severity scale. For frequencies between 100 and 500 Hz, at a received SPL of 130 dB re 1 μPa, divers and swimmers detected body vibration. None of the divers tested rated levels of 140 dB re 1 μPa as “very severe”; however, at 157 dB re 1 μPa, sound was rated as “very severe” 19 per cent of the time. No physiological damage was observed at the highest levels tested: 160 dB re 1 μPa (Fothergill et al. 2001). In a subsequent study, recreational divers were exposed to tonal signals or 30 Hz-sweeps at frequencies between 100 and 500 Hz at received levels of 130-157 dB re 1 μPa (Pestorius et al. 2009). Each exposure lasted for seven seconds. Nine female and 17 male scuba divers were tested, all wearing full body neoprene wetsuits. Diver aversion and perception of body vibration were used as test parameters. The results showed no sex-specific differences. The results differed as a function of frequency – while test results showed a strong overall variation between subjects, signals at 100 Hz elicited the strongest aversion in all tests and even at 148 dB a few diver ratings indicated extreme aversion. Due to this and the strong variation between test subjects, the following exposure limit for both military and recreational divers was suggested as a conservative measure: For frequencies between 100 and 500 Hz, the maximum SPL should be 145 dB re 1 μPa over a maximum continuous exposure of 100 seconds or with a maximum duty cycle of 20 per cent and a maximum daily cumulative total of three hours. The trading relation between the maximum SPL and duration was 4 dB per doubling of duration (e.g. 141 dB SPL for a 200 second exposure) (Pestorius et al. 2009).

Considering only frequencies between 100 and 500 Hz, Parvin (2005) suggested 145 dB re 1 μPa as a safety criterion for recreational divers and swimmers. Seismic impulses are broadband sources, and therefore, to be precautionary, the 145 dB re 1 μPa SPL suggested by Fothergill et al. (2001) and Parvin (2005) has been applied in this study as a broadband SPL and as a human health assessment threshold for recreational divers and swimmers. This does not imply that this level is associated with the onset of injury.

4. Methods

4.1. Parameters Overview

Sound propagation was modelled up to 100 km from each single impulse modelled site (listed in Table 5). The specifications of the seismic source and the environmental parameters used in the propagation models are described in detail in Appendix C. A single sound speed profile for July was considered in this modelling study; this was identified as the month that would provide the farthest propagation when considering the months July to October, due to the presence of a slight upward refracting sound speed profile (see Appendix C.4.2). Whilst the potential operational window of the survey is from 1 August to 31 October, July, was included to represent a worst-case scenario, although it is not substantially different to August.

The acoustic properties of the seafloor in the survey acquisition area vary depending on the water depth and the area on the continental shelf. Two geoacoustic profiles were developed and used for various modelled sites (see Appendix C.4.2). Sediment in the survey area was modelled as layered cemented and semi-cemented carbonates for Site A,1–5,9–10 (Table 5) on the continental shelf edge. The deeper modelling sites on the slope sediments (Sites 6-8) were modelled as a succession from soft to hard sediments (silty carbonate sand to cemented limestone) (Table 5).

4.2. Acoustic Source Model

The pressure signature of the individual airguns and the composite decidecade-band point-source equivalent directional levels (i.e., source levels) of the 3440 in^3 and 3480 in^3 seismic sources were modelled with JASCO's Airgun Array Source Model (AASM). Although AASM accounts for notional pressure signatures of each seismic source with respect to the effects of surface-reflected signals on bubble oscillations and inter-bubble interactions, the surface-reflected signal (known as surface ghost) is not included in the far-field source signatures. The acoustic propagation models account for those surface reflections, which are a property of the propagating medium rather than the source.

AASM considers:

- Array layout.
- Volume, tow depth, and firing pressure of each airgun.
- Interactions between different airguns in the array.

All seismic sources considered were modelled over AASM's full frequency range, up to 25 kHz. Appendix B.1 details the AASM model.

4.3. Sound Propagation Models

Three sound propagation models were used to predict the acoustic field around the seismic source:

- Combined range-dependent parabolic equation and Gaussian beam acoustic ray-trace model (MONM-BELLHOP, 5 Hz to 25 kHz).
- Full Waveform Range-dependent Acoustic Model (FWRAM, 5 Hz to 1042 Hz).
- Wavenumber integration model (VSTACK, 10 Hz to 1024 Hz).

The models were used in combination to characterise the acoustic fields at short and long ranges in terms of SEL, SPL, PK, and PK-PK. Appendix B.2 details each model. MONM-BELLHOP was used to calculate SEL of a 360° area around each source location. The model calculated propagation losses up to distances of 100 km from the source in each cardinal direction, with a horizontal separation of 20 m between receiver points along the modelled radials. The sound fields were modelled with a horizontal angular resolution of $\Delta\theta = 2.5°$ for a total of N = 144 radial planes. Receiver depths were chosen to span the entire water column over the modelled areas, from 2 m to a maximum of 5000 m, with step sizes that increased with depth. To supplement the MONM results, high-frequency results for propagation loss were modelled using Bellhop for frequencies from 1259 Hz to 25 kHz. The MONM and Bellhop results were combined to produce results for the full frequency-range of interest.

FWRAM was used to model synthetic seismic pulses and to generate a generalised range-dependent SEL to SPL conversion function for the considered modelled sites (Appendix C.2). FWRAM was run to 100 km at four of the eleven single impulse modelling sites, along four radials (fore and aft endfire, and port and starboard broadside) for computational efficiency. Along each radial, the computation was done with a regular depth step of 1 m over the entire water column, and a horizontal range step of 20 m. The range-dependent conversion function was applied to predicted per-pulse SEL results from MONM-BELLHOP to estimate SPL values. FWRAM was also used to calculate water column PK levels.

VSTACK was used to calculate close range PK, PK-PK and particle acceleration magnitudes along transects at the seafloor from the loudest direction of the seismic source at the shallowest modelled sites within each survey area (Site A, 1–2). The maximum modelled range for VSTACK was 1000 m and a variable receiver range increment that increased away from the source was used, which increased from 10 to 25 m. Received PK and PK-PK levels were computed for a receiver 50 cm above the seafloor for assessment of receptors at or just above the seabed. Particle acceleration magnitudes were computed for a receiver 5 cm above the seafloor for assessment of seabed attached receptors.

During a seismic survey, new sound energy is introduced into the environment with each pulse from the seismic source. The vessel towing the airgun was modelled travelling at 4.5 knots, with an overall inter-pulse-interval of 18.75 m. The modelling for Scenario 1 and Scenario 2 included 9472 and 9470 seismic impulses, respectively. While some impact criteria are based on the per-pulse energy released, others, such as the marine mammal, turtle and fish SEL criteria used in this report (Sections 3) account for the total acoustic energy marine fauna is subjected to over a specified period of time, defined in this report as 24 h. An accurate assessment of the accumulated sound energy depends not only on the parameters of each seismic pulse impulse, but also on the number of impulses delivered in a period and the relative positions of the impulses. Appendix C.3 provides additional details on the methods used to calculate the accumulated sound energy for the considered scenarios.

5. Results

5.1. Acoustic Source Levels and Directivity

AASM (Section 4.2) was used to predict the horizontal and vertical overpressure signatures and corresponding power spectrum levels for the seismic source, with results provided in Appendix C.5 along with the horizontal directivity plots.

Preliminary source modelling was conducted to determine the source with the highest equivalent far-field acoustic output of two considered source arrays. This was determined to be a 3480 in^3 seismic source with a 6 m tow depth (see Appendix D for details)

Table 9 shows the PK and per-pulse SEL source levels in the horizontal-plane broadside (perpendicular to the tow direction), endfire (along the tow direction), and vertical directions. The vertical source level that accounts for the "surface ghost" (the out of phase reflected pulse from the water surface) is also presented to make it easier to compare the output of other seismic source models.

Figure C-10 shows the broadside, endfire, and vertical overpressure signature and corresponding power spectrum levels for the source. The signature consists of a strong primary peak, related to the initial release of high-pressure air, followed by a series of pulses associated with bubble oscillations. Most energy was produced at frequencies below 251 Hz. Frequency-dependent peaks and nulls in the spectrum result from interference among airguns in the source and correspond with the volumes and relative locations of the airguns to each other.

Table 9. Far-field source level specifications for the 3480 in^3 seismic source, for a 6 m tow depth. Source levels are for a point-like acoustic source with equivalent far-field acoustic output in the specified direction. Sound level metrics are per-pulse and unweighted.

Direction	Peak source pressure level ($L_{S,pk}$) (dB re 1 µPa m)	Per-pulse source SEL ($L_{S,E}$) (dB 1 µPa^{2}m^{2}s)	
		10–2000 Hz	2000–25000 Hz
Broadside	248.6	225.3	185.7
Endfire	247.5	225.1	190.6
Vertical	258.1	230.9	197.9
Vertical (surface affected source level)	258.1	233.5	200.9

5.2. Per-Pulse sound fields

This section presents the per-pulse sound fields in terms of maximum-over-depth SPL, SEL, PK, and seafloor PK, PK-PK and particle acceleration. The different metrics are presented for the following reasons:

- SPL sound fields were used to determine the distances to marine mammal and turtle behavioural thresholds (see Sections 3.1 and 3.3) and the human health assessment threshold (Section 3.5).
- Per-pulse SEL sound fields are used as inputs into the 24 h SEL scenarios, to determine the distance to the squid response sound level (Section 3.4.3) and context for the range to 160 dB re 1 µPa^2·s, relevant for the EPBC Act Policy Statement 2.1 (DEWHA 2008).
- PK metrics within the water column are relevant to thresholds and guidelines for marine mammals, sea turtles, fish, fish eggs and larvae (as well as plankton) (Sections 3.1–3.3).
- PK metrics at the seafloor are relevant to guidelines for fish, fish eggs and larvae (Section 3.2) and the sound level for no effect on corals and sponges

- PK-PK metrics at the seafloor are relevant to sound levels used in the assessment of impacts to benthic invertebrates (Section 3.4.1).
- Particle acceleration metrics are relevant for the assessment of impacts to bivalves (seabed attached receptors, Section 3.4.1).

The maximum and 95% distances (calculated as detailed in Appendix C.1) for per-pulse SEL and SPL metrics are presented in Tables 10 and 11. The SPL sound fields, and distances to relevant isopleths can be visualised on the contour maps presented in Figures 2 to 14, whilst the per-pulse SEL sound field maps are presented in Appendix E. The SPL sound fields are also presented as vertical slices for selected sites along the endfire and broadside directions out to 20 km, with the airgun array in the centre (Figures 15 to 17).

The distance to the maximum-over-depth SPL isopleth (145 dB re 1µPa, SPL) for the human diver health assessment threshold (Section 3.5) at the three modelling sites closest to King Island is presented in Table 12, with the sound level at three locations relevant to the Waterwitch Reef Abalone Research Area presented in Table 13.

Maximum distances to PK and PK-PK thresholds were calculated for four of the modelled single impulse sites in the water column, with maximum-over-depth results presented in Table 14. Maximum distances to PK and PK-PK thresholds were also calculated for three of the modelled single impulse sites at the seafloor (Tables 15 and 16).

5.2.1. Tabulated results

5.2.1.1. Entire water column

Table 10. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the 3480 in^3 source to modelled maximum-over-depth per-pulse SEL isopleths from the modelled single impulse sites, with water depth indicated.

Per-pulse SEL (L_p; dB re 1 µPa²·s)	Site 1 (Depth: 103 m)		Site 2 (Depth: 69 m)		Site 3 (Depth:102 m)		Site 4 (Depth: 115 m)		Site 5 (Depth: 118 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
190	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
180	0.26	0.2	0.28	0.24	0.24	0.21	0.22	0.2	0.16	0.15
170	1.08	0.84	1.1	0.88	1.02	0.8	0.98	0.77	0.88	0.6
162‡	3.06	2.46	3.56	2.51	2.98	2.41	2.96	2.3	3.12	2.45
160#	3.84	3.07	4.39	3.27	3.68	2.93	3.54	2.82	3.84	3.07
150	10.5	8.38	12.9	10.3	10.5	8.27	10	7.42	10.9	8.23
140	28.9	23.1	33.6	27.7	25.5	20.1	20.7	17.3	35	27.3
130	53.5	40.8	57.4	46.5	37.5	31.1	51.2	31.7	138	105
120	>100	/	>100	/	>100	/	>100	/	>100	/
Per-pulse SEL (L_p; dB re 1 µPa²·s)	**Site 6 (Depth: 798 m)**		**Site 7 (Depth: 606 m)**		**Site 8 (Depth:299 m)**		**Site 9 (Depth: 125 m)**		**Site 10 (Depth: 106 m)**	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
190	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
180	0.14	0.12	0.14	0.12	0.14	0.12	0.24	0.2	0.24	0.2
170	0.46	0.39	0.48	0.41	0.8	0.69	0.92	0.7	1.04	0.8
162‡	2.14	1.69	2.22	1.69	3.34	2.14	2.64	2.1	3.08	2.4
160#	2.8	2.16	3.7	2.18	3.67	3.34	4.44	2.92	3.76	2.93
150	11.8	9.09	11.3	8.41	13.8	9.21	9.28	7.24	9.9	8.16
140	41.6	30.8	55.3	36.8	56.9	40.9	38.7	26.8	24.7	18.8
130	>100	/	>100	/	>100	/	>100	/	68.5	39.3
120	>100	/	>100	/	>100	/	>100	/	>100	/

Low power zone assessment criteria DEWHA (2008).
‡ Sound level associated with squid behavioural response (inking) to impulsive noise (Fewtrell and McCauley 2012).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 11. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the 3480 in^3 source to modelled maximum-over-depth SPL isopleths from the modelled single impulse sites, with water depth indicated.

SPL (L_p; dB re 1 µPa)	Site 1 (Depth: 103 m)		Site 2 (Depth: 69 m)		Site 3 (Depth:102 m)		Site 4 (Depth: 115 m)		Site 5 (Depth: 118 m)	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
190	0.2	0.17	0.24	0.2	0.2	0.17	0.2	0.18	0.18	0.16
180	0.86	0.67	0.96	0.76	0.84	0.68	0.8	0.64	0.74	0.59
175#	1.62	1.29	1.66	1.26	1.62	1.28	1.48	1.18	1.42	1.14
170	3.04	2.41	2.98	2.44	2.96	2.37	2.92	2.23	2.8	2.17
166†	4.72	3.68	5.43	3.94	4.5	3.55	4.34	3.38	4.62	3.47
160‡	8.74	7.21	10.6	8.39	8.7	6.95	8.05	6.26	8.55	6.26
150	23.6	19.6	31.3	25	22.9	17.9	20.1	16.3	36.1	21.3
140	49.5	38.9	48.9	40.4	36	28.1	37.9	28.2	>100	/
130	>100	/	>100	/	>100	/	>100	/	>100	/
SPL (L_p; dB re 1 µPa)	**Site 6 (Depth: 798 m)**		**Site 7 (Depth: 606 m)**		**Site 8 (Depth:299 m)**		**Site 9 (Depth: 125 m)**		**Site 10 (Depth: 106 m)**	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
200	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
190	0.12	0.11	0.12	0.11	0.12	0.11	0.18	0.18	0.2	0.18
180	0.4	0.34	0.4	0.34	0.74	0.58	0.74	0.61	0.84	0.68
175#	0.75	0.69	1.36	0.77	1.26	0.95	1.38	1.15	1.62	1.31
170	2.42	1.87	3.12	1.86	3.19	2	2.53	2.05	2.94	2.31
166†	3.89	2.9	4.45	3.38	5.14	3.78	5.32	3.53	4.2	3.46
160‡	11.1	6.48	10.4	6.36	8.88	7.7	7.78	6.07	8.43	6.92
150	32.6	24.9	42.2	27.7	44.3	31	36.8	21.3	21.2	15.9
140	>100	/	>100	/	>100	/	>100	/	49.3	36
130	>100	/	>100	/	>100	/	>100	/	>100	/

Threshold for turtle behavioural disturbance from impulsive noise (McCauley et al. 2000b).
† Threshold for turtle behavioural response to impulsive noise (NSF 2011).
‡ Marine mammal behavioural threshold for impulsive sound sources (NOAA 2019).
A slash indicates that $R_{95\%}$ radius to threshold is not reported when the R_{max} is greater than the maximum modelling extent.

Table 12. Maximum (R_{max}) horizontal distances (in km) from the 3480 in^3 array to modelled maximum-over-depth SPL isopleth (145 dB re 1µPa, SPL) for the human diver health assessment threshold from Parvin (2005) at three modelling sites closest to King Island (Figure 1), with water depth indicated.

SPL (L_p; dB re 1 µPa)	Distance R_{max} (km)		
	Site 2 (Depth: 69 m)	Site 3 (Depth: 102 m)	Site 4 (Depth: 115 m)
145	41.9	32.4	30.6

Table 13. Maximum-over-depth per-pulse received levels at the Waterwitch Reef Abalone Research Area (WRARA) location of interest for the 3480 in^3 array when array is at Site 3 (see Figure 1, tow heading is due south).

Metric	**Received level at western edge of WRARA**	**Received level at centre of WRARA**	**Received level at eastern edge of WRARA**
SPL (dB re 1 µPa)	146.9	145.3	143.11

Table 14. Maximum (R_{max}) horizontal distances (km) from the 3480 in^3 array to modelled maximum-over-depth peak pressure level (PK) thresholds based on the NOAA Technical Guidance (NMFS 2018a) for marine mammals, and Popper et al. (2014) for fish and Finneran et al. (2017) for turtles, at four modelling sites (Table 5) , with water depth and tow azimuth indicated.

Hearing group	**PK threshold (L_{pk}; dB re 1 µPa)**	**Distance R_{max} (km)**			
		Site 3 (Depth:102 m)	**Site 6** (Depth: 798 m)	**Site 7** (Depth: 606 m)	**Site 10** (Depth: 106 m)
Low-frequency cetaceans (PTS)	219	0.03	0.03	0.03	0.03
Low-frequency cetaceans (TTS)	213	0.07	0.06	0.06	0.06
Mid-frequency cetaceans (PTS)	230	–	–	–	–
Mid-frequency cetaceans (TTS)	224	–	–	–	–
High-frequency cetaceans (PTS)	202	0.34	0.21	0.21	0.33
High-frequency cetaceans (TTS)	196	0.60	0.42	0.41	0.62
Phocid pinnipeds in water (PTS)	218	0.04	0.04	0.04	0.04
Phocid pinnipeds in water (TTS)	212	0.08	0.07	0.07	0.07
Otariid pinnipeds in water (PTS)	232	–	–	–	–
Otariid pinnipeds in water (TTS)	226	–	–	–	–
Sea Turtle (PTS)	232	–	–	–	–
Sea Turtle (TTS)	226	–	–	–	–
Fish: No swim bladder (also applied to sharks)	213	0.07	0.06	0.06	0.06
Fish: Swim bladder not involved in hearing; Swim bladder involved in hearing Fish eggs, and larvae	207	0.17	0.13	0.13	0.14

A dash indicates the threshold is not reached within the limits of the modelling resolution (20 m).

5.2.1.2. Seafloor

Table 15. Maximum (R_{max}) horizontal distances (in m) from the 3480 in^3 array to modelled seafloor peak pressure level thresholds (PK) from three single-impulse modelled sites (Table 5), with water depth indicated.

Hearing group/animal type	PK threshold (L_{pk}; dB re 1 µPa)	Distance R_{max} (m)		
		Site A (Depth: 61 m)	Site 1 (Depth: 103 m)	Site 2 (Depth: 69 m)
Sponges and corals†	226	4	*	*
Fish: No swim bladder (also applied to sharks)	213	80	81	77
Fish: Swim bladder not involved in hearing; Swim bladder involved in hearing Fish eggs, and larvae	207	147	153	154

† Heyward et al. (2018)
An asterisk indicates that the sound level was not reached.

Table 16. Maximum (R_{max}) horizontal distances (in m) from the 3480 in^3 seismic source to modelled seafloor peak-peak pressure levels (PK-PK) from three single-impulse modelled sites (Table 5), with water depth indicated. Results included in relation to benthic invertebrates (Section 3.4.1).

PK-PK ($L_{pk\text{-}pk}$; dB re 1 µPa)	Explanation	Distance R_{max} (m)		
		Site A (Depth: 61 m)	Site 1 (Depth: 103 m)	Site 2 (Depth: 69 m)
213[a,b,c]	Lobster and scallop experiments, maximum single impulse exposure measured.	140	138	144
212[b,c]	Scallop experiments, maximum single impulse exposure measured.	152	154	156
210[a,b]	Lobster experiments, maximum single impulse exposure measured.	181	183	199
209[a,b]	Lobster experiments, maximum single impulse exposure measured.	192	198	214
202[d]	Lobster (no mortality or damage to mechano-sensory systems, recoverable injury)	324	340	414

[a] Day et al. (2019), lobster experiments, maximum single impulse exposure measured.
[b] Day et al. (2016a), lobster and scallop experiments, maximum single impulse exposure measured.
[c] Day et al. (2017), scallop experiments, maximum single impulse exposure measured.
[d] Payne et al. (2008), lobster, no mortality or damage to mechano-sensory systems, recoverable injury

5.2.2. Sound field maps and graphs

5.2.2.1. Sound Level Contour Maps

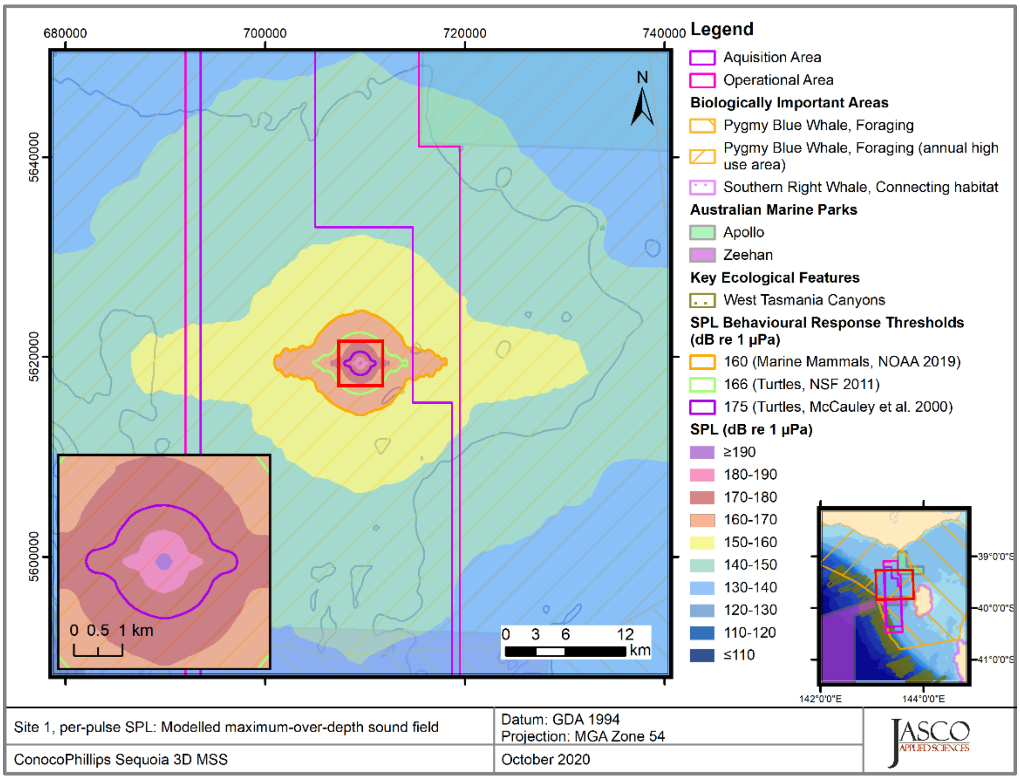

Figure 2. *Site 1, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

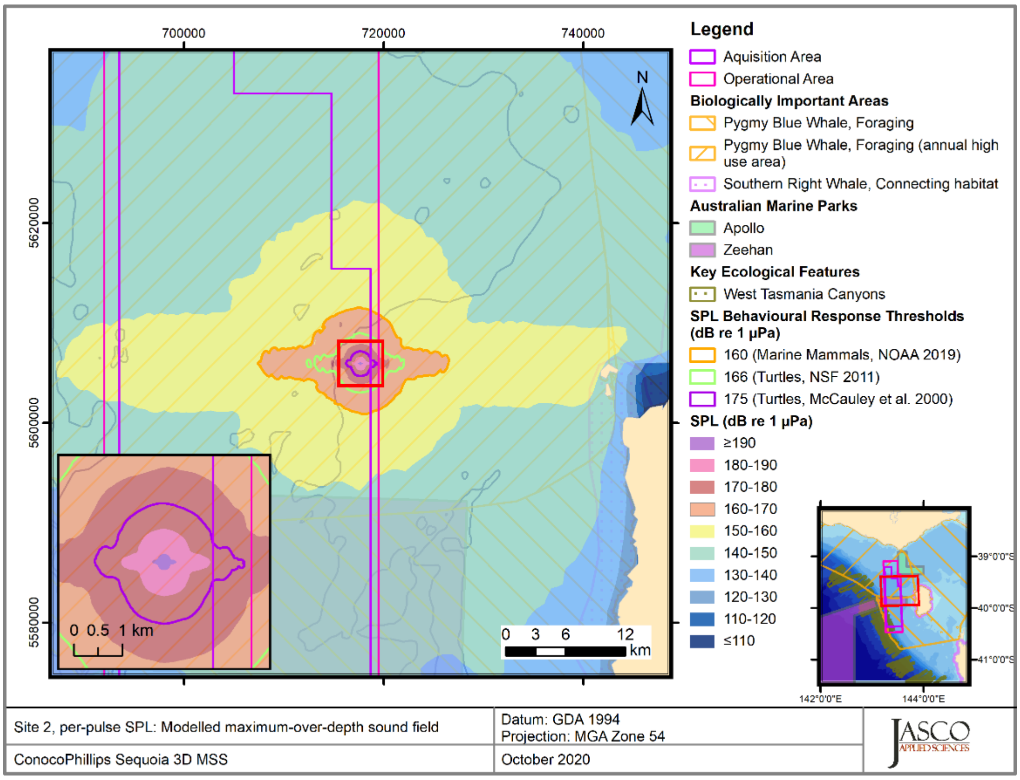

Figure 3. *Site 2, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

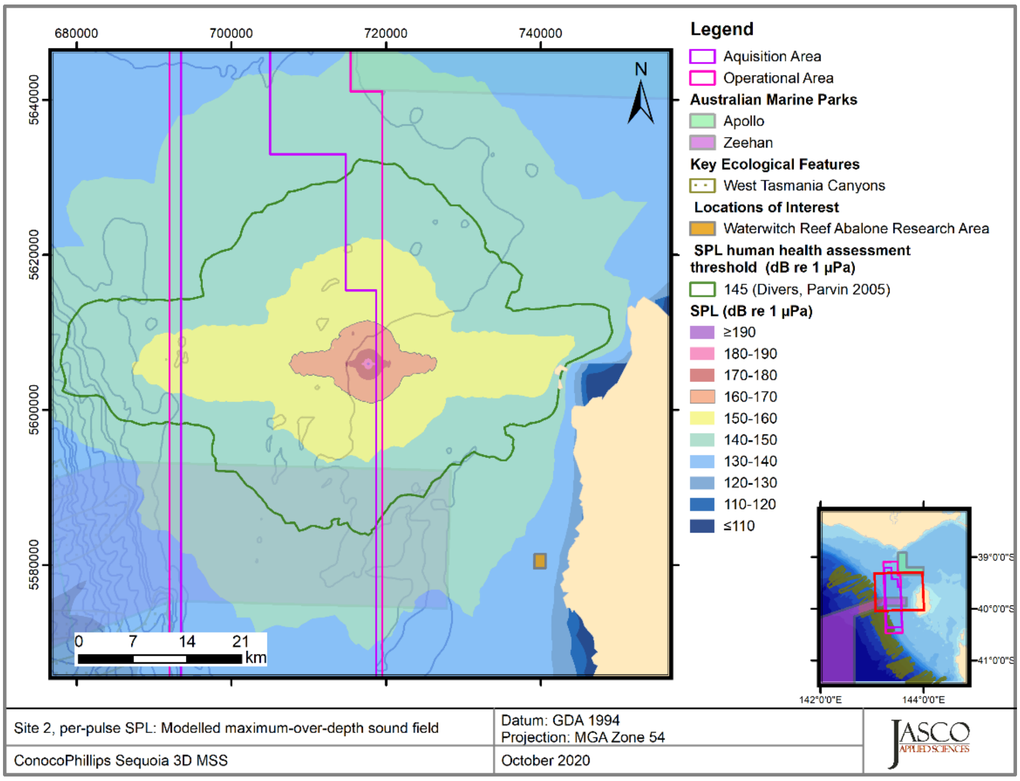

Figure 4 *Site 2, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the human divers health assessment threshold.

