

# Guidelines for Long-term Maintenance Dredging Management Plans

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# Introduction

## Background

The Queensland and Australian Governments developed the Reef 2050 Long-Term Sustainability Plan<sup>1</sup> (Reef 2050 Plan) in response to concerns about the management of the Great Barrier Reef (GBR) by the World Heritage Committee in 2011. Reef 2050 Plan is aimed at strengthening Australia's management of the GBR, and providing a blueprint for the continuing efforts to preserve it and its Outstanding Universal Value (OUV).

The Queensland Government launched the Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports<sup>2</sup> (MDS) on 30 November 2016. This addressed requirements of Reef 2050 Plan Water Quality Action number 16 (WQA16), which requires the following:

*“Develop a State-wide coordinated maintenance dredging strategy which:*

- *Identifies each port's historical dredging volumes and likely future requirements and limits*
- *Identifies appropriate environmental windows to avoid coral spawning, seagrass recruitment, turtle breeding and weather events*
- *Examines opportunities for the beneficial reuse of dredge material or on-land disposal from maintenance activities*
- *Establishes requirements for risk-based monitoring programs.”*

The MDS aims to provide certainty to the ports industry and to the wider community that the economic and social contribution of ports is maintained, while ensuring the continued protection of Queensland's environmental assets. The MDS presents a standardised long-term maintenance dredging management framework (MDS Framework) as per **Figure 1**.

**Figure 1: MDS Framework**



<sup>1</sup> <http://www.environment.gov.au/marine/gbr/long-term-sustainability-plan>

<sup>2</sup> <http://www.tmr.qld.gov.au/business-industry/transport-sectors/ports/maintenance-dredging-strategy>

Principle 1 of the MDS recommended the development and implementation of Long-term Maintenance Dredging Management Plans (LMDMPs) in accordance with the MDS Framework, addressing operational needs, environmental risks, monitoring and adaptive actions that can improve whole-of-system understanding, the certainty of environmental outcomes and stakeholder confidence. Action 1 of the MDS requires the development of guidelines to assist each Great Barrier Reef World Heritage Area (GBRWHA) port in preparing a LMDMP consistent with the requirements of the Queensland Government. These guidelines can be applied to ports Queensland-wide. This guideline must be read in conjunction with relevant legislation.

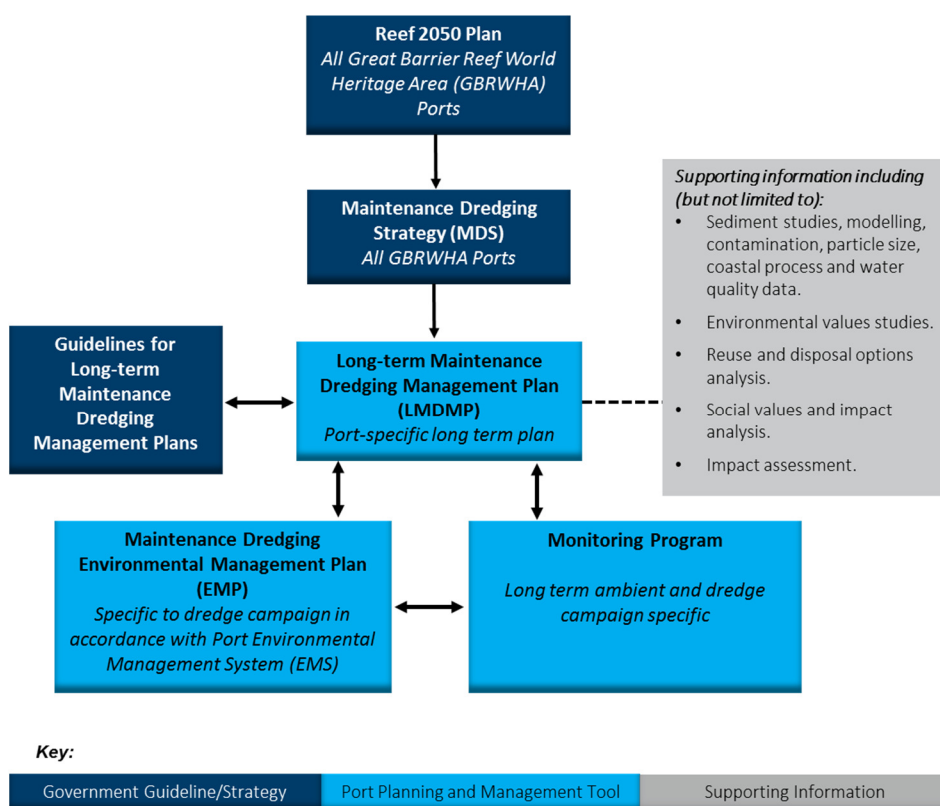
LMDMPs are prepared during the “Select Option” phase of the MDS Framework. LMDMPs are to take into account learnings from the full cycle of the MDS Framework to determine the best way to plan and manage the port’s maintenance dredging needs. Key elements from the MDS Framework should be addressed in the LMDMP, however it is not expected that all elements will be specifically covered.

LMDMPs are not a statutory component of the port regulatory framework and the State will not have an ‘approving’ role for them. However, it is anticipated that their development and the continuous improvement process that they embody will lead to greater transparency and improved environmental outcomes. If ports wish to use LMDMPs to support statutory assessment processes for maintenance dredging and any associated activities, they should consult with the relevant State and Commonwealth regulators during the preparation of the LMDMP. The Queensland Ports Association will continue to support improvement by identifying and sharing best and good practice approaches to dredging management amongst all GBR ports.

## Context

These Guidelines support the MDS by providing State guidance on long term planning and management approaches which should be applied to maintenance dredging of ports in the GBRWHA (refer **Figure 2**).

**Figure 2: Planning and implementation mechanisms for maintenance dredging of ports Queensland wide<sup>3</sup>**



<sup>3</sup> GBRWHA Ports are mentioned specifically in Figure 2 as the Reef 2050 and MDS specifically relate to GBRWHA ports, however, these Guidelines can be applied to ports Queensland wide.

