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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by the City of Kwinana to undertake a Preliminary Environmental Assessment of the Indian Ocean Gateway (IOG) proposal. The Indian Ocean Gateway proposal is a staged relocation of the Fremantle Inner Harbour to the (proposed) Outer Harbour in Cockburn Sound.

The Kwinana Industrial Area currently contributes $11 billion/annum to the WA economy (City of Kwinana 2015). The IOG will assist with traffic congestion, freight movements, job creation and productivity. This report identifies the key risks and benefits, environmental approval requirements and the key considerations of a land-backed wharf option versus an island-port option.

In order to describe the environmental approval needs of the project, the potential environmental impacts are identified. Management and mitigation measures are offered to minimise impacts to enable the Environmental Protection Authority’s (EPA’s) objectives to be met. Environmental approvals will include the submission of a referral document under Section 38(a) of the Environmental Protection Act 1986. Consultation with the Office of the Environmental Protection Authority (OEPA) will be required to confirm the level of assessment for the proposal. A referral to the Federal Department of the Environment under the Environment Protection and Biodiversity Conservation Act 1999 is recommended to ensure impacts to Matters of National Environmental Significance (MNES) are assessed and managed.

Key infrastructure considerations will include land access, materials handling (dredged material and source material), relocation and management of existing inlets and outlets (Newgen Power Station outfall, Perth Seawater Desalination Plant inlet and outlet, Kwinana Power Station intake and outfall).

Coordinating the multiple uses of Cockburn Sound (recreational, industrial, natural and cultural) and conflicting management objectives will require close management with stakeholders and the community. The port options will require detailed investigations and management to ensure marine water quality is protected. The Environmental Protection Authority (EPA) has developed an environmental quality management framework (EQMF) to protect and maintain the quality of the State’s marine environment, which is based on the principles and guidelines of the National Water Quality Management Strategy (NWQMS). The Cockburn Sound Environmental Protection Authority (EPA 2015d) Environmental Quality Criteria Reference Document for Cockburn Sound will be a key instrument for the marine development in Cockburn Sound having been developed after extensive scientific and public consultation to protect the quality of Cockburn Sound.

Having the support of government and community will be key to ensuring an efficient use of resources to bring this project to fruition on behalf of the people of Western Australia.
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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMC</td>
<td>Aboriginal Cultural Material Committee</td>
</tr>
<tr>
<td>AHA</td>
<td>Aboriginal Heritage Act 1979</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
</tr>
<tr>
<td>AHIS</td>
<td>Aboriginal Heritage Inquiry System</td>
</tr>
<tr>
<td>AMC</td>
<td>Australian Marine Complex</td>
</tr>
<tr>
<td>ASS</td>
<td>Acid Sulfate Soils</td>
</tr>
<tr>
<td>BPPH</td>
<td>Benthic Primary Producer Habitat</td>
</tr>
<tr>
<td>CEMP</td>
<td>Construction Environmental Management Plan</td>
</tr>
<tr>
<td>CSMC</td>
<td>Cockburn Sound Management Council</td>
</tr>
<tr>
<td>CS Act</td>
<td>Contaminated Sites Act 2003</td>
</tr>
<tr>
<td>DAA</td>
<td>Department of Aboriginal Affairs</td>
</tr>
<tr>
<td>DER</td>
<td>Department of Environment Regulation</td>
</tr>
<tr>
<td>DotE</td>
<td>Department of the Environment</td>
</tr>
<tr>
<td>DPaW</td>
<td>Department of Parks and Wildlife</td>
</tr>
<tr>
<td>DoT</td>
<td>Department of Transport</td>
</tr>
<tr>
<td>DRF</td>
<td>Declared Rare Flora</td>
</tr>
<tr>
<td>EAG</td>
<td>Environmental Assessment Guideline</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Authority</td>
</tr>
<tr>
<td>EP Act</td>
<td>Environmental Protection Act 1986</td>
</tr>
<tr>
<td>EPBC</td>
<td>Environment Protection and Biodiversity Conservation</td>
</tr>
<tr>
<td>EPBC Act</td>
<td>Environment Protection and Biodiversity Conservation Act 1999</td>
</tr>
<tr>
<td>EV</td>
<td>Environmental Value</td>
</tr>
<tr>
<td>EQMF</td>
<td>Environmental Quality Management Framework</td>
</tr>
<tr>
<td>EQO</td>
<td>Environmental Quality Objective</td>
</tr>
<tr>
<td>FHPA</td>
<td>Fish Habitat Protection Area</td>
</tr>
<tr>
<td>IOG</td>
<td>Indian Ocean Gateway</td>
</tr>
<tr>
<td>KIA</td>
<td>Kwinana Industrial Area</td>
</tr>
<tr>
<td>MMO</td>
<td>Marine Mammal Observer</td>
</tr>
<tr>
<td>NWQMS</td>
<td>National Water Quality Management Strategy</td>
</tr>
<tr>
<td>OEPAct</td>
<td>Office of the Environmental Protection Authority</td>
</tr>
<tr>
<td>PEC</td>
<td>Priority Ecological Community</td>
</tr>
<tr>
<td>PEIA</td>
<td>Preliminary Environmental Impact Assessment</td>
</tr>
<tr>
<td>PMST</td>
<td>Protected Matters Search Tool</td>
</tr>
<tr>
<td>RIZ</td>
<td>Rockingham Industry Zone</td>
</tr>
<tr>
<td>TEC</td>
<td>Threatened Ecological Community</td>
</tr>
<tr>
<td>WC Act</td>
<td>Wildlife Conservation Act 1950</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by the City of Kwinana to undertake a Preliminary Environmental Assessment of the Indian Ocean Gateway (IOG) proposal. The IOG proposal is a staged relocation of the Fremantle Inner Harbour to the (proposed) Outer Harbour in Cockburn Sound (refer Figure 1.0 and Plate 1.0).

