



Australian Government

Department of Climate Change, Energy,
the Environment and Water

National artificial reef guidelines

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Acknowledgement of Country

Our department recognises the First Peoples of this nation and their ongoing connection to culture and country. We acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living culture and pay respects to their Elders past, and present.

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Abbreviations and acronyms

AMSA	Australian Maritime Safety Authority
BRUV	baited remote underwater video
CAS RNs	Chemical Abstracts Service Registry Numbers
Cth	Commonwealth
DNA	deoxyribonucleic acid
eDNA	environmental DNA
EEZ	exclusive economic zone
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GBRMP	Great Barrier Reef Marine Park
GBRMP Act	<i>Great Barrier Reef Marine Park Act 1975</i>
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
LAT	lowest astronomical tide
LTMP	long-term management plan
MNES	matter (or matters) of national environmental significance
NATA	National Association of Testing Authorities
NEPM	<i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i>
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
PBDEs	polybrominated diphenyl ethers
PCDEs	polychlorinated diphenyl ethers
PFAS	per- and poly-fluoroalkyl substances
PFAS NEMP	PFAS National Environmental Management Plan 2.0
PCBs	polychlorinated biphenyls
Reef Authority	Great Barrier Reef Marine Park Authority
ROV	remotely operated vehicle

SMART	Specific, Measurable, Achievable, Relevant, and Time-Bound
TBT	tributyltin
the department	Australian Government Department of Climate Change, Energy, the Environment and Water
The guidelines	<i>National artificial reef guidelines</i> (this document)
The London Protocol	1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972
The Sea Dumping Act	<i>Environment Protection (Sea Dumping) Act 1981</i>
UNEP guidelines	<i>London convention and protocol/UNEP guidelines for the placement of artificial reefs</i>
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WGS84	World Geodetic System 1984

Introduction

Artificial reefs are structures or formations placed on the seabed for the purpose of increasing or concentrating populations of marine plants and animals, or for the purpose of being used in human recreational activities such as scuba diving and recreational fishing.

The design and placement of an artificial reef must not harm or introduce hazards into the marine environment. Therefore, careful planning and a permit issued by the Australian Government Department of Climate Change, Energy, the Environment and Water (the department) is required before an artificial reef can be placed in Australian waters. The *National artificial reef guidelines* (the guidelines) provide information about how to plan for an artificial reef, apply for a permit, and manage the reef throughout its life.

Legal requirements

In all Australian waters, the placement of artificial reefs is regulated by the Commonwealth *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act). Australian waters include any waters on the landward side of the exclusive economic zone (EEZ), and waters on the continental shelf of Australia where it extends beyond the EEZ. Areas determined to be internal waters of a state or territory are not included. The applicant should contact the department to help identify the boundaries of internal waters of a state or territory in the area where they plan to place the artificial reef.

Definitions (section 4 of the Sea Dumping Act)

Artificial reef

An artificial reef means a structure or formation placed on the seabed for the purpose of:

- increasing or concentrating populations of marine plants and animals, or
- being used in human recreational activities.

Artificial reef placement

Artificial reef placement means the placement of any controlled material into the sea for the purpose of creating an artificial reef, being a placement that is not contrary to the aims of the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972.

The placement of artificial reefs within the Great Barrier Reef Marine Park (GBRMP) is regulated by the *Great Barrier Reef Marine Park Act 1975* (Cth) (GBRMP Act). The Great Barrier Reef Marine Park Authority (Reef Authority) has legislative authority for activities within the GBRMP, including proposed artificial reefs under the Sea Dumping Act. As such, these guidelines do not apply within the GBRMP, and applicants should refer to the Reef Authority's [Policy on Fish Aggregating Devices and Artificial Reefs \(2023\)](#), which provides more detail regarding artificial reef applications in the GBRMP.

Reef placement must also meet the criteria for other relevant federal legislation, such as the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), and potentially relevant state and territory legislation and guidelines.

The legislation and guidelines that apply will depend on where the artificial reef is to be placed and the impacts it may have. The applicant must identify and fulfil all legal requirements before

placing an artificial reef. Seeking advice from relevant Commonwealth, state, territory or local government agencies is recommended.

Planning and assessment

Planning for an artificial reef involves several phases and components, and applying for a permit requires detailed information collected during all of the below phases:

- Before submitting an application, all applicants are encouraged to have a pre-application meeting with the Sea Dumping Section of the department to discuss requirements and potential challenges the application may face once submitted.
- During the initial planning phases, the applicant will need to define the aim and predicted benefits of the reef and assess its potential impacts. Consultation with government departments and agencies, as well as with local stakeholders such as business and community groups, and First Nations peoples is essential.
- The applicant will need to ensure that the intention of the reef aligns with section 4 of the Sea Dumping Act, that is, an artificial reef is a structure or formation placed on the seabed for the purpose of increasing or concentrating populations of marine plants and animals, or for the purpose of being used in human recreational activities.
- The applicant will need to select an appropriate site and conduct a baseline site investigation. Detailed descriptions of the site are required as outlined in the permit application form.
- The applicant will need to ensure that the material and design of the artificial reef are durable and stable and will not harm the environment or human health. If the artificial reef is to be formed from repurposed infrastructure such as oil and gas platforms, a vessel or an aircraft, detailed preparation is needed. Artificial reefs may need to be inspected by the department, or nominated person by the department, prior to placement.
- The applicant will need to plan and describe the expected method of preparation and placement for the reef as part of a Placement Plan to be submitted with their permit application.

Monitoring and management

Because artificial reefs are designed to be long-term structures, the applicant must plan for the ongoing management and monitoring of the reef to ensure that it remains safe and continues to achieve its aims.

The permit holder will need to provide a report to the department after the reef is placed. They must continue to monitor, assess, actively manage and report on the reef throughout the life of the permit. If the reef becomes hazardous or is not achieving its aims, the permit holder may be required to remove it.

1 These guidelines

These guidelines are designed to help anyone considering the placement of an artificial reef in Australian waters.

Artificial reefs are structures or formations placed on the sea floor. As with natural reefs, they generally support marine life and/or are used for human recreational activities such as diving, fishing or surfing. An increase in marine life can help to support fishing or tourism activities. Artificial reefs may also help to protect and manage the environment, for example, by restoring ecosystems.

Artificial reefs can be made from purpose-built modules and/or repurposed from vessels, aircraft, infrastructure and other materials.

1.1 Need for these guidelines

The aim of artificial reefs is to benefit the environment. However, artificial reefs that are inappropriately placed or made from inappropriate materials may harm the environment or lead to other negative impacts.

As a party to the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (the London Protocol), Australia has obligations to protect the marine environment from human activities. The Sea Dumping Act was enacted to fulfil Australia's obligations under the London Protocol to protect and preserve the marine environment, minimising impacts on marine living resources, human health, and other uses of the marine environment.

Anyone wishing to create an artificial reef in Australian waters must apply for a permit under the Sea Dumping Act. The guidelines seek to provide clear, consistent standards and criteria for the development and assessment of artificial reef applications. The framework set out in the guidelines aims to ensure that the impacts of artificial reef placement are adequately assessed and, when permitted, that impacts are managed effectively.

The guidelines also seek to promote better decision-making by regulators by improving the quality of information on which assessments are based.

1.2 Using the guidelines

The guidelines set out a framework for permit applications under the Sea Dumping Act. They are intended to be used in conjunction with the artificial reef placement permit application form on the department's [Sea Dumping webpage](#). The guidelines will help an applicant to fill out the application form and provide the department with adequate information on their application. It is important that the guidance is applied to a permit application as a whole, that is, all sections are addressed in the application.

The guidelines provide information about key considerations for each stage of the application form, and about the supporting documentation that will be required as part of the application.

Key actions and considerations for applicants are identified with the ☒ icon.

Depending on where the applicant is intending to create an artificial reef or on the likely impacts of the reef, they may be required to meet other legislative requirements (see [Legislative](#)

[framework](#)). Applicants should seek independent advice to ensure that they are meeting all of their legal obligations.

The guidelines also provide specific information about different types of artificial reefs in section 5. This section currently includes detailed information on vessels and aircraft (see [Types of artificial reef](#)), with sections on purpose-built artificial reefs and repurposed infrastructure being developed.

1.3 Guideline limitations

The guidelines do not provide specific scientific or technical advice on the design and development of artificial reefs for any specified purpose. The guidelines also do not provide specific or definitive advice about issues such as public safety, legal requirements, third-party liability exposure, occupational health and safety management, or marine engineering issues. Applicants should seek independent advice on these and other issues.

The guidelines are designed to support a tailored, risk-based approach to potential impacts associated with the proposed reef. The permit application needs to be commensurate with the scope, scale and risk of the project and tailored by the applicant on a case-by-case basis. For example, a larger reef composed of complex repurposed materials poses a greater risk and therefore requires evaluation by the applicant of aspects that may not be required by a purpose-built artificial reef composed of materials with no potential contaminants.



2 Legal responsibilities

Applicants wishing to create an artificial reef in Australian waters must follow all Australian legal requirements for the approval and management of the reef. The main requirement is the artificial reef permit, as set out in the Sea Dumping Act, but other legislation and requirements may also be relevant (see [Legislative framework](#)).

The applicant must identify and fulfil all legal requirements. The applicant should seek advice from relevant Australian, state, territory or local government agencies.

2.1 Artificial reef permits

A permit is required for the placement of an artificial reef in Australian waters. Permits are necessary to ensure that appropriate sites are selected, materials are suitable and appropriately prepared, there are no adverse impacts on the marine environment, and the reef does not pose undue danger to marine users.

If a permit is granted, it will be issued for a period that reflects the estimated life of the artificial reef. The typical permit length is 30–50 years. The applicant must request a timeframe for the life of the permit as part of the application.

The minister (or delegate) may assess the applicant's ability to comply with conditions of the permit or other applicable laws in considering whether to grant a permit. The assessment may include financial capacity and technical ability to meet the obligations under the permit and anticipated whole-of-life costs of the artificial reef including:

- preparation and placement (installation)
- maintenance, repair and monitoring
- remediation and rectification work
- the cost to maintain required insurances
- the risk of damage to persons, property, or to marine species or the environment, and
- decommissioning.

Applicants are encouraged to partner with state, territory or local government as co-applicants to ensure the reef can be appropriately managed over the life of the permit. There needs to be a clear budget commitment to the reef.

Where oil and gas infrastructure is proposed for re-purposing as an artificial reef, applicants are encouraged to involve the owner of the infrastructure in the application process, as they are most familiar with the usage and history of the infrastructure.

Permit process

Several steps are involved in an artificial reef permit application and project:

- ☒ Planning and consultation
 - Applicants are advised to arrange a pre-application meeting to discuss artificial reef proposals with the department early in the project. This can help to identify all the requirements for the application, and any other approvals the applicant may need (see [Legislative framework](#)). Applicants can contact the department at seadumping@dcceew.gov.au.

- At the pre-application meeting, the applicant should advise the department of details such as the type of artificial reef proposed (for example, vessel or purpose-built), the purpose and objectives of the reef, the location of the reef and the proposed project team (for example, owner of the structure, impact assessment specialists, preparation and placement team) and the baseline site investigation.
 - The applicant must consider and discuss with the department if the placement is likely to significantly affect the environment, and what requirements this creates under the EPBC Act (see [Environment Protection and Biodiversity Conservation Act 1999](#)).
 - Applicants must also discuss the proposal with all relevant government agencies and stakeholders (see [Consultation](#)).
- ☒ Self-assessment of impacts
 - The applicant will need to complete a self-assessment of the likely impacts of the artificial reef (see [Impact assessment](#)).
 - The permit application will need to include a baseline site investigation (see [Site selection](#)).
- ☒ Application
 - The applicant must complete a permit application, including results and details of stakeholder consultation, together with all other relevant supporting documentation. The application form can be found on the department's [Sea Dumping](#) webpage.
 - Applicants must address all aspects of the application form in a clear and comprehensive manner. If this is not done, the application will be incomplete and may be rejected by the department.
 - The application may require further information that cannot be easily included in the form (for example, site maps or reports). Any further information in supporting documents must be summarised and referred to in the form, and any supporting documents must be submitted with the application.
 - Applications cannot be changed after submission, unless in response to a request for further information from the minister (or a delegate), in which case depending on the nature and scope of changes, the minister (or delegate) may decide a new application is required to be submitted.
 - The application must include a Placement Plan (see [Reef placement](#)) and long-term management plan (LTMP) (see [Long-term management plan](#)) for assessment.
 - The applicant will need to complete payment of the application fee within 30 days of submitting their application (see [Fees](#)). See the application form for payment details.
- Consideration
 - After an application has been received, the department assigns a project officer and publishes notice of the application in the *Commonwealth Government Gazette*.
 - The application is initially assessed by the department to determine whether sufficient information has been provided; if not, additional information is requested from the applicant.
 - After the requested additional information is received and found suitable, and the material, site, monitoring and management, and all other aspects of the proposed reef are determined suitable for placement, the department prepares a final assessment and draft permit decision.
 - If the permit is proposed to be granted, the department will propose terms and conditions for the permit (see [Permit conditions](#)) and consult with the applicant about the proposed conditions.
 - If the permit is proposed to be refused, the applicant will be given an opportunity to provide final additional information prior to a decision being made.

- Decision
 - After comments on the proposed conditions are received and considered, the Minister for the Environment and Water (the minister, or delegate) considers the application, the assessment and draft permit, and a decision is made.
 - After a decision is made, the applicant is given either a signed permit or a letter detailing why the application was refused.
 - The department publishes notice of the decision in the *Commonwealth Government Gazette*.
 - Decisions made under the Sea Dumping Act, such as the granting of an artificial reef permit, can be subject to review through the Commonwealth Administrative Appeals Tribunal. Applications for review must be made to the tribunal within 28 calendar days of the decision, which is referred to as the 'appeal period'. For example, if the application is refused, the applicant can appeal the decision. Conversely, if the proposal is approved but there is opposition to it, those opposing the project can also appeal.
- ☒ Project
 - In the event the permit is granted, the applicant can proceed with placement of the reef in compliance with all permit conditions.
 - Following placement, the LTMP is put into action, and deliverables are reported to the department in line with the permit conditions.

Timeframes

Artificial reef projects can be very time intensive. Permit applications should be submitted to the department as early as possible (at least 12 months before the proposed date of placement).

During the planning stage, applicants should consider the schedule for fabrication or preparation and installation, however works should not proceed until after a permit is granted. Applicants are advised to carefully consider contractual arrangements to prevent any costs being incurred by the applicant should the permit be granted later than anticipated or not be granted.

It is the applicant's responsibility to advise the latest date that the reef could be placed, noting that the permit start date commences once the reef is placed (see [Reef placement](#)).

The Sea Dumping Act requires the minister (or delegate) to decide whether to grant a permit within 90 days of an application being 'duly made' (Figure 1). A duly made application is one where all aspects of the application form have been addressed and application fees have been paid within the legislated time frame of 30 days after submission.

An assessment can take more than 90 days if the duly made application does not have enough information. If additional information is required to assess the application (under section 18(3) of the Sea Dumping Act), an application will be deemed not to have been duly made until the required information has been provided.

It is important to note that a duly made application can become unduly made at a later point in time due to events such as a request for further information by the minister (or delegate), or an applicant not paying the fees within the required timeframe.

The department must request the additional information within the first 60 days after receiving a duly made application. The 90 day timeframe for a decision on whether to grant a permit will not begin until all the required information has been provided.

Complex applications may require the department to make more than one request for more information. Due to this, complex applications may take 12–18 months to be resolved; this is highly dependent on the applicant's ability to provide the requested information to the department and the minister's (or delegate's) satisfaction (for example, application timeframes can increase if additional site surveys are required).

Application assessment and timing

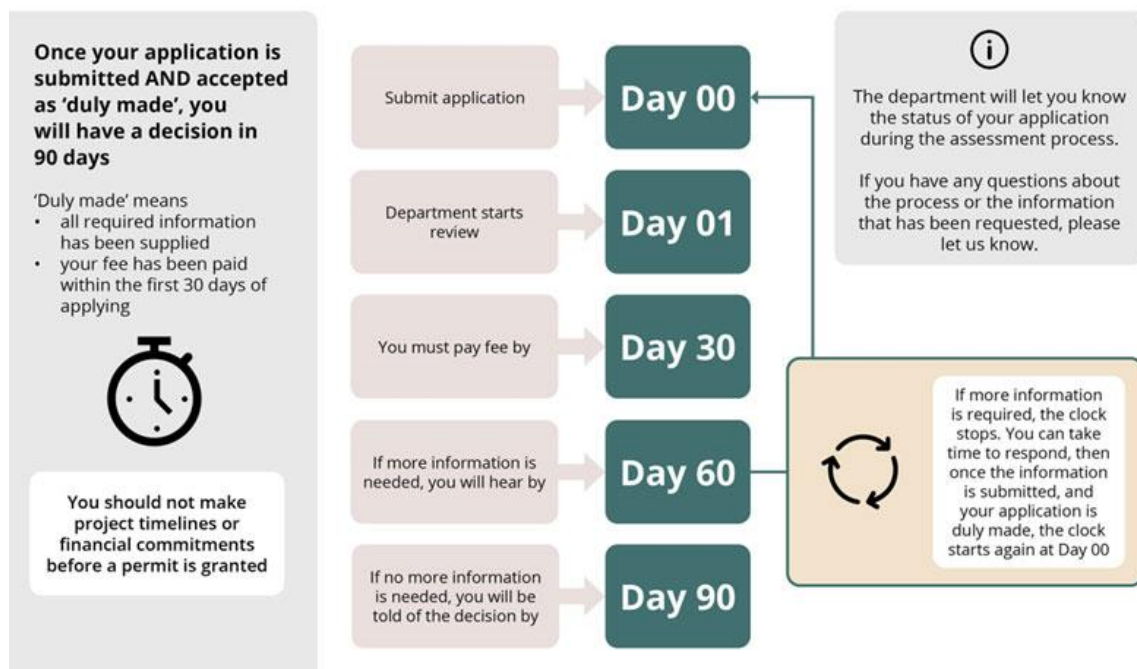


Figure 1 Timeframe for considering applications

In assessing a permit application under the Sea Dumping Act, the department must consider advice from the minister (or delegate; under section 160 of the EPBC Act) if the action is likely to have a significant impact on the environment. Where assessment is required under both the Sea Dumping Act and the EPBC Act, if the applicant submits their Sea Dumping Act application and requirements under the EPBC Act in a similar timeframe, the assessment processes will be coordinated as much as possible. However, applicants should seek early advice from the department on the requirements of both acts and timing of submissions and applications.

Fees

Fees for permit applications can be found on the department's [Sea Dumping](#) website. Fees represent the cost of administering the permit process and are prescribed under the Environment Protection (Sea Dumping) Regulations 1983. In accordance with the regulations, the application fee must be paid within 30 calendar days of the application being submitted. If the applicant does not pay the fee, the application will be not duly made and will not be further considered.

Permit conditions

In the event the sea dumping permit is granted, the applicant becomes the permit holder. The permit will include terms and conditions that must be complied with (see [Compliance and enforcement](#)).

Examples of conditions typically included in a permit are:

- establishment of public safety and environmental protection exclusion zones in land and sea for the placement of the artificial reef
- access for department appointed personnel to witness the placement
- notification to relevant authorities of the proposed placement activity, time and location
- contingency plans for the identification of, and response to, any pollutants, debris or public safety hazards arising from the placement
- checking the artificial reef is safe before public access is permitted
- requirements to ensure that the artificial reef does not pose an undue risk to navigation and is properly marked
- post-placement notification to specified authorities
- ongoing monitoring and management of the reef, including the submission of periodic reports to the department or other specified agencies
- requirement for the removal of the reef when the permit expires (for information regarding reefs proposed to be left in place for perpetuity, see [Decommissioning of the artificial reef](#))
- compliance with any conditions from other government agencies in the form of licences, permits or conditions of approval.

2.2 Legislative framework

Three key Commonwealth acts regulate the placement of artificial reefs:

- Sea Dumping Act
- EPBC Act
- GBRMP Act.

The GBRMP Act regulates artificial reefs within the GBRMP. These guidelines do not apply within the GBRMP, and applicants should refer to the Reef Authority's [Policy on Fish Aggregating Devices and Artificial Reefs \(2023\)](#), which provides more detail regarding artificial reef applications in the GBRMP.

Additional approvals for placement of an artificial reef may be required under the EPBC Act if the proposed action is likely to have a significant impact on a matter (or matters) of national environmental significance (MNES; a further definition of MNES can be found at the department's [What's protected under the EPBC Act](#) website). Additional approvals may also be required under relevant state or territory legislation.

These guidelines outline the requirements to place an artificial reef under the Sea Dumping Act. They aim to ensure that artificial reef development is consistent with the aims of the London Protocol, to which Australia is a contracting party. These guidelines are also consistent with international guidance on artificial reefs, namely the 2009 [London convention and protocol/UNEP guidelines for the placement of artificial reefs](#) (UNEP guidelines) (Figure 2). The UNEP guidelines provide further detail and advice on all aspects of artificial reefs and can be referred to at all stages of design, application, placement and monitoring of artificial reefs.

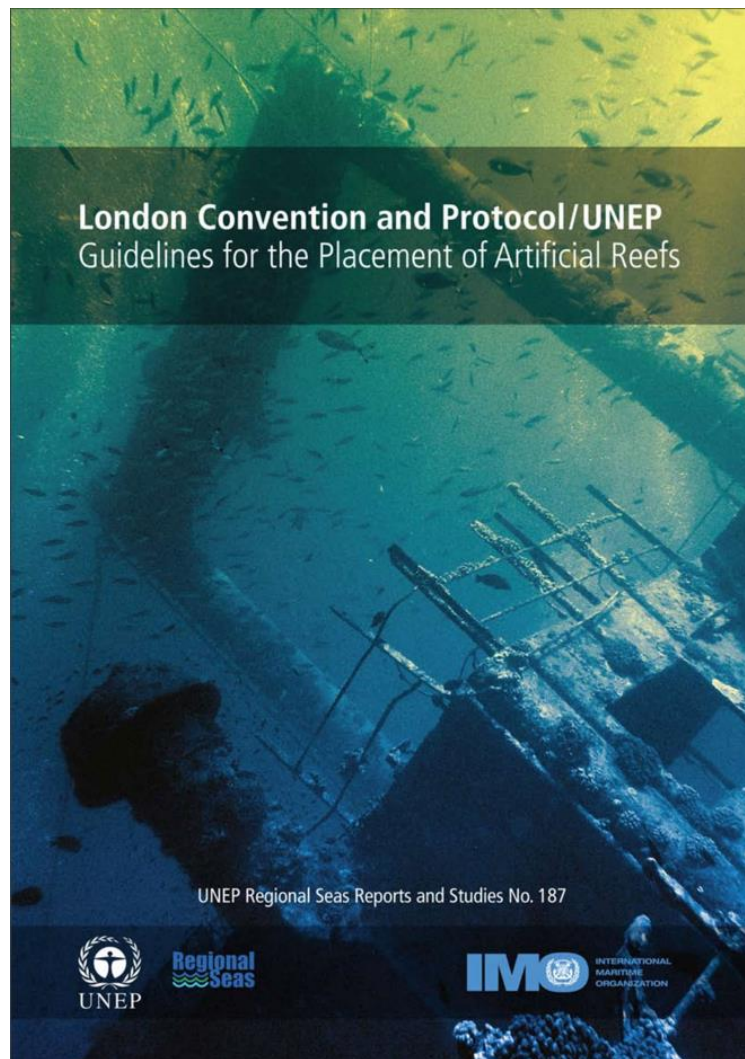


Figure 2 Cover of the *London convention and protocol/UNEP guidelines for the placement of artificial reefs*

Environment Protection (Sea Dumping) Act 1981

☒ Anyone wishing to create an artificial reef in Australian waters needs to meet the requirements of the Sea Dumping Act.

