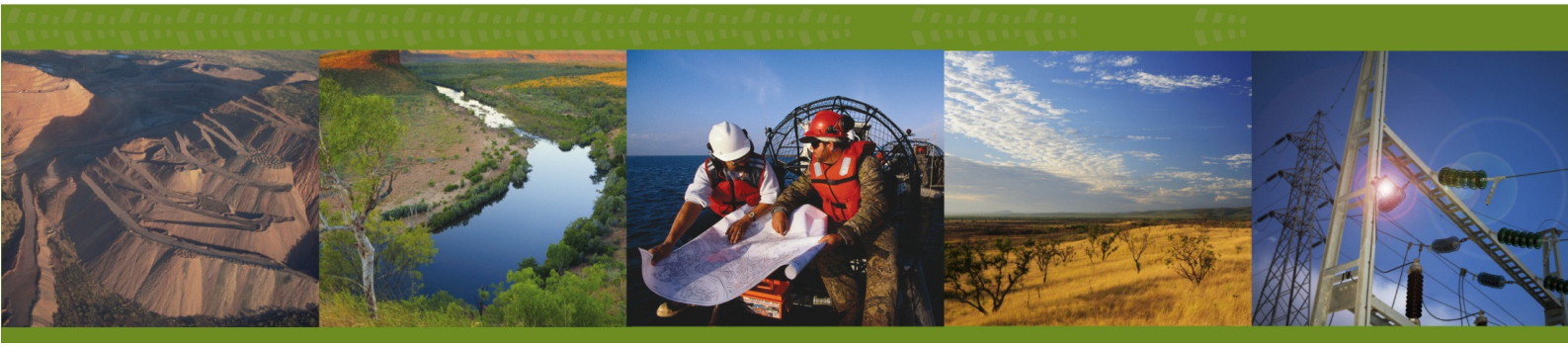

Mangles Bay Marina Based Tourist Precinct

Construction Environmental Management Program

Prepared for
Cedar Woods Properties Ltd
by Strategen

February 2012

STRATEGEN
environmental consultants

Mangles Bay Marina Based Tourist Precinct

Construction Environmental Management Program

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1. Introduction

1.1 Background

The proposed Mangles Bay Marina Based Tourist Precinct (the Proposal) is a refinement of previous proposals that have been put forward since the early 1990's.

This Proposal is for a tourist based marina development comprising a single entry marina to accommodate up to 500 pens and moorings and a surrounding land development comprising tourism, accommodation, commercial, public open space and residential land uses.

The project will provide much needed protected boating facilities in Mangles Bay, enhance public access to Mangles Bay and create a vibrant tourist district that will attract visitors to the region and create employment opportunities for Rockingham and the surrounding area. The project will also include rehabilitation of the wider Cape Peron bushland and provide additional passive recreation facilities such as walkways and information incorporating local aquatic clubs. The Project design objectives are included in Appendix 1.

The Proposal consists of the following elements:

- marina
- boating access channel
- provision and maintenance of service infrastructure
- land development area
- rehabilitation of degraded areas of surrounding vegetation and seagrass transplantation to offset vegetation losses.

1.2 Purpose and scope of document

This Construction Environmental Management Program (CEMP) has been prepared as a supporting document to the Public Environmental Review (PER) of the Proposal as assessed by the Office of Environmental Protection Authority in accordance with the *Environmental Protection Act 1986* (EP Act). This CEMP has also been prepared to address concerns raised by stakeholders during consultation.

The purpose of this CEMP is to document environmental management objectives and strategies in relation to this Proposal including:

- measures to prevent, minimise and mitigate potential environmental impacts during the construction phase of the Proposal
- details of the timing and persons responsible for implementation of the management measures
- monitoring and reporting procedures.

The CEMP provides an overview of the environmental initiatives to be undertaken during the Proposal to support the impact assessment presented in the PER. Specifically, this CEMP addresses the key environmental factors identified in the environmental impacts assessment of the Proposal and the key management considerations associated with the construction phase of the Proposal.

1.3 Cedar Woods environmental policy and commitment

Environmentally Sustainable Development (ESD) principles are key drivers for Cedar Woods projects. The following principles are the central objectives for Cedar Woods projects:

Green Estates and Buildings

- the preservation and enhancement of natural ecosystems
- proponent of 'Greensmart' principles
- intelligent water use and solar orientation of lots, facilitation of passive solar design
- comprehensive Design Standards applied to each estate facilitating ESD best practice
- energy efficiency – 6 star apartments and townhouses
- provision of landscaping packages which contain a water wise selection of plants and grass types.

Urban Water Management

- water sensitive design features – bio filtration systems incorporated into estate water features which treat and reuse storm water throughout the development
- rainwater tanks are encouraged through design standards and in some projects actually supplied and installed by Cedar Woods
- use of recycled water for public areas.

Urban Renewal, Waste & Heritage Preservation

- adoption of stringent waste minimisation plans for all projects which incorporate the reuse of viable materials within the development and mandate the sustainable disposal of all disused materials
- minimisation of development impact upon surrounding community
- utilisation of comprehensive urban renewal strategies for disused or under-utilised urban sites
- preservation and restoration of pre-existing heritage features influenced by ethnographic findings
- implementation of site remediation and decontamination programs
- adding value to the existing communities by enlivening tired streetscapes as part of project design strategy.

Cedar Woods' Environment Policy emphasises the commitment to protecting the natural environment.

The Mangles Bay Marina Based Tourist Precinct environmental intent is to:

- create a development that respects the marine and land environment of the area
- maintain existing water quality in Mangles Bay
- improve long-term viability of seagrass in Cockburn Sound
- improve management of both the surrounding land and marine environments
- include a financial commitment to more than offset any environmental impact to the land.

1.4 Cedar Woods Environmental management system

The activities undertaken by the Proponent is supported by the EMS which covers the environmental approvals, environmental management plans, incident management systems and awareness and training programs utilised for construction phases undertaken by construction contractors.

Cedar Wood's and its contractors focus is on continuous improvement in the management of potential environmental impacts throughout the construction phase of the Project. The EMS has been established to assist the Proponent and its contractors to audit environmental performance, identify areas for improvement and the implementation of appropriate corrective actions.

2. Implementation

2.1 Responsibilities

All Cedar Woods personnel are responsible for the environmental performance of their activities and for complying with their general environmental "duty of care". All contractors involved with the Proposal will be under a contractual agreement to abide by Cedar Woods' environmental obligations. Cedar Woods will be responsible for the implementation, maintenance and evaluation of compliance with this CEMP. Key personnel (Project Manager, Construction Manager, Superintendents and Site Environmental Officer) will be made responsible for communicating environmental matters and ensuring management practices and procedures are being implemented.

Construction contractors working with Cedar Woods will be responsible for complying with the environmental specifications contained within their contract, and develop policies and procedures compliant with this CEMP. Table 1 describes the roles and responsibilities of personnel responsible for this CEMP. Contractor responsibilities will be outlined within contract documents.

Table 1 Roles and responsibilities

Position	Responsibility
Project director	Provide the tools necessary (such as this CEMP) to ensure that site personnel are able to meet Cedar Woods corporate and legislative requirements. Implement and review this CEMP in accordance with the review schedule.
Project manager	Ensure this CEMP is being adhered to by all staff and contractors. Participate in compliance audits and inspections. Report results of compliance audits and inspections to the Project manager.
Construction manager	Provide technical support to site personnel. Ensure all staff are aware of their environmental obligations. Ensure contractors are aware of their environmental obligations. Coordinate and carry out site environmental inductions, inspections and internal audits. Report results of compliance audits and inspections to the Project director.
Site personnel/contractors	To be aware of all site environmental management strategies and procedures and be able to demonstrate this awareness when required. Report all known breaches of the environmental management strategies and procedures to the Project manager.

2.2 Environmental induction

Construction workers will receive environmental training to ensure they are aware of their responsibilities and are competent to carry out their work in an environmentally acceptable manner.

Environmental training will address the following:

- regulatory requirements applying to construction workers
- roles and responsibilities
- environmental issues for the project
- environmental management
- incident reporting
- site environmental objectives
- responding to complaints from the public
- emergency response and procedures
- remedial actions.

2.3 Community complaints

All community complaints will be recorded on a complaints register and investigated. A summary of the complaint and the subsequent investigation, including any monitoring results and corrective action will be prepared and reported in the Annual Environmental Report. See Section 3 for further details regarding reporting.

2.4 Incidents and corrective actions

An incident is an occurrence which has caused or has the potential to cause damage to the individual and/or environment and/or property.

All environmental incidents and 'near misses' will be recorded on an Environmental Incident Register. Incidents will be recorded by the person who causes or identifies the incident within the shift as soon as practicable within 12 hours of its identification. Incidents and 'near misses' will be investigated and appropriate measures implemented to prevent recurrence.

Responsibilities in relation to reporting environmental incidents are as follows:

- the Project manager shall report the incident to the relevant government agency, in accordance with the relevant legislation or where committed to in management plans
- the Construction manager will ensure that the cause of the incident is determined and the appropriate remedial and/or preventative action is taken
- the Project manager will review the environmental incident register regularly to ensure that any trends are identified and to assess the effectiveness of preventative measures.

2.5 Emergency response

Emergency response plans will be developed to minimise environmental impacts of emergency scenarios (including hazardous materials, dredged spoil, dewatered water storage facilities, failure of water retention structures and unplanned discharges).

The emergency response plans will detail:

- potential environmental emergencies
- associated measures required to mitigate environmental harm
- communication procedures and emergency contact details.

Basic emergency response training will be provided to all personnel, and selected dedicated personnel will undergo further training to form an Emergency Response Team. Appropriate emergency response equipment will be available on site.

2.6 Stakeholder consultation

In 2005 and 2006, public consultation was undertaken to assist in the development of a concept plan for a marina based tourist precinct for Cape Peron. The consultation process included public forums, establishment of a Stakeholder Reference Group, public advertising, project website, information hotline and various individual stakeholder meetings. Key government agencies, non-government organisations and other stakeholder groups including Aboriginal representatives have also been included within this consultative process.

Cedar Woods was appointed as the Project proponent and consultation commenced with the City of Rockingham and key government agencies including the OEPA and the Department of Planning in 2009. The Proponent also met with the local fishing and boating clubs and established the Boating Clubs User Group.

The Proponent has commenced a broader stakeholder engagement process with a Stakeholder Reference Group which will include local user groups, community groups and adjacent leaseholders. Details of stakeholder consultation undertaken to date is outlined within the Public Environmental Review document.

3. Performance review program

3.1 Monitoring and auditing

Cedar Woods and contractors shall conduct regular environmental inspections. Any opportunities for improvements shall be discussed, recorded and implemented in an agreed timeframe. During an audit the contractor shall make available appropriate personnel as required.

A compliance audit will be carried out in accordance with this EMP within 4 weeks of commencement of construction, and at quarterly intervals thereafter during construction works.

In the event that monitoring or inspections identify adverse impacts, Cedar Woods will develop and implement management contingencies in consultation with the relevant Government Departments.

3.2 Review and reporting

This management plan is subject to the following review mechanisms:

- on an as-needs basis when project conditions so dictate
- a formal annual review.

Any changes to this construction environmental management plan will be referred to the Department of Environment and Conservation (DEC) and the Office of Environmental Protection Authority (OEPA) and will be recorded.

4. Environmental management program outline

This EMP has been structured in a logical manner to first introduce the Proposal and to define the overarching environmental management procedures, processes and systems in place to ensure all environmental management measures are adequately implemented. The EMP then outlines the processes in place to ensure document control and continuous improvement of the document through regular review.

The management plans have been developed in response to the impacts identified during the environmental impact assessment process of the construction phase of the Proposal. Each plan contains detailed measures to guide the implementation of the Proposal in an environmentally acceptable manner. Some management parameters are cross referenced between individual management plans to account for the dynamic and often interrelated nature of the cause and effect processes that may potentially occur, as part of site environmental management.

This CEMP contains the following environmental management plans:

- groundwater management (Section 5)
- surface water management (Section 6)
- dredging and dredge spoil management (Section 7)
- terrestrial biodiversity and habitat management (Section 8)
- marine biodiversity and habitat management plan (Section 9)
- Graceful Sun-moth management plan (Section 10)
- dust management (Section 11)
- noise and vibration management (Section 12)
- fire management plan (Section 13)
- cultural heritage management (Section 14)
- hydrocarbon management plan (Section 15)
- waste management plan (Section 16)
- contaminated sites and acid sulphate soils management plan (Section 17)
- public access and beach management plan (Section 18)
- rehabilitation management plan (Section 19)
- community issues management plan (Section 20)
- visual amenity management plan (Section 21)
- road traffic management plan (Section 22).

5. Groundwater management plan

5.1 Potential impacts to be managed

A wet construction technique will eliminate almost entirely the need for groundwater abstraction in the form of dewatering during construction. It is anticipated, however, that minor, short term dewatering may potentially be required although this is expected to be below levels requiring licence. In the event that a licence is required, the management action described in 5.4 will apply.

The following aspects of the proposed Mangles Bay Marina may potentially impact on groundwater values within the Proposal area:

- changes to local groundwater levels
- exposure of acid sulphate soils if they exist within the land development area
- saltwater intrusion caused by the inland movement of the saltwater-groundwater (fresh) interface due to the inland marina.

5.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the Groundwater management plan are the:

- Surface water management plan (Section 6)
- Dredge and dredge spoil management plan (Section 7)
- Terrestrial biodiversity and habitat management plan (Section 8).

5.3 Environmental performance objectives

The EPA applies the following objectives in assessing proposals that may affect groundwater:

- to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected
- to ensure that emissions do not adversely affect environmental values or the health, welfare or amenity of people and land uses by meeting statutory requirements and acceptable standards.

5.4 Management actions

Specific actions have been identified to assist in achieving the EPA management objectives mentioned above. These are outlined in Table 2.

Table 2 Groundwater management actions

Item	Action	Purpose	Timing	Responsibility
Water use				
1.	If required. water licences for dewatering and water supply will be obtained.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment and to ensure compliance with the RiWI Act.	Prior to construction.	Project manager.

Item	Action	Purpose	Timing	Responsibility
2.	Water will only be taken from points licensed by the DoW.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment and to ensure compliance with the RiWI Act.	At all times.	Construction manager.
3.	The amount of groundwater abstracted will be reconciled regularly against the licence limit, and will not exceed the licensed limit.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment and to ensure compliance with the RiWI Act.	Quarterly.	Construction manager.
4.	Dewatering times will be minimised through dry excavation of the marina until excavation approaches the groundwater level.	To minimise duration of impact.	Construction.	Construction manager.
5.	Targets will be developed to drive continuous improvements in on-site and off-site water management, and actions will be implemented to meet such targets.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	Prior to construction.	Construction manager.
6.	Dewatering shall be undertaken in a manner that does not result in erosion or pollutants being released to land or the marine environment.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	At all times.	Project manager.
7.	Options for disposal of dewater will be considered, in order of preference: 1. Recharge of local groundwater Reuse for dust suppression and other construction needs. 2. Reuse off site. 3. Irrigation. 4. Discharge to local marine environment. 5. Storage of water for evaporative disposal.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	At all times.	Construction manager.
8.	Develop trigger criteria for water levels with modifications to operations should trigger criteria be breached.	To prevent lowering of water levels below predetermined levels.	Prior to dewatering	Project manager.
9.	Establish a contingency plan for use in the event that groundwater bore supply and/or quality is diminished.	To prevent reduction of groundwater supply and quality.	Prior to dewatering	Construction manager.
Water quality				
10.	A water quality monitoring program and schedule will be established for groundwater prior to groundwater abstraction. The monitoring program will clearly identify the applicable legal compliance limits.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment and to ensure compliance with the RiWI Act.	Prior to construction.	Project manager.
11.	Prior to dewatered water disposal, the water must comply with appropriate criteria (e.g. ANZECC water quality guidelines) and be acceptable to the OEPA, DEC and DoW.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	Prior to dewatering.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
12.	Develop trigger criteria for water quality with an investigation program should criteria be breached	To prevent reduction in water quality.	Prior to dewatering.	Construction manager.
Acid sulphate soils				
13.	Preparation of an Acid Sulphate Soil management plan (ASSMP) in accordance with the DEC environmental management requirements.	To identify and manage acid sulphate soils on site and at Lake Richmond.	Prior to dewatering.	Project manager.
14.	Implementation of an acid sulphate management sub-plan.	To identify and manage acid sulphate soils on site and at Lake Richmond.	Prior to dewatering.	Construction manager.
15.	Establish baseline groundwater conditions and monitor to detect any changes.	To ensure early detection of signs of impact on groundwater quality.	Prior to dewatering.	Construction manager.
Groundwater dependent ecosystems				
16.	A groundwater monitoring program will be established within the TEC SCP30a.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	Prior to construction.	Project manager.
17.	A groundwater monitoring program will be established surrounding Lake Richmond to monitor groundwater levels within and around the.TEC 'Holocene Dune Sedgeland' at Lake Richmond.	To ensure groundwater abstraction does not cause detrimental impacts to the surrounding environment.	Prior to construction.	Project manager.
Reporting				
18.	All baseline data and environmental monitoring results will be provided to the DEC Kwinana office and DoW Kwinana-Peel office annually.	To demonstrate no significant impact to groundwater levels or quality and compliance with licence/approval conditions.	Annually.	Project manager.