The IOG includes the following precincts (City of Kwinana 2015):

- Australian Marine Complex (AMC) – the advanced ship building area also servicing the expanding oil and gas industries;
- Kwinana Industrial Area (KIA) – the traditional heavy manufacturing and refining centre for the State;
- Rockingham Industry Zone (RIZ) – largely as yet undeveloped, this is an area for the expansion of industry;
- Latitude 32 - also largely undeveloped, although the Flinders Estate is well underway, offers a massive area for industrial expansion;
- All of the remaining land within the current Air Quality Buffer as identified in the draft South Metropolitan Peel Sub-regional Planning Framework; and
- A new Outer Harbour for bulk goods and container freight.

The Indian Ocean Gateway proposal will return long-term dividends to the State of Western Australia, assisting with traffic congestion, freight movements, job creation and productivity. The Kwinana Industrial Area will be protected from urban encroachment. The transition to the Outer Harbour offers opportunities for the revitalisation of Fremantle with a renewed focus on residential and commercial development, tourism and entertainment. State asset sales, such as the sale of the Fremantle Port, need to be structured to ensure optimal long term community benefits, with mandates for investment in further infrastructure that will build long term revenue streams. Government and private sector contributions offer funding models that alleviate financial burdens to governments (City of Kwinana 2015).
1.2 Scope

360 Environmental’s scope included the following:

- Environmental approvals requirements;
- Key environmental factors, mitigation and management; and
- Key considerations and benefits of a land backed option versus an island based option.

This assessment identifies the potential environmental impacts of the proposed project, and offers management and mitigation measures to minimise impacts to ensure the Environmental Protection Authority’s (EPA’s) objectives can be met.

1.3 Objectives

The objectives of this report are to identify key environmental risks and considerations associated with the Indian Ocean Gateway proposal.

1.4 Report

The report is presented in the following way:

- Section 1.0 - Introduction
- Section 2.0 - Legal framework, key legislation and principles of environmental protection and marine environmental quality
- Section 3.0 - Environmental approval requirements
- Section 4.0 - Environmental factors, mitigation and management
- Section 5.0 - Land-backed wharf and island port considerations
- Section 6.0 - Conclusion
- Sections 7.0 and 8.0 - Limitations and references.
2 Legal Framework

2.1 Key Legislation

Key pieces of legislation and guidance material relevant to the project includes:

- Environmental Protection Act 1986 (EP Act)
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- Aboriginal Heritage Act 1972 (AHA)
- Contaminated Sites Act 2003
- Environmental Protection (Noise) Regulations 1997
- Wildlife Conservation Act 1950 (WC Act)
- State Planning Policy No. 2.6: State Coastal Planning Policy 2013
- EPA guidelines and procedures, specifically the following Environmental Assessment Guidelines (EAGs):
  - EAG 1 Defining the Key Characteristics of a Proposal (EPA 2012)
  - EAG 3. Protection of benthic primary producer habitats in Western Australia’s Marine Environment. (EPA 2009)
  - EAG 7 Environmental assessment guideline for marine dredging proposals (EPA 2011)
  - EAG 8 Environmental principles, factors and objectives (EPA 2015a)
  - EAG 9 Application of a significance framework in the EIA process (EPA 2015b)
  - EAG 15 Protecting the Quality of Western Australia’s Marine Environment (EPA 2015c).

- Environmental Protection Authority, 2015d. Environmental Quality Criteria Reference Document for Cockburn Sound (March 2015). Published by the Environmental Protection Authority, this technical document enables interpretation of the Policy and Plan. It was revised and updated and a new version released in March 2015.


An Environmental Management Plan, prepared by the Cockburn Sound Management Council, outlines on-ground actions for implementing the Policy, and establishes the particular roles and responsibilities of managers and user groups.