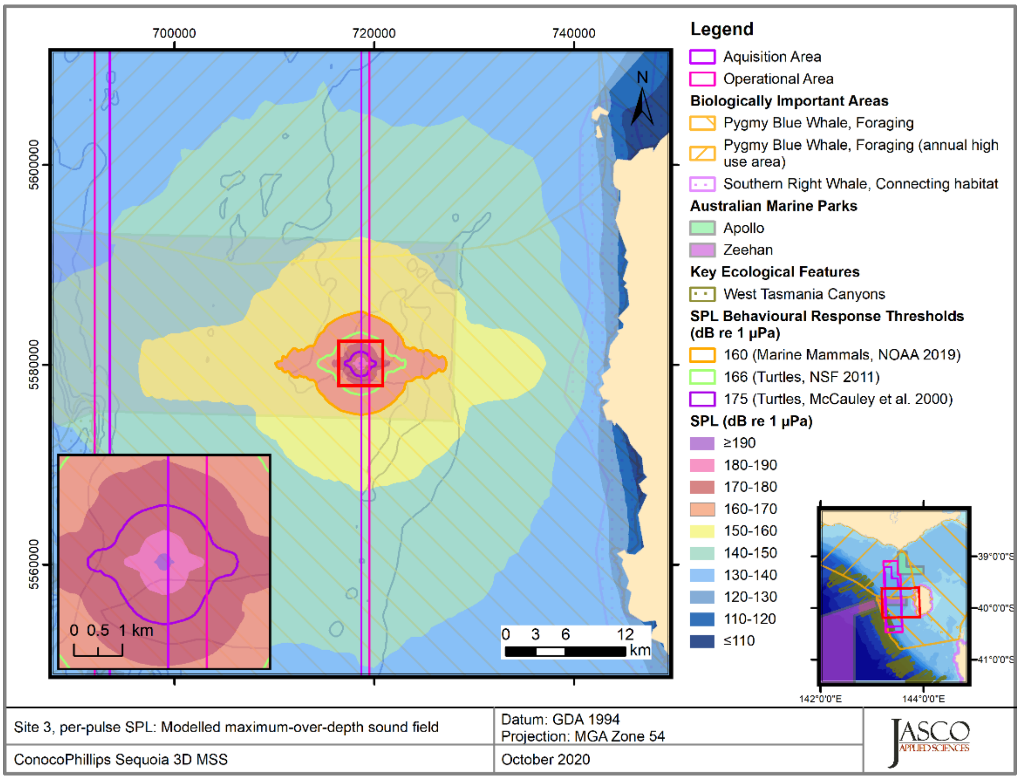

Figure 5. *Site 3, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

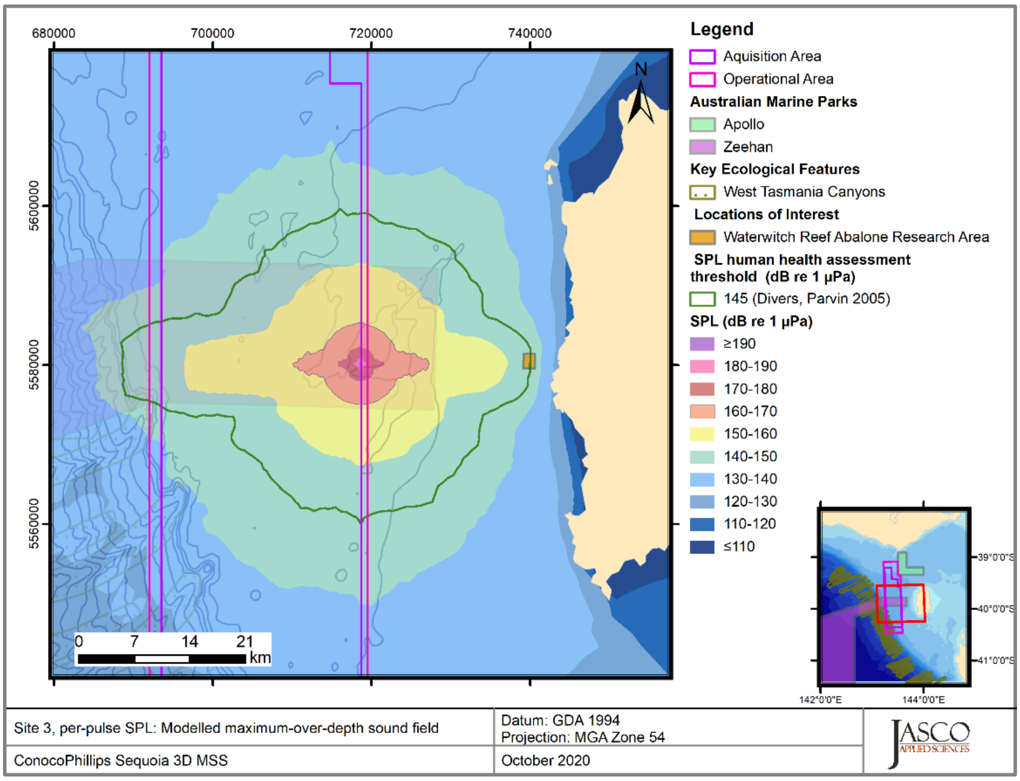

Figure 6 *Site 3, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the human divers health assessment threshold.

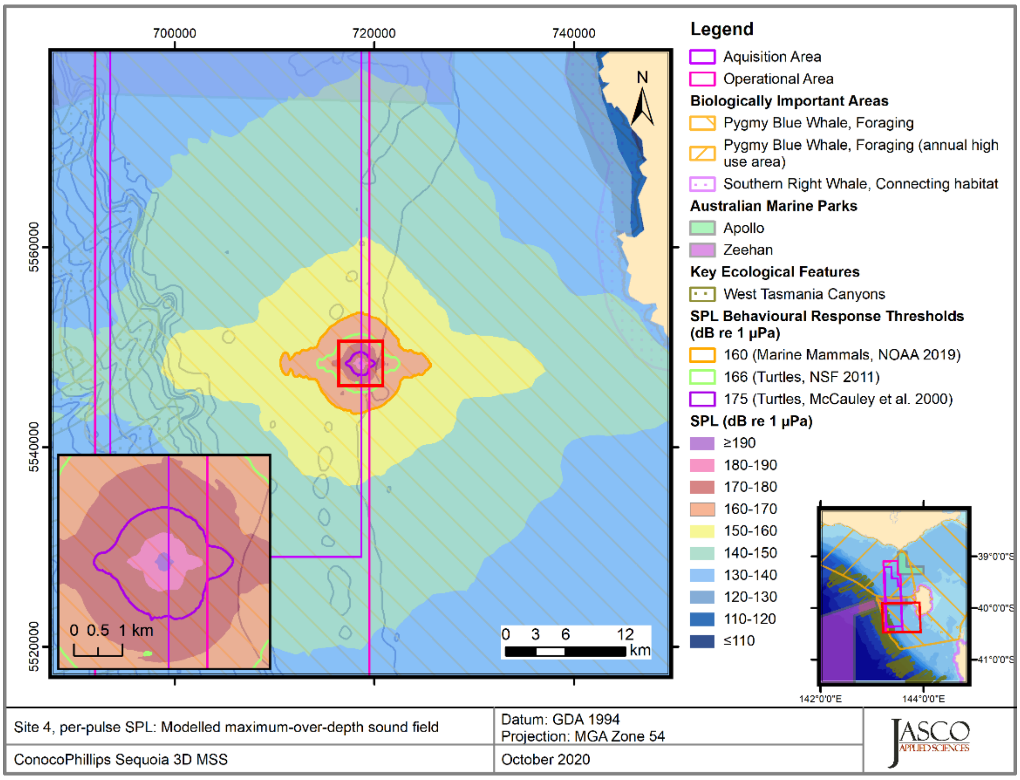

Figure 7. *Site 4, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

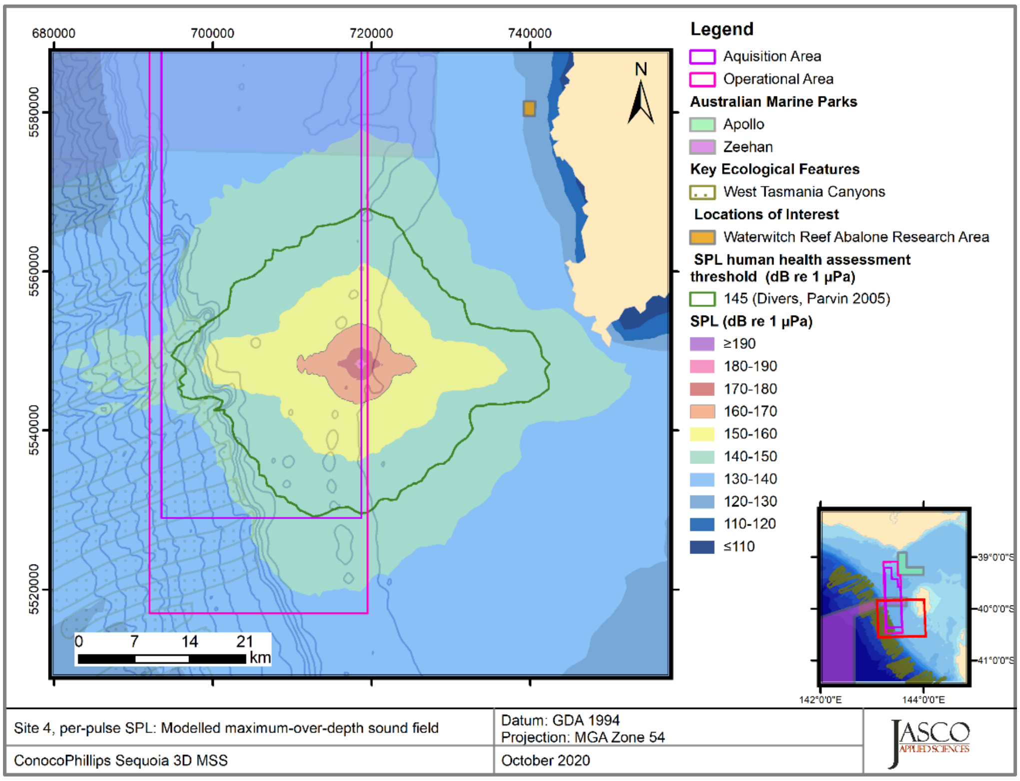

Figure 8 *Site 4, tow azimuth 180º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleth for the human divers health assessment threshold.

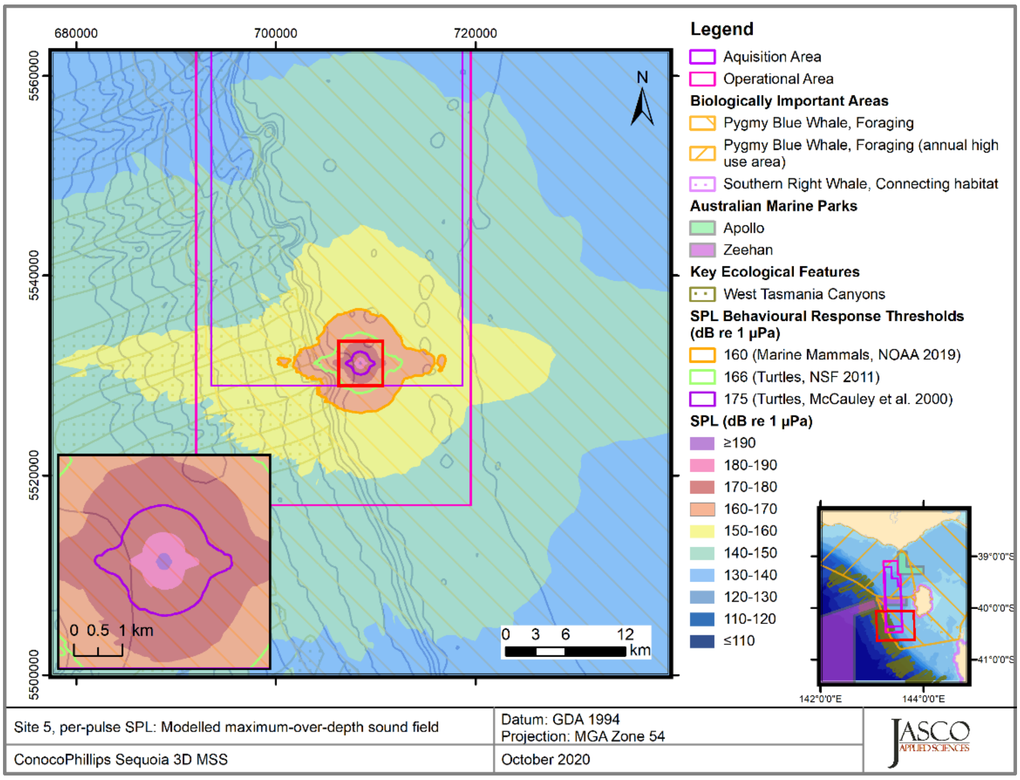

Figure 9. *Site 5, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

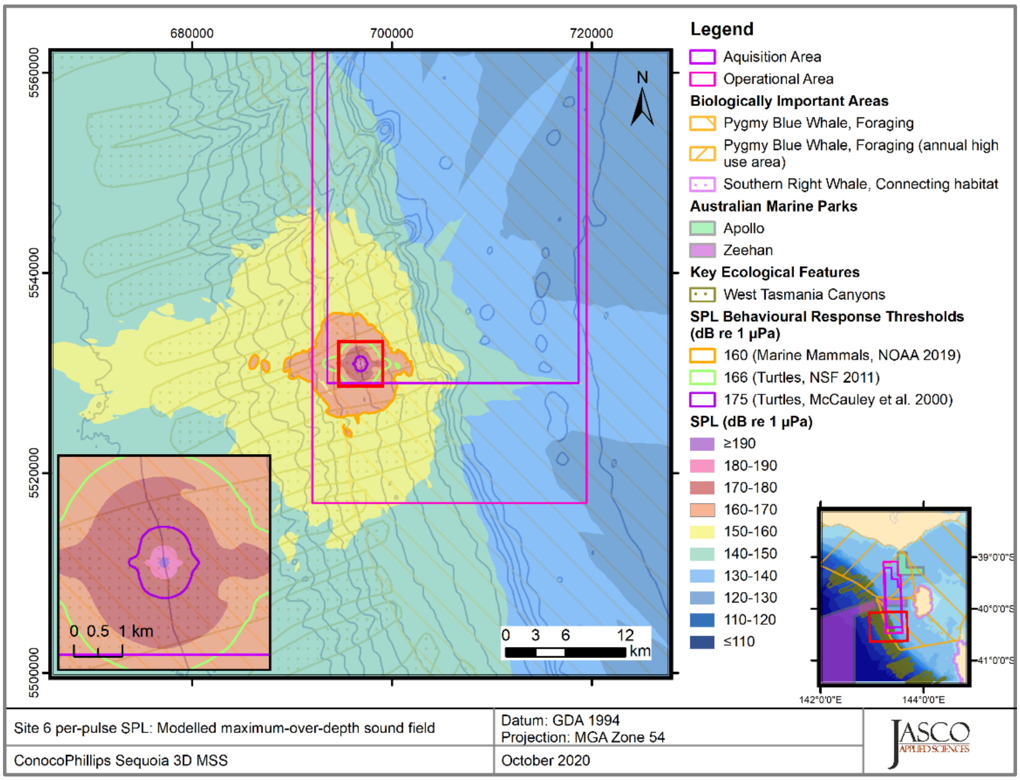

Figure 10. *Site 6, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

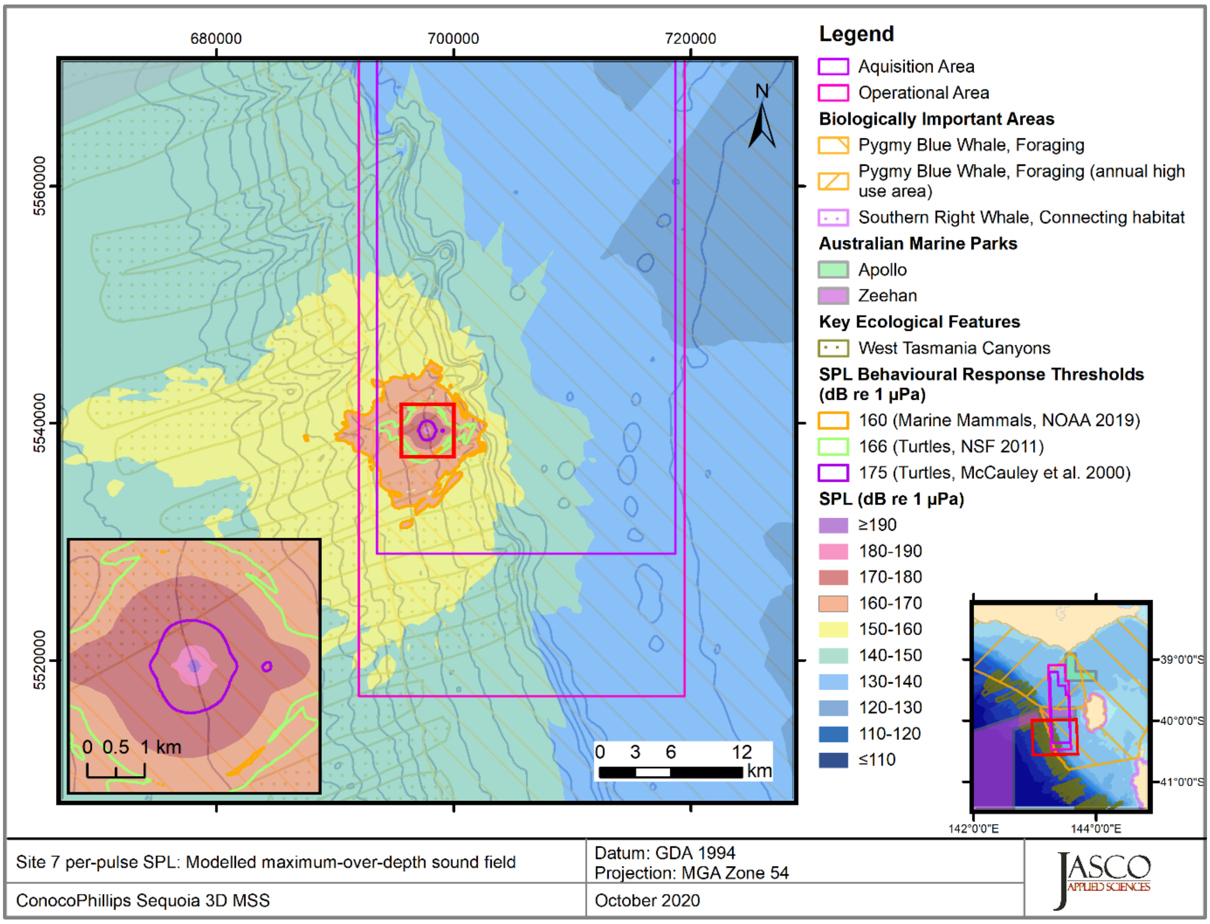

Figure 11. *Site 7, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

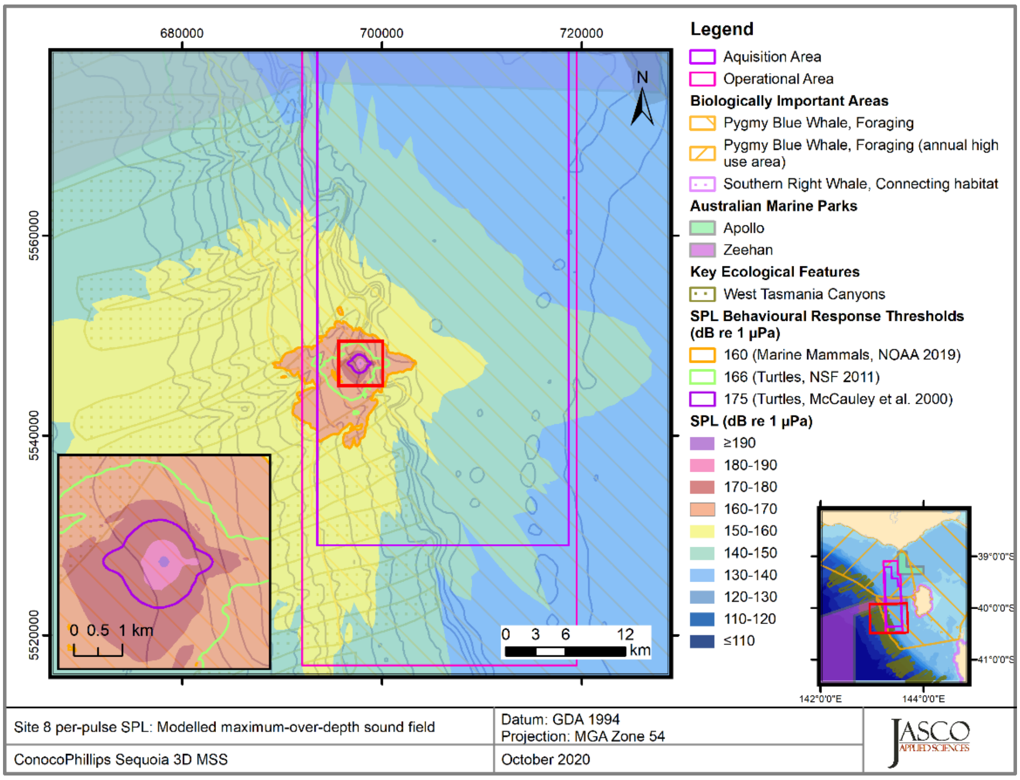

Figure 12. *Site 8, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

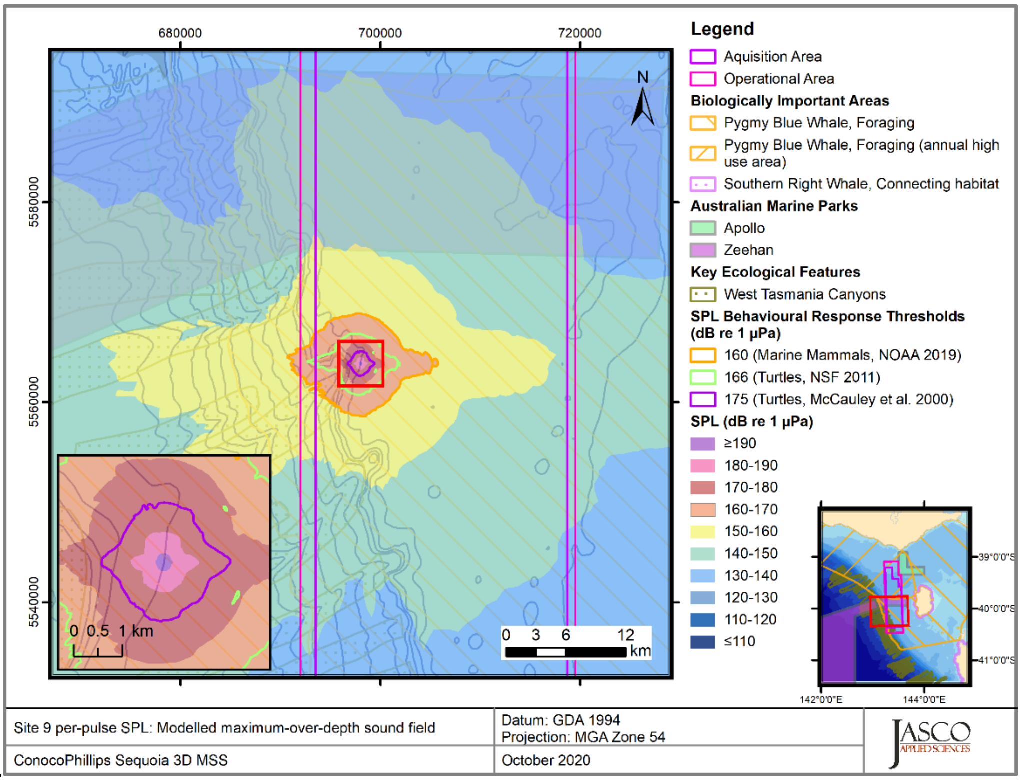

Figure 13. *Site 9, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

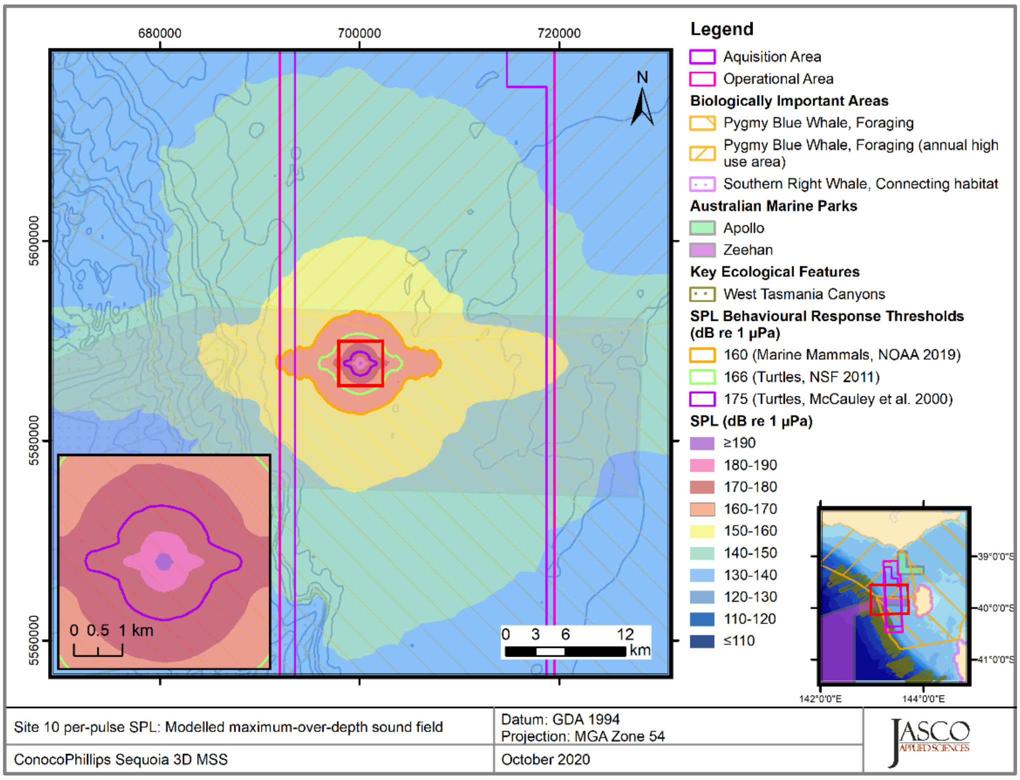

Figure 14. *Site 10, tow azimuth 0º, SPL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps, and the isopleths for behavioural response thresholds for marine mammals and turtles.

5.2.2.2. Vertical Slices of Modelled Sound Fields

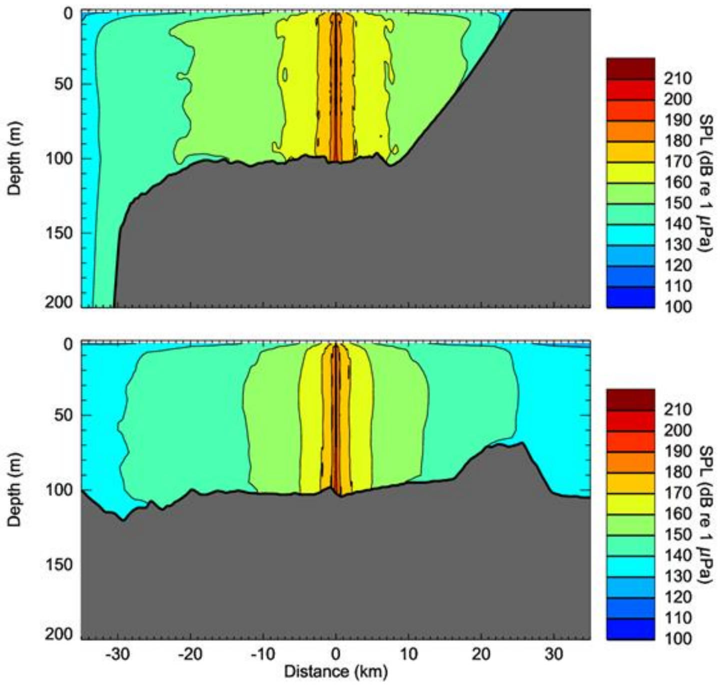

Figure 15. *Site 3, tow azimuth 180º, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in for the broadside slice is 90° counter-clockwise from the tow azimuth. The positive distance for the endfire slice is inline with the tow azimuth (the direction of transit).

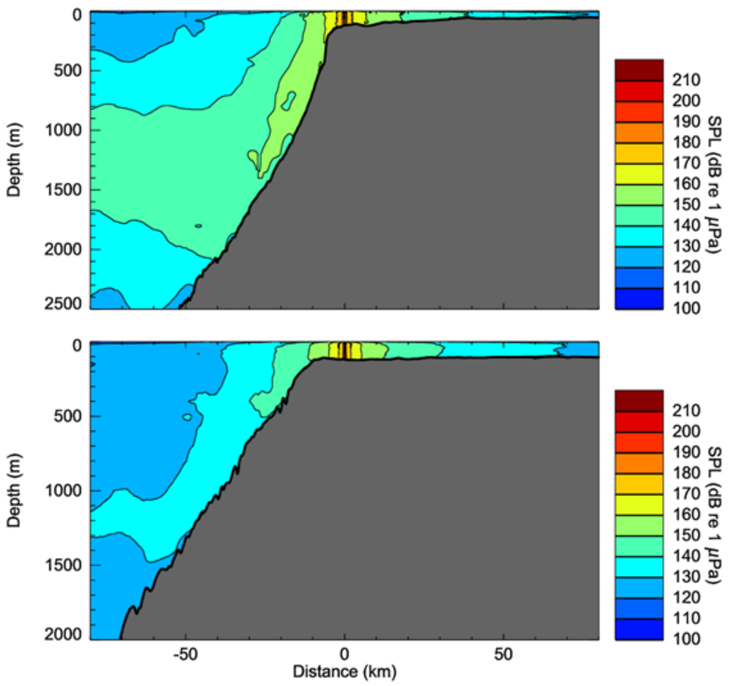

Figure 16. *Site 5, tow azimuth 0º, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in for the broadside slice is 90° clockwise from the tow azimuth. The positive distance for the endfire slice is in line with the tow azimuth (the direction of transit).

