

Esso Highlands Limited



Papua New Guinea LNG Project

**Environmental and Social Management Plan
Appendix 16: Dredging Management Plan**

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1.0 OBJECTIVES

Esso Highlands Limited (Company) has developed this Dredging Management Plan as part of its Environmental and Social Management Plan (ESMP).

The Dredging Management Plan outlines the process to be implemented to manage of dredging and placement of dredged material from Caution Bay.

Contractor shall develop a Site-Specific Dredging Management Plan to include the specific details of the proposed dredging program, and means to meet the objectives set out below.

This will be assisted by the provision of results from investigations of spoil contamination status, disposal site selection and plume modelling needed to support the application for a dredging permit prior to the commencement of works.

The objectives of Company's Dredging Management Plan are to:

1. Reduce impacts of dredging on the marine life and water quality
2. Reduce sediment (turbid plume) mobilisation during dredging and placement of dredge material.

Performance Criteria for the management of dredging will include the following:

- No significant decrease in marine water quality at sensitive locations as a result of the proposed dredging
- No significant impacts on the marine environment as a result of dredging activities.

The Dredging Management Plan should be read in conjunction with the following Company documents:

- Water Management Plan
- Erosion and Sediment Control Management Plan
- Spill Prevention and Response Plan
- Hazardous Material Management Plan
- Erosion and Sediment Control Management Plan
- Acid Sulfate Soils Management Plan.

2.0 LEGAL AND OTHER REQUIREMENTS

The PNG LNG Project Environmental Impact Statement (mitigation measure M211) states that the Project will adhere to Commonwealth of Australia, National Assessment Guidelines for Dredging 2009, or similar guidelines with respect to dredging and disposal of dredged material (including protocols for investigating contamination and suitability of material for disposal, alternative options for use of material, management of dredging operations and site selection).

The Australian National Assessment Guidelines for Dredging (NAGD, 2009), has been developed to ensure the impacts of dredged material loading and disposal are adequately assessed and, when ocean disposal is permitted, that impacts are managed responsibly and effectively. It seeks to provide clear, consistent standards and criteria for assessment of dredged material, and in so doing facilitate better decision-making by regulators, by improving the quality of information on which assessments are based.

The NAGD recommends very similar information requirements as the NMSA, however, also includes the assessment of the loading site, generally these requirements include:

- Demonstration that all alternatives to ocean placement have been evaluated
- Assessment sediment quality
- Characterisation of loading and placement sites
- Assessment of potential impacts on the environment at loading and placement site
- Identification monitoring and management measures to control or mitigate impacts at loading and placement sites.

The assessment framework the protocol for the assessment of potential contaminants in dredged material are summarised in the NAGD. Contractor shall reference this document in the planning and design of the dredging activity and in the preparation of Contractor's Site Specific Dredging management plan.

It should be noted that the PNG Marine Pollution (Sea Dumping) Act (which currently exists in draft form and is to be administered by the National Maritime Safety Authority (NMSA)) requires that dredged material to be disposed at sea must be shown to be free of contamination; by meeting the sediment quality guidelines contained in Schedule 1 of the Act, in accordance with sediment sampling and testing procedures published by the Authority from time to time.

Other requirements applicable to this plan are identified in Attachment 1.

3.0 SURVEYS

Surveys are required to assess the status of contamination of the material to be dredged.

Further, modelling studies are also required to determined potential extent of plumes from dredging and disposal of spoil in order to identify an appropriate area where spoil can be placed to with minimal impact to sensitive habitats.

The results will provide further background information for the development of the site-specific dredge management plan.

Contractor shall confirm that any surveys described in the plans listed above have been completed. Additional surveys may be required as detailed in this plan.

In relation to contamination status of material to be dredged, the permit for dredging and placement of spoil requires that the dredged material is shown to be free from contaminants and meets the sediment quality guidelines contained in Schedule 1 of the Act.