Artificial reef placement within the area of jurisdiction of the Sea Dumping Act without a permit, or not in accordance with the conditions set out in a permit, is unlawful. Civil and criminal penalties apply.

Under the Sea Dumping Act, an artificial reef means a structure or formation placed on the seabed either:

- for the purpose of increasing or concentrating populations of marine plants and animals, or
- for the purpose of being used in human recreational activities.

The Sea Dumping Act implements Australia's obligations under the London Protocol. Artificial reef placement must be a legitimate placement as described by the Sea Dumping Act. Placement of an artificial reef cannot be used as an excuse for dumping or disposal of waste. The installation of artificial reefs is considered as placement, not dumping, under the terms of the

London Protocol, provided such placement is not contrary to the aims of the London Protocol. These aims are to:

... protect and preserve the marine environment from all sources of pollution and take effective measures, according to their scientific, technical and economic capabilities, to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter (1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972).

The Sea Dumping Act applies in all Australian waters, from the low water mark to the limits of the EEZ, which extends 200 nautical miles from the coastline. Australian waters also include any waters on the continental shelf of Australia where it extends beyond the EEZ (Figure 3). It does not include waters that are defined as waters within the limits of a state or territory. Generally, the state or territory limits are low waters along the coastline together with bay closing lines (usually no more than 6 nautical miles in length) and river closing lines.

In some areas of the coastline, locating the state or territory limits may be difficult, especially where islands are located very close to the coastline and in relation to certain bays. In these cases, there are detailed legal principles that must be applied to determine the exact location of the state or territory limits. Because defining state or territory limits can be a complex task, applicants may need to seek their own legal advice.

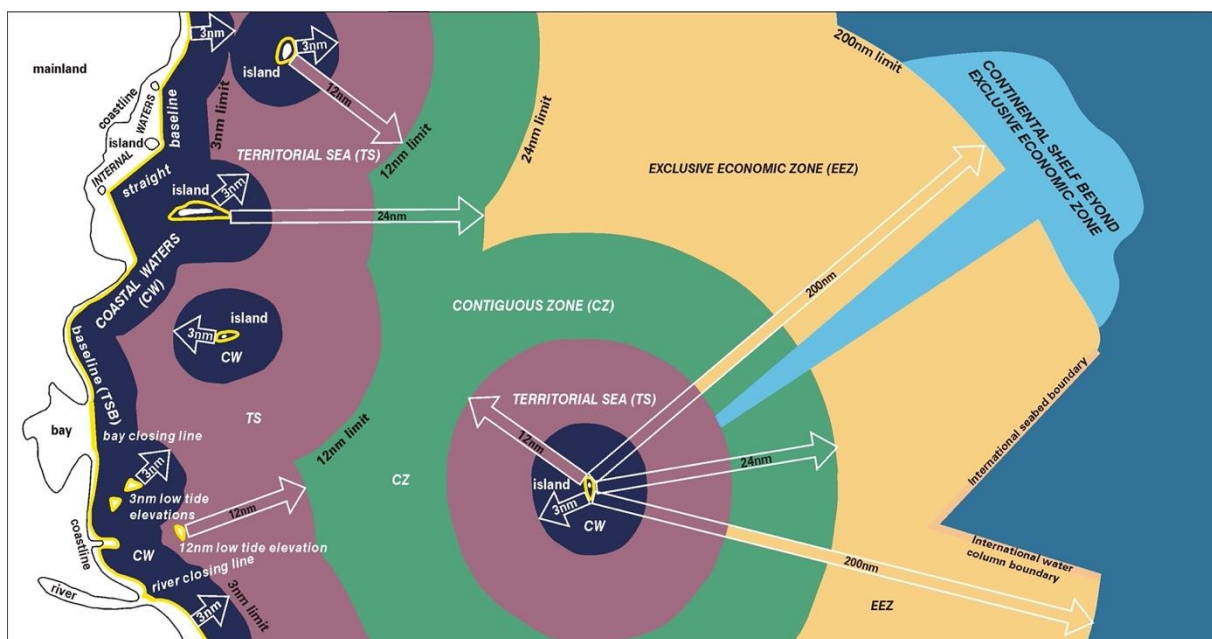


Figure 3 The Sea Dumping Act applies within Australian waters

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Environment Protection and Biodiversity Conservation Act 1999

☒ The applicant must meet the requirements of the EPBC Act.

An activity or action will require separate assessment and approval under part 9 of the EPBC Act if it is likely to have a significant impact on one or more of the following MNES:

- World Heritage properties
- Wetlands of international importance (Ramsar)
- listed threatened species and ecological communities

- listed migratory species
- the environment of Commonwealth marine areas
- National Heritage places
- Commonwealth land or actions involving a Commonwealth agency
- the GBRMP (see also [Great Barrier Reef Marine Park Act 1975](#)).
- the environment, from nuclear actions
- water resources, from coal seam gas development and large coal mining development.

For example, placement of an artificial reef will require referral under the EPBC Act if:

- the action is taken within a Commonwealth marine area and the action has, will have, or is likely to have, a significant impact on the environment or
- the action is taken outside a Commonwealth marine area and the action has, will have, or is likely to have, a significant impact on the environment within a Commonwealth marine area.

An action is considered likely to have a significant impact on the environment in a Commonwealth marine area as outlined in the Matters of National Environmental Significance Significant impact guidelines 1.1 (see box below and [Information and resources](#) for further information).

Matters of National Environmental Significance Significant impact guidelines 1.1

Definition: The Commonwealth marine environment significant impact criteria

An action is likely to have a significant impact on the environment in a Commonwealth marine area if there is a real chance or possibility that the action will:

- result in a known or potential pest species becoming established in the Commonwealth marine area
- modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results
- have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution
- result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health
- result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected, or
- have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.

If an applicant wants to take any action on a matter that the EPBC Act covers, they need to consider referral to the department under this legislation. An EPBC self-assessment helps you understand your duties under the EPBC Act (refer to [Self-assessment before making a referral under the EPBC Act](#)).

Great Barrier Reef Marine Park Act 1975

Within the boundaries of the GBRMP, the Reef Authority has been delegated authority under the Sea Dumping Act. The guidelines do not apply within the GBRMP, and applicants should refer to the Reef Authority's [Policy on Fish Aggregating Devices and Artificial Reefs \(2023\)](#), which provides more detail regarding artificial reef applications in the GBRMP. Any future Reef Authority policies will also apply for applications in the GBRMP boundary.

Other Commonwealth legislation and approvals

Several other government agencies also have regulatory functions that may apply to aspects of artificial reef placement, including, but not limited to:

- other sections within the department (for example, environmental assessments under the EPBC Act and heritage assessments)
- Director of National Parks as the decision maker on Australian Marine Park matters
- National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)
- Australian Maritime Safety Authority (AMSA).

Requirements under the *Underwater Cultural Heritage Act 2018* must be considered when planning and preparing applications for artificial reefs in accordance with the relevant guidelines (see [Information and resources](#)).

AMSA should be consulted when artificial reefs are planned to be established in Australian waters. Artificial reefs must be well clear of regular shipping routes or in waters deep enough to permit safe navigation by deep draught ships (that is, clear of normal shipping routes).

Other Commonwealth legislation may need to be considered during the planning and application processes, including, but not limited to:

- *Biosecurity Act 2015*
- *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

☒ Applicants will need to apply to each regulatory authority for any relevant permits and approvals. Seek advice early about what other legislation may be applicable to the project (see [Consultation](#)).

In setting conditions on artificial reef permits, the minister (or delegate) will review any other Commonwealth, state or territory conditions, and consider their consistency with the requirements of the Sea Dumping Act and related policies or guidelines. Where the state or territory conditions do not appropriately manage the impacts under the Sea Dumping Act, the minister (or delegate) may attach additional conditions to the permit (see [Permit conditions](#)).

State and territory legislation and approvals

State and territory governments are responsible for regulating artificial reef development that occurs within waters within the limit of the state or territory, and, in most instances, have additional requirements for reefs placed within their adjacent coastal waters.

Other state and territory agencies, such as environmental, maritime and fisheries agencies, may also have relevant legislation or regulations.

☒ Applicants will need to consult their state or territory government to determine the nature and scope of any approvals required under the laws of that state or territory (see [Consultation](#)).



3 Planning and assessment

Permit applications are assessed in accordance with the Sea Dumping Act. Specific factors that are considered during the assessment include, but are not limited to:

- project aims
- stakeholder consultation and response to stakeholder issues
- site suitability, including potential impacts of the reef on the surrounding environment
- appropriateness of the material and its preparation
- proposed method and timing of placement, including measures to mitigate any risks
- long-term monitoring and management arrangements.

In planning a project and developing an application, the applicant will need to consider these and other factors as outlined in the guidelines.

3.1 Planning an artificial reef project

In the initial planning stages of a project, applicants must carefully consider what the reef is designed to achieve and the likely impacts for the environment and the community. Applicants will need to consult Australian Government departments and agencies, and other government agencies relevant to their state or territory. They will also need to consult local stakeholders. Applicants must consider the resources required in the planning, impact assessment and placement phases of the project, and over the entire timeframe of the requested permit.

A tailored, risk-based approach to potential impacts associated with the proposed reef is recommended to provide for the best scientific outcomes. That is, the evaluation by the applicant needs to be commensurate with the scope, scale and risk of the project and tailored on a case-by-case basis. For example, a larger reef composed of complex repurposed materials poses a greater risk and therefore requires analysis and monitoring of aspects that may not be required by a purpose-built artificial reef composed of material with no potential contaminants.

Objectives and impacts

☒ Applicants must clearly state the goals and objectives of the artificial reef proposal, demonstrating how the reef will be fit for the intended purpose.

The objective of an artificial reef is typically related to the definition under the Sea Dumping Act, that is, increasing or concentrating populations of marine plants and animals, or being used in human recreational activities. The purpose of an artificial reef may include the restoration or rehabilitation of marine habitats, and/or the promotion of recreational, research and educational use of the area. Applicants must outline how the objective will be measured such as environmental monitoring, social surveys or economic analyses by suitably experienced and/or qualified person(s).

☒ Applicants must demonstrate the negative and positive potential impacts of the proposed artificial reef, including potential unintended impacts such as pollution.

Examples of positive outcomes include:

- the ecological and community benefits that would be provided by developing an artificial reef intended to recruit and sustain preferred recreational fishing species, thus enhancing local recreation opportunities
- the community amenity and local economic benefits that would be provided by developing an artificial reef intended to attract divers or recreational fishers.

In the case of artificial reefs proposed to improve local biodiversity or fish stocks, applicants should demonstrate that the proposed structure will provide new productive habitat, as opposed to non-productive habitat.

Consultation

☒ Applicants are advised to arrange a pre-application meeting to discuss artificial reef proposals with the department early in the project to receive guidance and advice on the concept and development of the intended artificial reef project (see [Permit process](#)).

Early consultation will help to ensure that the application meets the requirements and can be assessed promptly, avoiding delays caused by inadequate information. It will also limit the risk of time and resources being invested in an artificial reef project that is unlikely to be granted a permit.

Communication with the department must continue for the life of the application. This can help ensure that all aspects of the application package and reef preparation process are comprehensively addressed, thus reducing potential delays.

☑ Applicants will also need to consult with other relevant Australian, state or territory government departments and agencies (see [Other government agencies](#)), including pre-application consultation as required.

☑ Applicants must demonstrate open communication and good-faith consultations with stakeholders (see [Stakeholders](#)). Consultations must take place before submitting an application. The department will consider the interests of stakeholders when assessing the permit application.

Government stakeholders

As part of the permit application process, the applicant must consult other relevant departments and agencies as appropriate. When processing applications, the department will require evidence that the applicant consulted other relevant authorities.

Other Australian Government agencies the applicant may need to consult include, but are not limited to:

- Airservices Australia – responsible for air traffic management, aviation rescue firefighting services, aeronautical information, aviation communications and radio navigation aids (e.g., when explosive scuttling or the use of pyrotechnics is planned, so that Notices to Airmen may be issued)
- Australian Communications and Media Authority – responsible for undersea communications cables
- Australian Hydrographic Office – responsible for marine charts, marine navigation information, Notices to Mariners, charting of military maritime exercise areas
- AMSA – responsible for the maritime safety of international shipping and domestic commercial vessels (including safe navigation), protection of the environment from ship-sourced pollution, and providing a national search and rescue service.
- Biosecurity section of the relevant state and Commonwealth departments – responsible for biosecurity management, including vessel biofouling management and ballast water regulations
- Department of Industry, Science and Resources – responsible for regulation of offshore petroleum and greenhouse gas activities in Commonwealth waters
- DCCEEW Energy divisions – responsible for energy policies and programs, the Energy and Climate Change Ministerial Council, and renewable energy including offshore renewable energy infrastructure
- National Native Title Tribunal – responsible for registration and determination of native title claims
- NOPSEMA – responsible for regulation of offshore petroleum, greenhouse gas and renewable activities in Commonwealth waters, including decommissioning of infrastructure and facilities
- Offshore Infrastructure Regulator - regulates work health and safety, infrastructure integrity and environmental management for offshore infrastructure activities with functions administered by NOPSEMA.

The applicant will also need to consult relevant government departments or agencies in their state or territory. The specific authorities to contact will vary between jurisdictions, but generally are those with responsibilities for:

- environment protection, conservation and management
- marine transport and marine navigation safety
- ports and harbours
- fishing and aquaculture
- offshore petroleum and seabed minerals activities
- marine conservation and management of marine protected areas
- native title and Indigenous heritage
- tourism
- regional development
- underwater cultural heritage protection.

Non-government stakeholders

As part of the permit application process, applicants must consider the interests of relevant stakeholders. The organisations they may need to consult will depend on the location and material of the proposed artificial reef. Applicants should tend towards wide and inclusive consultation with stakeholders.

The types of organisations that applicants could consider to be potential stakeholders include but are not limited to:

- community representatives
- native title holders, registered claimants, and First Nations peoples and Custodians
- municipal and regional councils
- chambers of commerce, and local business and tourism organisations
- local businesses associated with diving, boating, fishing and marine tourism
- commercial fishing industry bodies and commercial fishing operators
- local aquaculture operators
- local clubs associated with diving, boating and fishing
- local and regional environment, conservation and maritime heritage groups
- recreational fishing associations
- recreational diving groups
- local sea rescue organisations and surf lifesaving clubs
- ports
- shipping companies
- local universities.

Consultation can include local community meetings, advertisements in social media or regional websites and newspapers, and direct mail or email. Formal written consultation can be an effective method for providing relevant key stakeholders with all the details of the application, including the alternatives investigated, the nature of the material, the proposed location and

timing, any predicted impacts, mitigation measures and proposals for the placement and ongoing management and monitoring of the reef.

Consultation with stakeholders must be clearly documented and included as part of the application and summarised in the table provided in Section 10 of the application form. Information about the consultations should consider the following aspects:

- name, address and contact details of the organisation or person(s) consulted
- method of communication (for example, letter, email, phone, via website, personal discussion)
- information provided and/or the request made by the applicant
- date of initial contact
- whether a reply or comment was received, and the date received
- summary of any requirements, comments or concerns expressed by the stakeholder
- action taken by the applicant to address the stakeholder's response, or reasons why action was considered impractical or not warranted.

Further consultation may be required if the proposal changes during the development of the application or the consultation process.

Resources

Artificial reef projects are labour-intensive and time-consuming. They can also be expensive, even if the materials are obtained at no cost. Organisations interested in placing artificial reefs must have the resources to complete the project, including funds, committed personnel, expertise, equipment and insurances.

☒ Applicants must carefully consider their resources before applying for a permit to place an artificial reef.

Costs associated with site selection and evaluation, material preparation, reef placement, and ongoing management and monitoring will be substantial.

In most cases, suitably qualified person(s) will be required for certain aspects of the artificial reef project, such as site selection, clean-up of material before placement, reef placement, and post-placement management and monitoring.

Artificial reefs require post-placement management and monitoring to ensure the long-term protection of the surrounding environment and/or human health. Accordingly, applicants must demonstrate that they are able to make a long-term commitment to ongoing management and monitoring of the proposed reef over the whole-of-life of the project.

In addition, modification, repairs and decommissioning of the artificial reef is likely to be extremely costly. The viability of contingency measures, and the financial resources required to implement them, are important factors in artificial reef proposals and must be considered early in the planning process. The cost to decommission the reef must be considered for every application.

3.2 Site selection

Appropriate site selection is critical to the long-term viability of artificial reefs. In planning the project, the applicant must carefully consider a variety of sites that may be suitable for the proposed artificial reef. The sites should be evaluated in consultation with relevant stakeholders.

☒ Applicants are required to provide the department with a rationale on why the final site was selected, and the reasons for discounting others. This rationale must provide, for each site considered, a summary of:

- location
- proximity to important features
- proximity to protected and sensitive areas
- stakeholder issues
- physical and biological characteristics
- potential impacts of the proposed reef
- the reasons for selection or exclusion.

All of the above factors must be considered, however the impacts associated with some factors may not need to be evaluated in detail by the applicant. The extent of analysis by the applicant is dependent on the scope, scale and risk of the project.

Location

Applicants must provide details of the location selected for the placement of the artificial reef. The coordinates of the proposed site must be specified (latitude and longitude in degrees, minutes and seconds). The World Geodetic System 1984 (WGS84) should be used. When specifying the site coordinates, applicants must make provisions for the size of the reef material, the likelihood of minor inaccuracies in placement, and the potential for the material to drift during placement.

A colour copy of the relevant marine chart displaying the proposed location of the artificial reef must be included in the permit application. The marine charts must show depth contours to provide key information on local benthic (seabed) geomorphology and features (for example, reefs), and any existing infrastructure at the proposed location.

☒ Any maps provided as part of the application must be of high quality and labelled clearly. Ideally, spatial data should be provided in shapefile format.

Depth of the site is a key determinant of site suitability. Minimum and maximum depths of the reef at the site must be specified in the application as metres below lowest astronomical tide (LAT). When an artificial reef is intended for recreational diving use, the maximum depth at the site should be within the safe depth limits of recreational diving. The applicant must consult their state or territory maritime safety authority for further guidance.

The site history is also an important consideration to ensure it is not contaminated. For areas that may be contaminated, site history can be determined following the principles described in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPM) (see [Information and resources](#)), for example, projects near dredge spoil or other dumping sites, sewage outfalls, ports, oil and gas operations, or areas receiving runoff from infrastructure such as airports, fire stations or industry. The purpose of the NEPM is to establish a nationally

consistent approach to the assessment of site contamination. Volume 6 provides principles and tools to conduct an ecological risk assessment.

Proximity to important features

The proximity of the proposed reef site to important features must be detailed in the permit application. Features may be marked on a map(s) and/or described in a table or text. Important features may be identified using marine charts (for example, navigation channels) and satellite or aerial imagery (for example, coral reefs) but may need to be physically checked at the site (ground-truthed).

Such important features are discussed in more detail in the following sections and may include:

- nearest land and local cities or towns
- access points for the reef (for example, boat ramps and marinas)
- navigation channels, shipping lanes, ports and anchorages, and subsea infrastructure such as cables and pipelines
- commercial and recreational fishing areas
- aquaculture facilities
- areas used for recreational boating and other water sports
- historical, cultural, heritage-listed and scientific sites including underwater cultural heritage
- native title areas
- other artificial reefs
- marine reserves
- areas inhabited by listed threatened species or used by migratory species, and areas supporting ecological communities
- any other significant and/or potentially sensitive features occurring in the area (for example, coral reefs, rocky outcrops, seagrass and sponge beds).

The application must include details of the potential impacts or risks that the proposed artificial reef poses to these features, and how the applicant will manage these impacts and risks.

Protected and sensitive areas

Sites must be chosen to avoid or minimise negative impacts of the proposed reef on the local marine environment, particularly on MNES (see [Environment Protection and Biodiversity Conservation Act 1999](#)). The department is unlikely to recommend a permit be granted for an artificial reef placed in protected or sensitive areas, such as:

- areas that have protected matters, which include MNES or other matters protected by the EPBC Act, or any other environmental matters listed under relevant state or territory legislation
- marine protected areas, which are waters declared to be marine parks, aquatic reserves or any other type of zoning or planning by Commonwealth, state or territory governments
- biologically important areas, which are areas where species are known to conduct biologically important behaviours such as breeding, foraging or migration
- sensitive areas, such as seabed communities featuring algae (for example, macroalgae, turf and benthic microalgae), seagrasses, mangroves, corals or mixtures of these groups.

Applicants must describe the nearby protected and sensitive habitats. This should include the distances to these habitats, marine plants and animals present on or near these habitats, and where possible the condition of these habitats. Depending on the scope, scale and risk of the project, the description could be based on desktop data, or may require field survey and/or sampling.

The department is unlikely to recommend a permit be granted for an artificial reef that would impact an Australian Marine Park, World Heritage property, or National Heritage place. Applicants proposing an artificial reef near protected or sensitive areas must engage in early, detailed discussions with the department, and where relevant, state or territories departments, before submitting an application. The Sea Dumping Section will seek advice from across the Australian Government if a proposal of this type is submitted, as legislation other than the Sea Dumping Act may be relevant.