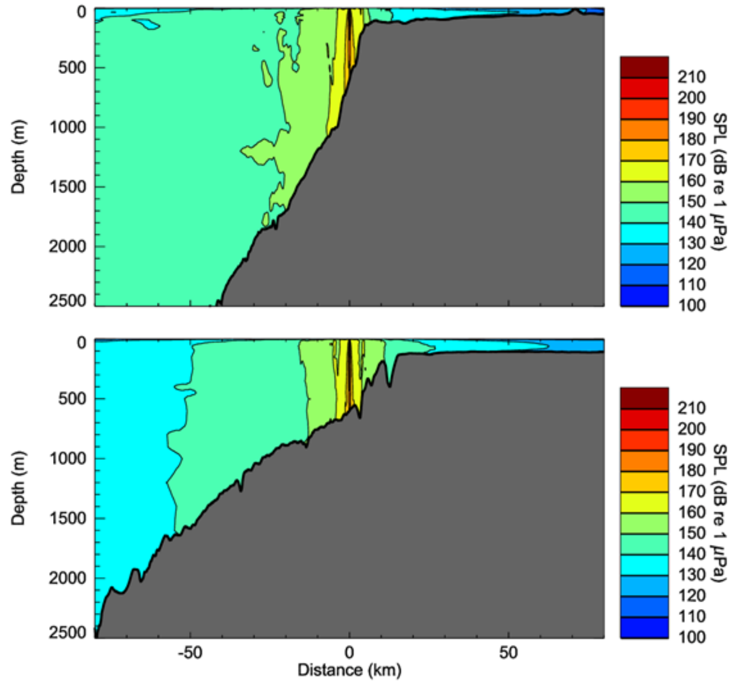

Figure 17. *Site 7, tow azimuth 0º, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in for the broadside slice is 90° clockwise from the tow azimuth. The positive distance for the endfire slice is in line with the tow azimuth (the direction of transit).

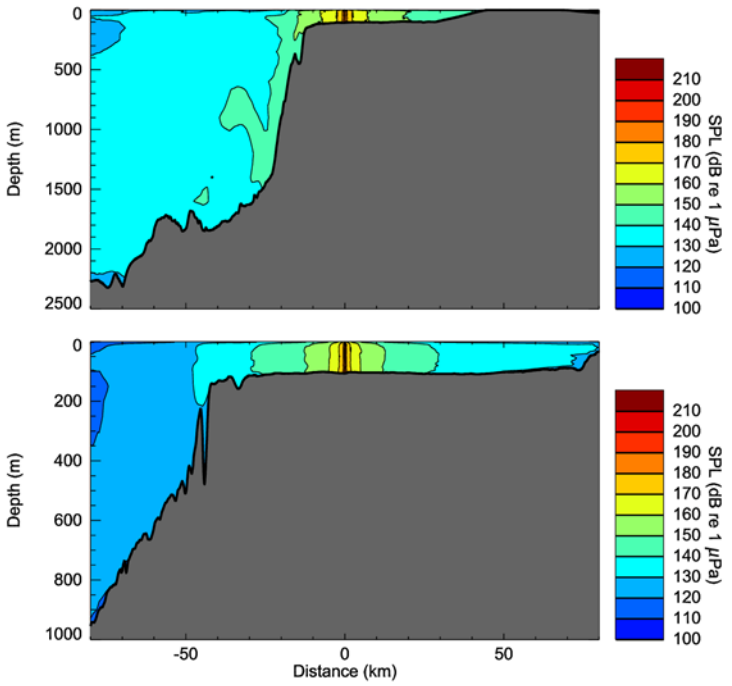

Figure 18. *Site 10, tow azimuth 0º, SPL*: Sound level contours in vertical slice of the sound field, perpendicular to (broadside, top) and along the tow direction (endfire, bottom). The positive distance direction in for the broadside slice is 90° clockwise from the tow azimuth. The positive distance for the endfire slice is in line with the tow azimuth (the direction of transit).

5.2.3. Particle motion

Figures 19–20 show modelled maximum particle acceleration as a function of horizontal range in four perpendicular directions from the centre of the 3480 in^3 seismic source at two modelled Site A and Site 1 (61 and 103 m water depth respectively). The modelling considered a resolution of 10 m, and a receiver positioned 5 cm off the seafloor. The maximum distance to a particle acceleration 37.57 ms^{-2} (Section 3.4.1 and Day et al. (2016a)) occurs at maximum range of 1.5 m for Site A and is not reached at Site 1 (Figures 19 and 20) .

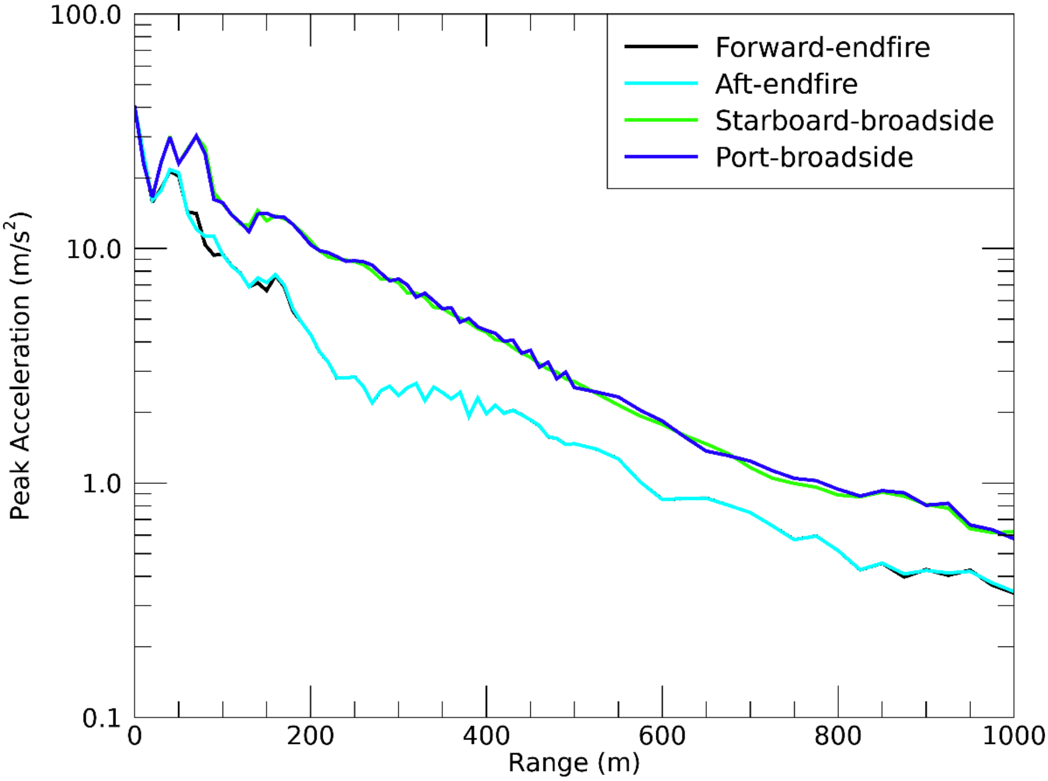

Figure 19. *Site A* (61 m water depth): Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of a single 3480 in^3 seismic source along four directions.

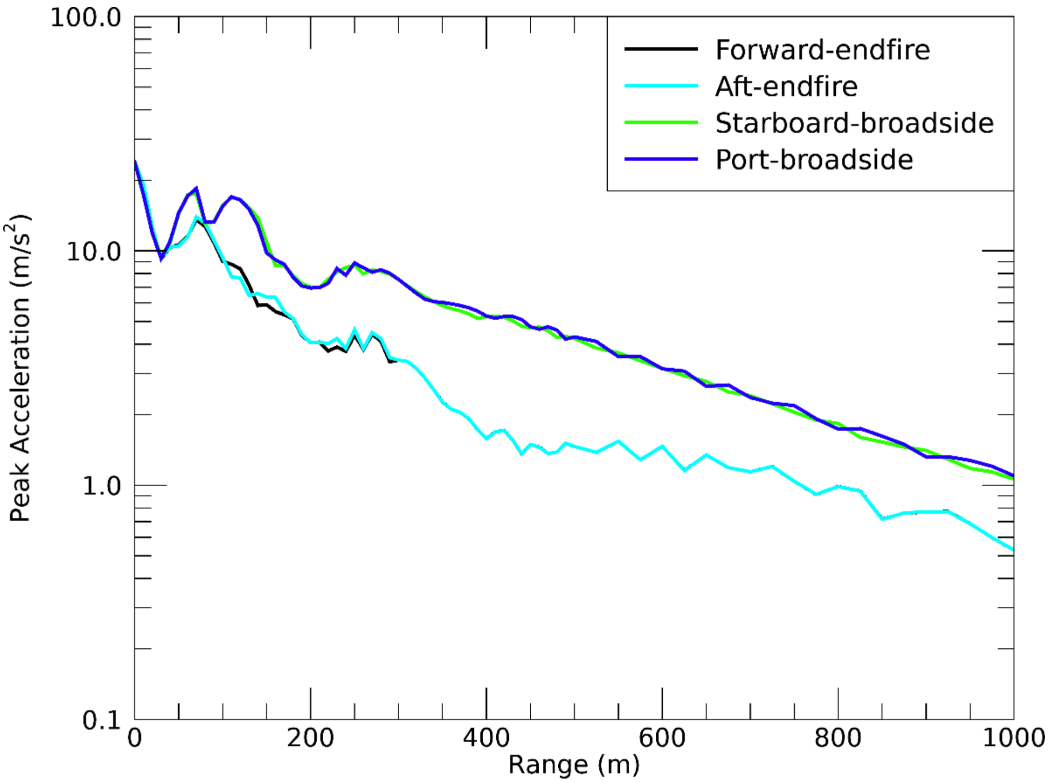

Figure 20. *Site 1* (103 m water depth): Peak particle acceleration magnitude at the seafloor as a function of horizontal range from the centre of a single 3480 in^3 seismic source along four directions.

5.3. Multiple Pulses Sound Fields

This section presents the sound fields in terms of SEL accumulated over 24 hours of survey, for the two modelled SEL_{24h} scenarios. Frequency-weighted SEL_{24h} sound fields were used to estimate the maximum and 95% distances (R_{max} and $R_{95\%}$; calculated as detailed in Appendix C.1) to marine mammals and turtle PTS and TTS thresholds (listed in Table 17), and to estimate maximum distance and the area to injury and TTS thresholds for fish over the entire water column and at the seafloor (Table 18).

The SEL_{24h} sound fields are presented as contour maps in Figures 21 to 24. These figures present the unweighted SEL_{24h} in 10 dB steps, as well as the isopleths corresponding to criteria thresholds. Only contours at ranges larger than the nearfield of the seismic source are rendered.

5.3.1. Tabulated Results

Table 17. *Marine mammal and sea turtle criteria*: Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) from the survey lines to permanent threshold shift (PTS) and temporary threshold shift (TTS) thresholds considering 24 h of survey activity (maximum-over-depth).

Hearing group	Weighted SEL thresholds ($L_{E,24h}$; dB re 1 µPa²·s)	Scenario 1		Scenario 2	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS					
Low-frequency cetaceans	183	1.18	319	0.98	247
Mid-frequency cetaceans	185	-	-	-	-
High-frequency cetaceans	155	0.08	2.21	0.08	3.26
Phocid pinnipeds in water	185	0.08	2.54	0.08	3.26
Otariid pinnipeds in water	203	-	-	-	-
Sea Turtles	204	0.08	2.54	0.08	3.26
TTS					
Low-frequency cetaceans	168	27.9	5317	56.6	6524
Mid-frequency cetaceans	170	0.08	1.72	0.08	2.69
High-frequency cetaceans	140	0.32	98.3	0.28	87.5
Phocid pinnipeds in water	170	0.72	177	0.58	142
Otariid pinnipeds in water	188	0.08	1.9	0.08	3.14
Sea Turtles	189	0.50	145	0.46	124

A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Table 18. *Fish criteria*: Maximum horizontal distances (R_{max}, in km) from the survey lines and area (km^2) to injury and temporary threshold shift (TTS) thresholds considering 24 h of survey activity.

Marine fauna group	**Threshold for SEL_{24h}** ($L_{E,24h}$; dB re 1 µPa^2·s)	**Scenario 1**		**Scenario 2**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
Mortality and potential mortal injury					
Maximum-over-depth					
I	219	0.08	1.90	0.08	3.14
II, fish eggs and fish larvae	210	0.08	2.54	0.08	3.26
III	207	0.08	2.54	0.08	3.26
Seafloor					
I	219	*	*	*	*
II, fish eggs and fish larvae	210	*	*	*	*
III	207	*	*	*	*
Fish recoverable injury					
Maximum-over-depth					
I	216	0.08	2.54	0.08	3.26
II, III	203	0.09	5.11	0.08	3.98
Seafloor					
I	216	*	*	*	*
II, III	203	*	*	*	*
Fish TTS					
Maximum-over-depth					
I, II, III	186	2.55	827	2.52	768
Seafloor					
I, II, III	186	2.36	706	2.4	661

Fish I–No swim bladder; Fish II–Swim bladder not involved with hearing; Fish III–Swim bladder involved with hearing.
An asterisk indicates that the sound level was not reached.

5.3.2. Sound Level Contour Maps

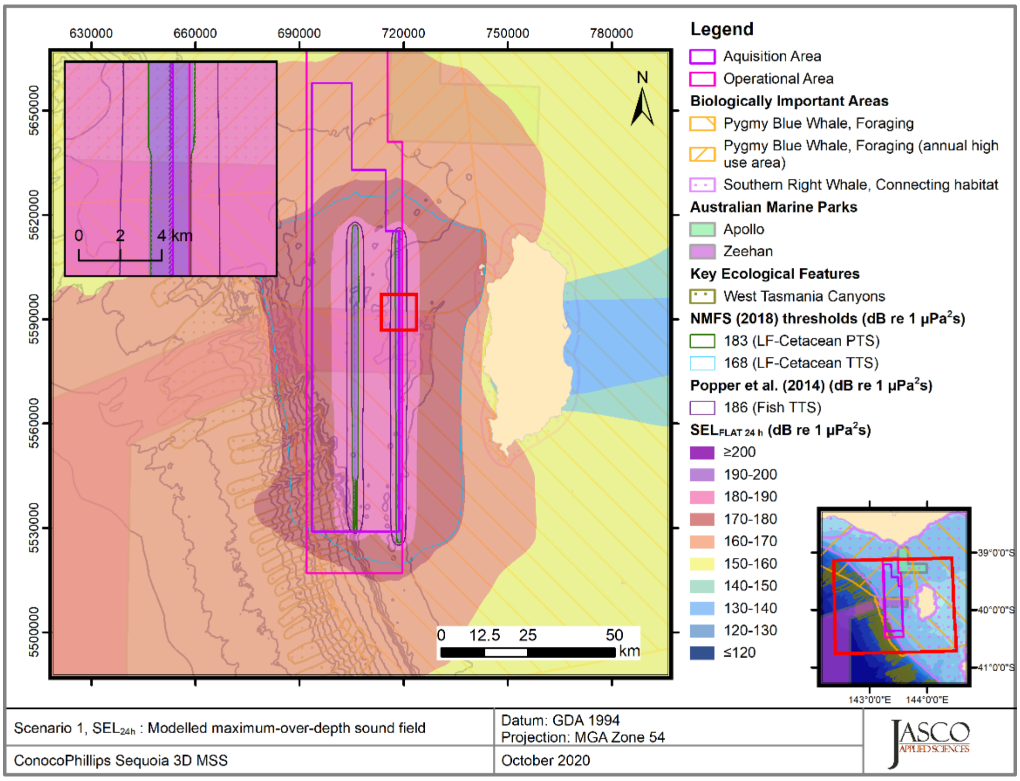

Figure 21. *Scenario 1*: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for cetaceans and fish. Thresholds omitted here were not reached or not large enough to display graphically. Refer to Tables 17 and 18 for tabulated radii.

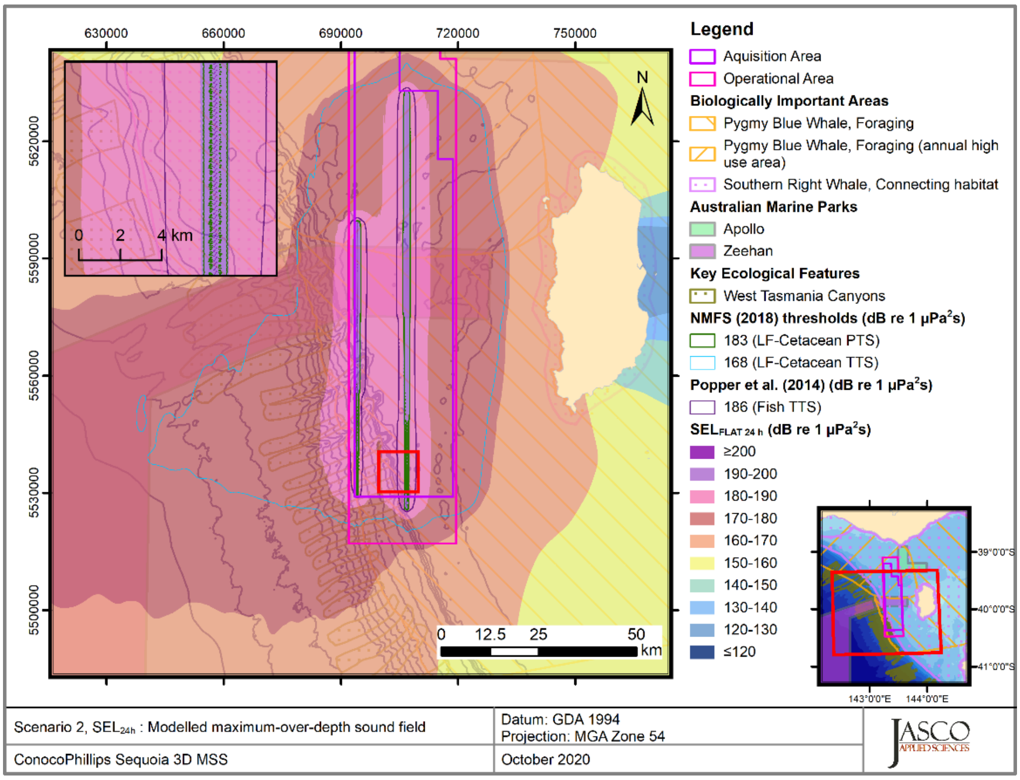

Figure 22. *Scenario 2*: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for cetaceans and fish. Thresholds omitted here were not reached or not large enough to display graphically. Refer to Tables 17 and 18 for tabulated radii.

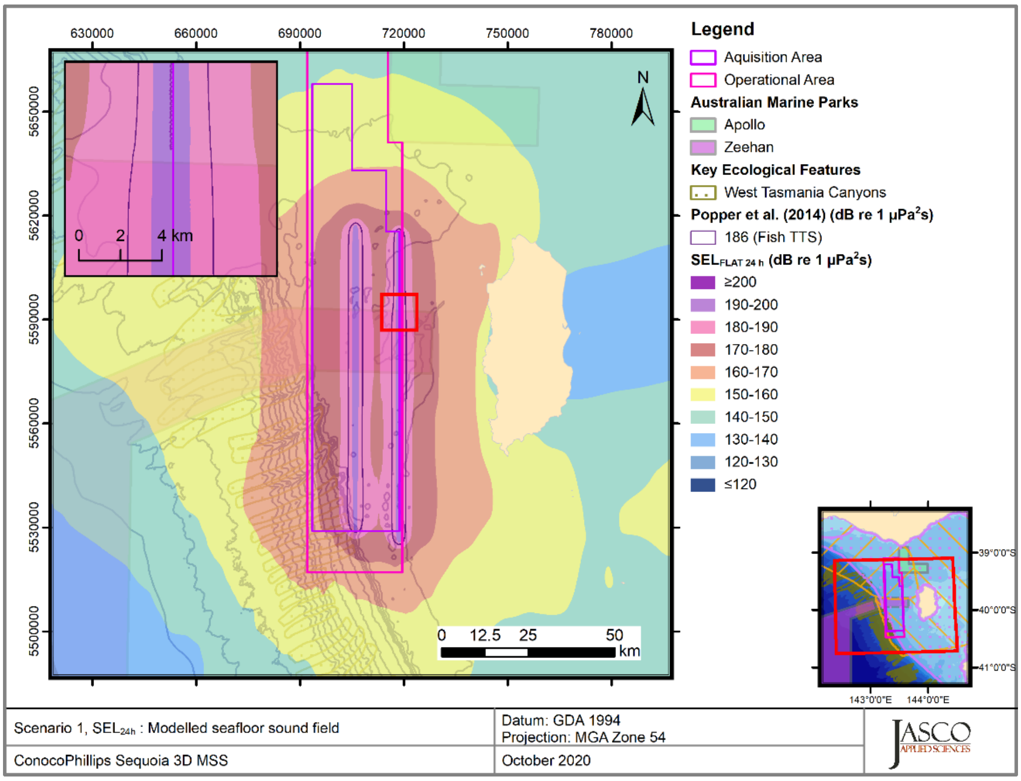

Figure 23. *Scenario 1*: Sound level contour map showing unweighted seafloor SEL_{24h} results, along with isopleths for fish. Thresholds for omitted here were not reached or not large enough to display graphically. Refer to Table 18 for tabulated radii.

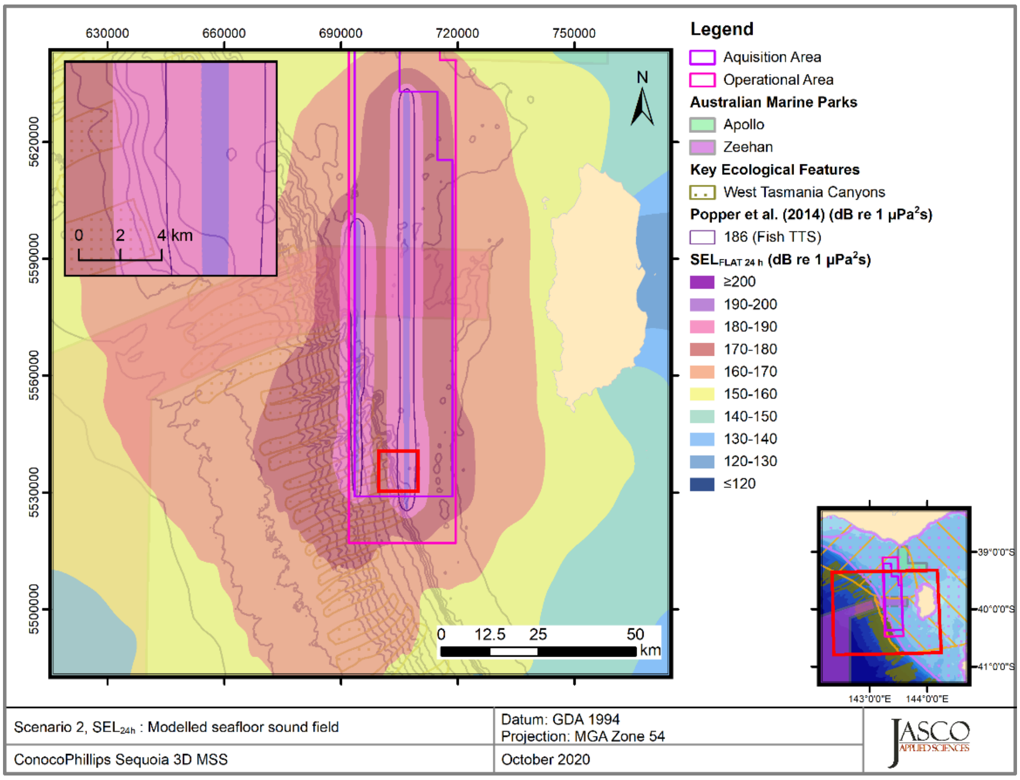

Figure 24. *Scenario 2*: Sound level contour map showing unweighted seafloor SEL_{24h} results, along with isopleths for fish. Thresholds for omitted here were not reached or not large enough to display graphically. Refer to Table 18 for tabulated radii.

6. Discussion and Summary

This modelling study predicted underwater sound levels associated with the planned Sequoia 3D MSS. The underwater sound field was modelled for a 3480 in^3 seismic source (Appendix C.5).

Most acoustic energy from a seismic source is output at lower frequencies, in the tens to hundreds of hertz (see Appendix C.5.1 as an example). The overall broadband (10–25 000 Hz) unweighted per-pulse SEL source level of the 3480 in^3 seismic source operating at 6 m depth was 225.3 dB 1 μPa^{2}m^{2}s in the broadside direction and 225.1 dB 1 μPa^{2}m^{2}s in the endfire direction. The peak source pressure level in the same directions was 248.6 and 247.6 dB re 1 μPa m, respectively (Table 9). Furthermore the modelled 3480 in^3 array had a pronounced broadside directivity for decidecade-bands between ~100 to 251 Hz (Appendix C.5.1), which caused a noticeable axial bulge in the modelled acoustic footprints.

An analysis of seasonal sound speed profiles for the months July to October (presented in Appendix C.4.2) identified that July that would provide the farthest propagation, due to the presence of a slight upward refracting sound speed profile. Whilst the potential operational window of the survey is from 1 August to 31 October, July, was included to represent a worst-case scenario, although it is not substantially different to August. Modelling also accounted for site-specific bathymetric variations (Appendix C.4.1) and local geoacoustic properties (Appendix C.4.3).

6.1. Per-Pulse Sound Levels

The per-pulse modelling sites encompassed water depths from 61 to 798 m across two different geological areas with a single representative water column profile. At all single impulse sites the distances to identified isopleths were greater in the broadside direction than in the endfire direction, a difference apparent in all footprint maps in Section 5.2.2.1. The array directionality and frequency content coupled with the bathymetry had a considerable effect on propagation at longer distances, with generally larger lobes of sound energy extending into the deeper waters perpendicular to the continental shelf.

In discussion of the frequency content of the seismic source, sites located in deeper water have a lower “cut-off frequency (f_c)” than sources in shallower water. The cut-off frequency is a single number that describes how much acoustic energy can propagate with minimal loss between the sea-surface and seafloor interfaces. For a given acoustic signal, frequencies below f_c are subject to higher loss compared to frequencies above the f_c (Jensen et al. 2011). The cut off frequency inversely proportional to water depth; therefore for sites where the water depth was greater than 125 m (Sites 6–8) a large amount of low-frequency energy from the seismic source can propagate in the water column. For shallower sites (Site A, Sites 1–5, 9–10) the very low high energy frequencies of the seismic source do not propagate as effectively as they would in deeper water.

In a similar way the acoustic energy can be trapped between the sea-surface and seafloor, variations in the sound speed profile can form ducts, which can trap acoustic energy within the ocean interior. The sound speed profile (Figure C-7) was primarily downwards refracting down to 1000 m depth apart from a moderate surface duct. This surface duct (≤40 m deep) in the profile shown in Figure C-7 is not deep enough to trap energy below approximately 550 Hz (see Equation 1.36 in Jensen et al. (2011)). The surface duct therefore can only trap the higher frequencies of the array that contribute less to the broadband source level than lower frequencies (Figure C-10). However, when trapped, high frequencies can propagate with little loss and can produce higher levels near the sea-surface than scenarios where no surface duct is present.

The sound speed profile had a minimum sound speed at approximately 1100 m that forms the sound channel axis. For source locations above the continental shelf break, significant amounts energy can be reflected from the seabed and trapped in the sound channel which can then propagate for large distances deep within the ocean interior. This results in larger ranges to all isopleths in the offshore directions, furthermore the largest ranges occur when the broadside azimuth of the array points in the offshore direction. This is particularly obvious in the slice plots showing the broadside direction (Section 5.2.2.2, Figures 15–18).

It is these environmental effects coupled with the directionality of the seismic source the result in the unique sound field footprints, isopleths contours and associated isopleth distances. The vertical slice plots (Section 5.2.2.2) assist in demonstrating the influence of the bathymetry, source location and sound speed profile on the sound field. As an example, the distances to SPL thresholds for behavioural response in marine mammals typically increased as water depth increases (see Table 11) and this can be attributed to lower cut off frequency in deeper ocean. However, the orientation of the source is also key, as the array has a pronounced directivity pattern, with greater distances to sound levels in the broadside direction and offshore direction as compared to the endfire direction.

6.2. Particle Motion

Section 5.2.3 discuss the relevance of particle motion (acceleration) to bivalves on the seabed. Particle acceleration decays rapidly away from the source location within the distance equal to half the water depth. It is then influenced by shallow water propagation effects, such as constructive interference from sea-surface and seabed reflections. This resulted in up to 10 ms^{-2} variation in predicted levels out to a distance equivalent to two water depths, Beyond this distance, it exhibited an almost linear decay (Figures 19 and 20).

Day et al. (2016a) and Day et al. (2016b) included a regression of particle acceleration versus range for the single 150 in^3 airgun used in their study (minimum range of 6 m) and showed that acceleration at 10 and 100 m range was typically 26 and 5 ms^{-2}, respectively. Day et al. (2016a) and Day et al. (2016b) also referenced an unpublished maximum particle acceleration measurement of 6.2 ms^{-2} from a 3130 in^3 airgun array at 477 m range in 36 m of water. In this study, the modelled peak acceleration at 10 m range was predicted to be between 19.1 and 23.1 ms^{-2} depending on the site, the corresponding values at 100 m range are between 9.4 and 15.7 ms^{-2}. At ~477 m, our study predicts acceleration ranging between 2.8 and 4.3 ms^{-2} in the broadside directions. These result aligns with the measurements reported in Day et al. (2016a) and Day et al. (2016b), thus represents what is likely to occur.