5.5 Monitoring and corrective actions

The proposed monitoring regime (Table 3) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved will result in corrective action. After construction, the monitoring, targets and corrective actions will be reviewed by the Project manager in consultation with the DEC, DoW City of Rockingham where relevant.

Table 3 Groundwater monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
Dewatering					
1.	Monitoring of off site bores for pH and EC.	Monthly during dewatering activities.	No significant reduction in water quality.	Modification to dewatering program.	Construction manager.
2.	Monitoring of water levels in nearby residential garden bores.	Monthly during dewatering activities.	No significant reduction in groundwater level.	Modification to dewatering program.	Construction manager.
Dewatered water					
3.	Collection of field parameters including pH, EC, dissolved oxygen, redox potential and temperature.	Every two weeks during dewatering.	No significant reduction in water quality.	Modification to dewatering program.	Construction manager.
Acid Sulphate Soils					
4.	Monitoring program is to be undertaken in accordance with the ASSMP.	In accordance with the ASSMP.	In accordance with the ASSMP.	In accordance with the ASSMP.	In accordance with the ASSMP.

6. Surface water management plan

6.1 Potential impacts to be managed

The dominant surface water feature within the surrounding area is Lake Richmond, and therefore will be the focus of this management plan, including other surface water aspects related to this Proposal. The following aspects of the proposed Mangles Bay Marina may potentially impact on the values of Lake Richmond and surface water aspects of the Proposal:

- hydrological changes during construction of the marina waterbody will lead to temporary groundwater drawdown which may lead to:
  - lowering of water levels in Lake Richmond
  - exposure of acid sulphate soils if they exist around Lake Richmond
- saltwater intrusion caused by the inland movement of the saltwater-groundwater (fresh) interface due to the inland marina into Lake Richmond
- increased population as a result of development may increase indirect impacts on Lake Richmond through uncontrolled access, rubbish and domestic pets
- alteration of stormwater management infrastructure.

6.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the surface water management plan are the:

- Dredging and dredge spoil management plan (Section 7)
- Hydrocarbon management plan (Section 15).

6.3 Environmental performance objectives

The EPA applies the following objective in assessing proposals that may affect surface water:

- to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected
- to ensure that emissions do not adversely affect environmental values or the health, welfare or amenity of people and land uses by meeting statutory requirements and acceptable standards.

6.4 Management actions

Specific actions have been identified to assist in achieving the EPA management objectives mentioned above. These are outlined in Table 4.

Table 4 Surface water management actions

Item	Action	Purpose	Timing	Responsibility
Stormwater				
1.	Installation of gross pollutant traps and swales to treat stormwater generated on the construction site prior to infiltration or discharge. In larger events, treated stormwater may be discharged into Mangles Bay.	To prevent stormwater from the development from entering the Lake Richmond.	During construction.	Construction Manager.
2.	Silt fences will be placed in or along drainage lines.	To reduce speed of flow and sediment load.	Prior to construction.	Construction Manager.
3.	Clearing only to occur within authorised areas.	To prevent erosion	During construction.	Construction Manager.
4.	Rehabilitate retained vegetation areas within the Proposal area	To prevent erosion and maintain soil stability.	During and post construction.	Project Director.
5.	Design the Proposal in a water sensitive manner.	To minimise impacts of the Proposal on the urban water cycle and to protect aquatic ecosystems.	Prior to construction.	Project Director.
Acid sulphate soils				
6.	An acid sulphate soil management plan will be developed and construction workers will be inducted on appropriate procedures should acid sulphate soils be identified on site during the construction phase. The acid sulphate soil management plan will apply to the project site and to Lake Richmond.	To prevent contamination of Lake Richmond.	During construction.	Project Director.
Lake Richmond				
7.	Minimising impacts of construction on groundwater levels by implementing Groundwater Management Plan.	To prevent changes to surface water levels.	During and post dewatering and construction.	Construction Manager.

6.5 Monitoring and corrective actions

The proposed monitoring regime (Table 5) outlines activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved will result in corrective action. After construction, the monitoring, targets and corrective actions will be reviewed be reviewed by the Project manager in consultation with the DEC, DoW City of Rockingham where relevant.

The monitoring at Lake Richmond will be conducted at permanent monitoring locations.

Table 5 Surface water monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
Stormwater					
1.	The construction site will be inspected for: • erosion/runoff • water pooling • condition of infiltration basin/ponds.	Weekly during wet season Following storm event	No erosion or significant sediment transport No pooling within construction areas	1. Investigate cause of water quality change. 2. Change procedures. 3. Monitor to identify effectiveness of remedial action.	Construction manager.
Lake Richmond					
2.	Water quality monitoring of Lake Richmond throughout the construction phase including: • real time water level monitoring using a data logger • water quality monitoring • stratification monitoring for pH, dissolved oxygen, temperature and electrical conductivity • transects of the Lake.	Monthly during construction	No alteration in water quality within Lake Richmond	1. Investigate cause of water quality change. 2. Change procedures. 3. Monitor to identify effectiveness of remedial action.	Construction manager.

7. Dredging and dredge spoil management plan

Dredging management actions (including maintenance dredging) are discussed in Appendix 2 of this CEMP: Mangles Bay Marina Dredging Environmental Management Plan.

8. Terrestrial biodiversity and habitat management plan

8.1 Potential impacts to be managed

The Proposal may potentially impact terrestrial habitat and biodiversity during the construction phase of the Proposal. The following aspects of the Proposal may impact terrestrial biodiversity values:

- clearing of vegetation for the Proposal will directly disturb fauna habitat and may result in the loss of both habitat and individual fauna
- change to groundwater levels during construction of the marina may affect groundwater dependent vegetation
- creation of new saltwater interface as a result of land based marina may affect saltwater/freshwater interface dependent vegetation
- increased population as a result of development may increase indirect impacts on vegetation through uncontrolled access, rubbish and domestic pets
- vehicle movements and earthworks in the Proposal area may result in the loss of individual fauna and introduce and spread weed species
- fragmentation of Bush Forever site 355 as a result of clearing for the development
- dust generation due to earthworks and vehicle movements that has the potential to smother vegetation
- predation on terrestrial fauna species from introduced domestic pets from the land development
- potential edge effects to surrounding vegetation from clearing and construction activities.

Management of Marine biodiversity (i.e. seagrass) values are addressed in the Marine Biodiversity and Habitat Management Plan.

8.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the terrestrial biodiversity and habitat management plan include:

- Marine biodiversity and habitat management plan (Section 9)
- Graceful Sun Moth management plan (Section 10)
- Rehabilitation management plan (Section 19).

8.3 Environmental performance objectives

The EPA applies the following objectives in assessing proposals that may affect biodiversity:

- to maintain the abundance, diversity geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge
- to maintain biological diversity that represents the different plants, animals and microorganisms, the genes they contain and the ecosystems they form, at the levels of genetic diversity, species diversity and ecosystem diversity.

8.4 Management actions

Specific management actions have been identified to manage the potential impacts identified during the environmental impact assessment on terrestrial biodiversity within and surrounding the Proposal area. These are outlined within Table 6.

Table 6 Terrestrial biodiversity and habitat management actions

Item	Action	Purpose	Timing	Responsibility
Clearing				
1.	Clearing of vegetation within designated clearing areas only.	To prevent unauthorised clearing within and surrounding the Proposal area.	Construction.	Construction manager.
2.	Delineate the boundaries of the vegetation to be cleared for construction in the field with flagging tape, signage or fencing.	To prevent unauthorised clearing within and surrounding the Proposal area.	Prior to construction.	Construction manager.
3.	Restrict movement of construction machinery and equipment to designated tracks and roads.	To prevent unauthorised clearing within and surrounding the Proposal area.	Construction.	Construction manager.
4.	Stage clearing of vegetation so that areas are cleared only as required.	To allow fauna to move out of areas to be cleared gradually.	Construction.	Construction manager.
5.	Conduct fauna collection prior to each stage of clearing using licensed fauna handlers.	To re-locate any fauna that might be impacted upon by the clearing.	Construction.	Construction manager.
Fauna				
6.	Implementation of fauna encounter procedures including fauna relocation and handling.	To prevent injury or death to native animals.	Construction.	Construction manager.
7.	Give native animals encountered on-site the opportunity to move on if there is no threat to personnel safety in doing so.	To prevent injury or death to native animals.	Construction.	Construction manager.
8.	Call the nominated carer or Wildlife Hotline to rescue sick or injured native animals if they are encountered.	To prevent loss of native animals.	Construction.	Construction manager.
9.	Limit noise and vibration that may disturb fauna.	To minimise disturbance to fauna.	Construction.	Construction manager.
10.	Provide suitable areas as conservation offsets.	To redress any potential impacts to native fauna from the Proposal.	Prior to construction.	Project director.
11.	Restrict the duration of exposure of open trenches (no part of the trench open for more than 5 days).	To minimise the potential for fauna to become trapped.	Construction.	Construction manager.
12.	Conduct inspections of trenches for trapped fauna at the start and end of each day and within half an hour prior to backfilling.	To prevent injury or death to native animals.	Construction.	Construction manager.
Weeds				
13.	Implement an induction program for construction personnel which contains information on: • hygiene procedures for all vehicles, machinery and equipment upon entering and leaving the Proposal area • specific soil management requirements • requirement to remain within designated clearing areas.	To reduce the risk of construction activities introducing and/or spreading weeds and plant pathogens by ensuring construction personnel are aware of appropriate management measures and requirements	Prior to construction.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
14.	Establish clean down site/s at access points to Proposal area. The clean down site/s will be designed to ensure soil is collected and disposed of in a manner that does not allow the introduction or spread of weeds or plant pathogens. At each permanent clean down site there will be a sign describing the hygiene procedure/s required to be implemented.	To prevent the introduction and spread of weeds and pathogens.	Construction.	Construction manager.
15.	The hygiene procedure will include a clean down instruction to consist of brushing, gouging and/or scraping to remove compacted soil and/or plant material. This will be followed by jetting with compressed air such that all soil and/or plant residue is removed. All residue removed will be collected and disposed off-site.	To prevent the introduction and spread of weeds and pathogens.	Construction.	Construction manager.
16.	In wet conditions, clean down will be performed using high pressure water treated with sodium hypochlorite in the ratio of 2 L to every 3000 L of water (wash down). Water will be collected for re-use on site following sterilisation.	To prevent the introduction and spread of weeds and pathogens.	Construction.	Construction manager.
17.	Undertake a vehicle hygiene check for all vehicles/machinery entering the construction site for the first time. Each vehicle will be given a 'hygiene sticker' indicating that they have been checked and assessed for hygiene performance.	To prevent the introduction and spread of weeds and pathogens.	Construction.	Construction manager.
18.	Inspect the construction areas for infestations of declared species and weed species not previously recorded in the area.	To prevent the introduction and spread of weeds and pathogens.	Construction.	Construction manager.
19.	Prepare and implement a weed control program.	To decrease weed cover in the Proposal area.	Construction.	Project manager.
Pest animals				
20.	No domestic pets allowed on site.	To prevent pest animal invasion.	Construction.	Construction manager.
21.	Dispose of food scraps and other waste to sealed on-site tamper-proof waste disposal bins.	To prevent pest animal invasion.	Construction.	Construction manager.
Rehabilitation				
22.	Implement progressive rehabilitation of sites disturbed during construction, especially drainage channels as per Rehabilitation management plan (Section 19).	To minimise the area of exposed surfaces at any one time to prevent sedimentation in downstream/down-slope environments, to maximise rehabilitation success by ensuring minimal topsoil storage times.	During and post construction.	Construction manager.
23.	Rehabilitation of disturbed areas will be undertaken progressively to assist in reducing the spread of weeds.	To reduce total weed coverage.	During and post construction.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
24.	Native seeds and plants will be salvaged during clearing and utilised in rehabilitation.	To reduce opportunity for weed invasion.	Prior to clearing vegetation and post construction.	Construction manager.
25.	Consolidate and formalise walking tracks and provision of board walks in sensitive areas.	To reduce disturbance to vegetation.	Construction.	Construction manager.
26.	Install fencing where required.	To protect vegetation from trampling.	Prior to and during construction.	Construction manager.
27.	Landscape the median strips and verges of Memorial Drive and internal roads.	To provide cover for fauna crossing the roads.	Post construction.	Construction manager.
28.	Establish a monitoring program to evaluate the rehabilitation performance.	To ensure rehabilitation is effective.	Post construction.	Project manager.

8.5 Monitoring and corrective actions

The proposed monitoring regime (Table 7) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, the monitoring, targets and corrective actions will be reviewed be reviewed by the Project manager in consultation with the DEC.

Table 7 Terrestrial biodiversity and habitat monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Compliance of marked clearing boundary with development maps.	Daily during construction.	No clearing adjacent to areas where clearing boundaries are not defined.	Report as Environmental Incident and initiate Incident Procedure (Appendix 8), which shall include: • investigating the cause of the incident • redefining boundaries.	Construction manager.
2.	Extent of clearing and ground disturbance along pre-defined boundaries.	Daily during construction.	No clearing or disturbance outside of pre-defined boundaries.	Report as Environmental Incident and initiate Incident Procedure (Appendix 8), which shall include: • investigating the cause of the incident • redefining boundaries if due to inadequate boundary marking • rehabilitate affected area as required in accordance with the Rehabilitation Management Sub-plan (Section 19). • monitoring the success of remedial action.	Construction manager.

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
3.	Weed species found along common use infrastructure areas during construction.	Quarterly.	No new plant pathogens or weed species observed or recorded in the mapped area during construction.	1. Map the extent of any new weed areas 2. Map the distribution of the newly introduced species. 3. Identify activities that may have potentially introduced the species. 4. Plan and implement a monitoring or control treatment program in the case of identifying a declared noxious weed species and DEC in the case of identifying a priority environmental weed). 5. Re-educate contractors of the importance of hygiene control measures.	Construction manager.
4.	Feral animals in the Proposal area during construction.	Quarterly.	No new pest animals or sightings of feral animals during construction.	1. Investigate cause. 2. Undertake eradication program as required. 3. Undertake intervention or remediation works (e.g. reduce bins, trapping, re-education).	Construction manager.

9. Marine biodiversity and habitat management plan

9.1 Potential impacts to be managed

Potential effects on marine habitat and biodiversity during the construction phase of the Proposal to be managed are as follows:

- irreversible loss of benthic habitat due to the footprint of the access channel
- temporary changes in water quality during construction (turbidity, nutrient-related water quality, contaminants) due to dredging, and drainage of seawater in the settlement and infiltration basins into the shallow groundwater system (which discharges to Mangles Bay)
- temporary changes to marine water quality due to hydrocarbon spills and waste emissions from construction equipment
- inappropriate waste disposal causes adverse effects (entanglement, ingestion) on marine fauna
- disturbance of marine fauna during dredging
- introduction of marine pests from the dredge

Temporary changes in turbidity during construction activities are expected to have minimal effects on seagrass and other marine biota. Water quality modelling indicates total suspended solids values of 5 mg/L or less only occurring outside the access channel footprint for 1% of the time over the duration of the three month dredging program (i.e. six hours).

9.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the marine biodiversity and habitat management plan are the:

- Dredging and dredge spoil management plan (Section 7)
- Hydrocarbon management plan (Section 15)
- Waste management plan (Section 16)
- Seagrass Rehabilitation and Monitoring Management Plan (separate document to be produced).

9.3 Environmental performance objectives

The EPA applies the following objectives in assessing proposals that may affect biodiversity:

- to maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge
- to maintain biological diversity that represents the different plants, animals and microorganisms, the genes they contain and the ecosystems they form, at the levels of genetic diversity, species diversity and ecosystem diversity.

The EPA also requires that the extent, severity and duration of impacts on benthic habitat and associated biota be defined in accordance with Environmental Assessment Guideline No. 7 *Environmental Assessment Guideline for Marine Dredging Proposals* (EAG 7; EPA 2011) using spatially-defined zones as follows:

- Zone of High Impact (ZoHI) - the area where impacts on seagrass meadows and associated benthic organisms were predicted to be irreversible (defined as lacking a capacity to return or recover to a pre-dredging state within a timeframe of five years or less)
- Zone of Moderate Impact (ZoMI) - the area where predicted impacts on seagrass and benthic organisms were expected to be sub-lethal, and/or the impacts were recoverable within a period of five years following completion of the dredging activities
- Zone of Influence (ZoI) - the area where changes in environmental quality associated with dredge plumes were predicted, but these changes were not expected to result in a detectible impact on benthic biota. The ZoI represents the predicted maximum extent of the dredge plumes, and beyond it there should be no dredge-generated plumes discernible from background conditions at any stage during the dredging campaign. EAG 7 (EPA 2011) notes that the ZoI can be large, but at any point in time the dredge plumes are likely to be restricted to a relatively small portion of the ZoI. Reference sites for monitoring natural variability are ideally located outside of the Zone of Influence of the dredging activities.

Zones according to EAG 7 (EPA 2011) were conservatively derived as follows:

- Zone of High Impact (ZoHI) - comprising the development footprint (direct losses due to the access channel and batters, breakwaters and beach breakwaters, reclamation areas, and indirect loss due to a 15 m halo effect around the breakwaters),
- Zone of Moderate Impact (ZoMI) –notionally defined as extending 10 m beyond the ZoHI (conservative modelling results implied an outer boundary of the ZoMI that coincided with the outer boundary of the ZoHI, so a notional ZoMI was defined to avoid a boundary marking a change from 'irreversible loss of benthic biota' to 'no detectable impacts on benthic biota')
- Zone of Influence (ZoI) - the outer boundary of the ZoI was defined using the 100th percentile of the area where a TSS threshold of 2 mg/L was exceeded, representing the maximum extent of the visible plume.