Great Barrier Reef Marine Park

Within the Great Barrier Reef Marine Park, applicants should refer to the Reef Authority's [Policy on Fish Aggregating Devices and Artificial Reefs \(2023\)](#), which provides more detail regarding artificial reef applications in the GBRMP.

Australian Marine Parks

Applicants who wish to place an artificial reef inside, or within 50 kilometres of, an Australian Marine Park (other than the GBRMP) must have early and detailed discussions with the department and the Director of National Parks before submitting an application. Australian Marine Parks are afforded higher levels of protection and artificial reefs are not allowed in Sanctuary Zones (IUCN Ia) and are only allowed in National Park Zones (IUCN II) for the protection, conservation or restoration of habitats and consistent with the IUCN zone definition. In addition to requiring a Sea Dumping permit, any artificial reef within an Australian Marine Park will require consultation with the Director of National Parks to ensure the activity is consistent with the EPBC Act, EPBC Regulations and the relevant marine park management plan.

World Heritage property or National Heritage place

Applicants wishing to place an artificial reef inside, or within 50 kilometres of, a World Heritage property or National Heritage place, must have early and detailed discussions with the department before they submit an application. These discussions will allow applicants to understand the heritage values that could be impacted if the proposal were to progress. World Heritage properties and National Heritage places are MNES and are protected under the EPBC Act. Any action that is likely to have a significant impact on the heritage values of these areas must be referred to the Australian Government for assessment and approval under the EPBC Act.

Applicants should also engage early with First Nations peoples and communities of World Heritage properties and National Heritage places that may be impacted by the placement of artificial reefs. The department's website provides interim guidance that may assist applicants (see [Information and resources](#)).

Applicants have the option to review the impact of a proposal on heritage values independently. In the case of a World Heritage Area, the property's Outstanding Universal Value is described by the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention. For National Heritage places, listed values are described on the Australian Heritage Database (see [Legislative framework](#)).

State or territory marine parks

For reefs associated with state or territory marine parks, the applicant must consult with the relevant state or territory government. The outcomes of this consultation must be discussed with the department at the pre-application meeting, with full details provided in the application.

3.3 Baseline site investigation

☒ Applicants must investigate the proposed site(s) to characterise the environment and establish a baseline from which the impacts of the placement can be measured. The results of the baseline investigation must be included with the permit application.

It is important that the site investigation provides a recent and robust baseline for the evaluation of future impacts and long-term monitoring and adaptive management (see [Long-term monitoring and adaptive management](#)). The required period for baseline data will depend on certain variables. Data that has been collected within the previous 5 years is typically considered appropriate for most variables such as sediment characteristics and bathymetry. For variables that do not tend to change substantially within a 5-year period, such as oceanographic and weather conditions, including data older than 5 years may be suitable.

Applicants are strongly encouraged to discuss the proposed methods to be used in the investigations with the department during the pre-application meeting and prior to undertaking the site investigation. This provides the opportunity for the required information to be agreed upon, and a satisfactory baseline established to inform ongoing monitoring, if a permit is granted.

Applicants must design a baseline site investigation that is suited to the characteristics of the site, and the scope, scale and risk of the project. For projects involving potential contaminants, baseline characteristics should be determined following the principles described in the NEPM 1999 (see [Information and resources](#)), for example, projects using repurposed infrastructure or in areas that may be contaminated such as near dredge spoil or other dumping sites, sewage outfalls, ports, oil and gas operations, or areas receiving runoff from infrastructure such as airports, fire stations or industry.

It is important to consider each aspect at an appropriate scale. For example, biological aspects need to be considered within and immediately surrounding the proposed placement site(s), whereas socio-economic aspects generally need to be considered at a regional scale. It is important to consider direct impacts (for example, loss of habitat on the sea floor under the proposed artificial reef structure) and facilitated or indirect impacts, which may include off-site impacts such as more boat traffic from local ramps to the reef, or pollution.

Physical and chemical aspects

The description of physical and chemical aspects needs to be commensurate with the scope, scale and risk associated with the proposed reef. For example, a larger reef composed of complex repurposed materials poses a greater risk and therefore requires analysis and monitoring of aspects that may not be required by a purpose-built artificial reef composed of material with no potential contaminants.

The following aspects must be considered for inclusion are listed below with the requirement for evaluation by the applicant and the required level of detail dependent on the nature of the project.

- water depth at LAT

- bathymetry
- oceanographic and weather conditions including frequency and severity of storms together with appropriate peak storm conditions for the design life of the proposed reef
- sediment characteristics including sediment type, particle size and any contaminants
- physical and chemical characteristics of the water column, including turbidity, pH, salinity, temperature, dissolved oxygen, chemical and biological oxygen demand, nutrients and any other contaminants
- underwater noise
- presence of thermocline/pycnocline and associated variations due to weather and season
- mean direction and velocity of surface and bottom drifts
- velocities of storm-wave-induced bottom currents
- general wind and wave characteristics
- sediment movement dynamics
- other nearby artificial structures and natural reefs
- marine debris (for example, fishing line or other anthropogenic inputs)
- coastal morphology (if near coast).

Common sample and data collection techniques include side-scan sonar imaging, multibeam sonar imaging, drop camera inspections, towed video transects, diver-based video transects, sediment grabs (Van Veen or other), sediment corers (piston or push corers), oceanographic waverider buoys, tidal gauges, national weather and climate records, and acoustic Doppler current profilers.

For details regarding sample collection and data analysis (for example, determining sample points, conducting sample analysis, data collection and analysis) applicants can refer to:

- Australian and New Zealand Water Quality Guidelines for fresh and marine water quality (AWQG)
- the Monitoring and Sampling Manual, Environmental Protection (Water) Policy 2009 (Queensland Monitoring and Sampling Manual) or similar state, territory or local guidance
- where relevant, the department's per- and poly-fluoroalkyl substances (PFAS) National Environmental Management Plan (PFAS NEMP) (see [Information and resources](#)).

Oceanographic and weather conditions

Details of the prevailing oceanographic and weather conditions must be included in the permit application. Applicants must outline how the conditions will affect the reef placement, the long-term viability of the artificial reef, and the potential for water quality impacts associated with wave action, sediment disturbance and turbidity.

Aspects that must be considered for inclusion are listed below with the requirement for evaluation by the applicant and the required level of detail dependent on the location and nature of the project.

- tides (tidal period and orientation of tidal ellipses)
- currents
- winds

- swell and wave climate
- seabed surge
- frequency and severity of storms and cyclones for the design life in terms of the average recurrence interval for the proposed design life.

This information is important in assessing conditions where the reef material may move or be damaged, and the likelihood this may occur. Applicants must also consider these factors when deciding the orientation of the artificial reef and the need for additional weighting. Marking prevailing oceanic and tidal currents on a map with the proposed reef is recommended.

Bathymetry and seabed characteristics

A description of the seabed at the intended reef site and the nearby area must be included in the permit application. The following aspects must be considered for inclusion with the requirement for evaluation by the applicant and the required level of detail dependent on the location and nature of the project.

- bathymetry including a description of sand ripples and any areas of exposed hard substrate
- a description of the sediment including sediment type, particle size and any potential contaminants (for example, heavy metals, hydrocarbons, nutrients)
- a description of the sediment layers to inform how the reef will bed-in and if it could sink into or be buried by sediment, which is particularly important if the reef is made of heavy materials such as concrete or is placed on soft sediments or areas likely to experience heavy scour.

Hydroacoustic surveys can be undertaken across the study area to determine bathymetry and seabed characteristics, and inform a coastal processes investigation. Geotechnical assessments must be undertaken where hydroacoustic surveys are determined by the department to be inconclusive, or where required by the project (for example, higher risk material, heavy structures to be placed, soft sediments, shallow water, marginal site suitability), such as penetration tests to determine the thickness of sediment layers.

Sediment and water quality

The description of sediment and the water quality must be commensurate with the scope, scale and risk associated with the proposed reef. The description could be provided by targeted field sampling and/or existing desktop data, depending on the nature of the proposed reef and availability of existing data.

For example, the characteristics of the water column around the proposed site can be important to determining the likelihood of the reef being able to meet its objectives:

- at locations near contamination sources, for example, sewage outfalls, near river mouths or other areas receiving runoff, or near ports or oil and gas operations
- for reefs with biological aims, for example, restoration
- for reefs used for in-water activities, for example, diving, snorkelling or surfing
- for reefs used for increasing or concentrating marine animals for human consumption, for example, recreational or commercial fishing.

It can also be important to have an understanding of the physical and chemical composition of the sediments, particularly levels of contamination. Sediments, particularly fine sediments with high levels of organic material, can act as sinks for contaminants such as metals. These contaminants can be re-released into the water column if the sediments are disturbed, for

example, during the placement of an artificial reef. Details of previous dumping activities or other potential sources of contamination that may affect the sediment in the proposed area should also be included in the application to inform the site history and baseline characterisation.

Where required, sediment and water quality should be determined in accordance with the AWQG for fresh and marine water quality (including comparison to trigger values), and where relevant the PFAS NEMP (see [Information and resources](#)). The evaluation should include a list of any known or expected chemical contaminants in the sediment and water column, including new chemicals of concern (for example, PFAS, mercury) and other better understood chemicals.

Where required, the applicant must involve professionals with the appropriate expertise to conduct the evaluation work, with sediment and water samples analysed at a nationally accredited laboratory.

Biological aspects

It is important to understand the existing biology and ecology of the proposed site. The following aspects must be considered with the requirement for evaluation and the required level of detail dependent on the location and nature of the project.

- listed threatened species and ecosystems
- migratory species and routes
- details of nearby natural reefs, including the distance from the proposed site to the reefs
- benthic communities (marine plants and animals) and habitats, noting that bare substrates such as sand and mud also provide habitat for infauna such as worms and bivalves, and epifauna such as echinoderms and holothurians
- fish assemblages
- introduced and pest marine species
- larval availability and settlement properties
- pelagic and local species identification
- current fishing pressures
- other local and widespread ecological interactions (for example, predation of protected species)
- any other relevant biological considerations specific to the project.

Common field data collection tools include environmental DNA (eDNA), baited remote underwater video (BRUV), drop cameras, towed video transects, diver-based video transects, diver counts, recreational or commercial fishery catch data, settlement plates or mats, sediment grabs, physical sample collection, and underwater microphones.

Marine community composition

Applicants must describe the marine community composition at the proposed site before the reef is placed, and consider any expected changes that may occur after placement.

Applicants should consider marine plants (for example, seagrass and macroalgae) and sessile benthic invertebrates (for example, coral), together with mobile species such as invertebrates, fish and large megafauna that may use the site as habitat, feeding grounds or for any other reason including marine turtles, sea snakes, dugongs, dolphins, whales and sharks. The

requirement for evaluation and the required level of detail is dependent on the location and nature of the project.

The ecological interactions between the species before and after placement should be considered, particularly with regards to protected species and communities.

Tidal, diurnal, monthly, seasonal and multiyear cycles must be considered when identifying the species that may be present at the proposed site due to substantial changes in community composition in association with these aspects.

Where relevant, the different life stages of the species should also be considered. For example, when a reef is proposed to be placed in association with seagrass meadows, which provide critical nursery grounds for bottom-dwelling fishes and crustaceans.

If the applicant intends to place or release marine plants (for example, macroalgae cultivation) or animals (for example, oyster or coral reef restoration) onto the reef, this needs to be included in the application and discussed with the relevant state or territory departments (for example, fisheries).

Underwater noise is a recognised form of pollution that may cause harm to marine species, including protected species such as marine turtles, dugongs and whales. Loud or constant noise may have both lethal and non-lethal impacts on marine populations. If the proposed artificial reef is in a location frequented by protected species and expected to increase or change vessel use in the area, a baseline profile of underwater noise may be required. This will allow any significant noise changes after placement to be considered against a baseline level.

Artificial reefs must not negatively impact migratory marine animals, either during placement of the reef or in the longer term. The location of the reef must be considered with regards to known migratory routes, together with key breeding, feeding and refuge (rest) locations.

Pest species

Pest species can also use newly placed hard substrate in the marine environment, leading to the growth and spread of species that may cause harm to the wider environment. Where possible, applicants should list the known and likely pest species in their proposed area. The [Long-term management plan](#) section also requires applicants to consider mitigation measures to be taken if pest species are found to be colonising the reef in later monitoring.

Larval recruitment

The possibility, level and likely sequence of larval recruitment, both for desired species and pest species, may need to be considered depending on the nature of the project (for example, reefs designed for coral or oyster restoration). Open hard substrate is often limited in marine environments, and settlement patterns are usually designated by the planktonic forms of species in the area. Depending on the nature of the project, the applicant may need to provide some indication of the predicted settlement patterns of species on the newly placed reef, and how these patterns will develop over the reef's lifetime. This information can be desktop (for example, literature review) or field based (for example, settlement mats or plates).

Socio-economic and cultural aspects

Applicants must describe the socio-economic and cultural features of the local area. The proximity of the proposed reef site to important socio-economic and cultural features should be included in the application and may be detailed in the text, tabulated or marked on a map(s). The following aspects must be considered with the requirement for evaluation and the required level of detail dependent on the location and nature of the project.

- local cities and towns
- ports and commercial shipping (including proximity to port limits and security zones, commercial vessel anchorage and shipping channels)
- access points and amenities (for example, boat ramps and marinas)
- commercial and recreational fishing areas
- aquaculture facilities
- tourism areas and features
- areas used for recreational boating and other water sports
- navigation and safety features
- offshore oil and gas infrastructure
- renewable energy infrastructure
- subsea cables and pipelines
- defence or military exclusion zones
- historical, cultural, heritage-listed and scientific sites including underwater cultural heritage
- native title areas
- other relevant information.

Reporting

A baseline investigation report, detailing the methodology and findings, must be provided as part of the permit application. Video records and still images of the site can also be submitted for review with the application. These should be clearly identified so that viewers can accurately determine where a particular image was captured.

3.4 Material selection and reef design

Appropriate material selection and design can greatly enhance artificial reef properties such as biological productivity, species abundance and diversity, and value and amenity to human users.

Material selection

The main concerns when selecting material to be used as an artificial reef must be the immediate and ongoing protection of the marine environment from physical impact (for example, debris) and contaminating substances, as well as enhancement of the local ecosystem. Applicants will need to consider the properties and maintenance of materials in the long-term management of the artificial reef.

Material proposed for use in an artificial reef must be inert, stable, durable and structurally sound. Materials that are likely to be considered appropriate include:

- steel
- concrete
- ceramic
- natural rock (note that some rocks may contain heavy metals that could be released into the sea through leaching; any natural rocks proposed for artificial reef development must be identified as chemically inert in the marine environment)

- purpose-built materials, which can be a combination of the above materials.

Materials not suitable for use as artificial reefs include fibreglass vessels, building rubble, car bodies, tyres, whitegoods and plastics including concrete reinforced with plastic fibres (see [Concrete reinforced with plastic fibres](#)).

☒ The applicant must provide a thorough description and inventory of the material proposed for their artificial reef with their permit application. A description of both the internal and external structures of the material, along with photographs and/or video footage, should be provided. If the material proposed is a man-made structure, drawings or structural diagrams must be included.

☒ Additional information must include details of the composition of the material, its age, size (tonnage and linear dimensions) and current condition, accompanied by supporting photographs.

☒ Applicants are to provide details of the current location of the material and where it will be available for inspection.

☒ Applicants must provide details of the owner of the material proposed as the artificial reef. If the applicants do not own the material, then documentation that proves the applicant has permission to place the material as a reef must be provided. If the material is a vessel, then the vessel's name and/or details of registration (including country of registration) must also be provided. Applicants must provide a copy of the deed of gift, if applicable.



The history and use of repurposed material must be detailed including the chemical components of the materials, such as paints or coatings. Repurposing oil and gas infrastructure is becoming a more common type of artificial reef application received by the department. This infrastructure can hold significant amounts of hazardous chemicals in the various parts, units and compartments. The following sections and the UNEP guidelines provide detail on the materials that will need to be removed from these structures before they will be considered for placement as artificial reefs. The UNEP guidelines should be closely consulted before an application is submitted.

Section 5.3 of this document (currently under development) will provide more detailed requirements for repurposing infrastructure to create an artificial reef.

Alternatives

Applicants must carefully consider whether the material proposed is suitable for an artificial reef. Creating an artificial reef must not be considered a convenient way of disposing of material at sea. For repurposed oil and gas infrastructure, the UNEP guidelines should be consulted. Further details will be provided in section 5.3 once it is finalised by the department.

Harm minimisation

Artificial reefs can pose risks to the environment through the presence of harmful materials or marine pests and disease.

Identifying harmful materials

Any material that could be released into the marine environment and lead to environmental contamination, or could break away from the reef, or could otherwise represent an ingestion or entanglement hazard to marine animals, must be removed or otherwise managed before the reef placement.

Materials and items likely to pose an environmental contamination or marine debris risk include:

- chemicals contained within or on the material to be placed on the seabed
- plastics and other synthetic materials
- wood
- rocks containing high levels of heavy metals
- glass
- any small or lightweight materials, such as tyres or construction rubble.

If the material proposed for placement as an artificial reef is a man-made structure that initially had another purpose, such as a vessel or oil and gas infrastructure, materials that need to be considered for removal include:

- fuels, oils, paints, heavy metals and low specific activity scale (radioactive deposit inside pipes and other production equipment), including contaminants in process equipment, engines, generators, pipe work, pumps, tanks, oil sumps, hydraulic systems, tubing, drill string
- equipment containing liquid polychlorinated biphenyls (PCBs)
- foams and other buoyant materials (including plastics)
- fire retardant chemicals

- stocks of chemicals used in oil and gas production (for example, corrosion inhibitors, biocides, defoamers, demulsifiers, scale inhibitors and antifreeze)
- lubricants and coolants in platform equipment
- electrical equipment (for example, transformers, batteries, accumulators and cables/wiring)
- coolers, scrubbers, separators and heat exchangers
- tanks for drilling consumables, including bulk storage of muds
- storage facilities for production and other chemicals, including cells in concrete gravity bases
- sacrificial anodes (which can increase metal concentrations in marine environments, for example, zinc)
- fire-extinguishing/firefighting equipment
- gas dehydrators and gas-sweetening units
- helicopter fuelling systems, piping, valves and fittings, and compressors
- insulation systems
- plastics
- any contaminants specific to steels and alloys used in petroleum facilities.

Applicants need to demonstrate there will be no impact where materials are proposed to be left in place, based on the AWQG (including comparison to trigger values where available).

Concrete reinforced with plastic fibres

In recent years there has been a shift towards using polypropylene (a type of plastic) fibres as a concrete reinforcement material in artificial reef modules. The department is concerned about the potential impact of plastic fibres on the marine environment and the minister (or delegate) is unlikely to grant a permit for artificial reefs that include plastic fibres in their designs.

Artificial reefs should use traditional steel reinforcement or other natural fibres to reinforce concrete. Applicants are welcome to suggest suitable alternatives within their applications.

These recommendations are based on a review of scientific literature and expert opinion by the National Environmental Science Program, which found that:

- All plastics and their associated additives are potential pollutants. Although there was no consensus on whether the release of plastic into the environment from plastic-reinforced concrete artificial reefs was likely to be ecologically significant, the precautionary principle suggests plastic-reinforcing must be avoided.
- Depending on the structural stability of the concrete, over long timeframes (likely longer than 30-50 years) there will be a release of contained plastics into the environment. The sediment is the most likely receptor for the plastics unless they are positively buoyant. Evidence for plastic additive leaching in concrete is scarce as few studies have addressed this question. However, the lack of laboratory-based studies, or long-term monitoring, does not definitively rule out potential harmful impacts such as leaching of additives or release of plastic fibres into the marine environment.
- Where an artificial reef is meeting its objective and leaving the reef in place at the end of the permit life is deemed the best environmental outcome by the department, the reef needs to remain environmentally safe throughout the lifetime and eventual degradation. Since it is likely that any plastic materials and toxic chemicals contained within plastic-reinforced marine concrete will eventually enter the marine environment, either directly or through

reef dwelling organisms, artificial reefs made of such material constitute an environmental hazard.

This policy position will not affect the operation of existing artificial reefs permitted under the Sea Dumping Act. However, where an applicant applies for a change to an existing permitted reef, this policy will be considered.

Marine pest, disease and quarantine issues

☒ A list of potential marine pest, disease and quarantine risks must be included as part of the permit application. Details must include the identification and evaluation of the risks (including desktop investigations and surveys of the fouling species on nearby structures or hard substrate where relevant) and information on how the risks have been managed.

For repurposed material, applicants must identify, assess and manage marine pest and quarantine risks (especially marine pests on vessels and platforms) intended for placement as an artificial reef. This should be done in consultation with the biosecurity section of the state or territory government. All material of potential concern must be stored, transported and disposed of in accordance with current quarantine regulations. Marine pest risks can arise from biofouling, underwater fittings, internal seawater systems, seawater held in tanks for ballast, trim or weight compensation.

Artificial reefs used for scuba diving and fishing will increase boat traffic and may attract commercial operators. Applicants must include an evaluation of the increased risk of marine pests due to increased maritime activity.

Disease can be introduced through biological material, such as recycled bivalve shells used in artificial reefs, which have viable microorganisms within remnant oyster tissue (for example, Pacific Oyster Mortality Syndrome, QX disease).

If the artificial reef site is considered a potential site for colonisation by introduced species, a surveillance monitoring program, focusing specifically on the species most likely to be introduced, may be required. This information must be presented as part of the application documents.

Evaluation of chemical contamination

If the material proposed for placement as an artificial reef is a man-made structure that initially had another purpose, the applicant must evaluate and manage any possible impact by conducting contaminant assessment work commensurate with the scope, scale and risk of the project. The applicant must ensure that a suitably qualified person, with appropriate professional expertise conducts the evaluation due to the complex nature of the work.

The following aspects must be considered with the requirement for evaluation and the required level of detail dependent on the location and nature of the project:

- Identify all the substances present on or in the proposed reef infrastructure including:
 - names, chemical formula, and Chemical Abstracts Service Registry Numbers (CAS RNs; unique identifier that provides an unambiguous means to distinguish chemical substances or molecular structures when there are many possible systematic, generic, proprietary or otherwise trivial names)
 - respective total masses and concentrations
 - physical and chemical characteristics
 - Australian Safety Data Sheets
 - current national and international regulatory controls for each substance
 - other relevant information.