JASCO has several measurements of particle acceleration vs distance from seismic airgun arrays made with a variety of sensor types, ranging from extremely close range in shallow water to deeper water and longer ranges. In 110 m of water over a sandy seabed we found seabed accelerations of 20 ms^{-2} at a radial closest point of approach (CPA) distance of 15 m. In much shallower waters, accelerations in excess of 40 ms^{-2} were measured at CPA distances of 50 m, and higher levels again were received at close range in shallow water. The results also show that the specific conditions at each location affect the fine scale results of both modelling and measurements.

For bivalves, the maximum distance to a particle acceleration value to 37.57 ms^{-2} for a receiver 5 cm off the seafloor, is 1.5 m for comparison to literature results in Table 7 of Day et al. (2016a).

6.3. Multiple Pulse Sound Fields

The accumulated SEL over 24 hours of seismic source operation was modelled considering two representative scenarios with a realistic acquisition pattern for the Sequoia 3-D MSS. The modelling predicted the accumulation of sound energy, considering the change in location and the azimuth of the source at each pulse point, which were used to assess distances to the SEL_{24h} based thresholds and guidelines. The results were presented as maps of the accumulated exposure levels and tabulated values of ranges to threshold levels and exposure areas for the given effects criteria (Section 5.3).

The footprints and range maxima for all SEL_{24h} criteria are substantially influenced by the locations of the source near the shelf break and slope. For an acquisition line which transitions from shallow to deep water, more low frequency energy is transmitted into the water column, where it can be trapped in the deep-water sound channel and propagate with minimal loss. This effect is manifested in the large extent for isopleths and R_{max} distances to thresholds in the offshore direction shown Figures 21–22. Furthermore, the rate of attenuation decreases as distance from the acquisition lines increases, and propagation of this nature can further reduce the attenuation rate and allow lower levels to persist to longer ranges.

Considering the discussion of the directionality of the seismic source and the effects of the environment on the modelled single impulse sound fields discussed above, the maximum-over-depth ranges to isopleths like the SEL_{24h} results for TTS threshold for low-frequency cetaceans will occur largest at long ranges off the continental shelf. However, the modelling indicates that at the greatest distances these levels will likely occur within the deep ocean, due to energy being trapped in the deep sound channel. Therefore, the contours and radii may not accurately represent the received exposures for marine mammals at longer ranges if they do not dive to depths associated with the deep sound channel (centred at 1100 m).

6.4. Summary

This section summarises the distances to the noise effect criteria applied in this study (Section 3) for the various fauna groups. The effect criteria for impairment of marine mammals, fish and sea turtles use dual metrics (PK and SEL_{24h}), and the longest distance associated with either metric is required to be applied, and thus is presented in this summary.

The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. Where the corresponding SEL_{24h} effect radii are larger than those for peak pressure criteria, they often represent an unlikely worst-case scenario. More realistically, marine mammals, fish and sea turtles would not stay in the same location for 24 hours, but rather a shorter period, depending upon their behaviour and the proximity and movements of the source. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be impaired, but rather that an animal could be exposed to the sound level associated with impairment (either PTS or TTS) if it remained in that location for 24 hours.

Marine mammals

Table 19 summarises the distances to effect criteria for marine mammals.

Table 19. Maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and PTS and TTS thresholds for marine mammals (PK values from Table 14 and SEL_{24h} values from Table 17).

Hearing group	Modelled distance (in km) to effect threshold (R_{max})		
	Behavioural response[1]	Impairment: TTS[2]	Impairment: PTS[2]
Low-frequency (LF) cetaceans	11.1	56.6	1.18
Mid-frequency cetaceans		0.08	-
High-frequency cetaceans		0.62	0.34
Phocid pinnipeds in water		0.72	0.08
Otariid pinnipeds in water		0.08	–

[1] Noise exposure criteria: NOAA (2019)
[2] Noise exposure criteria: NMFS (2018a)
A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Sea turtles

Table 20 summarises the distances to effect criteria for sea turtles.

Table 20. Maximum (R_{max}) horizontal distances (in km) from modelled sites or scenarios to behavioural response thresholds and PTS and TTS thresholds for sea turtles (maximum-over-depth, PK values from Table 14 and SEL_{24h} values from Table 17).

Hearing group	Modelled distance (in km) to effect threshold (R_{max})			
	Behavioural response[1]	Behavioural disturbance[2]	Impairment: TTS[3]	Impairment: PTS[3]
Turtles	1.66	5.43	0.50	0.08

[1] Noise exposure criteria: NSF (2011)
[2] Noise exposure criteria: McCauley et al. (2000a)
[3] Noise exposure criteria: Finneran et al. (2017)

Fish, fish eggs, and fish larvae

This modelling study assessed the ranges for quantitative criteria based on Popper et al. (2014) and considered both PK (seafloor and water column) and SEL_{24h} metrics associated with mortality and potential mortal injury as well as impairment in the following groups:

- Fish without a swim bladder (also appropriate for sharks in the absence of other information).
- Fish with a swim bladder that do not use it for hearing.
- Fish that use their swim bladders for hearing.
- Fish eggs and fish larvae.

Tables 21 and 22 summarise the distances to injury criteria for fish, fish eggs and fish larvae along with the relevant metric and the location of the information within this report.

Table 21. Summary of maximum fish, fish eggs, and larvae injury and TTS onset distances for single impulse and SEL_{24h} modelled scenarios (maximum-over-depth, PK values from Table 14 and SEL_{24h} values from Table 18).

Relevant hearing group	Effect criteria	Scenario 1		Scenario 2	
		Metric associated with longest distance to criteria	R_{max} (km)	Metric associated with longest distance to criteria	R_{max} (km)
Fish: No swim bladder	Injury	SEL_{24h}	0.08	SEL_{24h}	0.08
	TTS	SEL_{24h}	2.55	SEL_{24h}	2.52
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing	Injury	PK	0.17	PK	0.13
	TTS	SEL_{24h}	2.55	SEL_{24h}	2.52
Fish eggs, and larvae	Injury	PK	0.17	PK	0.13

Table 22. Summary of maximum fish TTS onset distances for SEL_{24h} modelled scenarios, seafloor receptors , values from Table 18.

Relevant hearing group	Effect criteria	Scenario 1		Scenario 2	
		Metric associated with longest distance to criteria	R_{max} (km)	Metric associated with longest distance to criteria	R_{max} (km)
Fish: No swim bladder	TTS	SEL_{24h}	2.36	SEL_{24h}	2.4
Fish: Swim bladder not involved in hearing and Swim bladder involved in hearing					
Fish eggs, and larvae					

Invertebrates, Sponges, Coral and Plankton

To assist with assessing the potential effects on these receptors, the following were determined:

- Crustaceans (lobster and crab): The sound level of 202 dB re 1 µPa PK-PK from Payne et al. (2008), associated with no mortality or damage to mechano-sensory systems, and recoverable injury for lobster, was considered at the seafloor; the sound level was reached at ranges between 0.324 and 0.414 km depending on the modelled site (Table 16).

  Within the Operational Area the water depths associated with the Tasmanian Giant Crab Fishery are primarily between 130 and 500 m. Modelling Site 1 (103 m depth) was used to assess sound levels at the seafloor, and the distance to sound level of 202 dB re 1 µPa PK-PK at this site was 340 m. At the same modelling site, the maximum single impulse exposure measured in Day et al. (2019) during the lobster experiments, 213 dB re 1 µPa PK-PK, was predicted to occur at 138 m from the centre of array.
- Bivalves: The distance where a particle acceleration of 37.57 ms^{-2} at the seafloor could occur was determined for comparing to results presented in Day et al. (2016a). The maximum distance to this particle acceleration level was 1.5 m for the two sites considered (Section 5.2.3).
- Sponges and coral: the PK sound level at the seafloor directly underneath the seismic source was estimated at all modelled sites and compared to the sound level of 226 dB re 1 µPa PK for sponges and corals (Heyward et al. 2018); it was reached at 4 m from a modelled site A (Table 15).
- Octopus and squid: The maximum (R_{max}) and 95% ($R_{95\%}$) distances to the sound level of 162 dB re 1 $\mu Pa^2 \cdot s$ from Fewtrell and McCauley (2012) associated with inking, and referred to as a startle response threshold, was estimated to be 3.34 and 2.14 km respectively (Table 10).

Glossary

1/3-octave
One third of an octave. Note: A one-third octave is approximately equal to one decidecade (1/3 oct ≈ 1.003 ddec; ISO 2017).

1/3-octave-band
Frequency band whose bandwidth is one one-third octave. Note: The bandwidth of a one-third octave-band increases with increasing centre frequency.

A-weighting
Frequency-selective weighting for human hearing in air that is derived from the inverse of the idealized 40-phon equal loudness hearing function across frequencies.

absorption
The reduction of acoustic pressure amplitude due to acoustic particle motion energy converting to heat in the propagation medium.

attenuation
The gradual loss of acoustic energy from absorption and scattering as sound propagates through a medium.

Auditory frequency weighting (auditory weighting function, frequency-weighting function)
The process of band-pass filtering sounds to reduce the importance of inaudible or less-audible frequencies for individual species or groups of species of aquatic mammals (ISO 2017). One example is M-weighting introduced by Southall et al. (2007) to describe "Generalized frequency weightings for various functional hearing groups of marine mammals, allowing for their functional bandwidths and appropriate in characterizing auditory effects of strong sounds".

azimuth
A horizontal angle relative to a reference direction, which is often magnetic north or the direction of travel. In navigation it is also called bearing.

bandwidth
The range of frequencies over which a sound occurs. Broadband refers to a source that produces sound over a broad range of frequencies (e.g., seismic airguns, vessels) whereas narrowband sources produce sounds over a narrow frequency range (e.g., sonar) (ANSI/ASA S1.13-2005 R2010).

bar
Unit of pressure equal to 100 kPa, which is approximately equal to the atmospheric pressure on Earth at sea level. 1 bar is equal to 10^5 Pa or 10^{11} µPa.

boxcar averaging
A signal smoothing technique that returns the averages of consecutive segments of a specified width.

broadband sound level
The total sound pressure level measured over a specified frequency range. If the frequency range is unspecified, it refers to the entire measured frequency range.

broadside direction
Perpendicular to the travel direction of a source. Compare with endfire direction.

cetacean
Any animal in the order Cetacea. These are aquatic, mostly marine mammals and include whales, dolphins, and porpoises.

compressional wave
A mechanical vibration wave in which the direction of particle motion is parallel to the direction of propagation. Also called primary wave or P-wave.

continuous sound
A sound whose sound pressure level remains above ambient sound during the observation period (ANSI/ASA S1.13-2005 R2010). A sound that gradually varies in intensity with time, for example, sound from a marine vessel.

decade
Logarithmic frequency interval whose upper bound is ten times larger than its lower bound (ISO 2006).

decidecade
One tenth of a decade (ISO 2017). Note: An alternative name for decidecade (symbol ddec) is “one-tenth decade”. A decidecade is approximately equal to one third of an octave (1 ddec ≈ 0.3322 oct) and for this reason is sometimes referred to as a “one-third octave”.

decidecade band
Frequency band whose bandwidth is one decidecade. Note: The bandwidth of a decidecade band increases with increasing centre frequency.

decibel (dB)
One-tenth of a bel. Unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power (ANSI S1.1-1994 R2004).

endfire direction
Parallel to the travel direction of a source. See also broadside direction.

ensonified
Exposed to sound.

far-field
The zone where, to an observer, sound originating from an array of sources (or a spatially distributed source) appears to radiate from a single point. The distance to the acoustic far-field increases with frequency.

fast-average sound pressure level
The time-averaged sound pressure levels calculated over the duration of a pulse (e.g., 90%-energy time window), using the leaky time integrator from Plomp and Bouman (1959) and a time constant of 125 ms. Typically used only for pulsed sounds.

frequency
The rate of oscillation of a periodic function measured in cycles-per-unit-time. The reciprocal of the period. Unit: hertz (Hz). Symbol: f. 1 Hz is equal to 1 cycle per second.

hearing group
Groups of marine mammal species with similar hearing ranges. Commonly defined functional hearing groups include low-, mid-, and high-frequency cetaceans, pinnipeds in water, and pinnipeds in air.

geoacoustic
Relating to the acoustic properties of the seabed.

hearing threshold
The sound pressure level for any frequency of the hearing group that is barely audible for a given individual in the absence of significant background noise during a specific percentage of experimental trials.

hertz (Hz)
A unit of frequency defined as one cycle per second.

high-frequency (HF) cetacean
The functional cetacean hearing group that represents those odontocetes (toothed whales) specialized for hearing high frequencies.

impulsive sound
Sound that is typically brief and intermittent with rapid (within a few seconds) rise time and decay back to ambient levels (NOAA 2013, ANSI S12.7-1986 R2006). For example, seismic airguns and impact pile driving.

low-frequency (LF) cetacean
The functional cetacean hearing group that represents mysticetes (baleen whales) specialized for hearing low frequencies.

mean-square sound pressure spectral density
Distribution as a function of frequency of the mean-square sound pressure per unit bandwidth (usually 1 Hz) of a sound having a continuous spectrum (ANSI S1.1-1994 R2004). Unit: $\mu Pa^2/Hz$.

median
The 50th percentile of a statistical distribution.

mid-frequency (MF) cetacean
The functional cetacean hearing group that represents those odontocetes (toothed whales) specialized for mid-frequency hearing.

mysticete
Mysticeti, a suborder of cetaceans, use their baleen plates, rather than teeth, to filter food from water. They are not known to echolocate, but they use sound for communication. Members of this group include rorquals (Balaenopteridae), right whales (Balaenidae), and grey whales (*Eschrichtius robustus*).

non-impulsive sound
Sound that is broadband, narrowband or tonal, brief or prolonged, continuous or intermittent, and typically does not have a high peak pressure with rapid rise time (typically only small fluctuations in decibel level) that impulsive signals have (ANSI/ASA S3.20-1995 R2008). For example, marine vessels, aircraft, machinery, construction, and vibratory pile driving (NIOSH 1998, NOAA 2015).

octave
The interval between a sound and another sound with double or half the frequency. For example, one octave above 200 Hz is 400 Hz, and one octave below 200 Hz is 100 Hz.

odontocete
The presence of teeth, rather than baleen, characterizes these whales. Members of the Odontoceti are a suborder of cetaceans, a group comprised of whales, dolphins, and porpoises. The skulls of toothed whales are mostly asymmetric, an adaptation for their echolocation. This group includes sperm whales, killer whales, belugas, narwhals, dolphins, and porpoises.

otariid
A common term used to describe members of the Otariidae, eared seals, commonly called sea lions and fur seals. Otariids are adapted to a semi-aquatic life; they use their large fore flippers for propulsion. Their ears distinguish them from phocids. Otariids are one of the three main groups in the superfamily Pinnipedia; the other two groups are phocids and walrus.

otariid pinnipeds in water (OPW)
The functional pinniped hearing group that represents eared seals under water.

parabolic equation method
A computationally efficient solution to the acoustic wave equation that is used to model transmission loss. The parabolic equation approximation omits effects of back-scattered sound, simplifying the computation of transmission loss. The effect of back-scattered sound is negligible for most ocean-acoustic propagation problems.

particle acceleration
The rate of change of particle velocity. Unit: metre per second squared (m/s^2). Symbol: *a*.

particle velocity
The physical speed of a particle in a material moving back and forth in the direction of the pressure wave. Unit: metre per second (m/s). Symbol: *v*.

peak pressure level (PK)
The maximum instantaneous sound pressure level, in a stated frequency band, within a stated period. Also called zero-to-peak pressure level. Unit: decibel (dB).

peak-to-peak pressure level (PK-PK)
The difference between the maximum and minimum instantaneous pressure levels. Unit: decibel (dB).

percentile level, exceedance
The sound level exceeded *n*% of the time during a measurement.

permanent threshold shift (PTS)
A permanent loss of hearing sensitivity caused by excessive noise exposure. PTS is considered auditory injury.

phocid
A common term used to describe all members of the family Phocidae. These true/earless seals are more adapted to in-water life than are otariids, which have more terrestrial adaptations. Phocids use their hind flippers to propel themselves. Phocids are one of the three main groups in the superfamily Pinnipedia; the other two groups are otariids and walrus.

phocid pinnipeds in water (PPW)
The functional pinniped hearing group that represents true/earless seals under water.

pinniped
A common term used to describe all three groups that form the superfamily Pinnipedia: phocids (true seals or earless seals), otariids (eared seals or fur seals and sea lions), and walrus.

point source
A source that radiates sound as if from a single point (ANSI S1.1-1994 R2004).

power spectrum density
Generic term, formally defined as power in W/Hz, but sometimes loosely used to refer to the spectral density of other parameters such as square pressure or time-integrated square pressure.

pressure, acoustic
The deviation from the ambient hydrostatic pressure caused by a sound wave. Also called overpressure. Unit: pascal (Pa). Symbol: *p*.

pressure, hydrostatic
The pressure at any given depth in a static liquid that is the result of the weight of the liquid acting on a unit area at that depth, plus any pressure acting on the surface of the liquid. Unit: pascal (Pa).

rms
root-mean-square.

shear wave
A mechanical vibration wave in which the direction of particle motion is perpendicular to the direction of propagation. Also called secondary wave or S-wave. Shear waves propagate only in solid media, such as sediments or rock. Shear waves in the seabed can be converted to compressional waves in water at the water-seabed interface.

signature
Pressure signal generated by a source.

sound
A time-varying pressure disturbance generated by mechanical vibration waves travelling through a fluid medium such as air or water.

sound exposure
Time integral of squared, instantaneous frequency-weighted sound pressure over a stated time interval or event. Unit: pascal-squared second ($Pa^2 \cdot s$) (ANSI S1.1-1994 R2004).

sound exposure level (SEL)
A cumulative measure related to the sound energy in one or more pulses. Unit: dB re 1 $\mu Pa^2 \cdot s$. SEL is expressed over the summation period (e.g., per-pulse SEL [for airguns], single-strike SEL [for pile drivers], 24-hour SEL).

sound exposure spectral density
Distribution as a function of frequency of the time-integrated squared sound pressure per unit bandwidth of a sound having a continuous spectrum (ANSI S1.1-1994 R2004). Unit: $\mu Pa^2 \cdot s/Hz$.

sound field
Region containing sound waves (ANSI S1.1-1994 R2004).

sound intensity
Sound energy flowing through a unit area perpendicular to the direction of propagation per unit time.

sound pressure level (SPL)
The decibel ratio of the time-mean-square sound pressure, in a stated frequency band, to the square of the reference sound pressure (ANSI S1.1-1994 R2004).

For sound in water, the reference sound pressure is one micropascal (p_0 = 1 µPa) and the unit for SPL is dB re 1 μPa^2:

$$L_p = 10 \log_{10}(p^2/p_0^2) = 20 \log_{10}(p/p_0)$$

Unless otherwise stated, SPL refers to the root-mean-square (rms) pressure level. See also 90% sound pressure level and fast-average sound pressure level. Non-rectangular time window functions may be applied during calculation of the rms value, in which case the SPL unit should identify the window type.

sound speed profile
The speed of sound in the water column as a function of depth below the water surface.

source level (SL)
The sound level measured in the far-field and scaled back to a standard reference distance of 1 metre from the acoustic centre of the source. Unit: dB re 1 µPa·m (pressure level) or dB re 1 $\mu Pa^2 \cdot s \cdot m$ (exposure level).

spectrum
An acoustic signal represented in terms of its power, energy, mean-square sound pressure, or sound exposure distribution with frequency.

temporary threshold shift (TTS)
Temporary loss of hearing sensitivity caused by excessive noise exposure.

transmission loss (TL)
The decibel reduction in sound level between two stated points that results from sound spreading away from an acoustic source subject to the influence of the surrounding environment. Also referred to as propagation loss.

wavelength
Distance over which a wave completes one cycle of oscillation. Unit: metre (m). Symbol: λ.

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Appendix A. Acoustic Metrics

A.1. Pressure Related Acoustic Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of p_0 = 1 μPa. Because the perceived loudness of sound, especially pulsed sound such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate sound and its effects on marine life. Here we provide specific definitions of relevant metrics used in the accompanying report. Where possible, we follow the American National Standard Institute and International Organization for Standardization definitions and symbols for sound metrics (ANSI 2013, e.g., ISO 2017), but these standards are not always consistent.

The zero-to-peak sound pressure, or peak sound pressure (PK or $L_{p,pk}$; dB re 1 µPa), is the decibel level of the maximum instantaneous acoustic pressure in a stated frequency band attained by an acoustic pressure signal, $p(t)$:

$$L_{p,\mathrm{pk}} = 10\log_{10}\left(\frac{\max|p^2(t)|}{p_0^2}\right) = 20\log_{10}\left(\frac{\max|p(t)|}{p_0}\right) \quad \text{(A-1)}$$

PK is often included as a criterion for assessing whether a sound is potentially injurious; however, because it does not account for the duration of an acoustic event, it is generally a poor indicator of perceived loudness.

The peak-to-peak sound pressure (PK-PK or $L_{p,pk\text{-}pk}$; dB re 1 µPa) is the difference between the maximum and minimum instantaneous sound pressure, possibly filtered in a stated frequency band, attained by an impulsive sound, $p(t)$:

$$L_{p,\mathrm{pk\text{-}pk}} = 10\log_{10}\left(\frac{[\max(p(t)) - \min(p(t))]^2}{p_0^2}\right) \quad \text{(A-2)}$$

The sound pressure level (SPL or L_p; dB re 1 µPa) is the root-mean-square (rms) pressure level in a stated frequency band over a specified time window (T; s). It is important to note that SPL always refers to an rms pressure level and therefore not instantaneous pressure:

$$L_p = 10\log_{10}\left(\frac{1}{T}\int_T g(t)\,p^2(t)\,dt \Big/ p_0^2\right) \quad \text{(A-3)}$$

where $g(t)$ is an optional time weighting function. In many cases, the start time of the integration is marched forward in small time steps to produce a time-varying SPL function. For short acoustic events, such as sonar pulses and marine mammal vocalizations, it is important to choose an appropriate time window that matches the duration of the signal. For in-air studies, when evaluating the perceived loudness of sounds with rapid amplitude variations in time, the time weighting function $g(t)$ is often set to a decaying exponential function that emphasizes more recent pressure signals. This function mimics the leaky integration nature of mammalian hearing. For example, human-based fast time-weighted SPL ($L_{p,fast}$) applies an exponential function with time constant 125 ms. A related simpler approach used in underwater acoustics sets $g(t)$ to a boxcar (unity amplitude) function of width 125 ms; the results can be referred to as $L_{p,boxcar\ 125ms}$. Another approach, historically used to evaluate SPL of impulsive signals underwater, defines $g(t)$ as a boxcar function with edges set to the times corresponding to 5% and 95% of the cumulative square pressure function encompassing the duration of an impulsive acoustic event. This calculation is applied individually to each impulse signal, and the results have been referred to as 90% SPL ($L_{p,90\%}$). In this report, SPL refers to $L_{p,boxcar\ 125ms}$.

The sound exposure level (SEL or L_E; dB re 1 µPa²·s) is the time-integral of the squared acoustic pressure over a duration (T):

$$L_E = 10\log_{10}\left(\int_T p^2(t)\,dt \Big/ T_0 p_0^2\right) \tag{A-4}$$

where T_0 is a reference time interval of 1 s. SEL continues to increase with time when non-zero pressure signals are present. It is a dose-type measurement, so the integration time applied must be carefully considered for its relevance to impact to the exposed recipients.

SEL can be calculated over a fixed duration, such as the time of a single event or a period with multiple acoustic events. When applied to pulsed sounds, SEL can be calculated by summing the SEL of the N individual pulses. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, the SEL can be computed by summing (in linear units) the SEL of the N individual events:

$$L_{E,N} = 10\log_{10}\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}} \tag{A-5}$$

Because the SPL and SEL are both computed from the integral of square pressure, these metrics are related numerically by the following expression, which depends only on the duration of the time window T:

$$L_p = L_E - 10\log_{10}(T) \tag{A-6}$$

When applied, the frequency weighting of an acoustic event should be specified, as in the case of weighted SEL (e.g., $L_{E,LF,24h}$; see Appendix A.5).

A.2. Particle Acceleration and Velocity Metrics

Since sound is a mechanical wave, it can also be measured in terms of the vibratory motion of fluid particles. Particle motion can be measured in terms of three different (but related) quantities: displacement, velocity, or acceleration. Acoustic particle velocity is the time derivative of particle displacement, and likewise acceleration is the time derivative of velocity. For the present study, acoustic particle motion has been reported in terms of acceleration and velocity.

The particle velocity (v) is the physical speed of a particle in a material moving back and forth in the direction of the pressure wave. It can be derived from the pressure gradient and Euler's linearised momentum equation where ρ_0 is the density of the medium:

$$v = -\int \nabla p(t)dt/\rho_0 \tag{A-7}$$

The particle acceleration (a) is the rate of change of the velocity with respect to time, and it can be obtained from equation A-7 as:

$$a = \frac{dv}{dt} = -\frac{\nabla p(t)}{\rho_0} \tag{A-8}$$

Unlike sound pressure, particle motion is a vector quantity, meaning that it has both magnitude and direction: at any given point in space, acoustic particle motion has three different time-varying components (x, y, and z). Given the particle velocity in the x, y, and z, directions, v_x, v_y, and v_z, the particle velocity magnitude $|v|$ is computed per the Pythagorean equation:

$$|v| = \sqrt{v_x + v_y + v_z} \tag{A-9}$$

The magnitude of particle acceleration is calculated similarly from the particle acceleration in the *x*, *y*, and *z* directions.

A.3. Decidecade Band Analysis

The distribution of a sound's power with frequency is described by the sound's spectrum. The sound spectrum can be split into a series of adjacent frequency bands. Splitting a spectrum into 1 Hz wide bands, called passbands, yields the power spectral density of the sound. This splitting of the spectrum into passbands of a constant width of 1 Hz, however, does not represent how animals perceive sound.

Because animals perceive exponential increases in frequency rather than linear increases, analysing a sound spectrum with passbands that increase exponentially in size better approximates real-world scenarios. In underwater acoustics, a spectrum is commonly split into decidecade bands, which are one tenth of a decade wide. They are approximately one third of an octave (base 2) wide and are therefore often referred to as 1/3-octave-bands. Each octave represents a doubling in sound frequency. The centre frequency of the ith band, $f_c(i)$, is defined as:

$$f_c(i) = 10^{\frac{i}{10}}\,\text{kHz} \tag{A-10}$$

and the low (f_{lo}) and high (f_{hi}) frequency limits of the ith decade band are defined as:

$$f_{lo,i} = 10^{\frac{-1}{20}} f_c(i) \quad \text{and} \quad f_{hi,i} = 10^{\frac{1}{20}} f_c(i) \tag{A-11}$$

The decidecade bands become wider with increasing frequency, and on a logarithmic scale the bands appear equally spaced (Figure A-1). The acoustic modelling spans from band 7 (f_c (7) = 5 Hz) to band 44 ($f_c(44)$ = 25 kHz).

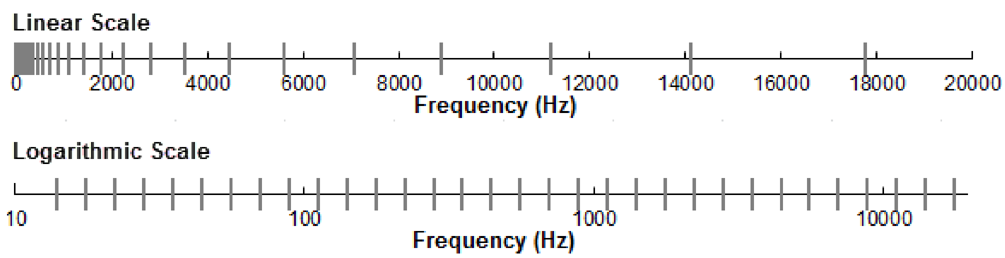

Figure A-1. Decidecade frequency bands (vertical lines) shown on a linear frequency scale and a logarithmic scale.

The sound pressure level in the ith band ($L_{p,i}$) is computed from the spectrum $S(f)$ between $f_{lo,i}$ and $f_{hi,i}$:

$$L_{p,i} = 10\log_{10} \int_{f_{lo,i}}^{f_{hi,i}} S(f)\,df \tag{A-12}$$

Summing the sound pressure level of all the bands yields the broadband sound pressure level:

$$\text{Broadband SPL} = 10\log_{10} \sum_i 10^{\frac{L_{p,i}}{10}} \tag{A-13}$$

Figure A-2 shows an example of how the decidecade band sound pressure levels compare to the sound pressure spectral density levels of an ambient noise signal. Because the decidecade bands are wider with increasing frequency, the decidecade band SPL is higher than the spectral levels at higher frequencies. Acoustic modelling of decidecade bands requires less computation time than 1 Hz bands and still resolves the frequency-dependence of the sound source and the propagation environment.

