Lanco Resources Australia

Bunbury Port Berth 14 Expansion and Coal Storage and Loading Facility

Volume 1 — Public Environmental Review

November 2012

B2399 2162530A

LANCO
Always Inspiring

PARSONS BRINCKERHOFF

Public Environmental Review

Bunbury Port Berth 14A Expansion and Coal Storage Facility

November 2012

Lanco Resources Australia

PARSONS BRINCKERHOFF

Parsons Brinckerhoff Australia Pty Limited
ABN 80 078 004 798

Level 5
503 Murray Street
Perth WA 6000
PO Box 7181
Cloisters Square WA 6850
Australia
Telephone +61 8 9489 9700
Facsimile +61 8 9489 9777
Email perth@pb.com.au

Certified to ISO 9001, ISO 14001, AS/NZS 4801
A+ GRI Rating: Sustainability Report 2010

An invitation to comment on Bunbury Port Berth 14A Development for Coal Storage and Loading Facility

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on this Proposal. Both electronic and hard copy submissions are most welcome.

Lanco Resources Australia Pty Ltd (Lanco) proposes to develop Berth 14A within the Inner Harbour of Bunbury Port for the export of 1 million tonnes of coal per annum. The proposal is consistent with the Bunbury Port Authority Structure Plan (2009). Coal will be sourced from Lanco Collie Basin operations and transported via rail to the port facility.

The proposal occupies an area approximately 30 hectares in size and includes the following:

- dredging of berth approach and pocket
- construction of Berth 14A to accommodate bulk carriers
- construction of a new rail spur to service Berth 14A
- materials handling infrastructure including train unloading, conveyors, stackers, storage and ship loading facilities.

In accordance with the *Environmental Protection Act 1986* (WA), a Public Environmental Review (PER) has been prepared which describes this Proposal and its likely effects on the environment. The PER is available for a public review period of 6 weeks from Wednesday 21 November 2012, closing on Wednesday 16 January 2013.

Comments from government agencies and from the public will assist the EPA to prepare an assessment report in which it will make recommendations to government.

Where to get copies of this document

Printed copies of this document may be obtained from:

Name: D. Trench
Address: Level 15 BGC Centre, 28 The Esplanade, Perth WA 6000
Phone: 08 6188 2200
Email: d.trench@griffincoal.com.au

Hard copies of the PER may be purchased at a cost of $10.00 per copy, or a CD-ROM version will be provided (no charge). Copies may also be obtained from:

http://www.griffincoal.com.au/operationberth.html

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action – including any alternative approaches. It is useful if you indicate any suggestions you have to improve the Proposal. All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the *Freedom of Information Act 1992* (WA), and may be quoted in full, or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the work for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate the names of all participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or issues specific to the Proposal. It helps if you provide reasons for you conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the Proposal more environmentally acceptable. When making comments on specific elements of the PER:

- clearly state your point of view
- indicate the source of your information or argument, if applicable
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make is easier for your submission to be analysed:

- attempt to list points so that the issues raised are clear; a summary of the submission is helpful
- refer each point to the appropriate section, chapter or recommendation in the PER
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering
- attach any factual information you wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name
- your address
- the date
- whether you want your submission to be confidential.

Information in submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submission is Wednesday 16 January 2013.

The EPA prefers submissions to be sent electronically using one of the following:

- the submission form on the EPA's website: https://consultation.epa.wa.gov.au
- by email to matt.spence@epa.wa.gov.au

OR

If you do not have access to email then please post your submission to:

The Chairman
Environmental Protection Authority
Locked Bag 33
CLOISTERS SQUARE PERTH WA 6850
Attention: Matt Spence

OR

Submissions can be delivered to:

Environmental Protection Authority
Level 4 The Atrium
168 St Georges Terrace
PERTH
Attention: Matt Spence

OR

Submissions can be faxed to:

(08) 6467 5556

Contents – Volume 1

Contents (Continued)

Contents (Continued)

Page number

Contents (Continued)

Contents (Continued)

Contents (Continued)

Contents (Continued)

List of tables

List of tables (continued)

Page number

List of figures

Appendices

Technical Reports – Volume 2

Volume 2A

Technical Report 1 – Indicative dredge plan for modelling
Technical Report 2 – Site selection and assessment for offshore placement of dredge material
Technical Report 3 – Marine environmental quality studies
Technical Report 4 – Hydrodynamic and sediment transport modelling
Technical Report 4A – Independent specialist review of hydrodynamic and sediment transport modelling

Volume 2B

Technical Report 5 – Benthic habitats near Bunbury, Western Australia
Technical Report 6 – Benthic primary producer habitat loss assessment
Technical Report 7 – Marine fauna studies
Technical Report 7A – Underwater construction noise impact assessment
Technical Report 8 – Marine sediment sampling and analysis report
Technical Report 9 – Air quality – dust emissions

Volume 2C

Technical Report 10 – Draft dredging and spoil disposal management plan
Technical Report 11 – Draft marine environmental management plan (MEMP)
Technical Report 12 – Flora and fauna assessment
Technical Report 13 – Level 2 Surveys – Waterbirds and Western Ringtail
Technical Report 14 – Groundwater assessment
Technical Report 15 – Preliminary site investigation – including Auditor letter on SAP
Technical Report 16 – Noise impact assessment
Technical Report 17 – Aboriginal heritage advice
Technical Report 18 – Preliminary water management plan
Technical Report 19 – Koombana Bay baseline marine monitoring report

Marine and terrestrial biodiversity checklist

Glossary

Term or abbreviation	Definition
µS/cm	Micro Siemens per centimetre (measure of electrical conductivity)
AASS	actual acid sulphate soils
ADCP	Acoustic Doppler Current Profiler
AEC	Areas of environmental concern
AHD	Australian Height Datum. Datum surface (baseline land surface height based on sea level) for measurement of altitude of geographic features.
AHIS	Aboriginal Heritage Inquiry System
ANZECC	Australian and New Zealand Environment Conservation Council
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
Assigned noise levels	highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises; these levels are determined under the *Environmental Protection (Noise) Regulations 1997* (regulation 8)
Astronomical tide	Tide levels expected under average meteorological conditions
AWAC	Acoustic Wavers and Currents
benthic	Ecological term pertaining to the sea bed
BHD	Back hoe dredger
Biofouling	The accumulation of marine organisms on underwater surfaces of vessels in seawater
BPA	Bunbury Port Authority
BPPH	benthic primary producer habitat. Seabed communities within algae, seagrass, mangroves, corals or combinations of these group are prominent components
Bunbury Port	Comprises Bunbury Inner Harbour and Bunbury Outer Harbour
Bunbury Power Station site	Portion of the site formerly occupied by the Western Power Bunbury Power Station (coal fired power station; demolished in 2000).
C-PODS	passive acoustic monitoring methods
CD	Chart Datum. Datum surface (baseline sea level surface) for measurement of depths below sea level. Based on lowest astronomical tide.
CEMP	Construction Environmental Management Plan
CEO of DEC	Chief Executive Officer of Department of Environment and Conservation
CMP	Construction Management Plan
Controlled action	A proposal that is likely to have a significant impact on MNES, affects Commonwealth land or is proposed by the Commonwealth; regulated under the EPBC Act

Term or abbreviation	Definition
CoT	Certificate of title
Cetacean	Marine mammals such as dolphins and whales
CSD	Cutter section dredger
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Decibel
dB(A)	'A-weighted' sound power level in decibels. A-weighted noise measurements are those that have been scaled to account for the differential response of the human ear to different sound frequencies (i.e. noises with frequencies within the human ear's most sensitive range are scaled to be louder than noises with frequencies outside of this range).
DEC	Department of Environment and Conservation
DIA	Department of Aboriginal Affairs
DP	Deposited Plan
DoMP	Department of Mines and Petroleum
DoW	Department of Water
DRF	Declared rare flora species
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
DSI	Detailed Site Investigation
EAG3	*Environmental Assessment Guideline No. 3: Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment*
EAG7	*Draft Environmental Assessment Guideline No. 7: Marine Dredging Proposal*
EC	Electrical conductivity
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ESD	Environmental Scoping Document. Stipulates EPA requirements for form, content, timing and procedure for PER.
GEL	Generally expected level (metal concentrations in food standard for molluscs)
Greater Bunbury Region Scheme	defines the broad pattern of land use for the City of Bunbury and the Shires of Harvey, Dardanup and Capel; includes regional reservations and broad land use zones; prepared in accordance with the *Western Australian Planning Commission Act 1985*
Griffin Coal	Griffin Coal was purchased by Lanco Resources and are the operators of Griffin Coal mine.
Griffin Coal Mine	Griffin Coal operations are based in the Collie Basin, in the south west of Western Australia and approximately 90 kilometres east of Bunbury.

Term or abbreviation	Definition
GSWA	Geological Survey of Western Australia
ha	hectare
Hazmat	Hazardous materials
Hr	Hour
hrs	Hours
IHSP	Bunbury Port Inner Harbour Structure Plan (Thompson McRobert Edgeloe 2009); see 'Structure Plan'
Impact threshold	The level of sound at which a particular impact such as death, injury or annoyance is experience by a particular marine species
Influencing factor	decibel value added to the statutory minimum assigned noise level; used for noise sensitive premises such as residences and incorporated into the assigned noise levels. Relevant influencing factor depends on the land use zonings within a radius from the noise receiver
km	kilometre
endangered ecological communities	an ecological community included in the endangered category of the list of threatened ecological communities (EPBC Act, Section 248)
L_{A1}	assigned noise level which is not to be exceeded for more than 1% of the time
L_{A10}	assigned noise level which is not to be exceeded for more than 10% of the time
L_{Amax}	assigned noise level which is not to be exceeded at any time
Lanco	Lanco Resources Australia Pty Ltd (the Proponent)
listed migratory species	a migratory species included in the EPBC Act list of migratory species (EPBC Act, Section 209)
listed threatened species	a native species included in the EPBC Act list of threatened species (EPBC Act, Section 181)
listed threatened ecological communities	an ecological community included in the EPBC Act list of threatened ecological communities (EPBC Act, Section 178)
London Protocol	*1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972*. International agreement that limits waste disposal in the marine environment. Enforced in Australia under the Sea Dumping Act.
m	metre
m^2	Square metres
m^3	Cubic metres
mAHD	Metres Australian Height Datum.
Marine megafauna	Includes a variety of animal groups such as cetaceans (dolphins and whales), pinnipeds (sea lions), seabirds, sharks and predatory fish
mBGL	Metres below ground level

Term or abbreviation	Definition
mCD	Metres chart datum
m/day	metres per day
mg/L	Milligrams per Litre
ML	Maximum level (metal concentrations in food standard for molluscs)
MNES	matters of national environmental significance (as defined under the EPBC Act 1999)
MODIS	Moderate Resolution Imaging Spectroradiometer
Mtpa	Million tonnes per annum
m/s	Metres per second
m/year	Metres per year
NATA	National Association of Testing Authorities, Australia
NTU	Nephelometric Turbidity Units (measurement of turbidity)
ODGDM	National *Ocean Disposal Guidelines for Dredged Material* (Environment Australia, 2002)
OEPA	Office of the Environmental Protection Authority
PASS	Potential acid sulphate soils
PER	Public Environmental Review
PF	Priority Flora species
pH	Measure of acidity and alkalinity
Pinnipeds	Species belonging to the sub-order Pinnipedia including seals, lions and walruses
The Project	The Lanco Bunbury Port coal export facility project, as described in this PER
PSD	Particle size distribution
PSI	Preliminary Site Investigation
Referral	Documentation prepared by the proponent and reviewed by the EPA to determine level of environmental impact assessment required for a proposal
SAP	Sampling and Analysis Plan
Sea Dumping Act	*Environment Protection (Sea Dumping) Act 1981*
Section 18 consultation	Aboriginal community consultation
Significant proposal	A proposal that, if approved, would have a significant effect on the environment
SMF	Synthetic mineral fibres
SWMRP	South West Marine Research Program. A partnership between the Dolphin Discovery Centre, Murdoch University, Government, industry and the community.

Term or abbreviation	Definition
Strategic proposal	A proposal or proposals that, if implemented, would have a significant effect on the environment, defined under the EP Act
Strategic Referral	Referral to the EPA for a strategic proposal, required under the EP Act
Structure Plan	policy document to guide development and decision making within the Inner Harbour; conforms to the strategic planning requirements under the *Port Authorities Act 1999*
SWEC	South West Environment Centre
SWL	Standing water levels
t	tonnes
TBT	Tributylin (biocide; common contaminant in ports; additive in antifouling paints)
t/day	Tonnes per day
TDS	Total dissolved solids
TEC	Threatened ecological communities
TL	Transmission Loss; underwater noise measurement, measuring change in signal strength with range
tpa	tonnes per annum
tph	Tonnes per hour
TSM	Total suspended matter
TSS	total suspended sediment
TTS	Slight , recoverable loss of hearing
WA	Western Australia or Western Australian
WMP	Waste Management Plan
WRC	Water and Rivers Commission

Executive summary

This executive summary provides a summary of the Bunbury Port berth 14A expansion and coal storage facility public environmental review (PER).

Introduction

This PER assesses the environmental impacts associated with the proposed construction and operation of a coal handling and export facility at Berth 14A within the Bunbury Port Inner Harbour – The Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (the Project).

The proponent for the Project is Lanco Resources Australia Pty Ltd (LRAPL), Perth (referred as 'Lanco') a subsidiary of Lanco Infratech Limited, Gurgaon, India. Lanco are proposing to export coal sourced from their Griffin Coal operations in the Collie basin through Berth 14A at Bunbury Port.

The Project falls within the boundary of the Bunbury Port Inner Harbour Structure Plan (the IHSP) (Thompson McRobert Edgeloe 2009) which was released by the Bunbury Port Authority (BPA) in 2009. The IHSP allows for the creation of two berths however it is proposed that Lanco will only developed Berth 14A which has been assessed in this PER. The Project and location of Berth 14A are consistent with the objectives of the IHSP.

The Project

The Project is for the construction and operation of Berth 14A within the inner harbour of Bunbury Port to facilitate the export of up to 15 million tonnes of coal per annum (Figure E.1). The Bunbury Port is an existing operating harbour and the proposal is consistent with the Bunbury Port Authority's IHSP (TME 2009). A summary of the key characteristics for the Project is presented in Table E.1.

In order to process this increased volume of coal, new transport facilities, a handling plant and berthing arrangements are required at Bunbury Port to mobilise the coal from the mine to the ship.

To increase flexibility and maintain efficiency, the coal handling facility is designed to receive coal by rail and unload either directly to a berthed ship or to the enclosed stockpile shed. It is proposed that the enclosed shed will allow up to a six day supply of stockpiled coal. The stockpiled coal would act as a buffer between the unloading and loading processes to ensure a waiting ship is loaded as quickly as possible, as well as allowing train unloading to proceed if a ship is not available.

The dredging of Berth 14A and its approach is necessary to provide sufficient space to allow bulk carriers to enter and depart the new berth. Dredging works includes both marine and terrestrial footprints that may include some rock fracturing in limited areas. Construction also requires construction of wharf facility and armoured slope protection at the entrance of the basin and other open areas with suitable local materials.

Table E.1 Key characteristics table

Marine Components	**Description**
Berth pocket	Berth pocket dredged to -12.7 m Chart Datum (CD) to accommodate Panamax sized vessels. Associated approach navigational area dredged up to 12.2 mCD. Dredged berth pocket of approximately 10ha, including both terrestrial and marine areas.
Dredging ▪ Capital ▪ Maintenance	 Dredge volume of up to 2.7 million cubic metres (m^3). Underwater rock fracturing may be required to remove up to approximately 20,000 m^3 of rock. Required approximately every 2–3 years. To be carried out by BPA.
Spoil disposal	Final dredging quantities will be determined as the final designs for Berth 14A are prepared. The offshore spoil disposal site has been identified to occur in Commonwealth waters, and as such does not form part of this assessment. Suitability of this site, as well as the disposal of spoil, will be assessed by the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) under the Commonwealth *Environmental Protection (Sea Dumping) Act 1981*.
Berth structure	Likely to be piled structure, in addition to armoured slope protection at the entrance of the basin and other open areas with suitable local materials.
Terrestrial components	**Description**
Material handling infrastructure	Train unloader, conveyors, stackers, coal storage facility and ship loading equipment.
Rail	New rail loop and unloading station within the site boundary (refer to Figure 1.1) to the north west of the Preston River.
Throughput	15 Million tonnes per annum.
Construction period	Approximately 18 months.
Water requirements	Still to be determined during the detailed design for the Berth14.
Vegetation loss	Approximately 2 ha of native vegetation. Additional vegetation would be lost however this is either highly disturbed or planted.
Terrestrial ground disturbance	Approximately 30 ha.

Figure E.1 Project layout

Justification of the Project

The local consumption of coal from the Griffin Coal operations in Collie is limited to the existing power plants in the South West region. It is estimated that Griffin Coal through the expansions of their Muja and Ewington operations has the potential to produce up to 20 million tonnes of coal per annum which is far beyond the local consumption requirements. Based on these projections it is estimated that there is a mine life resource in excess of 50 years in providing for domestic consumption, reserve resource and development of alternative markets.

The demand of sub bituminous coal in the Asian economies has increased in recent years and the viability of the Griffin coal mine is centred on its potential to export coal after meeting the local demand. In order to efficiently export material from Collie, it is important to create the requisite port and rail infrastructure for evacuation of coal from the mines.

Currently, Bunbury Port does not export coal from any of the existing berths however the IHSP has identified Berth 14A for coal export. The proposed export quantity proposed to be exported from Berth 14A, almost doubles the current export capacity within the Port.

The Project has several benefits to the local economy including additional revenue, employment creation (during both construction and operation) and provision of additional services to support the operations.