2.2 Principles of Environmental Protection

The principles set out in section 4A of the EP Act and described in EAG 8 (EPA 2015a) require a project to demonstrate the Precautionary Principle is met as part of the design process. This includes:

- Care is taken to avoid serious or irreversible damage to the environment;
- The project footprint has been designed to pose the lowest risk to the environment, by avoiding areas of high environmental significance;
- Protection and enhancement of the environmental values;
- Minimal impact on the natural environment; and
- Conservation of natural resources and minimisation of energy consumption and waste.

To demonstrate the Principle of Inter-generational Equity is met, the health, diversity and productivity of the environment will need to be maintained whilst providing a benefit for future generations through improved recreational amenity and increased environmental awareness. In order to meet the Principle of the Conservation of Biological Diversity and Ecological Integrity, the project design will need to consider biological diversity and ecological integrity, avoiding areas of high biological and ecological significance.

Principles relating to improved valuation, pricing and incentive mechanisms will require transparent consideration of all environmental factors in the valuation of assets and services during design of the project. The Principle of Waste Minimisation will need to be demonstrated throughout the construction and operational phases of the project.

2.3 Marine Environmental Quality

The Environmental Protection Authority (EPA) has developed an environmental quality management framework (EQMF) to protect and maintain the quality of the State’s marine environment, which is based on the principles and guidelines of the National Water Quality Management Strategy (NWQMS). In the West Australian marine environment there are five recognised environmental values (EVs), each with their own Environmental Quality Objective (EQO) (EPA 2015c):

**Ecosystem Health**
- EQO: maintain ecosystem integrity at a high level of ecological protection

**Fishing and Aquaculture**
- EQO: seafood (caught or grown) is of a quality safe for eating
- EQO: water quality is suitable for aquaculture purposes

**Recreation and Aesthetics**
- EQO: water quality is safe for primary contact recreation (e.g. swimming and diving)
- EQO: water quality is safe for secondary contact recreation (e.g. boating and fishing)
- EQO: aesthetic values of the marine environment are protected

**Industrial Water Supply**
- EQO: water quality is suitable for industrial use

**Cultural and Spiritual**
- EQO: cultural and spiritual values are protected

The State Environmental (Cockburn Sound) Policy and implementation documents for the protection of Cockburn Sound were released by the Minister for the Environment in January 2005, after extensive scientific and public consultation. The Policy is backed by the powers in the *Environmental Protection Act 1986* and authorises the Cockburn Sound Management Council to report annually on the 'State of the Sound' and have this report tabled in Parliament. In 2010 the OEPA revised its map of Cockburn Sound incorporating changes associated with both constructed and approved developments. The EPA subsequently updated Schedule 2 and Schedule 3 of the State Environmental (Cockburn Sound) Policy and reviewed the 5% cumulative surface area limit for low ecological protection areas. The 5% cumulative surface area limit has not been changed.
Environmental Approval Requirements

Table 1 outlines the project considerations required to inform the environmental documentation.

### 3.1 Environmental Project Considerations

#### Table 1: Overall Project Considerations and Approvals

<table>
<thead>
<tr>
<th>PROJECT ASPECT</th>
<th>REQUIREMENT</th>
<th>LEGISLATION</th>
<th>DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Approval Documentation</td>
<td>Approval from Federal Environment Minister required to “significantly impact” Matters of National Environmental Significance (MNES) (e.g. cetaceans/Cockburn Sound)</td>
<td>Environment Protection and Biodiversity Conservation Act 1999</td>
<td>Federal Department of the Environment (DotE)</td>
</tr>
<tr>
<td>Environmental setting and environmental risk assessment to determine key factors</td>
<td>Approval required from EPA and Minister for Environment to implement a significant proposal Referral documentation Likely to be a Public Environmental Review Level of Assessment Approval (Works Approval) to construct a Prescribed Premises Approval (Licence) to operate a Prescribed Premises</td>
<td>Environmental Protection Act 1986, Part IV s38 Environmental Protection Act 1986, Part V Contaminated Sites Act 2003 Environmental Protection (Noise) Regulations 1997 Wildlife Conservation Act 1950 (WC Act)</td>
<td>Environmental Protection Authority (EPA) Decision Making Authorities</td>
</tr>
<tr>
<td>Project Environmental Management</td>
<td>Review of background information relevant to port construction and development. Collation of engineering design information and determination of impacts to intakes and outlets and hydrodynamics (refer Table 3).</td>
<td></td>
<td>Local Government EPA</td>
</tr>
<tr>
<td>Stakeholder Engagement</td>
<td>Community and stakeholder engagement strategy and implementation plan</td>
<td></td>
<td>Local Government EPA</td>
</tr>
<tr>
<td>Aboriginal heritage</td>
<td>Engagement and approval to disturb listed sites of Aboriginal heritage significance (if required)</td>
<td>Aboriginal Heritage Act 1972 Section 18</td>
<td>Department of Aboriginal Affairs</td>
</tr>
<tr>
<td>Land access</td>
<td>Authority to access Lease of Crown Land Easement over Crown Land Development Approval</td>
<td>Land Administration Act 1997 Planning and Development Act 2005 Native Title Act</td>
<td>Local Government Western Australian Planning Commission (WAPC) Fremantle Port Authority Department of Transport LandCorp MRWA Rail (Brookfield/PTA/ Australian Rail Track Corporation Ltd) Department of Lands and Information Landowners</td>
</tr>
</tbody>
</table>
4 Environmental Factors, Mitigation and Management