A summary of the role and content of each of these mechanisms is provided below:

### **Maintenance Dredging Strategy**

The strategy was released in November 2016 and provides a strong risk-based framework for sustainable, leading practice maintenance dredging. It:

- sets the overall vision and direction for maintenance dredging at all GBRWHA ports<sup>4</sup>
- identifies broad level actions
- is a specific action developed as part of the Reef 2050 Plan.

### **Long-term Maintenance Dredging Management Plan (LMDMP)**

A plan used by individual ports, developed in a transparent manner and aimed at creating a framework for continual improvement in environmental performance. It should include:

- objectives (including maintain safe navigation, minimise impacts to local values)
- an understanding of port-specific sedimentation conditions and processes
- management approaches (including dredge avoidance and reduction)
- an assessment of beneficial reuse options and a process for ongoing review of these
- long-term dredging requirements based on sediment rates, port safety and port efficiency needs
- a strong stakeholder focus
- a strong risk-based framework for environmental management<sup>5</sup>.
- identified material risks, detail the important environmental values that need to be managed, the outcomes that are sought and the means through which these outcomes will be achieved
- key local controls, including an analysis of relevant local environmental windows identified to manage impacts on coral spawning, seagrass recruitment, turtle breeding and weather events. The Maintenance Dredging Environmental Management Plan (EMP) will provide detailed campaign-specific operational controls, and risk treatments for less material risks
- governance arrangements, including the process for performance auditing against the LMDMP
- a long-term focus of 10 or more years with continual improvement processes as improvement opportunities present nested within a minimum 5-yearly review framework.

### **Maintenance Dredging Environmental Management Plan**

The Maintenance Dredging EMP is to be developed in alignment with the Environmental Management System (EMS) for the port to ensure appropriate standard of risk assessment, quality assurance and document control. It details the specifics of managing a single dredging campaign and should include the following:

- approval conditions
- risk assessment in accordance with the framework outlined in the LMDMP
- relevant management threshold triggers (e.g., water quality, seagrasses, and corals, as determined by the risk framework)
- any specific environmental windows to be applied to the planned campaign

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<sup>4</sup> While Action 1 of the MDS specifically identifies GBRWHA ports specifically, the framework established as part of the MDS can be applied to ports Queensland wide

<sup>5</sup> Based on ISO31000 methodologies and considering a suite of risk mitigations as outlined in PIANC Reports 100 *Dredging Management Practices for the Environment* and 108 *Dredging and Port Construction Around Coral Reefs*.

- specific, targeted management and mitigation measures (including project-related and process-related management actions) applying to the campaign, and
- details on how these management measures align with the Port's overall EMS.

### **Environmental monitoring**

Environmental monitoring is conducted to monitor the effects of dredging activities and inform adaptive management. Environmental monitoring should include:

- Port specific program addressing values and risks.
- Monitoring at each port should contain three parts; the first is the baseline and ambient monitoring and the two other parts are campaign specific:
  1. baseline (broader whole-of-port monitoring designed to establish a baseline and typically followed by ambient monitoring)
  2. impact detection (approvals compliance)
  3. real-time adaptive management when the level of risk determines that it is needed.

Monitoring results, including those from real-time adaptive management, should be reviewed and the outcomes of reviews incorporated at relevant timeframes to ensure that the environmental effects of dredging activities are managed effectively.

EMPs and the environmental monitoring program should be reviewed and updated after the completion of each dredge campaign in accordance with the requirements of the relevant regulator.

The tiered mechanisms above provide a comprehensive approach for planning and managing maintenance dredging over both the long-term and for short-term specific dredging campaigns. This structure provides consistency in achieving a comprehensive and strategic approach with respect to maintenance dredging and associated environmental management, which will provide benefits to port authorities and regulators over the long term.

In addition to the above, there may be other management documents required to support the existing statutory assessment processes for maintenance dredging and associated activities with the Australian Government Department of the Environment and Energy and Great Barrier Reef Marine Park Authority. Synergies between the LMDMP and these other management documents should be sought by ports where possible/practical to enhance implementation and compliance outcomes.

## **Purpose of the guidelines**

These guidelines have been designed to assist ports in determining the content, information standard, communications and processes that are expected of a LMDMP. LMDMPs are a plan to ensure a robust long-term approach to the planning, consultation, monitoring and reporting of maintenance dredging activities. The guidelines also outline the Queensland Government's expectation with respect to continued improvement in maintenance dredging management, environmental performance, transparency and accountability. The key audience for the LMDMP is the port staff responsible for any aspect of maintenance dredging. Secondary audiences are regulators, port customers and interested stakeholders.

The content outlined in these guidelines is not exhaustive and is intended to be used in conjunction with other public policy and industry guideline documents as well as relevant State and Commonwealth legislation, including but not limited to:

Commonwealth:

- *Environment Protection (Sea Dumping) Act 1981*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Great Barrier Reef Marine Park Act 1975*

State:

- *Sustainable Ports Development Act 2015*
- *Environmental Protection Act 1994*
- *Fisheries Act 1994*
- *Coastal Protection and Management Act 1995*
- *Marine Parks Act 2004*
- *Transport Infrastructure Act 1994*

The Guideline should also be used in conjunction with the reference materials outlined in section 5 at the end of this document.

## Guiding principles

The development and implementation of each port LMDMP will be guided by the Reef 2050 principles for the management and protection of the World Heritage Area and the applicable principles from the MDS <sup>6</sup>:

- developing the knowledge base, using the best science available
- avoiding or minimising the need for maintenance dredging
- application of the principles of ecologically sustainable development
- maintaining and enhancing environmental values, including the OUV of the GBRWHA
- look for opportunities to deliver environmental protection, restoration or enhancement outcomes (working with nature principles)
- application of comparative analysis to determine the most suitable solutions
- application of adaptive management and continuous improvement processes
- reporting evaluated performance and providing access to data and information from monitoring
- favouring transparency, consultation with key stakeholders and values-based assessment.

## Framework for implementation

### LMDMP production and publication

Port Authorities are required to progress LMDMPs for maintenance dredging for each of their ports as a priority with the expectation that they will be completed and publicly available by 31 December 2018.

The LMDMP should be published on the port's website providing transparency and to support stakeholder involvement.