Regulatory framework

The environmental assessment, approval and regulation of the Project fall under both Western Australian and Commonwealth government jurisdiction. The Project requires initial approval from:

- The Western Australian Minister for Environment pursuant to the provisions of the *Environmental Protection Act 1986* (EP Act)
- The Commonwealth Minister for Sustainability, Environment, Water, Population and communities pursuant to the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- The Commonwealth Minister for Sustainability, Environment, Water, Population and Communities pursuant to the provisions of the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act).

In addition to State and Commonwealth legislation, there are a number of international conventions and bilateral agreements for the protection of fauna and flora, dredging and marine aspects which have been considered.

Stakeholder consultation

During the preparation of the PER, consultation has been undertaken with the local community and relevant stakeholders. The issues raised during the consultation have been considered in the preparation of this PER. Consultation activities undertaken have included:

- project briefings to government agencies and authorities
- community information session held in Bunbury in September 2011
- establishment of a project website.

Consultation will continue to occur during the public exhibition period with a submissions report being prepared at the conclusion of this period.

Environmental impacts and mitigations

The environmental scoping document (ESD), which was prepared by the Environment Protection Authority (EPA), identified ten environmental factors to be considered within this PER:

- terrestrial flora and vegetation
- terrestrial fauna
- groundwater
- marine environmental quality
- benthic habitat
- marine fauna
- soil
- air quality
- noise and vibrations
- surface water flows.

Chapters 6 to 15 of this PER provides a detailed assessment of each of the key factors, the existing environment, impacts, management and mitigation and predicted environmental outcomes.

The Project is expected to have both positive and negative environmental, social and economic impacts. The key environmental impacts of the Project (in accordance with those identified by the ESD) are

summarised in Table E.2, along with key management measures proposed to achieve the predicted environmental outcome.

A detailed discussion of each of each of the key factors, the existing environment, impacts and management and mitigation are provided in Chapters 6–15 of this PER.

Conclusion

The Project is for the export of coal from Berth 14A within the Bunbury Port Inner Harbour. The Project is consistent with the Bunbury Port Structure Plan and has support from BPA.

This PER has identified a range of potential environmental impacts as a result of the Project. These impacts primarily relate to the marine environment and the cumulative impact of noise. The PER has recommended numerous management measures which has been summarised in Table E.2 to avoid or reduce these potential impacts. In consideration of the recommended management and mitigation measures, it is unlikely that the Project will have any long term negative impacts on the environment.

The Project is expected to have social and economic benefits for the Bunbury and South West region of Western Australia through increased employment opportunities during both the construction and operational phases of the project.

Various measures and commitments are recommended to avoid and/or manage the identified impacts associated with construction and operation of the Project. Many of these will be incorporated in the final CEMP and the operating environmental management system.

Next steps

Lanco Resources Australia are seeking approval for the construction and operation of the Project. The next steps in the process are as follows:

- An eight week public review of the PER and invitation for the community and stakeholders to make a submission. Submissions should be made to:

  The Chairman Environmental Protection Authority
  Locked Bag 33, CLOISTERS SQUARE PERTH WA 6850
  Attention: Matt Spence.

- Proponent to prepare a response to public submissions.

- EPA preparation and finalisation of assessment report on environmental factors and recommended conditions to the Minister for Environment.

Table E.2 Summary of management measures and predicted environmental outcomes

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Construction					
Terrestrial flora and vegetation	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.	Vegetation within the study area is predominantly exotic, with small areas of degraded remnant and pioneering native vegetation. The majority of the study area has been degraded by weed invasion, with little native vegetation located within the boundaries of the site.	Loss of native vegetation	Implementation of clearing protocols during the clearing of land within the eastern portion of the site.	Reduction of native vegetation impacted by the development to approximately 6 ha of degraded coastal scrub.
			Spread of weed cover	Development of an onsite sediment and erosion control plan to mitigate or manage any impacts to vegetation related to sedimentation of water sources. Vehicles and other equipment used in clearing the site are to be cleaned so they are completely free of soil, seeds and plan material before entering and leaving the site.	No increase in the existing cover of weed species during construction.
			Foreshore management	Lanco would contribute to input of a Foreshore Management Plan if required to be prepared by BPA	Projection of critical foredune vegetation from any damage from the Project
Terrestrial fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.	Fauna habitats within the Project area are generally in poor condition and provide only limited habitat for only some opportunistic birds and common amphibians associated with disturbed coastal landscapes.	Loss of black cockatoo foraging habitat	Landscape management plan	Landscaping using foraging species of the black cockatoo's including *Acacia saligna* and banksia species where possible away from proposed road and rail.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Groundwater	To maintain the quality and quantity of groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected	Three main hydrogeological units underlay the Project area including the superficial formation that forms an unconfined aquifer (superficial aquifer), Bunbury basalt (aquiclude), Yarragadee Formation (confined aquifer in this area).	Reduced integrity of the confining basalt layer	Design of rock fracturing and excavation activities to minimise blast energy.	Integrity of the Bunbury basalt is not compromised during construction activities.
			Acidification of groundwater due to disturbance of acid sulphate soil during construction	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of water prior to disposal.	Appropriate management of acid sulphate soils during earthworks to avoid acidification of aquifer.
			Abstraction of existing contaminated groundwater	Prior to dewatering to identify sources of contamination in groundwater on site. Collect and treat contaminated groundwater and dispose to appropriate licence facility	No discharge of contaminated water on site.
Marine Environmental Quality	To maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected	The Project area and surrounds is located within the Leschenault Catchment which is a complex hydrological network of natural rivers and artificial drains. Both the Preston River and Leschenault Estuary have been heavily modified by previous works which include river diversions, reclamation, and opening of the estuary (via 'the Cut') and creation of a separate inlet (known as the Leschenault Inlet).	Decrease in the water quality conditions	Dredging and Spoil Disposal Management Plan	Maintain primary and secondary contact, water quality conditions for Moderate Levels of Ecological Protection as defined in the MEMP.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Benthic habitats (including benthic primary producer habitats)	To maintain marine ecological integrity through protection, management and improved knowledge of benthic habitats, including benthic primary producer habitats (BPPH)	Biotic coverage is typically low across the Project area. Coverage varied with substrata, with reef (51.1%) and sand inundated reef (52.8%) having higher biotic coverage than sand areas (25.0%). Biotic coverage is also generally higher in the northern half of the Project area compared to the southern part of the Project area. The biotic groups observed in this assessment are persistent with very little seasonal change in biotic coverage at a community level.	Loss of benthic habitat due to dredge impacts.	Dredging and Spoil Disposal Management Plan including identification of site suitable for the monitoring of benthic habitats during and following the dredge program.	No loss of benthic habitat due to dredging
Marine fauna	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 in knowledge.	The study area is defined as the area including the inner harbour area, Koombana Bay and extending approximately 10 km to the north and 10 km to the west of Koombana Bay. The large area is inhabited by marine fauna (megafauna particularly) including cetaceans, pinnipeds, birds, turtles and fish.	Impacts to the resident dolphin and turtle population	Dredging and Spoil Disposal Management Plan including passive acoustic monitoring of dolphins, a visual monitoring program pre and post dredging and no dredging to occur if dolphins are observed with the observation zone.	No detectable adverse effects on dolphin movements in Project area or Project attributable impacts to dolphin population health or no change in the abundance, diversity, geographic distribution and productivity of fauna at the species level.
			Rock fracturing on marine mega fauna	Dredging and Spoil Disposal Management Plan including preferential timing for high impact activities, validation of noise modelling and visual of marine mega fauna	Adopt industry best-practise measures to minimise the risk of harm to marine megafauna should rock fracturing be required.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Soil quality	To ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.	The soils within the vicinity of the berth are highly altered from the diversion of the Preston River in 1968/9 and land reclamation when the inner harbour was constructed.	Disturbance of Acid Sulphate Soils	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of contaminated material.	Exposure of acid sulphate soils during earthworks is appropriately managed. Dewatering of acid sulphate soils during earthworks is appropriately managed.
			Disturbance of existing contaminated soil	SAP developed and DSI implemented. Procedures developed and implemented that include the storage, treatment and disposal of contaminated soil.	Contaminated soil encountered is disposed and treated in accordance with procedure with no impact to surrounding environment.
			Compaction of soil profile	Construction footprint to consider operational footprint. Heavy machinery and vehicles restricted to designated access paths	Areas of soil compaction minimised and rehabilitated where appropriate.
			Contamination of soil from demolition of buildings and/or excavation of contaminants.	Preparation and implementation of CEMP. Design of hardstand areas to incorporate GPT and sumps to treat stormwater prior to leaving the site. A Hazmat survey of the administration building and warehouse conducted to identify synthetic mineral fibres, ACM and lead based paint, prior to demolition. Development of an asbestos management plan.	No contamination of soil during construction of Berth 14A and demolition of existing infrastructure.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Air quality	To ensure dust emissions do not adversely affect environment values of the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Existing dust emission sources that may contribute to dust loading within the local airshed include, but are not limited to: ▪ activities at the port ▪ vehicle movements ▪ non port-related industrial activities ▪ natural sources such as sea spray, dust storms bushfires etc	Dust emission exceedences during construction	Construction dust management plan	No exceedance in dust deposition goals.
Noise and vibrations	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	Existing noise levels from the port vary widely depending on both the port operating conditions and the prevailing weather conditions. The highest noise levels are observed at noise sensitive locations to the SW of the port for light down wind conditions. Traffic noise dominates noise from the port during the day. However, during the night traffic flows fall sharply and, under favourable weather conditions, noise from the port can become dominant.	Construction noise	Preparation of a noise management plan to be submitted to DEC	Work carried out in accordance with control of noise practices set out in Section 6 of the Australian Standard 2436 -1981 *Guide to Noise Control on Construction Maintenance and Demolition Sites*
Surface water flow – coal stockpile management	To maintain the quality of water and air emissions so that existing and potential environmental values, including ecosystem maintenance, are protected.	The site is currently undeveloped with no formal water management systems operating.	Surface drainage	Preparation of a CEMP	Minimisation of erosion, sedimentation and contamination of surface water during construction

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Solid and liquid waste		Solid and liquid waste is managed locally for the buildings that currently exist on the site.	Waste	Preparation of a waste management plan for inclusion in the CEMP	Commitment to reuse and recycling wherever possible.
Aboriginal and European Heritage		There is no significant Aboriginal or European Heritage Items within the Project Area.	Heritage	Preparation and implementation of a CEMP including management measures to protect identified heritage items.	No impact to any European or Aboriginal heritage item.
Operation					
Terrestrial flora and vegetation	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.	Fauna habitats within the Project area are generally in poor condition and provide only limited habitat for only some opportunistic birds and common amphibians associated with disturbed coastal landscapes.	Increase in existing weed cover	Regular treatment of weeds to suppress germination	No increase in the existing cover of weed species during operation.
Groundwater quality	To maintain the quality and quantity of groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected	Three main hydrogeological units underlay the Project area including the superficial formation that forms an unconfined aquifer (superficial aquifer), Bunbury basalt (aquiclude), Yarragadee Formation (confined aquifer in this area). The superficial aquifer in the project location contains variable groundwater quality, influenced by sea water intrusion and anthropogenic factors.	Contamination of groundwater.	Design of hardstand areas to include GPT and sumps to treat stormwater prior to leaving the site. An operating EMP will identify actions for protection of groundwater from potential contamination sources.	No contamination of groundwater from operation of Berth 14A.
			Operation discharges	Preparation and implementation of a marine environmental management plan	Conformation of the water quality criteria for low levels of environmental protection.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Marine fauna	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 in knowledge	The study area is defined as the area including the inner harbour area, Koombana Bay and extending approximately 10 km to the north and 10 km to the west of Koombana Bay . The large area is inhabited by marine fauna (megafauna particularly) including cetaceans, pinnipeds, birds, turtles and fish.	Introduction of marine pests from vessels entering Berth 14A	Preparation and implementation of a MEMP	No additional introduced marine pests entering and/or becoming established within the Inner Harbour as result of activities from Berth 14A.
Marine environmental quality	To maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected.	The Project area and surrounds is located within the Leschenault Catchment which is a complex hydrological network of natural rivers and artificial drains. Both the Preston River and Leschenault Estuary have been heavily modified by previous works which include river diversions, reclamation, and opening of the estuary (via 'the Cut') and creation of a separate inlet (known as the Leschenault Inlet).	General maintenance activities	Preparation and implementation of a MEMP	Conformance with BPA tenant requirements and no more than 12.5% of total complaints received by BPA to be related to Berth 14A.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Soil quality	To ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.	The soils within the vicinity of the berth are highly altered from the diversion of the Preston River in 1968/9 and land reclamation when the inner harbour was constructed.	Contamination of soil from general activities	Preparation and implementation of Environmental Management Plan. EMP to include waste management measures. Design of hardstand areas to incorporate GPT and sumps to treat stormwater prior to leaving the site.	No contamination of soil from the operation of Berth 14A.
			Disturbance of acid sulphate soils	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of contaminated material.	Dewatering of acid sulphate soils during operation of train unloading station appropriately managed and contained.
Air quality	To ensure that dust emissions do not adversely affect environmental values of the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Existing dust emission sources that may contribute to dust loading within the local airshed include, but are not limited to: ▪ activities at the port ▪ vehicle movements ▪ non port-related industrial activities ▪ natural sources such as sea spray, dust storms bushfires etc	Significant increase in existing exceedences at sensitive receptors	Ambient air monitoring program	No visible dust during operation. Continuous review of operational emission impacts. No significant increase in current emission exceedences within the Port.
			Spontaneous combustion	Preparation of a spontaneous combustion management plan	Reduced likelihood of spontaneous combustion.

Environmental factor	EPA objective	Existing environment	Potential impact	Management measure	Predicted environmental outcome
Noise and vibration	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal be ensuring the noise levels meet statutory requirements and acceptable standards	Existing noise levels from the port vary widely depending on both the port operating conditions and the prevailing weather conditions. The highest noise levels are observed at noise sensitive locations to the SW of the port for light down wind conditions. Traffic noise dominates noise from the port during the day. However, during the night traffic flows fall sharply and, under favourable weather conditions, noise from the port can become dominant.	Operational noise	Further consultation with DEC and EPA when undertaking the detailed design of the facility, particularly the ship loaders.	Operational noise emissions reduced as far as feasibly possible to reduce any cumulative emission exceedences during operation.
Surface water flow – coal stockpile management	To maintain the quality of water and air emissions so that existing and potential environmental values, including ecosystem maintenance, are protected.	The site is currently undeveloped with no formal water management systems operating.	Surface drainage Waste	Finalisation of the water management plan, including leachate management	Management of surface water including leachate to reduce impacts to the aquatic environment.

1. Introduction

1.1 Overview

This Public Environmental Review (PER) assesses the environmental impacts associated with the proposed construction and operation of a coal handling and export facility at Berth 14A within the Bunbury Port Inner Harbour – The Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (the Project).

The proponent for the Project is Lanco Resources Australia Pty Ltd (LRAPL), Perth (referred as 'Lanco').a subsidiary of Lanco Infratech Limited, Gurgaon, India.

In 2011, Lanco purchased Griffin Coal who is a significant supplier of coal in the Western Australian (WA) coal industry. Griffin Coal operations are based in the Collie Basin, in the south west of Western Australia and approximately 90 kilometres east of the Project site (refer to Figure 1.1).

Lanco are proposing to export coal sourced from their Griffin Coal operations in the Collie basin through Berth 14A at Bunbury Port.

The development of Berth 14A, including a new rail loop, material handing infrastructure, dredging to create a berth pocket and new wharf facilities are subject to this PER.

The Project falls within the boundary of the Bunbury Port Inner Harbour Structure Plan (the IHSP) (Thompson McRobert Edgeloe 2009) which was released by the Bunbury Port Authority (BPA) in 2009. The BPA has recently submitted to the Environmental Protection Authority (EPA) a Strategic Referral for the IHSP and an Environmental Scoping Document (ESD) was approved by the EPA in January 2012. The Project and location of the berth are consistent with the objectives of the IHSP, and this is discussed further in section 1.3.2.

1.2 Purpose of Public Environmental Review

This document describes and assesses the significance of the environmental impacts associated with the construction and operation of the Project, including how these impacts will be avoided, minimised and managed should the Project proceed. The scope of the Project assessed in this PER includes:

- an introduction to the Project, its background and the proponent
- a detailed project description including a project justification
- outline of the community and stakeholder consultation
- description of the existing environmental factors of the Project
- assessment on the various environmental factors and its impact on the Project as prescribed by the EPA during construction and operation
- management and mitigation measures for all environmental factors.

1.3 Project background

1.3.1 Location

The Project is located in the South West region of Western Australia, within the City of Bunbury and specifically within the Inner Harbour of the existing Bunbury Port (refer Figure 1.1).

The Project is located on the former Bunbury Power Station site within an 'L shaped area' portion of land surrounded by the Inner Harbour Basin to the south and west, Leschenault Inlet to the east and Koombana Bay to the north. Adjoining the site to the south east is the Alcoa and Worsley facilities which exports Alumina whilst on the western side of the inner harbour is woodchip and mineral sands facilities.

The Project will occupy an area of approximately 27 hectares however a greater area has been assessed as part of this PER. The Project layout (refer to Figure 5.1) is consistent with the Heads of Agreement between Lanco and BPA and will be comprised of a new berth, materials handling section and a new rail loop from the existing rail line.

1.3.2 Project development

The Project complies with the land uses outlined in the Bunbury Port Structure Plan. After significant consultation with BPA, the location of the rail loop has been modified to that presented in the ESD for this Project and that shown in the Structure Plan.

The proposed new rail loop has been located around the existing rail loop. This was done to ensure that land within the middle of the rail loop was not sterilised for future users. A detailed description of the Project is provided in Chapter 5.