9.4 Management actions

Specific management actions have been identified to manage the potential impacts identified during the environmental impact assessment on marine biodiversity and habitat within and surrounding the Proposal area. These are outlined within Table 8.

Table 8 Marine biodiversity and habitat management actions

Item	Action	Purpose	Timing	Responsibility
Dredging activities				
1.	Dredge will be operated within the approved footprint at all times.	To ensure that the loss of benthic habitat[1] remains within predicted loss estimates and that dredging does not generate excessive turbidity outside the zone of influence predicted in dredge plume modelling.	During dredge operation.	Construction manager and dredge operator
2.	Dredge vessel will be configured with a "Green Valve" if practicable.	To reduce sediment and turbidity plume.	Prior to commencement of dredging operations.	Construction manager

Item	Action	Purpose	Timing	Responsibility
3.	A drag head will be utilised to loosen the bottom material prior to suction and water jets will be employed to assist in loosening the sand.	To optimise the throughput and decrease the duration of the dredging program.	During dredge operation.	Construction manager
4.	The suction heads at the end of the pipes will be kept above the seabed until the scheduled dredging area has been reached.	To prevent unnecessary sea bed disturbance.	During dredge operation.	Construction manager.
Marine Fauna				
5.	Marine fauna observations will be conducted[2] by a designated spotter on board the dredge to identify the presence of penguins, dolphins, sea lions, turtles or other marine megafauna in the vicinity[2] of the dredge vessel.	To prevent impact with and subsequent injury or death of marine fauna.	During daylight operation of dredge.	Construction manager and dredge operator.
6.	If any marine megafauna are identified in the defined observation zone, the dredger will cease dredging until they have moved outside the observation zone or be re-positioned where possible, to avoid potential interactions	To prevent impact with and subsequent injury or death of marine megafauna.	Ongoing during dredging operations.	Construction manager and dredge operator.
7.	An Introduced Marine Pest (IMP) inspection on all dredge vessels and equipment will be undertaken by an appropriately qualified marine scientist (Department of Fisheries approved list of IMP inspectors). Vessels to be declared clean of fouling biota within 48 hours prior to mobilisation to Mangles Bay.	To prevent the introduction of IMPs and potential impacts on marine biodiversity	Prior to mobilisation of vessel or equipment to site	Construction manager
Marine water quality and benthic habitat				
8.	Deployment of additional silt curtain, conditions permitting (see also Section 7)	To ensure that sediment suspended during dredging will be contained by the silt curtain	Ongoing during dredging operations	Construction manager and dredge operator.
9.	Routine monitoring of turbidity in seagrass meadows adjacent the dredging area	To ensure that seagrass health in the ZoMI is not irreversibly affected by excessive turbidity generated during dredging, and there is no detectable effect on seagrass health in the ZoI .	Ongoing during dredging operations	Construction manager and dredge operator.
10.	Undertake seagrass rehabilitation as per Seagrass Rehabilitation and Monitoring Management Plan (to be developed)	To ensure that any seagrass directly lost as a result of the proposal is offset by at least an equivalent area of rehabilitated seagrass	Prior to commencement of dredging and construction operations	Project manager

Notes:

[1] Direct loss of seagrass not to exceed 5.30 ha (includes breakwaters, reclamation areas, channel and batters) and indirect loss not to exceed 0.36 ha (based on a 15 m halo effect around the breakwaters)

[2] Within a 500 m exclusion zone for 30 minutes prior to dredge starting, and with visual observations maintained continuously during dredging

9.5 Monitoring and corrective actions

The proposed monitoring regime (Table 9) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction the Project manager will review the construction monitoring program in consultation with the OEPA, DEC, Department of Fisheries and City of Rockingham where relevant.

The proposed monitoring sites for light attenuation and seagrass include those monitored during baseline studies for the Proposal, and focuses on seagrasses in deeper water as these are expected to be more sensitive to lesser water quality (Oceanica 2011).

Table 9 Marine biodiversity and habitat monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	GPS tracking to monitor the position of the dredge vessel.	Ongoing during duration of dredging.	Dredging to remain within the approved footprint.	1. Breach of boundary will be investigated. 2. Personnel operating the dredge will be reminded about the approved footprint 3. Rehabilitation of area equivalent to the size of the disturbed area will be undertaken.	Construction manager.
2.	Monitoring of drainage water from the settlement ponds for contaminants. Parameters monitored may include: • pH Nutrients (total nitrogen, nitrate/nitrite and ammonium) total phosphorus and orthophosphate) • Total Suspended Solids (TSS) • TBT • Metals (Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Zn).	Fortnightly, commencing from one month prior to construction starting, through to one month after dredging ceases	No exceedance of water quality criteria for high ecological protection area for Cockburn Sound marine waters (EPA (2005). Nutrient concentrations consistent with results of dredge material characterisation.	1. Investigate cause of exceedance in water quality criteria and/or cause of unexpectedly high nutrient concentrations. 2. Alter dredging operation or undertake re-treatment of dredged material as required (refer to Appendix 2).	Construction manager.
3.	Visual assessment (location, length, width and direction)[1] and photographic record of any turbid plume originating from the construction area	Twice daily during dredging and turbidity-causing construction works	No excessive turbidity outside of the predicted ZoI is generated during construction. Photographic record to confirm visual assessment.	1. Investigate cause of excessive turbidity. 2. Initiate contingency action (e.g. silt curtain, change dredge methods and timing) to reduce turbidity. 3. Inform DEC/OEPA, CSMC and City of Rockingham if necessary	Construction manager

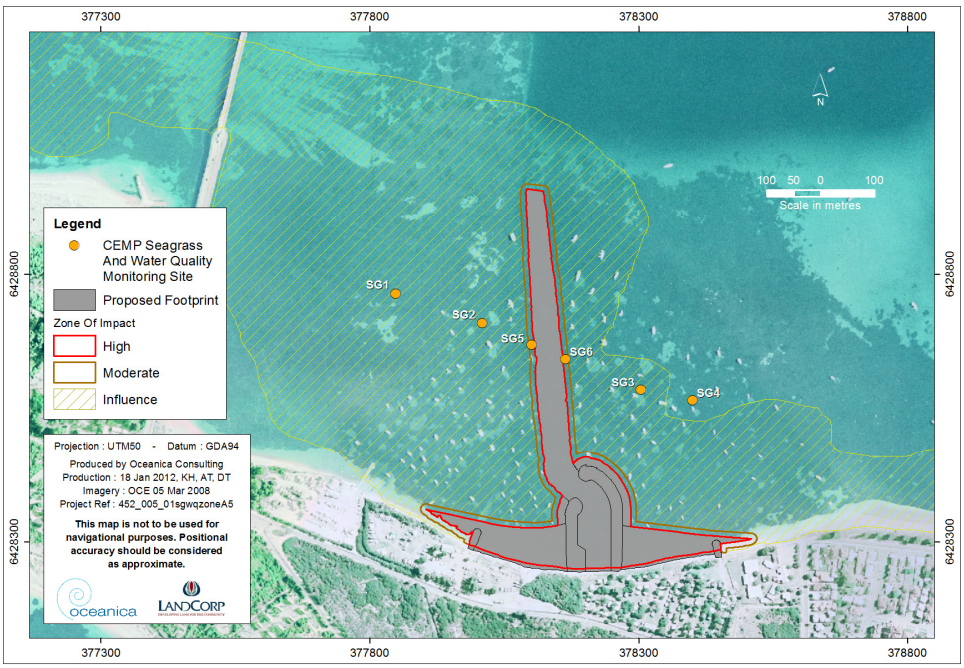
Item	Activity and location	Frequency	Target	Corrective action	Responsibility
4.	Light attenuation[2] (a measure of turbidity), calculated from *in situ* light loggers (downloaded fortnightly) at two sites in the ZoMI (sites SG5 and SG6, Figure 1), three sites in the ZoI (sites SG1 to SG3, Figure 1) and three reference sites outside the ZoI (site SG4, Figure 1 and sites MBE and MBW, Figure 2)	Continuously from two months prior to construction to two months after construction	During construction, the fortnightly median light attenuation in the ZoMI not to exceed the 95th percentile of reference sites, and the fortnightly median light attenuation in the ZoI not to exceed the 80th percentile of reference sites[3].	1. Investigate cause of exceedance. 2. Initiate fortnightly monitoring of seagrass shoot density and seagrass health to determine impact on seagrasses (see Item 5). 3. If required, change dredge methods and timing to reduce turbidity.	Project manager (to be undertaken by a qualified marine scientist)
5.	Seagrass shoot density (*Posidonia sinuosa*) to be measured as per Cockburn Sound SEP protocols (EPA 2005b) in 24 fixed quadrats (20 cm x 20 cm) at the same sites as light attenuation (see Item 4). Visual assessment of seagrass health (e.g. smothering of seagrass, epiphyte load) also to be documented at each site via underwater photographs (for contextual information).	Within two weeks prior to commencement and within two weeks following completion of the construction works. Additional monitoring during construction to be conducted as required, if triggered by exceedance of the light attenuation targets (see Item 4)	During construction, median seagrass shoot density in the ZoMI not to fall below the 5th percentile of reference sites, and median seagrass shoot density in the ZoI not to fall below the 20th percentile of reference sites[3].	1. Investigate cause of turbidity. 2. Stop work on site. 3. Instigate measures to prevent further deterioration of conditions 4. Initiate more detailed monitoring of ambient water quality and seagrass shoot density. 5. Inform DEC/OEPA if necessary	Project manager (to be undertaken by a qualified marine scientist)

Notes:

[1] Visual assessment to include date, relevant weather and sea-state conditions and proximity of plume to nearest edge of dense seagrass meadows adjacent to the construction site.

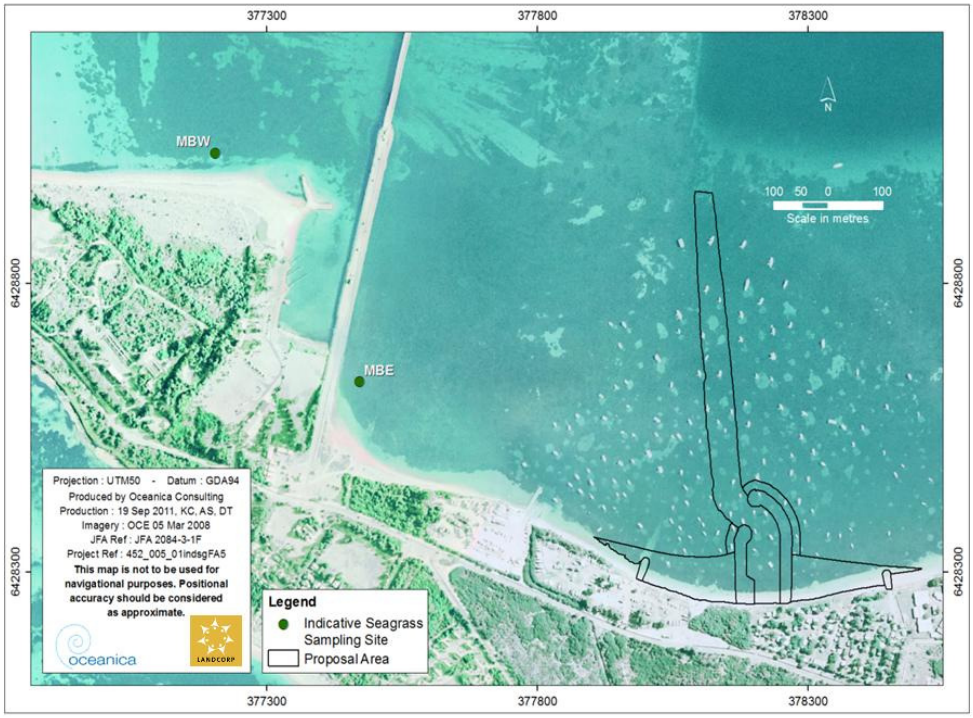
[2] LAC to be calculated daily using light data collected between 10:00 and 14:00.

[3] Targets based on the protocols of the State Environmental (Cockburn Sound) Policy (EPA 2005a). Data from potential impact sites to be compared with reference sites of similar depth, as per EPA (2005a, b).



Note: All sites located on the 2.5–3.0 m depth contour, except site SG1 (depth 1.5 m) which was not possible due to the rapid shallowing of waters towards the Causeway.

Figure 1 Seagrass monitoring sites SG1 to SG6, relative to Zones of Moderate Impact and Influence



Note: Site MBW located in water depth of 2.5–3.0 m, and site MBE ~1.5 m.

Figure 2 Seagrass reference sites MBE and MBW

10. Graceful Sun-moth management plan

10.1 Potential impacts to be managed

The Graceful Sun-moth (GSM), *Synemon gratiosa,* is a day flying moth endemic to the area between Beekeepers National Park (10 km North of Leeman) and Preston Beach (Bishop et al 2010), with GSM habitat present and one individual recorded in the Proposal area. A number of key threatening processes have been identified for the GSM (DEC 2011), including:

- clearing of habitat for urban, rural and industrial development
- inappropriate management of habitat (e.g. destruction by fire, grazing and dieback).

The conservation initiatives identified by the DEC as being appropriate to support the protection of the GSM are to:

- protect areas of native vegetation that contain, or potentially contain, subpopulations
- develop and implement a suitable fire management strategy
- increase community awareness
- investigate formal conservation arrangements
- investigate options for establishing additional subpopulations
- minimise the use and maintenance of fire trails in March, when males have established their territories
- undertake monitoring of known sites
- fence known sites to prevent public access.

The conservation activities identified by the DEC and Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) have been applied within the environmental management measures of this management plan. These management measures are intended to supplement the Offsets Strategy in order to achieve the overall biodiversity and habitat outcomes of the Proposal.

10.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the GSM management plan are the:

- Terrestrial biodiversity and habitat management plan (Section 8)
- Fire management plan (Section 13).

10.3 Management actions

Specific management actions have been identified to manage the potential impacts identified during the environmental impact assessment on the Graceful Sun Moth within and surrounding the Proposal area. These are outlined within Table 10.

Table 10 Graceful Sun-moth management actions

Item	Action	Purpose	Timing	Responsibility
1.	Fence GSM protection site.	To prevent disturbance to GSM habitat.	Prior to clearing and construction.	Project manager.
2.	Establish a GSM protection site within rehabilitated areas.	To prevent disturbance to GSM habitat.	Prior to clearing and construction.	Project manager.
3.	Conduct trapping/ inspection for GSM prior to clearing.	To prevent individual loss of GSM.	Prior to clearing and construction.	Project manager.
4.	Translocate any GSM found within area to be cleared.	To prevent individual loss of GSM.	Prior to clearing and construction.	Project manager.
5.	Consolidate and formalise walking tracks and provision of board walks in sensitive areas.	To prevent disturbance to potential GSM habitat.	Construction.	Construction manager.
6.	Prohibit recreational vehicle use on tracks.	To prevent disturbance to potential GSM habitat.	During and post Construction.	Construction manager.
7.	Implement a fire management plan to minimise the incidence of fire.	To prevent fire disturbance to potential GSM habitat.	During and post Construction.	Construction manager.
8.	Identify options for establishing additional areas of GSM habitat.	To assist with the local recovery of the species.	Construction.	Project manager.

10.4 Monitoring and corrective actions

The proposed monitoring regime (Table 11) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, this management and monitoring actions will be reviewed by the Project manager in consultation with the DEC and DSEWPAC.

Table 11 Graceful sun moth monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Monitor GSM protection site, integrity of fencing and health of vegetation.	Monthly during clearing and construction.	No evidence of trespassing or trampling of vegetation or decline in vegetation health.	1. Reinstall fencing. 2. Rehabilitation including replanting where practicable.	Project manager.

11. Dust management plan

11.1 Potential impacts to be managed

Dust may be generated during the construction phase as a result of clearing of vegetation and demolition of existing structures on site, earthmoving and vehicle traffic on unsealed surfaces. In dry, windy conditions, particles can lift from disturbed areas resulting in visible dust emissions. The generation of dust from the Proposal will be influenced by:

- the frequency at which dust generating activity takes place
- meteorological conditions such as wind speed
- moisture content of the dust source
- composition of dust, including particle size distribution, particle density
- the condition of the dust source.

Impacts to be managed include:

- short term dust emissions during the construction phase from clearing and demolition of existing structures

The nearest sensitive receptors to the Proposal area are the residences east along Hymus St/Safety Bay Road and recreation camps west of Memorial Drive and Point Peron Road during the construction stages of the Proposal.

11.2 Relationship between this management plan and other management plans

The Community Issues management plan (Section 20) is also considered relevant to this Dust management plan.

11.3 Environmental performance objectives

The EPA environmental objective for air quality is:

- to ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards (EPA 2004).

11.4 Management actions

During construction there will be a need to manage the potential for dust generation and to ensure appropriate and timely responses in the event of dust complaints during the construction phase of the Proposal. Specific management actions have been identified to assist in achieving the EPA's environmental objective and are included in Table 12.