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<sup>6</sup> Reference can be made to the principles of the Reef 2050 Cumulative Impact Management and Net Benefit draft policy documents which are being developed to provide guidance on how to reduce threats and improve the Reef's resilience



## Supporting Information

Maintenance dredging and disposal activities reporting together with data and information used in the development of the LMDMP should be published on the port's website in an accessible and timely manner.

In alignment with other Reef 2050 Plan commitments ports should ensure data is made available to the Reef Integrated Monitoring and Reporting Program (RIMReP).

## Stakeholder engagement

LMDMPs should be underpinned by the best available science and a strong stakeholder focus with consideration of environmental, social and economic values incorporated transparently into decision making. In developing LMDMPs, it will be important to understand not only the values that are present through monitoring and assessment results, but also the values that are important to port users, regulators, local community, non-government organisations and other interested parties. Decisions and actions on LMDMPs should provide for broad community involvement on issues which affect them.

Once ports have an understanding of what values are important, they can use this information to help inform their analysis of the potential management options that are available. When a set of options have been identified, it will then be necessary to undertake a comparative analysis and identify the most appropriate option to adopt. All of these considerations should occur well in advance of a formal approvals process.

Technical Advisory and Consultative Committees (TACCs) focus on providing external advice to ports on priority environmental, social and economic issues and should be used by ports as a way of ensuring representation of a broad range of stakeholder interests in the decision-making process. TACCs are an appropriate mechanism for ports to engage with stakeholders as part of the development and oversight of LMDMPs. The Queensland Government expects that ports will utilise TACCs both during and after the development of LMDMPs including:

- Early engagement with TACCs to gain an understanding of the values that are important to stakeholders before any concrete plans are established.
- TACC participation in the comparative analysis process, enabling stakeholder consideration and feedback on the options development process to determine and assess the alternatives and assist in determining the most appropriate option.
- TACCs will review the performance and effectiveness of specific dredging campaigns, consider key learnings from the review and provide advice on whether the LMDMP requires updating to reflect any of these learnings. This will enable ports to understand, from a stakeholder's point of view, how effective were the options chosen and whether there are better ways of undertaking dredging activities in the future.
- TACC participation in the updating and renewal of LMDMPs to ensure LMDMPs reflect any learnings or improvements identified during dredging campaigns.
- The TACCs can be used by ports to consider and respond to any concerns raised following the finalisation of the LMDMP including those raised by the general public.

TACC membership should include regulators, community members and other stakeholders. To ensure good outcomes are achieved it is important that the members of a TACC have appropriate representation with sufficient skills and expertise. TACC function and effectiveness is enhanced by transparency in their membership, their mandate, their access to information upon request, their consensus-forming and reporting mechanisms, their Minutes or communiques, and by transparency in the port's response to TACC recommendations.

The LMDMP should document the list of stakeholders consulted, produce a summary of the concerns raised, and provide a description of how raised concerns have been considered and addressed. Once a LMDMP is finalised, it is important that the outcomes of the LMDMP are reported on in a way that is easily accessible and understandable by the general public.

## Comparative analysis process

While all ports are very different, a consistent, consultative, robust, transparent and repeatable process should be used within each port to assess options and determine preferences for managing maintenance dredging and disposal requirements. In essence, ports need to have a thorough understanding of their local environmental values, and this understanding should lead to discrimination between options (i.e. any fatal flaws from an environmental perspective are to be ruled out up front). Description of comparative analysis processes should include the criteria used to assess options, consultation processes used, how consultation feedback was addressed, and what the final outcomes were after responding to feedback.

The comparative analysis process can use a range of different tools but it is important that evaluations weigh a range of criteria to determine the most sustainable short and long-term solutions. Criteria should include environment, human health, cost, time, social, operational, technical and other relevant matters. The TACC should play a pivotal role in reviewing the comparative analysis method including the criteria and the weightings to be applied to individual criterion. It is essential that this method is scalable depending on the nature and complexity of the port.

A comparative risk assessment of alternatives will be necessary where the *Environment Protection (Sea Dumping) Act 1981* and Annex 2 of *1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972* (the London Protocol) is to apply. The assessment will need to consider human health risks, environmental costs, hazards (including accidents), economics and exclusion of future uses; with reasons to be given for why alternatives are unsuitable. Where alternative disposal options exist without undue risks to human health or the environment, or disproportionate costs, they must be prioritised.

## Updates to LMDMPs

To facilitate the continual improvement of maintenance dredging practices that maintain and promote ecosystem health and resilience, Queensland ports must review their LMDMPs at least every 5 years, and where necessary make revisions to their LMDMPs to ensure they reflect the most up to date understanding of risk, sedimentation processes, options available for sediment management including re-use or disposal, and the management of the impacts of maintenance dredging.

Reviews should consider the question of whether the outcomes (of managing maintenance dredging and disposal impacts) are consistent with the objectives detailed in the LMDMPs.

## Transitional arrangements

The development and implementation of LMDMPs that address operational needs, environmental risks, monitoring and adaptive actions are necessary to improve the certainty of environmental outcomes and stakeholder confidence. Ports need to maintain operational continuity, and therefore undertake maintenance dredging in accordance with existing approvals and long-term plans, while LMDMPs are being developed.