1.3.3 Land use and tenure

The Project area has been identified in the IHSP (2009) which identifies the Project area for the following indicative land uses (refer to Figure 1.2):

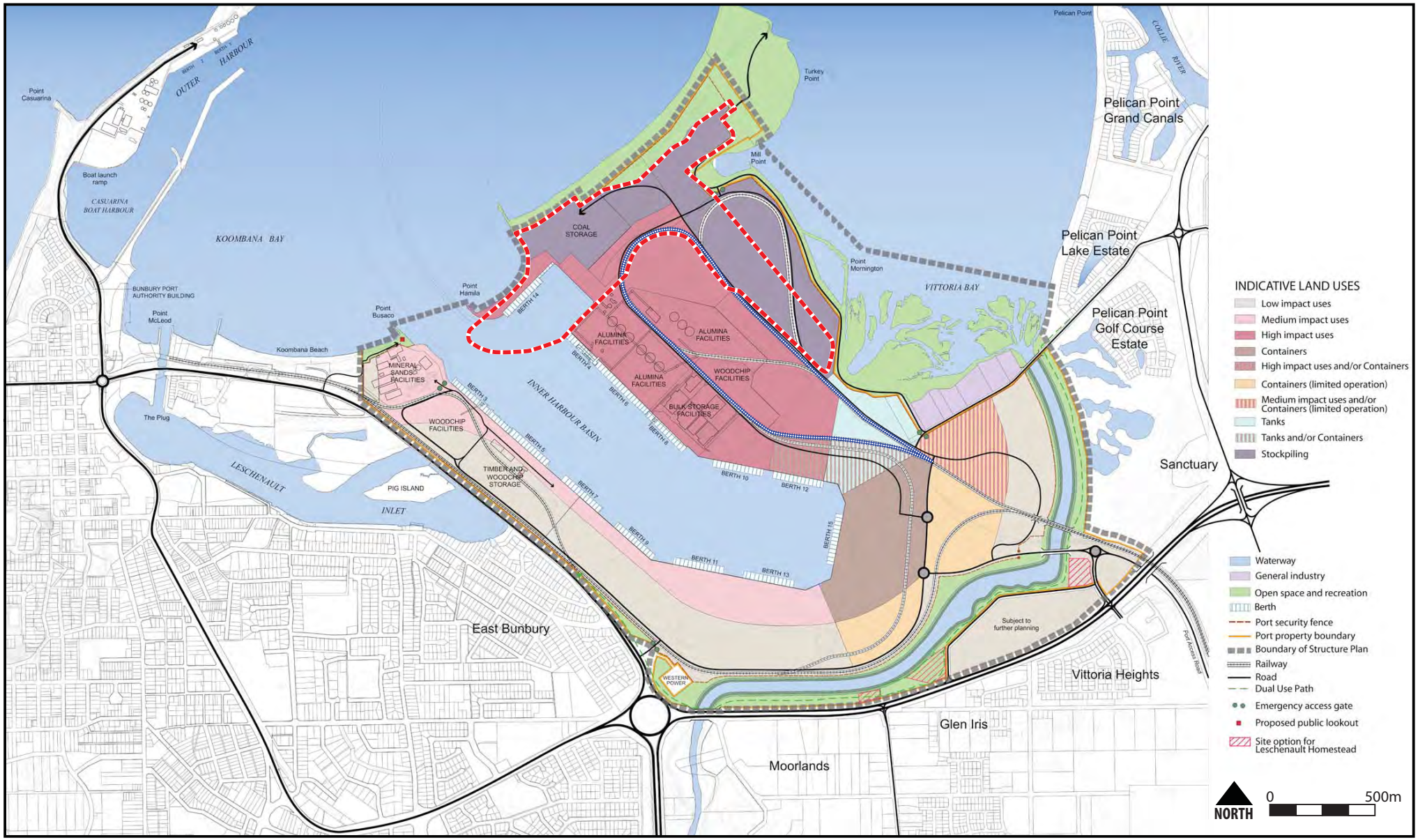
- general industry (Coal storage)
- high impact uses
- waterway.

Land to the north and east boarding Koombana Bay and the Leschenault Inlet is described as regional open space under the *Greater Bunbury Region Scheme* (2007) to protect the conservation values of these areas. Whilst the Project adjoins this area, no works occur within areas described as regional open space.

The Project is consistent with the indicative land uses described in the Bunbury Port IHSP.

The majority of the Project area is currently vacant occupying lots either owned by BPA or marked as 'for the purpose of Bunbury Port purposes'. The confirmation of the final land boundary of the Project area shall be made after the Lease Agreement is executed between Lanco and Bunbury Port Authority. Table 1.1 provides the ownership details for each land parcel affected by the Project.

Figure 1.1 Site location



Site boundary New rail loop

Figure 1.2 Structure Plan

Table 1.1 Land tenure

Land owner/Primary interest holder	Lot	Deposited plan
BPA	Lot 1	23101
BPA	Lot 2	23101
Crown land – BPA	Part Lot 963	220558
Crown land (Reserve) – State of WA	Lot 965	220558
Crown land (Reserve) – State of WA	Lot 428	30984
Crown land (Reserve) – State of WA	Lot 429	193963

1.3.4 Project summary

The Project is for the construction and operation of Berth 14A within the inner harbour of Bunbury Port to facilitate the export of up to 15 million tonnes of coal per annum. The Bunbury Port is an existing operating harbour and the proposal is consistent with the IHSP (TME 2009).

The Project supports the export of coal from the proposed expansion of the Griffin Coal operations in the Collie Basin through the Project.

In order to process this increased volume of coal, new transport facilities, a handling plant and berthing arrangements are required at Bunbury Port to mobilise the coal from the mine to the ship.

The works assessed in this PER include the coal handling facility including a new rail loop, enclosed stockpile shed, conveyor systems, ship loading facilities and a new berth. It is proposed that the new rail loop would allow the delivery of coal-loaded wagons to be unloaded and then return empty to the mine to be re-loaded again.

To increase flexibility and maintain efficiency, the coal handling facility is designed to receive coal by rail and unload either directly to a berthed ship or to the enclosed stockpile shed. It is proposed that the enclosed shed will allow up to a six day supply of stockpiled coal. The stockpiled coal would act as a buffer between the unloading and loading processes to ensure a waiting ship is loaded as quickly as possible, as well as allowing train unloading to proceed if a ship is not available.

The dredging of Berth 14A and its approach is necessary to provide sufficient space to allow bulk carriers to enter and depart the new berth. Dredging works includes both marine and terrestrial footprints that may include some rock fracturing in limited areas. Construction also requires construction of wharf facility and armoured slope protection at the entrance of the basin and other open areas with suitable local materials. The key characteristics of the proposed works are identified in Table 1.2 and illustrated in Figure 5.1.

Table 1.2 Key characteristics

Marine components	**Description**
Berth pocket	Berth pocket dredged to -12.7 m Chart Datum (CD) to accommodate Panamax sized vessels. Associated approach navigational area dredged up to 12.2 mCD. Dredged berth pocket of approximately 13 ha, including both terrestrial and marine areas.
Dredging	
▪ Capital	Dredge volume of up to 2.7 million cubic metres (m^3). Underwater rock fracturing may be required to remove up to approximately 20,000 m^3 of rock.
▪ Maintenance	Required approximately every 2–3 years. To be carried out by BPA.
Spoil disposal	Final dredging quantities will be determined as the final designs for Berth 14A are prepared. The offshore spoil disposal site has been identified to occur in Commonwealth waters, and as such does not form part of this assessment. Suitability of this site, as well as the disposal of spoil, will be assessed by the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) under the Commonwealth *Environmental Protection (Sea Dumping) Act 1981*.
Berth structure	Likely to be piled structure, in addition to armoured slope protection at the entrance of the basin and other open areas with suitable local materials.
Terrestrial components	**Description**
Material handling infrastructure	Train unloader, conveyors, stackers, coal storage facility and ship loading equipment.
Rail	New rail loop and unloading station within the site boundary (refer to Figure 1.1) to the north west of the Preston River.
Throughput	15 Million tonnes per annum.
Construction period	Approximately 18 months.
Water requirements	Still to be determined during the detailed design for the Berth14.
Vegetation loss	Approximately 2 ha of native vegetation. Additional vegetation would be lost however this is either highly disturbed or planted.
Terrestrial ground disturbance	Approximately 27 ha.

1.3.5 Related projects

This PER only assesses the works associated with the Port, a separate assessment will be undertaken for works associated with the Griffin Coal mine expansion (Muja South) and the upgrade of the existing rail line from Collie to Bunbury Port.

An ESD has been prepared for the Muja South mine expansion project and it is expected that a draft PER will be submitted to the OEPA in December 2012. The upgrade of the existing rail line is yet to begin formal assessment procedures and will not be undertaken by Lanco or Griffin Coal.

1.4 Proponent

The proponent for this proposal is Lanco Resources Australia Pty Ltd (Lanco) which is the Australian subsidiary of Lanco Infratech Ltd India.

Lanco is one of India's leading power generating companies and purchased Griffin Coal in February 2011. Griffin Coal was established in 1927 within the Collie Basin in the south-west of WA. The company has exported coal since the 1960s and is now one of the largest coal suppliers in WA.

Coal proposed to be exported from Berth 14A would be sourced from the Griffin Coal operations in the Collie Basin.

The contact person for this proposal is:

Name: D Trench
Address: Level 15 BGC Centre, 28 The Esplanade, Perth WA 6000
Phone: (08) 6188 2200
Email: d.trench@griffincoal.com.au

1.5 The Project team

Parsons Brinckerhoff have prepared this PER on behalf of Lanco and have co-ordinated the preparation of all technical studies and completed the flora and fauna, groundwater, contaminated lands and visual impact specialist studies. Several organisations also prepared specialist studies as part of the environmental assessment process, including:

- Wave Solutions – marine environmental quality, benthic habitats, marine fauna, dredge disposal management
- AED – air quality
- SVT – noise and vibrations
- SLR Consulting – underwater noise modelling
- Strategen – Community & stakeholder consultations
- Brad Goode & Associates – Aboriginal heritage
- Mott Macdonald – port engineering
- BMT – WBM – material handling engineering.

1.6 Structure and content of this PER

This PER has been presented in two volumes. Volume 1 identifies and assesses the key environmental issues based on the requirements of the ESD (refer to Appendix A), outcomes of the consultation process and the results of the detailed environmental studies. Volume 1 also provides a detailed description of the project. The structure and content of Volume 1 are summarised in Table 1.3.

Volume 1 is supported by several technical reports in Volume 2, providing detailed information on the background to the project, assessment methods used and the results of the specialist studies.

The specialist reports have been used to inform the PER in Chapters 6 to 15 of this report. In particular, the management and mitigation measures suggested in the specialist reports have been taken in account.

The following studies have been prepared and are discussed in detail in Chapter 6 to 15 of this report:

- Level 1 terrestrial flora and fauna assessment
- Level 2 waterbird survey and assessment
- groundwater assessment
- marine environmental quality assessment
- benthic primary producer habitat assessment
- marine fauna assessment
- contaminated land assessments
- air quality assessment
- terrestrial and underwater noise assessments.

Table 1.3 identifies the ESD requirements and where they have been addressed in this report.

Table 1.3 ESD requirements addressed in the PER

ESD requirements	Section addressed in the PER
Terrestrial flora and vegetation	
▪ Complete a Level 1 (Reconnaissance) flora and vegetation survey within the proposal footprint and immediate adjacent area to identify any proposed construction and operational elements that may affect significant flora and vegetation.	Chapter 6, Technical Report 12
▪ Assess the potential direct and indirect impacts that may result from any proposed construction and operation activities on flora and vegetation.	Section 6.3
▪ Assess all direct and indirect impacts to native vegetation in regional and public open space, and the adjacent Leschenault Estuary from the proposal.	Section 6.3 and Section 7.3
▪ Identify any potential coastal set-back or buffer zones required between the development and adjacent flora and vegetation, and how they will be incorporated into the design of the proposal.	Section 6.4
▪ Define the specific environmental outcome(s) to be achieved for loss of native vegetation.	Section 6.5
▪ Identify management measures to mitigate adverse impacts on the significant flora and vegetation to meet the EPA's objectives.	Section 6.4
Terrestrial fauna	
▪ Design and detail a Level 2 target survey for waterbirds and shorebirds which are protected by national and international agreements.	Chapter 7, Technical Report 13
▪ Identify any construction and operation elements of the proposal that may affect significant fauna and fauna habitat.	Section 7.3
▪ Assess the potential direct and indirect impacts that may result from any proposed construction and operation activities on waterbirds and shorebirds and their habitat.	Section 7.3

ESD requirements	Section addressed in the PER
▪ Identify measures to mitigation adverse impacts on significant fauna and fauna habitat to meet the EPA's objectives.	Section 7.4
Groundwater quality	
▪ Characterise the hydrogeology of the groundwater system and the quality and quantity of the groundwater within the Project areas and surrounding area.	Chapter 8, Technical Report 14
▪ Where groundwater is contaminated, determine the extent of the contamination.	Section 8.2
▪ Develop a conceptual hydrogeological model and predict the hydrogeological changes that will result from the proposal to determine the severity and duration of potential impacts.	Section 8.2
▪ Predict the likelihood that rock fracturing will breach the confining basalt layer of the Yarragadee aquifer, potentially allowing for saline water intrusion to public water supply.	Section 8.3
▪ Define specific environmental outcome(s) to be achieved for groundwater consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 8.5
▪ Prepare a remediation and/or disposal plan for contaminated material if contaminated groundwater is encountered.	Section 12.4
▪ Provide a contingency and monitoring plan, should a breach of the confining layer of the Yarragadee Aquifer occur.	Section 8.4
Marine environmental quality	
Construction Phase ▪ Conduct a baseline water and sediment quality survey program to characterise pre-development marine water and sediment quality in the area of the proposal and identify background levels of toxicants and physiochemical parameters.	Section 9.1, Technical Reports 3 & 20
▪ Provide baseline data collected to date.	Technical Report 19
▪ Complete a sampling and analysis plan for ocean disposal and reclamation to the satisfaction of the Office of the EPA (OEPA) and in consultation with the DEC and Commonwealth Department of Sustainability, Environment, Water, Population and Communities.	Technical Report 8
▪ Perform analysis of sediment samples and interpret resultant data.	Technical Report 19
▪ Detail the proposed dredging and spoil placement methods.	Technical Report 10
▪ Assess if the Environmental Values (EVs), Environmental Quality Objectives (EQOs) and associated levels of protection proposed for operations phase would be temporarily compromised during the construction phase. If so, predict the extent, severity and duration of potential impacts.	Technical Report 11
▪ Detail management measures and contingency plans proposed to protect the environmental values and achieve objectives and levels of ecosystem protection during construction.	Section 9.4, Technical Report 11
▪ Propose the environmental protection outcomes to be achieved for marine water and sediment quality consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 9.5

ESD requirements	Section addressed in the PER
▪ Consider cumulative impacts of the proposal in the context of existing and approved developments and activities in the area.	Chapter 9.4, Technical Report 8
Operational Phase ▪ Develop a Marine Environmental Management Plan in close collaboration with the Bunbury Port Authority.	Technical Report 11
▪ Propose EVs, EQOs and spatially define the levels of ecological protection that are to be achieved by the proposal throughout the operations phase.	Technical Report 11
▪ Identify and assess ongoing threats and pressures to marine water and sediment quality within the berth pocket and approaches taken (excluding the navigation channel) to minimise those threats and pressures.	Section 9.3
▪ Predict consequences of the threats and pressures identified and the outcomes of those predictions in context of proposed EVs, EQOs and levels of ecological protection.	Technical Report 11
▪ Conduct water, sediment and/or biota quality surveys as necessary, and report the findings of those surveys.	Technical Report 19
▪ Examine the likely effectiveness of the design of the proposal and proposed management measures.	Section 9.4
▪ If there is a high risk of not meeting the ecological and/or social EVs and EQOs and levels of ecological protection, evaluate and spatially define the degree of conformity and non-conformity of the proposal.	Technical Report 11
▪ Detail management measures and contingency plans proposed to meet the environmental values, objectives and levels of ecosystem protection during operations.	Section 9.4 and Technical Report 11
Benthic Habitats (including benthic primary producer habitats (BPPH))	
▪ Conduct surveys to identify the key components of different benthic habitats and report the findings of those surveys.	Chapter 10, Technical Report 5 & 6
▪ Produce spatially-accurate maps showing the extent and distribution of the different benthic habitats.	Section 10.1.5, Technical Report 5
▪ Identify the proposal's-related activities that would potentially impact benthic habitats.	Section 10.3
▪ Detail the measures exercised to avoid and, where avoidance is not possible, minimise impacts of the proposal on benthic habitats.	Section 10.4
▪ Provide scientifically sound predictions of the likely extent, severity and duration of direct and indirect impacts of the proposal on benthic habitats.	Section 10.3
▪ Implement guidance outlined in EAG No. 3 (Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment) when losses of, or serious damage to. Benthic Primary Producer Habitats are predicted.	Technical Report 6
▪ Detail the proposed environmental monitoring and management arrangements designed to minimise impacts and ensure that the environment will be protected to at least the level indicated by the predictions.	Section 10.4
▪ Propose the specific environmental protection outcomes(s) to be achieved for Benthic Primary Producer Habitats consistent with the EPA's Draft Environmental Assessment Guideline No. 4.	Section 10.5