- Assess the likelihood of negative impacts from contaminants informed by the above and develop monitoring and management frameworks, including:
 - Describe the fate and behaviour of contaminants within the receiving marine environment. Partitioning and dispersion modelling should be used to predict contaminants' leaching behaviour, concentrations, movement, and distribution pattern in and near the selected site.
 - Summarise the data that describe the possible effects on the marine plants, animals and ecosystems, considering the short and long-term effects.
 - Integrate the exposure and effects information to assess the likelihood of negative impacts and magnitude using the above exposure scenarios. This evaluation should consider both the acute and chronic impacts for direct and indirect exposure to the nearby and adjacent ecosystem (considering various life stages of the species) and humans. This evaluation should also describe the data/model uncertainties and sensitivities associated with the prediction.
 - Describe the framework to monitor, intervene, and remediate possible and detected impacts, including mitigation and contingency planning to minimize and manage impacts.
 - Use the collected data to inform decision-making and evaluations.

Activities such as cleaning-up, collection and disposal of hazardous waste and removal, treatment or disposal of waste or material contaminated with hazardous chemicals also needs to be considered. The applicant must manage the possible risks from these scenarios by consulting technical experts, implementing state and territory requirements, and consulting national and international guidance, protocols and conventions (for example, Basel, Minamata and Stockholm conventions, Safe Work Australia (asbestos) and the PFAS NEMP (see [Information and resources](#)).

Harmful materials clean-up and reporting

☒ For repurposed infrastructure, material preparation and clean-up must occur to the greatest practical extent. This can be a time-intensive exercise and should be factored into the project planning and budget. When considering clean-up requirements and procedures, applicants are advised to consider environmental impacts, and both technical and economic feasibility.

☒ For repurposed infrastructure, details of all aspects of the preparation and management of harmful materials must be outlined in a clean-up plan and included as part of the permit application, including:

- A list of contaminants (as outlined in the [Evaluation of chemical contamination](#)) and wastes that will be removed from the material before placement, along with details of how these materials will be disposed.
- Details of any contaminants and wastes that are intended to remain on or within the material at the time of reef placement. A rationale for why these materials will not be removed from the proposed reef must be included. The applicant must also be able to demonstrate that these materials will not pose an environmental or health risk when left in place. Any measures to prevent these materials posing a pollution threat to the marine environment (in the short and long-term) should be discussed. The applicant should involve professionals with the appropriate expertise to assess possible impacts of contaminants proposed to remain in or on the materials, with references to the AWQG for fresh and marine water quality (see [Information and resources](#)).
- A description of the process used to clean tanks, pipes and other structures including corresponding removal efficiencies. Applicants should consider how to conduct cleaning in

an environmentally sound way, including containing and removing wastewater created in the cleaning process.

- Details of the chemical characterisation of areas of the proposed reef material after cleaning (for example, tanks, hulls) to confirm that the material has been cleaned to the maximum practical extent, including chemical residual (identity and corresponding concentrations) in all parts, units and compartments.

The exact contents of the clean-up activity plan will depend on the stage of preparation and cleanliness of the material when the permit application is submitted to the department (see [Permit process](#)). If preparations are in the preliminary stages, applicants should outline the steps they will take to adequately prepare the material. Alternatively, if material preparations and clean-up are already underway when the permit application is submitted, applicants include details of both the preparations already completed and the remaining clean-up planned to be undertaken.

Applicants are urged to discuss all aspects of material clean-up with the department (see [Consultation](#)). Applicants should be prepared to provide a report verifying the clean-up, as a condition of a granted permit. An inspection by department staff or appointed personnel may be required.

Durability and stability

Durability and stability are key considerations when assessing the suitability of material for an artificial reef, and during preparation of the material. Materials must be chosen and prepared to:

- minimise the risk of their breaking up during reef placement and in the longer term (durability)
- ensure that the reef can be placed in the correct location and remain in this position after sinking (stability).

☒ Applicants are advised to consult a marine engineer or naval architect for specialist advice about structural integrity, watertight integrity (for preparation, transfer and placement phases) and vessel stability. State or territory marine transport agencies may also need to be consulted about vessel survey requirements.

Durability

Durability is increased if the proposed reef material is in sound condition before placement. Indicators of material durability include:

- type and thickness of structural materials
- extent and degree of existing corrosion
- extent and quality of paint coatings and other corrosion-control features
- degree to which structural integrity of the material is compromised by the need to adequately prepare the material (for example, to remove hazardous materials or provide diver access).

Minimising damage to the key structural elements of the reef material during the preparation phase will also promote durability of the reef.

☒ Applicants must include details of these factors in their permit application. An evaluation of the likelihood of material break-up during placement and in the longer term must also be included.

Stability

Reef materials must be stable enough to maintain the structure and function of the reef, both during the placement process and in the longer term.

The reef material must be able to withstand the waves, tidal currents and worst weather conditions likely at the proposed site. Reef materials that can be tipped over, rolled or fractured present a hazard to the surrounding environment and marine users.

☒ Applicants must provide details of measures to be implemented to maximise the long-term stability of the proposed artificial reef.

Reef materials near the surface of the water and also in association with the seabed can be affected by waves. Structures must be subject to hydrodynamic assessment for sliding and overturning. Industry standard hydrodynamic coefficients should be used where specific test data is not available.

Reef design

Artificial reefs must be designed and constructed so that the overall design of the reef, as well as individual reef structures, allow the best chance of achieving the intended purpose of the reef. This will be considered in the department's assessment of the reef.

As part of the application, applicants need to clearly state how the reef design was developed and how it will achieve its intended aims.

☒ Applicants must include a report that models the shape of each part of the artificial reef and how this will respond to the known and predicted currents and surge associated with waves and wind, both in calm conditions and in a 1-in-100-year storm. This report will tie in with the stability section of the application and must consider both sliding and toppling stability.

Applicants proposing artificial reefs intended to provide habitat need to consider reef configuration, reef profile, total surface area and interstitial spaces.

Human safety

Human safety, particularly for divers, is always a major concern in the design and construction of artificial reefs. Artificial reefs that optimise habitat (for example, for fishing) while compromising human safety are unlikely to be permitted.

☒ Details of material preparation or modifications undertaken to provide appropriate access for divers must be included in the permit application. A diagram should be provided showing the spatial features and the layout of the reef in relation to a diver (where relevant), for ease of understanding and assessment.

If the artificial reef is intended for recreational use by divers, reef materials must be designed and prepared to permit appropriate access and minimise risks to diver safety (see also [Preparing for diver access](#)). Such measures will also help to mitigate potential hazards for marine animals in and around the proposed reef. If diving is proposed to be allowed or is possible on the proposed reef, the stability and longevity of the reef will be considered in detail as part of the application.

When assessing potential diver hazards and preparing to limit these risks, the applicant must consider factors such as:

- diver disorientation and inexperience
- limited in-water visibility
- limited peripheral vision
- restrictions on agility imposed by diving equipment
- additional snag and entanglement hazards presented by the bulkiness of diving equipment.

It is likely that a detailed hydrodynamics report, produced by a qualified marine and coastal engineer, will be required when a reef is intended as a diving attraction or is likely to be used as a dive site due to its depth and location.



3.5 Reef placement

☑ Applicants must develop a Placement Plan for submission with the permit application as a separate document. Applicants must detail and justify the intended method of preparation (for example, cutting in situ and cleaning of repurposed infrastructure) and placement in the application.

☑ The Placement Plan must be provided in the department's Placement Plan Template (see [Appendix 1](#)), with an overview of the plan provided in the permit application form for an artificial reef.

The Placement Plan must include all preparation and placement activities, e.g., cutting of oil and gas infrastructure, crane and lift plan, potential vessels used, diver involvement, and human and navigational safety. Any proposed activities must be considered in an ecological context with a risk assessment conducted. Applicants will need to determine the most appropriate method of material preparation and placement for their proposed artificial reef.

☑ The permit application and Placement Plan must describe the placement to the best of the applicant's knowledge at the time of the application.

Where details are unknown (for example, vessel or placement date), applicants can provide these details by way of an updated Placement Plan at least 90 days prior to the placement. In this instance, applicants are encouraged to provide as much information as possible regarding suitable criteria as specific details in an application form such as vessel name/registration cannot be changed post-application (however a Placement Plan can be updated).

The Placement Plan includes all details up to and including the placement of the artificial reef, including the post-placement inspection and report, with details beyond this point included in the LTMP (see [Long-term management plan](#)).

The application form and the Placement Plan must include:

- details regarding all preparation activities
- method of placement
- timing of placement
- transport to site
- exclusion zones
- contingency measures
- persons in charge
- notifications.

AMSA should be consulted on the risk to navigational safety associated with the placement of any artificial reef, by emailing NavSafety@amsa.gov.au. AMSA recommends that the navigational safety measures put in place for artificial reef placement and operation include but are not limited to:

- Communicating the location and description of planned activities to the Australian Hydrographic Office and nearby maritime authorities well in advance.
- Liaising with AMSA's Joint Rescue Coordination Centre well in advance of the operations so that the Joint Rescue Coordination Centre is able to consider issuing appropriate radio navigational warnings to shipping (for example, AUSCOAST Warning).

- Marking and lighting any on water objects or buoys in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (previously known as International Association of Lighthouse Authorities), requirements and ensuring these objects/buoys are sufficiently radar conspicuous and installed with Automatic Identification System aids to navigation with consideration of deployment of 'virtual aids to navigation'.

Timing of placement

☒ Applicants must propose date(s) and time(s) of proposed placement(s), including why this date(s) was chosen. A placement window can be provided where the exact date is not known, for example suitable weather window in June that satisfies contractors' safe operation conditions. Details must be updated to the department a minimum of 6 weeks prior to placement.

The date(s) of reef placement must be chosen so that weather and sea conditions are most likely to be suitable for the safe transfer of the material to the proposed reef site and its subsequent placement. This date(s) should also be chosen to minimise the risk of injury or disturbance to sensitive marine species. For example, the applicant may need to consider events such as whale migration, turtle nesting and coral spawning times. Applicants should also consider conflict with the activities of other marine users in the region (for example, dredging operations, commercial fishing and sailing regattas).

Placement should occur during daylight and when visibility is good enough to establish and maintain the exclusion zones set in the permit (see [Exclusion zones](#)). Placement should start sufficiently early in the day to ensure enough daylight to complete placement, including implementation of any contingency measures, monitoring and responding to any pollution incidents arising from the placement. Where placement needs to take place outside of daylight hours, nighttime operations will be considered where the correct controls are in place (for example, due to weather patterns and calm oceanic conditions in the early morning before dawn, and using vessels that are designed for 24 hour operations with experienced crew).

From a permit perspective, the duration that the reef will be in place commences when the placement is complete. For example, where placement is expected to occur within 2 years of being granted a permit (that is, a 2-year placement period) and the reef is to be in place for 30 years, the 30-year LTMP period would commence when the post-placement inspection and report is complete. The onus is on the applicant to request a specific placement period and LTMP duration, with the permit duration to be the combined duration, that is, a reef with a 2-year placement period and a 30-year LTMP would require a 32-year permit.

Method of placement

The method of placement of artificial reef materials is determined by the:

- intended purpose of the artificial reef
- size, type and construction of the material
- site characteristics
- orientation of the material after placement
- safety and environmental factors.

The most common option for the placement of artificial reef materials is to use a winch or crane from a barge, lighter, boat or other platform directly onto the placement site. If the reef is using repurposed infrastructure (such as oil and gas infrastructure), all preparation including cutting, craning and dismantling procedure must be detailed in the application. The application must

also include details on what is remaining at the infrastructure site, both above and below the mudline.

Where details are unknown, applicants are encouraged to provide as much information as possible. For example, where a vessel has not been confirmed, provide details of any criteria that will be considered to ensure that the vessel is fit for purpose, such as the size of the vessel and inclusion of a crane with suitable lifting capacity.

Specific placement methods for vessels can be found in [Vessels and aircraft](#).

Transport to site

☒ Applicants must provide details in the permit application of how the material will be transported to the placement site including loading procedures, details of the marine supply base, transport methods, the route to be taken, number and timing of transport runs, the method of locating the correct location, mooring at the placement site, exclusion zones, and required weather windows and limiting sea state criteria for the tow (and the placement) including contingency.

Applicants will need to consider the risk that a vessel or other floating structure may flounder in an unintended manner during the tow or at the placement site. Measures to prevent this should be considered and included in the application.

Applicants must refer to national and international navigation regulations and guidance for towing, including the correct tow symbols and lights on the object being towed and adequately sized and manned tow vessel for the operation. The relevant section of the Placement Plan should be reviewed by a naval architect or suitably qualified engineer.

☒ Applicants are expected to plan for risks associated with transport to site, including taking account of sea and weather conditions at the intended time of transfer and placement.

Exclusion zones

☒ Exclusion zones (also referred to as safety zones) need to be established around the proposed reef site for the duration of the placement. Applicants must include details of exclusion zones including the size and location of exclusion zones (maps are useful), how they will be enforced, and how the public and other relevant parties will be notified of their existence.

The size of the exclusion zones will vary depending on the size and type of material and the method of placement. Explosive scuttling activities will typically need the largest exclusion zones.

Two categories of exclusion zones need to be established:

- Public safety exclusion zones are intended to limit the risk of injury to members of the public, whether they are on shore, in vessels or in aircraft. Applicants are expected to determine a suitably sized exclusion zone in consultation with relevant authorities. In the case of explosive scuttling, an airspace exclusion zone may also be required.
- Environmental exclusion zones are intended to reduce the risk and significance of any direct injury or disturbance (including acoustic disturbance) to marine animals. These exclusion zones principally concern whales and dolphins, which have particularly sensitive hearing; however, turtles, seals and dugongs may also need to be considered, depending on the location. For non-explosive placement, expect this exclusion zone to have a radius of 300 metres; for explosive placement, expect this zone to have a radius of about 2 nautical miles (3.6 kilometres).

Applicants must make suitable provisions for spotting marine animals within the exclusion zone. Depending on the risk posed by the project and placement activity, operations may need to be suspended until the marine animals have moved out of the exclusion zone (for example, using explosives or lifts of large infrastructure with high safety risk). The generally accepted timeframe is 30 minutes from the exit of the marine animals from the exclusion zone to the restart of operations. Applicants are urged to discuss the details of such provisions with the department. The presence of marine animals must be monitored by suitably qualified persons with binoculars, either from operating vessels or spotter aircraft.

Placement activities will need to be suspended or aborted if the set exclusion zones cannot be effectively established, monitored or maintained.

When identifying exclusion zones there may be a need to notify AMSA's Joint Rescue Coordination Centre and the Australian Hydrographic Office so that a Notice to Mariners can be issued. Australian Notices to Mariners are the authority for correcting paper navigational charts and paper nautical publications published by the Australian Hydrographic Office. Local authorities may circulate the Notice to Mariners published by the Australian Hydrographic Service.

Notifications

☒ Permit holders must notify relevant authorities about the intended reef placement activity so that public safety measures can be implemented. Notification should include details of the proposed placement activity, time and location.

In all cases, the Australian Hydrographic Service must be informed so that it may publish a Notice to Mariners about the intended placement and, if relevant, the tow to the placement site. Applicants must also notify the organisation responsible for maritime safety in the local area (for example, state or territory authorities, or the nearest port) and AMSA's Joint Rescue Coordination Centre.

Applicants must also inform Airservices Australia of the intended activity if explosive scuttling or the use of pyrotechnics is planned, so that Notices to Airmen may be issued.

☒ Details of these notices, or the intention to provide such notices, must be included in the application and Placement Plan.

Contingency measures

Contingency plans must be developed to manage unplanned events, including events such as:

- foundering or flooding of the material, either during transfer to the placement site or once moored at the site before placement (see [Transport to site](#))
- inability to reach the specified site
- incomplete sinking or break-up of the reef material during sinking
- undetonated explosives or pyrotechnics
- reef components are not in the correct location or orientation
- if a placed vessel or other artificial reef becomes unsafe for diving and must be closed permanently or until made safe
- pollution (for example, release of oil or floating debris), particularly during transfer to the site and immediately after placement

- other potential environmental impacts such as physical damage to coral or seagrass or interactions with marine animals.

☒ Details of the contingency plans must be included in the application and Placement Plan.

Persons in charge

Personnel involved in transferring and placing material, setting explosives, and establishing and maintaining exclusion zones must be appropriately qualified and experienced.

☒ Applicants must provide details of the personnel engaged to perform these tasks in the application and the Placement Plan. In particular, applicants must provide the name and qualifications of the person who will be in charge of the reef placement.

Where the persons in charge is not known at the time of application, a list of minimum qualifications and experience that will be held by the persons can be provided. Applicants must then provide details of the persons in charge by way of an updated Placement Plan at least 90 days prior to the placement.

Post-placement inspection and report

☒ Permit holders will need to ensure that the artificial reef material is placed at the approved location, at the time and in the manner specified in the sea dumping permit.

☒ Immediately after reef placement, the site and reef material must be inspected by suitably qualified members of the placement team to ensure that it is safe for divers and the public before access is permitted. Details of the inspection must be sent to the department in a post-placement inspection report.

The inspection must verify placement as designed, by:

- ensuring that the reef material has settled on the seabed, and that the placement occurred at the specified location and orientation
- ensuring that the reef is safe for all users including safe navigation and recreation, particularly for divers (if applicable, noting that if it is not, any necessary modifications or repair work must be done)
- identifying the presence, or confirming the absence, of any visible pollution or debris, such as oil slicks or floating material
- confirming the correct placement and operation of any stipulated marker(s) (for example, buoys and lights)
- confirming that the highest point of the vessel or other material has the minimum specified overwater clearance, as specified in the permit; if this was not achieved, measures must be taken by the permit holder to achieve the required clearance (for example, removal of a section of the structure).

☒ After placement of the reef, the permit holder must submit a report to the department, including:

- the date and time of placement
- the GPS coordinates of the reef (for each module where relevant) including accuracy in $\pm$ metres
- the depth of water over the highest point of the reef, as measured at LAT, and the date and time of this observation

- the position and description of the cardinal mark and any other visual indicators (for example, buoys and lights) marking the reef if these are required
- confirmation that the Australian Hydrographic Service, and Airservices Australia if explosives or pyrotechnics were used, were informed of the proposed placement in a timely manner prior to the placement, so that notice to mariners and/or airmen was issued
- confirmation that any designated safety exclusion zone was clear of people, vessels and aircraft (as applicable) at the time of placement
- confirmation that any designated environment exclusion zone was clear of marine animals, as specified in the permit, at the time of placement
- the absence or presence of any visible pollution or debris following placement, such as oil slicks or floating material, and any subsequent clean-up actions
- the names and relevant training and experience of the person(s) who undertook marine animal spotting during placement, the marine animals observed within the monitoring zone including, for each sighting, the date, time, species (or nearest identification), location (GPS coordinates) and approximate distance of the marine animals from the vessel, and the action taken to comply with exclusion zones
- all findings of the post-placement inspection
- confirmation that formal notification has been provided to the Australian Hydrographic Service, and any relevant state or territory marine safety or marine transport agency, including location and depth of the artificial reef.

The permit holder must ensure that a suitably qualified person undertakes any surveys (for example, side-scan sonar) used to confirm the placement of the reef, and that the surveys are undertaken with a very high level of accuracy. Video footage may also be useful.

The department may use the details provided in the post-placement report as a point of reference for any subsequent audit of the sea dumping permit and its implementation.

3.6 Impact assessment

☒ The applicant must conduct a comprehensive evaluation of the potential impacts of the artificial reef on the marine environment, both at the proposed site and surrounding areas, and socio-economically and culturally.

The impact assessment must consider how the reef will likely affect and/or change all aspects evaluated in the baseline environmental investigation, including directly under the footprint of the reef, the area near the reef and further afield.

Placement

The applicant must consider the potential impacts associated with the placement process, including preparation and cleaning where infrastructure is being repurposed.

Material selection and potential contamination

The impact assessment must consider the materials being used. For repurposed infrastructure, the impact assessment needs to include a chemical contamination evaluation commensurate with the scope, scale and risk associated with the proposed reef (see [Evaluation of chemical contamination](#) and [Physical and chemical aspects](#)).

Long-term impacts and decommissioning of the reef

☑ In the risk assessment, the applicant must also provide details of the predicted fate of the material after placement. This includes a description of the expected longer-term condition of the artificial reef and how this will affect the factors listed above.

The impact of removal of the reef, either during the life of the permit (due to the reef not fulfilling its aims) or at the end of the permit life, must be considered (see [Decommissioning of the artificial reef](#)).

Likelihood, consequence and mitigation of impacts

The impact assessment must include details of all foreseeable impacts of the reef and its associated uses. The assessment must include the likelihood that these impacts will occur, an estimate of their consequence (severity), the size and timescale of the potential impact footprint, and proposed mitigation measures (noting monitoring is not considered a mitigation measure).

The assessment must be commensurate with the scope, scale and risk of the project informed by the site selection (see [Site selection](#)) and baseline (see [Baseline site investigation](#)) evaluations. It is important that the baseline site investigation provides a recent and robust baseline for the evaluation of impacts. The following aspects must be considered for inclusion, along with any other project-specific aspects:

- changes to sediment movement patterns
- changes to seabed topography and geomorphology
- sediment contamination from leaching of materials
- changes to water quality
- changes to water flow currents and wave action
- changes to coastal processes (if appropriate)
- impacts to marine plants and animals directly under the footprint of the proposed reef
- any localised smothering of marine plants and animals due to changed sediment movement patterns
- destruction or degradation of, or damage to, existing habitat, either by direct physical contact, shading or changes to sediment transport
- the expected colonisation process and how this will affect the local species
- megafauna interaction with the reef
- migratory species' interactions with the reef
- expected attraction of species to the reef and how this will
 - alter the pre-placement ecological balance and processes
 - affect any nearby natural or artificial reef locations
 - affect how local organisms interact with the reef structure
- any potential impacts (significant or otherwise) on MNES (use of the Protected Matters Search Tool available on the department's website, see [Information and resources](#))
- an increase in use by divers or recreational fishers and how this is expected to affect the abundance and diversity of the ecological assemblage
- changes to the underwater noise and vibration environment

- impacts of increased boat traffic and associated factors (for example, anchoring, and boat strikes for turtles or marine mammals)
- impacts of material break-up over time, or the release of residual pollutants
- any expected impacts on turbidity and light availability, and how this will affect species at all levels of the food web
- expected larval settlement and colonisation patterns
- expected pest species
- impacts of the reef on nearby important features (for example, connectivity of species' habitats)
- social, economic and cultural impacts, including
 - an increase in the use of the area
 - impacts on facilities
 - impacts on commercial fishing grounds
 - interaction with shipping lanes
 - impacts on underwater cultural heritage (sites and people)
 - damage to, or interference with, existing subsea infrastructure such as pipelines, cables and outfalls.