Table 2 contains a summary of environmental factors, mitigation and management. The environmental impact assessment will need to demonstrate that the EPA objectives can be met. The environmental factors that may be significant and will require mitigation and management are:

- Benthic Communities and Habitat
- Coastal Processes
- Marine Environmental Quality
- Marine Fauna
- Hydrological Processes
- Heritage.
<table>
<thead>
<tr>
<th>THEME</th>
<th>ENVIRONMENTAL FACTOR</th>
<th>ENVIRONMENTAL OBJECTIVE</th>
<th>POTENTIAL IMPACT</th>
<th>PROPOSED MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea</td>
<td>Benthic Communities and Habitat</td>
<td>To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.</td>
<td>Impact from:</td>
<td>Habitat mapping.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• land-backed wharf footprint</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• construction and discharge</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• reduced water clarity.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water quality monitoring.</td>
<td></td>
</tr>
<tr>
<td>Coastal Processes</td>
<td>To maintain the morphology of the subtidal, intertidal and supratidal zones and the local geophysical processes that shape them.</td>
<td>Potential to impact longshore sediment transport (erosion and accretion).</td>
<td>Minimise seabed footprint and hard stand features. Coastal process investigation and monitoring.</td>
<td></td>
</tr>
<tr>
<td>Marine Environmental Quality</td>
<td>To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.</td>
<td>Potential to impact water quality from:</td>
<td>Management measures include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• port construction activities</td>
<td>sediment contamination investigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• waste/discharge from:</td>
<td>water quality monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o construction activities</td>
<td>construction site briefings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o operations</td>
<td>no refuelling onsite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>o public use</td>
<td>spill procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Management measures include:</td>
<td>waste management.</td>
</tr>
<tr>
<td>Marine Fauna</td>
<td>To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.</td>
<td>Potential impact by:</td>
<td>Management measures include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• pile driving (underwater noise)</td>
<td>safety zones</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• construction and discharge.</td>
<td>a Marine Mammal Observer (MMO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>pre-start survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>soft start procedure</td>
</tr>
<tr>
<td>THEME</td>
<td>ENVIRONMENTAL FACTOR</td>
<td>ENVIRONMENTAL OBJECTIVE</td>
<td>POTENTIAL IMPACT</td>
<td>PROPOSED MANAGEMENT</td>
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<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Land</td>
<td>Flora and Vegetation</td>
<td>To maintain representation, diversity, viability and ecological function at the species, population and community level.</td>
<td>Clearing resulting in:</td>
<td>Management measures during site clearing and construction include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• potential loss of conservation significant flora species (if present onsite)</td>
<td>• minimise footprint</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• partial loss of conservation significant vegetation types</td>
<td>• site induction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• spread of weeds and pathogens.</td>
<td>• clearly identify exclusion zones</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• retain areas of vegetation where possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• maximise the use of local native vegetation species in landscaping and revegetation areas.</td>
</tr>
<tr>
<td>Landforms</td>
<td></td>
<td></td>
<td>The project is not expected to impact landforms.</td>
<td>No management required.</td>
</tr>
<tr>
<td>Subterranean Fauna</td>
<td></td>
<td></td>
<td>The project is not expected to impact subterranean fauna.</td>
<td>No management required.</td>
</tr>
<tr>
<td>Terrestrial Environmental Quality</td>
<td></td>
<td></td>
<td>Potential to impact soils by waste/discharge from:</td>
<td>Management measures include:</td>
</tr>
<tr>
<td>Terrestrial Fauna</td>
<td></td>
<td></td>
<td>• construction activities</td>
<td>• site inductions</td>
</tr>
<tr>
<td>Water</td>
<td>Hydrological Processes</td>
<td></td>
<td></td>
<td>• no refuelling onsite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Potential impact to hydrological regimes including groundwater or surface water. Contaminated sites in area.</td>
<td>• spill procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• waste management.</td>
</tr>
<tr>
<td>THEME</td>
<td>ENVIRONMENTAL FACTOR</td>
<td>ENVIRONMENTAL OBJECTIVE</td>
<td>POTENTIAL IMPACT</td>
<td>PROPOSED MANAGEMENT</td>
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<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Inland Water Environmental Quality</td>
<td>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</td>
<td>Inland environmental water quality from diversion, ponding and pooling. Marine water quality is discussed in the appropriate section.</td>
<td>Understand and maintain flow and environmental water quality.</td>
</tr>
<tr>
<td>Air</td>
<td>Air Quality and Atmospheric Gases</td>
<td>To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice.</td>
<td>Impact to air quality from port construction and activities.</td>
<td>Needs to meet:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Environmental Protection (Kwinana) (Atmospheric Waste) Policy, Environmental Protection Authority (EPA) 1999.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Air Quality Impacts from Land Development Sites. EPA Guidance Statement 18.</td>
</tr>
<tr>
<td>People</td>
<td>Amenity</td>
<td>To ensure that impacts to amenity are reduced as low as reasonably practicable.</td>
<td>Reduced visual amenity and recreational activities during construction. The project will enhance traffic congestion in longer term.</td>
<td>Manage impacts to visual amenity and recreation by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• 3D imagery for stakeholder and community engagement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• informative signs to notify public</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• constructing timing (March-December)</td>
</tr>
<tr>
<td>THEME</td>
<td>ENVIRONMENTAL FACTOR</td>
<td>ENVIRONMENTAL OBJECTIVE</td>
<td>POTENTIAL IMPACT</td>
<td>PROPOSED MANAGEMENT</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Heritage</td>
<td>To ensure that historical and cultural associations, and natural heritage, are not adversely affected.</td>
<td>Potential to disturb artefacts within a registered site under the Aboriginal Heritage Act 1972.</td>
<td>Management measures will include:</td>
<td>• liaison with Aboriginal communities and native title claimants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Section 18, if required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ground disturbing works monitored for skeletal or archaeological material</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Site briefing on unexpected finds procedures.</td>
</tr>
<tr>
<td>Human Health</td>
<td>To ensure that human health is not adversely affected.</td>
<td>The proposal is not expected to impact human health.</td>
<td>Ensure management to minimise risks to human health.</td>
<td></td>
</tr>
</tbody>
</table>