ESD requirements	Section addressed in the PER
Marine fauna	
▪ Identify and assess the values and significance of marine faunal assemblages within the proposal area and immediate adjacent area and describe these values in a local, regional and State context.	Chapter 11, Technical Report 7
▪ Identify critical windows of environmental sensitivity for marine mammals and key fisheries in the area.	Technical Report 7
Marine mammals ▪ Describe the presence of marine mammals in the proximity of the proposal.	Section 11.1.1
▪ Undertake underwater noise modelling to determine potential noise exposure levels.	Section 11.1.2, Technical Report 7 (Appendix 7.E)
▪ Consult with the Bunbury Dolphin Discovery Centre on measures to mitigate effects of the proposal on the dolphin population in Koombana Bay.	Chapter 4
▪ Describe management and monitoring protocols to be implemented during blasting, pile driving and wharf construction that will reduce the risk of marine fauna being exposed to noise transmitted through water.	Section 11.4
Fisheries ▪ Describe the major fisheries in the Geographe Bay/Bunbury region and Leschenault estuary that may be affected by the proposal.	Section 11.1.2
▪ Describe and assess the potential direct and indirect impacts on recreationally and commercially important marine species.	Section 11.3
Introduced Marine Organisms (IMOs) ▪ Survey and identify the abundance and extent of any invasive marine species already present in the Project area.	Section 11.1.3, Technical Report 7
▪ Evaluate risk of invasive marine species introduction from dredging plants and from ongoing operations.	Section 11.3
▪ Describe management and monitoring protocols to be implemented during dredging and construction to avoid introduction of IMOs, and controls available to manage this risk.	Section 11.4
▪ Define the specific environmental outcome(s) to be achieved for marine fauna consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 11.5
Soil quality	
▪ Conduct investigations to identify land where there is a risk of disturbing acid sulphate soils.	Chapter 12
▪ Map known and suspected contaminated sites.	Section 12.2.2
▪ Identify known and suspected contaminated sites and complete investigations to characterise the nature of the contamination.	Section 12.2.2, Technical Report 15
▪ Describe and assess the potential direct and indirect impacts from acid sulphate soils resulting from the proposal on the receiving environmental, including potential for monosulphidic black oozes.	Section 12.2.1
▪ Identify areas where disturbance of contaminated sites will result from the construction of the proposal.	Section 12.2.1

ESD requirements	Section addressed in the PER
▪ Where sites are to be disturbed, assess potential direct and indirect impacts.	Section 12.3
▪ Describe the potential to generate acidic conditions during dewatering activities in areas known to contain acid sulphate soils.	Section 12.3
▪ Describe the measures that will be implemented to ensure that contaminated sites are identified and remediated to a standard that protects the environment, compatible with the intended land use system, and is consistent with the appropriate criteria and legislation.	Section 12.4
▪ Define the specific environmental outcome(s) to be achieved for soil quality consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 12.5
Air quality	
Construction ▪ Develop a Dust Management Plan for those areas that are likely to be affected consistent with DEC's 'A guideline for managing the impacts of dust and associated contaminants from land development sites.'	Section 13.4.1
Operational ▪ Identify all sources of air emissions from the proposal as a result of material handling and loading activities.	Chapter 13, Technical Report 9
▪ Describe the control measures that will be implemented to ensure that dust emissions from material handling infrastructure and stockpiles are managed to a standard that protects the surrounding environment and NEPM standards.	Section 13.4
▪ Undertake modelling of all emission sources incorporating proposed control measures.	Technical Report 9
▪ Identify and map the likely extent of dust emissions.	Section 13.3.2
▪ Describe the air quality monitoring procedures that will be carried out.	Section 13.4
▪ Detail management measures to be implemented to prevent, control and mitigate the risk of fire occurring within the coal stockpiles.	Section 13.4
▪ Define the specific environmental outcome to be achieved for operation dust consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 13.5
Noise and vibration	
▪ Identify the likely noise emission sources during the construction and operation phases of the proposal.	Section 14.2
▪ Evaluate the potential noise impacts of the proposal	Section 14.3
▪ Evaluate the potential noise impacts from the transport of material to the port using noise exposure levels in the Statement Planning Policy 5.4.	Section 14.3
▪ Identify management and amelioration measures to mitigate noise impacts of proposal.	Section 14.4
▪ Define the specific environmental outcome(s) to be achieved for noise emissions consistent with the Draft EPA Environmental Assessment Guideline No. 4.	Section 14.5

ESD requirements	Section addressed in the PER
Surface water flow – Coal Stockpile Management	
▪ Develop a Leachate Management Plan for the coal stockpiles at the storage and loading facility.	Chapter 15
Other environmental issues	
▪ Surface drainage	Section 15.1
▪ Solid and liquid wastes	Section 15.2
▪ Aboriginal and European heritage	Section 15.3

2. Project justification

This chapter describes in detail the need and benefits of the Project and an evaluation of the design options. The overall objective of the Project is to provide a port facility for the export of coal from the Lanco/Griffin operations at Collie.

2.1 Project need

The Griffin Coal Mine at Collie presently produces approximately 4 million tonnes of coal of which 0.75 million tonnes is allowed to be exported through Kwinana port. It is estimated that through the expansions of their Muja and Ewington operations there is the potential to produce up to 20 million tonnes of coal per annum which is far beyond the local consumption requirements. Based on these projections, it is estimated that there is a mine life resource in excess of 50 years in providing for domestic consumption, reserve resource and development of alternative markets.

The local consumption of Collie coal is limited to the existing power plants in the South West region The future potential for increased local consumption of coal is also limited to only few millions of tonnes coal for the upcoming industries in the collie region.

The demand of sub bituminous coal in the Asian economies has increased in recent years and the viability of the Griffin coal mine is centred on its potential to export coal, after meeting the local demand. In order to efficiently export material from Collie, it is important to create the requisite port and rail infrastructure.

Bunbury Port is situated approximately 90 km from the Collie mines and is the closest Port to the mine operations. Currently, the Port does not export coal from any of the existing berths, however the IHSP has identified Berth 14A for coal export.

2.2 Project benefits

The Project has several benefits to the local economy including additional revenue, employment creation (during both construction and operation) and provision of additional services to support the operations. The export quantity proposed to be exported from Berth 14A, almost doubles the current export capacity within the Port. The increased number of ships will generate ship related services such as providing ship provisions and stores to crew, bunkering, water supply, repairing etc. The requirement for ship chandlers, bunker supplier, waste disposal and other local suppliers will rise with the arrival of an increased number of ships. This is likely to create economic benefits to the City of Bunbury.

The development and operation within the port of Bunbury will significantly contribute to the trade, economic development and employment in the South West region.

2.3 Evaluation of options

The location of the Berth 14A for coal exports were explored by BPA through the Evans & Peck report (2009) which also identified the adjoining area as coal storage area. As a result, there was little scope for Lanco to explore other berth options.

Specific design options for the infrastructure components were considered and are briefly discussed below:

- Coal Unloading Facility. Both a tippler and bottom dump system were considered. It was determined to reduce the air quality impacts, particularly relating to coal dust, a bottom dump system would have a better environmental outcome.

- Coverage of stockpiles. Many coal terminals throughout Australia, especially within Queensland are open stockpiles. Given the sites locality to the Bunbury township and potential air quality and noise impacts, fully enclosed stockpiles were considered most appropriate. The visual amenity of the covered stockpile is also considered a better option than open coal storage.

- Jetty structure. Several options were considered for the Jetty, including an armoured rock and piled, sheet piling or a diaphragm. Whilst the detailed design is yet to be completed, a combination of piled structure and diaphragm wall may be considered.

- Use of precast construction materials against in situ construction for infrastructure facility in order to minimise on site hazards and also they are environmental friendly.

- Pre-fabricated and pre-assembled structures will be used were possible in order to minimise environmental impact due to on-site construction.

- Location of the Jetty. The IHSP identifies two berths within the Berth 14A pocket. It is proposed that two jetty structures will be developed adjacent to each other on the north western wall. Lanco considered Berth 14A, which is the Berth closest to the existing channel, the most appropriate for their operations.

- Dredging options. Several dredging options were considered including the use of cutter suction and backhoe dredger. The final decisions shall be based on availability of appropriate dredger and cost considerations at the time of actual construction.

- Disposal option. Given the proposed dredging options, two options were considered for disposal, being land based or sea disposal. Given the proposed quantity of material and the identification of an appropriate offshore disposal site, offshore disposal was the preferred disposal option.

3. Regulatory framework

The environmental assessment, approval and regulation of the Project fall under both Western Australian and Commonwealth government jurisdiction. The Project requires initial approval from:

- the Western Australian Minister for Environment pursuant to the provisions of the *Environmental Protection Act 1986* (EP Act)
- the Commonwealth Minister for Sustainability, Environment, Water, Population and communities pursuant to the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities pursuant to the provisions of the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act).

This PER has been prepared to support approval from the Western Australian Minister for Environment. The process for environmental assessment under the EP Act and EPBC Act is outlined below in sections 3.1 and 3.2 respectively.

In addition to State and Commonwealth legislation, there are a number of international conventions and bilateral agreements for the protection of fauna and flora, dredging and marine aspects. The agreements and conventions described in section 3.3 have been considered and applied where appropriate in this PER.

3.1 Western Australian environmental approval process

The EP Act is the principal statute relevant to environmental protection in Western Australia. The Project was referred to the Environmental Protection Authority (EPA) under Section 38 of the EP Act on 7 April 2011. On 10 May 2011, the EPA advised the level of assessment for the Project was a PER with a 6 week public review period and with the EPA preparing the Environmental Scoping Document (ESD). Figure 3.1 outlines the procedure for a PER level of assessment.

The ESD prepared by the EPA outlined the scope of the assessment of the Project, as well as providing an indicative timeline for the process. The ESD was approved at a Board Meeting of the EPA in September 2011.

This PER has been prepared in accordance with the Environmental Impact assessment Administrative Procedures 2010 (the Administrative Procedures) for environmental assessment prescribed under the EP Act.

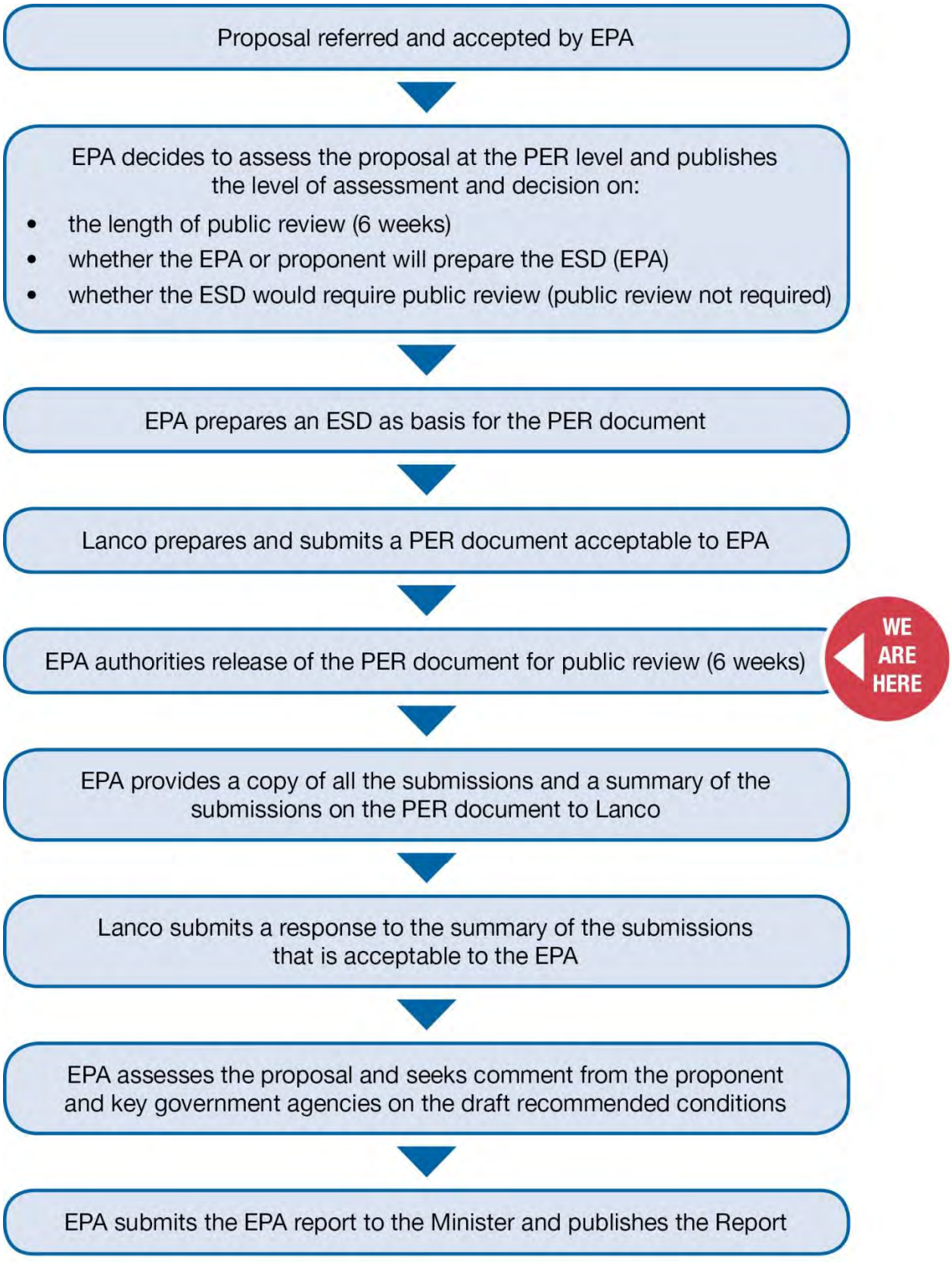


Figure 3.1 Assessment procedure for Public Environmental Review

The Project is also subject to compliance with applicable guidelines and regulations developed by the EPA and other State government agencies. Guidance Statements are issued by the EPA to assist proponents and the general public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process. Other EPA position statements relevant to the Project are listed in Table 3.1.

Table 3.1 Key EPA position statements, guidance statements and environmental assessment guidelines applicable to the Project

Title
Position statement
Position Statement No. 2 – Environmental protection of native vegetation in Western Australia (2000)
Position Statement No. 3 – Terrestrial biological surveys as an element of biodiversity protection (2002)
Position Statement No. 7 – Principals of environmental protection (2002)
Guidance statement
EPA Guidance Statement No. 3 –Separation distances between industrial and sensitive land uses (2005)
EPA Guidance Statement No.6 – Rehabilitation of terrestrial ecosystems (2006)
EPA Guidance Statement No.8 – Environmental Noise (Draft) (2007)
EPA Guidance Statement No. 10 – Level of assessment for proposal affecting areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region (2006)
EPA Guidance Statement No.14 – Road and Rail Transportation Noise (Preliminary Draft)
EPA Guidance Statement No.18 – Prevention of air quality impacts from land development sites (2000)
EPA Guidance Statement No.20 – Sampling of short-range endemic invertebrate fauna for environmental impact assessment in Western Australia (2009)
EPA Guidance Statement No. 33 – Environmental Guidance for Planning and Development (2008)
EPA Guidance Statement No. 41 – Assessment of Aboriginal Heritage (2004)
EPA Guidance Statement No. 51 – Terrestrial fauna surveys for environmental impact assessment (2004)
EPA Guidance Statement No. 55 – Implementing Best Practice in Proposal Submitted to the Environmental Impact Assessment Process (2003)
EPA Guidance Statement No. 56 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (2004)
Environmental Assessment Guideline (formally guidance statements)
EPA Environmental Assessment Guidelines No. EAG3 – For Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment (2009)
EPA Environmental Assessment Guidelines No. EAG4 – Towards outcome based conditions (Draft, 2009)
EPA Environmental Assessment Guidelines No. EAG6 – Timelines for Environmental Assessment (2010)
EPA Environmental Assessment Guidelines No. EAG7 – Marine Dredging Proposal (2011)
Other
EPA Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (2010)

This PER has been reviewed by the EPA to ensure it complies with the requirements of the ESD. A six week public review period has been specified by the EPA. At the conclusion of the public review period the EPA, in consultation with Lanco, will review the comments received and identify issues and matters requiring a response.

Lanco will prepare a submissions report which will respond to the comments received. When the EPA is satisfied with Lanco's response, it will prepare an assessment report and recommendations for the Minister for Environment.

The Minister will make a decision on whether the Project should be approved and if so, under what conditions.

The projected timing for this Project is provided in Table 3.2 below.

Table 3.2 Projected timing for assessment

Key stage	Agreed milestone
Lanco releases approved PER for public exhibition	15 November 2012
Public exhibition (6 weeks plus 2 weeks for Christmas holiday period)	21 November 2012 – 16 January 2013
Lanco response to submissions	2 weeks
OEPA assesses proposal for consideration by the EPA	7 weeks
Preparation and finalisation of EPA Report	5 weeks from receipt of final information

3.2 Commonwealth environmental approvals process

3.2.1 Environment Protection and Biodiversity Conservation Act 1999

The Project was referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the provisions of the EPBC Act on 28 June 2011 as the proposed dredge disposal site is located in Commonwealth waters.

As of May 2012, DSEWPaC are yet to determine if the proposed activity is a 'controlled action' under the EPBC Act due to the potential significant impacts on the following Matters of National Environmental Significance:

- listed threatened species or communities (Section 18 and 18A)
- listed migratory species (Section 20 and 20A); and
- Commonwealth marine areas (Section 23 and 24A).

3.2.2 Environment Protection (Sea Dumping) Act 1981

The *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act), regulates the loading and disposal of waste at sea. The Act also fulfils Australia's international obligations under the London Protocol to prevent marine pollution by controlling dumping of wastes and other matter.

Under the Sea Dumping Act, the Commonwealth aims to minimise the threat of pollution by:

- prohibiting ocean disposal of waste considered too harmful to be released in the marine environment; and
- regulating permitted waste disposal to ensure environmental impacts are minimised.

An application to dispose of dredged material at sea is proposed to be submitted to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities under the *Sea Dumping Act* in 2012. DSEWPaC has approved the draft Marine SAP which will be used to support the Sea Dumping Permit.

3.2.3 Bilateral agreements

As the Project includes disposal of material within Commonwealth waters a bilateral agreement between the Commonwealth and Western Australian government is not possible and therefore assessments under Commonwealth legislation will proceed as a separate but concurrent process to this PER.