Table 12 Dust management

Item	Action	Purpose	Timing	Responsibility
Clearing and exposed areas				
1.	Areas to be cleared will be clearly marked and flagged.	To prevent unnecessary clearing.	Prior to ground disturbance.	Construction manager.
2.	The total area of exposed ground surfaces will be minimised (stockpiles and cleared areas).	Minimise wind generated dust.	During construction.	Construction manager.
3.	Cleared areas on land development areas will be stabilised following vegetation clearance.	Minimise wind generated dust.	During construction.	Construction manager.
4.	Cleared vegetation will be chipped and mulch used for soil stabilisation.	Minimise wind generated dust.	During construction.	Construction manager.
Vehicles				
5.	The speed of all vehicles on-site shall be restricted to 20 km/hr. This speed will be further reduced if large amounts of dust are still being generated.	Minimise generation of dust by vehicle and equipment movement.	During construction.	Construction manager.
6.	Heavy vehicles and earthmoving equipment will be cleaned prior to exit from the site.	To prevent deposition of material on external roads, which may contribute to dust emissions.	During construction.	Construction manager.
Dust suppression and control				
7.	Onsite water carts will be provided and maintained in good working condition. Water carts will have a total capacity of not less 10,000L per 5ha of disturbed land or a suitable alternative such “Zerosion” or “Environex".	Minimise generation of dust by vehicle and equipment movement and to minimise wind generated dust.	During construction.	Construction manager.
8.	Biodegradable dust suppression will be applied to areas prone to dust generation.	Minimise wind generated dust.	During construction.	Construct.ion manager
9.	Screens (wind fencing) around the development site to block out wind.	Minimise wind generated dust	Prior to construction.	Construction manager.
10.	Hydromulching of dust generation areas.	Minimise wind generated dust.	During construction.	Construction manager.
Community complaints				
11.	A complaints management system will be established relating to Dust emissions.	To ensure complaints by nearby residents are captured.	During construction.	Construction manager.

11.5 Monitoring and corrective actions

The proposed monitoring regime (Table 13) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, the monitoring program and management actions will be reviewed by the Project manager in consultation with the relevant City of Rockingham staff.

Table 13 Dust monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Construction site will be inspected for visual dust lift.	Daily.	No significant dust lift over the site.	1. Investigate cause. 2. Implement appropriate dust control measures, which may include: • limiting the quantity of machinery/vehicles in operation. • removal dust source material within 24 hours. • installing additional wind fencing. • reducing the vehicle speeds below 20 km/hr. 3. Monitor success of control measure. If the measure is inadequate, seek alternative measures (consultation with relevant agencies may be required).	Construction manager.
2.	Levels of available dust suppressant will be checked.	Weekly.	Sufficient suppressant available to manage dust on-site.	1. Investigate cause. 2. Restock chemical suppressant and/or ensure water carts are refilled.	Construction manager.

12. Noise and vibration management plan

12.1 Potential impacts to be managed

Noise and vibration will be generated during construction and operational phases of the Proposal resulting in an increase in vibration and ambient noise levels in the vicinity of the Proposal area. Sources of noise and vibration from the Proposal include:

- operation of machinery and equipment
- vehicle traffic.

Noise and vibration may affect fauna behaviour or surrounding residents however, the effect is dependent on the distance from the source of noise/vibration and the location of sensitive receptor or the sensitivity of fauna. Nearby sensitive receptors include:

- residences east along Hymus St/Safety Bay Road
- recreation camps west of Memorial Drive and Point Peron Road.

12.2 Relationship between this management plan and other management plans

The Community issues management plan (Section 20) is considered relevant to the noise and vibration management plan.

12.3 Environmental performance objectives

The management actions below will ensure compliance with the *Environmental Protection (Noise) Regulations 1997*, through adherence with the following objectives:

1. L10 noise level for short high noise level events measured over 15 minutes is not to exceed 20 dB(A) above background L10 noise levels established in Environmental Protection (Noise) Regulations 1997.
2. Long term noise measured hourly is not to exceed 10 dB (A) of noise level established in the Environmental Protection (Noise) Regulations 1997.
3. Site will operate in accordance with good noise control practice as defined in Section 6 of AS 2436-1981 (Standards Australia, 1981).

To ensure that the public is not disturbed by the construction works, no vibration level will exceed a peak particle velocity of 10 mm/s during construction.

The EPA environmental objective for noise is:

- to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards (EPA 2009).

12.4 Management actions

The Proposal will be subject to *Environmental Protection (Noise) Regulations 1997* during the construction phase of the project. However, under Regulation 13, construction noise from construction sites are not required to meet the assigned levels, provided certain conditions are met. The following noise management measures will be implemented as part of the Proposal (Table 14).

Table 14 Noise and vibration management actions

Item	Action	Purpose	Timing	Responsibility
1.	Construction equipment utilised is the quietest reasonably available.	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
2.	Construction work will be carried out in accordance with Section 6 of the Australian Standards 2436-1981 "Guide to noise control on construction, maintenance and demolition sites".	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
3.	Construction activities will operate only on Weekdays, during the operating hours 7:00am – 4:00pm.	To prevent disturbance of beach users and residents during peak usage periods.	During construction.	Construction manager.
4.	Construction activities will not occur during public holidays.	To prevent disturbance of beach users and residents during peak usage periods.	During construction.	Construction manager.
5.	Engines and equipment will be properly maintained in good working order.	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
6.	All equipment will be operated in a safe and efficient manner.	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
7.	Non-essential maintenance will be carried out during day-light hours.	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
8.	Screens, enclosures and other noise mitigating devices shall be used where there is a risk of unacceptable noise levels to the community.	To reduce the noise emissions from the construction site.	During construction.	Construction manager.
9.	A noise emissions complaint telephone service will be established, related to the construction and dredging activities.	To ensure complaints by nearby residents are captured and the source of noise is addressed.	During construction.	Construction manager.

12.5 Monitoring and corrective actions

The proposed monitoring regime (Table 15) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, this management plan will be reviewed by the Project manager, together with relevant parties of the City of Rockingham.

Table 15 Noise and vibration monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Vibration and noise monitoring will be undertaken at locations as indicated in the Noise and Vibration management plan.	Ongoing.	No exceedence of levels outlined in Section 12.3	1. Investigate cause. 2. Initiate noise or vibration reduction measures. 3. Monitor success.	Construction manager.
2.	Monitoring the number of noise and/or vibration complaints.	Ongoing.	No public complaints relating to noise or vibration.	1. Assess conformance with construction activities detailed in the management actions table. 2. If non-conformance detected, the situation shall be rectified immediately. 3. If activities are in conformance with management actions but nuisance is still apparent, a noise measurement shall be taken at the location of complaint and assess adherence to AS 2436 1981 guidelines for sound levels and management actions amended accordingly. 4. Complaints to be managed in accordance with the Noise and vibration management plan.	Project manager.

13. Fire management plan

13.1 Potential impacts to be managed

Aspects of the Proposal requiring management to mitigate potential impacts resulting from fire include:

- ignition of fuel or oil spills/leakages during re-fuelling of construction equipment, or ignition of other material during construction activities with an ignition source
- solid waste disposal on site during construction.

13.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the fire management plan are:

- Waste management plan (Section 16)
- Hydrocarbon management plan (Section 15).

13.3 Environmental performance objectives

The environmental objectives are to protect property within and adjacent to the Proposal area and to maintain biodiversity within adjacent Rockingham Lakes Regional Park and Point Peron.

13.4 Management actions

The following fire management actions (Table 16) will be implemented during the construction phase of the Proposal.

Table 16 Fire management actions

Item	Action	Purpose	Timing	Responsibility
1.	Induct construction personnel on fire and emergency response procedures.	To decrease the risk of fire outbreaks occurring and spreading.	Prior to construction personnel commencing work on site.	Construction manager.
2.	Maintain and operate construction machinery in accordance with relevant fire safety standards.	To decrease the risk of construction machinery causing fire outbreaks.	At all times during construction.	Construction manager.
3.	Ensure the majority of construction machinery is fitted with dry chemical extinguishers that have been tagged by an approved inspector.	To ensure fire outbreaks can be controlled quickly and effectively.	At all times during construction.	Construction manager.
4.	Ensure the majority of construction machinery is fitted with approved spark arrestor exhaust systems.	To decrease the risk of construction machinery causing fire outbreaks.	At all times during construction.	Construction manager.
5.	Liaise with FESA in relation to controls and risk mitigation for days of very high and extreme fire hazard.	To decrease the risk of construction vehicles causing fire outbreaks.	Upon notification of fire hazard.	Construction manager.
6.	Ensure a fire fighting unit with a minimum 400 L capacity is operational and readily accessible for fire fighting requirements.	To ensure fire outbreaks can be controlled quickly and effectively.	At all times during construction.	Construction manager.
7.	Ensure fire fighting equipment is maintained to comply with relevant fire safety standards.	To ensure fire outbreaks can be controlled quickly and effectively.	At all times during construction.	Construction manager.

13.5 Monitoring and corrective actions

The proposed monitoring regime (Table 17) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, the Project manager will review the management plan in consultation with the City of Rockingham.

Table 17 Fire monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Observation to detect outbreak of fire in construction areas.	Ongoing during construction.	No incidence of fire.	1. Report as Incident and initiate Incident Response Procedure (Appendix 8), including as appropriate • immediately extinguishing fire • investigating cause • rehabilitating burnt area as required.	Construction manager.

14. Heritage management plan

14.1 Potential impacts to be managed

The potential impacts of the project on Aboriginal and European heritage values and the causal aspects of the Proposal requiring management are listed below. These aspects have the potential to disturb known and/or unknown heritage sites and affect ethnographic values, and relate primarily to physical disturbance of the land surface from project activities, including:

- physical disturbance of sites of Aboriginal and European heritage significance by:
  - unauthorised access
  - removal or disturbance of artefacts
- presence of construction and operational personnel has potential to disturb heritage sites, disrupt cultural association meetings and gatherings and affect ethnographic values.

14.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the cultural heritage management plan are the:

- Rehabilitation management plan (Section 19)
- Terrestrial biodiversity and habitat management plan (Section 8).

14.3 Performance objectives

The EPA applies the following objective when assessing proposals that may impact on heritage:

- to ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

14.4 Management

Specific actions have been identified to assist in achieving this management objective (Table 18). Management actions may be altered consistent with the outcomes of the proposed Section18 application under the *Aboriginal Heritage Act 1972* to impact two Aboriginal Heritage Sites.

Table 18 Heritage management actions

Item	Action	Purpose	Timing	Responsibility
1.	Implement an induction program for construction personnel on: • significance of Aboriginal heritage and the potential impacts of the project • procedures to report potential new sites • obligations under the *Aboriginal Heritage Act 1972* (WA) • requirements for the protection of known Aboriginal sites.	To ensure protection of known sites of Aboriginal heritage significance in accordance with the requirements of the *Aboriginal Heritage Act 1972* (WA), to improve knowledge of Aboriginal cultural heritage in non-indigenous people associated with the project.	Prior to personnel commencing work on-site.	Construction manager.
2.	Document the location of protected areas on development design plans and make available to planners, agents, contractors, and relevant employees.	To ensure protection of known sites of Aboriginal heritage significance in accordance with the requirements of the	Prior to commencement of ground disturbance.	Project manager.

Item	Action	Purpose	Timing	Responsibility
3.	Flag the boundaries of construction areas to ensure activities do not intrude into areas where Aboriginal sites are present.	*Aboriginal Heritage Act 1972* (WA), to improve knowledge of Aboriginal cultural heritage in non-indigenous people associated with the project.	Prior to commencement of ground disturbance.	Construction manager.
4.	Ensuring all construction personnel stay to defined access roads.		Prior to commencement of ground disturbance.	Construction manager.
5.	Any interference with heritage sites shall be reported as incidents to the Department of Indigenous Affairs.	To ensure protection of previously unrecorded Aboriginal heritage sites detected during construction/clearing activities in accordance with the *Aboriginal Heritage Act 1972* (WA).	During clearing and earthworks.	Construction manager.
6.	If a suspected heritage site is detected, work will be stopped immediately and supervisor informed.		During clearing and earthworks.	Construction manager.
7.	If suspected skeletal remains found – works shall cease immediately until all clear is given by Police, DIA, ALO and archaeologists.		During construction.	Construction manager.
8.	Objects found during construction works shall be salvaged and managed according to advice from archaeologists and Aboriginal Elders.		During construction.	Construction manager.
9.	Nyungar heritage monitors issued with a permit under Section 16 of the *Aboriginal Heritage Act 1972* (WA) will be on-site to monitor clearing and earthworks activities.		As required.	Project manager.
10.	A qualified archaeologist issued with a permit under Section 16 of the *Aboriginal Heritage Act 1972* (WA) will be available to come to site if a suspected heritage site is uncovered.		As required.	Project manager.

14.5 Monitoring and corrective actions

The proposed monitoring regime (Table 19) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, the Project manager will review this management plan in consultation with the relevant Aboriginal and heritage groups, the DIA and the City of Rockingham.

Table 19 Cultural heritage monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Confirm that Aboriginal monitors are present.	During ground disturbing activities.	No disturbance to known sites of Aboriginal heritage significance.	1. Report as incident. 2. Installation of fencing around known heritage sites and rehabilitation of site as required.	Construction manager.

15. Hydrocarbon management plan

15.1 Potential impacts to be managed

The transportation and storage of chemicals and hazardous can present risk to the environmental if not properly managed. Aspects of the project that may represent risk include a spill or disposal to the environment include:

- handling and storage of fuel and chemicals (fuel, lubricants and incidental chemicals required for maintenance of vehicles and machinery)
- refuelling of vehicles and machinery (hydrocarbons - fuel)
- maintenance of light vehicles and machinery (hydrocarbons – fuel, lubricants; coolant)
- transfer of fuel to mobile fuel tankers (if local storage tank established by contractors)
- disposal of waste storage containers, hydrocarbons and chemicals
- excavation work close to gas/sewer pipelines
- malfunction of construction equipment (e.g. break in hydraulic hose).

15.2 Relationship between this plan and other management plans

Other management plans considered relevant to the hydrocarbon management plan are the:

- Groundwater management plan (Section 5)
- Surface water management plan (Section 6)
- Contaminated sites management plan (Section 17).

Additional steps to manage potential impacts to groundwater and surface water values of the proposal site, including water quality monitoring, are outlined in the groundwater and surface water management plans (Section 5 and Section 6). The handling and treatment of a contaminated site (e.g. asbestos found onsite) is covered in the contaminated sites management plan (Section 17).

15.3 Performance objectives

The transport, storage and handling of fuel, chemicals, explosives and a contaminated site will be in accordance with legislative requirements and incorporate the following standards and guidelines where possible:

- AS 1940 – 2004, “(Incorporating Amendment No 1) The Storage and Handling of Flammable Liquids”
- AS 1940 – 2004, “The Storage and Handling of Flammable and Combustible Liquids”
- NFPA 30, “Flammable and combustible liquids code”, 2003 Edition
- DEC, “Contaminated Sites Act 2003”.

The key objectives for hydrocarbon management are:

1. To minimise the risk of spillage or escape of hazardous materials from chemical storage areas.
2. To minimise the risk of spillage from vehicle or equipment servicing and refuelling.

15.4 Management

During construction there will be a need to manage hydrocarbons on site. Specific management actions have been identified to assist in achieving the environmental objectives and are included in Table 20.

Table 20 Hydrocarbon management actions

Item	Action	Purpose	Timing	Responsibility
Induction and register				
1.	A Hazardous Materials Register will be prepared and maintained for all hazardous materials kept on site. The Register shall be located on site and accessible to all personnel.	To provide the following safety and handling information: • descriptions of materials and their uses • handling procedures • storage regulations and standards • quantities stored onsite • Material Safety Data Sheets (MSDS's).	Prior to and during construction.	Construction manager.
2.	A register will be maintained to record fuel deliveries of a 100 Litres or greater to the site.	To establish an inventory of hydrocarbons on site.	During construction.	Construction manager.
3.	Inductions for all site construction personnel shall include briefing in the handling and storage of fuels and chemicals, transferring of fuel and the refuelling of vehicles and machinery, vehicle maintenance and details of the onsite location of the Hazardous Materials Register.	To ensure best management practices for hydrocarbons and chemicals are undertaken by all personnel.	During construction.	Construction manager.
4.	Relevant Part V Environmental Approvals under the EP Act will be applied for if triggers for prescribed premises are met.	To ensure the appropriate licences are held before construction commences.	Prior to construction.	Project manager.
Handling and storage				
5.	Hydrocarbons will be stored within appropriately bunded vessels or within bunded areas.	To prevent spills and contamination of soil and / or groundwater / surface water.	During construction.	Construction manager.
6.	All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards *AS1940* and *AS1692*.	To ensure chemicals are appropriately stored.	During construction.	Construction manager.
7.	Bunds will be maintained as part of the monthly site checks be appropriate persons.	To ensure chemicals are appropriately stored.	During construction.	Construction manager.
8.	240L spills kits will be made available on site and kept adequately stocked.	To allow for appropriate management of spills.	During construction.	Construction manager.
9.	Handling of chemicals/fuels shall take place in areas where there is no potential for runoff to reach retained vegetation or Proposal area boundaries.	To prevent impact to vegetation and / or surface water.	During construction.	Construction manager.
10.	Topsoils will be separately stockpiled and strategically located away from drainage lines, concentrated surface water flows, trafficable areas and area where contaminating substances are used or stored.	To ensure that topsoil is not contaminated.	During construction.	Construction manager.
11.	Spills will be immediately cleaned up, with contaminated material appropriately disposed in designated hydrocarbon bins.	To mitigate the impact of spills on soil, groundwater and surface water.	During construction.	Construction manager.
12.	When disposal of waste hydrocarbons or chemicals is required, the waste shall be collected by a licensed operator as required, and shall be disposed of at a waste management facility licensed to accept the waste.	To ensure contaminated material and chemicals are disposed of appropriately.	During construction.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
13.	Environmental incidents related to hydrocarbon and chemical spills will be reported in accordance with Section 2.4 of this plan.	To mitigate the impact of spills on soil, groundwater and surface water.	During construction.	Construction manager.
Dredge operations				
14.	Fuel transfer to the dredge will be monitored and any spills or leaks reported immediately.	To minimise the risk of contamination of the marine environment.	Ongoing during dredge operation.	Construction manager.
15.	All hazardous waste will be stored in secure containers on board the dredge, and removed to an appropriate disposal facility.	To minimise the risk of contamination of the marine environment.	Ongoing during dredge operation.	Construction manager
16.	Spill cleanup kits will be provided on the dredge vessel.	To minimise the risk of contamination of the marine environment.	Ongoing during dredge operation.	Construction manager.
Refuelling and maintenance				
17.	Equipment and vehicles including surface mobile equipment shall be subject to a regular maintenance program.	To reduce the likelihood of spills and leakages occurring.	During construction.	Construction manager.
18.	Refuelling activities will be undertaken in appropriately bunded areas.	To reduce the likelihood of spills and leakages occurring.	During construction.	Construction manager.
Emergency response				
19.	Develop and emergency response procedure in accordance with DoW Water Quality Protection Note Contaminated Spills (WQPN No. 10).	For determining the appropriate level of response according to the degree (or classification) of the spill.	Prior to construction.	Construction manager.
20.	Maintain a register of emergency response documentation.	To establish inventory of emergency responses on site.	Construction.	Construction manager.
21.	Notify the DEC of hydrocarbon spills in accordance with the Environmental Protection (Unauthorised discharges) Regulations 2004 and the *Contaminated Sites Act 2003.*	To ensure potential spills are remediated according to the Environmental Protection (Unauthorised discharges) Regulations 2004 as hydrocarbons are a schedule 1 in these regulations.	Construction.	Project manager.