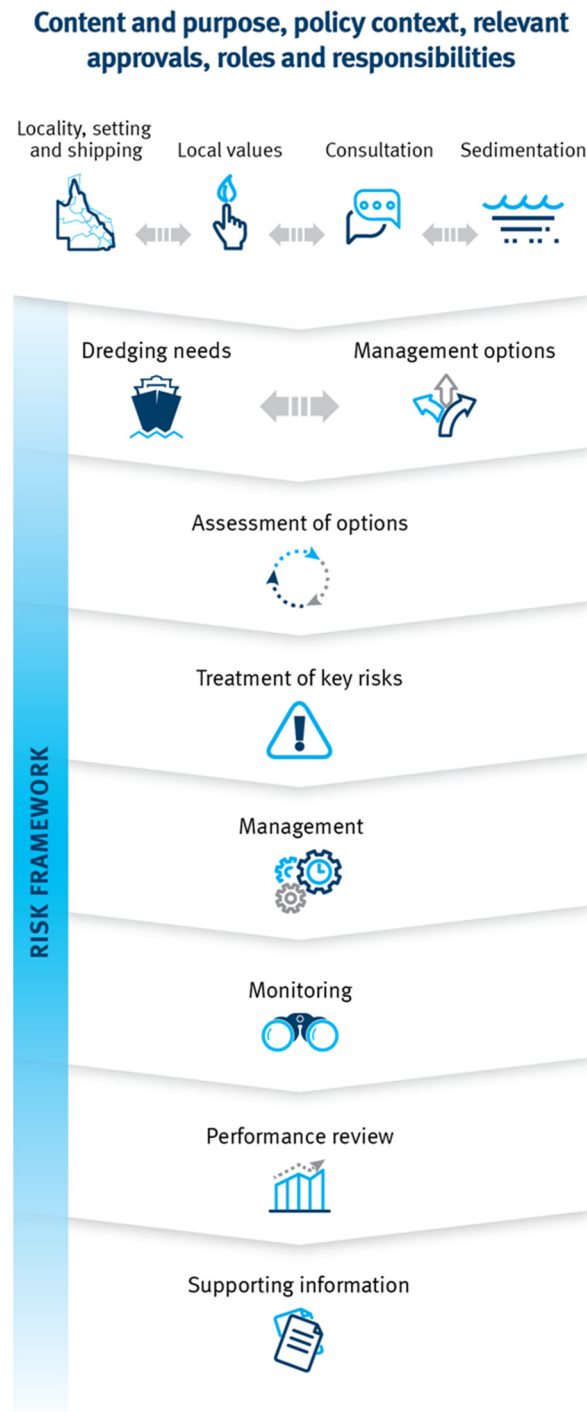
It is recognised that a number of ports already have existing long-term management plans for maintenance dredging associated with statutory approvals that extend beyond 2018. These existing plans do not replace the need to develop a LMDMP in accordance with this Guideline by 31 December 2018. If the LMDMP development process identifies material improvements, ports are expected to investigate opportunities and incorporate these improvements where feasible. Ports should consult with regulators to manage any transitional arrangements for existing management plans associated with statutory approvals.

# LMDMP content

This section provides specific guidance to practitioners on the typical content of a LMDMP. The LMDMP is an opportunity to synthesise and summarise management approaches, processes and information that has been gathered through related studies. Additionally, it sets the overall strategy and direction on how maintenance dredging activities will be planned, governed and implemented in the long term.

The LMDMP content map (Figure 3) provides a road map of the desired content of a LMDMP. Content descriptions are related by icons to the elements of the graphic.

**Figure 3: Long Term Maintenance Dredging Management Plan Content Map**



# 1. Introduction

The introduction to the LMDMP outlines the context and purpose of the LMDMP and makes clear what the port's overriding objectives are in relation to the management of sediment associated with maintenance dredging at the port. In describing the context, ports should outline:

- the objectives and purpose of the LMDMP
- the scope of the LMDMP in terms of spatial extent and activities covered
- LMDMP review timeframe and process
- the policy context (e.g. Reef 2050 Plan and the MDS)
- details of any existing or required approvals, relevant conditions and any other statutory obligations
- governance arrangements which apply to the development and delivery of the LMDMP and maintenance dredging activities, including:
  - roles and responsibilities of port authority and port customers
  - stakeholder consultation and involvement during the life of the LMDMP, including TACC terms of reference and membership
  - potential for independent review by suitably qualified experts

Setting objectives and making the purpose of the LMDMP clear is also critical. Such objectives might include:

- maintaining knowledge of the sediment characteristics and quality
- ensuring a robust, transparent long-term planning approach to managing port sediment
- maintaining safe navigation for the continued operation of the port
- maintaining and enhancing environmental values, including the OUV of the GBRWHA
- continual improvement in the management of sediment and dredging actions.



## 2. Port locality, setting and shipping

This section provides an overview of the port including:

- its location and environmental setting
- a short outline of its history
- details of current and anticipated future use(s) based on master planning projections, focussed on shipping needs, navigation and trade volumes
- navigational infrastructure (including depth and width details of channels, berths, aprons, swing basins) and associated capacity.

The description should ultimately set the scene for the maintenance of navigational infrastructure and explain the broad role and function of the port both now and into the future.



### 3. Port environmental values

*(Note: environmental values include social, heritage and cultural values)*

This section references specific studies available (historic and ongoing) to characterise the environment with particular relevance to maintenance dredging (zone of influence and focus on marine environments). These should relate to:

- environmental values including applicable elements of GBRWHA OUV
- cultural values
- heritage values
- social values
- commercial activities
- recreational activities.

This section aims to synthesise existing studies to establish what environmental values are important to manage during maintenance dredging activities and identify actions to maintain knowledge of environmental values (i.e. link to ambient monitoring program).



### 4. Consultation and key issues

In arriving at a detailed understanding of long-term maintenance dredging management requirements and associated issues at a port, it is expected that comprehensive stakeholder engagement with affected and interested stakeholders has been undertaken in the development of the LMDMP.

This section documents the stakeholder engagement to date and its outcomes, including details of who has been engaged, a summary of the feedback that has been provided and a summary of how the feedback has been taken on board.

This section identifies the mechanisms by which reports and information on which the LMDMP is based can be accessed, thus facilitating broad community involvement on issues which affect them.

*NB: Future stakeholder engagement throughout the life of the LMDMP should be outlined in the governance section of the introduction.*

## 5. Sediment assessment

This section describes the process and studies that have (or will) be undertaken to understand sediment dynamics, characteristics, sedimentation rates that can be used to forecast dredging requirements, analysis of avoid, reduce and reuse options, and the justification for proposed sediment management solutions including maintenance dredging.

This section summarises studies and reports used to inform the development of a long term maintenance dredging approach.



### 5.1 Port sediment

This section describes the nature of sediment at the port and details how it interacts with port operations. This should include an understanding of the:

- regional and local hydrographic, coastal and riverine processes as they affect relevant sediment movements and loads
- coastal and riverine process in the region of the port that influence sediment behaviour
- source and fate of the sediments moving within the port
- the physical properties of the sediment (including particle size), mapped across the different areas of the port where dredging occurs and where there is variation between the areas
- volumes, areas and rates of deposition within the port
- flux of material under differing conditions (ambient, energetic, cyclonic)
- chemical and contamination knowledge (history) of sediments in the port, including:
  - contamination history
  - nutrient content
  - sources of any contamination to water and sediment that may adversely affect sediment quality
- changes in depths within navigational infrastructure (including channels, berths and swing basins)
- non-sediment material contained in the dredged material, for example cargo spillage.