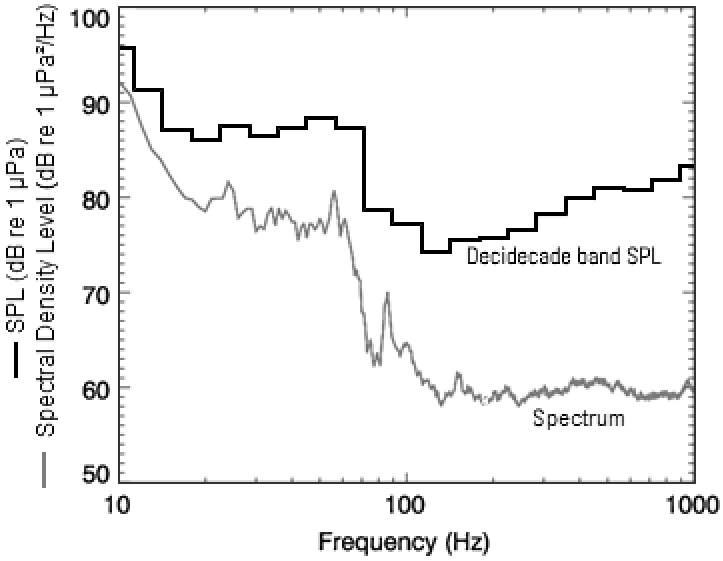

Figure A-2. Sound pressure spectral density levels and the corresponding decidecade band sound pressure levels of example ambient noise shown on a logarithmic frequency scale.

A.4. Marine Mammal Impact Criteria

It has been long recognised that marine mammals can be adversely affected by underwater anthropogenic noise. For example, Payne and Webb (1971) suggested that communication distances of fin whales are reduced by shipping sounds. Subsequently, similar concerns arose regarding effects of other underwater noise sources and the possibility that impulsive sources–primarily airguns used in seismic surveys–could cause auditory injury. This led to a series of workshops held in the late 1990s, conducted to address acoustic mitigation requirements for seismic surveys and other underwater noise sources (NMFS 1998, ONR 1998, Nedwell and Turnpenny 1998, HESS 1999, Ellison and Stein 1999). In the years since these early workshops, a variety of thresholds have been proposed for both injury and disturbance. The following sections summarise the recent development of thresholds; however, this field remains an active research topic.

A.4.1. Auditory Impairment

There are two categories of auditory threshold shifts (also termed Noise Induced Threshold Shift, NITS): Permanent Threshold Shift (PTS), a physical injury to an animal's hearing system; and Temporary Threshold Shift (TTS), a temporary reduction in an animal's hearing sensitivity as the result of physiological and mechanical processes in the inner ear. While PTS undoubtedly constitutes an injury, TTS (as a temporary effect) was not considered in the same way. However, recent research clearly indicates that already moderate levels (<12 dB) of TTS produced an accelerated hearing loss (PTS) resulting from progressive neural degeneration with age (Kujawa and Liberman 2006, 2009, Maison et al. 2013, Kujawa and Liberman 2015).

The criteria for assessing possible effects of impulsive noise (such as pile driving or seismic impulses) on marine mammals, NMFS (2018a), was applied in this study.

A.4.2. Behavioural response

Numerous studies on marine mammal behavioural responses to sound exposure have not resulted in consensus in the scientific community regarding the appropriate metric for assessing behavioural reactions. However, it is recognised that the context in which the sound is received affects the nature and extent of responses to a stimulus (Southall et al. 2007, Ellison and Frankel 2012, Southall et al. 2016).

For impulsive noise, NMFS currently uses step function thresholds of 160 dB re 1 µPa SPL (unweighted) to assess and regulate noise-induced behavioural impacts for marine mammals (NOAA

2018b, NOAA 2019). The threshold for impulsive sound is derived from the High-Energy Seismic Survey (HESS) panel (HESS 1999) report that, in turn, is based on the responses of migrating mysticete whales to airgun sounds (Malme et al. 1984). The HESS team recognised that behavioural responses to sound may occur at lower levels, but significant responses were only likely to occur above a SPL of 140 dB re 1 µPa. Southall et al. (2007) found varying responses for most marine mammals between a SPL of 140 and 180 dB re 1 µPa, consistent with the HESS (1999) report, but lack of convergence in the data prevented them from suggesting explicit step functions.

A.5. Marine Mammal Frequency Weighting

The potential for noise to affect animals depends on how well the animals can hear it. Noises are less likely to disturb or injure an animal if they are at frequencies that the animal cannot hear well. An exception occurs when the sound pressure is so high that it can physically injure an animal by non-auditory means (i.e., barotrauma). For sound levels below such extremes, the importance of sound components at particular frequencies can be scaled by frequency weighting relevant to an animal’s sensitivity to those frequencies (Nedwell and Turnpenny 1998, Nedwell et al. 2007).

A.5.1. Marine mammal frequency weighting functions

In 2015, a U.S. Navy technical report by Finneran (2015) recommended new auditory weighting functions. The overall shape of the auditory weighting functions is similar to human A-weighting functions, which follows the sensitivity of the human ear at low sound levels. The new frequency-weighting function is expressed as:

$$G(f) = K + 10\log_{10}\left[\left(\frac{(f/f_{lo})^{2a}}{\left[1+(f/f_{lo})^2\right]^a\left[1+(f/f_{hi})^2\right]^b}\right)\right] \quad \text{(A-14)}$$

Finneran (2015) proposed five functional hearing groups for marine mammals in water: low-, mid-, and high-frequency cetaceans, phocid pinnipeds, and otariid pinnipeds. The parameters for these frequency-weighting functions were further modified the following year (Finneran 2016) and were adopted in NOAA’s technical guidance that assesses noise impacts on marine mammals (NMFS 2016, NMFS 2018a). Table A-1 lists the frequency-weighting parameters for each hearing group; Figure A-3 shows the resulting frequency-weighting curves.

Table A-1. Parameters for the auditory weighting functions used in this project as recommended by NMFS (2018a).

Hearing group	a	b	f_{lo} (Hz)	f_{hi} (kHz)	K (dB)
Low-frequency cetaceans (baleen whales)	1.0	2	200	19 000	0.13
Mid-frequency cetaceans (dolphins, plus toothed, beaked, and bottlenose whales)	1.6	2	8800	110 000	1.20
High-frequency cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* and *L. australis*)	1.8	2	12 000	140 000	1.36
Phocid seals in water	1.0	2	1900	30 000	0.75
Otariid seals in water	2.0	2	940	25 000	0.64

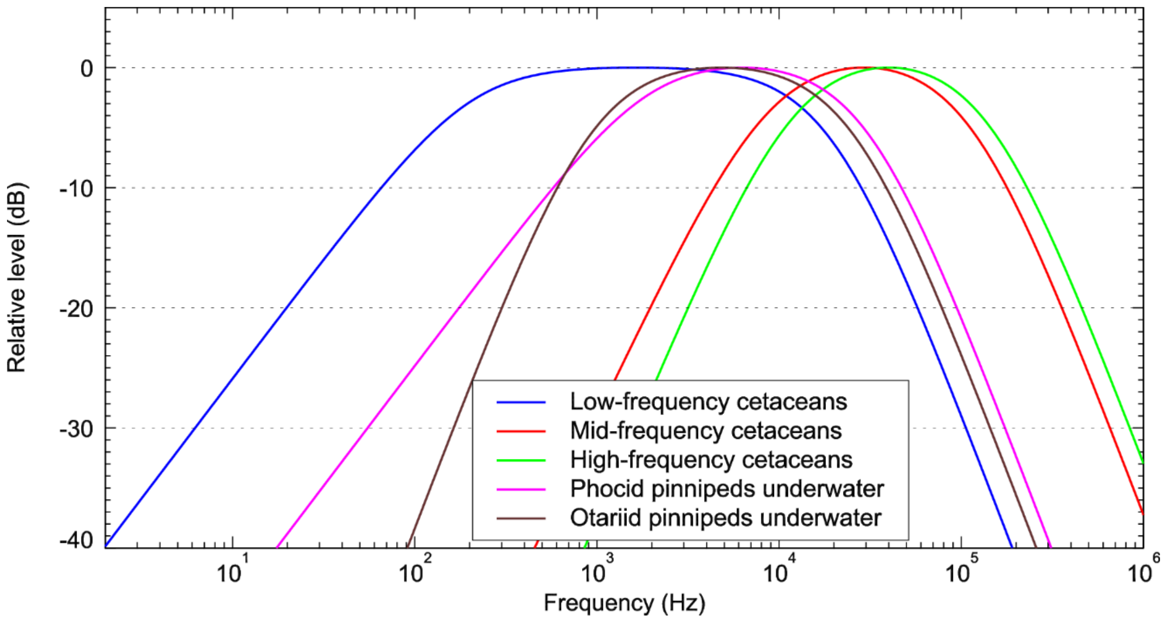

Figure A-3. Auditory weighting functions for functional marine mammal hearing groups used in this project as recommended by NMFS (2018a).

A.6. Fish, Fish Eggs, and Fish Larvae Impact Criteria

In general, any adverse effects of seismic sound on fish behaviour depends on the species, the state of the individuals exposed, and other factors. We note that, despite mortality being a possibility for fish exposed to airgun sounds, Popper et al. (2014) do not reference an actual occurrence of this effect. Since the publication of that work, newer studies have further examined the question of possible mortality. Popper et al. (2016) adds further information to the possible levels of impulsive seismic airgun sound to which adult fish can be exposed without immediate mortality. They found that the two fish species in their study, with body masses in the range 200–400 g, exposed to a single-impulse of a maximum received level of either 231 dB re 1 µPa (PK) or 205 dB re 1 µPa^2·s (SEL), remained alive for 7 days after exposure and that the probability of mortal injury did not differ between exposed and control fish.

In the discussion of the criteria, Popper et al. (2014) discuss the complications in determining a relevant period of mobile seismic surveys, as the received levels at the fish change between impulses because the source is moving, and that in reality a revised guideline based on the closest PK or the per-pulse SEL might be more useful than one based on accumulated SEL. This is because exposures at the closest point of approach (CPA) are the primary exposures contributing to a receiver's accumulated level (Gedamke et al. 2011). Additionally, several important factors determine the likelihood and duration a receiver is expected to be in close proximity to a sound source (i.e., overlap in space and time between the source and receiver). For example, accumulation time for fast moving (relative to the receiver) mobile sources is driven primarily by the characteristics of the source (i.e., speed, duty cycle; NMFS 2016, 2018a).

As discussed in Popper (2018), many fish species move around, some over large distances. The author suggests that it is reasonable to think that if the sound of a seismic source becomes too loud, the fish will move away from the source because they are able to determine the direction of a sound source. If the fish moves away, the amount of energy to which it is exposed is likely to be one or a few seismic pulses, and these would not likely be loud enough to result in any effect because the fish would move away at a much lower level signal than could cause harm. Data on TTS for fish are very limited, with the only study that examined recovery from seismic impulses being Popper et al. (2005). Popper (2018) states that if this study had been conducted on wild, free-swimming fish instead of caged ones, there would have been no effect whatsoever because they were likely to have moved away from the source as it approached them, as would happen with normally free-moving demersal and pelagic fish species associated with a 3-D seismic survey in northern Australian waters, extrapolating from the Bethany 3-D assessed in Popper (2018).

Therefore, the time over which energy should be accumulated in each individual fish in the survey area should be limited to the time over which fish receives the maximum exposure, and 24 h is likely too long a period for calculating the accumulation of energy in determining potential harm (e.g., damage or TTS) (Popper 2018). Even if fish do show some TTS, recovery will start as soon as the most intense sounds end, and recovery is likely to even occur, to a limited degree, between seismic pulses. Based on very limited data, recovery within 24 h (or less) is very likely. If TTS does occur, the duration of exposure to the most intense sounds that could result in TTS will be over just a few hours. Thus, energy accumulating over longer periods than a few hours is probably inappropriate (Popper 2018).

Appendix B. Models

B.1. Acoustic Source Model

The source levels and directivity of the seismic source were predicted with JASCO's Airgun Array Source Model (AASM). AASM includes low- and high-frequency modules for predicting different components of the seismic source spectrum. The low-frequency module is based on the physics of oscillation and radiation of airgun bubbles, as originally described by Ziolkowski (1970), that solves the set of parallel differential equations that govern bubble oscillations. Physical effects accounted for in the simulation include pressure interactions between airguns, port throttling, bubble damping, and generator-injector (GI) gun behaviour discussed by Dragoset (1984), Laws et al. (1990), and Landro (1992). A global optimisation algorithm tunes free parameters in the model to a large library of airgun source signatures.

While airgun signatures are highly repeatable at the low frequencies, which are used for seismic imaging, their sound emissions have a large random component at higher frequencies that cannot be predicted using a deterministic model. Therefore, AASM uses a stochastic simulation to predict the high-frequency (800−25,000 Hz) sound emissions of individual airguns, using a data-driven multiple-regression model. The multiple-regression model is based on a statistical analysis of a large collection of high quality seismic source signature data recently obtained from the Joint Industry Program (JIP) on Sound and Marine Life (Mattsson and Jenkerson 2008). The stochastic model uses a Monte-Carlo simulation to simulate the random component of the high-frequency spectrum of each airgun in an array. The mean high-frequency spectra from the stochastic model augment the low-frequency signatures from the physical model, allowing AASM to predict airgun source levels at frequencies up to 25,000 Hz.

AASM produces a set of "notional" signatures for each array element based on:

- Array layout
- Volume, tow depth, and firing pressure of each airgun
- Interactions between different airguns in the array

These notional signatures are the pressure waveforms of the individual airguns at a standard reference distance of 1 m; they account for the interactions with the other airguns in the array. The signatures are summed with the appropriate phase delays to obtain the far-field source signature of the entire array in all directions. This far-field array signature is filtered into decidecade frequency bands to compute the source levels of the array as a function of frequency band and azimuthal angle in the horizontal plane (at the source depth), after which it is considered a directional point source in the far field.

A seismic array consists of many sources and the point source assumption is invalid in the near field where the array elements add incoherently. The maximum extent of the near field of an array (R_{nf}) is:

$$R_{\mathrm{nf}} < \frac{l^2}{4\lambda} \tag{B-1}$$

where λ is the sound wavelength and l is the longest dimension of the array (Lurton 2002, §5.2.4). For example, a seismic source length of l = 21 m yields a near-field range of 147 m at 2 kHz and 7 m at 100 Hz. Beyond this R_{nf} range, the array is assumed to radiate like a directional point source and is treated as such for propagation modelling.

The interactions between individual elements of the array create directionality in the overall acoustic emission. Generally, this directionality is prominent mainly at frequencies in the mid-range between tens of hertz to several hundred hertz. At lower frequencies, with acoustic wavelengths much larger than the inter-airgun separation distances, the directionality is small. At higher frequencies, the pattern of lobes is too finely spaced to be resolved and the effective directivity is less.

B.2. Sound Propagation Models

B.2.1. MONM-BELLHOP

Long-range sound fields were computed using JASCO's Marine Operations Noise Model (MONM). Compared to VSTACK, MONM less accurately predicts steep-angle propagation for environments with higher shear speed but is well suited for effective longer-range estimation. This model computes sound propagation at frequencies of 5 Hz to 2 kHz via a wide-angle parabolic equation solution to the acoustic wave equation (Collins 1993) based on a version of the U.S. Naval Research Laboratory's Range-dependent Acoustic Model (RAM), which has been modified to account for a solid seabed (Zhang and Tindle 1995). MONM computes sound propagation at frequencies > 1 kHz via the BELLHOP Gaussian beam acoustic ray-trace model (Porter and Liu 1994).

The parabolic equation method has been extensively benchmarked and is widely employed in the underwater acoustics community (Collins et al. 1996). MONM accounts for the additional reflection loss at the seabed, which results from partial conversion of incident compressional waves to shear waves at the seabed and sub-bottom interfaces, and it includes wave attenuations in all layers. MONM incorporates the following site-specific environmental properties: a bathymetric grid of the modelled area, underwater sound speed as a function of depth, and a geoacoustic profile based on the overall stratified composition of the seafloor.

MONM computes acoustic fields in three dimensions by modelling transmission loss within two-dimensional (2-D) vertical planes aligned along radials covering a 360° swath from the source, an approach commonly referred to as N×2-D. These vertical radial planes are separated by an angular step size of $\Delta\theta$, yielding N = 360°/$\Delta\theta$ number of planes (Figure B-1).

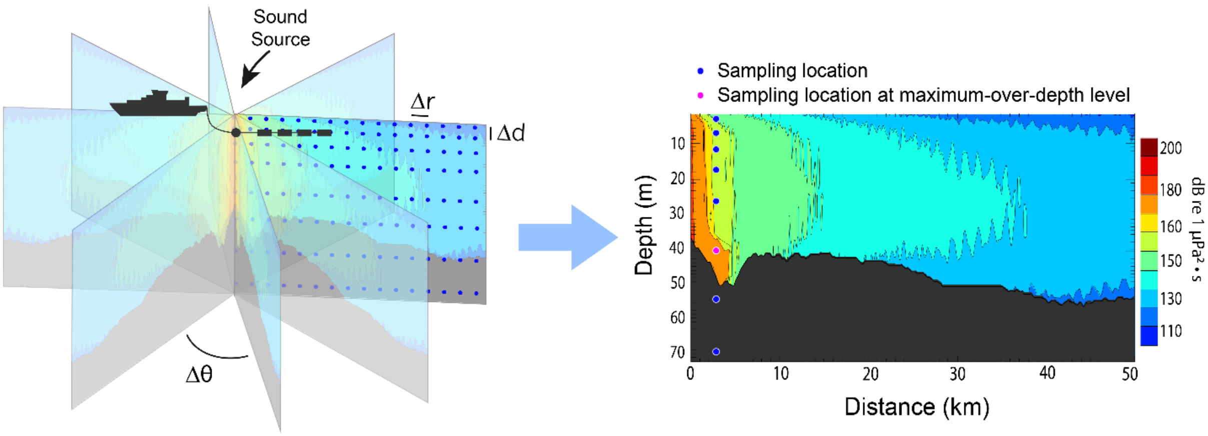

Figure B-1. The N×2-D and maximum-over-depth modelling approach used by MONM.

MONM treats frequency dependence by computing acoustic transmission loss at the centre frequencies of decidecade bands. Sufficiently many frequency bands, starting at 5 Hz, are modelled to include most of the acoustic energy emitted by the source. At each centre frequency, the transmission loss is modelled within each of the N vertical planes as a function of depth and range from the source. The decidecade-band received per-pulse SEL are computed by subtracting the band transmission loss values from the directional source level in that frequency band. Composite broadband received per-pulse SEL are then computed by summing the received decidecade-band levels.

The received per-pulse SEL sound field within each vertical radial plane is sampled at various ranges from the source, generally with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The step sizes are chosen to provide increased coverage near the depth of the source and at depths of interest in terms of the sound speed profile. For areas with deep water, sampling is not performed at depths beyond those reachable by marine mammals. The received per-pulse SEL at a surface sampling location is taken as the maximum value that occurs over all samples within the water column, i.e., the maximum-over-depth received per-pulse SEL. These maximum-over-depth per-pulse SEL are presented as colour contours around the source.

B.2.2. Full Waveform Range-dependent Acoustic Model: FWRAM

For impulsive sounds from the seismic source, time-domain representations of the pressure waves generated in the water are required to calculate SPL and PK. Furthermore, the seismic source must be represented as a distributed source to accurately characterise vertical directivity effects in the near-field zone. For this study, synthetic pressure waveforms were computed using FWRAM, which is a time-domain acoustic model based on the same wide-angle parabolic equation (PE) algorithm as MONM. FWRAM computes synthetic pressure waveforms versus range and depth for range-varying marine acoustic environments, and it takes the same environmental inputs as MONM (bathymetry, water sound speed profile, and seafloor geoacoustic profile). Unlike MONM, FWRAM computes pressure waveforms via Fourier synthesis of the modelled acoustic transfer function in closely spaced frequency bands. FWRAM employs the array starter method to accurately model sound propagation from a spatially distributed source (MacGillivray and Chapman 2012).

Besides providing direct calculations of the PK and SPL, the synthetic waveforms from FWRAM can also be used to convert the SEL values from MONM to SPL.

B.2.3. Wavenumber Integration Model

Sound pressure levels near the seismic source were modelled using JASCO's VSTACK wavenumber integration model. VSTACK computes synthetic pressure waveforms versus depth and range for arbitrarily layered, range-independent acoustic environments using the wavenumber integration approach to solve the exact (range-independent) acoustic wave equation. This model is valid over the full angular range of the wave equation and can fully account for the elasto-acoustic properties of the sub-bottom. Wavenumber integration methods are extensively used in the field of underwater acoustics and seismology where they are often referred to as reflectivity methods or discrete wavenumber methods. VSTACK computes sound propagation in arbitrarily stratified water and seabed layers by decomposing the outgoing field into a continuum of outward-propagating plane cylindrical waves. Seabed reflectivity in the model is dependent on the seabed layer properties: compressional and shear wave speeds, attenuation coefficients, and layer densities. The output of the model can be post-processed to yield estimates of the SEL, SPL, and PK.

VSTACK accurately predicts steep-angle propagation in the proximity of the source, but it is computationally slow at predicting sound pressures at large distances due to the need for smaller wavenumber steps with increasing distance. Additionally, VSTACK assumes range-invariant bathymetry with a horizontally stratified medium (i.e., a range-independent environment) which is azimuthally symmetric about the source. VSTACK is thus best suited to modelling the sound field near the source.

B.2.3.1. Particle Motion

VSTACK was also used to compute estimates of particle acceleration for two modelled sites (Sites A and 1) for the 3480 in^3 airgun array. Particle motion waveforms were modelled and pulse metrics were computed from the time-domain traces. VSTACK uses the wavenumber integration approach to solve the exact acoustic wave equation for arbitrarily layered range-independent acoustic environments.

The VSTACK model setup for the particle velocity scenarios was identical to that for the peak pressure scenarios in terms of source treatment, frequency range and environmental model. The particle acceleration and velocity waveforms were computed to a maximum distance of 1000 m in the broadside and endfire directions from the centre of the airgun array for a receiver 5 cm above the seafloor.

As discussed above in Appendix A.2, particle velocity (v) is the physical speed of a particle in a material. It can be derived from the pressure gradient and Euler's linearised momentum equation where ρ_0 is the density of the medium (Appendix A.2). Since the wavenumber integration kernel is a product of analytic expressions in terms of range and depth, VSTACK computes particle velocity by computing the spatial gradient of the pressure field analytically in the frequency domain. Fourier synthesis is applied to compute time series synthetic pressure and/or velocity waveforms at depth and range receivers by convolving the source waveforms with the impulse response of the waveguide. Particle velocity metrics at each receiver location were calculated from the modelled particle motion along three perpendicular axes (horizontal and along the source-receiver path, horizontal and perpendicular to the source-receiver path, and vertical).

The particle velocity results were converted to acceleration by time differentiation. The peak particle acceleration and velocity were calculated from the maximum of the predicted acceleration and velocity magnitude, defined as “peak magnitude” and are presented as plots of peak value versus range (Appendix A.2).

B.3. Model Validation Information

Predictions from JASCO’s Airgun Array Source Model (AASM) and propagation models (MONM, FWRAM and VSTACK) have been validated against experimental data from a number of underwater acoustic measurement programs conducted by JASCO globally, including the United States and Canadian Artic, Canadian and southern United States waters, Greenland, Russia and Australia (Hannay and Racca 2005, Aerts et al. 2008, Funk et al. 2008, Ireland et al. 2009, O'Neill et al. 2010, Warner et al. 2010, Racca et al. 2012a, Racca et al. 2012b, Matthews and MacGillivray 2013, Martin et al. 2015, Racca et al. 2015, Martin et al. 2017a, Martin et al. 2017b, Warner et al. 2017, MacGillivray 2018, McPherson et al. 2018, McPherson and Martin 2018).

In addition, JASCO has conducted measurement programs associated with a significant number of anthropogenic activities which have included internal validation of the modelling (including McCrodan et al. 2011, Austin and Warner 2012, McPherson and Warner 2012, Austin and Bailey 2013, Austin et al. 2013, Zykov and MacDonnell 2013, Austin 2014, Austin et al. 2015, Austin and Li 2016, Martin and Popper 2016).

Appendix C. Methods and Parameters

This section describes the specifications of the seismic source that was used at all sites and the environmental parameters used in the propagation models.

C.1. Estimating Range to Thresholds Levels

Sound level contours were calculated based on the underwater sound fields predicted by the propagation models, sampled by taking the maximum value over all modelled depths above the sea floor for each location in the modelled region. The predicted distances to specific levels were computed from these contours. Two distances relative to the source are reported for each sound level: 1) R_{max}, the maximum range to the given sound level over all azimuths, and 2) $R_{95\%}$, the range to the given sound level after the 5% farthest points were excluded (see examples in Figure C-1).

The $R_{95\%}$ is used because sound field footprints are often irregular in shape. In some cases, a sound level contour might have small protrusions or anomalous isolated fringes. This is demonstrated in the image in Figure C-1(a). In cases such as this, where relatively few points are excluded in any given direction, R_{max} can misrepresent the area of the region exposed to such effects, and $R_{95\%}$ is considered more representative. In strongly asymmetric cases such as shown in Figure C-1(b), on the other hand, $R_{95\%}$ neglects to account for significant protrusions in the footprint. In such cases R_{max} might better represent the region of effect in specific directions. Cases such as this are usually associated with bathymetric features affecting propagation. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment.

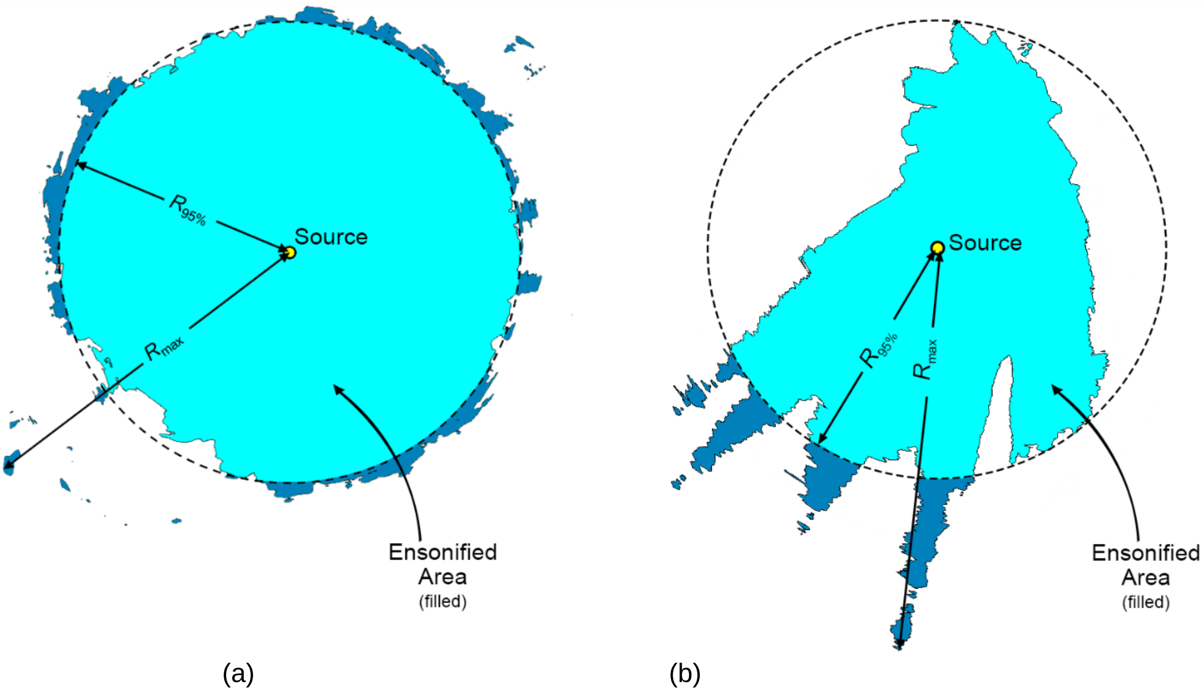

Figure C-1. Sample areas ensonified to an arbitrary sound level with R_{max} and $R_{95\%}$ ranges shown for two different scenarios. (a) Largely symmetric sound level contour with small protrusions. (b) Strongly asymmetric sound level contour with long protrusions. Light blue indicates the ensonified areas bounded by $R_{95\%}$; darker blue indicates the areas outside this boundary which determine R_{max}.

C.2. Estimating SPL from Modelled SEL Results

The per-pulse SEL of sound pulses is an energy-like metric related to the dose of sound received over a pulse's entire duration. The pulse SPL on the other hand, is related to its intensity over a specified time interval. Seismic pulses typically lengthen in duration as they propagate away from their source, due to seafloor and surface reflections, and other waveguide dispersion effects. The changes in pulse length, and therefore the time window considered, affect the numeric relationship between SPL and SEL. This study has applied a fixed window duration to calculate SPL (T_{fix} = 125 ms; see Appendix A.1), as implemented in Martin et al. (2017b). Full-waveform modelling was used to estimate SPL, but this type of modelling is computationally intensive, and can be prohibitively time consuming when run at high spatial resolution over large areas.

For the current study, FWRAM (Appendix B.2.2) was used to model synthetic seismic pulses over the frequency range 5–1024 Hz. This was performed along all broadside and endfire radials at three sites. FWRAM uses Fourier synthesis to recreate the signal in the time domain so that both the SEL and SPL from the source can be calculated. The differences between the SEL and SPL were extracted for all ranges and depths that corresponded to those generated from the high spatial-resolution results from MONM. A 125 ms fixed time window positioned to maximize the SPL over the pulse duration was applied. The resulting SEL -to-SPL offsets were averaged in 0.02 km range bins along each modelled radial and depth, and the 90th percentile was selected at each range to generate a generalised range-dependent conversion function for each site. The range- dependent conversion function was averaged between the two sites and applied to predicted per-pulse SEL results from MONM to model SPL values. Figures D-2 to D-4 show the conversion offsets for Sites 3, 6, 7 and 10; the spatial variation is caused by changes in the received airgun pulse as it propagates from the source.