Cumulative impacts

The impact assessment must consider the intra-project cumulative impacts of the factors listed above and how these could affect the marine environment in the vicinity of the proposed artificial reef (e.g., impacts in turtles associated with water quality plus predation plus entanglement).

Inter-project cumulative impacts on the region may need to be assessed, dependent on the nature of the project and the location of other artificial reefs. Applicants should discuss cumulative impacts with the department at the pre-application meeting where further guidance is required.

Protected Matters Search Tool report and interpretation

The department requires that all artificial reef applications include a report, and interpretation of the report, from the Protected Matters Search Tool (see [Information and resources](#)). This Protected Matters Search Tool is a tool provided by the department that allows applicants to highlight their proposed placement area on a map, then provides a report noting all of the protected matters under the EPBC Act within that area.

The department recommends that the search area includes the artificial reef placement area, the transport route that will be used (from the loading zone area on land to the reef site), and any areas expected to have increased vessel traffic due to placement of the artificial reef (such as boat ramps or marinas, and the likely path from the boat ramp or marina to the artificial reef). The department also recommends that the search includes a 2 kilometre buffer zone around all areas.

Once the report is generated, the likelihood of occurrence must be documented for each listed species/community and potential impacts must then be assessed for relevant species. The impact assessment can be based on desktop or field data. If significant impacts are likely, these must be highlighted in the application.



4 Long-Term management plan

☑ Applicants must develop a LTMP for submission with the permit application as a separate document. Implementation of the LTMP normally forms part of the permit conditions.

☑ The LTMP must be provided in the department's Long-term Management Plan Template (see [Appendix 2](#)), with an overview of the plan provided in the permit application form for an artificial reef.

After a sea dumping permit has been issued, applicants are responsible for safe placement (see [Reef placement](#)) and long-term monitoring and management of the artificial reef. A detailed outline of the monitoring and management procedures must be included in a LTMP, which is to be provided as a separate, supporting document to the application form. The LTMP commences when the activities outlined in the Placement Plan finish, that is, once the reef is verified to be placed as per the reef design.

The creation of an artificial reef, particularly one intended for use by divers, will require ongoing management for many years. Applications must include a LTMP for the artificial reef to ensure that it remains viable over the long-term and does not become an environmental or safety hazard. The LTMP must focus on monitoring to identify potential problems early (preferably

before they occur) and on establishing effective and achievable management measures. It is important that the LTMP is based on a robust environmental baseline data obtained during the baseline site investigation. The LTMP also needs to outline the end-of-life decommissioning plan and allow for rehabilitation in the event of damage to the marine environment.

☑ Applicants should be aware that the department is likely to require undertakings related to monitoring and management of aspects such as structural and material integrity, public safety (for divers and other marine users), and hazards.

These ongoing monitoring and management commitments require the availability of adequate and appropriate financial, human and material resources for the life of the permit and will be major undertakings for permit holders. Some artificial reef projects create committees or working groups to manage preparation and ongoing management commitments. These groups typically include representatives from key stakeholder bodies and others with management interests, such as regulatory agencies, municipal authorities, port authorities, local dive businesses and marine conservation groups. Although these committees may form the working body for the monitoring and management of the reef, the permit holder remains liable for undertaking the monitoring plan and management actions. Co-application with state or local government is recommended.

The placement of artificial reefs provides opportunities for involvement of research bodies and commercial interests. Collaboration with these parties may help the applicant to meet their monitoring commitments and, in some cases, contribute to funding the applicant's ongoing management commitments.

A tailored, risk-based approach to potential impacts associated with the proposed reef is recommended to provide for the best scientific outcomes. That is, the monitoring needs to be commensurate with the scope, scale and risk of the project and tailored on a case-by-case basis. For example, a larger reef composed of complex repurposed materials poses a greater risk and therefore requires monitoring (and evaluation) of aspects that may not be required by a purpose-built artificial reef composed of material with no potential contaminants.

4.1 Long-term monitoring and adaptive management

Long-term monitoring and adaptive management must be presented in a summary table to clarify how it will be undertaken. The department recommends a table with column headings such as those listed below in bold, which can be supported by no more than 2 tables (for example, a separate table outlining the monitoring timeline).

- **Aspect (or Reporting area):** the subject matter of the risk and monitoring as determined during the risk assessment, for example, fishing activities.
- **Impacting pathway:** as determined during the risk assessment, for example, impacts to protected shark species breeding nearby.
- **Objective:** the goals of each of the monitoring activity, for example, i) no by-catch of protected sharks and ii) no impacts to protected shark breeding site.
- **Monitoring method:** the methods used to monitor each of the objectives, for example, i) surveys of recreational fishermen at boat ramp throughout the year and ii) remotely operated vehicle (ROV) or BRUV surveys at breeding sites.
- **Monitoring frequency:** the frequency for each method, for example, i) monthly (for surveys of recreational fishermen at boat ramp throughout the year) and ii) weekly during breeding season (for ROV or BRUV surveys at breeding sites).

- **Data type:** the type of data for each of the objectives, for example, i) qualitative survey results) and ii) quantitative (transects) and qualitative (general observations) video footage.
- **Responsibility:** the individual or entity that will undertake the monitoring, for example, i) recreational fishers and ii) suitably qualified marine scientist and ROV or BRUV operator.
- **Threshold to trigger mitigation:** the threshold or level at which the associated mitigative action will need to take place based on the outcomes of the monitoring, for example, i) one protected shark death, or injury likely to result in one death, at any point in time during the life of the permit and ii) reduced presence compared to baseline or no breeding individuals detected during 3 consecutive weekly surveys by the applicant during breeding season.
- **Mitigative action(s):** what will take place if the trigger threshold is reached, for example, for both i) and ii) contact the relevant state or territory government agency (for example fisheries and marine parks) to determine root cause, overall impact and likelihood of repeat occurrence, to determine the most appropriate mitigative action(s), which may include those listed below:
 - increase frequency of surveys and liaison with state agencies until likelihood of repeat is acceptable
 - changes to fishing methods permitted
 - temporary closures
 - raise education and awareness of reef users modifications or removal of the reef.

Monitoring should be linked to the SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) criteria:

- **Specific:** Specify an outcome to be achieved for a specific aspect to be monitored in a specified location.
- **Measurable:** Include quantifiable performance measures and milestones relating to the specific aspect to be monitored that can be readily compared over time.
- **Achievable:** Realistic when compared with baseline performance and resources available.
- **Relevant:** Directly link the aspect to be monitored with the impacts of the proposal.
- **Time-bound:** Include specific timeframes for the completion of the monitoring. This might be a number of weeks or months after the main impact of a project or set period of time (for example, one year) prior to the expiry of the permit.

Monitoring must also help to determine whether the artificial reef is achieving its purpose. For example, if the reef was created to increase fish stocks for recreational fishers, then a key objective of monitoring would be to quantify the post-placement increase in fish stocks. In most cases, the plan will need to include monitoring of stability and structural integrity, as well as physical environment and ecological monitoring.

☒ Applicants must provide details of the frequency and duration of the monitoring program, including how often various aspects of the reef will be monitored, and how long the monitoring program will run. Applicants must also nominate who will be responsible for implementing the monitoring, and how often monitoring reports will be submitted to the department.

☒ Applicants should suggest and justify a timeframe for review of the monitoring plan. The timeframe will be agreed with the department before the final plan is approved.

Regular monitoring is required and more frequent monitoring at the start of the life of the permit/reef is encouraged. When monitoring data shows that the reef is achieving its purposes

and not causing harm to the marine environment, monitoring rounds can become less frequent. Monitoring after major storms should continue throughout the life of the permit.

Monitoring must be tailored for each reef as they are all different, however a typical monitoring frequency is:

- within 6 months, or twice per year, for the first 2 years after placement
- once per year in year 3–5
- every 5 years from year 6 to the end of the permit
- within 6 months of any major storm events
- a final survey at the end of the permit life.

4.2 Stability and structural integrity

☒ Applicants will need monitoring programs for stability and structural integrity to ensure that the artificial reef does not create a hazard to the marine environment or other users over time.

Aspects that must be addressed by ongoing monitoring and responsive management include:

- artificial reef positional stability
- durability and structural integrity
- maintenance of safety for other marine users of the area (for example, diving and boating).

Methods for monitoring positional stability and material condition may include:

- GPS location of the artificial reef
- multibeam survey of the artificial reef
- periodically measuring the thickness of material (for example, steel) on key structural members where possible (for example, on exposed surfaces)
- periodically measuring sag, torsional distortion or other indicators of structural change on exposed parts of the reef, which may be measured against set reference markers.

There should be an emphasis on monitoring and reporting of positional stability for the first few years after placement, until the artificial reef material has bedded-in and gained some stability. However, monitoring programs will be required for the duration of any artificial reef permit (including after major storm events), particularly for structures intended for diving.

Aspects of artificial reef positional stability, including permanency of placement at the original position, orientation and vertical stability, and any deviation from these parameters as originally established, must be detected, measured and reported.

For example, if an artificial reef moves significantly during a storm, its new position must be advised to the Australian Hydrographic Service and monitoring requirements may need review. If a structure that is in an upright position topples, diver access and safety must be reviewed, and additional access holes may need to be cut.

Durability and structural integrity refer to the material condition of the structure. Inevitably, over time, material degradation and physical forces will cause the structure and fabric of the artificial reef materials to deteriorate.

Monitoring any deterioration is particularly important to diver safety: deterioration can lead to new obstruction, entanglement, impact, laceration and abrasion hazards for divers as structures collapse, and steel plates fracture and shear, especially during or after extreme weather events.

☑ Permit holders must ensure that these emerging hazards are properly identified and dealt with over the life of the artificial reef. Options for reducing hazards that may arise throughout the life of the artificial reef include, for example:

- removing debris as it is generated
- barring access to portions of the artificial reef that become dangerous
- removing or modifying objects posing new hazards to divers.

☑ Buoys, lights and other markers mandated by relevant maritime safety authorities will also require periodical checking. Ongoing monitoring programs must contain a standard action that the artificial reef is checked for positional stability, material condition and integrity of markers after severe storm events and storm seasons typical of the area where the reef is sited.

4.3 Physical and chemical environmental monitoring

☑ Permit holders must monitor relevant aspects of the physical and chemical environment, with the parameters and level of detail commensurate with the scope, scale and risk of the project.

Additionally, all environment monitoring programs require surveys to be completed before the artificial reef placement, to establish baseline conditions. They may also require the ongoing monitoring of control sites in addition to the artificial reef site (see [Site selection](#)).

Long-term environment monitoring must consider aspects such as:

- marine debris (for example, fishing line or other anthropogenic inputs)
- changes in seabed topography or sediment movement
- changes in sediments (physical composition and contaminant levels)
- changes in water quality (for example, turbidity or contaminants).

Water and sediment quality data should be compared to specific guidelines or standards, for example, default guideline values for water and sediment in the AWQG.

Monitoring and management of the reef material must detect any breakdown of materials releasing contaminants into the water or sediment, and then respond with clean-up and prevention of further breakdown or release.

Depending on the scope, scale and risk of the project, monitoring may involve sampling and analysing sediments and/or benthic species for contaminants. Information from this type of monitoring can be used to confirm the predictions of the impact assessment. It is also useful for assessing similar artificial reef placements proposed in the future. Measurements that may be required in this sort of monitoring include the concentration of heavy metals or organic compounds in sediments, or recording any deformations in specified species around the artificial reef.

If there is considered to be any risk of scouring or alterations to natural sediment transport and deposition patterns around the artificial reef, the permit holder may be required to undertake a program of monitoring to determine if alterations have occurred and, if so, to what extent. For monitoring of this sort, a multibeam survey or reference markers and sediment depth indicators can be used.

4.4 Biological monitoring

☑ Permit holders are likely to need to monitor some of the marine plants and animals at the artificial reef (for example, protected species, target species for restoration or recreation, pest species) and in surrounding areas, depending on the scope, scale and risk of the project.

Depending on the type of material to be placed and the location and purpose of the artificial reef, factors mentioned in the [Biological aspects](#) section of these guidelines may need to be monitored. Changes in the composition of biological assemblages, in addition to growth and health of marine plants and animals, may need to be monitored depending on the project.

Monitoring results must be compared with the baseline conditions that were established during the pre-placement investigation. Programs may also require ongoing monitoring of control sites in addition to the artificial reef site.

Monitoring of introduced marine species

Placement of an artificial reef in a soft-sediment habitat may create opportunities for introduced species requiring a hard substrate to become established, such as mussels, tubeworms or algae. Most introduced species are effective colonisers and will readily take advantage of the vacant habitat space provided by an artificial reef.

Increased recreational boat traffic can also result in the introduction of marine pests to the artificial reef area.

If the artificial reef site is considered a potential site for colonisation by introduced species, a surveillance monitoring program focusing specifically on the range of species likely to be introduced to the region will be required.

Monitoring of ecological impact on areas adjacent to the artificial reef

The selection of an appropriate site for placement and appropriate preparation of the artificial reef material before placement (see [Site selection](#) and [Material selection and reef design](#)) must ensure an acceptably low risk of environmental impacts on adjacent habitats or commercial activities (for example, aquaculture).

However, monitoring to verify the artificial reef is not significantly affecting adjacent marine habitats may still be required and may include:

- measurement of sediment scour or deposition on seagrass beds or in mangrove forests
- measurement of sedimentation on algae, sponge beds, shell reef or coral reefs
- measurement of any reduction or increase in the abundance, density and diversity of nearby benthic habitats
- measurement of sediment scour or deposition on underwater cultural heritage
- qualitative and/or quantitative evaluation of the changes to species that use these habitats.

Methods that could be used include:

- quantitative surveys using photo or video techniques (for sessile organisms such as corals or sponges)
- qualitative interpretation based on observation (presence/absence of protected or target species)
- fixed-point photography using a sequence of photographs to assess impacts over time.

Monitoring of toxicity impacts on adjacent marine habitats

In some cases, it may be a requirement of the permit to verify that contaminants are not adversely affecting adjacent marine habitats. This may include chemical analysis of water, sediments or species at the reef site and/or potential impact sites to measure the concentrations of potential toxins.

In addition to sampling areas identified as potentially at risk, permit holders may also be required to undertake proactive monitoring, including ongoing sampling of the reef material and the adjacent sediments and water column.

Where required, applicants must involve professionals with the appropriate expertise to conduct the monitoring, with references to the AWQG, the Queensland Monitoring and Sampling Manual or similar state, territory or local guidance, and where relevant the PFAS NEMP (see [Information and resources](#)).

4.5 Monitoring related to the objectives of the reef

Recreational activities

The following sections provide guidance on monitoring for reefs with different purposes. It is not intended to be an exclusive list of artificial reef types or purposes.

Artificial reefs created for fishing

If the artificial reef is to be constructed for recreational fishing, the extent to which the target species are using the reef is likely to require monitoring. Where artificial reefs for fishing are constructed near important habitat for protected marine species or communities (for example, breeding, feeding or resting areas), monitoring is likely to be required at the artificial reef and nearby important habitats. For example, monitoring would likely be required to determine how the protected grey nurse shark interacts with the artificial reef including by-catch, and if there are any impacts to residency or breeding at nearby breeding sites.

Artificial reefs created as dive sites or surfing locations

Reefs intended as dive sites or surfing locations need to demonstrate no harm to the marine environment (through monitoring), including considerations such as stability and public safety, potential contaminants, and interaction of divers or surfers with protected species. The targeted monitoring of specific species may be less intensive than for reefs created for extraction or harvest given the typically non-extractive nature of recreational diving and surfing.

Increasing or concentrating populations of marine plants and animals

If the aim of the artificial reef is to increase or concentrate populations of marine plants or animals, an appropriate monitoring program needs to be established to ensure that aims are being met. Monitoring to determine if the target species or ecosystem is becoming established is likely to be required, and monitoring to compare the artificial reef with natural reefs nearby and regionally may be required. Monitoring typically involves benthic surveys that focus on the target species or ecosystem (for example, photo quadrats or video transects).

Reefs for restoration

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed (Society of Ecological Restoration, see [Information and resources](#)). A change in habitat type at a particular location, such as an artificial reef that

provides hard structure at a location that is dominated by sand, mud or seagrass, is not considered restoration.

Artificial reefs for restoration typically involve increasing concentrations of habitat-forming marine animals such as corals or oysters at a location that has experienced a decline in condition at that particular location (for example, death following mass coral bleaching, physical destruction of oyster beds).

By their nature, artificial reefs for restoration are typically low risk as they are not prone to impacts associated with extraction (for example, by-catch of protected species) or contaminants (where appropriate purpose-built modules or material are used).

4.6 Trigger points and mitigative measures

All aspects of the monitoring program should be linked to the SMART criteria (see [Long-term monitoring and management](#)).

Trigger points provide a threshold at which mitigative measures may need to be implemented, to correct any harm that the proposed reef is causing to the marine environment or correct the course of the artificial reef to achieve its goals. Trigger point values and mitigative measures must be definitive and not include statements such as ‘may include’ or ‘unacceptable levels’. These types of statements do not provide assurance that appropriate actions will be taken.

As an example, for impacts associated with structural integrity:

- trigger points could include when the reef:
 - overturns as determined by visual observation
 - experiences sliding as determined by GPS location or side-scan sonar, or
 - is covered in sediment, or sinks below the sediment line, as determined by sediment covering more than half of the module by height, and
- mitigation measures could include:
 - gather further information regarding the movement and/or sedimentation for review by suitable qualified specialists to determine the cause and likely risk (consequence and likelihood)
 - monitor the reef for further changes on a daily or weekly basis commensurate with risk
 - repair, modify or remove the reef in consultation with the department (noting additional approval may be required).

There must be a clear step-by-step progression in all LTMPs: from describing each monitoring aspect and timing, to nominating a scientifically based trigger point value, to implementing a mitigative measure. It is acknowledged that it may not be possible to provide a definitive mitigative measure for all potential impacts (for example, fisher satisfaction of the reef, where dissatisfaction could be caused by multiple factors and therefore the mitigative actions would differ depending on the source), however mitigative measures should be provided for each potential impact wherever possible.

4.7 Modifications and repairs

If monitoring shows that the reef is not meeting its objectives or is causing environmental harm, and this cannot be rectified through the nominated mitigative measures (see [Trigger points and mitigative measures](#)), the department may decide during the period of the permit that the structure requires modification or repair. If the harm is serious enough, the department can require removal of the structure (see [Decommissioning of the artificial reef](#)).

☑ Applicants must ensure that the LTMP includes mitigative measures that include modification, repair or removal of artificial reef materials to protect the marine environment or users of the area. They must be able to demonstrate that they have resources, both financial and personnel, to undertake modifications or repairs.

The modification or repair process depends on several factors, including the type of material, water depth, and the bathymetric characteristics of the seabed. A study may be needed to determine the likely impacts of the modification or repair, including:

- the current state of the reef and the seabed
- the resources and methods required to modify the structure, as well as the risks involved
- the regeneration of the ecosystems that have been damaged by the placement of the structure (for example, where a reef is unintentionally placed over a dense seagrass meadow rather than bare substrate as intended)
- the regeneration of the ecosystems on the reef that may have to be removed to undertake modification or repairs (for example, where part of a reefed vessel used for diving needs to be removed for safety reasons and coral is damaged due to unavoidable physical disturbance near the point of removal).

The permit holder may make minor modifications and repairs, regardless of breaching of trigger points, throughout the life of the permit without seeking approval from the department. Major modifications or repairs will require consultation with the department before they occur. Major modifications or repairs include adding any further material, or shifting or altering the shape, form, material or location of any components of the artificial reef.

Under the Sea Dumping Act, the minister (or delegate) can also require the permit holder to remedy any environmental damage that may arise after placement.

4.8 Decommissioning of the artificial reef

Decommissioning of the artificial reef is the default option at the end of the life of the permit, however a reef can be proposed to be left in place for perpetuity where it does not pose any risk (for example, to the environment, navigation or the safety of users) and is meeting its objectives. The permit holder would need to survey and assess the reef and submit a report outlining whether they wish to leave the reef in place, partly remove the reef, or remove the whole reef. The report would need to be submitted during the second last year of the permit, that is, reporting during year 28 for a 30-year permit. The evaluation should focus on the impact to the species and ecosystem that has formed on the reef and in the surrounding area, as well as the likely schedule of material degradation and safety considerations.

Under the Sea Dumping Act, the minister (or delegate) can require removal of the artificial reef. Removal may be required if mitigative measures are not effective and the trigger points continue to be breached. Other examples that may require the reef to be removed include:

- the artificial reef material is placed in a location or condition contrary to the requirements of a sea dumping permit, or is placed without approval
- the reef material presents an unforeseen pollution hazard or safety hazard
- the artificial reef placement has had unacceptable impacts on other ecological or biophysical processes that could not be reasonably foreseen.

The evaluation may be included as part of a monitoring event if the associated reporting is within the second last year of the permit. In this monitoring report, the permit holder should provide a conclusion regarding any requirements for ongoing monitoring and maintenance after

the permit expires. If the proposed intention is for the reef to be left in place, the applicant must clearly discuss associated impacts in this report. The department is unlikely to recommend a reef is left in place where it contains potentially hazardous materials (for example, plastic).

☒ Applicants must plan for both the long-term management (see [Long-term monitoring and management](#)) and potential removal of artificial reef material.