### 5.2 Minimisation of sediment accumulation and dredging needs

The section describes any examinations undertaken to reduce the rates of sedimentation in navigational areas that could avoid or reduce the need to dredge. Consideration should be given to:

- sedimentation avoidance measures – including sediment deflection works, sediment by-pass, sediment barriers, design and alignment of future channel and berths
- reduction actions – steps to reduce dredging and disposal volumes and frequency including sediment traps, sediment mobilisation techniques, drag barring, bed levelling and side casting.

Based on the examination of these options, the most appropriate and effective measures should be selected and described as management actions, including application locations, timing and frequency. The reduced sedimentation accumulation rates should be factored into the future dredging needs. In some instances, trials and pilot programs may be required.



## 5.3 Maintenance dredging and disposal requirements

This section provides a description of the need/justification for maintenance dredging and disposal including:

- navigational considerations
- actual and projected impacts of sediment accumulation on ship movements and economic trade in the short, medium and long term
- consideration of potential to operate without maintenance dredging or only partial maintenance dredging.
- the analysis undertaken to determine the necessity for maintenance dredging based on sedimentation rates and minimisation actions (as per sections above).

Following analysis of the need for dredging, a calculation of future maintenance dredging requirements can be made.

This calculation should draw on the information for the sections above plus the port's dredging and disposal history, the current dredging requirement and projected maintenance dredging and disposal needs. The resulting output should be a forecast of future dredging requirement by:

- volumes
- frequency
- locations within the port
- contingency allowance for periodic events based on past evidence (e.g. cyclones or flood events and their anticipated frequency).

Estimates of the expected volumes and likely duration and frequency of maintenance dredging and disposal campaigns should be detailed for the next 10 years and be accompanied by associated assumptions.



## 5.4 Examination of reuse, recycle and disposal options

Having determined that maintenance dredging will be necessary, and the likely volumes, frequency and type of material (particle size and contamination) determined, this section details the range of sediment management options available to the port. Options should be examined and contextualised based on a structured comparative analysis study.

The study should look at the:

- steps that can be taken to improve the quality of the spoil, including those targeting improvements in sediment contaminant status and processing or handling methods that would reduce impacts from various options and improve opportunities for beneficial reuse
- reuse, recycle and disposal options including:
  - commercial or industrial uses, such as construction, agriculture, infill (roads),
  - environmental rehabilitation
  - land reclamation
  - disposal both on land and at-sea
  - returning sediment to the coastal environment, such as beach nourishment or sediment bypassing.

Studies underpinning this section are likely to involve iterative revisiting of options, as examination of improvements in sediment quality or processing lead to further opportunities to re-use. For example, sediment management options should not be constrained by historic dredging equipment choices or methods but should consider the manner in which alternative equipment or techniques influence the range of and choice amongst options.

Expert analysis of the feasibility, demand, cost and environmental implications of each option will be required. Environmental implications should be based on a select number of key environmental factors that can be assessed common to all options, e.g. changes in water quality, impacts on OUV, greenhouse gas emissions, and disturbance to important ecosystems. A full impact assessment will be required for a selected or preferred option, however a full assessment of each option is not necessary.

Options that are not feasible or have significant adverse elements can be discounted from any comparative analysis.

Comparisons of options should involve a repeatable and transparent method against the key objectives that have been developed in consultation with key stakeholders (i.e. the TACC). Decisions need to be based on both quantitative evidence and an evaluation of the important values to stakeholders. A single solution may not be optimal or possible and so the comparative analysis should consider a mix of options that could be utilised over the longer term over 10+ years (a 15-25 year horizon may be more useful). The final outcome can then form the port's long-term dredging and disposal strategy.

## **5.5 Selected future dredging and disposal strategy**

This section identifies the preferred option for dredging and the preferred option for disposal, including supporting management measures to avoid or reduce dredging and disposal volumes and frequency.

This should include reasons and justifications underpinning the selection of options. This section should highlight how the comparative analysis incorporated important environmental, social, cultural and economic values based on stakeholder input. Mention should be made about investigating options throughout the life of the LMDMP and looking for continuous improvement and beneficial outcomes.

A system for identifying and triggering dredging activities should be included. This may be based on an annual timetable or on survey and deposition rates as appropriate for the port.

Given the potential for changes associated with sediment management options, it will be necessary to outline a process within the LMDMP to show how there will be a regular (5 or 10-yearly) review of all sediment management options. Notwithstanding this, ports should maintain a 'watching brief' for improvements in technology and methodology in the periods between major reviews and apply them as required.




## 6. Risk assessment framework

Having identified both the future dredging needs (Section 5.3) and the selected reuse/disposal option (section 5.5) a more detailed examination is required of the likelihood and consequence of potential environmental risks. An environmental risk assessment at this point is not aimed at evaluating options as this should already have occurred in the options analysis in Section 5.4 (unacceptable environmental impact options will have been ruled out through that process). Rather it is about informing management and risk treatment actions that may be required.

The selected dredging and disposal strategy should be examined using an appropriate risk assessment method. In general, the risk assessment framework should document the processes in accordance with a ports' existing risk management systems. **Table 1** provides a guide to undertaking a risk assessment.

**Table 1: Risk assessment**



Risk Management Process	Description
<b>Identify Risks</b>	<ul style="list-style-type: none"> <li>Based on the identified environmental, social and cultural values, including GBRWHA OUV, determine the material short, medium and long-term risks and uncertainties that need to be addressed in managing the dredging and disposal activities. This needs to consider cumulative impacts and net benefit.</li> <li>Consideration of these values should address matters such as sensitivity, vulnerability and adaptive capacity for values (including GBRWHA OUV) within the relevant zone of influence.</li> </ul>
<b>Analyse Risks</b>	<ul style="list-style-type: none"> <li>Identify and determine the likelihood and consequence of each identified material risk according to port-specific risk assessment process. However it should be noted regulators have their own assessment processes.</li> <li>Determine the risk level.</li> </ul>
<b>Evaluate Risks</b>	<ul style="list-style-type: none"> <li>Determine the acceptability of risks, or the need for further risk mitigation.</li> </ul>
<b>Treat Risks</b>	<ul style="list-style-type: none"> <li>Determine measures to avoid risks where this is feasible.</li> <li>For impacts that cannot be avoided, identify measures to mitigate adverse effects.</li> <li>For impacts that cannot be adequately mitigated, identify offsets that are proposed to counteract impacts to values.</li> <li>Where significant residual impacts remain (to matters of national environmental significance) approval under the EPBC Act may be required.</li> </ul>

The risk management process should be regionally relevant. Documenting these processes will assist in prioritising actions that improve risk, over those that are neutral or negative.