It should be noted that the PER is an endorsed environmental assessment process under the recently amended Commonwealth and Western Australian State Bilateral Agreement (March 2012).

3.3 Other approvals

The Project is required to comply with other relevant Western Australian and Commonwealth legislation. Current key legislation applicable to this Project includes but is not limited to that outlined in Table 3.3.

Further discussion of relevant legislation is detailed further in the assessment chapters of this PER.

Table 3.3 Key State Government legislation applicable to the Project

Title	Aspect
Legislation	
Aboriginal Heritage Act 1972	Archaeological and ethnographic heritage
Agricultural and Related Resources Protection Act 1976	Weeds and feral pest animals
Conservation and Land Management Act 1984	Flora and fauna/habitat/weeds/pests/diseases/ Conservation Estate/land management
Contaminated Sites Act 1983	Management of Pollution
Dangerous Goods Safety Act 2004	Dangerous goods management
Environmental Protection Act 1986 (Part V)	Licensing, prescribed premises, works approvals, native vegetation clearing permits
Fire and Emergency Services Authority of Western Australia Act 1998	Emergency services, industrial fire
Health Act 1911	Human health management
Heritage of Western Australia Act 1990	European heritage management
Land Administration Act 1997	Administration of State land in Western Australia
Litter Act 1979	Prevention of litter

Title	Aspect
Local Government Act 1995	Development approvals and management
Occupational Health, Safety and Welfare Act 1984	Promote and improve standards for occupational safety and health
Planning and Development Act 2005	Controls over planning in metropolitan and local levels
Pollution of Waters by Oil and Noxious Substances Act 1987	Protects waters from pollution by oil and other substances
Port Authorities Act 1999	Operation and management of port activities
Public Works Act 1902	Relates to the provision of public works
Rights in Water and Irrigation Act 1914	Planning, regulation, management, protection and allocation of water
Shipping and Pilotage Act 1967	Shipping and pilotage in and about the ports, fishing boat harbours and mooring control areas
Maritime Act 1982	Navigation and shipping
Soil and Land Conservation Act 1945	Conservation of soil and land resources, and to the mitigation of the effects of erosion, salinity and flooding
Waterways Conservation Act 1976	Protection of surface and groundwater
Wildlife Conservation Act 1950	Conservation and protection of wildlife
Regulations	
Environmental Protection (Noise) Regulations 1997	Noise standards and management
Environmental Protection (Clearing of native Vegetation) Regulations 2004	Clearing of native vegetation

In addition to the statutory requirements above and this projects' connection to expansion of infrastructure projects within the region it is also important to consider the relationship to the Greater Bunbury Regional Scheme.

3.4 The post approval process

If the Project is approved under Part IV of the EP Act, other related approvals will also have to be obtained before Project commencement, if required. These may include:

- Dangerous good licence for storage of hazardous (flammable) materials (Department of Mines and Petroleum WA). Under the *Dangerous Goods Safety Act 2004* a licence is required for the storage of hazardous (flammable) materials.
- Dewatering licence (Department of Water). Under Schedule 1, Clause 30 of the *Rights in Water and Irrigation Act 1914* a licence to undertake dewatering of train uploading station during construction may be required.
- Bore application (Department of Water). The Project is within the Bunbury proclaimed groundwater area. Within proclaimed groundwater areas it is illegal to take water without a licence. Should groundwater be required for dust suppressor a licence under the *Rights in Water and Irrigation Act 1914* will be required.
- Development application for construction works (Bunbury Port Authority).

- Part V Works Approval (DEC WA) under the EP Act will be prepared concurrently with this PER. DEC will ensure that the Works Approval conditions are consistent with the Ministerial Statement issued under Part IV of the EP Act.

- Vegetation clearing permit (DEC WA). Under the EP Act, the clearing of any native vegetation requires a permit.

4. Community and stakeholder consultation

This chapter describes the community and stakeholder consultation undertaken before and during preparation of this PER. A summary of the identified stakeholders, communication tools and consultation activities undertaken is included.

This chapter also provides an overview of key issues raised by stakeholders and, where relevant, how these concerns have been addressed through the design of the Project and/or its assessment. Ongoing consultation activities are also outlined.

Lanco is committed to full consultation with interested members of the public and relevant stakeholders.

4.1 Consultation objectives

The objectives of the consultation activities undertaken during the PER preparation have been to:

- meet or exceed consultation requirements set for the Project by the Environmental Protection Authority (EPA)
- clearly identify all Project stakeholders and encourage their involvement in the community consultation process and development of the PER
- provide balanced and objective information to assist the community in understanding the environmental impacts of the Project and to enable informed input to the preparation of the PER
- obtain stakeholder and community feedback by providing a variety of means for all Project stakeholders to raise ideas, issues and concerns
- integrate with and pay due regard to other consultation activities affecting Project stakeholders, in particular that being undertaken by the Bunbury Port Authority (BPA)
- demonstrate to stakeholders and community members who participate in the PER consultation process how their input was taken into account and reflected in the PER document submitted to the EPA
- support stakeholders and community members who choose to engage during the statutory public review and appeals periods, by maintaining transparent and responsive communication channels.

A variety of communication methods and tools were employed to achieve these objectives, as described in section 4.3.1.

4.2 Identification of stakeholders

The identification of stakeholders is an ongoing process. All engagement activities have included an invitation for interested stakeholders to be included in a Project database to receive Project-related correspondence.

Key stakeholders identified to date include:

- BPA
- Bunbury Port Community Liaison Committee
- Department of Environment and Conservation (DEC)

- Department of Water (DoW)
- Department of Planning (DoP)
- City of Bunbury
- Department of Tourism
- South West Development Commission
- Main Roads WA
- Department of Transport
- Department of Indigenous Affairs
- Department of Fisheries
- Department of Mines and Petroleum
- Department of Sustainability Environment Water Populations and Communities
- recreational and commercial fishermen
- local Members of Parliament
- local businesses including other port users
- local community members
- local Aboriginal stakeholders
- non-government organisations.

The involvement of stakeholders in the consultation process has been encouraged through a variety of community and stakeholder engagement processes, as described in section 4.3.

4.3 Community and stakeholder engagement processes

4.3.1 Communication tools

Project contact details were established and identified on all Project-related information. These contact details include a:

- Lanco information line: (08) 9486 7667
- Berth 14A webpage at www.griffincoal.com.au.

4.3.1.1 Project briefings

Government agencies and authorities were consulted before and during preparation of the PER. Project briefings by Lanco and Griffin Coal were undertaken in August and September 2011 with each of the following: the BPA, South West Development Commission , Department of Planning, Department of Transport, City of Bunbury, Department of Mines and Petroleum, Main Roads WA, DEC and DoW.

Project briefings consisted primarily of a short presentation on the Project and an update on specific technical studies of relevance to each stakeholder. Each briefing was followed by a discussion with the Project team.

Project briefings by Lanco and Griffin Coal were also undertaken with the Dolphin Discovery Centre Board and at the Outer Harbour Community meeting.

Relevant Members of Parliament, industry representatives, local business operators and non-government organisations were briefed on the Project during informal meetings, including the neighbouring tenant, Aloca in August and September 2011 specifically about dust issues.

The Environmental Scoping Document (ESD) prepared by the EPA identified the importance of consulting with the Bunbury Dolphin Discovery Centre to identify measures to mitigate

effects of the Project on the dolphin population in Koombana Bay. Formal meetings were held in August and September 2011 with the Dolphin Discovery Board in addition to ongoing technical discussions surrounding the marine impact assessments.

Communications and consultation with the BPA have been ongoing throughout the preparation of the PER and the concept design development.

4.3.1.2 Berth 14A webpage

A Berth 14A Project webpage has been established on the Griffin Coal website as an information resource for key stakeholders and the general public. Key documents and an opportunity to request further information are available on the webpage.

4.3.1.3 Advertisements

Notices advertising the community information session (see below) were placed in the *Bunbury Herald* on 16 and 23 August 2011 and the *South West Times* on 18 and 25 August 2011.

4.3.1.4 Community information session

One community information session was held during the PER's preparation. The session sought to provide the community and stakeholders with an overview of the current Project, as well as an opportunity to seek further clarification or ask questions of the Project team and specialists. In addition, both the scope and progress of the technical studies were addressed in the sessions.

An email notification of the community information session was sent to 217 stakeholders registered in the Project contact database. As detailed above, newspaper advertisements were also issued advising the community of the upcoming session.

The session was held on Thursday 1 September 2011 at the Koombana Bay Sailing Club, Bunbury, from 3 pm to 7 pm and was attended by over 60 community members.

Stakeholders who attended the session were given the opportunity to identify issues/concerns with the Project through a stakeholder response survey that was provided as stakeholders left the session. The survey enabled stakeholders to rank key issues based on their importance to each individual, to identify other environmental issues, and to request further contact and/or information regarding the Project.

4.3.1.5 Aboriginal community consultation

Consultation with Aboriginal community members was undertaken during two Aboriginal heritage investigations undertaken for the *Bunbury Port Inner Harbour Structure Plan* (IHSP). These reports include a preliminary archaeological investigation of the IHSP area and surrounding environment by Quartermaine Consultants in 2005 and an Aboriginal Heritage survey by Brad Goode in 2008.

No formal Section 18 consultation is required for the PER.

4.3.1.6 Individual briefings

The Project team has been available to discuss issues with interested individuals as points of concern have arisen. Discussions have been held either over the phone or at individual meetings.

4.3.2 Consultation outcomes to date

4.3.2.1 Project briefings

Table 4.1 summarises the consultations undertaken to date with government authorities and agencies, including any issues raised.

Table 4.1 Summary of issues raised by government authorities and agencies

Government agency consulted	Comment, issue raised	Response to comment, issue
South West Development Commission	Mine expansion; Train traffic increase/intersections; Future racecourse development in Boyup Brook; Consultation with South West Environment Centre (SWEC).	Assessments of the mine expansion, and associated increases in train traffic and future developments are outside the scope of this PER. Mine expansion and train traffic details and impacts will be addressed in the scope of the future rail upgrade. Consultation with SWEC is scheduled to be undertaken.
City of Bunbury	Perception management; Importance of community information at each stage.	A Project-specific consultation plan was developed for this Project. Community and stakeholder consultation is addressed in this chapter (Chapter 4 of the PER).
Department of Mines and Petroleum	University of Western Australia population study should be considered when considering the potential employment generation; Obtain Bunbury Port dust and noise study reports; Use experienced Collie coal handlers at the Port.	Potential impacts of the Project on air quality and noise are addressed in Chapters 14 and 15 of this PER, respectively. On-site management would be undertaken in accordance with the approved environmental management plan (EMP). The Project would use local services and products, where possible.
Main Roads WA	Concern about road crossings and Coalfields Highway upgrades and increased use; Suggested that bus transport be considered; Encouraged a grade separation at Estuary Drive due to increased train movements.	An assessment of impacts to the road network beyond the Project site is outside of the scope of this PER; however, it will be addressed in the scope of the future rail upgrade.
DEC	Part V of the Environmental Protection Act 1986 (EP Act) requirements for infrastructure and uncovered loading; Mine expansion; Potential interaction of coal and seawater; Fire management along train routes; On-site management issues.	Coal would be unloaded and handled in covered facilities as described in Chapter 5. An assessment of the mine expansion is outside the scope of this PER. Potential interactions between coal and seawater are addressed in Chapter 10. On-site management would be undertaken in accordance with an approved EMP.

Table 4.2 summarises consultation undertaken to date with non-government organisations.

Table 4.2 Summary of issues raised by non-government organisations

Organisation consulted	Comment, issue raised	Response to comment, issue
Dolphin Discovery Centre Board	Presentation on dolphin numbers, population spikes, potential impacts of construction on dolphins; Winter is preferred construction season.	Potential impacts of the Project on marine fauna are addressed in Chapter 12. On-site management would be undertaken in accordance with an approved EMP.
Dolphin Discovery Centre volunteers	Concerns about summer dredge plume during the main dolphin spotting/snorkelling season (low visibility); Maintenance dredging of the channel contributing to the dredging plume; Timing of dredging and construction; Ship traffic; PER process and statutory timeframes.	Potential impacts of the Project on marine fauna are addressed in Chapter 12. Potential impacts of dredging would be confirmed once the type of dredging and a detailed dredging plan are finalised. On-site management would be undertaken in accordance with an approved CEMP. An assessment of harbour traffic, including ships, is outside the scope of this PER. The PER process is discussed in Chapter 3.
Outer Harbour Community Group	Impacts of construction, including dust, noise, traffic, child safety and the planning of the Marsden Hill subdivision.	Potential impacts of the Project on air quality and noise are addressed in Chapters 14 and 15, respectively. Changes in traffic and the Marsden Hill subdivision are outside the scope of this PER. On-site management would be undertaken in accordance with an approved EMP.

4.3.2.2 Community information sessions

Of the stakeholders who attended the community consultation session on 1 September 2011, 16 returned a stakeholder response survey. Key issues identified during the process included visual impacts, rock fracture impacts, noise and dust impacts, dredge plumes and the Project's impacts on tourism and recreational fishing.

On the stakeholder response survey, individuals were asked to rank issues based on their importance to them. Issues determined to have a high importance to stakeholders included dust, noise and dredge plume impacts. Issues of moderate importance to individuals included rock fracture during construction and recreational fishing. Visual impacts and impacts on tourism were determined to be of medium to low concern to stakeholders.

Stakeholders had the opportunity to identify additional issues of concern on the stakeholder response survey. A summary of public concerns identified at the community information session is included in Table 4.3.

Table 4.3 Summary of issues raised at the community information session

Key issue	Specific issue raised	Response to issue/comment
Dust	Dust generation due to unsealed roads and/or coal transport and subsequent dust management	Potential impacts of the Project on air quality are addressed in Chapter 14 of this PER. On-site management would be undertaken in accordance with an approved EMP.
Dust	Storage of coal (i.e. covered storage to mitigate dust impacts)	Coal would be stored in a covered shed as discussed in Chapter 5 of this PER. On-site management would be undertaken in accordance with an approved EMP.
Dust	End-use of collected dust	The end use of dust collected during operation would be determined during the preparation of the EMP for the facility.
Marine fauna	Impact of noise (construction and operation) on dolphins	Potential impacts of the Project on marine fauna are addressed in Chapter 12. On-site management would be undertaken in accordance with an approved EMP.
Marine fauna	Impact on dolphin habitat	Potential impacts of the Project on marine fauna are addressed in Chapter 12. On-site management would be undertaken in accordance with an approved EMP.
Traffic	Increased train traffic in Collie and heavy vehicle traffic during construction at the Port and the mine	An assessment of impacts on the road network beyond the Project site is outside the scope of this PER; however, it will be addressed in the scope of the future rail upgrade.
Traffic	Rail route options (limited rail route access to the port)	An assessment of impacts to the rail network beyond the Project site is outside the scope of this PER; however, it will be addressed in the scope of the future rail upgrade.
Traffic	Traffic control on South-Western Highway (potential overpass development)	An assessment of impacts to the road network beyond the Project site is outside the scope of this PER; however, it will be addressed in the scope of the future rail upgrade.
Community consultation	Forum for post-construction issues/complaints	A forum for post construction issues will be considered as part of the overall environmental management plan for the site. BPAs community liaison committee may also be a forum to address any major issues.
Community consultation	Compensation	No compensation is currently being considered. Impacts will be addressed in the EMPs developed for the Project.
Terrestrial vegetation	Protection and enhancement of vegetation (particularly the foreshore)	Potential impacts of the Project on terrestrial vegetation (and proposed protection measures) are addressed in Chapter 7. On-site management would be undertaken in accordance with an approved EMP.
Project commitments	Use of local materials/resources during construction	The Project would incorporate the used of local materials and services during Project development, where possible.

4.3.2.3 Individual briefings

Table 4.4 summarises concerns of individuals raised during the PER process.

Table 4.4 Summary of issues raised by individuals

Individual consulted	Comment, issue raised	Response to comment, issue
Member of Parliament	Collie traffic	Ongoing consultation with the Collie Shire will be undertaken; however, an assessment of impacts to the road network beyond the Project site is outside of the scope of this PER.
Local business operator	Impact of construction and operation on dolphin numbers, community amenity and tourism	A Dolphin Discovery Centre Board briefing was undertaken on 25 July 2011. A Volunteer briefing was undertaken on 7 September 2011. Potential impacts of the Project on marine fauna are addressed in Chapter 12.
Industry representative body	Request for formal project briefing	Briefing to be organised with various industry groups during the PER assessment process.

4.3.3 Ongoing consultation activities

The PER will be exhibited (for public review) for a minimum of 6 weeks. During the exhibition period, Lanco will continue to consult with the community and key stakeholders to provide information on the PER and to provide methods through which comments on the PER and/or Project can be made.

4.3.3.1 Public displays

Printed and/or electronic copies of the PER will be available at various public locations, including Bunbury library, the Conservation Council of WA, and Lanco and Griffin Coal offices. In addition to the PER, displays will include Project-specific posters and/or fact sheets.

4.3.3.2 Community information session

One community information session will be held during the PER exhibition period. The session will allow members of the community to engage with the Project team. Copies of the PER, information posters and/or fact sheets will be available at the session.

Notification of the session will be advertised in local newspapers and emailed to stakeholders registered in the Project contact database.

Additional community information sessions may be undertaken, as required, in response to significant requests for further information from the public.

4.3.3.3 Project information and webpage

Details of the Lanco information line and Project webpage are included on all printed Project-specific documents to allow members of the community to find out more information on the Project, the PER public exhibition and how to make a submission.

As information is finalised it will be uploaded to the Project webpage (www.griffincoal.com.au).

4.3.3.4 Submissions report

At the conclusion of the public exhibition period, the EPA will provide a copy of all submissions and a summary of the submissions to Lanco for consideration. After reviewing the submissions, Lanco will prepare a report documenting its response to the submissions to the satisfaction of the EPA. Any design changes required in response to the submissions would be documented in this Submissions Report, as well as the assessment of any additional impacts caused by the design change.