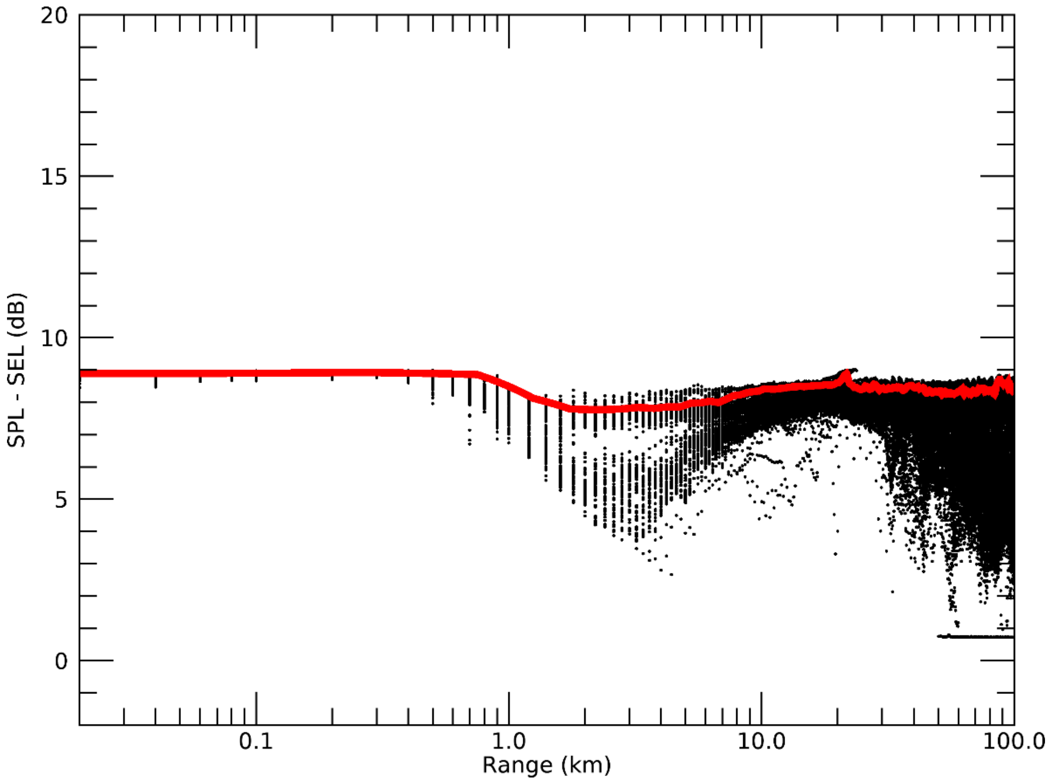

Figure C-2. *Site 3*: Range-and-depth-dependent conversion offsets for converting SEL to SPL for seismic pulses. Slices are shown for the 3480 in^3 seismic source. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

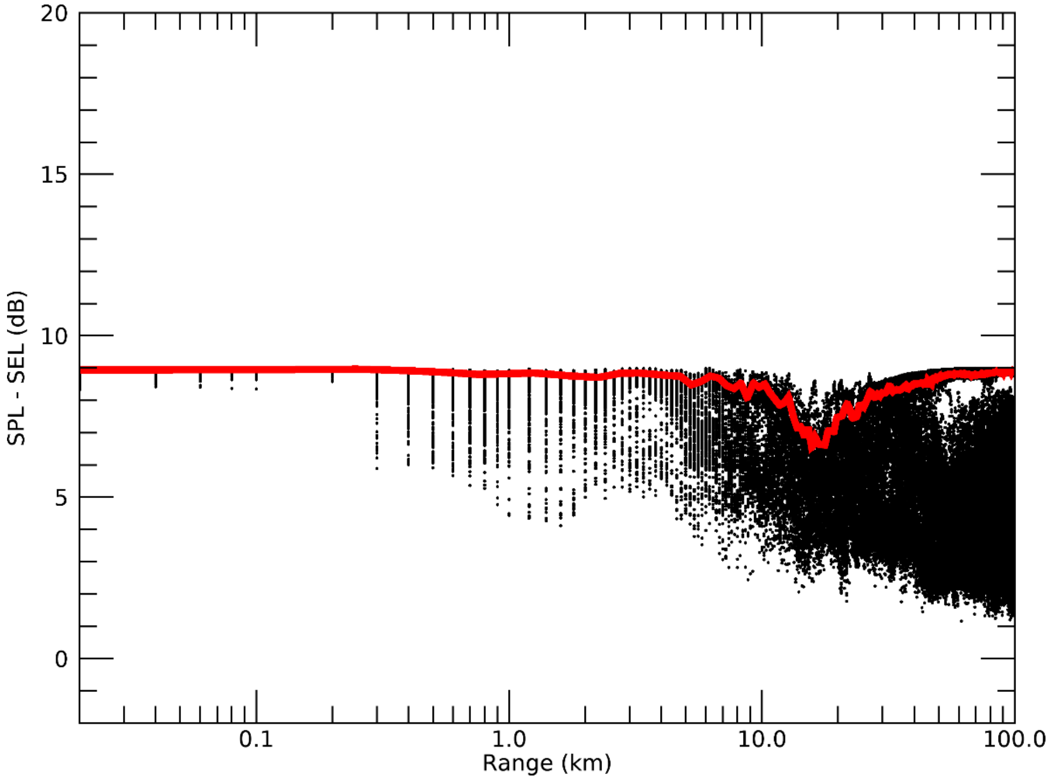

Figure C-3. *Site 6*: Range-and-depth-dependent conversion offsets for converting SEL to SPL for seismic pulses. Slices are shown for the 3480 in^3 seismic source. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

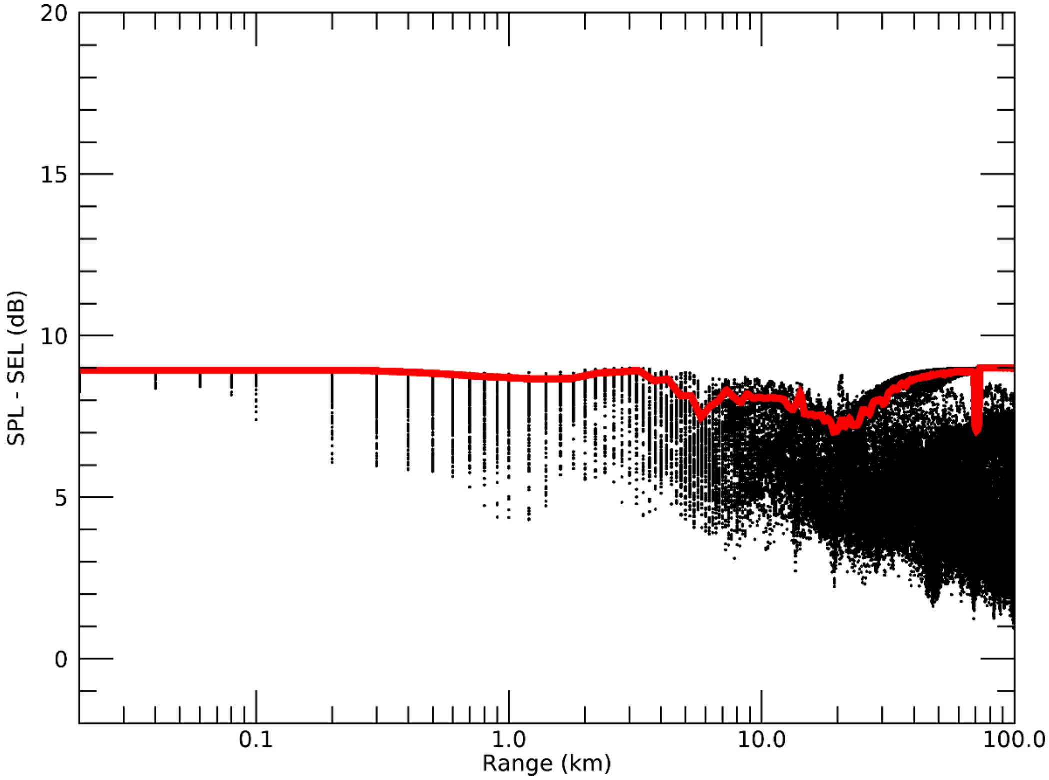

Figure C-4. *Site 7*: Range-and-depth-dependent conversion offsets for converting SEL to SPL for seismic pulses. Slices are shown for the 3480 in^3 seismic source. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

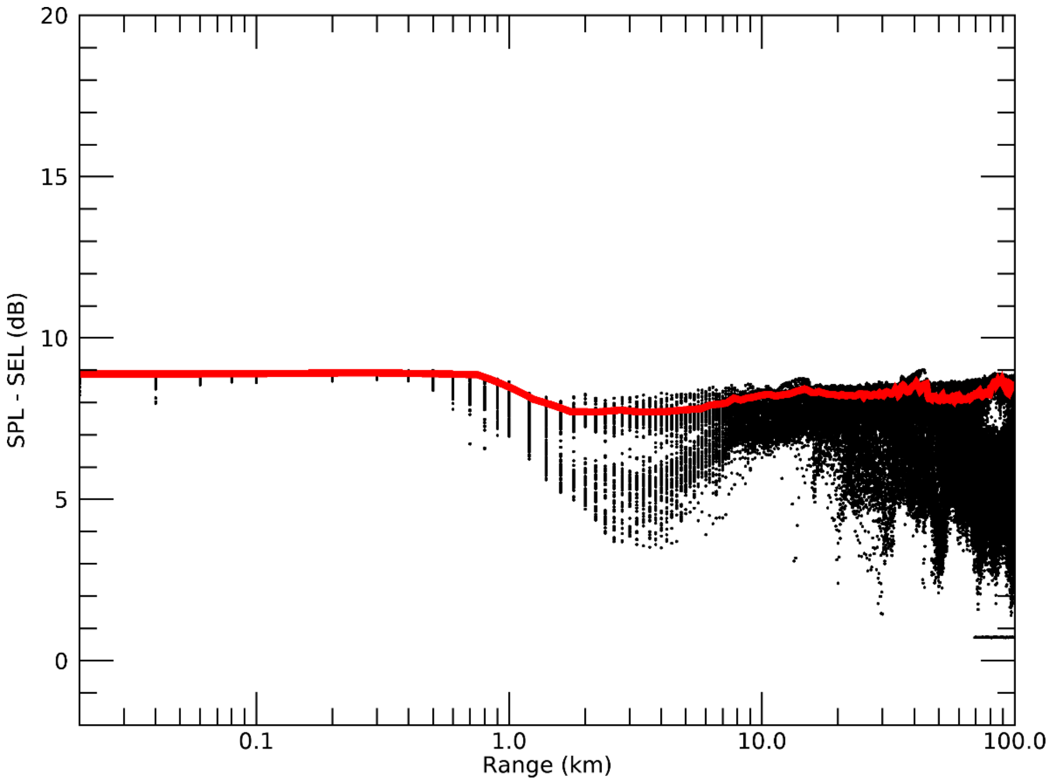

Figure C-5. *Site 10*: Range-and-depth-dependent conversion offsets for converting SEL to SPL for seismic pulses. Slices are shown for the 3480 in^3 seismic source. Black lines are the modelled differences between SEL and SPL across different radials and receiver depths; the solid red line is the 90th percentile of the modelled differences at each range.

C.3. Accumulated SEL Calculation

When there are many seismic pulses, it becomes computationally prohibitive to perform sound propagation modelling for every single event. The distance between the consecutive seismic impulses is small enough, however, that the environmental parameters that influence sound propagation are virtually the same for many impulse points. The acoustic fields can, therefore, be modelled for a subset of seismic pulses and estimated at several adjacent ones. After sound fields from representative impulse locations are calculated, they are adjusted to account for the source position for nearby impulses.

Although estimating the cumulative sound field with the described approach is not as precise as modelling sound propagation at every impulse location, small-scale, site-specific sound propagation features tend to blur and become less relevant when sound fields from adjacent impulses are summed. Larger scale sound propagation features, primarily dependent on water depth, dominate the cumulative field. The accuracy of the present method acceptably reflects those large-scale features, thus providing a meaningful estimate of a wide area SEL field in a computationally feasible framework.

To produce the map of accumulated received sound level distributions and calculate distances to specified sound level thresholds, the maximum-over-depth level was calculated at each sampling point within the modelled region. The radial grids of maximum-over-depth and seafloor sound levels for each impulse were then resampled (by linear triangulation) to produce a regular Cartesian grid. The sound field grids from all impulses were summed (Equation A-5) to produce the cumulative sound field grid with cell sizes of 20 m. The contours and threshold ranges were calculated from these flat Cartesian projections of the modelled acoustic fields. The single-impulse SEL fields were computed over model grids approximately 150 × 150 km in range, which encompasses the full area of the cumulative grid (the entire survey area).

C.4. Environmental Parameters

C.4.1. Bathymetry

Water depths throughout the modelled area were extracted from the Australian Bathymetry and Topography Grid, a 9 arc-second grid rendered for Australian waters (Whiteway 2009) for the region shown in Figure 1. Bathymetry data were extracted and re-gridded onto a Universal Transverse Mercator (UTM) coordinate projection (Zone 54) with a regular grid spacing of 200 ×200 m to generate the bathymetry in Figure C-6 (note the data is re-projected or the display in the Map Grid of Australia (MGA) coordinate system).

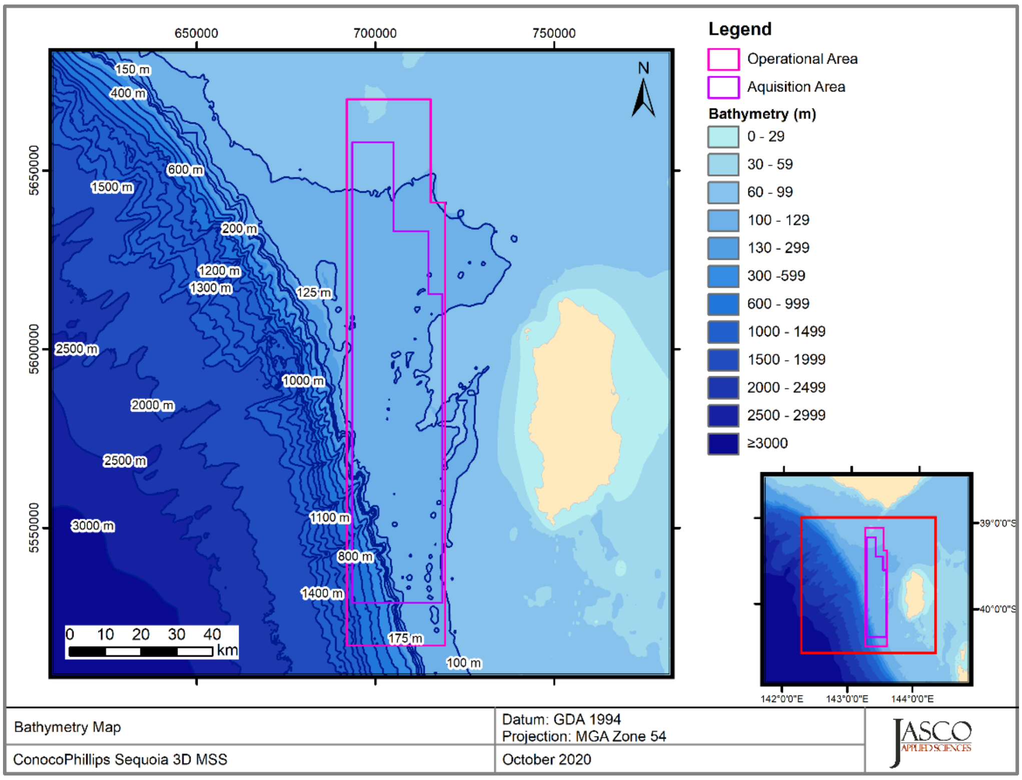

Figure C-6. Map of the modelling area presenting the variation in water depth.

C.4.2. Sound speed profile

The sound speed profiles for the modelled sites were derived from temperature and salinity profiles from the U.S. Naval Oceanographic Office's Generalized Digital Environmental Model V 3.0 (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world's oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based on global historical observations from the U.S. Navy's Master Oceanographic Observational Data Set (MOODS). The climatology profiles include 78 fixed depth points to a maximum depth of 6800 m (where the ocean is that deep). The GDEM temperature-salinity profiles were converted to sound speed profiles according to Coppens (1981).

Mean sound speed profiles for July to October were derived from the GDEM profiles within a 100 km box radius encompassing all modelling sites. The sound speed profile in July is expected to be most favourable to longer-range sound propagation during the proposed survey time frame due to a slight upward refracting profile section in the upper 40 m. This profile section was also present in August, although to a slightly lesser extent. As such, July was selected for sound propagation modelling to ensure precautionary estimates of distances to received sound level thresholds. Figure C-7 shows the resulting profile used as input to the sound propagation modelling.

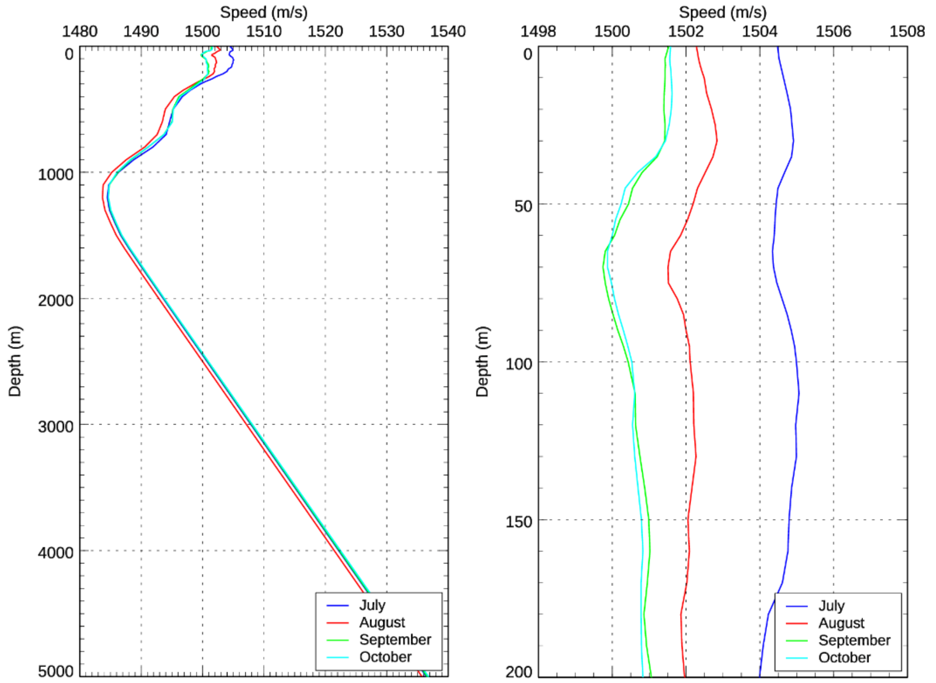

Figure C-7. Monthly averaged sound speed profiles for July to October. The plot on the right shows the top 200 m of water; the plot on the left shows the profiles over the entire water column The profile for July was used in modelling all sound fields. All profiles were calculated from temperature and salinity profiles from GDEM V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

C.4.3. Geoacoustics

Geotechnical data has been acquired from borehole analysis near the modelling Sites 1–5, 9–10 at the western edge of the Bass Strait (Duncan et al. 2013). The sediment is typified by a thin layer of well-cemented calcarenite overlying a softer sand/calcarenite layer that extends for a further 100 m below the sea floor. The sound propagation models use a single value shear speed, which has been set at a value representative of the layers beneath the cemented calcarenite layer. Table C-1 lists the geoacoustic properties used for modelling.

Table C-1. Geoacoustic profile used as the input to the models for Sites 1–5, 9–10.

Depth below seafloor (m)	Material	Density (g/cm^3)	P-wave speed (m/s)	P-wave attenuation (dB/λ)	S-wave speed (m/s)	S-wave attenuation (dB/λ)
0–1	Well-cemented calcarenite	2.2	2600	0.2	500	0.4
1–101	Slightly to semi-cemented sand/calcarenite	1.9	2100	0.12		
101–1000	Semi-cemented sand/calcarenite	1.9	2200	0.12		
>1000	Basement (rock)	3.0	3800	0.1		

Geoacoustic parameters used for modelling at sites in deeper waters (Sites 6–8) were derived from sedimentary grain size measurements from the Australian Government’s Marine Sediments (MARS) database (Heap 2009). Most of these samples were taken at the seafloor, although some are from sediment from greater depths in the seabed. On average, the surficial grain size indicates silty sand is present throughout the modelled area. Geotechnical data along the southern Australian shelf typically show sand overlaying calcarenite layers (Bradshaw 2002, Duncan et al. 2013). Representative grain sizes and porosity were used in the grain-shearing model proposed by Buckingham (2005) to estimate the geoacoustic parameters required by the sound propagation models. Table C-2 lists the geoacoustic parameters used for modelling.

Table C-2. Geoacoustic profile used as the input to the models at Sites 6–8.

Depth below seafloor (m)	Material	Density (g/cm^3)	P-wave speed (m/s)	P-wave attenuation (dB/λ)	S-wave speed (m/s)	S-wave attenuation (dB/λ)
0–10		1.88	1605–1700	0.35–0.70		
10–20		1.88–1.89	1700–1755	0.70–0.85		
20–50		1.89–1.90	1755–1850	0.85–1.15		
50–100	Silty carbonate sand to semi-cemented limestone	1.90–1.92	1850–1950	1.15–1.35	255	3.65
100–200		1.92–1.96	1950–2100	1.35–1.60		
200–500		1.96–2.05	2100–2355	1.60–1.95		
>500		2.05	2355	1.95		

C.5. Seismic Source

The layout of the 3480 in³ seismic source used for modelling in this study is provided in Figure C-8. Details of the airgun parameters are provided in Table C-3. Additionally the layout details for the 3440 in³ source considered in the array comparison (Appendix D) are provided in Figure C-9 and Table C-4.

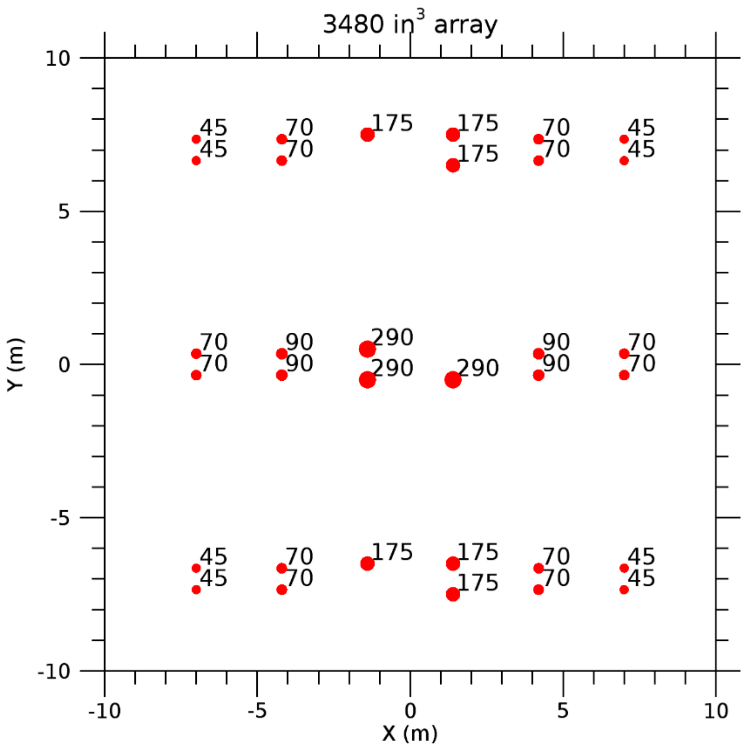

Figure C-8. Layout of the modelled 3480 in³ array. Tow depth is 6 m. The labels indicate the firing volume (in cubic inches) for each airgun. Also see Table C-3.

Table C-3. Layout of the modelled 3480 in^3 array. Tow depth is 6 m. Firing pressure for all guns is 2000 psi. Also see Figure C-8.

String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)	String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)	String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)
	1	7	−7.35	6	45		13	7	−0.35	6	70		25	7	6.65	6	45
	2	7	−6.65	6	45		14	7	0.35	6	70		26	7	7.35	6	45
	3	4.2	−7.35	6	70		15	4.2	−0.35	6	90		27	4.2	6.65	6	70
	4	4.2	−6.65	6	70		16	4.2	0.35	6	90		28	4.2	7.35	6	70
	5	1.4	−7.5	6	175		17	1.4	−0.5	6	290		29	1.4	6.5	6	175
1	6	1.4	−6.5	6	175	2	19	−1.4	−0.5	6	290	3	30	1.4	7.5	6	175
	8	−1.4	−6.5	6	175		20	−1.4	0.5	6	290		32	−1.4	7.5	6	175
	9	−4.2	−7.35	6	70		21	−4.2	−0.35	6	90		33	−4.2	6.65	6	70
	10	−4.2	−6.65	6	70		22	−4.2	0.35	6	90		34	−4.2	7.35	6	70
	11	−7	−7.35	6	45		23	−7	−0.35	6	70		35	−7	6.65	6	45
	12	−7	−6.65	6	45		24	−7	0.35	6	70		36	−7	7.35	6	45

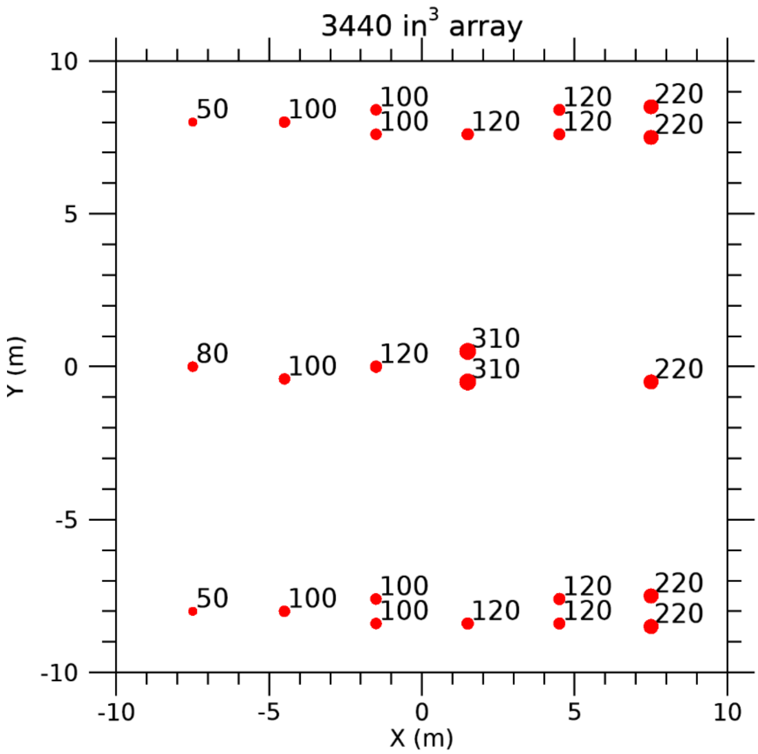

Figure C-9. Layout of the modelled 3440 in^3 array. Tow depth is 6 m. The labels indicate the firing volume (in cubic inches) for each airgun. Also see Table C-4.

Table C-4. Layout of the modelled 3440 in^3 array. Tow depth is 6 m. Firing pressure for all guns is 2000 psi. Also see Figure C-9.

String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)	String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)	String	Gun	*x* (m)	*y* (m)	*z* (m)	Vol (in^3)
	1	7.5	-8.5	6	220		11	7.5	-0.5	6	220		21	7.5	7.5	6	220
	2	7.5	-7.5	6	220		15	1.5	-0.5	6	310		22	7.5	8.5	6	220
	3	4.5	-8.4	6	120		16	1.5	0.5	6	310		23	4.5	7.6	6	120
	4	4.5	-7.6	6	120		17	-1.5	0	6	120		24	4.5	8.4	6	120
1	5	1.5	-8.4	6	120	2	18	-4.5	-0.4	6	100	3	25	1.5	7.6	6	120
	7	-1.5	-8.4	6	100		20	-7.5	0	6	80		27	-1.5	7.6	6	100
	8	-1.5	-7.6	6	100								28	-1.5	8.4	6	100
	9	-4.5	-8	6	100								29	-4.5	8	6	100
	10	-7.5	-8	6	50								30	-7.5	8	6	50

C.5.1. Array Source Levels and Directivity

Figure C-10 shows the broadside (perpendicular to the tow direction), endfire (parallel to the tow direction) and vertical overpressure signature and corresponding power spectrum levels for the 3480 in^3 array (Appendix C.5). Horizontal decidecade-band source levels are shown as a function of band centre frequency and azimuth (Figure B-11).