## 7. Identification and treatment of key risks

Having identified the preferred dredging and disposal strategy this section documents the key risks as an output from the risk assessment. For any material risks identified, the LMDMP needs to:

- detail the important environmental values that need to be managed
- the outcomes that are sought
- detail how management actions will be adopted to reduce the risks
- outline the process by which monitoring and performance reviews will be used to evaluate the performance of risk mitigation.

As part of risk treatment, ports should identify and apply environmental windows supported by the evidence-based risk assessment. Where environmental risks are identified as high, consideration must be given to additional management controls during periods of coral spawning, seagrass recruitment and turtle breeding. Following large weather events, consideration should also be given to how emergency dredging and disposal requirements can be managed, and any potential additional controls that may be required.

Specific operational controls for material risks, and the identification and control of less material risks, should be dealt with in campaign-specific EMPs (see Section 8).

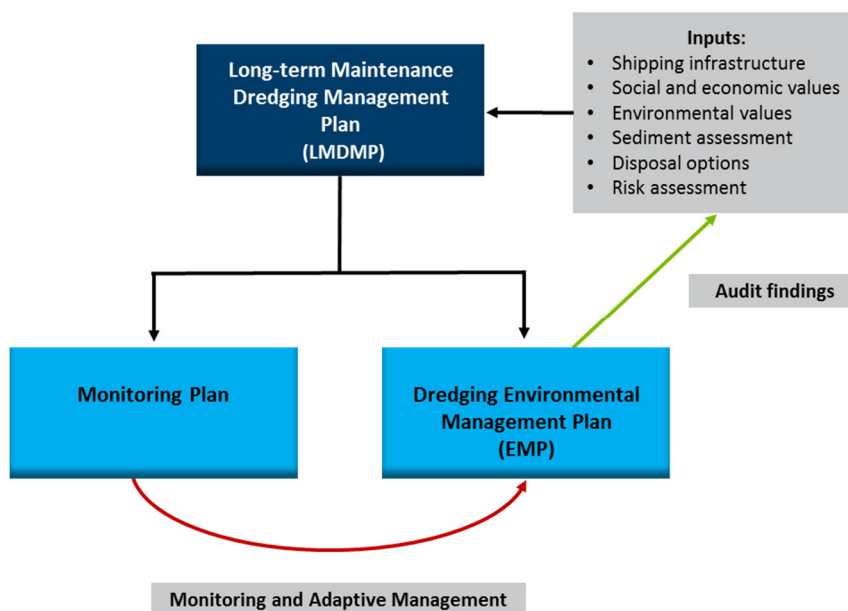


## 8. Environmental management

The section outlines how environmental risks will be managed during the planning, execution and post execution of dredging activities.

As per the recommended structure in **Figure 4**, management of dredging should be controlled by the LMDMP as an overarching planning document supported by an EMP for campaign specific requirements and a monitoring program. These three elements should align to ensure coverage of all aspects and all levels of management and monitoring. Accordingly, the LMDMP does not need to get into the specifics of in-water dredge management, but rather set up a process for EMP development, implementation and review.

**Figure 4: Elements of dredging management and monitoring**



This section provides an overview of how dredging actions will be managed and require the development of an EMP. The EMP should be dredging campaign specific and include:

1. location and description of the activities
2. timing of the dredging operations
3. measures to meet permit conditions with references to legislative requirements
4. pre-dredging actions – notifications, monitoring plans, dredge selection and scheduling
5. standard management measures relating to:
  - waste management
  - ballast water management
  - bunkering of fuel
  - vessel wash-down
  - marine pest monitoring and management
6. adaptive management measures relating to:
  - water quality
  - marine fauna climate conditions
7. operation and incident reporting
8. post-dredging – surveys, monitoring, audit and reporting
9. emergency procedures and contacts.

In particular the EMP outlines strategies and actions to minimise impacts, and to avoid contamination and pollution and provide linkages to the environmental monitoring program. This should include:

- specific and auditable measures to avoid or reduce impacts (for both the dredge and disposal sites)
- triggers and adaptive responses where necessary
- contingencies for natural events such as cyclones and floods
- compliance monitoring and reporting
- corrective actions for impacts identified by monitoring
- responsibilities and timing for management and monitoring activities.

This section also provides an overview of the adaptive management and monitoring approach that will be employed to support maintenance dredging activities.

The LMDMP should set out the mechanism for monitoring results to be fed back into management arrangements and corrective measures at appropriate time scales.



## 9. Monitoring Framework

The LMDMP provides a framework for dredging and disposal related monitoring that includes:

- ambient monitoring – ongoing and related to key environmental parameters
- impact monitoring – before and after dredging analysis to confirm and refine impact management
- real-time monitoring – during dredging to inform adaptive management response actions.

Monitoring and environmental studies should focus on understanding the marine and terrestrial environment, how it may be impacted by maintenance dredging (including the scale of impact), and how those impacts can be avoided or mitigated in the future. It is recommended that information is provided on how previous long-term monitoring (if applicable) has informed the management measures and long term monitoring proposed.

**Table 2** outlines the type and level of monitoring that is expected to occur at a port. In preparing this section of the LMDMP, ports must ensure that their monitoring program broadly aligns with the requirements outlined in Table 2 below.