15.5 Monitoring and corrective actions

The proposed monitoring regime (Table 21) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, this management plan will be reviewed by the Project manager together with the DEC and other relevant government agencies.

Table 21 Hydrocarbon monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Inspect integrity of valves, pumps and connections used in the transport of fuels and chemicals.	As part of construction site entrance inspection.	All equipment remains free from leaks and faults.	1. Investigate cause. 2. Conduct maintenance / repairs. 3. Monitor success.	Construction manager.
2.	Inspect hydrocarbon and chemical storage containment areas, including integrity of storage vessels and containers.	Weekly during environmental inspection.	All vessels and containers are maintained in good condition and meet applicable standards and regulations.	1. Investigate cause. 2. Conduct maintenance / repairs. 3. Monitor success.	Construction manager.

16. Waste management plan

16.1 Potential impacts to be managed

Wastes will be generated during the construction phase of the Proposal. Wastes covered by this management plan include:

- building material waste – off cuts, overspill of concrete, packaging, etc
- litter including food and drink packaging
- black and grey water – onsite portable toilets
- office equipment (portable offices) – paper, cardboards, etc
- wastewater – water generated from dewatering.

The potential impacts to the surrounding environment resulting from poor management practices are:

- contamination of surface water, groundwater and marine environment through incorrect waste storage and disposal
- adverse effects on marine fauna (e.g. entanglement, ingestion) due to incorrect waste disposal
- inefficient use of resources through failure to reduce, recycle, re-use or recover waste
- waste not properly contained may attract unwanted feral animals
- dewatering may generate contaminated wastewater depending on the soil and water characteristics.

16.2 Relationship between this plan and other management plans

The main management plans that are related to the waste management plan include:

- groundwater management plan (Section 5)
- surface water management plan (Section 6)
- dredging and dredge spoil management plan (Section 7)
- terrestrial biodiversity management plan (Section 8)
- marine biodiversity and habitat management plan (Section 9)
- hydrocarbon management plan (Section 15).

Handling and storage of hydrocarbons and hydrocarbon wastes are addressed in the hydrocarbon management plan (Section 15).

16.3 Performance objectives

The environmental objectives for effective waste management during on site construction activities for the Proposal are to:

- to protect environmental integrity from waste contamination
- to ensure safe handling, treatment and disposal of all generated wastes in accordance with legal requirements.

16.4 Management

During construction there will be a need to manage waste on site and to ensure appropriate and timely responses in the event of public complaints. Specific management actions have been identified to achieve the environmental objectives and are included within Table 22.

Table 22 Waste management actions

Item	Action	Purpose	Timing	Responsibility
Induction				
1.	All construction personnel will be inducted on relevant waste management procedures.	To ensure appropriate disposal of all personal rubbish and incidental construction rubbish generated.	Prior to personnel commencing work on site.	Construction manager.
2.	A procedure for the identification of hazards, potential modes of failure, and assessment of risks posed by waste disposal facilities will be developed.	To promote appropriate disposal.	Prior to personnel commencing work on site.	Project manager.
Waste disposal				
3.	Appropriate waste disposal facilities (e.g. bins) shall be provided in strategic locations onsite.	To promote appropriate disposal.	Construction.	Construction manager.
4.	Waste receptacles (rubbish bins) will always have lids secured	To prevent waste materials to be blown out and access by animals.	Construction.	Construction manager
5.	Waste bins shall be located such that they do not affect the community and not close to surrounding premises.	To prevent a reduction in amenity due to odours and visibility.	Construction.	Construction manager.
6.	Separation of waste for recycling will be encouraged.	To minimise the environmental footprint of the construction activity.	Construction.	Construction manager.
7.	Inert domestic and industrial waste and putrescible waste will be disposed of at approved offsite landfill facilities.	To minimise the environmental footprint of the construction activity.	Construction.	Construction manager.
8.	Controlled wastes will be collected, removed from the site and disposed of at a licensed facility in accordance with the requirements of the Environmental Protection (Controlled Waste) Regulations 2003 including obtaining tracking receipts.	To minimise the environmental footprint of the construction activity.	Construction.	Construction manager.
9.	Environmental hazards and impacts will be evaluated for materials and chemicals during transport, storage, use and disposal.	To minimise the environmental footprint of the construction activity	Construction.	Construction manager.
10.	No construction material will be left on site.	To minimise the environmental footprint of the construction activity.	Following completion of construction.	Construction manager.
11.	Portable chemical toilet facilities will be located on site.	To prevent pollution of the terrestrial environment.	Construction.	Construction manager.
Dewatering				
12.	Waste water will be excluded from drainage features as far as practicable.	To prevent contaminated water from entering the groundwater or surface water systems surrounding the Proposal Area.	Construction.	Construction manager.
13.	Where required, clean water diversion systems and contaminated water collection systems will be established.	To prevent contaminated water from entering the groundwater or surface water systems surrounding the Proposal Area.	Construction.	Construction manager.
Dredge vessel				
14.	All rubbish on the dredging vessel will be contained within appropriate containers.	To prevent pollution of marine environment adjacent to the dredging footprint.	During dredge operation.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
15.	Rubbish will be removed from the dredge to an appropriate disposal facility.	To prevent pollution of marine environment adjacent to the dredging footprint.	During dredge operation.	Construction manager.
16.	Sewerage and domestic waste water will be stored in a holding tank on board the dredge, prior to being disposed of at regular intervals by a licensed contractor.	To prevent pollution of marine environment adjacent to the dredging footprint.	During dredge operation.	Construction manager.

16.5 Monitoring and corrective actions

The proposed monitoring regime (Table 23) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, this management plan will be reviewed by the Project manager in consultation with the relevant government agencies.

Table 23 Waste monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Inspection of Waste disposal facilities (including liquid effluent)	Weekly	All waste is disposed of in designated disposal facilities	1. Investigate cause. 2. Alter management actions accordingly (e.g. relocate disposal facilities). 3. Re-inform all personnel of waste management responsibilities. 4. An Environmental Incident Report (Appendix 8) shall be completed if greater than one cubic metre of waste in open.	Construction manager.
			Waste disposal facilities are properly containing waste and frequency of collection/ emptying is sufficient	1. Investigate cause. 2. If due to misuse re-inform all personnel of proper use of facilities. 3. If due to facility fault mitigate immediately (e.g. replace or modify facility). 4. If due to collection/ emptying frequency then make necessary arrangements with waste collection contractor to implement. 5. An Environmental Incident Report (Appendix 8) shall be completed if greater than one cubic metre of waste in open.	Construction manager.

17. Contaminated sites and acid sulphate soils management plan

17.1 Potential impacts to be managed

Potential sources of impact during development works are:

- earthworks (excavation and dewatering) have the potential to disturb and expose contaminated soil, sediment and/or water if contamination exists on site
- excavation on site or along service infrastructure corridors has the potential to disturb ASS if they occur on the site
- exposure of contaminated sediments during the dredging of the marina access channel.

17.2 Relationship between this plan and other management plans

Other management plans that are relevant to the contaminated sites and acid sulphate soils management plan include:

- Hydrocarbon management plan (Section 15)
- Groundwater management plan (Section 5)
- Surface water management plan (Section 6)
- Dredging and dredge spoil management plan (Section 7).

17.3 Environmental performance objectives

The environmental performance objective that applies to surface water, groundwater, water quality and ecology that surface and groundwater supports is:

- to ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people, and land uses by meeting statutory requirements and acceptable standards.

The environmental performance objective that applies to soil quality is:

- to ensure that rehabilitation achieves an acceptable standard compatible with the intended land use and consistent with appropriate criteria.

17.4 Management actions

Specific management actions have been identified to assist in achieving the environmental objectives are included within Table 24.

Table 24 Contaminated sites management actions

Item	Action	Purpose	Timing	Responsibility
1.	Conduct further investigations at three localised locations of potential contamination.	To identify areas of contaminated land for remediation prior to cessation of construction and the use of the land by the public and/or residents.	During construction, prior to release of the land by the Proponent.	Construction manager.
2.	Conduct a detailed health and receptor risk assessment.	To ensure suitability of the land for use by the public and residents.	During construction, prior to release of land by the Proponent.	Construction manager.
3.	Test dredge spoil and excess soil for contaminants prior to disposal to develop the most appropriate management and disposal strategy.	To prevent contamination arising from inappropriate disposal of dredge spoil and excess soil.	Throughout dredge operation	Construction manager.
4.	Maintain an up to date contaminated sites inventory.	To comply with the Contaminated Sites act 2003 (WA) and to identify any contaminated sites remaining and clean up requirements before approval by government agencies for release of the land by the Proponent.	During construction.	Construction manager.
5.	Develop an ASSMP inclusive of Dredge Spoil in accordance with the relevant DEC environmental management requirements.	To comply with the Contaminated Sites act 2003 (WA) and to identify any contaminated sites remaining and clean up requirements before approval by government agencies for release of the land by the Proponent.	Prior to construction.	Project manager.
6.	Implement an ASSMP in accordance with the relevant DEC environmental management requirements.	To comply with the Contaminated Sites act 2003 (WA) and to identify any contaminated sites remaining and clean up requirements before approval by government agencies for release of the land by the Proponent.	During construction.	Construction manager.

17.5 Monitoring and corrective actions

The proposed monitoring regime (Table 25) includes activities to be performed throughout the life of the Proposal and which, if the target is not achieved, will result in corrective action.

Table 25 Contaminated sites monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Test dredge spoil and excess soil for contaminants prior to disposal.	Monthly.	To identify ASS.	Cease dredging activities and further investigate dredge spoil	Construction manager.
2.	Test marine water quality for significant chemical changes.	Prior to commencement of dredging and monthly throughout dredging operation.	To identify signs of the release of ASS into the marine environment.	Cease dredging activities and further investigate marine water quality until there is no further evidence of contamination.	Construction manager.
3.	Monitoring to be undertaken in accordance with the ASSMP.	In accordance with ASSMP.	In accordance with ASSMP.	In accordance with ASSMP.	In accordance with ASSMP.

18. Public access and beach management plan

18.1 Potential impacts to be managed

The primary objective of the Proposal is to enhance public access to Mangles Bay and create a vibrant tourist precinct that will attract visitors to the region. Therefore, impediments to public access as part of the Proposal are likely to be the highest during the construction phase of this Project, as areas will be blocked to previously utilised areas of the Proposal area to ensure public safety is maintained throughout the construction phase of the project.

Aspects of the Proposal requiring management to mitigate potential impacts resulting from construction on public access to beach areas and surrounding recreational uses include:

- interruption of beach access from the marina entrance channel
- interruption of access to yacht club and boating facilities
- interruption of pedestrian traffic flow
- increased traffic flows during construction within and surrounding the Proposal area
- dredge movements may limit access to both recreational boating and skiing within Mangles Bay.

In addition to ensuring continued public access, ongoing management will be required to minimise impacts to the beaches at Mangles Bay (between the causeway and Palm Beach) and to maintain suitability for public use. Management of the beaches at Mangles Bay during construction will ensure:

- public access to the beach is safe for all users
- no unnecessary clearing and / or degradation of coastal vegetation
- suitability for recreational and fishing uses is maintained.

18.2 Relationship between this management plan and other management plans

Other management plans considered relevant to the public access and beach management plan are the:

- Noise and vibration management plan (Section 12)
- Community issues management plan (Section 20).

18.3 Environmental performance objectives

Statement of Planning Policy No. 2.6: State Coastal Planning Policy (SPP2.6) was developed under Section 5AA of the *Town Planning and Development Act* (1928). The policy applies to the coast throughout Western Australia with the objectives to:

- protect, conserve and enhance coastal values, particularly in areas of landscape, nature conservation, indigenous and cultural significance
- provide for public foreshore areas and access to these on the coast
- ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities
- ensure that the location of coastal facilities and development takes into account coastal processes including erosion, accretion, storm surge, tides, wave conditions, sea level change and biophysical criteria.

The EPA applies the following objective when assessing proposals that may impact on public access:

- to ensure that existing and planned uses are not compromised.

18.4 Management actions

During construction there will be a need to manage public access and the beaches surrounding the Proposal site and to ensure appropriate and timely responses in the event of public complaints. Specific management actions have been identified to assist in achieve the EPA's environmental objective and those of SPP2.6 and included within Table 12.

Table 26 Public access and beach management actions

Item	Action	Purpose	Timing	Responsibility
Public access				
1.	Alternative pedestrian access pathways will be provided surrounding the Proposal area.	To ensure safety of the public and provide access to the beachfront.	Prior and during construction.	Construction manager.
2.	Public access to construction areas will be restricted by site fencing.	To ensure safety of the public.	Prior to construction.	Construction manager.
3.	Appropriate traffic management requirements will be in place.	To ensure safety of the public.	Prior to and during construction.	Construction manager.
4.	Routing of construction traffic to avoid existing high volume and/or residential areas.	To ensure safety of the public and traffic flow.	Prior to and during construction.	Construction manager.
Recreational use				
5.	Public facilities will be installed adjacent to access points and/or carparks, including showers, toilet, rubbish facilities.	To provide facilities to support public use of the beach.	Prior to construction.	Construction manager.
6.	Interpretive signs will be installed at areas of Public use relating to flora, fauna and heritage values of the area.	To educate and inform about the environmental and cultural aspects of the area.	Prior to construction.	Construction manager.
7.	Establishment of a complaints management system by the Proponent to ensure complaints by nearby residents are captured.	To ensure public access issues are addressed.	During construction.	Project manager.
Coastal vegetation and environment				
8.	Weed eradication will be conducted along boundaries of access paths, car parks and construction area.	To prevent the establishment of introduced species, which may compete with native plants.	Monthly and as needed.	Construction manager.
9.	Brush fencing will be installed along access paths and car park boundaries.	To prevent access to dunes.	Prior to construction.	Construction manager.
10.	Clearing required for the proposal will be planned prior to activities, with areas to be disturbed clearly marked with flagging.	To avoid unnecessary clearing.	Prior to ground disturbance.	Construction manager.
Vehicle access				
11.	Areas prohibited to access by all vehicles will be clearly indicated with signs.	To prevent unauthorised access to the beach by vehicles.	Prior to construction.	Construction manager.
12.	Construction vehicles and machinery will be restricted to the approved footprint.	To minimise impacts outside the proposal area.	During construction.	Construction manager

18.5 Monitoring and corrective actions

The proposed monitoring regime (Table 27) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action. Following construction, the Project manager will review this management plan in consultation with the City of Rockingham.

Table 27 Public access beach monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Construction site, access ways and car park boundaries will be surveyed for weeds.	Monthly.	No introduction of weed species not previously recorded.	Undertake weed control.	Construction manager.
2.	Ensure fences are secure and safe.	Weekly.	Fences are in good condition and erect.	Investigate any breach or damage, and repair fencing.	Construction manager.
3.	Ensure pathways are stable and safe.	Weekly.	Pathways are in good condition.	Investigate any damage, and conduct repairs.	Construction manager.
4.	Community issues - complaint handling and response.	Ongoing as required.	As outlined in the community issues management plan (Section 20).	As outlined in the community issues management plan (Section 20).	As outlined in the community issues management plan (Section 20).

19. Terrestrial Vegetation Rehabilitation management plan

19.1 Potential impacts to be managed

The rehabilitation strategy focuses on ensuring that residual impacts of vegetation clearing and ground disturbance are mitigated to the greatest possible extent and that the ecological function of retained areas is reinstated by addressing:

- new disturbance from vegetation clearing and ground disturbance, in particular for construction and installation of infrastructure.