This following sections provide further information to the summary provided in Table 1.
## 4.1 Marine Investigations

Table 3 outlines the likely marine investigations that will be required at a minimum to inform the environmental documentation. Stakeholders are identified.

**Table 3: Marine Studies, Stakeholders and Documentation**

<table>
<thead>
<tr>
<th>ASPECT</th>
<th>REQUIREMENT</th>
<th>STAKEHOLDERS</th>
</tr>
</thead>
</table>
| Low Ecological Protection Area, Moderate Ecological Protection Area and High Ecological Protection Area | Calculations and approvals under the SEP (2015). The 5% cumulative surface area limit applies for development in Cockburn Sound. | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Marine infrastructure impacts (refer Figure 1: Marine Infrastructure) | Manage inlets and outlets; Newgen Power Station outfall, Perth Seawater Desalination Plant inlet and outfall, Kwinana Power Station intake and outfall. Hydrodynamic modelling | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Coastal processes modelling (refer Figure 2: Indicative Historical Coastal Movement) | Investigate wave reflection/refraction, and impacts to coastal processes resulting from the land backed wharf. Hydrodynamic modelling to investigate impacts resulting from the land backed wharf and dredging | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Marine fauna                                      | Habitat state and federally protected species                              | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Marine habitat mapping (including seagrass) (refer Figure 5: Marine Habitat) | Habitat mapping for Cockburn Sound was undertaken in 2012. Determine the locations of seagrass for monitoring purposes, habitat mapping. | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Marine monitoring – water quality, sediments and seagrass | Manage potential impacts to seagrass during dredging activities  
Monitoring of water quality and sediments, monitoring of benthic habitat  
Establish baseline conditions | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |
| Dredge and Reclamation Management Plan | Geotechnical investigation(s) required to ensure suitability for dredging and port structure. Concurrent with this investigation, sediment and infauna samples may be taken and analysed to determine contamination present and define the presence (if any) of significant benthic infauna in the project area. Determining the dredge volumes, construction methodology and source material will be required. Management will need to address and mitigate risks to the marine environment from construction and operation. | Department of the Environment (DotE)  
Minister for the Environment  
Department of Environment Regulation (DER)  
Department of Parks and Wildlife (DPaW)  
Environmental Protection Authority (EPA)  
Office of the Environmental Protection Authority (OEPA)  
OEPA – Marine Ecosystems Branch  
Department of State Development (DSD)  
Department of Aboriginal Affairs (DAA)  
Department of Planning and Infrastructure  
Local government.  
Department of Transport  
City of Kwinana  
City of Rockingham  
City of Cockburn  
CSMC  
Water Corporation  
Fremantle Port Authority  
Western Power  
Department of Defence |

1Note: Modelling should be undertaken for various scenarios, including all project stages.
4.2 Benthic Communities and Habitat

4.2.1 Environmental Objective
To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales (EPA 2015a).

4.2.2 Potential Impact
Further to a review of the EPA’s Environmental Assessment Guideline No. 3 (EPA 2009) the presence of seabed communities within the area will need to be managed to avoid cumulative irreversible loss of, or serious damage to, benthic primary producer habitat (BPPH).

The proposal has the potential to indirectly impact BPPH in surrounding areas during construction and operational activities that interfere with the seabed increasing suspended solids and releasing potential contaminants.