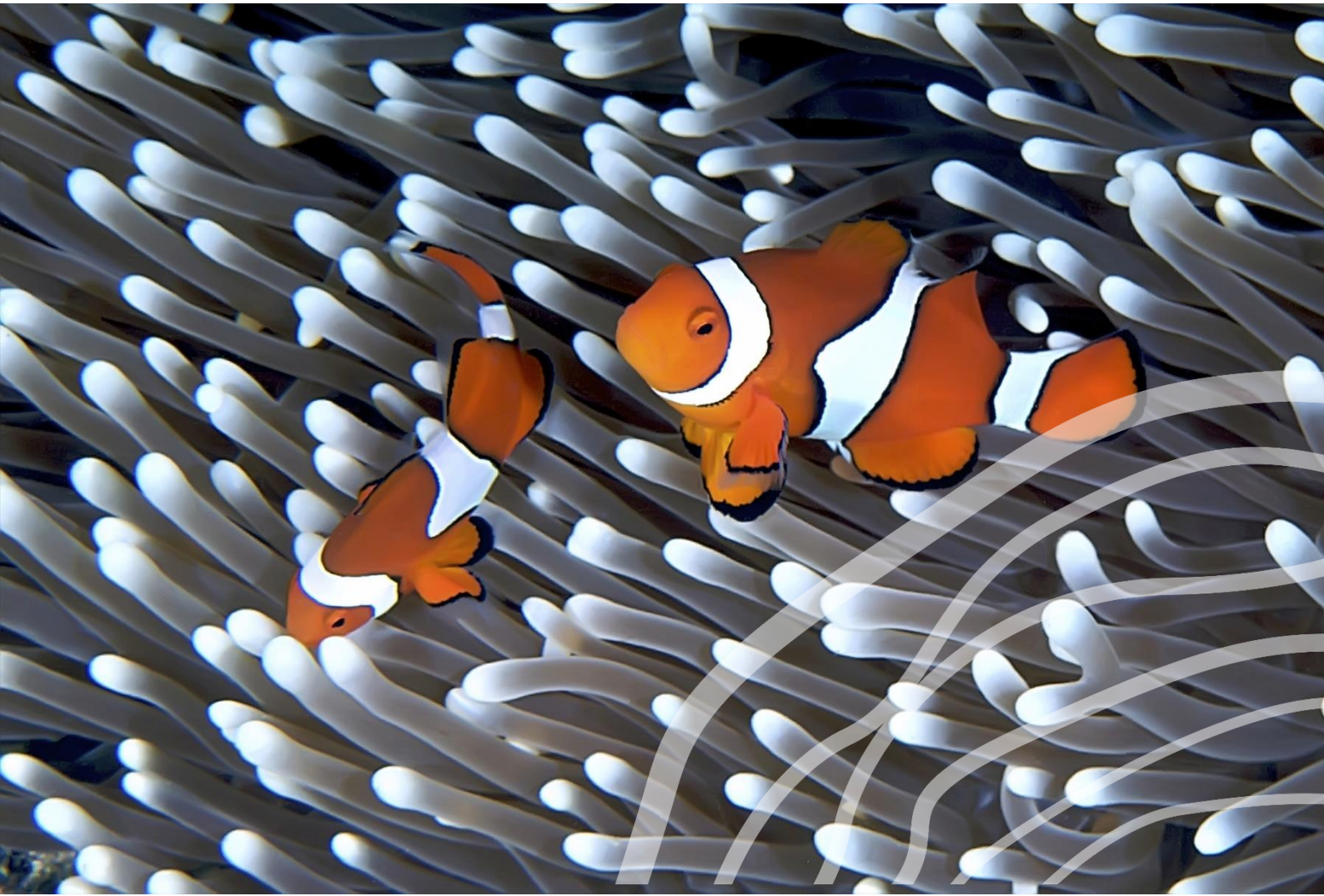
4.9 Compliance and enforcement

Permits are granted with conditions, which are appended to the permit (see [Permit conditions](#)). The permit holder(s) are responsible for ensuring that any conditions required under the permit are incorporated into project planning, implementation and ongoing operations. The permit holder must also ensure that all persons involved in the placement activities comply with the permit and the requirements of the Sea Dumping Act.

Compliance and enforcement activities under the Sea Dumping Act operate in accordance with the department's Compliance Policy (see [Information and resources](#)).

The purpose of this policy is to describe the principles used by the department when dealing with possible violations of environment and heritage legislation.

The policy describes the factors considered in determining appropriate responses to violations, including whether legal proceedings will be pursued. The department's approach and procedures for individual cases may vary where there are specific legislative requirements.



5 Types of artificial reef

There are 3 broad types of artificial reefs, based on the material used to construct them:

- vessel and aircraft
- purpose-built
- repurposed infrastructure.

Integrated reefs are formed out of 2 or more of the above types. The following sections provide detailed guidance on each type of artificial reef.

The sections on purpose-built reefs and repurposed infrastructure are currently under development. When complete, they will provide detailed guidance on using these materials in the construction of artificial reefs.

5.1 Vessels and aircraft

Vessels and aircraft can be repurposed as structures for establishing artificial reefs. Prospective applicants intending to sink a vessel or aircraft as an artificial reef are advised to seek independent legal advice. Issues such as legal requirements for public and diver safety, marine navigation safety, and potential liabilities need to be considered.

Workplace safety is an important issue to consider. The applicant must involve professionals with the appropriate expertise to prepare and clean-up, manage corresponding waste, and treat and dispose of materials containing hazardous chemicals. The applicant must consult relevant state or territory authorities for requirements related to workplace safety, such as Safe Work Australia (asbestos), and where relevant, guidance provided by the Basel Convention (waste disposal), Stockholm Convention (persistent organic pollutants), and the PFAS NEMP (see [Information and resources](#)).

Stability

Before placement

Removing and relocating components of the proposed reef material (particularly heavy material such as fuel and trim water) will affect vessel or aircraft stability. Generally, removing weight from low in a ship (for example, ballast bars, bilge piping, engine room machinery) makes the vessel less stable, while removing weight from high in the ship makes it more stable.

☒ The stability of the vessel or aircraft must be considered an integral part of the preparation plans. Applicants must be continuously aware of stability conditions and watertight integrity (see [Watertight integrity](#)). They must have contingency measures available to improve stability or counter flooding when required.

After placement

Positional stability of the artificial reef will be increased if it is placed at an appropriate site (see [Site selection](#)).

Additional ballast in the vessel or aircraft can also help to limit the likelihood of movement, particularly in severe conditions such as storms. Types of ballast include concrete (either poured directly into the hull or as pre-set blocks), steel (in pellet or ingot form) and clean washed sand or rock. Water has no ballast effect once a vessel is sunk, so should only be considered as possible ballast when moving the vessel from the preparation site to the reef location. Lead ballast must not be used.

☒ Applicants must provide details of implementation measures to maximise the long-term stability of the proposed artificial reef. In particular, applicants must specify the type and amount of any additional ballast. The use of additional ballast must be approved by the department before it is placed within the reef material. Any water and associated sediments used for ballast must be managed in accordance with the department's ballast water management requirements (see [Information and resources](#)).

Watertight integrity

Once a permit has been granted, the vessel or aircraft must maintain sufficient watertight integrity to be sunk in the intended manner at the correct location.

Vessel scuttling preparations (for example, cutting holes in the hull) should not impair the seaworthiness of the vessel. Vessels should not be prepared until a permit has been granted.

Applicants should consider delaying preparations until the 28-day appeal period has expired (see [Permit process](#) and [Timeframes](#)).

☑ Applicants should carefully consider the work plan to ensure preparation requirements do not greatly affect watertight integrity. The scuttling contractor should be consulted for advice on these issues.

Several specific flooding risks need to be considered:

- Pay special attention to hull openings and internal preparations that degrade the internal compartmentalisation of a vessel, especially during tows and mooring. Hull openings are often required to remove bulky items and to prepare for diver access. However, they present a significant risk of flooding; internal modifications that reduce watertight integrity would worsen the consequences.
Hull openings should be well above the waterline, or temporarily sealed for mooring and towing (open-ocean tows require structural sealing). Hull openings intended for near or below the waterline should only be cut by explosive charge as part of the scuttling process (see [Method of placement](#)).
- Towing presents a special problem, particularly if the vessel must be towed over open waters. If the vessel is to be towed at sea, the hull must be watertight and structurally sound, and a temporary pumping capability should be provided.
Preparing a derelict vessel for open-ocean towing requires special expertise, so the applicant should seek professional advice. Even for tows that are both short and sheltered, the applicant will need to consider tow speed, natural roll, list, loll, and the possibility of encountering higher seas during the tow.
- Mooring a vessel during clean-up or before sinking poses greater risks than would typically be encountered alongside a wharf. Vessels will be subject to wind-induced or wave-induced roll, and low hull openings present a flooding hazard. Single-point moorings allow the ship to head into the wind, which often minimises weather effects. Multipoint moorings that prevent the ship from swinging on its mooring may exaggerate the effects of weather on the vessel – for example, rolling or pitching could be significantly increased. Consider having temporary pumping capability if intending to moor the vessel.
- Free surface effect is the ability of fluids, such as water, to accumulate on one side of a vessel and induce a list or loll. This may cause flooding or lead to capsize, particularly if it occurs high above the waterline and involves a large amount of fluid. This may be an issue if fluids are allowed to accumulate in bilges, if tanks are kept in a partially full condition, or if excessive amounts of liquid are used to flush or wash down decks. The scuttling downflooding method, reserve buoyancy and stability should be assessed by a naval architect or suitably qualified marine engineer to ensure sufficient righting momentum is maintained during the scuttling.

Preparing for diver access

Operations associated with clean-up and preparations for diver access have the potential to adversely affect stability. Decreased stability may then cause premature and uncontrolled capsizing, foundering or sinking of the vessel or aircraft, especially if it has to be moved to its intended location. The applicant will need to pay attention to stability issues in the preparation phase (see [Stability](#)).

Generally, existing doorways, hatches and hull openings cut or enlarged for diver access should be of sufficient size. Specifically:

- for openings providing access from the interior to the exterior of the hull, the size should permit simultaneous passage by 2 divers, side by side, to allow a diver in distress to be

assisted from the wreck. As a minimum, the opening should be 1.5 metres high by 1.8 metres wide.

- for internal openings, the size should permit clear access for at least one diver at a time; as a minimum, openings should be 1.0 metre high by 1.0 metre wide (a larger opening is preferred, if practical).

Other factors to consider in providing appropriate access for divers include:

- removing and enlarging existing doorways and hatches that are intended to be left open post-placement
- sealing or barricading hatches and doorways that are not intended to provide passage for divers
- barricading small, enclosed spaces to prevent entry
- providing extra hull, bulkhead and deckhead openings of appropriate size, number and location
- providing 2 visible exit points from all rooms, which allows safe exiting if one exit becomes blocked
- including both horizontal and vertical openings for diver access
- removing sharp and irregular edges where sections of material have been cut out
- removing jagged, irregular edges from sections of corroded or damaged material
- removing snag and impact hazards such as valves, studs, loose pipes, cable trays, racks and shelving; removing snag and impact hazards fitted to bulkheads and deckheads is especially important
- removing objects that may break during scuttling, such as glass or mirrors
- removing entanglement hazards presented by cables and small-bore pipes
- removing doors from any domestic-type refrigerators and ovens that will remain in place.

Generally, non-structural materials should be removed, except if they will enhance diver interest without compromising safety. Items that may be considered 'non-structural' include false decks and false deckheads, loose deck plates, non-structural bulkheads, and wood panelling.

When assessing the requirements to render a vessel or aircraft safe for diving, applicants must plan for any damage and deterioration to structures and fittings that could occur from scuttling (for example, from explosive shock), flooding or long-term immersion.

Clean-up procedures

Applicants should note that the information provided in this section is intended only as guidance on the department's requirements for material clean-up. The information relates to vessels, however, it generally applies to oil and gas infrastructure, aircraft, and other potential repurposed reef materials.

Vessels and aircraft to be used as artificial reefs must not pose a hazard to the environment. This includes preventing pollution from potential contaminants or rubbish (see [Hydrocarbons](#), [Hazardous equipment and materials](#), [Hazardous chemicals](#) and [Rubbish](#)). They must also be safe for any human interaction such as diving.

The most effective way to prepare a vessel or aircraft for placement as an artificial reef and prevent pollution is to strip it of all internal fittings and equipment, except for those that are securely fixed, structurally sound, and composed only of inert materials and durable items. This

approach also helps to make the structure safe for diving. Testing of paints, wiring or other components may be required to determine if environmental contaminants such as hazardous chemicals are present.

Materials and items that are likely to pose an environmental contamination or marine debris risk, so should be removed, include:

- anti-fouling paints
- asbestos lagging or cladding
- batteries, electronic valves, cathode ray tubes and video displays
- bulkhead and deckhead lining materials
- coolants and coolant additives
- crew effects (for example, bedding, clothing)
- fishing gear, such as nets and lines
- fluorescent light tubes and fittings, incandescent lamps
- fuel and lubricating oil, greases
- hydraulic fluid
- lead ballast
- ozone-depleting substances in refrigeration, air-conditioning systems and fire suppression systems
- some paints
- radioactive materials (for example, luminous dials and displays, luminous 'exit' and 'escape' signs, smoke detectors, night vision or low-light-level optical equipment, specialist electronic instruments, flow meters)
- sewage and greywater
- thermal and acoustic insulation (for example, polyurethane, polystyrene, glass wool fibre)
- buoyancy foams
- fire retardants.

See Annex 5 of the UNEP guidelines for more information on vessel clean-up.

☒ The applicant must prepare clean-up plans to reduce or eliminate potential hazards from the vessel or aircraft. The applicant can consult the department for information and advice about clean-up procedures. The vessel or aircraft may require inspection before placement (see [Inspections](#)).

☒ Professionals with the appropriate expertise are needed when considering material clean-up. The applicant should consult a suitably qualified naval architect or marine engineer who will review clean-up and preparation plans and will act as a stability and watertight integrity consultant (see [Stability](#) and [Watertight integrity](#)).

☒ When preparing clean-up plans, the applicant should consider all waste management alternatives, including:

- re-use or offsite recycling (many vessel or aircraft components and metals can be recovered and/or recycled)

- destruction of hazardous materials (see [Hydrocarbons](#), [Hazardous equipment and materials](#) and [Hazardous chemicals](#))
- treatment to reduce or remove hazardous materials (see [Hydrocarbons](#) and [Hazardous equipment and materials](#))
- disposal of materials that are unsuitable in the marine environment (see [Debris and loose material](#) and [Introduced material](#)).

Fouling survey

☑ The applicant should arrange for a fouling survey to quantify the amount of fouling and to report on species that may represent a marine pest risk. Guidance on species of concern and how best to manage their removal is available from the Biosecurity section of the relevant department.

Hydrocarbons

The aim of the hydrocarbon clean-up is to remove all liquid hydrocarbons (fuels, lubricating and cooling oils, hydraulic fluids) from the vessel or aircraft to the maximum extent possible.

Generally, all liquid hydrocarbons must be removed, and semi-solids (greases) must be removed to the greatest extent practical. An inspector is likely to require access to every space, tank, compartment, pipe and component in the vessel or aircraft that is associated with the storage or use of liquid hydrocarbons (see [Inspections](#)).

The general guidance here applies to the preparation of hydraulic systems for placement. Applicants should note that hydraulic fluids may need to be kept separate from other waste oils and disposed of separately.

Some spaces, machinery and systems or items are more likely to be contaminated with hydrocarbons, so should be carefully checked and cleaned, or removed.

☑ Applicants will need to pay careful attention to the following spaces, machinery and systems during clean-up.

Tanks

Structural tanks

All structural tanks should be treated as contaminated with hydrocarbons unless evidence (such as ship drawings) confirms they are not or until proven otherwise by inspection and/or sampling. Structural tanks that are likely to be contaminated by hydrocarbons include:

- fuel storage settling, service or day tanks
- cargo tanks and oil tanks
- lubricating oil storage tanks
- sumps
- sluice trunks
- waste oil tanks and contaminated oil tanks
- hydraulic tanks
- aviation fuel tanks and ballast tanks
- stabiliser tanks

- voids
- cofferdams.

Tank interiors, including overheads, must be cleaned of all hydrocarbons. Methods of cleaning tanks are presented later in this section.

No visible hydrocarbons may remain on tank surfaces (including all interior fittings, piping and structural members) or on the water surface, if flooded. There should be no visible emulsified oil. If structural tanks are flooded, oil-absorbent pads and excess absorbent material for loose oil must be removed before placement.

Non-structural tanks

All non-structural tanks are assumed to be contaminated by hydrocarbons until proven otherwise by evidence (such as ship drawings) or inspection. Where practical, non-structural tanks should be removed. Non-structural tanks that are left in the vessel must be visually inspected. Note that non-structural tanks are often relatively small, so larger openings may need to be cut to allow for cleaning and inspection.

No hydrocarbons should be visible, and debris and excess loose oil-absorbent material must be removed.

Cleaning tanks

There are several effective methods to clean fuel and oil tanks. The best method to use depends on the type of hydrocarbon in the tank, the amount of residue, the extent of any hard or persistent deposits and residues, the size and layout of the tank, safety considerations, and ease of access. In general, lower-quality fuels and heavy oils require more cleaning effort. Similarly, tanks for dirty or water-contaminated oils require more cleaning effort.

Applicants should ensure that all oil, oily water and oily residues are collected and disposed of in accordance with relevant regulations. Applicants should also conform with local requirements if temporary storage or work areas for oils or oily water are required during vessel preparation. The tank interior may also contain hazardous contaminants that professionals with the appropriate expertise should handle. All collected waste requires special handling, treatment and/or disposal according to local laws.

Where possible and safe from a structural point of view, access openings may be cut into tanks (particularly double-bottom tanks, which are often difficult to access). Appropriate burning and welding precautions must be taken when opening tanks. Before tanks are accessed by clean-up personnel, appropriate safety precautions must be taken for confined space entries.

Several options are available for cleaning tanks:

- **Mechanical cleaning.** This method involves mechanically removing sludge and any remaining fluids and then wiping down all surfaces with rags and oil-absorbent material. Although it requires a lot of labour, this method limits the spread of contamination and minimises the production of oil-contaminated fluids that are expensive to dispose of.
- **Steam or hot water washing.** This method is effective, although it requires special equipment and generates large volumes of oily water. The use of surfactants (or soaps) is not recommended because they tend to emulsify any oil present and make the oily water exceptionally difficult to treat. This is likely to make disposal costs higher than necessary. In tanks in which deckheads and sides are reasonably free from contamination, pressure washing can cause splash, misting and carryover that can contaminate these otherwise clean surfaces.

- Detergent washing. Detergents, which are usually used with water washing, can be used to remove hydrocarbon deposits and films.
- Solvent washing. Solvents (for example, degreasers) may be an option for persistent deposits or residues, but the used solvent will also need to be removed, and all of the liquid product generated will require special handling and disposal.
- Specialist methods. It may be necessary to use more advanced methods, such as ultrasonic cleaning or special solvents.

In practice, it is likely that various cleaning methods need to be used, possibly sequentially, depending on the nature, location and persistence of the contamination. In general, mechanical cleaning is the first method to try, followed by steam or hot water washing, and then solvent or detergent washing for deposits that are difficult to remove.

Whichever method is used, the effluent and waste must be collected and treated. Large volumes will require a pump truck or barge, while smaller quantities may be handled in barrels. To avoid spills, take care when transferring effluent and waste. If large quantities of oil or oil-contaminated liquids need to be transferred, consider using a boom around the vessel or aircraft; this may be required by local authorities. The applicant must provide a description of the procedure to manage spillages of waste containing hazardous chemicals.

It is important to consider possible contaminants in waste materials and material clean-up and treatment procedures (see [Harm minimisation](#)).

Fuel, oil and hydraulic piping and fittings

Applicants should identify pipes and fittings that contained fuels, oils or oily water.

Generally, piping is assumed to have contained hydrocarbons unless the piping is clearly identified as not being part of a hydrocarbon or hydraulic system (for example, labels indicating sea water or fresh water, compressed air piping).

Fittings include valves, cocks, site glasses, coolers, siphon breakers, filters, manifolds and flexible couplings. All fittings must be either removed or opened and cleaned. For inspection, external areas should be opened, or a cut made through the lowest point of the fitting. Where fittings are of complex construction or have more than one oil-tight compartment (for example, coolers), access to all subcompartments or components is required for inspection (see [Inspections](#)).

Fuel and oil piping must be removed, or otherwise drained of all liquid. The requirement for cleaning and opening of pipes depends on the type of product that was in the lines. In general, the more viscous the product, the more opening and vigorous cleaning is required. For very viscous products (for example, Bunker C fuel), all piping and fittings should be fully opened for cleaning and visual inspection.

Vertical piping runs must have all valves completely opened, and any blanking flanges or spectacle plates removed.

Horizontal piping runs should be opened at low spots, or otherwise at a minimum of one opening every 3 metres. For light products, open by separating flanges and unbolting couplings, or cut the pipe completely through at the bottom. For heavy products, opening means that the pipe should be half-sectioned.

All filling stations or deck fittings that were used for receiving fuels, oils or other hydrocarbons should be either removed, or opened, drained and cleaned of hydrocarbons.

All waste extracted from the piping will need to involve professionals with the appropriate expertise and special handling, treatment and/or disposal. It is important to consider possible contaminants in waste materials and material clean-up and treatment procedures (see [Harm minimisation](#)).

Bilge piping

All piping running through the bilge areas of machinery spaces is assumed to be contaminated by hydrocarbons until proven otherwise. Piping in bilge spaces should be treated in the same way as fuel and oil piping (see [Fuel, oil and hydraulic piping and fittings](#)).

Gauges and gauge lines

Pressure gauges and gauge lines are assumed to be contaminated with the product that they were used to measure. Gauges should be removed from the ship, especially fluid-filled gauges. Gauge lines may be removed or blown through with air to remove contaminants.

Temperature gauges may be left in place if they do not contain any hazardous material such as mercury. Remove other measuring instruments from the vessel or aircraft, or open for cleaning and examination.

Take care when removing and disposing of mercury thermometers and pressure (usually vacuum) measuring devices, particularly those with capillary tubes.

Combustion engines

Combustion engines include any reciprocating engine that consumes fuel (typically diesel or petrol), and gas turbines. All visible oil and residues, including fuel and lubricants, must be removed.

The surrounding and support structure should be made accessible for inspection, especially the area under the engine. All components such as access panels, explosion doors, handhold doors, maintenance panels, gear covers, bearing covers, retaining plates and sump covers should be removed. Visible oil must be removed from all internal components. At least one main bearing must be opened to determine if its design allows oil to be trapped, and all bearings must be opened and cleaned if required. Heads on reciprocating engines must be removed or opened for cleaning and inspection.

All components of the fuel system should be stripped from the engine, including injectors, carburettors, supply/distribution/return lines, filters, pumps, relief valves, pressure-regulating mechanisms, governors and heat exchangers. If these items are left on the vessel or aircraft, they must be opened for cleaning and inspection.

Lubricating oil sumps should be drained and opened for cleaning and visual inspection, making extra access openings if required. All lubricating oil piping (both internal and external to the engine) must be removed or opened and drained. Components of the lubricating oil system should be opened and cleaned or removed. Internal oil gallery plugs should be removed. Bearing covers on external pedestal and thrust bearings should be removed, and drains opened. Engine-driven oil pumps must be pulled and cleaned. Any components used for engine oil filling and dirty oil drainage should be removed or opened and proven clean.

Other components and ancillary systems susceptible to contamination with hydrocarbons (for example, superchargers, turbochargers, air filters) should be opened for cleaning and inspection or removed from the vessel or aircraft.