5. Description of the Project

This chapter provides a description of the marine and land infrastructure required for the development of a coal export terminal at Berth 14A Bunbury Port and includes indicative construction and operational details which form the basis for this PER.

5.1 Project overview

The Project is for the establishment of a coal export facility at Berth 14A within the Inner Harbour of Bunbury Port. It is envisaged that the Project will provide for the export of up to 15 million tonnes per annum (Mtpa) of coal at the berth will be at a maximum rate of 8000 tonnes per hour (tph) for both in loading and out loading. The Project will include the following key components:

- land infrastructure
  - materials handling facilities including the development of a new rail loop and wagon unloading facilities
  - fully enclosed shed for the stockpiling of coal
  - below and above ground conveyor system
  - administration and welfare building
  - spares store and workshop
  - coal storage buffer bin
  - water treatment facilities
- marine infrastructure
  - a single berth located within the Inner Harbour of Bunbury Port for coal ship loading using up to two shiploaders
  - construction of Berth 14A to accommodate bulk carriers
  - dredging of the Berth 14A approach and berth pocket
  - rock armour slope protection for the Berth as well as Berth 14A ship arrival and departure basin. Sheet piling to retain land may also be considered during detailed design with impressed current cathodic protection used to protect immersed steel from corrosion in the marine environment.

This project description is based on the concept engineering design completed to date with options to be further designed and evaluated during the detailed design phase.

5.1.1 Project schedule

It is anticipated that construction activities would commence in June 2013 with completion by October 2014, subject to the relevant approvals and availability of required resources. The export quantity of coal would progressively increase until the full capacity of 15 Mtpa is achieved.

Dredging activities are proposed to commence during April 2013 and last for up to approximately 40 weeks dependent on the equipment used. If fracturing of basalt rock is required, an additional 5 weeks will be added to the dredging schedule.

5.1.2 Workforce

Approximately 70 staff would be required to operate the facility on a rotational shift basis 24 hours a day, seven days a week, 365 days per year. An additional 16 staff may be required to assist with administrative support services.

An average of 400 personnel may be required during construction. Exact numbers would be dependent on the construction methodology and would be confirmed after the detailed design is completed.

5.2 Project infrastructure

As described in section 5.1, both land and marine infrastructure is required to support the Project, a more detailed summary is provided below in section 5.2.1 and section 5.3.1.

5.2.1 Land infrastructure

5.2.1.1 Rail unloading infrastructure

The Project will include establishing a new rail loop adjacent to and outside the existing alignment. A train unloading facility will be located to the north of the proposed storage shed as shown in Figure 5.1.

The Project would receive coal only by rail with an average of 16 trains to be unloaded each day.

Trains are to be unloaded by bottom discharge into a series of below ground hoppers that feed onto a conveyor system. These are contained within a basement structure which also supports the beams carrying the rail track. The whole train unloading facility area is covered by an open ended steel framed building.

5.2.1.2 Conveyors

Coal would be carried from the train unloading station in underground box culverts which rise from the basement structure and once above ground in fully enclosed steel framed structures the storage shed or through bypassing storage directly to the ship loaders.

Conveyors servicing the storage shed may rise to the shed apex whereas conveyors which bypass the shed are set to minimal slopes as necessary to serve the shuttle devices. Where conveyors change direction or emerge from below ground level, steel framed buildings fully enclose both the conveyor and any other associated infrastructure.

All conveyors will have an average capacity to match the capacity of the unloading station and the ship loaders. All conveyors will be enclosed in galleries to minimise dust emissions to the environment other than conveyors which are located inside the storage shed. Conveyors will include the following peripheral equipment:

- magnet for ferrous metal removal
- metal detection
- speed sensing and belt slip protection
- belt weighers
- belt alignment protection

Figure 5.1 Project overview

- blocked chute detection
- dust suppression systems
- fire systems
- wash down water system
- emergency stop system.

The storage shed bypass system provides the facility with additional capacity for downtime of the shed stacking system with minimal impact on ship loading rates. The conveyor system can be configured for various conditions including:

- loading either stockpile shed from the unload station via one conveyor line at 4000 tph, with one conveyor not operational for maintenance reasons
- bypassing the stockpile shed to deliver coal direct from the unloading station to the reclaim conveyors at up to 4000 tph each to load a ship in berth at up to 8000 tph
- bypassing the stockpile shed to deliver coal from the unloading station to the reclaim conveyors at 2000 tph and use the shed stockpile reclaimers to make-up the load rate deficit of 4000 tph to load a ship in berth at 8000 tph
- loading the shed at 4000 tph each during high demand situations or 2000 tph during normal conditions.

5.2.1.3 Storage shed

The Project includes a fully enclosed shed which house the coal stockpiles and interconnecting conveyors from the rail unloading station to the stockpiles and from the stockpiles to ship loading facilities at Berth 14A.

The stockpiles are intended to provide a buffer of approximately 4–8 ship loads of coal to satisfy high demand situations. The larger shed is estimated to be up to 45 m high, 750 m in length and 100 m wide. Both shed will include the following:

- coal stacking system
- coal reclaim system
- ventilation system
- fire suppression system
- wash down water system.

Each storage shed has either a rail mounted stacker or stacking system consisting of an overhead conveyor integrated to the shed roof structure. A rail mounted travelling tripper with discharge ‘trouser’ chute can travel the length of the shed and will be capable of producing a 250,000 to 500,000 tonne capacity stockpile in each shed. The stacking system in each shed has an average capacity of 4000 tph.

The reclaim system allows coal to be removed from the stockpiles to the ship loader at an average capacity of 4000 tph. Each stockpile is equipped with reclaimer machines these provide the flexibility to reclaim from any area of the stockpile while stacking operations run concurrently.

5.2.1.4 Administration, workshop and welfare facilities

Administration facilities will be included as part of the Project and include an open plan office space including a reception and meeting areas. Staff changing and welfare facilities will be included within this building to accommodate the estimated operational staff numbers.

Also proposed is a workshop and spares store which is required to accommodate all the requirements of planned maintenance and running repairs. Truck access will be provided with unloading envisaged as using forklift or other mobile plant.

The administration facilities building is expected to be steel framed, with internal blockwork walls and an external aesthetically treatment.

5.2.2 Marine infrastructure

The existing shipping channel into the Bunbury Port Inner Harbour allows for a single vessel passage with priority given to vessels that are required to sail on the tide. Estimates for the annual export of coal from Berth 14A are based on the use of a partly loaded vessel (typically of Panamax/Kamsarmax/Minicape class) or a Supramax vessel with an average cargo per trip of 60,000 tonnes (t).

The marine infrastructure comprises the proposed berth structure for safe harbouring the ships, ship loading facilities and dredging required for arrival and departure of vessels into Berth 14A.

The seabed within the Berth 14A approach and berth pocket is required to be deepened to approximately 12.7 m below Chart Datum (CD). This will occur by dredging material which primarily consists of sand/silt.

A rock armour seawall will be constructed along the length of the berth as well as rock armour slope protection at the entrance to the basin.

5.2.2.1 Dredging

Up to 2.7 million cubic metres of material is proposed to be removed from the Berth 14A area. Table 5.1 summaries the indicative dredge volumes and duration of the excavations likely for Berth 14A. Table 5.1 indicates a worst case scenario for volume of dredged material, these details will be confirmed upon engagement of a dredging contractor.

Table 5.1 Indicative excavation volumes and durations

Material	Indicative volume (m^3)	Indicative Duration
Dry excavation	800,000 – to land disposal	
Dredged material to ocean disposal	**1,908,000**	40 weeks
Basalt rock	20,000	3 weeks rock fracturing & 2 weeks back hoe dredge grab

The main tasks undertaken during the excavation operations are outlined below:

- Conventional earth moving equipment will be used to remove land based material down to sea level (approximately -2 m). This material would be removed for land disposal within the Project site.
- A cutter suction dredge (CSD) will be used for the majority of the dredging works. It is proposed that the CSD would load hopper barges to transport the material to the nominated offshore dredge placement ground. Use an alternative backhoe dredger may be explored depending on the timing and actual duration of dredging.

- Marine drilling and rock fracturing followed by removal by grab or backhoe dredger will be used where hard rock is encountered.

Further details on the proposed dredging works are provided in the indicative dredge plan in Volume 2A – Technical Report 1 of this PER.

Ocean spoil disposal

The proposed offshore dredged material placement ground is a proposed new dredge placement area and is approximately 8.5 km directly west offshore and approximately 13 km north-west of the Inner Harbour in an area where the seabed is at -22 m CD (Refer to Figure 5.2). Assessment of this area has determined that any sediment disposed in this location is likely to remain undisturbed due to currents and wave action. The sediment in the area is coarse sand (Refer to Volume 2A – Technical Report 2).

5.2.2.2 Berth and wharf facilities

The berth facility will comprise a reinforced concrete jetty structure supported on circular steel piles. The detailed design of the jetty structure is still being finalised however it is likely that piles will be constructed by installing the steel tubes as a bored pile casing, removing soil within the tube until basalt is reached. Rock sockets penetrating 2 to 3 diameters into sound basalt will be bored into the rock using auger type equipment. After the base has been cleaned, the piles may be filled with reinforced concrete. The number of piles, their diameters and lengths are still being designed however it is envisaged that a standard pile design will be adopted.

The jetty structure will be fitted with fenders, bollards, rails for the ship loaders, handrails, lighting and other ancillary fittings to allow for a safe operation.

Berth 14A will have a local berth pocket, with the side slopes of the berthing area will be stabilised using rock or a precast concrete revetment to suit the design slopes.

5.3 Construction

5.3.1 Construction hours

Construction hours would generally be 7 am to 7 pm on any day which is not a Sunday or a public holiday though dredging activities would be undertaken 24 hours a day.

Should construction be undertaken outside these hours a Noise Management Plan would be prepared for approval from the Chief Executive Officer (CEO) of Department of Environment and Conservation (DEC).

5.3.2 Site establishment and preparation

On handover of the site from BPA any areas which are restricted or are required to be safeguarded or protected will be fenced. The restriction of access to areas of the site is likely to be phased as different areas of the site are released to the contractors.

Prior to the commencement of any bulk earthworks, utilities and services that are used by other Port users will be diverted to ensure continuation of service during construction and operation of the Project. This may include relocating the existing navigation equipment in the

vicinity of Berth14 to a suitable position clear of all works associated with the Project. The provision of temporary facilities for site personnel and site security will also be undertaken at this time.

Subject to agreement with BPA and prior to works approval being granted, areas available to contractors as lay down areas, parking and other temporary accommodation will be determined. These areas will be located within BPA managed land and away from any environmentally sensitive areas.

5.3.2.1 Demolition

Existing buildings and underground obstructions associated with the former power station may be removed during the construction works. If required, the demolition of these buildings and obstructions will be staged as it is expected that some of the existing buildings will be refurbished as necessary and used as temporary accommodation. Buildings will only be retained if their condition is deemed safe.

If demolition of the old power station is required, a survey will be undertaken to identify all unused ground water bores within this footprint that may penetrate the Yarragadee aquifer (Refer to Chapter 8).

5.3.2.2 Earthworks

A detailed earthworks plan will be prepared during the detailed design phase and included in the works approval documentation. In principle, the overall earthworks objective is to produce an earthworks balance to minimise the import/export of soil from the site. Temporary drainage will be catered for within the bulk earthworks.

A summary of the proposed works is described below:

- Prior to the earthworks commencing, vegetation within the disturbance footprint will be cleared and topsoil set aside for reuse.
- A large platform will be constructed, substantially at the same level that will accommodate the storage shed and related access. Ground improvement works will be undertaken across the storage shed area to reduce the variability in the load/settlement performance of the ground. This may typically involve vibro-compaction, jet grouting or other specialist techniques.
- Areas adjacent to the storage shed platform will be sloped to suit gradients for the predominantly sandy soils and to accommodate roads and hard standings.
- The area adjacent to the berth will be set to the same level as the berth in order to accommodate the access road.

5.3.3 Storage shed

5.3.3.1 Ground improvement

Ground improvements are necessary for the area associated with the storage shed. A flexible moisture barrier beneath the coal stockpile is required to separate the coal from the underlying soil and to facilitate collection and drainage of the leachate from the coal.

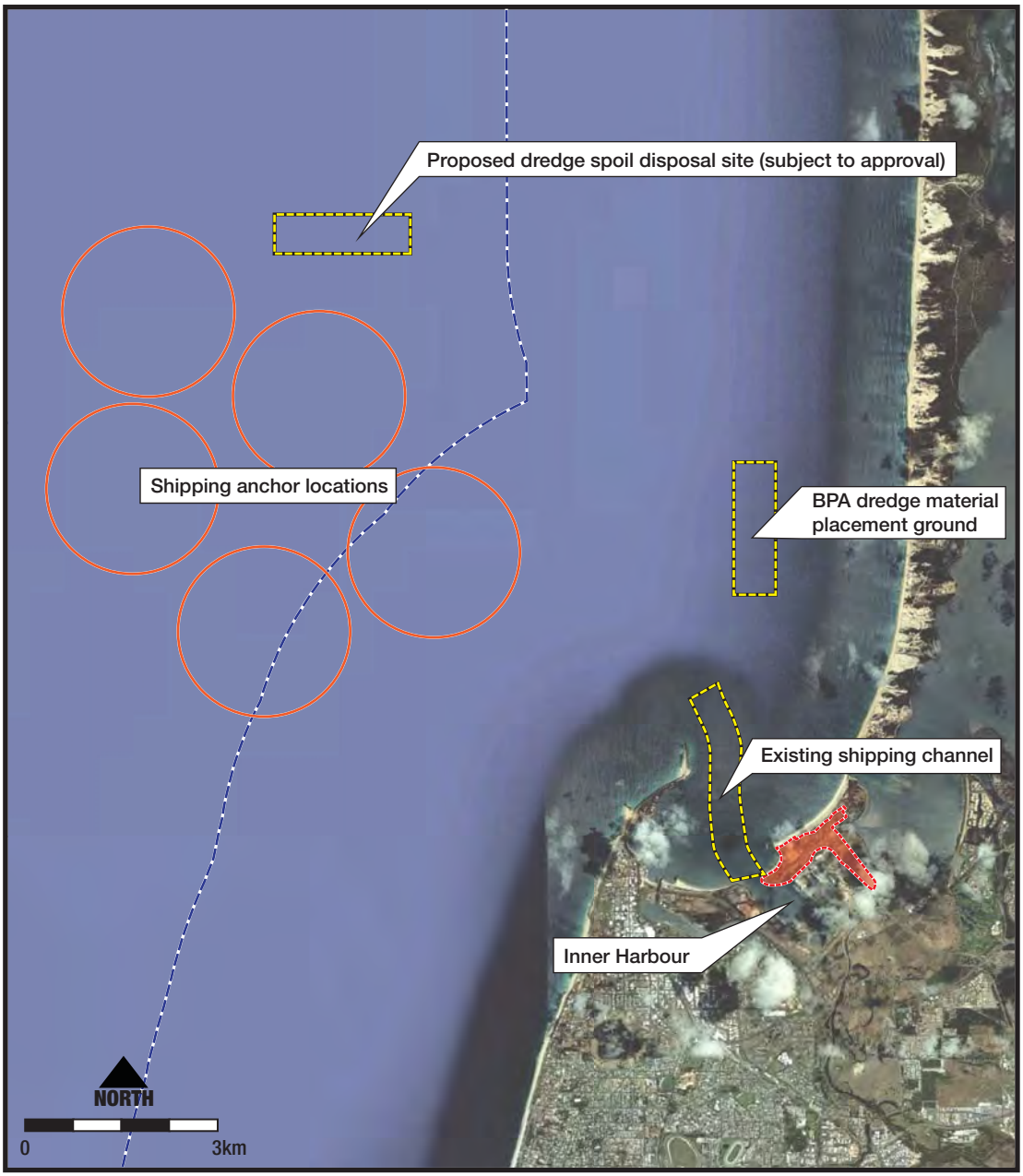


Figure 5.2 Location of marine infrastructure

Due to the loading of the stockpiled coal on the variable site soils, it is likely that ground improvements will be required to reduce the overall settlement and likely differential settlements across the area of the shed.

5.3.3.2 Foundations

The storage shed foundations will be subject to significant vertical and horizontal loads arising from the shed superstructure, the operational loads from the stackers and re-claimers. The foundations will be piled and penetrate the ground sufficiently to resist the lateral loads.

5.3.3.3 Storage shed superstructure

The storage shed superstructure will be designed as a portal frame truss structure or similar. This type of structure will provide the available space within the trusses to accommodate the required air and water services.

5.3.4 Ship loading

The Project includes up to two ship loaders which will sit on rail supported by the jetty deck structure. It is likely that the ship loaders will be fabricated offshore and supplied ready for use or in sections to be erected directly on the jetty.

It is expected that all materials for the ship loading facility will arrive by sea using the Berth 14A jetty.

5.3.5 Construction waste

In the establishment of construction contracts it will be a requirement that all contractors provide a waste management plan. Contractors will be required to adopt best practice management measures and where possible separate materials suitable for recycling.

A more detailed discussion on waste is provided in Chapter 15 of this PER.

5.3.6 Construction material delivery

Where possible, materials used during the construction phase will be prefabricated and delivered by sea to allow a greater degree of pre assembly and avoiding some of the size restrictions required for road transport. This is particularly applicable to steel structures including the trusses for the storage shed, conveyor support structures as well as mechanical and electrical plant.

Some materials will be required to be delivered either by road or rail. However detailed planning to specific requirements has yet to be undertaken. It is presumed is that most materials will arrive by road however subject to track availability; rail is also considered a viable option for delivery of bulk materials.

5.4 Operation

5.4.1 Operating hours

Approval is being sought for a 24 hour operation, 7 days a week, 363 days per year.

The delivery and unloading of material from trains will occur evenly over the 24 hour period.