This rehabilitation management plan addresses those areas that will require rehabilitation as a result of construction activities. The onsite rehabilitation management measures in this management plan are intended to supplement the offsite rehabilitation strategies associated with the offset strategy/package for the Proposal.

Rehabilitation will be undertaken progressively at sites disturbed by the Proposal that are no longer required for construction or infrastructure maintenance. Areas disturbed during construction will be rehabilitated where relevant.

Topsoil will be stripped from areas cleared for the construction of the development, consideration will be given to the practicality and feasibility of using cleared vegetation in rehabilitation. If considered appropriate, vegetation will be cleared in a manner that facilitates later re-spreading in rehabilitation areas.

Where possible, topsoil will be utilised immediately on rehabilitation areas. Where immediate use is not possible, topsoil will be stripped and stockpiled for later use on areas to be rehabilitated. Topsoil is a valuable resource for rehabilitation as it contains native flora propagules and beneficial fungi. The use in rehabilitation of local provenance topsoil and, where practicable and appropriate, re-spreading vegetation of vegetation from cleared areas will result in the growth of species that are adapted to the local conditions, often resulting in high species diversity and vegetation which represents the original range of plant species (Greening Australia 2009). This will facilitate the achievement of rehabilitation objectives. Topsoil will be spread over disturbed areas, allowing seeds and root stock stored in the soil to germinate and become established. Active re-seeding of some areas will also take place where required.

A seed collection program will be undertaken before vegetation is cleared as only seeds of plant species endemic to the Project Area will be used in revegetation. A seed mix appropriate to the area to be rehabilitated will be collected and used, including key indicator species for restoration of key vegetation forms. Seed will be prepared, treated (where appropriate) and scattered over the disturbed areas.

19.2 Relationship between this management plan and other management plans

The Terrestrial biodiversity and habitat management plan (Section 8) is also relevant to this Rehabilitation management plan.

19.3 Environmental performance objectives

The environmental objectives of the rehabilitation management plan are to:

- effectively rehabilitate disturbed sites not required for maintenance and operation of the Proposal
- minimise soil erosion
- enhance the ecological function and value of retained vegetation through re-establishment of indigenous species.

19.4 Management actions

Specific management actions have been developed for the Proposal to assist in achieving the above management objectives. These are outlined in Table 28.

Table 28 Rehabilitation management actions

Item	Action	Purpose	Timing	Responsibility
Baseline information				
1.	Select reference sites within adjacent Rockingham Lakes Regional park, containing landforms and vegetation comparable (or likely to have been comparable) to those of planned disturbance areas not required post construction.	To locate suitable sites against which to compare rehabilitation success.	Prior to ground disturbance.	Project manager.
2.	Survey reference sites identified in Item 19 above to determine indicator species, density of native species, % cover of native species, native species richness and % weed cover as outlined in Appendix 4	To locate suitable sites against which to compare rehabilitation success.	Prior to ground disturbance and quarterly throughout the rehabilitation process.	Project manager.
3.	Determine parameters and targets for each indicator species as appropriate e.g. density of indicator species, % cover of indicator species etc.	To locate suitable sites against which to compare rehabilitation success.	Prior to ground disturbance.	Project manager.
4.	Undertake a weed survey of the Proposal area to establish baseline information in accordance with the Terrestrial biodiversity and habitat management plan (Section 8).	To provide data to inform management.	As specified in the terrestrial biodiversity management plan.	As specified in the terrestrial biodiversity management plan.
Seed collection				
5.	Develop a species list for seed collection based on species known to germinate from seed and/or that can be propagated by nurseries (may require consultation with nurseries and rehabilitation experts in the area).	To maximise potential for rehabilitation success by ensuring appropriate species are used in seeding/planting.	Prior to seed collection.	Project manager.
6.	Contract experienced seed collector licensed by the DEC to undertake a seed collection program of plant species endemic to the project area following *Florabank Guidelines* (Greening Australia 2009) including: • gathering information and targeting certain species • undertaking seed collection in the optimum season for the species • collecting only mature seed • determining seed collection method (e.g. natural seed fall, collection by hand, mechanical harvesting, etc. • maintaining detailed record sheets to provide evidence that the seed is local provenance, e.g. date of collection, time of collection, person undertaking collection etc. • preparing material for transportation.	To maximise potential for rehabilitation success by ensuring seed collection is undertaken in accordance with appropriate guidelines and procedures.	Prior to seed collection.	Project manager.
7.	Ensure all seed to be used in rehabilitation is sourced from species that are endemic to the area/local provenance (unless otherwise authorised by the DEC).	To ensure species used in rehabilitation have adaptations to suit local conditions.	Prior to rehabilitation.	Project manager.

Item	Action	Purpose	Timing	Responsibility
8.	Monitor the progress of seed collection and store and process seed in accordance with Appendix 4.	To maximise potential for rehabilitation success by ensuring seed collection is undertaken appropriately.	Prior to rehabilitation.	Project manager.
9.	Implement hygiene management actions as outlined in the Terrestrial biodiversity and habitat management plan (Section 8).	To maximise potential for rehabilitation success by preventing the introduction and/or spread of weeds and plant pathogens into rehabilitation areas.	As specified in the biodiversity management plan (Section 8).	As specified in the terrestrial biodiversity and habitat management plan (Section 8).
Contaminated sites				
10.	Areas suspected to be contaminated by spills or leaks of hydrocarbons and/or inappropriate disposal of wastes will be investigated to determine the presence and/or level of contamination.	To determine whether rehabilitation areas are required to be remediated.	Prior to rehabilitation.	Construction manager.
11.	Remediate any soils that are determined to be contaminated in accordance with above.	To maximise potential for rehabilitation success by ensuring rehabilitation areas are not contaminated.	Prior to rehabilitation.	Construction manager.
Erosion/landform stability				
12.	Disturbed areas will be stabilised through a combination of contouring and slope stabilisation as required.	To minimise erosion of rehabilitated landforms.	Progressively as disturbed areas are not longer required.	Construction manager.
13.	All tracks to be rehabilitated will be ripped or scarified to minimise compaction.	To maximise potential for rehabilitation success by allowing roots and water to penetrate the soil profile.	During the rehabilitation process.	Construction manager.
14.	Disturbed areas shall be re-contoured and severely compacted soils ripped (on the contour) to enhance rainwater infiltration and root penetration and to trap seed and humus, thus providing suitable niches.	To maximise potential for rehabilitation success by allowing roots and water to penetrate the soil profile.	During the rehabilitation process.	Construction manager.
Topsoil management				
15.	Remove topsoil from cleared areas and manage in accordance with the terrestrial biodiversity and habitat management plan (Section 8).	To provide a natural source of seed, organic matter and microorganisms for areas to be rehabilitated.	Construction	Construction manager.
16.	Ensure material to be used for rehabilitation (e.g. topsoil, cleared vegetation, etc.) does not contain Declared weeds.	To maximise potential for rehabilitation success by preventing the introduction and/or spread of Declared weeds into rehabilitation areas.	Prior to rehabilitation.	Construction manager.
17.	Relocate stripped topsoil and (if applicable) cleared vegetation directly to areas required to be rehabilitated, where possible.	To maximise the benefits of using topsoil and mulch by minimising storage time.	During construction.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
18.	Spread stripped topsoil evenly across areas to be rehabilitated (to a nominal depth of approximately 100–150 mm). Work parallel with the contours as far as practicable, to minimise the creation of preferential drainage pathways.	To provide a natural source of seed, organic matter and microorganisms for areas to be rehabilitated.	During construction.	Construction manager.
19.	Rake rehabilitation areas to minimise potential impacts from compaction.	To maximise potential for rehabilitation success by allowing roots and water to penetrate the soil profile.	After spreading of topsoil and before placement of cleared vegetation.	Construction manager.
20.	Where direct replacement of rehabilitation material (e.g. topsoil, cleared vegetation, etc.) is not possible, stockpile material for later use in rehabilitation activities.	To provide a natural source of seed, organic matter and microorganisms for areas to be rehabilitated.	During construction.	Construction manager.
21.	Locate stockpiles of rehabilitation material (e.g. topsoil, cleared vegetation, etc.) within already disturbed areas wherever possible.	To minimise disturbance.	During construction.	Construction manager.
22.	Restrict topsoil stockpile height to less than 2 m.	To conserve native seed banks for direct propagule return, reduce the risk of self composting and provide opportunities for the roots of temporary vegetation growing on the topsoil stockpile to reach the deepest parts of the stockpile, thereby sustaining many micro-organisms.	During construction.	Construction manager.
23.	Where topsoil is not available, import topsoil in consultation with the DEC Kwinana office.	To provide a natural source of seed, organic matter and microorganisms for areas to be rehabilitated.	Within six months following completion of construction.	Construction manager.
Fencing				
24.	Provide temporary fencing and signage around rehabilitation areas.	To minimise disturbance to rehabilitation areas by restricting access.	After spreading of topsoil and (if applicable) cleared vegetation.	Construction manager.

19.5 Monitoring and corrective actions

The proposed monitoring regime (Table 29) includes activities to be performed throughout the construction phase of the project and which, if the target is not achieved, will result in corrective action. Following the construction phase of the Proposal, the Project manager will review this management plan in consultation with the DEC.

Table 29 Rehabilitation monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Native species richness, density and % cover within rehabilitation sites as outlined in Appendix 4.	Six monthly.	Mean native species richness, plant density and % cover in the rehabilitation site after five years (including at least two wet seasons where >75% of the long-term average rainfall has fallen) is greater than: • 70% of the mean % cover of natives in the reference sites • 70% of the mean native species richness in the reference sites.	1. Identify cause. 2. Implement approach to remedy cause, which could include: 3. application of fertilisers or wetting agents etc. if applicable 4. implement supplementary direct seeding or seedling planting program in accordance with Appendix 5 review rehabilitation process and amend if appropriate. 5. Monitor success of approach.	Project manager.
2.	Indicator species in rehabilitation sites.	Six monthly.	As determined in accordance with Items 2 and 3 in management actions table.	1. Identify cause. 2. Implement approach to remedy cause, which could include: • application of fertilisers or wetting agents etc. if applicable • implement supplementary direct seeding or seedling planting program in accordance with Appendix 5. 3. review rehabilitation process and amend if appropriate. 4. Monitor success of approach.	Project manager.
3.	Exotic species richness and % cover within rehabilitation sites as outlined in Appendix 6.	Six monthly.	Exotic flora species: • no greater than 10%increase in weed species density/cover/distribution compared to reference sites • no Declared Plants present on-site six months following completion of construction. • no infested areas • no new weed species present.	1. Identify cause. 2. Identify the weeds, their location and coverage. 3. Implement remedy which could include: 4. implementing a weed control program 5. reinforcing management actions in the terrestrial biodiversity and habitat management plan (Section 8). 6. Monitor success of control.	Project manager.

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
4.	Erosion within and adjacent to rehabilitation sites.	Opportunistically following heavy rainfall events.	Ensure landform is safe and stable with no erosion occurring 18 months after rehabilitation.	1. Identify cause of erosion. 2. Consult expert to determine appropriate remedy which may include 3. Installing culverts 4. Installing stormwater diversion structures. 5. Implement remedy. 6. Monitor success of remedy.	Construction manager.

20. Community issues management plan

20.1 Potential impacts to be managed

Aspects of the Proposal requiring management to mitigate potential community issues include:

- increase traffic on public roads during construction
- increase in ambient noise levels during construction
- increase in ambient dust levels during construction
- interaction between construction personnel and the local community
- potential unauthorised access to project facilities and rehabilitation areas.

Aspects relating to Aboriginal heritage and culture are addressed in the Cultural heritage management plan (Section 14).

20.2 Performance objectives

The environmental objective for community interaction is to minimise deleterious socio-economic impacts on the surrounding area, including all neighbouring landholders. This management also encourages effective and positive communication and community liaison between the managing bodies, project asset owners and external groups and government agencies.

20.3 Management actions

Specific management actions have been identified to assist in achieving the above management objective (Table 30).

Table 30 Community issues management actions

Item	Action	Purpose	Timing	Responsibility
Code of Conduct				
1.	Ensure contractors have developed Codes of Conduct appropriate to their specific engagement, scope of work and location of work and that include social considerations to minimise impacts to the existing community.	To encourage positive interaction with the community by ensuring contractors are aware of appropriate conduct.	Prior to engagement.	Construction manager.
2.	Ensure contractors have in place procedures for the induction of all construction personnel on environmental and social considerations and responsibilities in accordance with the environmental approval and requirements of the EMP.	To reduce the potential for social and environmental impacts by ensuring contractors are aware of their responsibilities.	Prior to commencement of construction.	Construction manager.
Community consultation				
3.	Ensure an effective and productive community consultation process is in place in accordance with the Cedar Woods Properties Ltd Communications Plan and the consultation framework.	To reduce the potential for social impact by ensuring effective communication.	Ongoing	Project manager.
4.	All occupiers of residences within 1 km of construction activities will be advised of the nature and duration of the activities planned.	To reduce the potential for social impact by ensuring effective communication .	At least one week prior to commencement of activities.	Construction manager.

Item	Action	Purpose	Timing	Responsibility
Recreation and tourism				
5.	Signs will be erected at strategic locations throughout the project area to advise that access to the Proposal area is restricted.	To reduce the potential for social impact by ensuring the public is aware of access restrictions.	At commencement of construction.	Construction manager.
6.	Public notices will be provided to nearby residents, boating and fishing clubs outlining proposed dredging schedule and the location of the dredging operation.	To ensure other maritime users are aware of dredging operation.	Prior to commencement of dredging operation.	Construction manager.
Security and safety				
7.	Signs will be erected at strategic locations throughout the Proposal area to advise that access to Proposal area is restricted.	To reduce the potential for social impact by ensuring the public is aware of access restrictions.	At commencement of construction.	Construction manager.
8.	Road safety measures such as speed limits and traffic control (for specific 'heavy usage' events) will be implemented.	To ensure increased traffic as a result of construction does not significantly affect local traffic and to mitigate the increased risk of accidents.	During construction.	Construction manager.
9.	Access to construction areas will be restricted in accordance with requirements under the *Occupational Safety and Health Act 1984* (WA) and associated regulations.	To ensure compliance with relevant legislation.	During construction.	Construction manager.
Dust				
10.	In the event that a complaint regarding off-site dust impacts is made, the following procedures should be followed: • the details of the complaint shall be recorded as an Environmental Incident Appendix 8. • a visual assessment of dust generation and winds should be made. • works shall be suspended until remedial measures are implemented, or until wind conditions become favourable.	To ensure community complaints are identified and addressed appropriately.	During construction.	Construction manager.
Noise				
11.	In the event that a complaint regarding off-site dust impacts is made, the following procedures should be followed: • the details of the complaint shall be recorded as an Environmental Incident Appendix 8. • an aural assessment of noise emissions will be undertaken by the City of Rockingham.	To ensure noise exceedances are identified and addressed.	During construction.	Construction manager.

20.4 Monitoring and corrective actions

The proposed monitoring regime (Table 31) includes activities to be performed throughout the life of the Proposal and which, if the target is not achieved, will result in corrective action.

Table 31 Community issues monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Community issues - complaint handling and response.	Ongoing as required.	No public complaints resulting from the project.	Complaints will be handled in accordance with procedures outlined in Section 20.	Project manager.
2.	Monitor the effectiveness and integrity of signage throughout the project area.	Ongoing as required.	No reports or visual evidence of unauthorised access to Proposal area.	1. Investigate cause. 2. Repair, replace, or relocate signage as required.	Project manager.

21. Visual amenity management plan

21.1 Potential issues to be managed

Aspects of the Proposal requiring management to mitigate potential visual amenity issues include:

- clearing vegetation which may alter the appearance of the natural environment and be visible from identified significant sites
- physical attributes of significant infrastructure that may obstruct or change views of existing natural features considered aesthetically significant. The infrastructure in itself may be aesthetically displeasing.

21.2 Performance objectives

The environmental objective for visual amenity is:

- to ensure that the aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable
- to maintain the integrity, ecological functions and environmental values of landscapes and landforms.

21.3 Management actions

Specific management actions have been identified to assist in achieving the above management objective (Table 32).

Table 32 Visual impact management actions

Item	Action	Purpose	Timing	Responsibility
1.	Retain a percentage of existing vegetation at strategic locations.	To maintain existing visual amenity as far as practicable.	Proposal design and construction.	Project manager.
2.	Minimise regrading of existing topography.	To maintain existing visual amenity as far as practicable.	Proposal design and construction.	Project manager.
3.	Align roads on existing contours where practicable.	To maintain existing visual amenity as far as practicable.	Proposal design and construction.	Project manager.
4.	Avoid interruption of natural ridgeline.	To maintain existing visual amenity as far as practicable.	Proposal design and construction.	Project manager.
5.	Connect the new development with existing residential and commercial areas through pedestrian access ways.	To maintain or enhance useability of landscape.	Proposal design and construction.	Project manager.
6.	Establish building height and distribution to provide diversity, permeability and limit mass.	To maintain existing visual amenity as far as practicable.	Proposal design and construction.	Project manager.
7.	Develop design guidelines that specify architectural design, colours, and materials that blend with the natural landscape and are visually sensitive to the area.	To maintain existing visual amenity as far as practicable.	Proposal design.	Project manager.
8.	Maintain key view corridors	To maintain existing visual amenity as far as practicable.	Proposal design.	Project manager.