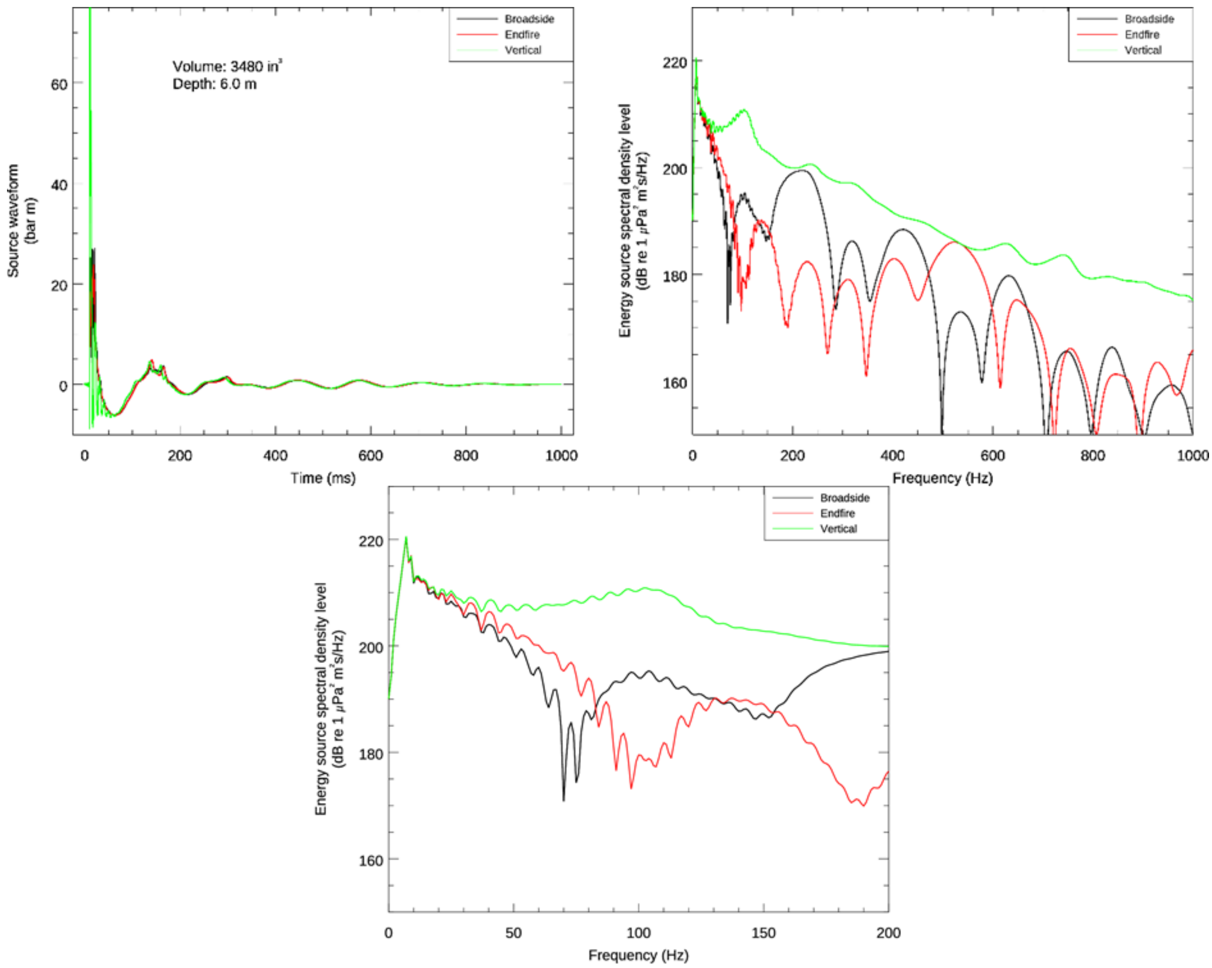

Figure C-10. Predicted source level details for the 3480 in^3 array at 6 m towed depth.(Top left) the overpressure signature and (Top right) the power spectrum for in-plane horizontal (broadside), perpendicular (endfire), and vertical directions (no surface ghost). (Bottom) the power spectrum for in-plane horizontal (broadside), perpendicular (endfire), and vertical directions (no surface ghost) for low frequencies (0–200 Hz).

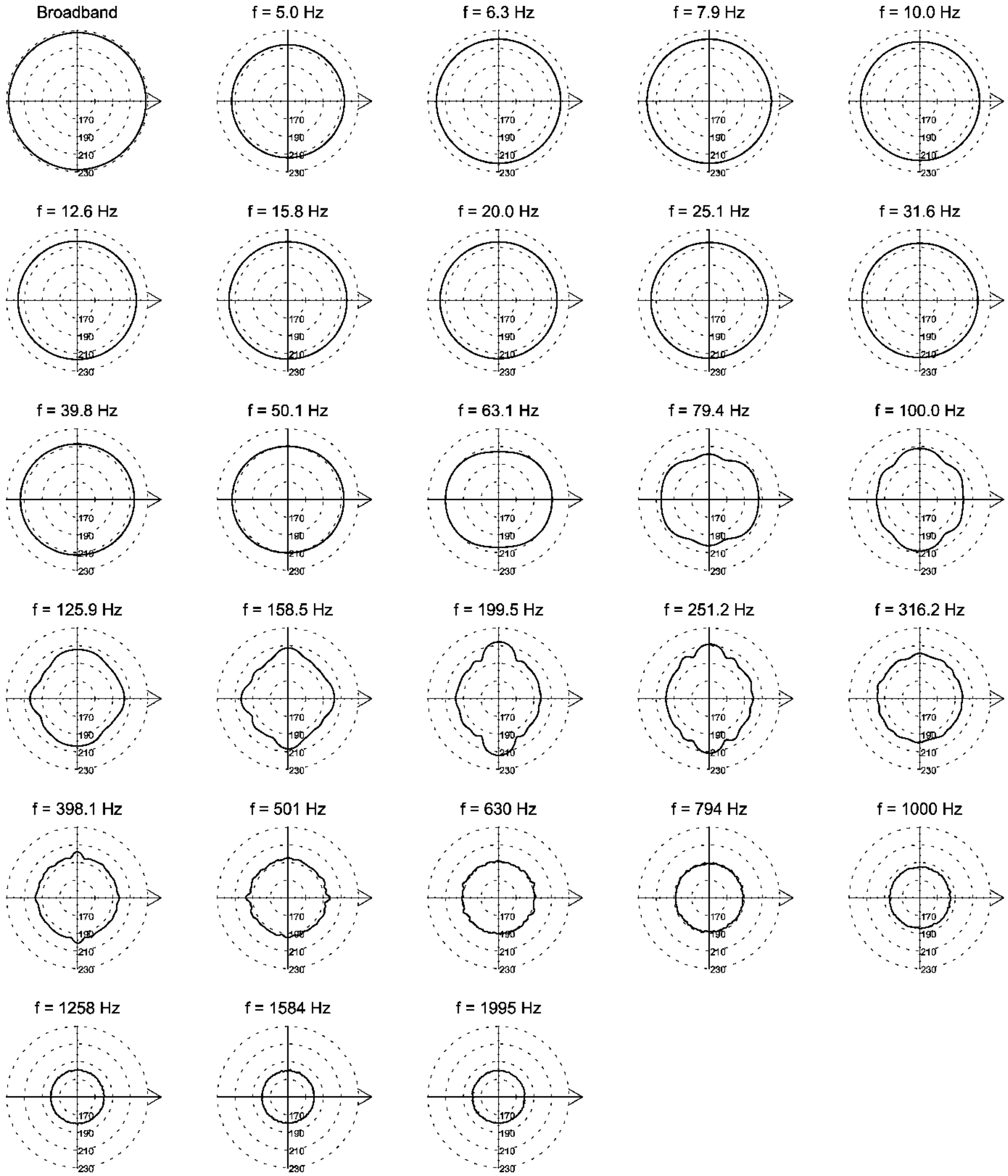

Figure C-11. Directionality of the predicted horizontal source levels for the 3480 in^3 seismic source, 5 Hz to 2 kHz. Source levels (in dB re 1 µPa^2·s m^2) are shown as a function of azimuth for the centre frequencies of the decidecade bands modelled; frequencies are shown above the plots. The perpendicular direction to the frame is to the right. Tow depth is 6 m (see Figure C-10).

Appendix D. Seismic Source Comparison

D.1. Acoustic Source Levels and Directivity

Four different seismic sources were considered for preliminary source analysis and selecting a worst-case seismic source, the total volumes were 3440 in^3 and 3480 in^3 and the arrays were modelled at a tow depth of 6 m. The results from AASM for these sources are provided in Table D-1.

Table D-1. Far-field source level specifications for the 3440 in^3 and 3480 in^3 sources. Source levels are for a point-like acoustic source with equivalent far-field acoustic output in the specified direction. Sound level metrics are per-pulse and unweighted.

Total volume (in^3)	Direction	Peak source pressure level ($L_{S,pk}$) (dB re 1 µPa m)	Per-pulse source SEL ($L_{S,E}$) (dB 1 µPa^{2}m^{2}s)
			10–25000 Hz
3440	Broadside	248.3	224.9
3480	Broadside	248.6	225.3
3440	Endfire	247.9	225.8
3480	Endfire	247.5	225.2
3440	Vertical	256.8	229.9
3480	Vertical	258.1	230.9

Appendix E. Per-Pulse SEL Sound Field Maps

Per-pulse SEL maps for all modelled sites are provided in Figures E-1 through E-10.

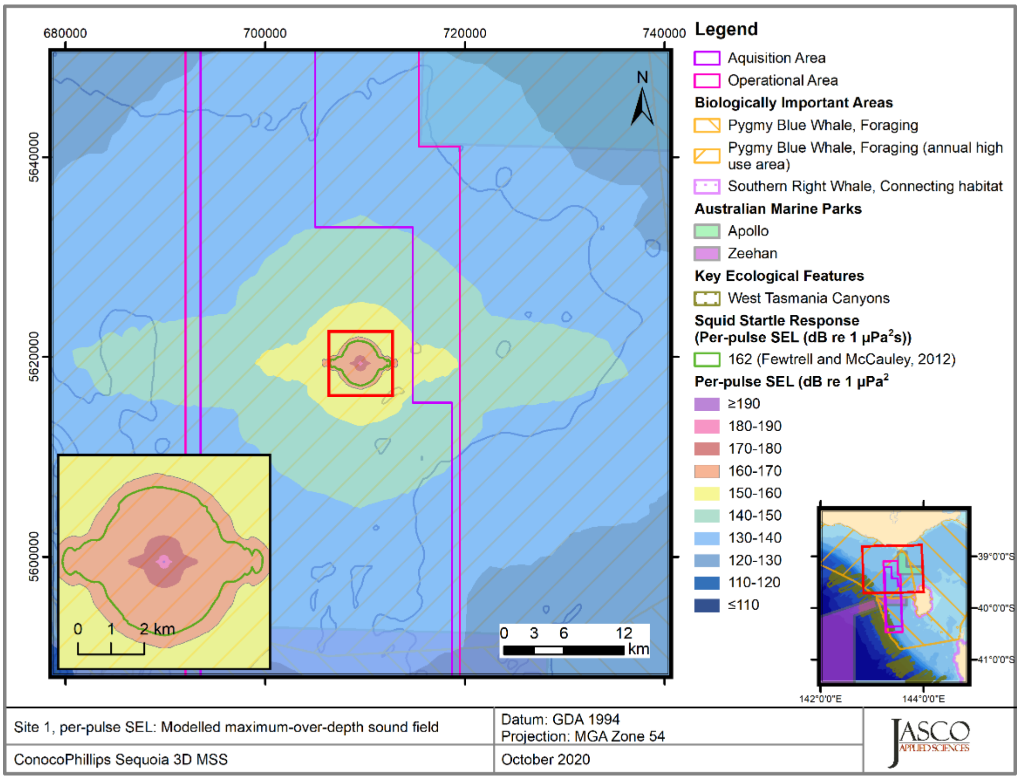

Figure E-1. *Site 1, tow azimuth 0º, per-pulse SEL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

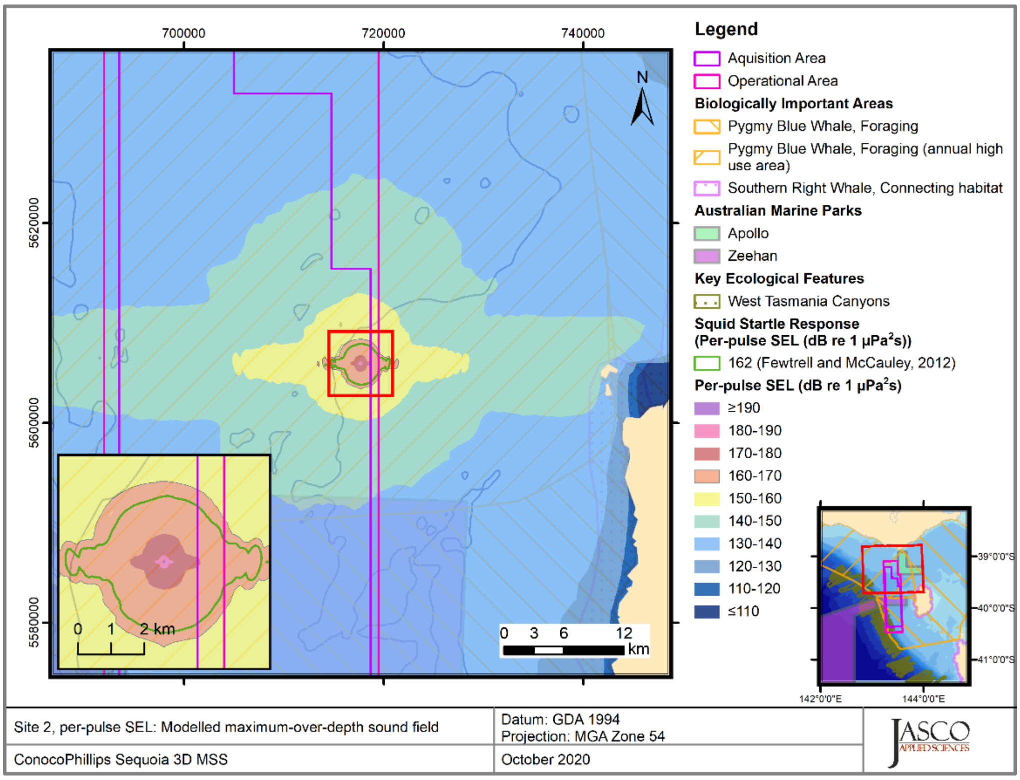

Figure E-2. *Site 2, tow azimuth 180º, per-pulse SEL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

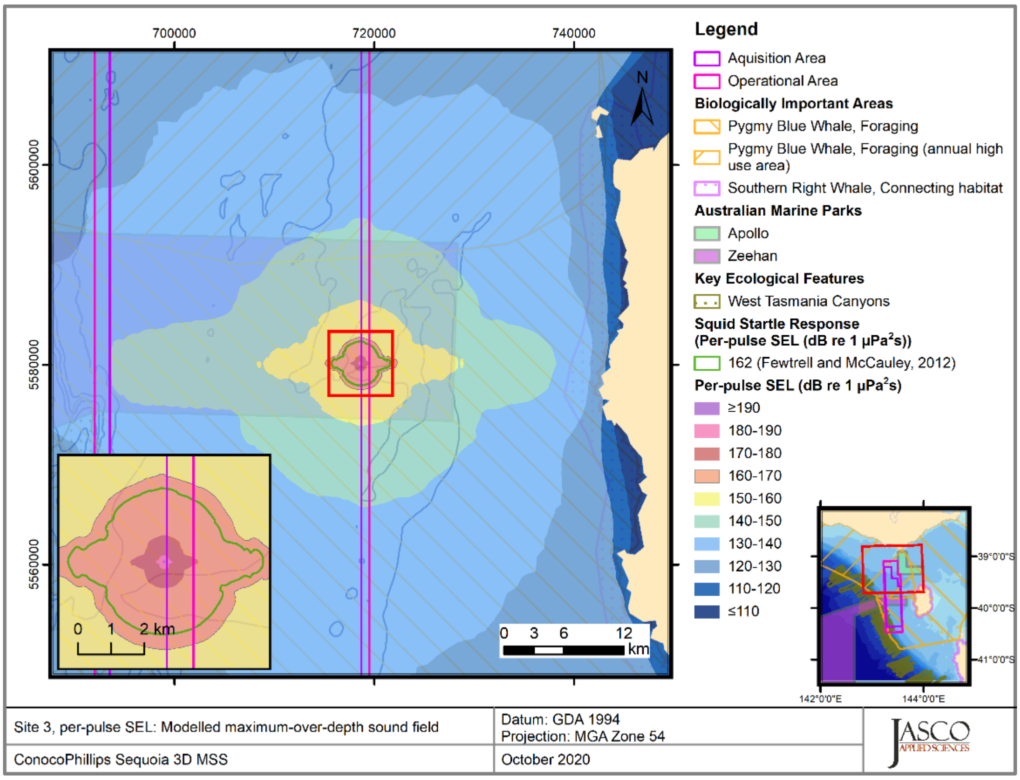

Figure E-3. *Site 3, tow azimuth 180º, per-pulse SEL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

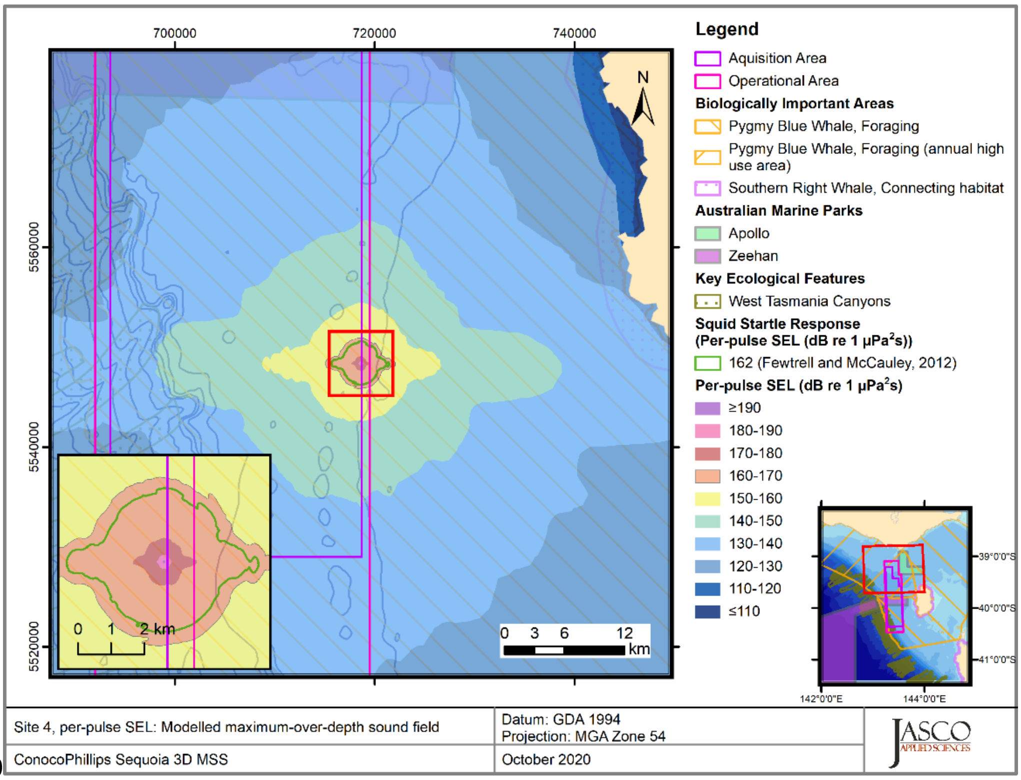

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Figure E-4. Site 4, tow azimuth 180º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

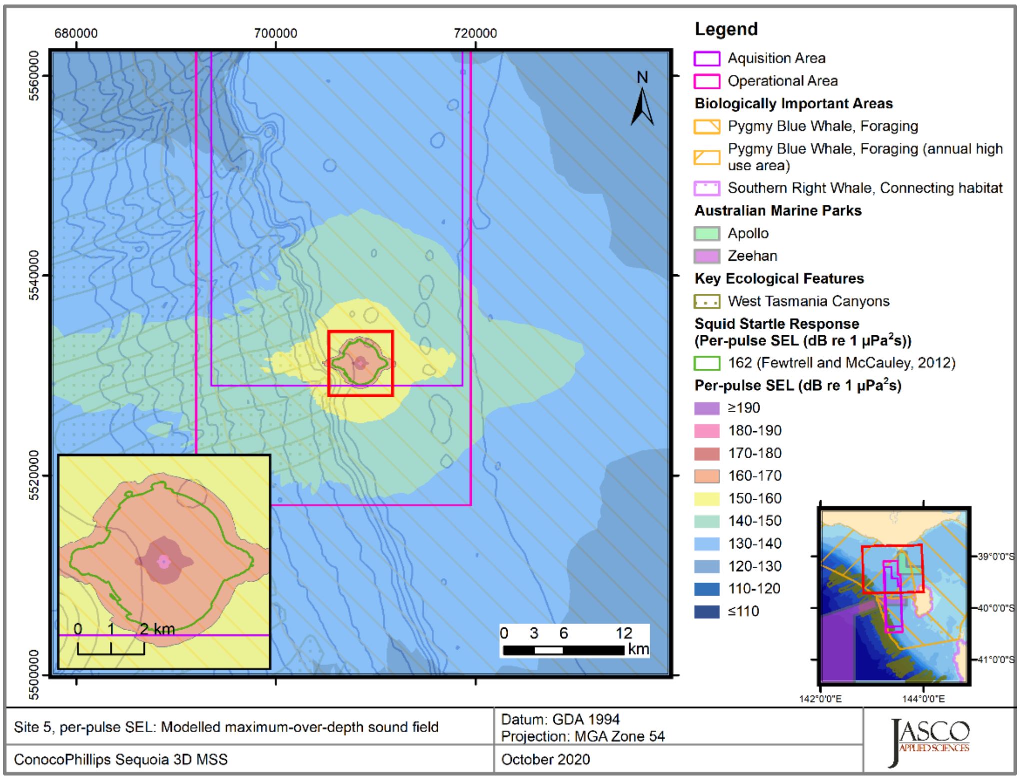

Figure E-5. *Site 5, tow azimuth 0º, per-pulse SEL*: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

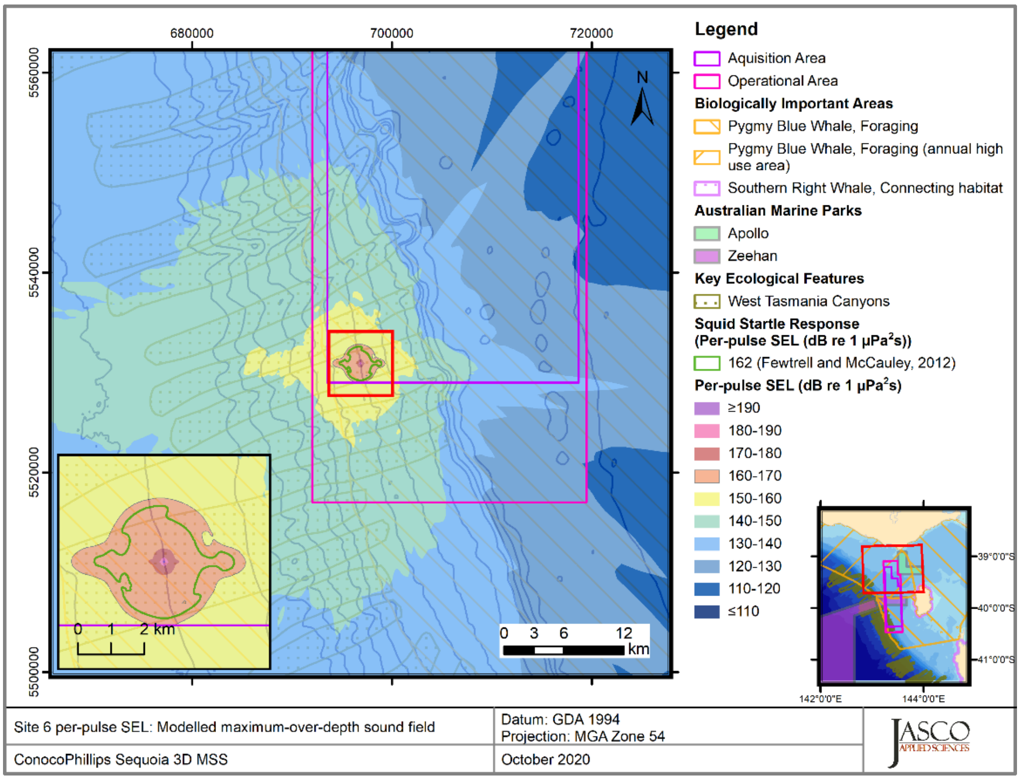

Figure E-6. Site 6, tow azimuth 0º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

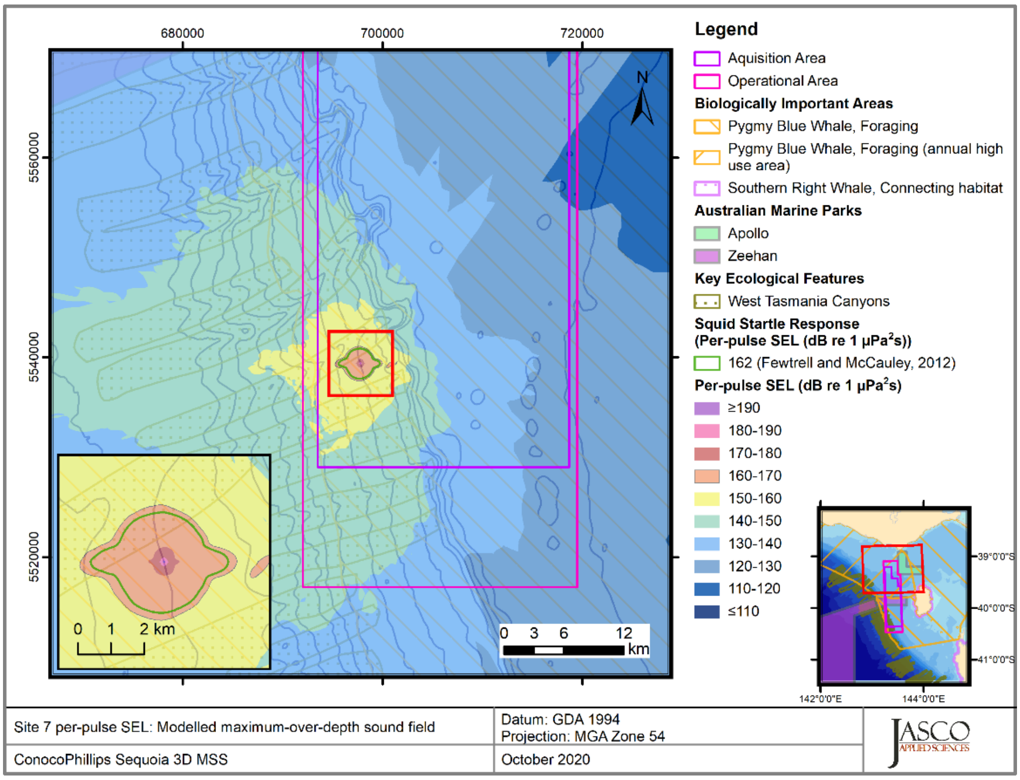

Figure E-7. Site 7, tow azimuth 0º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

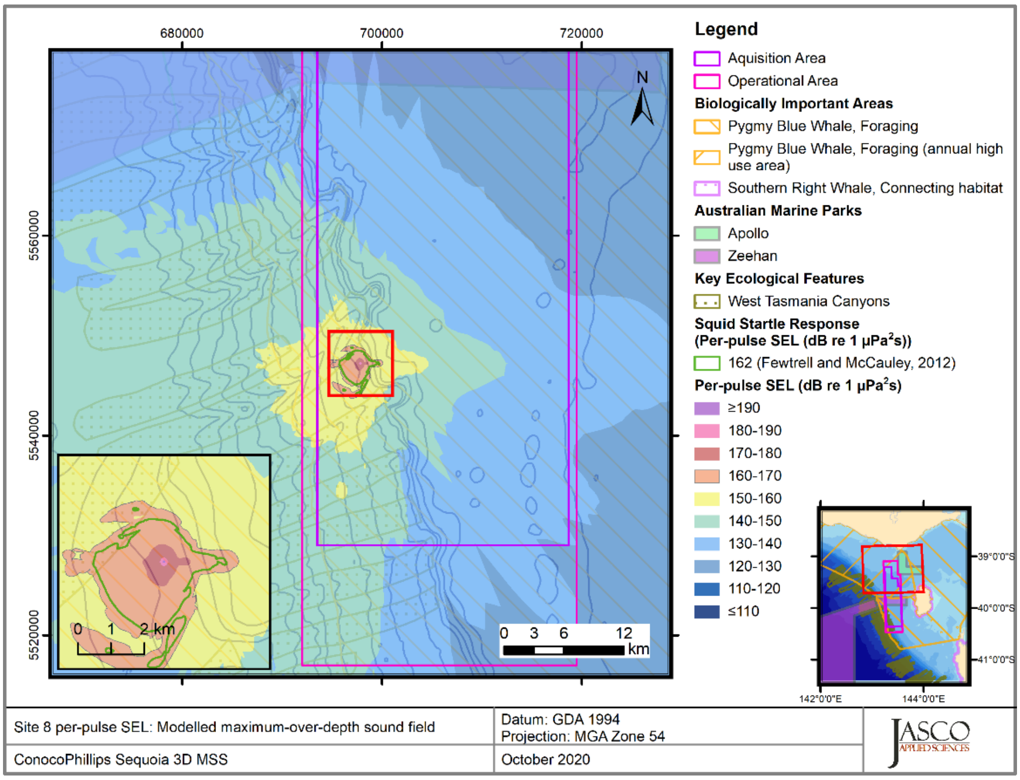

Figure E-8. Site 8, tow azimuth 0º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