4.2.3 Proposed Management
The proposed management measures could include hydrodynamic modelling, biosecurity measures and water quality monitoring.

4.3 Coastal Processes

4.3.1 Environmental Objective
To maintain the morphology of the subtidal, intertidal and supratidal zones and the local geophysical processes that shape them (EPA 2015a).

4.3.2 Potential Impact
The proposal has the potential to impact the subtidal zone by influencing the longshore sediment transport leading to erosion and accretion along the coastline. The impact of longshore sediment transport is most apparent when a hard feature (natural or man-made) interrupts sediment flow resulting in contrasting patterns of accretion/erosion on the forward and leeward sides of the feature.

4.3.3 Proposed Management
To ensure impacts to coastal processes are minimal and that coastal morphology is maintained coastal processes and sediment movement will be defined.

4.4 Marine Environmental Quality

4.4.1 Environmental Objective
To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected (EPA 2015a).
4.4.2 Potential Impact

The proposal has the potential to impact water quality by the following activities:

- construction activities (dredging) and reclamation that interfere with the seabed increasing suspended solids and releasing potential contaminants
- construction equipment (e.g. barge) contamination (e.g. spills)
- operational activities - maintenance dredging, risk from ship movements (biosecurity).

Water quality decline has the potential to impact the marine environment.

4.4.3 Proposed Management

The proposed management measures that could be implemented include:

- sediment investigations prior to dredging and reclamation to identify and manage contaminants of potential concern (could be undertaken as part of a geotechnical investigation)
- water quality monitoring, specifically for turbidity and light attenuation, within nearby seagrass communities to ensure acceptable light availability
- ensure that all site personnel are briefed on environmental risks prior to commencing any activities
- refueling management for construction and operations and protocols in place in case of a hydrocarbon spill
- ensure that waste is managed appropriately during the public use of the project following completion, including a zero tolerance for discharge to the sea.

4.5 Marine Fauna

4.5.1 Environmental Objective

To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected (EPA 2015a).

4.5.2 Potential Impact

The proposal has the potential to disturb conservation significant marine fauna, particularly during dredging and reclamation.

Cetaceans and pinnipeds are of particular concern during these construction activities and species are known to occur in the vicinity of the proposal.

4.5.3 Proposed Management

All seaside construction activities have the potential to impact on marine fauna, however for this project the key activity is dredging and reclamation. Management measures may
4.6 Terrestrial Investigations

Table 4 outlines the likely terrestrial studies that will be required at a minimum to inform the environmental documentation and the stakeholders who will review the information.

Table 4: Terrestrial Studies and Stakeholders

<table>
<thead>
<tr>
<th>TERRESTRIAL ASPECT</th>
<th>STAKEHOLDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated Sites (refer Figure 4: Contaminated Sites)</td>
<td>Minister for the Environment</td>
</tr>
<tr>
<td>Public Safety and Security</td>
<td>Department of the Environment (DotE)</td>
</tr>
<tr>
<td>Construction Risk</td>
<td>Department of Environment Regulation (DER)</td>
</tr>
<tr>
<td>Materials Sourcing</td>
<td>Department of Parks and Wildlife (DPaW)</td>
</tr>
<tr>
<td>Aboriginal Heritage</td>
<td>Environmental Protection Authority (EPA)</td>
</tr>
<tr>
<td>Groundwater Quality</td>
<td>Office of the Environmental Protection Authority (OEPA) - OEPA Terrestrial Ecosystems Branch</td>
</tr>
<tr>
<td>Noise</td>
<td>Department of Aboriginal Affairs (DAA)</td>
</tr>
<tr>
<td>Dust</td>
<td>Department of Planning</td>
</tr>
<tr>
<td>Traffic (Rowley and Anketell roads are proposed heavy haulage road links to IOG)</td>
<td>Department of Transport</td>
</tr>
<tr>
<td>Fauna, flora and vegetation (refer Figure 3: Flora and Fauna Constraints)</td>
<td>City of Kwinana</td>
</tr>
<tr>
<td>Amenity</td>
<td>City of Rockingham</td>
</tr>
<tr>
<td></td>
<td>CSMC</td>
</tr>
<tr>
<td></td>
<td>MRWA</td>
</tr>
</tbody>
</table>

4.7 Amenity

4.7.1 Environmental Objective

To ensure that impacts to amenity are reduced as low as reasonably practicable (EPA 2015a).

4.7.2 Potential Impact

The visual amenity and some recreational activities will be impacted during construction, however the construction phase of the project is likely to be.

The potential impacts include:

- construction equipment visible during the construction phase
- reduced ability for recreation (walking and fishing) in the areas, due to presence of construction equipment
- access reduced in the vicinity for public safety and noise impacts.

4.7.3 Proposed Management

The impact to amenity can be managed by:

- construction timing – limited to the “off season” for recreators (March – December) with the majority of construction activities planned for winter
construction activities undertaken in accordance with *Environmental Protection (Noise) Regulations 2007* and will not occur outside the hours of 7am-7pm on weekdays

- Dredging and import/transport of materials optimized.