Gearboxes, shafting and stern glands

Main gearboxes and associated clutches must be drained of all lubricating oils. All components such as access panels, explosion doors, handhold doors, maintenance panels, bearing covers and retaining plates should be removed. Internal gear sprayers, lubricating lines and other similar components should be removed, or opened and drained. Bearing covers on external pedestal and thrust bearings should be removed, and drains opened. Any bearings with sumps (typically plummer bearings) should have sumps fully opened and cleaned.

Oil bath-type stern tubes and glands should be drained of oil in a way that preserves the watertight integrity of the vessel during the clean-up phase. Options for replacing the gland function will depend on the design and structure of the vessel, but one option is to pour concrete around the shaft to seal the gland space. Some vessels are fitted with emergency gland systems, some of which operate with compressed air. Depending on specific circumstances, it may be preferable to extract oil from the stern glands as late as possible in the preparation process.

Vessels that are equipped with thrusters, propulsion pods, Z-drives, or other unconventional drive systems are considered case by case. The criterion is that no hydrocarbons or other potentially polluting fluids remain in the drive system. This process may require dry-docking.

Steering gear

Steering gear motors, hydraulic pumps, and associated piping and fittings should be removed, or opened and drained. Hydraulic telemotor systems should be treated similarly. Main steering rams should have the ram cylinders opened to allow inspection. Grease lines and reservoirs for rudder heads should be removed or opened and cleaned.

Vessels with combined drive and steering systems should be cleaned so that no hydrocarbons or other potentially polluting fluids remain in the drive system. This process may require dry-docking.

Auxiliary machinery

Auxiliary machinery refers to machinery and components that are not an integral part of the main propulsion system of the vessel. The term can include auxiliary propulsion units, pumps, motors, compressors, generators, alternators, capstans, windlasses, elevators, cargo handling machinery, air-conditioning and refrigeration plants, and desalination plants. Many pieces of auxiliary machinery either have a lubricating oil system or are in direct contact with liquid hydrocarbons.

For clean-up purposes, auxiliary machinery can be classified into 2 broad categories:

- machinery that does not use oil lubrication or hydraulics and does not contain grease (other than within sealed rolling element bearings)
- equipment that either uses fuel or lubricating oil or contains greases outside sealed bearings.

Machines in the first category do not generally require hydrocarbon clean-up, unless they were used for pumping fuel or oil, or they have large grease reservoirs. Examples of machinery usually not requiring clean-up include small water pumps and ventilation fans.

Preferably, auxiliary machinery should be removed, particularly if it has salvage value. If this is not practical, the machinery must be thoroughly checked and cleaned of all potential contaminants. All lubricating oil and hydraulic system components should be stripped from the machinery or opened and drained. Oil sumps should be opened, drained and wiped clean. Bearings should be opened and cleaned. An adequate opening that allows a complete visual

inspection of any sump is required. Auxiliary machinery that used a liquid hydrocarbon as a working fluid should be completely opened and drained.

Components such as grease-packed couplings, stuffing boxes, chain sprockets and worm drives must be opened. Mechanically removing the grease is usually best, although in cases with very limited access (such as gun turret rings), steam or solvent washing may be necessary

Hydraulic systems

Hydraulic systems comprise components such as pumps, storage tanks, accumulators, replenishment and overflow tanks, actuators, blocks, control valves, filters, coolers, distribution manifolds, and pressure and return lines. Hydraulic systems typically use a hydrocarbon-based fluid, although some systems use other fluids that should still be considered as potential pollutants.

Hydraulic systems should be depressurised before any work on them is started.

Hydraulic lines should be removed, or opened at every fitting and blown through with air until clear. Hydraulic fittings should be removed, or stripped to component level and cleaned. Hydraulic sumps (such as those found on hydraulically operated equipment and accumulators) that are left in place must be drained and opened for cleaning and visual inspection; this may require making additional access openings.

Cleaning fitted machinery, especially machinery that used oil for fuel and/or lubrication or was a hydraulic system, is a long and difficult process. Whenever possible, fitted machinery should be removed.

The clean-up plan should identify the fluids and other contaminants that need to be removed from machinery. Care should be taken to capture fluids to avoid the need for further clean-up. Fluid types should not be mixed as this may increase disposal costs. Large reservoirs of fluids should be drained first, followed by smaller accumulations in machinery housings, piping and fittings.

Gravity helps with fluid collection, so the clean-up plan should allow for an adequate drainage period. The period required will vary depending on internal machinery clearances, the length and size of piping, fluid viscosity, and temperature. Because oils and fuels will continue to weep for several days or weeks, clean-up plans should specify the catchment of seepage over this period.

Grease reservoirs and lines

All grease reservoirs should be removed or opened and cleaned. Grease lines should be removed or blown through with air until clear. All visible grease accumulations must be removed. Machinery that uses grease-packed gearboxes (typical on upper deck machinery) must be opened and cleaned of grease. Grease on chains, gears and sprockets must be removed. Greased cables should be removed.

Bilges

Bilge areas include the internal skin in the lower sections of engine rooms, machinery compartments, cargo holds and storerooms. The bilge area includes all areas that are subject to contact with oily water or that may be a catch area for spills from fuel, lubricating oil, liquid cargo or stores. It also includes interior skin areas that may have been contaminated with hydrocarbons through, for example, sprays, spills or disposal. In addition, bilge areas include the plating, and all surfaces of attached stiffeners and fittings.

Machinery and other components in bilges should be moved or removed, as necessary, to allow access for cleaning and inspection. Bilge areas should be free from oils, greases and sludge that are visible or evident to the touch. Remove any loose items or other debris contaminated with hydrocarbons. Any fluids used to clean bilges must also be removed.

In general, the approach and methods used for cleaning bilges are the same as for cleaning tanks. Cleaning of bilges should be planned as one of the final stages of the preparation process.

Cleaning bilges is complicated by poor access caused by frames, stiffeners, piping, deck plates, gratings, machinery and other equipment. It may be cheaper and easier to remove these items (especially if they are dirty or contaminated themselves) than to attempt to clean them and the adjacent bilge.

Bilges, once clean, are vulnerable to recontamination. Applicants should be aware of the following situations that may require a bilge to be re-cleaned:

- Piping, valves and fittings in hydrocarbon systems usually continue to weep for some time after initial draining. Drips should be captured whenever possible.
- Containers used for clean-up are vulnerable to tipping, especially in the conditions often found in vessels being prepared for dumping (for example, uncertain footing, poor lighting).
- Water should not be allowed to enter and accumulate in bilges unless it is part of a planned clean-up activity. Water generally complicates bilge clean-up because it must be handled as oily wastewater.

Decks and deck coverings

Decks and deck coverings include ceramic tile, linoleum and linoleum tile, carpet, rubber matting, wood, continuous coverings, and specially formulated, low-skid deck paints. Decks may also comprise bare steel or other metal plate, particularly in machinery spaces.

Decks and deck coverings should be cleaned of any oil and grease films. In compartments that have been subject to hydrocarbon spills during the vessel's life (for example, workshops, machinery spaces, compartments with fuel or oil tank overflows or tank covers), the deck coverings and any underlay must be checked for oil saturation. Deck coverings or underlay that have been saturated with hydrocarbons must be removed.

Bulkheads and deckheads

Bulkheads and deckheads must be free from oil and grease films. Where it is evident that a spill or accumulation has occurred, any coverings must be removed to reveal the full extent of the spill or accumulation.

☒ Any spaces, machinery and systems that are contaminated must be cleaned before placement of the vessel or aircraft as an artificial reef.

Hazardous equipment and materials

☒ Fitted materials and structural components containing hazardous materials and products must be removed. Materials and structural components containing hazardous materials will need the involvement of professionals with the appropriate expertise and special handling, treatment and/or disposal.

Applicants can apply for materials not specifically addressed in this section that are an integral component of the structure of the vessel to be left in place, for example, some paints applied to

the hull, fittings and machinery. Information about materials or items for such consideration by the department will need to be submitted as part of the application.

If there is any doubt about the requirements for a particular material or item, it should be removed and disposed of appropriately. It is important to consider possible contaminants in waste materials and material clean-up and treatment procedures (see [Harm minimisation](#)). Consult the department for further information and advice.

Electrical and electronic equipment

Depending on the vessel or aircraft, electrical and electronic equipment may include:

- radar
- sonar
- radio and weapons systems and associated displays
- navigation aids
- internal communication systems
- computer networks and entertainment systems (for example, video networks)
- equipment to generate electricity
- power conversion and distribution systems.

Many of these systems and their components pose a risk of pollution or injury to divers. For example, cathode ray tubes used in radar and sonar displays will implode after scuttling (because they are vacuum containers), producing jagged glass fragments that are coated in a carcinogenic phosphor. Other electronic components may contain oils and heavy metals, particularly large capacitors and inductors, transformers, relays and contactors, thermionic valves, and coupling devices.

Generally, all electrical and electronic equipment and components, except stationary components, should be removed from vessels or aircraft that are accessible to divers. Oil-filled transformers should always be removed.

Batteries

All batteries should be removed from the vessel or aircraft, including batteries that are part of fitted equipment. Emergency lighting systems and 'battle lanterns' in warships are fitted with batteries that should be removed.

Boilers and steam systems

Boiler fire boxes should be cleaned and opened for inspection. Any bricking or firewall material that shows evidence of hydrocarbon contamination should be removed from the vessel or aircraft. All boiler-mounted fuel components (for example, sprayers, burners, valves, fuel-control components) should be removed, or opened for cleaning and inspection.

Asbestos (see [Asbestos](#)) or other lagging around boilers and steam systems should be removed. Proper safety precaution according to local laws should be used when dealing with asbestos.

Fire suppression systems

Fire suppression systems should be fully decommissioned. All firefighting compounds should be removed from the vessel or aircraft, except for firefighting systems that steam drench, or use untreated sea water or fresh water. Storage containers, if left in place, must be opened for inspection. Any lines that have been used for firefighting products other than untreated sea

water or fresh water should be treated in the same way as fuel and oil piping (see [Fuel, oil and hydraulic piping and fittings](#)).

Some fire suppression systems use ozone-depleting substances such as halons. Ozone-depleting substances must be captured, stored and disposed of in accordance with applicable federal, state or territory regulations.

Fire suppression systems that use carbon dioxide must be deactivated and depressurised; carbon dioxide storage cylinders should be removed.

Compressed air systems

There are no specific requirements for the removal or clean-up of compressed air systems (except for hydrocarbon contamination, for example). However, compressed air systems should be depressurised before starting clean-up and preparation work.

Galleys and galley equipment

Galleys and galley equipment should be checked and cleaned of oils and greases. This includes deck drains, oven cooking ranges, deep fat fryers and ventilation extraction systems. All cooking greases and oils should be removed. Grease traps and filters should be removed or thoroughly cleaned.

Radioactive materials

The London Protocol prohibits the placement of radioactive material that has more than 'de minimis' (insignificant) levels of specific activity.

Vessels and aircraft are likely to contain a variety of low-level radioactive sources such as smoke detectors, illuminated emergency 'exit' or 'escape' signs, and certain instruments or gauges containing caesium-137.

It can be difficult to determine the exact level of radioactivity of a given device. The most practical way of managing all radioactive sources is to remove them and dispose of them appropriately.

Asbestos

Asbestos may be found in many forms on a vessel or aircraft, including as insulation; lagging; deck, bulkhead and deckhead linings; brake and clutch pads (as in windlasses); and valve packing.

Asbestos material may be a risk if it breaks free (for example, asbestos lagging or cladding). Asbestos material may be detached during the scuttling process if explosives are used (see [Method of placement](#)).

Any asbestos should be removed and handled in accordance with local regulations.

Wood

All wood, including wood fittings and furniture, should be removed, except if it is securely bonded to, or integral to, the structure of the vessel or aircraft. For example, deck timbers of a vessel may remain in place provided they are securely attached to the vessel and are unlikely to break free and float after a period of immersion.

Glass screens, panels and other items

Glass is likely to shatter and present a hazard to divers. All glass and glass objects, except for glass instrument faces and the panes in windows and scuttles, should be removed from the vessel or aircraft. This includes incandescent lamps and fluorescent tubes, electronic displays, television and computer monitors, plotting tables, and glass screens.

Plastics and other synthetic materials

All plastic materials should be removed from the vessel or aircraft. In some cases, plastic and other synthetic materials that are integral to the structure and are unlikely to detach and present debris, ingestion or entanglement hazards should be detailed in the application for consideration by the department.

Insulation

Insulation material should be removed from the vessel or aircraft. Insulation is found surrounding fridges and freezers, cold and cool rooms, and refrigerated holds. It may also be found surrounding hot areas such as machinery spaces and funnel uptakes. The insulation material will typically be on bulkheads, deckheads and decks, and possibly beneath a false decking. It may be applied over the plate structure of the compartment or as a sandwich between metal plates (making it integral to the bulkhead, deck or deckhead).

In cold areas, typical insulation materials include polyurethane, polystyrene or wool fibre; cork may be found in older ships. Insulation is usually buoyant, so may create floating debris and pose an ingestion hazard for marine animals.

Unknown materials, wastes and residues in cargo areas

Any waste product or material of unknown origin or content should be considered hazardous and removed from the vessel or aircraft.

Residues in cargo areas should also be considered hazardous and removed.

Blackwater

Blackwater (sewage) should be removed from the vessel or aircraft. Sewage tanks must be drained or pumped clear; sewage lines must be removed or flushed clear. Sewage removed may need to be treated as quarantine waste. Advice should be sought from the Biosecurity section of the relevant department on handling and disposal requirements.

Any sewage treatment plant or equipment such as biological reactors, macerators and dosing systems should be removed or thoroughly cleaned. Some shipborne systems rely on chlorine-dosing of effluent; any chlorination systems should be cleaned or stripped, while ensuring personnel safety and preventing pollution.

Greywater

Greywater, including drainage from sinks, showers, laundries and dishwashers, should be removed. Tanks and drainage and transfer lines must either be removed, or pumped or flushed clear. Clean sea water may be used to flush these systems, with disposal in line with port or harbour requirements.

Hazardous chemicals

Applicants are advised that handling, storage and disposal of hazardous materials must be conducted in accordance with applicable federal, state or territory requirements. Applicants are required to investigate all potential hazardous materials and provide a clear evaluation of them

in the application. This may involve hiring experts or undertaking laboratory analyses, to prove the level of clean-up is sufficient and safe.

Applicants need to demonstrate there will be no environmental impact where items containing these hazardous chemicals are proposed to be left in place, based on the AWQG (where guidelines are provided).

Beryllium

The major source of beryllium in the environment is the combustion of fossil fuels. Beryllium is also present in vessels or aircraft as a metal alloy or a component of ceramic products. In particular, beryllium is present in warships in items such as heat sinks, insulators, radomes, silicon-controlled rectifiers, aerial coupling and impedance matching devices, ceramic insulating washers, springs, and electrical contacts. Beryllium is also used as an alloy in airframes.

In Australian warships, compartments containing beryllium components are normally clearly marked with a placard. However, applicants are advised that such markings may have been removed or defaced in the period between a ship's decommissioning and when it is made available for an artificial reef.

Beryllium can present a health hazard to clean-up personnel, particularly when in particulate form. Health hazards may include fumes from burning or overheating; inhalation of particulate matter from breaking, chipping or machining; and particles entering the body through cuts and abrasions or contact with the eyes and skin. Applicants are advised to consider the potential health impacts of beryllium when planning and implementing vessel clean-up programs.

Cadmium

In vessels and aircraft, cadmium may be present in brazing and bearing alloys, paint, plastics, batteries, heavy-duty electrical contacts, electronic components, and high-strength alloy steel bolts, studs and nuts that are cadmium-plated.

Cadmium, particularly its corrosion products and oxide fumes, is a potential health hazard to clean-up personnel, and is also a pollution risk. Cadmium materials should be identified, removed, and disposed of in accordance with applicable federal, state or territory requirements.

Copper

Copper is typically found in electrical cabling and the windings of electrical motors and generators.

Vessels and other structures intended for use by recreational divers should be stripped of all copper cabling because it poses a risk to divers. The structural failure of cable trays and other cable retainers is inevitable, so they should also be removed.

Lead

Lead, which is typically found in ballast blocks, batteries, shielding and other similar fittings, must be removed.

Mercury

All instruments, equipment and components containing mercury (including gyroscopes, capillary-type vacuum gauges, thermionic valves, thermometers, some types of laboratory equipment, some light switches and older radar displays) must be removed from the vessel or aircraft and disposed of appropriately.

Zinc

Zinc is usually found in the form of metal platings and coatings. It is also found in sacrificial anodes, which are fitted to the exterior hull and sea chests, and to internal seawater systems such as piping systems and coolers. Sacrificial anodes can increase metal concentrations in marine sediments and water, and external sacrificial anodes should be removed. Anodes should be removed from internal systems, if practical. Applicants need to demonstrate there will be no impact where anodes are proposed to be left in place, based on the AWQG (including comparison to trigger values for zinc and other metals in the anode).

Other metals

There are no specific requirements to remove other metals. The department will decide on a case-by-case basis whether other metals need to be removed.

Halogenated organic compounds

Brominated and chlorinated organic compounds such as polybrominated diphenyl ethers (PBDEs) and polychlorinated diphenyl ethers (PCDEs) are contaminants of concern owing to their toxic, persistent, and bio-accumulative nature. They are found in plastic components of electrical equipment and buoyancy foams. If electrical materials are left in situ during the preparation process, these compounds pose potential harm to marine plants and animals.

In their solid form, PCBs may be used as an impregnating agent in other solid materials (for example, insulation materials, deck coverings). Liquid PCBs are typically found in components and machinery such as transformers, capacitors and electrical ballast (for motors and fluorescent light fittings). PCBs can also be an additive in substances such as hydraulic fluids. Large-diameter (greater than 25 millimetres), high-voltage electrical cabling may be sheathed in an insulating jacket containing liquid PCBs, especially if built before 1980. PCBs may be present in vessels or aircraft in both solid and liquid form. In their solid form, PCBs may be used as an impregnating agent in other solid materials (for example, insulation materials, deck coverings). Liquid PCBs are typically found in components and machinery such as transformers, capacitors and electrical ballast (for motors and fluorescent light fittings). PCBs can also be an additive in substances such as hydraulic fluids. Large-diameter (greater than 25 mm), high-voltage electrical cabling may be sheathed in an insulating jacket containing liquid PCBs, especially if built before 1980.

All PBDEs, PCDEs, PCBs and any similar chemicals must be removed. Equipment suspected of containing liquid PCBs may only remain in place if it is certified as PCB-free by a laboratory registered with the National Association of Testing Authorities (NATA), and if requirements for other polluting material and diver safety preparations are met.

Refrigerants and air-conditioning fluids

All refrigerants and air-conditioning fluids must be removed from the vessel or aircraft. Applicants are advised that refrigerants and air-conditioning fluids may be ozone-depleting substances, and should be captured, stored and disposed of in accordance with applicable federal, state or territory regulations.

Some refrigeration plants use ammonia, which must be purged from the refrigeration plant; the entire system must be flushed clean or dismantled and removed.

Antifreeze and coolants

Antifreeze and coolant materials must be drained and removed from machinery.

Paints

A variety of paint coatings, including undercoats and primers, are used on ships and other marine platforms. These may include lead and zinc chromate primer coatings and coal tar epoxy overcoats, especially in older vessels. Before reef placement, applicants should consider the possibility of toxic paint coatings, such as anti-fouling, when planning and undertaking preparation activities.

Anti-fouling coatings

Applicants will need to identify the type of anti-fouling coating, and the associated active ingredients (for example, tributyltin (TBT), lead, copper, zinc), on the vessel or other structures. This is particularly important if the proposed dumping site is close to shellfish aquaculture or wild harvest operations, or to pristine environments near rocky reefs. In the case of biocide-release coatings, the application should state the age and condition of the coating.

To identify the type and concentration of biocide, applicants may need to arrange laboratory analysis of anti-fouling paint samples if this information is not available from other reasonably reliable sources.

Rubbish

☒ Vessel or aircraft preparation must prevent any rubbish from entering the water.

Debris and loose material

All loose material such as clean-up debris must be removed. The standard of cleanliness required is broom or vacuum clean.

Heavy or bulky fitted equipment that has been disconnected or moved for cleaning or inspection may remain in its original compartment if it does not threaten diver safety.

All other debris must be placed in a sealed compartment or structural tank underneath the largest section of the superstructure. For ship stability, the chosen space may also need to be below the waterline. Before sealing debris in the compartment or structural tank, both the compartment and debris must be inspected (see [Inspections](#)).

Introduced material

Vessels and other structures intended for placement cannot be used for the convenient disposal of other materials.

No new material can be introduced into the vessel or aircraft, whether structural or not, unless it will be permanent and either is intended to improve diver safety (for example, using weldmesh and angle iron to prevent access to some areas) or will provide information on the vessel (for example, plaques, markers).

Explosive scuttling

☒ For use of explosives during placement, details of the qualified shotfirer, placement and connection of detonators, and the shotfiring process, must be fully detailed in the application and Placement Plan. Points to consider:

- Vessels can be scuttled by opening seacocks, internal watertight doors and hatches, so that the vessel floods and founders.
- Vessels can be scuttled using explosive devices to remove hull sections, so that the vessel floods at a rapid rate and sinks in a more controlled manner.

- Exclusion zones around materials to be placed using explosives must remain in effect from the time the charges are set to when the material has been scuttled, checked clear of non-detonated explosives and declared safe.
- For explosive scuttling, the personnel engaged in transporting and setting the explosives must have qualifications and registration according with the explosive and dangerous goods regulations of the state or territory in which the vessel or other material is prepared for scuttling. Similarly, the explosive materials and methods used must accord with the explosive and dangerous goods regulations of the state or territory in which the vessel or other material is prepared for scuttling.
- If using explosive scuttling, everyone in the vicinity of the reef site should be informed immediately before reef placement with a warning signal that a detonation is about to occur.
- It must be ensured that all explosives and pyrotechnics have been detonated correctly. If an explosive or pyrotechnic has failed to detonate, the reef must be made safe before it can be accessed by recreational divers.

For more details on reef placement, see [Reef placement](#).

Inspections

☒ Applicants must provide details of any inspections of the proposed artificial reef material that have been conducted to date, including:

- the date and place of inspection
- the purpose of the inspection
- the name and qualifications of the inspector(s)
- a copy of the inspection report, detailing the outcomes and recommendations arising from the inspection
- work completed in response to inspection outcomes or recommendations.

Some artificial reef permit assessments will involve at least one inspection by a suitably qualified person(s) appointed by, and acting on behalf of, the department. The process is determined case by case, but the inspection(s) will focus on examining the material to determine its suitability, and the state of preparation for the proposed placement – particularly, the removal of potential pollutants, diver and navigation hazards, and making the material fit for purpose.