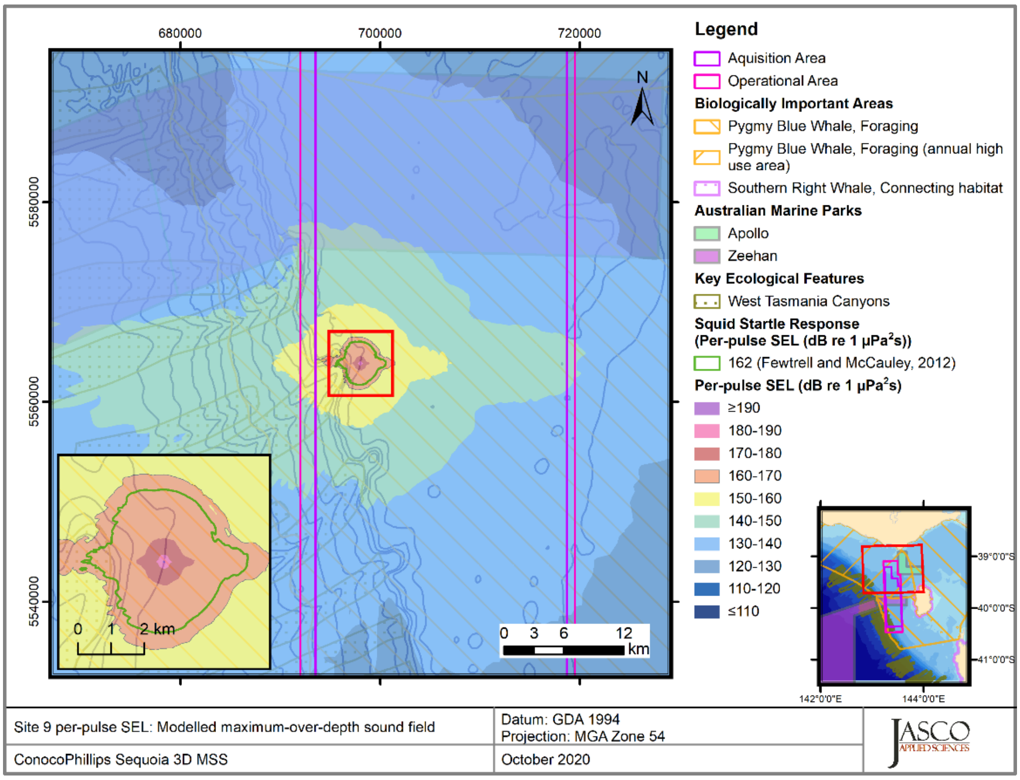

Figure E-9. Site 9, tow azimuth 0º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

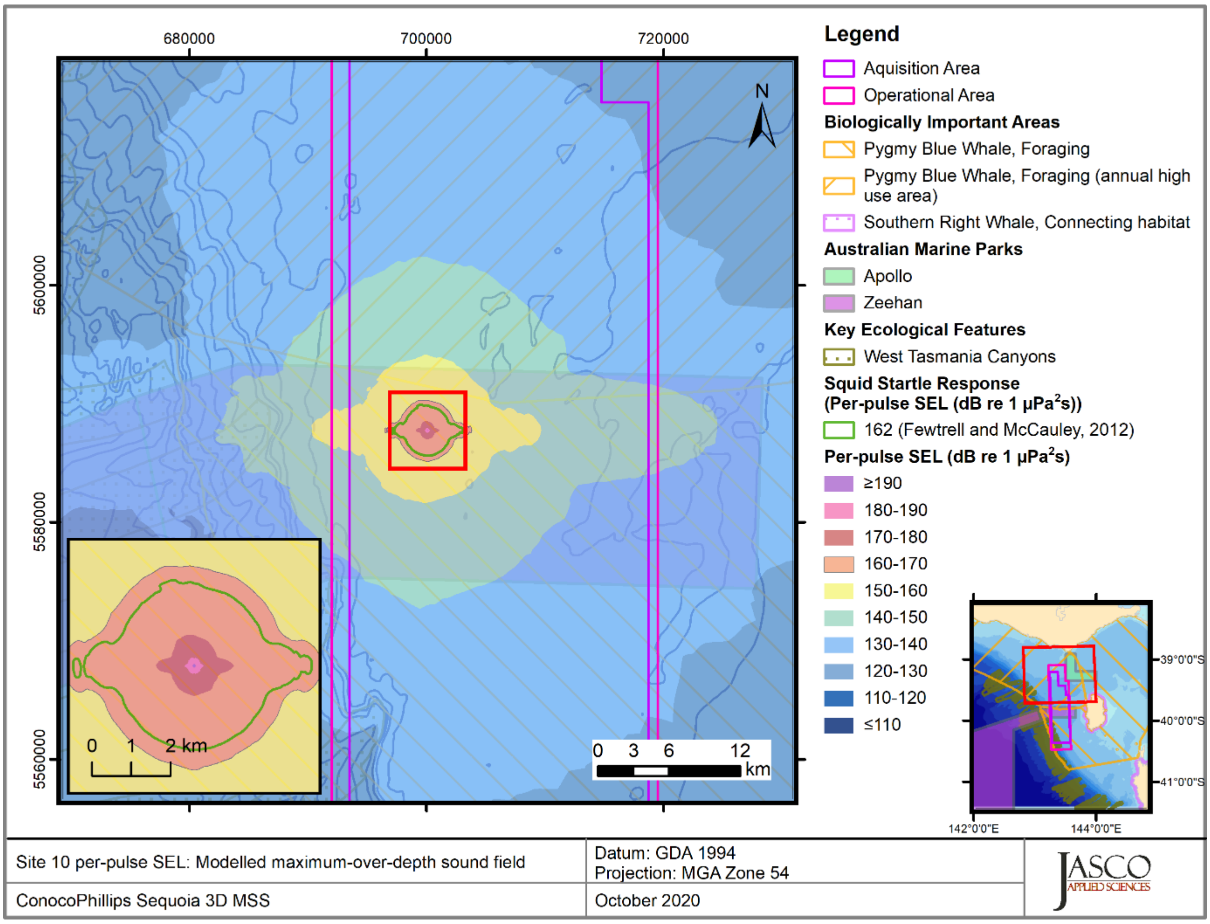

Figure E-10. Site 10, tow azimuth 0º, per-pulse SEL: Sound level contour map showing the unweighted maximum-over-depth sound field in 10 dB steps.

Supplementary Technical Note: Single Impulse Cumulative Assessment

Technical Note – Single Impulse Cumulative Assessment

ConocoPhillips Sequoia 3-D and Spectrum Geo Otway Marine Seismic Surveys

Submitted to:

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Contents

Figures

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1. Introduction

An approximation of the implications for the concurrent activities of seismic surveys close to the planned ConocoPhillips Sequoia 3-D Marine Seismic Survey (MSS), has been conducted, with the primary survey under consideration the planned Otway Deep Multi-Client (MC) MSS by Spectrum Geo.

The modelling approach for the two surveys considered source directivity and the area's range-dependent environmental properties. The seismic source arrays considered in the modelling studies were:

- A 3480 in^3 seismic source array that could be operated during the Sequoia 3D MSS (Koessler et al. 2020).
- A 3475 in^3 seismic source array that could be operated during the Otway Deep (MC) MSS (McPherson and Quijano 2018).

The additive effects of multiple concurrent seismic surveys in the region include:

1. The effects of multiple individual sound fields in separate geographic locations resulting in spatially separate areas of disturbance, such as when surveys occur at a significant distance from one another.
2. The potential interaction of sound fields produced by separate seismic surveys, where sound waves from the separate seismic sources may be received either in synchrony ("in synch") or out of synchrony ("out of synch").
3. Altering the predicted accumulated sound exposure level (SEL) footprints.

This analysis primarily considers Item 2, as for Item 1 the sources will be far enough apart that there will be no changes to predicted sound fields, and for Item 3, without a defined acquisition plan for the Spectrum Geo Otway Deep MSS, it is not possible to assess any differences in SEL footprints. Assessment of Item 3 can only be conducted when acquisition plans for both the Sequoia 3D and Otway Deep surveys are available.

Any additional surveys will be conducted without any intended temporal synchronisation between operations and the short duration of the airgun impulses (hundreds of milliseconds) as compared to the inter-pulse interval of several seconds, therefore any the perfect alignment of impulses is highly unlikely.

For this assessment, the closest two single impulse modelling sites from the modelling assessment for both surveys were considered, Site 1 from the Sequoia 3-D MSS and Site 6 from the Otway MC MSS (Figure 1). The locations for the two single impulse sites are shown in Table 1, and they are 50 km apart. These two modelled sites are 10 km further apart then the 40 km separation for concurrent operations which would be applied during each survey, however they provide guidance to the relative extent of the sound fields.

In summary, the aim of this technical note is to quantify the sound pressure level (SPL) that would result from combining the sound fields from both surveys under two assumptions, given the aforementioned caveats:

- Scenario 1: Pulses from both surveys do not overlap.
- Scenario 2: Pulses from both surveys overlap in time at any given point

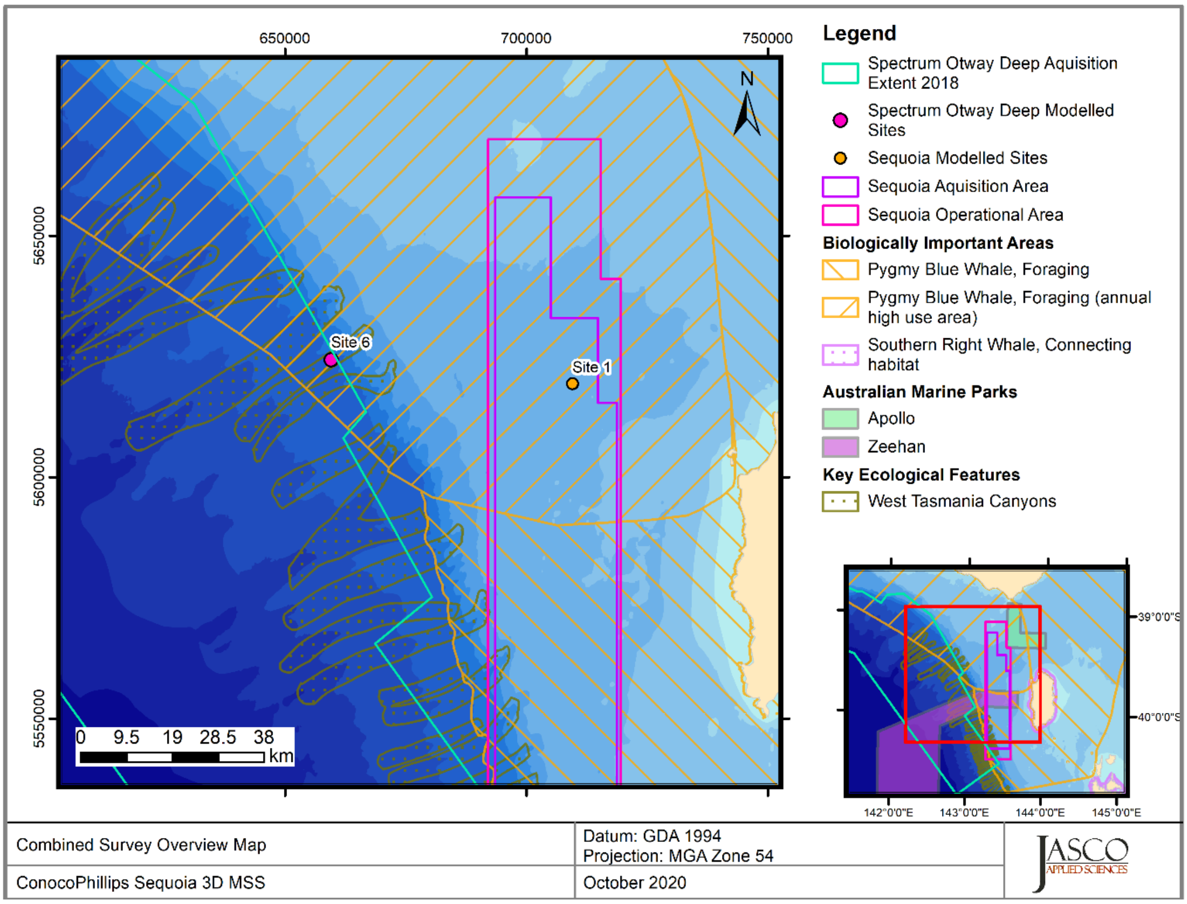

Figure 1. Modelled site locations overview.

Table 1. Location details for modelled sites (UTM Zone 54S).

Site	Survey	Water depth (m)	Latitude (°S)	Longitude (°E)	Easting (m)	Northing (m)	Tow heading (°)
1	Sequoia 3D	103	39° 32' 59.4733"	143° 26' 19.3794"	709541	5619362	0
6	Otway Deep MC	1076	39° 30' 57.3057"	142° 51' 21.3110"	659539	5624324	151

1.1. Background

The interaction of two separate seismic sound fields is a complex issue. JASCO Applied Sciences were engaged in 2018 to assess the potential overlap of seismic signals from two seismic source arrays operating within close proximity of one another (approximately 3 km) for the 2019 Santos Keraudren 3D MSS (Quijano et al. 2018, Santos WA Northwest Pty Ltd 2020). The study placed emphasis on quantifying how the use of two seismic sources might influence the received sound levels and the extent of seismic effects compared with the use of a single source. The main conclusion was that the two sources were largely non-synergetic in terms of per-pulse sound fields. An increase in sound levels may sometimes occur temporarily at locations where the received signals from each source occur in synch. However, in most instances, pulses will be out of synch and increased received per-pulse sound levels will not occur often.

However, a conservative assessment would consider the unlikely case of two pulses exactly synchronised with each other, or for SPL the 125 ms window used for the assessment aligning. This is because this scenario has the potential to increase sound levels. For pulses occurring simultaneously, the relative difference between received levels from the two surveys is important. To place this in context, if the received level at a nominal location of interest from each survey was to be the same, then the combined SPL would be 3 dB higher than the individual SPL, which represents a doubling of sound energy. However, the greater the difference in received SPL at the nominal receiver from each source, the smaller the resulting increase. For example, a difference of 10 dB between the received levels results in an increase equivalent to 0.4 dB for the combined level.

While the pulses will still line up occasionally for a brief moment at some locations, as shown in the example in Figure 2, unless they coincide roughly equidistant to both sources, the synchronous signals will be closer to one or the other of the two sources and their amplitudes will then be too unequal for the sum level to differ much from the stronger of the two components .

Therefore, the sound produced by two separate sources may generally be treated as spatially separated sound fields and single pulse sound levels will not typically increase as a result of synchronous pulses of sound. However, in circumstances when two seismic sources sail within close proximity of each other, the overall area where sound levels associated with different effects thresholds are exceeded will be greater. This would only occur for a relatively short period when the two survey vessels and seismic sources are operating at their closest points of approach to one another. At other times, the two seismic survey vessels may be tens or hundreds of kilometres apart.

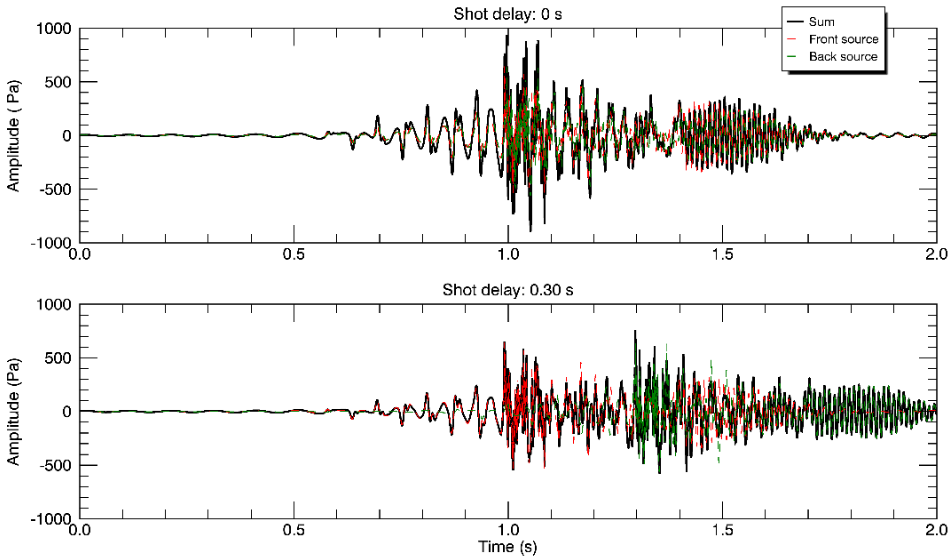

Figure 2. Two pulses of sound occurring in synch (top) and out of synch (bottom), Figure 6-25 from Santos Keraudren Extension 3D MSS Environment Plan (2020)

2. Results

The sound level contour maps for the two considered scenarios, Scenario 1: Pulses from both surveys do not overlap, Figure 3, and Scenario 2: Pulses from both surveys overlap in time at any given point, Figure 4. The increase in modelled SPL results for the overlap scenario compared to the no overlap scenario is shown in Figure 5.

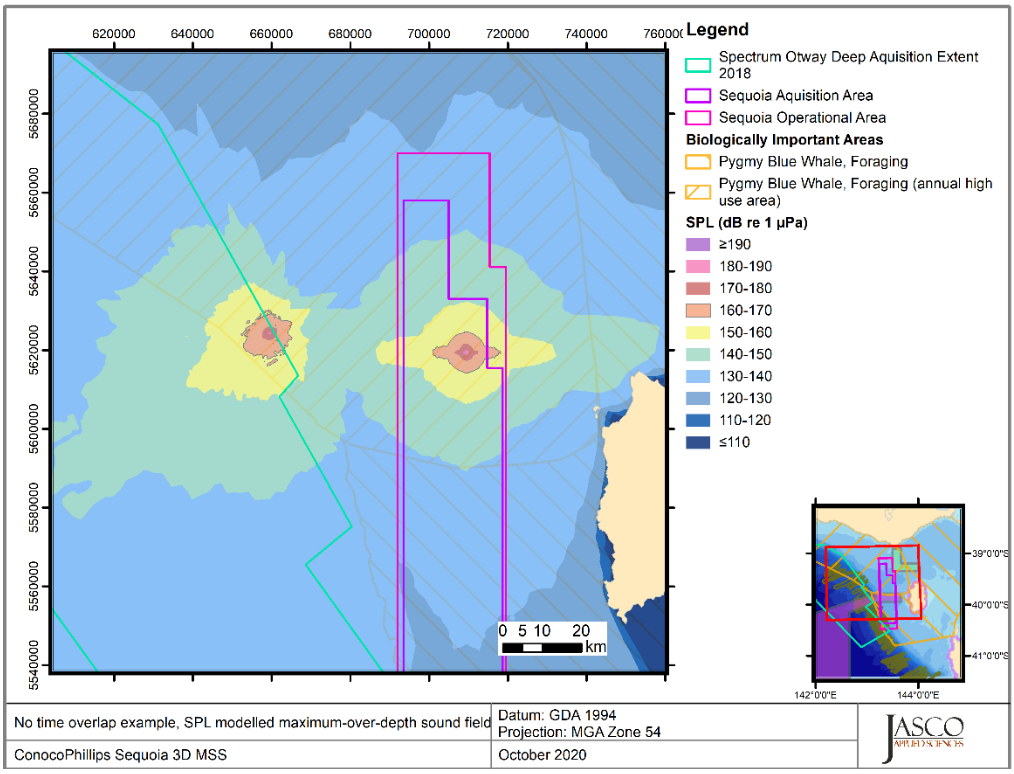

Figure 3. Sound level contour map showing unweighted maximum-over-depth SPL results for the Sequoia 3D MSS 3480 in³ array at Site 1, and the Otway Deep MC MSS 3475 in³ array at Site 6. The contours represent the situation in which pulses from the two survey arrays **do not overlap** in time.

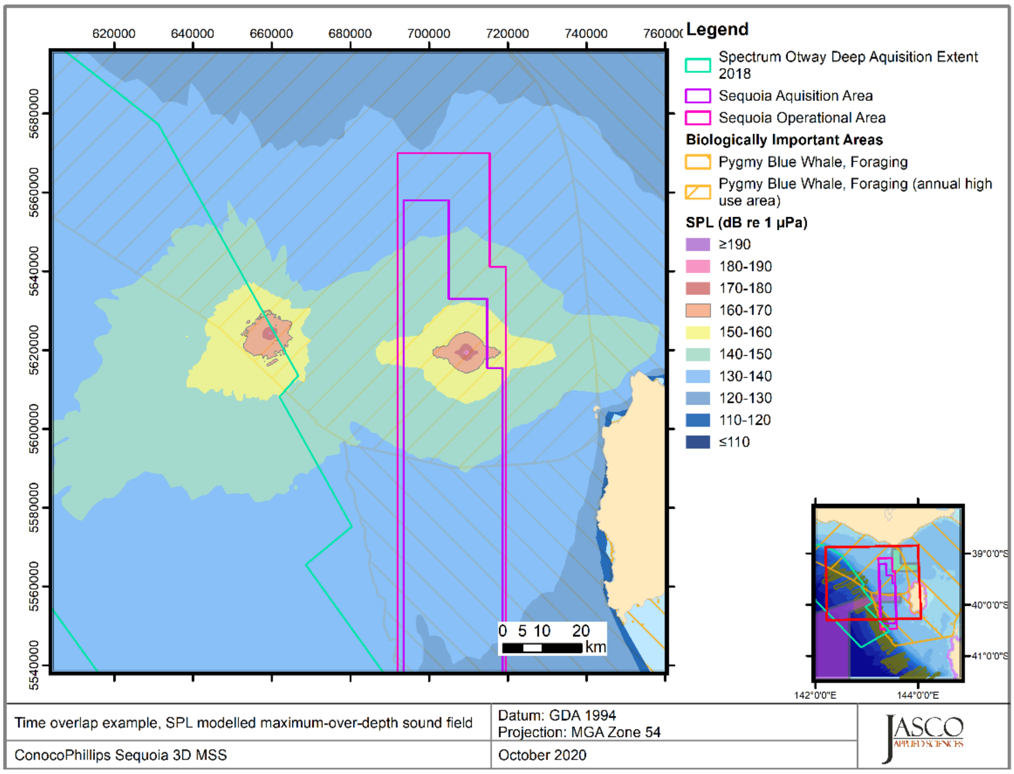

Figure 4. Sound level contour map showing unweighted maximum-over-depth SPL results for the Sequoia 3D MSS 3480 in^3 array at Site 1, and the Otway Deep MC MSS 3475 in^3 array at Site 6. The contours represent the situation in which pulses from the two survey arrays **overlap** in time.

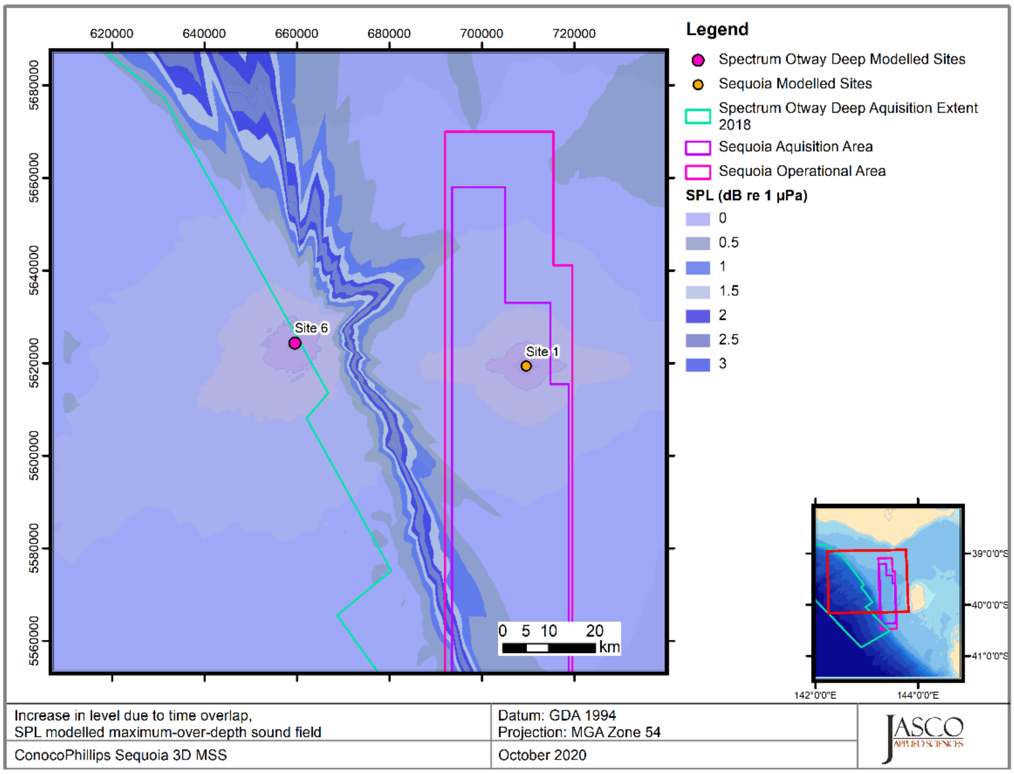

Figure 5. Sound level contour map showing the increase in modelled unweighted maximum-over-depth SPL results for the overlap scenario (Figure 3) compared to the no overlap scenario (Figure 4). The contours for the overlap scenario (Figure 3) are also shown for context.

3. Cumulative assessment

The most conservative cumulative operations exposure scenario accounting for a single impulse from both the Sequoia 3-D MSS and the Otway Deep MC MSS is to consider two simultaneous impulses at the minimum possible separation distance proposed for concurrent operations. While this distance will be no less than 40 km, the two modelling sites available for consideration from each survey had a minimum separation of 50 km.

Given that both surveys will be conducted without any intended temporal synchronisation between operations and the short duration of the airgun impulses (hundreds of milliseconds) as compared to the shot interval of several seconds (8.1 s for the Sequoia 3-D MSS and 8 s for Otway Deep MC MSS, respectively), this scenario is not very likely. Nevertheless, considering the possibility of the Sequoia 3-D MSS and the Otway Deep MC MSS occurring simultaneously, and the scenario of simultaneous impulses, the relative difference between received levels from the two surveys is important. The differences are most likely related to the relative difference in distance of the two surveys to the points of interest, differences in bathymetry and geological sub-bottom features as well as the aforementioned difference in source level between the two arrays.

Figures 3 and 4 illustrate how two pulses may combine to increase sound levels when they are exactly synchronised, compared with two pulses that are slightly out of synch, with a maximum difference of 3 dB, as shown in Figure 5.

The worst-case scenario considered, that of simultaneous impulses for the arrays in the two considered modelling sites, does not alter the area ensonified associated with any of the single impulse thresholds applied, or the distances to these thresholds.

An assessment of the potential changes to the accumulated SEL footprints has not been undertaken as acquisition plans for both surveys are not available, and therefore any assessment conducted would likely not be realistic.

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Koessler, M.W., C.R. McPherson, and S.J. Welch. 2020. *Sequoia 3D Marine Seismic Survey: Acoustic Modelling for Assessing Marine Fauna sound Exposures.* Document Number 02225. Technical report by JASCO Applied Sciences for Aventus Consulting Pty Ltd. .

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Supplementary Technical Note: Assessment of Seafloor Sound Levels for Excise Area Buffer

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TECHNICAL MEMORANDUM

DATE:	10 February 2021
FROM:	Matthew Koessler and Craig McPherson (JASCO Applied Sciences (Australia) Pty Ltd)
TO:	Aventus Consulting Pty Ltd
DOCUMENT NUMBER:	02312

SUBJECT: Assessment of Seafloor Levels for Giant Crab Buffer

1. Scope of Work

An assessment of the received levels at the seafloor at depths of 140 and 300 m to assist in determining the buffer zone around the Tasmanian Giant Crab exclusion area was requested.

2. Results

The tabulated results for seafloor PK-PK are presented in Table 1.

Table 1. Maximum (R_{max}) horizontal distances (in m) from the 3480 in^3 seismic source to modelled seafloor PK-PK levels from single-impulse modelled sites with water depth indicated.

PK-PK (L_{pk-pk}; dB re 1 μPa)	**Description**	**Maximum (R_{max}) horizontal distances (in m)**				
		Site A (Depth: 61m)	**Site 2 (Depth: 69m)**	**Site 1 (Depth: 103m)**	**Site B (Depth: 140m)**	**Site C (Depth: 300m)**
213[a,b,c]	Lobster and scallop experiments, maximum single impulse exposure measured.	140	144	138	155	105
212[b,c]	Scallop experiments, maximum single impulse exposure measured.	152	156	154	171	127
210[a,b]	Lobster experiments, maximum single impulse exposure measured.	181	199	183	201	176
209[a,b]	Lobster experiments, maximum single impulse exposure measured.	192	214	198	226	207
202[d]	Lobster (no mortality or damage to mechano-sensory systems, recoverable injury)	324	414	340	425	455

[a] Day et al. (2019a), lobster experiments, maximum single impulse exposure measured.
[b] Day et al. (2016a), lobster and scallop experiments, maximum single impulse exposure measured.
[c] Day et al. (2017), scallop experiments, maximum single impulse exposure measured.
[d] Payne et al. (2008), lobster, no mortality or damage to mechano-sensory systems, recoverable injury