Impacts to recreational activities would be minimised as far as practicable, with public safety remaining the primary focus.
5 Land Backed Wharf and Island Port Options

The location of the land backed wharf and island port options are in the Kwinana Industrial Area. This area currently contributes $11 billion/annum to the WA economy (City of Kwinana 2015). Figure 1 shows the City of Kwinana’s land back wharf staged option.

The proposed Fremantle Port Outer Harbor options include four staged options via either Rowley or Anketell Roads and provided in Appendix A.

Table 5 provides a summary of the advantages and disadvantages of the land backed wharf and island port options.
<table>
<thead>
<tr>
<th>ASPECT</th>
<th>LAND-BACKED WHARF</th>
<th>ISLAND PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>ADVANTAGE</strong></td>
<td><strong>DISADVANTAGE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental disturbance during construction (potential increased turbidity, toxicity or physical alteration)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smaller coastal interface disturbance requirement</td>
</tr>
<tr>
<td></td>
<td><strong>ADVANTAGE</strong></td>
<td><strong>DISADVANTAGE</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental disturbance during construction particularly dredging and reclamation (e.g. causing increased turbidity, toxicity or physical alteration). Impacts to Cockburn Sound hydrodynamics.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Large dredging requirements due to deeper bathymetry (leading to decreased water quality)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removal of natural habitat (e.g. high limestone reef, small interspersed reef outcrops and seagrass)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental impacts better understood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct, permanent and cumulative loss of benthic habitat through dredging and reclamation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct, permanent and cumulative loss of benthic habitat through dredging and reclamation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced impact on near-coast habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Species mortality (e.g. as a result of footprint and dredge plumes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seagrass impacts and shading (reduction in PAR levels)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of foraging for marine fauna</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hydrodynamic alterations (e.g. leading to circulation and flushing issues)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uncertainty around underwater noise (terrestrial noise impacts are better understood)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise impacts (e.g. from marine piling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>'Offshore' lighting impacts (e.g. to marine fauna)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased water circulation and residence times for waters in Cockburn Sound. Water residency time is a measure of the time it takes for a body of water to flush from an area of the ocean.</td>
</tr>
<tr>
<td>ASPECT</td>
<td>LAND-BACKED WHARF</td>
<td>ISLAND PORT</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>ADVANTAGE</strong></td>
<td><strong>DISADVANTAGE</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ADVANTAGE</strong></td>
<td><strong>DISADVANTAGE</strong></td>
</tr>
<tr>
<td>Economic</td>
<td>Lower cost associated with less materials handling due to shallower bathymetry</td>
<td>Increased cost associated with dredging required</td>
</tr>
<tr>
<td></td>
<td>Space to expand (3,865 hectares available within IOG)</td>
<td>Increased approvals cost (e.g. modelling and baseline studies required to achieve regulator and stakeholder confidence)</td>
</tr>
<tr>
<td></td>
<td>Use of established infrastructure nodes</td>
<td>Adverse impacts to valuable species (e.g. Pink Snapper as a result of alterations to water circulation). Cockburn Sound is a primary spawning area for Pink Snapper.</td>
</tr>
<tr>
<td></td>
<td>Ease of access (land-backed rather than isolated from mainland)</td>
<td>Impacts to inlets and outfalls</td>
</tr>
<tr>
<td></td>
<td>Industrial zone (3,865 hectares available)</td>
<td>Higher construction costs (e.g. materials)</td>
</tr>
<tr>
<td>Social</td>
<td>Industrial zone (3,865 hectares available)</td>
<td>Higher operational costs</td>
</tr>
<tr>
<td></td>
<td>Impacts to local recreational areas (e.g. dog / horse exercise beaches)</td>
<td>Inefficiencies in transport logistics (e.g. bridge may complicate transport logistics)</td>
</tr>
<tr>
<td></td>
<td>Impacts to recreational fishing and tourism operations</td>
<td>Constrained expansion potential</td>
</tr>
<tr>
<td></td>
<td>Aesthetic impacts of dredging (e.g. increased turbidity)</td>
<td>Potential for impacts to existing local industry (e.g. Water Corporation desalination plant, Newgen and Kwinana Power stations)</td>
</tr>
<tr>
<td></td>
<td>Visual amenity of port presence</td>
<td>Visual amenity of port presence</td>
</tr>
<tr>
<td></td>
<td>Reduced potential for land-based impacts to recreational areas</td>
<td>Impacts to recreational fishing and tourism operations</td>
</tr>
<tr>
<td></td>
<td>Aesthetic impacts of dredging (e.g. increased turbidity)</td>
<td>Aesthetic impacts of dredging (e.g. increased turbidity)</td>
</tr>
</tbody>
</table>
6 Conclusion

Coordinating the multiple uses of Cockburn Sound (recreational, industrial, natural and cultural) and conflicting management objectives will require close management with stakeholders and the community. To progress the approvals, the following items are recommended:

- **Environmental Approvals:**
  - consultation with the Office of the Environmental Protection Authority and submission of a referral under Section 38(a) of the *Environmental Protection Act 1986*; and
  - consideration of a referral to the Department of the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* to ensure impacts to matters of national significance are assessed and managed.