**Table 2: Monitoring**

Monitoring Type	Description
<p><b>Baseline monitoring</b> - provides the initial understanding</p> <p><b>Ambient monitoring</b> – is ongoing</p> <p><b>PORT WIDE</b></p>	<p>Monitoring focuses on changes in the condition of the local values and seeks to distinguish between unrelated ambient trends and any that relate to long-term performance of dredging controls. Such monitoring could be undertaken by the port or another entity (e.g. State Government, Local Government or Regional Water Quality Partnership). Results of port ambient monitoring should be reviewed and the outcomes of the review incorporated into the 5-yearly review of the LMDMP to ensure that it correctly identifies the status of important environmental values that are exposed to risks associated with maintenance dredging.</p>
<p><b>Impact monitoring</b> - impact detection (not real-time but against accepted longer term outcomes set in LMDMP).</p> <p><b>MAINTENANCE DREDGE CAMPAIGN-SPECIFIC</b></p>	<p>Monitoring should be sufficient to confirm that predicted impacts did or did not occur, and therefore to inform changes that need to be applied to successive campaigns. Monitoring may include additional efforts supplementary to longer term baseline monitoring and should adopt monitoring designs that are capable of discriminating short- and medium-term activity-based effects in close proximity to dredging and disposal from those in surrounding unaffected areas.</p>
<p><b>Real-time monitoring</b> – informs adaptive management</p> <p><b>MAINTENANCE DREDGING CAMPAIGN-SPECIFIC</b></p>	<p>This type of monitoring is undertaken where risk assessments indicate the potential for significant unplanned or uncertain impacts and where there are opportunities to minimise or avoid these impacts. Effective adaptive management needs to be planned around a suite of intervention measures to be implemented ahead of time, responsive to forecast conditions and evaluations of lead time and latency, and therefore incorporate decision thresholds sufficient to avoid harm.</p>

The results of campaign-specific monitoring should be reviewed after the campaign and any “lessons learnt” should be used to update campaign-specific EMPs and environmental monitoring. A broader long-term review of all baseline environmental monitoring should be undertaken as part of the 5-yearly review of the LMDMP.



## 10. Performance review

This section outlines what performance indicators are used to determine whether the objectives of the LMDMP (e.g. maintaining effective and safe port operations, maintaining and enhancing OUV of the GBRWHA, transparency, continuous improvement) are being met and to better inform future risk assessments.

Potential indicators may relate to:

- reducing dredging frequency or volumes
- avoiding residual sensitive receptor impacts
- success of management measures at achieving anticipated risk reductions
- improving understanding of port environmental processes
- avoiding and reducing sediment contamination.

This section also identifies:

- linkages to maintenance campaign-specific EMPs, environmental monitoring and associated performance measures
- processes in place to review the effectiveness of dredging management
- corrective actions that will be undertaken to address any performance measures that have not been achieved.

This section should also outline both regular and post-campaign reporting requirements from both a compliance and stakeholder perspective, including:

- information content
- legislative reporting requirements
- accessibility of information (e.g. website based)
- timeframes by which data will be published.

Ports should ensure that access to relevant information is provided in a timely manner.

Procedures for auditing performance against the LMDMP and the process for incorporating audit results in LMDMP revisions should be set out within the LMDMP. Specifically, the following should be considered:

- auditing processes (timing and responsibility)
- linkages to performance indicators and continual improvement
- documentation standards, record keeping and processes
- revision of the LMDMP.

Further, this section outlines actions to be implemented in the event of non-compliance, including reporting and revision of the LMDMP or EMP, and identify the person or organisation responsible for any corrective actions.

One of the objectives of the LMDMP is to foster continuous improvement in the management of sediment and maintenance dredging and disposal actions over the life of the LMDMP. This section identifies the mechanisms for continuous improvement to prevent harm and to mitigate environmental impacts over the longer term.

Where LMDMP's identify opportunities for improvements to current practices, ports should develop plans to implement improvements or progress further investigations to determine the viability of alternatives as soon as practical. It is recognised that maintenance dredging should continue to be consistent with existing approvals while alternatives are investigated or subsequent approvals are obtained.

Continuous improvement initiatives should include any research and participation in regional management entities (e.g. catchment groups or partnerships) undertaken to improve whole-of-system knowledge and to support management and monitoring and future applications. The incorporation of the results of review and audit in LMDMP revisions supports continuous improvement.



## 11. Supporting information

In accordance with the sediment management framework in the MDS, it is expected that a range of studies relevant to maintenance dredging would have been conducted or continued by a port in the intervening periods between preparation or revision of a LMDMP. Such studies might include (but not be limited to):

- sediment characterisation studies (e.g., contamination and particle size)
- coastal process and modelling data
- environmental values studies and mapping
- reuse and disposal options analysis
- social values and impact analysis
- impact studies and literature.

It is expected that the findings of these studies are synthesised, presented in this section of the LMDMP and are accompanied by appropriate reference to their availability on the port website. This supporting information will need to be updated and revised periodically taking into account recent investigations in response to changes in risk.

## Reference materials

Other documents relevant to considerations for compiling an LMDMP include, but are not limited to:

Document	Author	Description
<a href="#"><u>Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area</u></a>	Department of Transport and Main Roads (QLD)	The Strategy's primary objective is to provide certainty to the ports industry and to the wider community that the economic and social contribution of ports is maintained, while ensuring the continued protection of Queensland's valuable environmental assets, and in particular our World Heritage listed GBR.
<a href="#"><u>National Assessment Guidelines for Dredging 2009</u></a>	Department of Environment and Energy (Cth)	The National Assessment Guidelines for Dredging set out the framework for the environmental impact assessment and permitting of the ocean disposal of dredged material. The framework includes: evaluating alternatives to ocean disposal; assessing loading and disposal sites; assessing potential impacts on the marine environment and other users; and, determining management and monitoring requirements. Requirements for sea disposal are detailed at: <a href="http://www.environment.gov.au/marine/marine-pollution/sea-dumping">http://www.environment.gov.au/marine/marine-pollution/sea-dumping</a>
<a href="#"><u>Ports Australia Environmental Code of Practice for Dredging and Dredged Material Management</u></a>	Ports Australia	This Code sets out a series of environmental principles that Australian ports follow when undertaking dredging and when reusing, relocating or disposing of dredged material.
<a href="#"><u>Reef 2050 Long-Term Sustainability Plan</u></a>	Department of Environment and Energy (Cth)	The Reef 2050 Plan provides an overarching strategy for management of the GBR. It coordinates actions and guides adaptive management to 2050. The Reef 2050 Plan responds to the challenges facing the GBR and presents actions to protect its values, health and resilience while allowing ecologically sustainable development and use. Reef 2050 Plan documents and guidance can be found at: <a href="https://www.environment.gov.au/marine/gbr/long-term-sustainability-plan">https://www.environment.gov.au/marine/gbr/long-term-sustainability-plan</a> The <i>Reef 2050 Policy Guideline for Decision Makers</i> is for all government, community and industry decision makers who are updating or creating policies, plans, strategies, program or partnerships that affect the Great Barrier Reef. An integrated monitoring, modelling and reporting program for the Reef can be found at: <a href="http://www.gbrmpa.gov.au/managing-the-reef/reef-2050/reef-integrated-monitoring-and-reporting-program">http://www.gbrmpa.gov.au/managing-the-reef/reef-2050/reef-integrated-monitoring-and-reporting-program</a> Draft policies on Cumulative Impact Management and Net Benefit Policy are under development and are available at: <a href="http://www.gbrmpa.gov.au/managing-the-reef/reef-2050/reef-2050-plan-draft-policies-and-guideline-consultation">http://www.gbrmpa.gov.au/managing-the-reef/reef-2050/reef-2050-plan-draft-policies-and-guideline-consultation</a>
<a href="#"><u>An integrated monitoring framework for the Great Barrier Reef World Heritage Area</u></a>	Department of Environment and Energy (Cth)	The Integrated Monitoring Framework (IMF) guidance identifies the steps and provides clear direction to develop efficient and effective monitoring and reporting on the condition of nationally protected matters, including the GBR. The guidance was applied to the GBRWHA to inform the potential development of other integrated monitoring programs in other coastal and marine regions of Australia.
<a href="#"><u>Relevant documents relating to the Environment Protection (Sea</u></a>	Department of Environment and Energy (Cth)	Information relevant to the requirements under the <i>Environment Protection (Sea Dumping) Act 1981</i> can be found at: <a href="http://www.environment.gov.au/marine/marine-pollution/sea-dumping">http://www.environment.gov.au/marine/marine-pollution/sea-dumping</a> Applications for 10 year permits to dispose of maintenance dredge material at sea under the Sea Dumping Act will require a Long Term Monitoring and Management Plan. As per

Document	Author	Description
<b><u>Dumping) Act 1981.</u></b>		<a href="http://www.environment.gov.au/system/files/resources/c307da1c-237b-43a8-a178-583a60e388d1/files/ltmmp-guidance-material.pdf">http://www.environment.gov.au/system/files/resources/c307da1c-237b-43a8-a178-583a60e388d1/files/ltmmp-guidance-material.pdf</a> The checklist for completing Long-Term Management Plans: <a href="http://www.environment.gov.au/system/files/resources/c307da1c-237b-43a8-a178-583a60e388d1/files/ltmmp-checklist.pdf">http://www.environment.gov.au/system/files/resources/c307da1c-237b-43a8-a178-583a60e388d1/files/ltmmp-checklist.pdf</a>
<b><u>Model operating conditions: ERA 16 – Extractive and screening activities</u></b>	Department of Environment and Science(QLD)	These model operating conditions provide a framework of conditions applicable to all new environmental authorities for ERA 16(1), ERA 16(2) or ERA 16(3) where a site specific application is made. Additional conditions can also be applied at the discretion of the administering authority to address risks that are specific to a particular operation or site. Model operating conditions may be applied to existing environmental authorities with the agreement of the operator.
<b><u>Guideline: State Development Assessment Provisions - State Code 8: Coastal development and tidal works</u></b>	Department of Environment and Science (QLD)	This document provides guidance to applicants on the information required to support the assessment of a development applications against State Code 8 of the State Development Assessment Provisions. These development applications include to carry out operational work involving the disposal of dredge spoil or other solid waste material in tidal water, completely or partly in a coastal management district under the <i>Planning Act 2016</i> .
<b><u>Guideline for the allocation of quarry material</u></b>	Department of Environment and Science (QLD)	This document provides guidance to applicants on the information required to support the assessment of an application for an allocation to remove quarry material below high water mark under the <i>Coastal Protection and Management Act 1995</i> .
<b><u>Guideline: dredging and allocation of quarry material</u></b>	Department of Environment and Science (QLD)	This document focuses on the main state government approval processes and requirements associated with dredging activities proposed to be undertaken in tidal waters.
<b><u>Relevant policy and guidance documents</u></b>	Great Barrier Reef Marine Park Authority	A range of policy guidance is available to assist applicants for Great Barrier Reef Marine Park permits, including for dredging and disposal activities. Information about the permit application and assessment process is also available to assist applicants. <a href="http://www.gbrmpa.gov.au/zoning-permits-and-plans/permits">http://www.gbrmpa.gov.au/zoning-permits-and-plans/permits</a>
<b>PIANC Report #100, 2009. “Dredging Management Practices for the Environment, a structured selection approach.”</b>	PIANC	Outline of a methodology for selecting a management practice which can be regarded as the “best management practice” for a project.
<b>PIANC Report #108, 2010. “Dredging and Port Construction Around Coral Reefs”</b>	PIANC	Guidelines for the implementation of best practice methodology in environmental assessment and environmental management for dredging and port construction activities around coral.



# Acronyms

Acronym	Title
Cth	Commonwealth
EMP	Environmental Management Plan
EMS	Environmental Management System
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
ERA	Environmentally Relevant Activity
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
IMF	Integrated Monitoring Framework
LMDMP	Long-term Maintenance Dredging Management Plan
London Protocol	<i>1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972</i>
MDS	Maintenance Dredging Strategy
MDS Framework	Long-term Maintenance Dredging Management Framework
MNES	Matters of National Environmental Significance
NAGD	National Assessment Guidelines for Dredging 2009
OUV	Outstanding Universal Value
QLD	Queensland
Reef 2050 Plan	Reef 2050 Long-Term Sustainability Plan
RIMReP	Reef Integrated Monitoring and Reporting Program
TACCs	Technical Advisory and Consultative Committees
WQA	Water Quality Action