Ship loading will take approximately 16 hours for typical vessel but actual times will be variable based on ship movements into the berth. To allow for delays due to congestion, late arriving vessels and weather a berth occupancy rate of 70% has been allowed for.

5.4.2 Coal handling

The coal handling plant will facilitate the unloading of the rail wagons and the loading of vessels whilst maintaining a stockpile of material to act as a buffer between the two progresses.

5.4.2.1 Delivery of product

Trains will have the capacity to operate 24 hrs per day, seven days a week. Normal maintenance activities will be undertaken between scheduled trains and up to 14 days of shut-downs per year have been allocated for remedial track work.

In order to achieve 15 Mtpa, the daily output is estimated to be 42,750 t/day, with up to 16 trains arriving per day. The wagon unloading system will be fully automated. An operator would be present at the unloading station to initiate and oversee the process.

5.4.2.2 Storage shed

The storage shed proposed as part of the Project are capable of stockpiling between 250,000 t and 500,000 t of coal.

At an average coal supply rate, it will take approximately 6 to 14 days to reach a maximum storage level within the storage shed.

The shed proposed for this Project will include the following systems:

- stacking
  - each stockpile will be supplied by a stacking system located in the storage shed. Each stacking system has an average capacity of 4000 tph
  - it will be an automated process with sensors in place to detect the vicinity of the reclaimers and monitor the stockpile height
- reclaiming
  - each stockpile will be able to be reclaimed at an average capacity of 4000 tph by reclaimers with coal then delivered to the ship loaders
  - reclaimers would be automated unless the material is bypassing the storage shed directly to the vessel when some operator intervention is required
- dust collection

- fire suppression, including infrared cameras to detect areas at risk of spontaneous combustion

- wash down water system using fit for use quality water.

5.4.2.3 Conveyors

The conveyor system connects the train unloading station to the storage shed and will include a bypass shuttle to enable the product to be loaded directly to the ship from the unloading station.

The bypass system allows downtime of the shed stacking systems whilst having minimal effects on the ship loading rates. The conveyor system proposed can be configured for various conditions including:

- stack either shed from either unload station conveyor at 4000 tph, with the other conveyor down for maintenance
- stack the shed at 4000 tph each during high demand situations or 2000 tph during normal conditions
- bypass the stockpiles in the shed directly to feed coal from the trains to the reclaim conveyor at 4000 tph each to load a ship in berth at up to 8000 tph
- bypass the stockpiles in the shed directly to feed coal from the trains to each reclaim conveyor at 2000 tph and use the reclaimers in the shed to make-up the load rate deficit to load a ship in berth at up to 8000 tph.

5.4.2.4 Rail unloading

Train arrivals are intended to be scheduled evenly throughout a 24 hour day. The unloading station will consist of a hopper-style receptor with two feeder and conveyor systems suited for 79 t bottom discharge coal train wagons with a nominal cargo of 4,000 t per train. The wagon unloading station will include the following:

- a receiving hopper with segmented hopperlets
- belt feeders on each hopperlet with a total capacity of 8000 tonnes per hour (tph)
- up to two wagon unloading station rising conveyors with a combined capacity of 8000 tph
- dust collection, fire suppression and wash down water systems.

5.4.2.5 Ship loaders

Berth 14A will be equipped with two rail-mounted ship loaders, each with an average capacity of 4000 tph. The ship loaders will be equipped with hoisting boom and shuttle to allow accurate positioning of the chute within the ship's hatch. The ship loaders will operate to continuously load a vessel from when it arrives at the berth. It is expected that an average loading period per vessel will be 16 hours from whenever the vessel arrives.

5.4.2.6 Fire management

Fire management and mitigation measures would be further investigated during the detailed design of Berth 14A infrastructure however may include:

Early detection measures

An early warning and response system would be implemented to detect fires before they develop into a hazardous situation. This system may include:

- installation of rapid and reliable environmental monitoring systems for early detection of fires
- use of plant condition monitoring systems (sensors) such as bearing temperature, vibration, infrared sensors, brake releases, belt tracking, blocked chute, belt slip, etc.
- installation of communication systems to ensure communication between all personnel at the facility and external response agencies (e.g. FESA).
- implementation of a comprehensive and effective inspection system.

Fire suppression and extinguishing

- Automatic fire extinguishing systems on mobile plant.
- Water supply and reticulation to fire risk areas of the port development.
- Sufficient water supply to allow all personnel to self-escape while maximum expected water usage rate is sustained.
- Appropriate automatic fire suppression to fixed plant (e.g. belt conveyors in tunnels or pits), where practicable and applicable.
- Portable fire extinguishers for initial attack response on fixed plant (in particular electrical switchgear) and mobile plant.

Additional measures

- During loading at the mine, coal moisture content would be pre-screened to ensure that 'no hot or burning coal' is loaded into wagons.

- On arrival coal would be monitored to detect any burning or hot coal that is discharged.

- Conveyance systems would be equipped for heat detection and gas monitoring to predict the potential of combustion and sense combustion itself. Once these systems detect a fire, conveyors would be automatically stopped and a deluge system would supress the fire. Similarly, if hot coal is detected it would be cooled.

- Misting would be used to keep coal dust down.

- In coal shed, stockpile risk would be minimised through either the turnover or compaction of product, to ensure coal does not sit for extended periods of time unconsolidated. Fire would be managed using manual intervention. Manual intervention strategies would be developed in coordination with fire authorities.

- Fire safety systems designed for the port's buildings shall be assessed and controlled in accordance with AS 5062-2006.

- Other potential sources of ignition would be eliminated through prohibition of open flames and smoking, and enforcing a rigid maintenance schedule for equipment (e.g. motors and conveyor belts) used for coal handling.

5.4.3 Shipping and port facilities

Coal will be exported to a partly loaded vessels (typically Supramax/Panamax/Kamsarmax/ Minicape class) or a Supramax vessel that would depart at high tide to maximise the ship carrying capacity.

An average of 15 million t of coal is expected to be exported from Berth 14A per year. It is anticipated that there would be a ramp up period with full utilisation several years after initial operation (refer to Figure 5.2).

To achieve the required export quantity each vessel would be loaded with an average cargo of 60,000 tonnes per trip.

Each vessel is predicted to take approximately 20 hour to arrive, load and depart the port which includes approximately 16hrs loading material. This schedule allows for minor maintenance to be carried out on port based equipment between vessel loadings.

5.4.3.1 Ship loading

The concept design allows for vessels to be loaded by up to two ship loaders, each with an average loading capacity of 4000 tph. The ship loaders are expected to operate concurrently to allow the ship to be loaded evenly at a maximum rate. Ship loaders would be controlled by a local operator.

5.4.3.2 Vessels movement

The Project will result in additional 225–250 vessels entering the Bunbury Port Inner Harbour each year which approximately doubles the existing Port trade. The vessels would be under the Port's own pilotage and hauled by tugs during their entry to Berth 14A from the ports shipping channel. Vessels which are coming from Australian waters are under State port controls (Australian Maritime Safety Authority) which undertake inspections of ships if required before arrivals in the port. The Harbour Master of BPA would be in control of the vessel while in port. Ballast water is exchanged once the vessel enters the Australian maritime zone (refer to Chapter 9).

6. Terrestrial flora and vegetation

This chapter outlines the potential impacts associated with construction and operation of the Project on terrestrial flora and vegetation. A level one flora and vegetation survey (Parsons Brinckerhoff 2011a) has been completed for this PER and is provided as Technical Report 12 in Volume 2C of this PER.

6.1 Assessment undertaken

6.1.1 Desktop review

A desktop review of relevant terrestrial flora and vegetation of the Project area was undertaken by Parsons Brinckerhoff (Technical Report 12, Volume 2C).

Records of Threatened species know or predicted to occur were obtained from a range of database searches, as identified in Table 6.1 in addition to a review of ecological reports which had been prepared for the site, including Bennett (2008) and Harewood (2008).

Table 6.1 Databases searched for species records

Database	Search date	Area searched	Reference
WA NatureMap	5 August 2011	10 km buffer around the study site	WA DEC
EPBC Protected Matters Search Tool	9 October 2011	10 km buffer around the study site	Department of Sustainability, Environment, Water, Population and Communities (2011)

Subsequent to the desktop review, a gap analysis was undertaken on the information sought to assist in determining the requirements for further investigations.

6.1.2 Field survey

A broad scale vegetation assessment survey was undertaken of the Project area on 9 and 10 August 2011 to confirm the accuracy of information provided by desktop review. The field survey was conducted in accordance with the EPA Guideline No. 51 (2004) and consisted of:

- a broad scale vegetation assessment
- incidental observations of flora
- vegetation condition assessment against the Keighery vegetation scale (1994).

6.1.2.1 Vegetation assessment and incidental observations of flora

Vegetation type, floristic diversity, and potential presence of Threatened species were assessed using the random meander technique (Cropper 1993). This involved the recorder walking in a random manner through the entire site recording all species observed, boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its richness.

6.1.2.2 Vegetation condition assessment

The condition of vegetation was assessed through general observation and comparison against the Keighery scale (1994) as described in Table 6.2.

Table 6.2 Description of levels Keighery vegetation scale

Condition scale	Description
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure very severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (5)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

6.1.3 Biodiversity assessment under the EPBC Act

The desktop assessment conducted as part of the level 1 flora and vegetation assessment included a search of the EPBC Protected Matters Search Tool (SEWPaC 2010a) to identify any matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that may occur within the Project area and a 10 km buffer which included surrounding areas. Search results indicated that there are six plant species protected by the EPBC Act that could occur within the search area (Technical Report 12 in Volume 2C). None of these species were observed during the field survey and based on the habitat available throughout the Project area it is unlikely that they will occur. Consequently, a Referral under the EPBC Act for flora and vegetation is not required.

6.2 Existing environment

The study area is located at the southern end of the Leschenault Inlet, within the Port of Bunbury. The landscape surrounding the study area is devoid of large areas of natural vegetation, but functions as a mosaic of developed land with natural inclusions and linear features such as watercourses and roadside vegetation.

Vegetation within the study area is predominantly exotic, with small areas of degraded remnant and pioneering native vegetation (Bennett 2008; Technical Report 12, Volume 2C).

The majority of the study area has been degraded by weed invasion, with little native vegetation located within the boundaries of the site.

6.2.1 Broad vegetation types

Remnant native vegetation within the study area fell into two broad vegetation types:

- Dwarf Scrub (*Olearia axillaris*, *Scaevola crassifolia*, *Rhagodia baccata* ssp. *dioica*) over weeds – FCT29a – Coastal shrublands on shallow sands
- Thickets of *Acacia cyclops* and *Acacia cochlearis* FCT29b – *Acacia* shrublands on taller dunes.

Neither of these assemblages are listed as Threatened Ecological Communities by DEC (2008).

The remainder of the study area was dominated by exotic and non-native Australian flora. These vegetation types included:

- large areas of treeless land covered in a range of pasture weeds and non-native grasses
- large stands of exotic herbs such as Sandplain Lupin (**Lupinus consentinii*), Strapweed (**Trachyandra divaricate*) and Rose Pelargonium (*Pelargonium capitatum*)
- infestations of Soursob (**Oxalis pes-caprae*)
- thickets of non-native Victorian Teatree (*#Leptospermum laevigatum*)
- plantations of mixed exotic and non-native Australian plants
- stands of Peppermint (*Agonis flexuosa*), which although planted is an indigenous species.

Geographic distributions of vegetation types are indicated on Figure 6.1.

6.2.2 Vegetation condition

The majority of the site consisted of a mosaic of Victorian Teatree and other invasive weeds in a Degraded (5) condition on Keighery's (1994) scale. This vegetation type was severely impacted by disturbance, displaying evidence of partial clearing and extensive infestations of aggressive weeds throughout.

The remainder of the study area consisted of a pasture, weeds and plantation in Completely Degraded (6) condition, artificial ephemeral wetlands in Degraded (5) and Completely Degraded (6) condition, and a small patch of Dwarf Scrub (less than 1 ha) in Good (4) condition. Definitions of levels of condition included in the Keighery (1994) scale are detailed in Table 6.2.

6.2.3 Flora

No Threatened or Rare flora was observed during the field survey.

6.3 Impacts

6.3.1 Construction impacts

6.3.1.1 Loss of vegetation

Direct loss of native and exotic vegetation through land clearing would be the Project's major direct impact. Clearing native vegetation is known to affect threatened species of flora and is recognised as a threatening process under the EPBC Act and *Environmental Protection Act 1986* (EP Act).

Clearing of vegetation has a range of direct and indirect impacts on flora and vegetation. These impacts include:

- reduction of the extent of vegetation communities and associated habitats
- loss of local populations of species
- fragmentation of remnants of vegetation communities or local populations of individual species
- increased edge effects and habitat for invasive species
- reduction in the viability of ecological communities resulting from loss or disruption of ecological functions
- destruction of flora and fauna habitat and associated biological diversity
- soil exposure and altered water flow patterns resulting in increased erosion and sedimentation
- direct mortality to plants.

Construction of the Project would require the removal of approximately 6 ha of vegetation. The majority of vegetation removal would be composed of exotic species, along with two hectares of native vegetation which is not a listed vegetation community.

It is not likely that the Project would cause direct loss of any native vegetation outside the development footprint. Estuarine vegetation adjacent to the site is the most vulnerable to adverse effects, which may occur as result of uncontrolled sediment flows during construction. However, this is unlikely to occur as these sources of damage will be managed. Details on mitigation and management measures are provided in section 6.4.

6.3.1.2 Fragmentation

Habitat fragmentation is the process of dividing a single area of continuous habitat into two or more smaller isolated fragments, with a new habitat type occurring in the area between. Adverse effects of fragmentation include:

- barrier effects
- genetic isolation
- edge effects.

The extent to which these potential impacts affect flora and vegetation is determined by the distance between the fragments, local environmental conditions, the species present, and any possible mitigation measures in place.

The Project is likely to widen existing barriers and contribute to accumulative fragmentation existing within the Bunbury Port. However, the majority of the study area is already fragmented by existing infrastructure and the surrounding landscape is highly modified and cleared as a result of past land use. Consequently, it is unlikely that additional fragmentation

PARSONS BRINCKERHOFF

Level 15
28 Freshwater Place
Southbank VIC. 3006

ABN 84 797 323 433

PO Box 19016
Southbank VIC. 3006
Australia

Telephone +61 3 9861 1111
Facsimile +61 3 9861 1144
Email: melbourne@pb.com.au

0 100 200
metres

Scale (at A3) **1:6,000**

Coordinate System: **GDA 1994 MGA Zone 50**

Drawing Number: **2162530A_Vegetation**

Revision: **A1**

Date: **13/10/11**

Author: **CSB** *Checked by:* **LC**

Vegetation map for Berth 14, Bunbury Port

caused by the Project would have a significant impact on the viability of species that occur within the Project area.

6.3.1.3 Introduction and spread of weeds

The introduction of weed species can threaten ecosystems through competing with native vegetation for resources. This can lead to changes in community structure and composition.

The majority of the vegetation in the study area is already substantially weed-invaded. Consequently, the introduction of weed species during construction activities is unlikely to increase habitat modification significantly. Given the high level of weed invasion existing within the Project area, construction activities have potential to spread weeds from the Project to area to external sites, if vehicles, machinery and equipment are not managed appropriately.

6.3.1.4 Alterations to hydrology

Opportunistic, ephemeral wetland vegetation was recorded on bulldozer scrapes within the site. It is likely that alterations in surface water flow may result in changes to this man made wetland habitat's structure and function. Despite this, all wetland habitat observed within the site was reported in Degraded (5) or Completely Degraded (6) condition on the Keighery scale. Consequently, it is unlikely that modification of these habitats will have a significant impact on biodiversity values of the Project area.

6.3.2 Operational impacts

The only impact expected to potentially adversely affect flora and vegetation during the operational phase of the Project is the introduction and spread of weeds. Given the high level of weed invasion existing within the Project area, operational activities have potential to spread weeds from the Project to area to external sites, if vehicles, machinery and equipment are not managed appropriately.

6.4 Management and mitigation measures

Prior to construction, detailed flora and vegetation management measures would be developed and presented as part of a Construction Environmental Management Plan (CEMP) for the site and would address the management measures outlined in this section.

In addition to the CEMP, Lanco will contribute to any Foreshore Management Plan if required to prepared by BPA to manage the adjoining open space and recreational area to the north of the site boundary. This foreshore management plan will consider the requirements of the *State Planning Policy 2.6 – State Coastal Planning Policy Guidelines*.

6.4.1 Construction

6.4.1.1 Loss of vegetation

Disturbance of areas of native vegetation would be unavoidable during the construction process. Where practicable the loss of vegetation would be mitigated or managed to minimise disturbance of vegetation. Typical mitigation and management strategies include:

- implementing clearing protocols during the clearing of environmentally sensitive areas. This includes a larger portion of land in the eastern portion of the Project area, eastern areas of the site adjacent to the Leschenault Inlet
- identifying all plants to be cleared, by survey, prior to clearing
- clearly marking the limits of clearing and installing fencing around areas not to be cleared before construction activities begin, to avoid unnecessary vegetation removal
- wherever possible, revegetating and restoring disturbed areas. Revegetation is typically undertaken in accordance with a landscape management plan developed for the Project
- development of an onsite sediment and erosion control plan to mitigate or manage any impacts to vegetation related to sedimentation of water sources.

6.4.1.2 Fragmentation

Fragmentation of vegetation would be unavoidable during the construction process. Continuity of vegetation will be maintained wherever practicable.

6.4.1.3 Introduction and spread of weeds

The main focus of weed control would be to minimise the spread of weeds to areas where weeds are not currently established, within and external to the Project area. Typical weed mitigation and management measures:

- vegetation to be cleared would not be stockpiled on site and would be disposed of immediately offsite at a suitable waste facility licensed to accept green waste
- vehicles and other equipment used in clearing within the construction zone and general construction equipment are to be cleaned so they are completely free of soil, seeds and plant material before entering and leaving the site
- restricted access to areas infested with weeds
- controlled movement of soil, particularly soils that could contain weed seed of propagules
- treatment of weeds to suppress germination.