The contaminants of interest include:

- Metals and metalloids
 - Antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc (and iron and manganese to allow normalisation calculations).
- Total polychlorinated biphenyls (PCBs)
- Organochlorine pesticides
 - DDD, DDE, total DDT, Dieldrin, Chlordane, Lindane, Endrin.
- Polynuclear aromatic hydrocarbons (PAHs):
 - Acenaphthene, Acenaphthalene, Anthracene, Fluorene, Naphthalene, Phenanthrene, Benzo[a]anthracene, Benzo[a]pyrene, Dibenz[a]anthracene, Fluoranthene, Chrysene, Pyrene, low molecular weight PAHs, high molecular weight PAHs, Total PAHs.
- Radionuclides
- Tributyltin (TBT)

In relation to site for the placement of spoil, this will be selected on the basis of the most appropriate equipment and achievement of least impact of sedimentation to the marine environment.

Potential sites in deep water offshore of the barrier reef and within Caution Bay are under investigation, and the proposed site will be identified on the basis of results of modelling of dispersion of dredge and spoil plumes.

4.0 MANAGEMENT AND MONITORING

Table 1 presents a summary of the potential impacts related to dredging and disposal of contaminated sediments together with mitigation and management measures to avoid or reduce these impacts.

Contractor shall develop a Site-Specific Dredging Management Plan, which will as a minimum incorporate the measures described in Table 1 but shall not be limited to these measures.

Due to differing scopes of work and work locations, not all management and mitigation measures in the Dredging Management Plan are applicable to all Contractors. Company's Environmental and Social Mitigation Register defines which management and mitigation measures are applicable to each Contract scope of work.

In Table 1, any mitigation and management commitments that were contained in the PNG LNG Project Environmental Impact Statement (EIS) are identified by a code commencing with an 'M' in the 'Mitigation Item Reference Number' column. Some mitigation measures have been reworded to provide further clarity or more detailed information regarding required measures. In these instances, the code is displayed in italics, and these reworded measures supersede what is in the EIS.

Other mitigation and management commitments required by Company are identified in Table 1 with a code commencing with an 'A'.

Monitoring required as part of the Dredging Management Plan is also shown in Table 1.

Monitoring is to be undertaken as part of the Site Specific Dredging Management Plan, and is based on validating the predicted extents of plume formation; and meeting prescribed water quality criteria prescribed in permit conditions set by government agencies.

Contractor shall develop site-specific procedures for the monitoring program, to be agreed by Company.

Table 1: Management and Monitoring

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Source of Impact	Potential Impact and Relevant Management Plan Objective†	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Frequency	Responsibility
Disturbed sediments	<p>Contamination of marine surface waters.</p> <p>Impacts to reefs / seagrass habitats, fish resources and access to marine resources.</p>	<p>Equipment</p> <p>Contacto shall develop and implement a Site-Specific Dredge Management Plan, which will specify equipment and methods to reduce sediment plume dispersion as applicable.</p> <p>Selection of dredging methods and equipment that will minimize the production of turbid plumes.</p> <p>Fit turtle / large marine fauna excluding devices to dredge equipment; manage pump speed to reduce risk of turtle / large marine fauna capture (as necessary).</p> <p>Dredge equipment will conform to quarantine requirements when brought into PNG to avoid introduction of pests and exotic species.</p> <p>Operations</p> <p>Training of key personnel on dredging procedures and impact management.</p> <p>Conduct dredging to minimize generation of sediment plumes.</p> <p>Dredging not to be undertaken during unsuitable wind/wave conditions.</p> <p>All equipment operated in safe and efficient manner.</p>	<p>M211</p> <p>M217</p> <p>M218</p>	<p>Monitoring to validate whether conditions are within those predicted by modeling</p>	<p>Details of sites and frequency to be specified in the Contractor's Site Specific Dredging Management Plan. Frequency / locations may be determined by permit conditions.</p>	<p>Contractor</p>

Table 1: Management and Monitoring						
Source of Impact	Potential Impact and Relevant Management Plan Objective¹	Mitigation and Management (Design Feature/Specific Measure)	Mitigation Item Reference Number	Monitoring	Frequency	Responsibility
Spoil disposal	Contamination of marine surface waters. Impacts to reefs / seagrass habitats, fish resources and access to marine resources.	Pre-disturbance characterisation of disposal sites. Confirmation that turbid plumes will not reach key or sensitive environments. Disposal not to be undertaken during unsuitable wind/wave conditions. All equipment operated in safe and efficient manner.	As above	Monitoring to validate whether conditions are within those predicted by modeling	Details of sites and frequency to be specified in the Contractor's Site Specific Dredging Management Plan. Frequency / locations may be determined by permit conditions.	Contractor

5.0 ROLES AND RESPONSIBILITIES

Contractor shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of the Site-Specific Dredging Management Plan.