- **Engagement** - consultation with stakeholders, decision making authorities and the local community will be required prior to the finalisation of design and commencement of the project. This aspect is important given the nature and location of the proposal and history of development in Cockburn Sound.

- **Aboriginal Heritage** – consultation with traditional owners and, once construction design and methodology is finalised, an assessment on the requirement of a Section 18 application under the AHA.

- **Key infrastructure considerations** will include land access, materials handling (dredged material and source material), relocation and management of existing inlets and outlets (Newgen Power Station outfall, Perth Seawater Desalination Plant inlet and outlet, Kwinana Power Station intake and outfall).

Coordinating the multiple uses of Cockburn Sound (recreational, industrial, natural and cultural) and conflicting management objectives will require close management with stakeholders and the community. The port options will require detailed investigations and management to ensure the marine water quality is protected. The EPA has developed an EQMF to protect and maintain the quality of the State’s marine environment, which is based on the principles and guidelines of the NWQMS. The Cockburn Sound Environmental Quality Criteria Reference Document for Cockburn Sound (EPA 2015d) will be a key instrument for any marine developments in Cockburn Sound having been developed after extensive scientific and public consultation to protect the quality of Cockburn Sound.
7 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses (“client’s information”) provided by the client and other individuals and entities. In most cases where client’s information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client’s information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client’s information is contingent upon the accuracy, exhaustiveness and currency of the client’s information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client’s information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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8 References


Environmental Protection Authority (EPA) 2015a, Environmental Assessment Guideline for Environmental principles, factors and objectives (EAG 8), revised January 2015.

Environmental Protection Authority (EPA) 2015b, Environmental Assessment Guideline for Application of a significance framework in the environmental impact assessment process (EAG 9), revised January 2015.

Environmental Protection Authority (EPA) 2015c, Environmental Assessment Guideline for Protecting the Quality of Western Australia’s Marine Environment (EAG 15), March 2015.

Environmental Protection Authority (EPA) 2015d, Environmental Quality Criteria Reference Document for Cockburn Sound (March 2015).

Environmental Protection Authority (EPA) 2012, Environmental Assessment Guideline for Defining the Key Characteristics of a Proposal (EAG 1), May 2012.

Environmental Protection Authority (EPA) 2009, Environmental Assessment Guideline No. 3: Protection of Benthic Primary Producer Habitat, December 2009.


Government of Western Australia, 2005, State Environmental (Cockburn Sound) Policy 2005. Western Australia State Environmental Policy Series 01.
FIGURES

Figure 1: Marine Infrastructure
Figure 2: Indicative Historical Coastal Movement
Figure 3: Flora and Fauna
Figure 4: Contaminated Sites
Figure 5: Marine Habitat
Figure 1

Indian Ocean Gateway
Preliminary Constraints Assessment

Legend
Indian Ocean Gateway Coastal Infrastructure
- Stage 1
- Stage 2
- Proposed Road
- Proposed Rail
- Inlet
- Outlet
- Mooring Pile
- Boat Launching Ramp
- Overbeach Launch
- Inlet
- Offshore Breakwater
- Outfall Pipe
- Sea Wall
- Wharf

City of Kwinana

Data Sources:
- Cadstral Boundary Sourced from Landgate 2009
- Locality Map Sourced Landgate 2006
- Rare Flora Records and Vegetation Mapping Sourced from Public Transport Authority 2015
- Aerial Photography Sourced Landgate Feb 2015 (© Western Australian Land Information Authority 2015)
Figure 2
Indicative Historical Coastal Movement
SCP24: Northern Spearwedd shrublands and woodlands

City of Kwinana
Preliminary Constraints Assessment

Figure 3
Flora and Fauna Constraints
Indian Ocean Gateway

Contaminated Sites Database

- Stage 1: Remediated for Restricted Use
- Stage 2: Contaminated, Restricted Use
- Proposed Rail: Contaminated, Remediation Required
- Proposed Roads

Legend

City of Kwinana

Indian Ocean Gateway

Preliminary Constraints Assessment

Figure 4

Contaminated Sites
APPENDIX A

Fremantle Port Outer Harbour Options
Option 1
An offshore facility linked to the shore by a bridge at the northern end which would link with an extension of Rowley Road.
Option 2

An offshore facility linked to the shore by a bridge at the southern end which would link with an extension of Anketell Road.
Option 3

An offshore facility linked to the shore by a bridge at the northern end, and differing from Option 1 in that the port configuration is more perpendicular to the coastline.
Option 4
A partial land-backed, partial offshore facility in the area from Alcoa to Fremantle Port’s Kwinana Bulk Terminal, with berths constructed parallel to the shoreline.