Item	Action	Purpose	Timing	Responsibility
9.	Maintain a landscape buffer around project area that minimises visual impact on the area	To maintain existing visual amenity as far as practicable.	Proposal design.	Project manager.
10.	Maintain a landscape buffer along the coastline	To maintain existing visual amenity as far as practicable.	Proposal design.	Project manager.

21.4 Monitoring and corrective actions

The proposed monitoring regime (Table 33) includes activities to be performed throughout the construction phase of the Proposal and which, if the target is not achieved, will result in corrective action.

Table 33 Visual impact monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Implement a complaints register	Ongoing as required.	No public complaints resulting from the project.	Complaints will be handled in accordance with procedures outlined in Section 20.	Project manager.

22. Road traffic management

22.1 Potential issues to be managed

Aspects of the Proposal requiring management to mitigate potential road traffic issues include:

- Public safety issues including road traffic and pedestrian safety
- Reduction in amenity due to increased noise emissions

22.2 Performance objectives

The environmental objective for road traffic is to ensure that the increase in traffic resulting from the Proposal does not adversely impact on the amenity of social surroundings or increase the risk to local public safety.

22.3 Management actions

Specific management actions have been identified in order to achieve the above performance objective for road traffic.

Table 34 Road traffic management actions

Item	Action	Purpose	Timing	Responsibility
1.	Design roads according to City of Rockingham standards	To ensure appropriate traffic management and road safety.	Proposal design	Project manager.
2.	Route construction traffic to avoid existing high volume and/or residential areas	To minimise impacts on local traffic volumes.	Proposal design and construction	Project manager.
3.	Upgrade Memorial Drive to cater for increased demand, including installation of appropriate intersection controls	To ensure road traffic safety is maintained.	Proposal design and construction	Project manager.

22.4 Monitoring and corrective actions

The proposed monitoring regime (Table 35) includes activities to be performed throughout the life of the Proposal and which, if the target is not achieved, will result in corrective action.

Table 35 Road traffic issues monitoring regime

Item	Activity and location	Frequency	Target	Corrective action	Responsibility
1.	Community issues and complaints handling and response, as identified in Section 20	Ongoing as required	No public complaints resulting from the project	Complaints will be handled in accordance with procedures outlined in Section 20.	Project manager.

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Appendix 1

Project Design Objectives

MANGLES BAY MARINA BASED TOURIST PRECINCT - CRITICAL DESIGN PRINCIPLES AND COMMUNITY OBJECTIVES

The Mangles Bay Marina Based Tourist Precinct is centred on a marina for safe anchorage, family-friendly environment with opportunities for tourism, new business and education facilities. It will generate both long-term employment, as well as additional jobs during the construction phase. Degraded areas of Cape Peron will be rehabilitated, and the natural environment and heritage enhanced for visitors as well as locals. This Proposal will also create the opportunity for rehabilitation of significant areas of seagrass which has historically been degraded through use of non-environmentally friendly swing moorings in the bay.

Between April to September 2005 consultation was undertaken with more than 800 community members from a broad range of stakeholders groups including local residents, current users of Cape Peron, and representatives from federal, state and local government, local businesses, the local chamber of commerce and tourism, organisations and clubs, environmental interest groups and Aboriginal and heritage groups.

The consultation identified the several critical design principles to guide the formulation of the project concept plan. The critical design principles are outlined as follows:

SOCIAL

- Creation of a world class regional asset that is responsive to community values.
- Development of a shared vision that reflects local heritage, culture and visual amenity of the area.
- Improved marine, tourist and public recreational facilities.
- Provision of high quality public open space and better pedestrian friendly access to the beachfront and Cape area.

ECONOMIC

- Creation of a vibrant tourist district that will increase activity in the area and attract visitors to the region.
- Creation of sustainable employment opportunities for Rockingham and the surrounding area.
- Commercial/recreational opportunities.
- Provision of facilities for an already thriving marine eco-tourism industry.

ENVIRONMENTAL

- Creation of a development that respects the marine and terrestrial environment of the area.
- Improvement of water quality in Mangles Bay.
- Improvement of long-term viability of seagrass in Cockburn Sound.
- Improved management of both the surrounding land and marine environments.
- Includes an offset package to more than offset any terrestrial environmental impact.

Cedar Woods as LandCorp's project partner has committed also to deliver the following 10 community project objectives:

- Opening up the beach along Mangles Bay to public access.
- Construction of a dual use path along the length of the beachfront to the causeway.
- Affordable Family Holiday accommodation with beachfront access.
- A site for the Boating Clubs, on a non-commercial leasehold basis, with marina frontage and beach access.

- A seabed lease in the marina and adjoining the boating clubs in which the clubs can build pens and lease them to members.
- Room for up to 500 pens in total is required (there is no current commitment to build any pens).
- Commercial pens to be provided in the public tourist area for commercial charter operators.
- A tourism hub including restaurants, cafes and short-term serviced accommodation.
- $5 million remediation and enhancement of the balance of Cape Peron.
- A site for a Marine Science Centre.

Continued opportunity for public comment (both statutory and non-statutory) will be available throughout the planning and environmental approval process of the project.

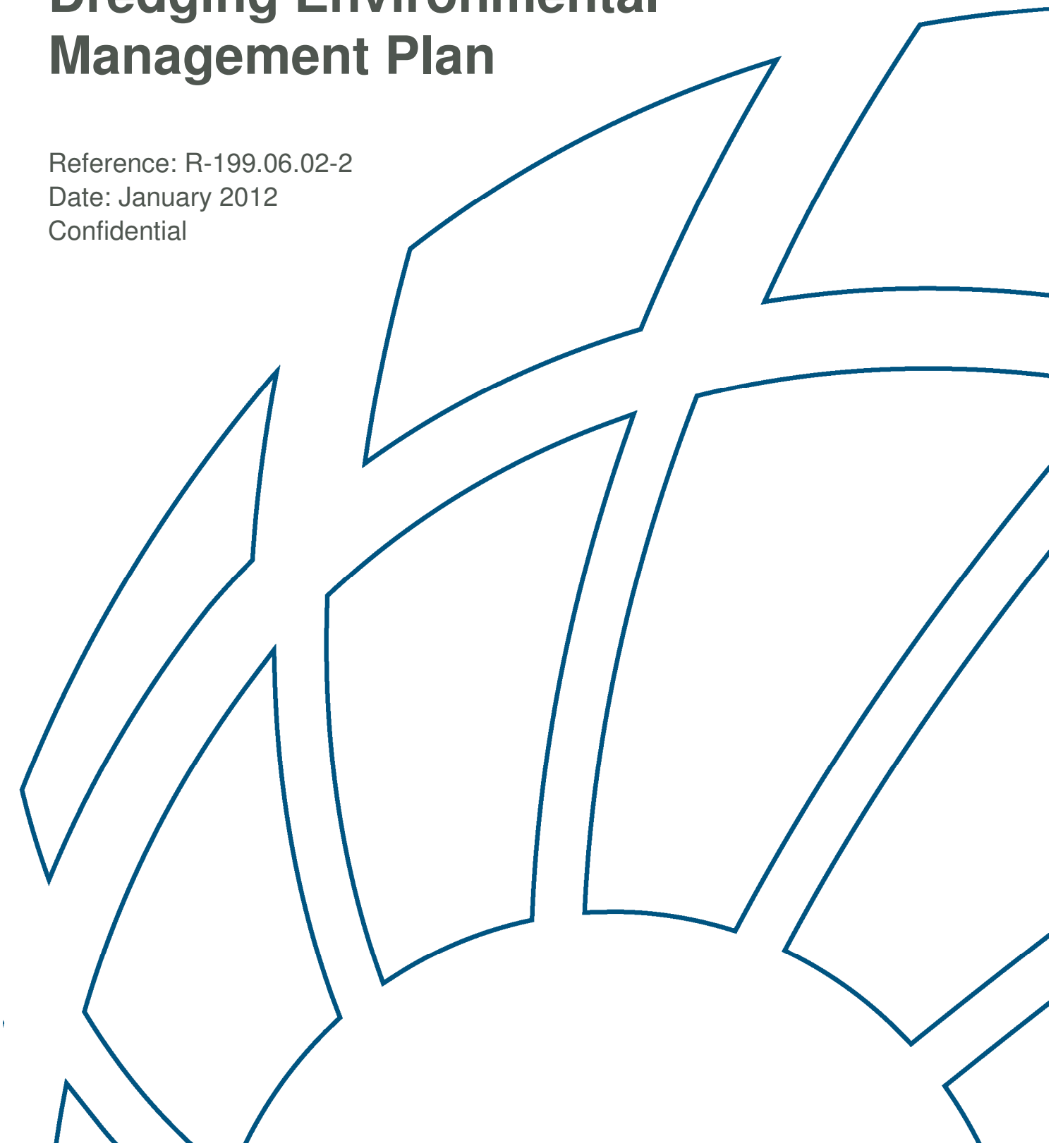
Appendix 2
Mangles Bay Marina Dredging
Environmental Management Plan

BMT JFA Consultants

"Where will our knowledge take you?"

Mangles Bay Marina: Dredging Environmental Management Plan

Reference: R-199.06.02-2
Date: January 2012
Confidential



CEDAR WOODS PROPERTIES LTD

MANGLES BAY MARINA

MANGLES BAY MARINA: DREDGING ENVIRONMENTAL MANAGEMENT PLAN

Prepared for

Cedar Woods TABEC

BMT JFA Consultants

By

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1 INTRODUCTION

1.1 Project Overview

Cedar Woods Properties Limited (Cedar Woods) is the proponent for the development of a marina located in Mangles Bay, at the southern end of Cockburn Sound.

The Mangles Bay Marina Based Tourist Precinct comprises a single entrance marina to accommodate up to 500 pens and moorings and a surrounding land development comprising tourism, accommodation, commercial, public open space and residential land uses.

The offshore component of the project development is comprised of the following key characteristics (as per the Public Environmental Review (PER) (Strategen, 2011)):

- Marina
  - Total water area of marina up to 12 ha
  - Deepest depth in the marina up to -4.0m AHD
  - Shallowest depth in the marina of -2.7m AHD
  - Construction of the marina will require excavation of up to 800,000m^3 (the volume of material below 0.0m AHD is 364,000m^3)
- Channel
  - Total channel length up to 550m
  - Total channel navigable width up to 30m, including batters the channel has a maximum width of 55m
  - Total channel area up to 3.4 ha (includes the footprint of 1:5 batters)
  - Total channel depth up to -4.0m AHD
  - Total channel dredging of up to 50,000m^3 of material (during
  - Dredged material will be pumped to onshore settlement ponds for subsequent offsite disposal.

Future periodic maintenance dredging of the access channel may be required to maintain design depths, and will be undertaken in accordance with the same principles and standards as applied to the capital dredging operations.

1.2 Dredging Environmental Management Plan

This Dredging Environmental Management Plan (DEMP) has been developed to provide a management framework for the execution of all dredging works that are undertaken for this project. Specifically, this includes the capital dredging works associated with the initial construction of the access channel to the marina facility, as well as any future maintenance dredging requirements. This DEMP provides details of the environmental management and monitoring strategies that will be implemented during the dredging works, which will be implemented with the objective of reducing any environmental impacts to the greatest extent possible.

This DEMP does not consider any aspect of the works associated with the onshore areas of the site, or the ‘dry’ construction of the marina.

1.3 Document Status

This document has been prepared to support the Public Environmental Review (PER) documentation and process.

Further revisions of this management plan are anticipated prior to the commencement of the works. These future revisions are expected to incorporate any additional activities or commitments that are required in order to ensure compliance with any further conditions stipulated as part of the approvals process.

2 DREDGING REQUIREMENTS

A navigable entrance channel is to be constructed to provide access between Mangles Bay and the proposed inland marina and canal development. The construction of the access channel is to be undertaken in parallel with the (land based) marina construction program.

The channel will have the following key characteristics:

- 55m wide (including batters)
- 550m in length
- design depth (that varies up) to -4m AHD deep.
- total area of up to 3.4 Ha.

The access channel will be constructed with stable batters in medium dense sand and will involved the dredging of up to 55,000m^3 of material.

Following the dredging of the channel, future maintenance dredging of the channel may be required to maintain the nominated design depths.

2.1 Capital Dredging Works

A small cutter suction dredge (CSD) will be used to complete the capital dredging of the access channel. CSD's operate via the action of a rotating cutter head which agitates and displaces the dredge material from the seabed which is then drawn into the suction pipe located immediately behind the cutter head. The dredge slurry, consisting of the dredge solids and water is then discharged via a system of floating and submerged pipelines to the nominated onshore disposal location. This method of dredging is commonplace in Western Australia and is completed annually at a number of marine facilities.

The dredge material will be transported to at least two onshore settlement ponds which will be constructed to receive the dredge slurry, and separate the dredged solids from the process water. The settlement ponds will be constructed to facilitate the rapid settlement of all suspended solids, and will include one or more internal weir boxes that will be utilised to manage the flow of the flow of the dredge process water within the pond system. The installation of internal silt curtains within the settlement ponds will also be considered, to better facilitate this process.

Following the settlement of the solids, the dredge process water will be released, primarily via infiltration beneath the settlement ponds. This process will be managed to ensure that the turbidity of the sea water in the Mangles Bay area does not exceed set trigger levels. The dredge material will be predominantly sand, and it is expected to be suitable for use as geotechnical fill within the proposed onshore development. Further information regarding the physical properties of the dredge material is provided in Section 3.

It is expected that the capital dredging works will be undertaken on a 12hr/day, 7 day per week basis and will be completed within a 12 – 15 week timeframe during the winter months of the bulk earthworks program. The timing of these works has been selected so as to minimise the impact on the marine environment, and particularly the potential impact of turbidity on seagrass habitat in the area.

2.2 Maintenance Dredging Works

The anticipated accretion rate of material within the dredged channel is difficult to accurately predict, although it is expected that the volume and frequency of maintenance dredging campaigns will be relatively low owing to the limited sediment mobility typically encountered within seagrass beds. Further information regarding the anticipated extent of future maintenance dredging requirements is provided in TN-199.06.02-1.

Various methodologies are available for the completion of the maintenance dredging including mechanical means (via a backhoe or grab), hydraulic suction or hydraulic jetting (agitation dredging). Maintenance dredging will most likely require a shallow layer to be removed over the channel base which may include coarse $CaCO_3$ sediments produced in the seagrass meadows, deposited silts from turbid fines reworked during storm events and possible organics expected to be present in relatively small volumes.

It is anticipated that maintenance dredging will be undertaken using the same methodology as the capital works, with a small sized CSD offering the most effective approach for completing the works. The material dredged during the maintenance operations will most likely be discharged via a combination of submerged and floating pipelines to one or more onshore settlement ponds.

The most appropriate location for the placement of the onshore settlement pond(s) will be determined on the basis of numerous factors including future land use, community consultation and other operational considerations. Potential options for the placement of the onshore settlement pond(s) include:

- on the beaches fronting the development
- on the beach adjacent to the Garden Island causeway
- within the carpark(s) located adjacent to the Garden Island causeway where a temporary bunded settlement area(s) can be constructed .

The availability and terms of use for such sites will need to be negotiated with the relevant regulatory bodies and key stakeholders including the Shire of Rockingham. Given the significant period of time until any maintenance dredging may be required, the most appropriate disposal site location should be assessed and selected at the time of the works being undertaken.

Notwithstanding this, it is noted that the amount of space available during future maintenance dredging operations is likely to be limited. Similarly, the required ‘footprint’ of such operations should be minimised to the greatest extent possible to minimise both impact and interference with other users of the area. Various options exist to minimise the amount of space required for the onshore settlement ponds, which include the use of geotextile bags, or the use of flocculent products to accelerate the settlement process thereby allowing for the use of smaller settlement ponds.

Offshore disposal of dredge sediments may be considered and would offer the least obtrusive disposal location, although this option would likely require sea dumping permit assessments and considerable additional environmental assessment studies.

3 ENVIRONMENTAL INFORMATION

3.1 Sediment Sampling and Analysis

The construction of the channel will require the dredging of approximately 55,000m^3 of marine sediments to provide access to the marina. The excavation will result in the suspension of sediment, and the possible release of contaminants into the water column. Accordingly, investigations were undertaken to assess the potential risk posed to the marine environment by any contaminants in the dredge material.

Sediment sampling has previously been undertaken in accordance with the NAGD (Commonwealth of Australia 2009), guidelines which require sampling at 12 sites for the characterisation of 50,000m^3 of dredge material.

Sampling within the vicinity of the proposed channel footprint cores was undertaken to the full depth of dredging.

Sampling sites were located randomly within the area to be dredged; however sites located closer to shore were slightly relocated to the closest mooring scar (the bare sand areas within seagrass meadows surrounding boat moorings). Site relocation within the mooring scars was undertaken for several reasons:

- it allowed for more straightforward sediment core extraction
- it provided a conservative approach to sediment assessment, as sediments in mooring scars (directly under moored boats) were more likely to be contaminated than sites under seagrass meadows
- it minimised damage to existing seagrass meadows.

In addition, four sites were sampled according to the methods specified in the Cockburn Sound State Environmental Policy (Environmental Protection Authority, 2005), in areas adjacent to the proposed access channel. This sampling was undertaken in order to provide baseline data on sediment contamination in the surface sediments of the region.