Contractor's Site-Specific Dredging Management Plan shall describe the resources allocated to and the responsible personnel for the execution of each task and requirement contained therein, and shall describe how roles and responsibilities are communicated to relevant personnel.

Company shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of Company's responsibilities in the Dredging Management Plan.

6.0 TRAINING AND AWARENESS REQUIREMENTS

Contractor shall ensure sufficient resources are allocated on an ongoing basis to achieve effective implementation of the Site-Specific Dredging Management Plan.

Contractor's Site-Specific Dredging Management Plan shall describe the training and awareness requirements necessary for its effective implementation.

Contractor's training activity associated with the Site-Specific Dredging Management Plan shall be appropriately implemented by means of a training needs assessment, training matrix/plan and by keeping records of training undertaken.

Company shall ensure that all Company personnel responsible for the execution of Company's tasks and requirements in the Dredging Management Plan are competent on the basis of education, training and experience.

Company's training activity associated with the Dredging Management Plan shall be appropriately documented by means of a training needs assessment, training matrix/plan and records of training undertaken.

7.0 PERFORMANCE INDICATORS

Table 2 outlines indicators for measuring and verifying performance in relation to dredging.

Table 2: Performance Indicators

ID #	Performance Indicator	Measurement	Relevant Management Plan Objective (Section 1)
1	Dredge material quality	All Schedule 1 parameters	1
2	Select spoil placement location	Demonstration by monitoring of avoidance of impacts to reefs / other key areas. Validate that conditions are within those predicted by modelling.	1
3	Approved (permit) to dredge and place	Detailed monitoring / validation program for compliance with permit conditions	2
Performance Indicators to be further developed and agreed between Contractor and Company			

† See Section 1.

8.0 REPORTING AND NOTIFICATION

Notification and reporting requirements will be defined by Company following the completion of the contamination assessment surveys and the generation of Contractor's Site Specific Dredging Management Plan.

Attachment 1: Legal and Other Requirements

LEGAL AND OTHER REQUIREMENTS

Contractor shall comply with applicable Papua New Guinea Laws and Regulations, applicable International Finance Institution (IFI) requirements and International Treaties and Conventions (where applicable).

Papua New Guinea Laws and Regulations

In addition to the draft PNG Marine Pollution (Sea Dumping) Act discussed above, the PNG Environment Act 2000 contains numerous provisions that promote environmental protection, regulate environmental impacts associated with development activities, and safeguard the life supporting capacity of air, water land and ecosystems.

International Financial Institution Requirements

The following International Finance Corporation (IFC) Guidelines are applicable to the dredging activity. Contractor shall meet the intent of these guidelines:

The IFC's Environmental, Health, and Safety Guidelines for Ports Harbours and Terminals also include a number of recommendations for consideration during dredge planning activities, dredging and placement of dredged material. Similar to the NMSA and NAGD requirements discussed below these recommendations include the:

- Evaluation of dredging material for their physical, chemical, biological and engineering properties
- Selection of methods and equipment to minimise destruction of habitat, avoidance of sensitive habitats (feeding breeding areas) and use of techniques such as silt curtains
- Initial assessment of reuse and land-based spoil placement options, and then if placed to sea, consideration of engineering methods for lateral containment, capping or other means of confinement. These would be a challenge in deep water, as would protection of sensitive areas if disposed within the lagoon
- Development of a Marine Dredging Management Plan

The IFC's EHS Guidelines, *Industry Sector Guidelines, Shipping* (p 12) also require the management of shipping operations "according to the provisions of the International Safety Management (ISM) Code, including the preparation of a formal, written, Safety Management System (SMS). The SMS should identify the assignment of roles and responsibilities, the resources available, and emergency procedures, among others."