Although not all diver access modifications can be safely made before actual placement, applicants should clearly mark intended openings and other modifications before final inspection so that the inspector can gain a clear appreciation of planned arrangements.

5.2 Purpose-built

This section is currently under development to provide guidance on using purpose-built modules in the construction of artificial reefs. These guidelines provide general advice around the process of applying for a permit and points to consider.

Purpose-built artificial reefs must be sited appropriately, with adequate consideration of heritage matters and the input of relevant stakeholders (see [Stakeholders](#)). Special consideration must be given to the type of materials used in the construction of reef modules (see [Material selection](#)).

5.3 Repurposed infrastructure

This section is currently under development to provide guidance on using repurposed oil and gas or other infrastructure in the construction of artificial reefs.

Generally, the use of repurposed oil and gas or other infrastructure for placement as artificial reefs is only allowed if it has been removed from the ocean and thoroughly cleaned of any potential contaminants before placement. Proposed reefing of repurposed infrastructure will be assessed on a case-by-case basis, including cleaning and other requirements as proposed by the applicant. Repurposed infrastructure from land-based sources (such as mining infrastructure) must be thoroughly cleaned of any potential contaminants before placement as an artificial reef.

Repurposed infrastructure to be placed as an artificial reef must be sited appropriately, with adequate consideration of heritage matters and the input of relevant stakeholders (see [Stakeholders](#)).

Where oil and gas infrastructure is proposed for re-purposing as an artificial reef, applicants are encouraged to involve the owner of the infrastructure in the application process, as they are most familiar with the usage and history of the infrastructure.

Applicants must detail and justify the intended method of preparation and placement in the application, by way of a Placement Plan submitted as a separate document. The Placement Plan must include all preparation and placement activities, e.g., cutting of oil and gas infrastructure, craning and lift plan, potential vessels used, diver involvement, and human and navigational safety. For repurposed oil and gas infrastructure, the application must also include details on what is remaining at the infrastructure site, both above and below the mudline.

Oil and gas wellheads

If the proposed artificial reef is going to be located at the site of oil and gas wellhead infrastructure, the wellhead infrastructure must be treated as per relevant legislation and jurisdiction. Wellhead infrastructure should be considered for removal to the mudline with wellheads plugged and abandoned as per NOPSEMA or state and territory guidance, noting authorisation and/or approvals remain with these agencies. Wellhead infrastructure below the mudline does not form part of artificial reef applications or permits.

6 Information and resources

A wide range of information and resources is available to help applicants plan their artificial reef project. The department does not necessarily endorse the below resources and they are provided for information only. The requirements of the Sea Dumping Act, this guidance and the UNEP guidance take precedence at all times.

6.1 International guidelines, protocols and conventions

- [1989 guidelines and standards for the removal of offshore installations and structures on the continental shelf and in the exclusive economic zone](#) (International Maritime Organization Resolution A.672(16), adopted on 19 October 1989).
- [1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 \(as amended in 2006\)](#).
- [Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal](#) (adopted in 1989) and [Technical guidance to manage hazardous waste containing persistent organic pollutants and Mercury](#).
- [Guidance on the national implementation of the 1996 protocol to the London convention 1972](#) (adopted in 2001).
- London convention and protocol [Assessment Framework for Scientific Research involving Ocean Fertilisation](#) (2010).
- [London convention and protocol/UNEP guidelines for the placement of artificial reefs](#) (International Maritime Organization 2009).
- [Minamata Convention on Mercury](#) (adopted in 2013) and [Minamata Online 3: Technical guidelines on mercury waste management](#) (2022).
- [OSPAR Commission](#):
 - [Assessment of construction or placement of artificial reefs](#) (2009).
 - [OSPAR guidelines on artificial reefs in relation to living marine resources](#) (2013).
- [Revised specific guidelines for assessment of platforms or other man-made structures at sea](#) (International Maritime Organization 2019).
- [Stockholm Convention on Persistent Organic Pollutants](#) (adopted in 2004) and [What are Persistent Organic Pollutants \(POPs\)?](#) (2019).
- [UNESCO World Heritage Convention](#) website.

6.2 Australian Government and agencies

- [Australian and New Zealand Water Quality Guidelines for fresh and marine water quality \(AWQG\)](#) (Water Quality Australia 2018).
- [Airservices Australia](#) website.
- [Australian Communications and Media Authority](#) website.
- [Australian Fisheries Management Authority](#) website.
- [Australian Hydrographic Office](#) webpages providing information on sea dumping and chemical dump sites at sea:

- [Chemical munitions sea dumping off Australia](#) (Department of Defence 2018).
- [Sea dumping in Australia: historical and contemporary aspects](#) (Department of Defence & Department of the Environment and Heritage 2003).
- Australian Marine Parks website providing guidance on [Commonwealth marine protected areas](#).
- Department of Agriculture, Fisheries and Forestry [Biosecurity for vessels](#) website.
- Department of Climate Change, Energy, the Environment and Water:
 - [Australian Heritage Database](#).
 - [Australasian Underwater Cultural Heritage Database](#) (for underwater cultural heritage such as shipwrecks, artefacts and aircraft).
 - [Assessments and approvals under the EPBC Act](#) website and guidelines on matters of national environmental significance.
 - [Biodiversity](#) website (for threatened, migratory and listed marine species and ecological communities).
 - [Compliance Policy](#).
 - Guidelines for working in the near and offshore environment to protect Underwater Cultural Heritage (2023).
 - [Energy](#) webpage.
 - [PFAS National Environmental Management Plan 2.0](#) (2020) (PFAS NEMP) and updated versions.
 - [Protected Matters Search Tool](#).
 - [Significant Impact Guidelines 1.1 - Matters of National Environmental Significance](#) (2013).
 - [Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies](#) (2013).
 - [The Interim Engaging with First Nations People and Communities on Assessments and Approvals under Environment Protection and Biodiversity Conservation Act 1999 \(interim guidance\)](#) (2023).
- [Department of Industry, Science and Resources](#) website.
- [Geoscience Australia](#) website.
- [Great Barrier Reef Marine Park Authority](#) website.
- [National Environment Protection \(Assessment of Site Contamination\) Measure 1999](#).
- [National Native Title Tribunal](#) website.
- [National Offshore Petroleum Safety and Environmental Management Authority](#) website.
- [National Offshore Petroleum Titles Administrator](#) website.

6.3 General information

- [Artificial reefs in Australia: a guide to developing aquatic habitat enhancement structures](#) (Recfishwest 2017).
- Buchanan, JB 1984, 'Sediment analysis', in NA Holme & AD McIntyre (eds), *Methods for the study of marine benthos*, Blackwell Scientific Publications.
- [Coastal artificial reef planning guide](#) (Joint Artificial Reef Technical Committee of the Atlantic and Gulf States Marine Fisheries Commissions 1998).
- [Guidelines for marine artificial reef materials \(2nd ed\)](#) (Gulf and Atlantic States Marine Fisheries Commissions 2004).

- [Guidance on Environmental Data Verification and Data Validation](#) (United States Environmental Protection Agency 2002) and [Guidance on Systematic Planning Using the Data Quality Objectives Process](#) (United States Environmental Protection Agency 2000).
- [How to Safely Remove Asbestos, Code of Practice](#) (Safe Work Australia 2011).
- [Monitoring and Sampling Manual, Environmental Protection \(Water\) Policy 2009](#) (Queensland Monitoring and Sampling Manual) (Department of Environment and Science 2018).
- [National artificial reef plan \(as amended\): guidelines for siting, construction, development, and assessment of artificial reefs](#) (United States Department of Commerce and National Oceanic and Atmospheric Administration 2007).
- [Office of National Marine Sanctuaries: science review of artificial reefs](#) (United States Department of Commerce 2012).
- [Practical guidelines for artificial reefs in the Mediterranean and the Black Sea](#) (Food and Agriculture Organization of the United Nations & General Fisheries Commission for the Mediterranean 2015).
- [Sampling design part 1 - application Contaminated Land Guidelines](#) and [Sampling design part 2 - interpretation Contaminated Land Guidelines](#) (New South Wales Environment Protection Authority 2022).
- [Society of Ecological Restoration](#) website.
- [Underwater Cultural Heritage Guidance for Offshore Developments](#) (Department of Environment and Energy 2019).

6.4 Vessels and aircraft

- [Australian ballast water management requirements](#) (version 8, Department of Agriculture, Water and the Environment 2020).
- [Clean-up standard for disposal at sea of vessels, aircraft, platforms & other structures](#) (revision 4, Environment Canada 2015).
- [National biofouling management guidelines for non-trading vessels](#) (version 1.0, Department of Agriculture and Water Resources 2009).
- [National guidance: best management practices for preparing vessels intended to create artificial reefs](#) (US Environmental Protection Agency & US Maritime Administration 2006).
- *Policy issues relating to the use of vessels as artificial reef material in Florida* (Florida Fish and Wildlife Conservation Commission 2001).
- [Resolution MEPC.210\(63\) 2012 Guidelines for safe and environmentally sound ship recycling](#) (International Maritime Organization 2012).
- [Revised specific guidelines for the assessment of vessels](#) (International Maritime Organization 2016).
- [Technical guidelines for the environmentally sound management of the full and partial dismantling of ships](#) (Secretariat of the Basel Convention 2003).
- [Towing and pushing of smaller construction barges](#) (Australian Maritime Safety Authority 2023).

6.5 Purpose-built

Under development.

6.6 Repurposed infrastructure

Under development.



Appendix 1 Placement Plan Template



Australian Government

Department of Climate Change, Energy,
the Environment and Water

Placement Plan Template for artificial reef permit

Background

This template is intended to be used in conjunction with the National artificial reef guidelines and artificial reef placement permit application form on the department's [Sea Dumping webpage](#). The National artificial reef guidelines set out a framework for permit applications under the [Environment Protection \(Sea Dumping\) Act 1981](#) (the Sea Dumping Act). The guidelines will help an applicant to fill out the application form and provide the department with adequate information on their application. This template cannot be used without first reading the National artificial reef guidelines and artificial reef placement permit application form.

After a sea dumping permit has been issued, applicants are responsible for safe placement and long-term monitoring and management of the artificial reef. The Placement Plan includes all details up to and including the placement of the artificial reef, including the post-placement inspection and report, with details beyond this point included in the Long-Term Management Plan (LTMP). From a permit perspective, the duration that the reef will be in place commences when the placement is complete. A template is also available for an artificial reef LTMP on the department's [Sea Dumping webpage](#).

About this template

This template should be used by applicants for an artificial reef Placement Plan. The Placement Plan is to be attached to the application form as a separate standalone document for approval. The application form is to provide an overview of the more detailed information provided in the Placement Plan.

Where details are unknown (e.g., vessel or placement date), applicants can provide these details by way of an updated Placement Plan at least 90 days prior to the placement.

The Placement Plan must include all preparation and placement activities. Applicants will need to determine the most appropriate method of material preparation and placement for their proposed artificial reef. Immediately after reef placement, the site and reef material must be inspected by suitably qualified members of the placement team with details of the inspection must be sent to the department in a post-placement inspection report.

The applicant is required to populate the information under each of the headings and delete all instructional text (including all text including and above 'Template for use by applicants starts on next page') before submission. The Placement Plan should also include a cover page, document version control details including contact details for applicant, table of contents including table of tables, table of figures, table of abbreviations and a reference list where specified.

Template for use by applicants starts on next page

Applicant to delete this text and insert cover page

Applicant to delete this text and insert document version control details including contact details for applicant

Applicant to delete this text and insert table of contents including table of tables and table of figures

Applicant to delete this text and insert table of abbreviations

The following questions must be detailed in the Placement Plan. This template outlines the minimum requirements only and the applicant is to include additional relevant information as required depending on the nature of the artificial reef application. The National artificial reef guidelines provide further information regarding what should be considered for inclusion.

1. Introduction

The Placement Plan should provide a brief introduction to the artificial reef project that is the subject of the permit application.

The introduction should provide a brief overview of:

- the purpose of the Placement Plan
- the key elements of the reef including reef design and any repurposing of materials
- the location of the reef including proximity to protected areas
- the main potential impacts relevant to placement activities and strategies planned to address the impacts as a table.

2. Method and timing of placement

Where details are unknown (e.g., vessel or placement date), applicants can provide these details by way of an updated Placement Plan at least 90 days prior to placement.

Provide full details on the proposed method of placement, including:

- the entire procedure for all preparation and placement activities (e.g., cutting of oil and gas infrastructure, crane and lift plan, potential vessels used, diver involvement, and human and navigational safety)
- if the proposal is to place material in stages, give the quantity per placement and proposed frequency of placements
- anchoring procedures for the placement vessel(s) (including current maps showing anchor points)
- exclusion zones and notifications
- disconnection from the vessel (if used for transport)
- any use of explosives and related safety procedures
- the person in charge of the placement operation notifications.

Date(s) and time(s) of proposed placement(s):

- include proposed placement date and latest possible placement date
- a placement window can be provided where the exact date is not known.

Provide full details on the proposed method of transport to the site, including:

- the place where the material will be loaded for transport (please provide a map as well as a description)

- full details on how the material will be loaded and secured
- the route from loading to the placement site.

Details of any vessel(s) to be used for transport and placement, including:

- name of vessel(s)
- owner of the vessel(s)
 - name
 - street address
 - postal address (if different to the street address)
 - phone/mobile
 - email.

3. Re-purposed vessels and aircraft

In addition, where relevant, for placement of vessels and aircraft as artificial reefs, provide full details of:

- intended method to be used to sink the vessel or aircraft
- installation of flooding mechanisms
- the explosives plan and method to verify that all explosives are detonated including details of authorised shot firer (if applicable).

4. Re-purposed infrastructure

In addition, where relevant, for placement of repurposed infrastructure as artificial reefs, provide full details of:

- all preparation activities including cutting in situ and cleaning
- what is remaining at the infrastructure site, both above and below the mudline.

Generally, the use of repurposed oil and gas or other infrastructure for placement as artificial reefs is only allowed if it has been removed from the ocean and thoroughly cleaned of any potential contaminants before placement. Proposed reefing of repurposed infrastructure will be assessed on a case-by-case basis, including cleaning and other requirements as proposed by the applicant.

Applicants are encouraged to involve the owner of the infrastructure in the application process, as they are most familiar with the usage and history of the infrastructure.

5. Quality and safety assurance

Provide full details of the quality assurance methods to be used for the site, including:

- assurance that the artificial reef will sink and that significant fragments will not be dispersed (if applicable)
- how the artificial reef's final position on the seabed will be confirmed
- how movement of the artificial reef will be prevented
- contingency plans for unplanned events such as:
 - foundering or flooding of the material, either during transfer to the placement site or once moored at the site before placement
 - inability to reach the specified site
 - incomplete sinking or break-up of the reef material during sinking
 - undetonated explosives or pyrotechnics (where relevant)
 - reef components are not in the correct location or orientation
 - pollution (for example, release of oil or floating debris), particularly during transfer to the site and immediately after placement
 - other potential environmental impacts such as physical damage to coral or seagrass or interactions with marine animals.

Provide full details of the safety assurance methods to be used for the placement process, including:

- engineering and safety standards
- the person responsible for implementing such standards (where not known at the time of application, provide a list of minimum qualifications and experience that will be held by the personnel involved)
- personnel involved in transferring and placing material, setting explosives, and establishing and maintaining exclusion zones must be appropriately qualified and experienced
- steps to be taken to ensure diver safety (if applicable)
- contingency measures such as if the artificial reef becomes unsafe for diving and must be closed permanently or until made safe.

Applicant to insert reference list

Appendix 2 Long-Term Management Plan Template



Australian Government

Department of Climate Change, Energy,
the Environment and Water

Long-Term Management Plan Template for an artificial reef permit

Background

This template is intended to be used in conjunction with the National artificial reef guidelines and artificial reef placement permit application form on the department's [Sea Dumping webpage](#). The National artificial reef guidelines set out a framework for permit applications under the [Environment Protection \(Sea Dumping\) Act 1981](#) (the Sea Dumping Act). The guidelines will help an applicant to fill out the application form and provide the department with adequate information on their application. This template cannot be used without first reading the National artificial reef guidelines and artificial reef placement permit application form.

After a sea dumping permit has been issued, applicants are responsible for safe placement and long-term monitoring and management of the artificial reef. A detailed outline of the monitoring and management procedures must be included in a Long-Term Management Plan (LTMP). The LTMP commences where the activities outlined in a Placement Plan finish, that is, once the reef is verified to be placed as per the reef design. A template is also available for an artificial reef Placement Plan on the department's [Sea Dumping webpage](#).

About this template

This template should be used by applicants for an artificial reef LTMP. The LTMP is to be attached to the application form as a separate standalone document for approval. The application form is to provide an overview of the more detailed information provided in the LTMP.

The LTMP must detail the procedures that will be undertaken to monitor compliance with the permit (should it be granted), monitor the performance of the reef (to determine whether project goals and objectives are being met and risks are being appropriately managed), and to outline the end-of-life decommissioning plan and allow for rehabilitation in the event of damage to the marine environment.

The applicant is required to populate the information under each of the headings and delete all instructional text (including all text including and above 'Template for use by applicants starts on next page') before submission. The LTMP should also include a cover page, document version control details including contact details for applicant, table of contents including table of tables, table of figures, table of abbreviations and a reference list where specified.

Template for use by applicants starts on next page

Applicant to delete this text and insert cover page

Applicant to delete this text and insert document version control details including contact details for applicant

Applicant to delete this text and insert table of contents including table of tables and table of figures

Applicant to delete this text and insert table of abbreviations

The following questions must be detailed in the LTMP. This template outlines the minimum requirements only and the applicant is to include additional relevant information as required depending on the nature of the artificial reef application. The National artificial reef guidelines provide further information regarding what should be considered for inclusion.

1. Introduction

The LTMP should provide a brief introduction to the artificial reef project that is the subject of the permit application.

The introduction should provide a brief overview of:

- the purpose of the LTMP
- the key elements of the reef including reef design and any repurposing of materials
- the location of the reef including proximity to protected areas
- the main potential impacts relevant to the long-term monitoring and management of the reef impacts
- procedures that will be undertaken to monitor compliance with the permit
- procedures that will be undertaken to monitor the performance of the reef
- the end-of-life decommissioning plan.

2. Goals and objectives

Describe the goals and objectives of the artificial reef proposal including:

- demonstrating how the reef will be fit for the intended purpose
- outlining how the objectives of the reef will be measured
- outlining any key issues or reporting areas identified during the investigation and planning phase.

3. Long-term monitoring and adaptive management

Describe the monitoring objectives and adaptive management measures that reflect the key impacts of the proposed reef including:

- clearly state the objectives to help determine whether the artificial reef is achieving its objectives
- describe the key impacts of the artificial reef on the marine environment, both at the proposed site and surrounding areas, and socio-economically and culturally (linked to the outcomes of the comprehensive impact assessment undertaken as part of the application)
- provide timelines for monitoring (frequency and duration of monitoring)

- provide full details on roles and responsibilities (i.e., who will undertake the monitoring)
- present the long-term monitoring and adaptive management in a summary table to clarify how it will be undertaken including for:
 - stability and structural integrity to ensure that the artificial reef does not create a hazard to the marine environment or other users over time
 - physical and chemical environment
 - marine plants and animals at the artificial reef (e.g., protected species, target species for restoration or recreation, pest species) and/or in surrounding areas, depending on the scope, scale and risk of the project.

Long-term monitoring and adaptive management must be presented in a summary table to clarify how it will be undertaken. Insert a table with the column headings: aspect (reporting area), impacting pathway, objective, monitoring method, monitoring frequency, data type, responsibility, threshold to trigger mitigation and mitigative action(s) (see Attachment 1 for an example table).

4. Financial assessment

Demonstrate the ability to make a long-term commitment to ongoing management and monitoring of the proposed reef over the whole-of-life of the project, including:

- cost estimate and evidence of ongoing funding to complete the project
- details of proposed suitably qualified person(s) that will undertake the monitoring.

5. Modifications, repairs and decommissioning

Describe modification, repair or removal procedures, including:

- mitigative measures to protect the marine environment or users of the area
- an emergency and incident response plan if the artificial reef becomes unsafe
- a decommissioning decision-making framework and plan in case trigger values are exceeded and for the end of permit life
- demonstrated resources, both financial and personnel, to undertake modifications or repairs.

Decommissioning is the default option at the end of the life of the permit, however a reef can be proposed to be left in place for perpetuity where it does not pose any risk (for example, to the environment, navigation or the safety of users) and is meeting its objectives. The permit holder would need to survey and assess the reef and submit a report outlining whether they wish to leave the reef in place, partly remove the reef, or remove the whole reef. The report would need to be submitted during the second last year of the permit, that is, reporting during year 28 for a 30-year permit.

6. Reporting

Describe reporting requirements including:

- a summary of the reporting commitments associated with the LTMP, which may include:
 - a list of required reports (e.g., monitoring, environmental incidents, auditing)
 - a description of report content for each required report
 - the schedule for preparing a report including recipient(s)
- the audit and review process that will be used to ensure ongoing compliance and adjust monitoring as required
- availability of the LTMP (that is, where it will be accessible, such as online access).

Applicant to insert reference list

Attachment 1 Example LTMP table

Aspect (or Reporting area)	Impacting pathway	Objective	Monitoring method	Monitoring frequency	Data type	Responsibility	Threshold to trigger mitigation	Mitigative action(s)
Threatened marine species	Increased aggregation, encounters, entanglement, incidental capture, or death of a threatened species or protected species.	Reduce the likelihood of impacts on any threatened species, including incidental capture and observing aggregation and interactions	i) Survey by specialist ii) Reports by fishermen or reef users	i) Monthly during breeding season ii) Monthly boat ramp surveys during breeding season	i) Quantitative (video transects) ii) Qualitative (anecdotal reports)	Permit holder	2 confirmed grey nurse sharks sighted on any single occasion during monitoring, or 5 or more confirmed individuals are consistently found on the artificial reef throughout the year OR 2 or more incidental deaths of marine turtles in one year	Build awareness of grey nurse sharks presence through social media posts and Fisheries advisory activities AND Review residency data (number of individuals, duration of visit, season etc.) against risk of impacts on grey nurse sharks with key grey nurse shark experts (as agreed with DCCEEW), and DCCEEW. If agreed experts deem risk of recreational fishing impacts have increased and may result in significant impacts to the threatened shark population, introduce gear restrictions (e.g., no bottom fishing) and/or fishing closure (e.g., during breeding season).