The results of the sediment sampling and analysis program are published in the PER (Strategen, 2011) and are summarised below:

- **Particle Size Distribution:** The sediments in the area to be excavated primarily comprised fine to coarse grained sands, with small percentages of silts and clays.
- **Metals:** Concentrations of metals within the sediments to be dredged did not exceed Ecological Investigation Levels (EIL), Health Investigation Levels (HIL) or Environmental Quality Guidelines (EQG), indicating that there was a low risk of adverse ecological effects due to dredging or disposal, and that the material was suitable for use on land.
- **Nutrients:** All nutrient and toxicant levels, were either below trigger levels, or where trigger levels are not specified, below or consistent with previous levels identified in Cockburn Sound.
- **Tributyltin (TBT) and total organic carbon (TOC):** TBT levels were below laboratory reporting levels at most sites and the 95% UCL concentration of TBT met the NAGD (Commonwealth of Australia 2009) screening level indicating a low risk of adverse ecological effects due to dredging or disposal.

- **Organics:** Concentrations of total polycyclic aromatic hydrocarbons (PAHs) and each constituent PAH within sediments were all below the limits of reporting at all sites and depths.
- **Acid Sulphate Soils:** The dredged sediments are to be disposed of on land, so testing for acid sulfate soil (ASS) potential was undertaken. Acid generating potential was recorded in some samples, however, the results also indicated that any acid produced following land disposal of sediments excavated to create the marina access channel would be neutralised by the in-situ buffering capacity of the sediments.

Prior to the completion of any future maintenance dredging works sample collection, testing and analysis will be undertaken in accordance with the requirements of the NAGD (Commonwealth of Australia 2009) guidelines.

Depending on the results obtained from these testing and analysis, suitable management measures will be implemented. It is not anticipated that the sediments encountered during future maintenance dredging campaigns will differ significantly from the sediments that have been sampled for the capital works.

3.2 Seagrass Losses

The area of seagrass directly impacted by the dredging is 3.263Ha, which will be restricted to the cut areas. The extent of these losses has been minimised in the planning process to ensure that the footprint of the site is restricted to the greatest extent possible.

No indirect losses of seagrass are expected as a result of turbidity generated during the dredging activities. Water quality modelling indicates the turbidity generated during dredging will be minimal, as well as being highly localised and relatively short-lived.

Future maintenance operations are not expected to result in the direct loss of any seagrass, as maintenance dredging will only be undertaken within the existing channel area. Similarly, any future maintenance dredging is likely to be short term in duration and indirect loss of seagrass is not expected as a result of turbidity generated during the dredging activities

3.3 Marine Fauna

A dedicated Marine Fauna Observer (MFO) will be engaged during dredging and marine-related construction works who must:

- demonstrate a knowledge of marine wildlife species in the Perth metropolitan region, particularly species listed under the Wildlife Conservation Act 1950 and associated notice
- be on duty at all times during dredging and marine-related construction works
- maintain a log of observations of marine fauna, including injured or dead fauna (of any species) within 500 m of dredging and construction, which is to be submitted to DEC at the completion of dredging and construction.

No dredging will commence until the MFO has verified that no dolphins or sea lions have been observed within a radius of 500 m of dredge machinery or the construction site during the 30 minute period immediately prior to commencement of dredging or construction work. If the MFO observes a dolphin or sea lion entering within 500 m of dredging or construction work, the dredging or construction work is to be suspended.

Dredging and construction work that has been suspended as above, shall not recommence until the dolphin has moved on of its own accord beyond 500 m from the dredging or construction area, or has not been seen within 500 m for 30 minutes.

Dredging and construction will only occur during daylight hours to enable an adequate level of observation by the Marine Fauna Observer. Dredging and marine construction works will occur outside the months of September to March to avoid the peak dolphin calving period (refer above).

4 MONITORING

Ongoing monitoring during dredging operations will be undertaken in accordance with the recommended methodology outlined in the NAGD (Commonwealth of Australia 2009) guidelines.

4.1 Water Quality Monitoring

As a minimum it is anticipated that water quality monitoring will be undertaken in accordance with the following commitments:

- daily visual plume monitoring will be undertaken, including the completion of visual plume extent sketches
- weekly measurements will be undertaken including secchi disk measurements and light attenuation measurements (to approximate TSS levels).

Monitoring will be undertaken at sites that are to be determined prior to the commencement of any dredging operations which will include both 'impact' and 'reference' sites.

The water quality results at the impact monitoring sites will continually be compared to the baseline results as well monitoring results recorded at reference sites located within the vicinity of the dredge areas to assess the extent of any differential attributable to the dredging operations.

The water quality monitoring results will be assessed during the dredging operations to ensure that the average turbidity at the impact sites does not exceed the average turbidity at the reference sites by more than 50% (trigger levels).

If ongoing monitoring indicates that dredging operations are resulting in this trigger level being exceeded, then contingency management measures may be implemented (as discussed in Section 5.2). The suitability of the trigger level will be reviewed following the commencement of any operations and may be altered if determined necessary.

4.2 Seagrass Monitoring

Seagrass monitoring sites will be determined prior to the commencement of dredging operations. These monitoring sites will be inspected (to assess the seagrass health, including shoot density and community composition) prior to the commencement of the works, and then subsequently at the mid-point of the dredging operations to assess any potential impacts occurring as a result of the dredging works. A final inspection of the monitoring sites will be undertaken two months after the cessation of the works.

The purpose of the impact monitoring will be to ensure that the maximum allowable seagrass losses are not exceeded.

If unacceptable impacts are recorded at the midway point of the dredging, then contingency management measures will be implemented (as discussed in Section 5.2). These contingency measures may also result in the frequency of ongoing monitoring requirements being increased, in consultation with Office of the Environmental Protection Authority (OEPA).

4.3 Disposal Location

On the basis of the results obtained from the sample testing and analysis program, the PER (Strategen, 2011) included the following management measures that will be implemented during the capital dredging works:

- undertaking due diligence ASS monitoring of the dredge material transported to the settlement ponds from construction of the access channel
- stockpiled dredge material will be tested for contaminants (such as metals and TBT) on advice from DEC Contaminated Sites Branch.

5 DREDGING OPERATIONAL MANAGEMENT

The development and implementation of dredging management measures will be undertaken in accordance with the recommendations outlined in the NAGD (Commonwealth of Australia, 2009) guidelines.

These management measures will be implemented during the dredging operations to prevent or minimise any adverse environmental outcomes occurring as a result of the works.

The key objectives of these strategies are to:

- ensure that impacts to seagrass habitats are minimised and kept within the limits outlined on the PER
- minimise the intensity and extent of suspended solids generated as a result of the dredging activities
- minimise the risk of harm to the environment occurring as a result of the dredging activities.

5.1 Dredging Management Strategies

The management measures to be implemented in the planning, preparation and execution of the dredging and disposal works are summarised below.

Planning Stage

- the dredging activities shall be planned to ensure that the extent of the dredging requirements, both in terms of area and volume, is minimised
- dredging activities shall be undertaken during the winter months (at a time when seagrasses are not actively growing)
- the duration of the dredging activities shall be minimised via the use of efficient and appropriate dredging equipment.

Dredging Operations

- industry best practice dredging methodologies shall be implemented at all times, incorporating the use of modern equipment and the most efficient possible operational methods (including the beneficial re-use of dredge material wherever possible)
- dredging is only to be undertaken using well maintained vessels which are free from structural defects and potential sources of leakages.
- during the dredging operations detailed records regarding all aspects of the dredging operations should be maintained including the working hours, location(s) and durations of each activity
- the placement of anchors and submerged dredge disposal pipelines should occur on patches of bare sand wherever possible
- all pipelines are to be well maintained and if any leaks are identified operations are to cease until the leak can be repaired
- the dredge process water is to be retained in the settlement pond system for the longest possible period to maximise the settlement of suspended sediments

- the infiltration of water into the ground underneath the settlement ponds is to be encouraged in preference to the discharge of dredge process water back into Mangles Bay
- silt curtains may be installed during the dredging program to control and limit the dispersion of any turbid return water that is discharged from the settlement ponds.

5.2 Contingency Management

Contingency management actions may be triggered in the event that routine monitoring during the dredging operations, exceeds trigger levels.

The contingency management actions that may be triggered include:

Phase 1 Contingency Response

- inspection of the dredge equipment to ensure that all components are operating correctly and without defect.
- immediate relocation of dredging activities within the site.
- increase frequency of monitoring and impact measurement activities

If further monitoring identifies that unacceptable environmental impacts have, or may potentially, occur as a result of the dredging operations a second stage level of contingency response will be triggered which includes:

Phase 2 Contingency Response

- notification of OEPA regarding the observed impact to date
- liaison with OEPA to determine the appropriate course of action.

6 COMMITMENT SUMMARY

The following commitments are contained within this document, and will be implemented during future dredging operations.

Planning Stage

- the planning of dredging operations will be undertaken in a manner consistent with the management measures discussed in Section 5.1 and in accordance with the NAGD guidelines (Commonwealth of Australia, 2009) guidelines.

Dredging Operations

- all dredging operations will be undertaken in a manner consistent with the management measures discussed in Section 5.1 and in accordance with the NAGD guidelines (Commonwealth of Australia, 2009) guidelines
- if monitoring identifies the exceedance of agreed trigger levels, or unacceptable impacts are recorded, then the contingency measures outlined in Section 5.2 will be implemented.

Sampling and Analysis, and Monitoring

- prior to the commencement of any dredging operations, sediment sampling will be undertaken in accordance with the requirements of the NAGD (Commonwealth of Australia, 2009) guidelines.
- water quality monitoring will be undertaken in accordance with the methodology outlined in Section 4.1
- seagrass monitoring shall be undertaken in accordance with the methodology outlined in Section 4.2 to ensure that impacts do not exceed those predicted in the PER (Strategen, 2011)
- during the dredging operations sediment sampling at the disposal site shall be undertaken in accordance with the methodology outlined in Section.

7 REFERENCES

- BMT JFA Consultants, 2011, *Mangles Bay Marina PER Agency Comments Responses*, TN-199.06.02-1, Prepared for Cedar Woods Properties Ltd.
- Commonwealth of Australia, 2009, *National Assessment Guidelines for Dredging*, Department of Environment, Heritage and the Arts, Canberra
- Environmental Protection Authority (EPA) 2005b, *Manual of Standard Operating Procedures - For Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria (2003-2004) A supporting document to the State Environmental (Cockburn Sound) Policy 2005, Prepared by:* Environmental Protection Authority, Report No. 21, Perth, Western Australia, January 2005.
- Strategen Environmental Consultants, 2011, *Mangles Bay Marina Based Tourist Precinct – Public Environmental Review*. Prepared for Cedar Woods Properties Ltd.

Appendix 3
Weed list

Appendix 3 – Weed list

Table 36 List of weed species within and surrounding the Project area

Species name	Common name
Asparagus asparagoides	bridal creeper
Bromus diandrus	great brome
Ehrharta calycina	perennial veldt grass
Eragrostis curvula	African love grass
Eurphorbia terracina	Geraldton carnation weed
Hyparrhenia hirta	tambookie grass
Lagurus ovatus	Hare's tail grass
Pelargonium capitatum	rose pelargonium
Romulea rosea	Guildford grass

Appendix 4
Monitoring procedures

Appendix 4 – Monitoring procedures

Rehabilitation monitoring will be undertaken quarterly. Depending on the progress of the site in relation to targets (Table 28) it may be possible to reduce monitoring. This would form part of the review and revision of the Rehabilitation management plan (Section 19).

It is recommended that an experienced contractor undertake the monitoring, which is likely to involve randomly placed 1 m^2 quadrats within the rehabilitation areas and reference sites. The number of quadrats will depend on their ability to provide a representative sample of the areas. The information that will be recorded includes:

- species list for native and exotic species
- native species richness, % cover and density
- exotic species richness, % cover, density and distribution
- presence/absence of erosion
- general comments on the whole area (e.g. success of revegetation and weed control measures, health of plants, discussion of comparison between rehabilitation sites and reference sites)

Recommendations for any work that needs to be undertaken in the future and/or statement that objectives are being met or of progress towards performance targets.

Appendix 5
Seed collection and direct seeding procedures

Appendix 5 – Direct seeding procedures

These instructions relate to the preliminary requirements and actual direct seeding of an area:

1. Undertake seed viability and germination testing if deemed necessary.
2. Store seed in a dry, cool place – about 10–15˚C to ensure seed viability.
3. Based on monitoring results determine the quantity and type of plants and volume of seed required for particular flora species.
4. Prior to direct seeding, conduct required treatment on seed to break dormancy and improve germination rates. Treatment could include smoking, freezing, boiling, scarifying, etc.
5. After achieving required weed control, rake area in preparation for direct seeding.
6. Combine treated seed with an appropriate medium (e.g. yellow sand or vermiculite) and distribute by an experienced operator, ensuring an even coverage over the whole area.

Appendix 6
Planting instructions

Appendix 6 – Planting instructions

The planting instructions outlined below relate to the preliminary requirements and actual installation of a plant:

1. Source seedlings required for the project from nurseries accredited under the Nursery Industry Accreditation Scheme of Australia if practicable.
2. Determine the quantity of various native flora species required and then engage contractors to undertake the necessary seed collection and plant propagation. The majority of plants should be produced from local provenance seed, as outlined in the monitoring targets (Table 29). The plants should be produced in forestry tubes (50 mm x 50 mm x 125 mm) and be in a healthy, non-root bound condition upon pick-up or delivery.
3. Undertake planting using the rip mound plant or infill augur planting method depending on the site conditions.
4. Determine the appropriate location for the various species of plantings (in consultation with an expert if required).
5. Dig a hole that is twice the size of the plant pot. The depth at which the seedling is planted should be sufficient to prevent predation by birds and impact from inundation.
6. Determine the appropriateness of additives, which could include Seasol, water granules, soil breaker, water retainer, wetting agent or fertiliser tablets. If they are required, add at the relevant time (i.e. in the hole prior to planting or upon watering in plants).
7. Remove the plant from the pot and place it in the hole, ensuring the base of the plant is slightly below the original soil surface.
8. Fill the soil in around the plant ensuring it sits in a basin that is approximately 200–300 mm in diameter and 50 mm deep to provide adequate water capture. Ensure the base of the plant is flush with the soil surface within the basin to prevent collar rot.

Appendix 7

Heritage site detection procedure

Appendix 7 – Heritage site detection procedure

In the event that a previously unrecorded suspected Aboriginal heritage site is detected or uncovered during construction or clearing activities, the following procedures will be followed:

1. Stop work (if safe to do so) in the area and within 30 m of the potential heritage site, and place flagging or barrier fencing around the area (including the 30 m buffer) until further advice is received.
2. Notify the Department of Indigenous Affairs (DIA) and [Relevant Aboriginal Group]. Notify police if skeletal remains are involved.
3. Determine the authenticity of the site or material using appropriate methods, in consultation with relevant stakeholders.
4. Implement suitable mitigation/management measures as soon as practicable once agreed upon by stakeholders.
5. Report as Environmental Incident and initiate Incident Procedure.
6. Complete an Aboriginal Site Recording Form (available from the DIA), and lodge the form with the DIA within seven days of discovery of potential site.
7. Record details of the site discovery for internal management records, including:
8. date and time of the discovery
9. method by which the site was uncovered, and the project activities occurring at the time
10. site description / nature of the site
11. nature of investigations taken in relation to the potential site
12. action taken in relation to the site (including supplementary monitoring and corrective actions)
13. reasons for taking no action in relation to the site (if such a decision was made)
14. outcomes of the process.
15. Review Aboriginal heritage management measures to determine the need for modification/addition to requirements, and improve or implement increased protective measures as required.
16. Update cultural heritage database (GIS record of site locations).
17. Update induction material for construction personnel as required.
18. Investigate potential for site avoidance. Where disturbance to the site can be avoided (e.g. via reconfiguration of the development), actions may include compiling a detailed site record, collection of the cultural material or protection of the site (e.g. fencing).
19. Where avoidance is not practicable, seek consent to disturb the site from the Minister for Indigenous Affairs through a Section 18 application under the *Aboriginal Heritage Act 1972* (WA), in consultation with the Native Title holders.
20. Prior to making an application under the *Aboriginal Heritage Act 1972* (WA), ensure that detailed archaeological recording of the relevant site is conducted by a qualified archaeologist, and consult in good faith with MG Corporation to determine acceptable methods by which site may be disturbed.

Appendix 8

Environment Incident Report Form

INCIDENT REPORT	
Reported by:	Date of incident:
Time of incident:	Associated activity:
Location of incident: *indicate location on attached map*	
Investigated by:	Date investigated:

1. INCIDENT DETAIL

___ Turbidity related issue	____ Heritage material disturbed without authorisation	____ Erosion issue
____ Fire prevention issue	____ Water pollution	____ Hydrocarbon spill
____ Noise complaint/issue	____ Dust complaint/issue	____ Chemical spill
		____ Other

2.

Description of incident:
Description of environmental damage/impact:
Contributing factors of incident occurring:
Controls, Procedures, Response plan, and/or Monitoring in place to prevent/address occurrence:

Corrective action taken immediately:
Relevant training or instructions given to personnel prior to incident:
Did this incident occur as a result of non-conformance with environmental management plan? ___ Yes ____ No **What related procedures were not conformed to?**

INCIDENT COMMUNICATION

People informed (contractors, supervising engineer, authorities):
Information provided:

SPILL RESPONSE

If a spill has occurred: **Details of material cleaned up/recovered – specific type, quantity/volume:**
Method of clean-up

Test and Results after clean-up (if applicable)

RECOMMENDATIONS AND CLOSE OUT

Further remedial action required to address this specific incident:			
Action required	Person responsible	Due date	Date completed
Recommendations to prevent reoccurrence			