6.4.2 Operational

The only direct impact which has the potential to have adverse effects on flora and vegetation during operation is the introduction and spread of weeds. Mitigation and management measures required for weed control during the operational phase of the Project are the same as those required during the construction phase, and are described in section 6.4.1.3.

6.5 Predicted environmental outcome

Table 6.3 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Loss of native vegetation	Implementation of clearing protocols during the clearing of land within the eastern portion of the site.	Reduction of native vegetation impacted by the development to approximately 6 ha of degraded coastal scrub.
Spread of weed cover	Development of an onsite sediment and erosion control plan to mitigate or manage any impacts to vegetation related to sedimentation of water sources. Vehicles and other equipment used in clearing the site are to be cleaned so they are completely free of soil, seeds and plan material before entering and leaving the site.	No increase in the existing cover of weed species during construction.
Operation		
Increase in existing weed cover	Regular treatment of weeds to suppress germination	No increase in the existing cover of weed species during operation.

7. Terrestrial fauna

This chapter summaries the *Flora and Fauna Assessment* and *Level 2 Surveys - Waterbirds and Western Ringtail,* prepared by Parsons Brinckerhoff (2012a), which is contained as Technical Report 12 and 13 in Volume 2C of this PER.

This chapter outlines the potential impacts to terrestrial fauna, including waterbirds, associated with the Project including impacts of constriction and operational phases.

7.1 Assessment approach

7.1.1 Desktop review

A desktop review of relevant terrestrial fauna was undertaken by Parsons Brinckerhoff (Technical Report 12, Volume 2C).

Records of Threatened species know or predicted to occur were obtained from a range of database searches, as identified in Table 7.1 in addition to a review of ecological reports which had been prepared for the site, including Bennett (2008) and Harewood (2008).

Table 7.1 Databases searched for species records

Database	Search date	Area searched	Reference
WA NatureMap	5 August 2011	10 km buffer around the study site	WA DEC
Birds Australia 'Bird Data'	5 August 2011	10 km buffer around the study site	Birds Australia www.birdata.com.au
EPBC Protected Matters Search Tool	9 October 2011	10 km buffer around the study site	Department of Sustainability, Environment, Water, Population and Communities (2011)

Subsequent to the desktop review, a gap analysis was undertaken on the information sought to assist in determining the requirements for further investigations.

A review of previous consultants' reports relating to ecological values of the proposed project area was undertaken and a gap analysis completed to determine the requirements for further field investigations.

7.1.2 Field survey

Subsequent to the desktop review and gap analysis, a level 1 fauna assessment (part of a level 1 flora and fauna survey) and a level 2 waterbird and Western Ringtail Possum survey were completed.

These surveys were undertaken to confirm the findings of previous investigations and provide an evaluation of terrestrial fauna throughout the remainder of the Project area.

The level 1 field survey was undertaken on 9 and 10 August 2011 whilst the level 2 waterbird and Western Ringtail Possum survey was undertaken from 18–20 January 2012. Surveys

were conducted according to methods outlined in EPA guidance Statement No. 56, Section 3 of the *Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010), and SEWPaC (2010b).

7.1.2.1 Level 1 Fauna (reconnaissance) survey

Opportunistic observations and an assessment of fauna habitat was undertaken to determine the likelihood of Threatened species occurring within the Project area. Fauna habitats were generally assessed by examining characteristics such as the structure and floristic of the canopy, understorey and ground vegetation, the structure and composition of the litter layer and other attributes important for feeding, roosting and breeding. Criteria used to evaluate fauna habitat are summarised in Table 7.2.

Table 7.2 Assessment criteria used to evaluate quality of fauna habitat

Habitat quality	Assessment criteria
Good	A full range of fauna habitat components are usually present (for example, old-growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
Moderate	Some fauna habitat components are missing (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
Poor	Many fauna habitat elements in low quality remnants have been lost, including old-growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

7.1.2.2 Level 2 Waterbirds and Western Ringtail Possum survey

The Level 2 waterbirds and Western Ringtail Possum survey provided a summary avian fauna known to occur in and within the vicinity of the Project area as well as details on the likelihood of the Western Ringtail Possum occurring within the Project area.

Waterbirds were surveyed at high and low tide over three days from 18 to 20 January 2012. Seasonal timing of surveys was coordinated with the period when most migratory shorebirds were most likely to be present. Surveys were designed to identify areas that may be important for feeding, resting and roosting. During waterbird surveys birds were observed with binoculars and a spotting scope, and numbers of birds, their locations and their activities were recorded. Surveys ranged from 30–90 minutes in length. Survey length was determined based on the size of the survey area and state of the tide.

Western Ringtail Possum surveys were undertaken over two nights (18 and 19 January 2012) using handheld LED narrow-spot flashlights (Arlec). Areas of planted Peppermint (*Agonis flexuosa*) and other species were scanned by flashlight for periods of 45–60 minutes. Fauna encountered during these periods were identified and recorded.

Full descriptions of methodology employed during these surveys are outlined in Technical Reports 12 and 13 in Volume 2C of the PER.

7.1.3 Biodiversity assessment under the EPBC Act

Desktop searches conducted during fauna assessment included a search of the EPBC Protected Matters Search Tool (SEWPaC 2010a) to identify any matters of national environmental significance protected by the EPBC Act that could occur within the Project area and within a 10 km radius. Search results indicated that there are 23 threatened terrestrial fauna species protected by the EPBC Act that may occur of which 13 are migratory terrestrial fauna species (seven of these are categorised as threatened).

7.2 Existing environment

7.2.1 Habitat availability

The suitability, size and configuration of fauna habitats within the Project area correlate broadly with the structure, floristic and quality of the local and regional vegetation types. Fauna habitats within the Project area are generally in poor condition and provide only limited habitat for only some opportunistic birds and common amphibians associated with disturbed coastal landscapes.

Previous earthworks within the Project area have led to the development of various artificial ephemeral wetlands within the eastern portion of the site. No conservation significant species are known to inhabit these wetlands. However, two common frog species have been recorded in these areas. It is likely that ecological function of these wetlands is dependent on seasonal inundation via rainfall.

7.2.2 Fauna species

7.2.2.1 Level 1 Fauna survey

67 vertebrate fauna species were recorded during the Level 1 fauna survey. Fauna observed included 62 birds species, three mammals and two frogs. Species encountered were typical of the mosaic of disturbed and semi-natural habitat found in the coastal zone in the vicinity of Bunbury.

Two conservation significant Black-cockatoo species, the Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) and the Carnaby's Black-Cockatoo (*C. latirostris*), were recorded utilising the Project area for non-breeding season foraging during the Level 1 fauna survey in August 2011. Both of these species are listed as protected under the EPBC Act and WC Act.

Black-cockatoos are likely to utilise scattered thickets of *A. saligna* distributed throughout the site, for foraging purposes. However, habitat types throughout the Project area do not include black-cockatoo breeding habitat, which is characterised by hollow-bearing *Eucalyptus* trees >0.5 m in diameter. Although the site does not contain black-cockatoo breeding habitat the presence of two of the black-cockatoo species in the Project area in August is consistent with their known movement patterns and foraging habits.

7.2.2.2 Waterbirds and shorebirds

A total of 71 birds species were recorded within the Project and adjacent areas during the Level 2 waterbirds survey in January 2012. Of these species, 34 were waterbirds and shorebirds targeted in the survey and three were either feral or species recorded beyond their native range.

The most abundant species recorded during the waterbirds study were pied cormorants, with the highest count at approximately 300 individuals. Even with a count as high as this, pied cormorant number remain at <5% of the threshold levels required for significance (Ramsar and Wetland directory). No other waterbirds observed approach any of the significance thresholds and therefore the study area cannot be regarded as a significant site for waterbirds or shorebirds.

The Project area and adjacent habitat does not contain any significant shorebird sites, survey sites listed in the national inventory of high tide roosts, or targeted national wader survey sites. All areas containing mudflats suitable for use by migratory shorebirds were small or restricted in distribution.

During the Level 2 waterbirds survey, numbers of shorebirds counted were very low and no aggregations of roosting shorebirds were observed at any of the rock-wall sites, with exception to single Common Sandpipers. These observations support the findings of previous investigations conducted within the Leschenault Inlet (DEC 2004) and Bunbury Port area (Bennelongia 2008), which indicate that the broader area does not contain habitat important for shorebirds.

7.2.2.3 Western Ringtail Possum (*Pseudocheirus occidentalis*)

The Project area does not contain any known remnant habitat for the Western Ringtail Possum (WRP). However, the site features extensive plantings of Peppermint (*Agonis flexuosa*), which is a key element of known WRP habitat, and the site does occur within the broadly known range of the species. Despite this, no WRPs have been recorded during targeted WRP surveys within the site.

7.3 Impacts

7.3.1 Construction impacts

7.3.1.1 Loss of vegetation and habitats

Construction of the Project would require the removal of approximately 6 ha of degraded native vegetation that may provide habitat for local and migratory fauna. Loss of vegetation and habitats can have many adverse impacts on fauna including:

- loss of biodiversity
- reduction in the viability of ecological communities resulting from loss or disruption of ecological functions (e.g. increased desiccation, light penetration, weed invasion, predation, and parasitism)
- increased edge effects and habitat for invasive species.

The majority of the vegetation removal would be composed of exotic species and is not likely to include significant habitats such as hollow-bearing trees. Consequently, it is unlikely that loss of habitat during construction would cause significant impact on fauna.

In addition to loss of habitat within the Project area, potential loss of habitat in areas surrounding the Project area needs to be considered. It is not likely that the Project would cause direct loss of habitat outside the development footprint. However, it has been noted that estuarine habitat adjacent to the site is the most vulnerable to adverse effects. Potential impacts on estuarine vegetation can be caused by uncontrolled sediment flows during

construction. This would be unlikely, as these sources of damage will be managed. Details on mitigation and management measures are provided in section 7.4.

7.3.1.2 Habitat fragmentation

Habitat fragmentation is the process of dividing a single area of continuous habitat into two or more smaller isolated fragments, with a new habitat type occurring in the area between. This new dividing habitat type is often artificial or inhospitable to species remaining in the fragments (Bennet 1990, 1993; Johnson *et al*. 2007). Adverse effects of fragmentation include:

- barrier effects, which result from reduced or discontinued movement of individuals of a species between areas of fragmented habitat
- genetic isolation, which occurs where individuals from a population are unable to interbreed with individuals from population in other fragments. This can lead to problems associated with low genetic diversity such as inbreeding depression and genetic drift, which can reduce the viability of populations within fragments
- edge effects, which occur where environmental conditions (e.g. light levels, wind speed, temperature etc.) change along zones located at the edges of habitat fragments. These new environmental conditions can promote invasion by weeds and pest fauna species, and increase predation.

The extent to which these potential impacts affect fauna is determined by the distance between the fragments, local environmental conditions, the species present, and any possible mitigation measures in place.

The Project is likely to widen existing barriers and contribute to accumulative fragmentation existing within the Bunbury Port. However, the majority of the study area is already fragmented by existing infrastructure and the surrounding landscape is highly modified and cleared as a result of past land use. Consequently, it is unlikely that additional fragmentation caused by the Project would have a significant impact on the viability of species that occur within the Project area.

7.3.1.3 Direct loss of or injury to fauna of conservation significance

Fauna injury or death could occur as a result of construction activities such as:

- vegetation (fauna habitat) clearing
- incidents involving vehicles or plant
- incidental trapping or drowning in trenches or other earthworks.

Typically, mobile species such as birds may be able to avoid the path of clearing. However other less mobile or nocturnal species may find it difficult to move rapidly over large distances.

Due to the small extent of vegetation proposed for clearing and the limited habitat available within the Project area, it is considered that vehicle strike during construction and maintenance work will not be significant. The proposed extension of the rail track and roads is not expected to significantly increase the risk of wildlife colliding with trains and road vehicles.

7.3.1.4 Altered hydrology

Alterations to surface hydrology may impact common frog species that utilise artificial wetland habitat within the Project area. However, it is unlikely that this would impact on the viability of local population of these species as there are extensive areas of wetland habitat located adjacent to the Project area, beyond the Project footprint.

7.3.1.5 Noise

At present, fauna within the Project area are already affected by noise levels associated with the existing port facility. During construction, fauna are likely to be exposed to additional noise produced by construction activities such as ground disturbance, machinery and vehicle movement, and vegetation clearing. This may cause disturbance to fauna. However, given the current extent of habitat disturbance in the local area and the existing noise environment, the effect is not expected to be significant.

7.3.1.6 EPBC Act

Two terrestrial fauna species protected by the EPBC Act, Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Black-Cockatoo (*C. latirostris*) were observed utilising the Project area during the non-breeding season foraging during the Level 1 flora and fauna survey. Although the site does not contain black-cockatoo breeding habitat, the presence of two of the black-cockatoo species in the Project area in August 2011 is consistent with their known movement patterns and foraging habits.

The most relevant trigger for an EPBC referral for these species would be the clearing of >1 ha of high quality foraging habitat (SEWPaC 2011). It is unlikely that this threshold will be met at this site, as although there is scattered foraging habitat (*Acacia saligna)* throughout the Project area, this covers less than one hectare and it is unlikely that the stands will all be lost during the life of the Project. Consequently, an EPBC Referral is not required for the listed terrestrial fauna species.

7.3.2 Operational impacts

7.3.2.1 Noise

The main potential operational impact of the Project is noise disturbance from activities associated with the coal loading facility. However, given the current noise environment associated with existing port facilities, increases in noise and their effect on fauna are not expected to be significant.

7.3.2.2 Light

Studies relating to the effect of light pollution on fauna have indicated that light pollution from a variety of sources can trigger behavioural and physiological responses, including but not limited to:

- an extension of daylight or twilight foraging behaviour into the night-time environment, sometimes referred to as the 'night light niche' where reptiles, microchiropteran bats, and some diurnal birds will forage for insects under artificial lighting (Schwartz & Henderson 1991)

- a disruption of seasonal day length cues that can trigger critical behaviours (Longcore & Rich 2004)

- a disruption to predator-prey relationships.

Given the current light environment associated with existing port facilities, increases in light and their effect on fauna are not expected to be significant.

7.3.2.3 Habitat fragmentation

Impacts created by barriers established during construction are expected to continue to impact fauna throughout the operational phase of the Project. However, given the majority of the Project area is already fragmented by existing infrastructure and the surrounding landscape is highly modified as a result of past land use. It is unlikely that additional fragmentation caused by the Project would have a significant impact on the viability of species that occur within the Project area.

7.4 Management and mitigation measures

7.4.1 Construction

7.4.1.1 Loss of vegetation and habitats

Disturbance of areas of habitat would be unavoidable during the construction process. Where practicable the loss of habitat would be managed to minimise disturbance of vegetation. Typical management strategies include:

- implementing clearing protocols during the clearing of environmentally sensitive areas. This includes a larger portion of land in the eastern portion of the Project area, eastern areas of the site adjacent to the Leschenault Inlet (Figure 6.2)
- identifying all plants to be cleared, by survey, prior to clearing
- clearly marking the limits of clearing and installing fencing around areas not to be cleared before construction activities begin, to avoid unnecessary vegetation removal
- wherever possible, revegetating and restoring disturbed areas. Revegetation would be typically undertaken in accordance with a landscape management plan developed for the Project
- development of an onsite sediment and erosion control plan to mitigate or manage any impacts to vegetation related to sedimentation of water sources.

7.4.1.2 Habitat fragmentation

Fragmentation of habitat would be unavoidable during the construction process. However, given the majority of the Project area is already fragmented by existing infrastructure and the surrounding landscape is highly modified and cleared as a result of past land use impacts, it is unlikely that impacts caused by habitat will be significant.

Continuity of vegetation and habitat will be maintained wherever practicable.

7.4.1.3 Direct loss of or injury to fauna of conservation significance

To minimise the risk of vehicle collisions with wildlife, new plantings of *A. saligna* would be located as far away from road and rail corridors as possible, to prevent collision with Black-Cockatoos.

7.4.1.4 Altered hydrology

Alterations to hydrology, including those associated with artificial wetlands would be unavoidable. Wherever possible, planning and design of project infrastructure would ensure minimal manipulation of drainage functions. To minimise sedimentation and contamination, potential sources such as soil stockpiles and any chemicals such as hydrocarbon fuels used on site will be appropriately stored and managed.

7.4.2 Operational

No additional impacts are expected to occur during the operational phase of the Project. Lanco will continue to work with the BPA to ensure that any indirect impacts to either the fauna of Koombana Bay and the Leschenault Estuary are minimised.

Activities associated with operation of the Project are expected to produce noise (refer to Chapter 14) and light. However given the current port environment, increases in noise and light and their effect on fauna are not expected to be significant.

7.5 Predicted environmental outcome

Table 7.3 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Loss of black cockatoo foraging habitat	Landscape management plan	Landscaping using foraging species of the black cockatoo's including *Acacia saligna* and banksia species where possible away from proposed road and rail.

8. Groundwater

This chapter outlines the potential groundwater impacts associated with the construction and operation of the proposed activities at Berth 14A. The chapter provides a summary of the *Groundwater Assessment – Proposed Berth 14A, Bunbury Port* report prepared by Parsons Brinckerhoff (2012b) and contained as Technical Report 14 in Volume 2C of this PER.

8.1 Assessment approach

A conceptual hydrogeological model was completed through a desktop hydrogeological assessment by utilizing reviews of historical investigations, online databases and data provided by the Department of Water (DoW) to establish the existing groundwater environment.

Resources utilised during the desktop assessment are summarised in Table 8.1.

Table 8.1 Summary of key resources utilised during desktop hydrogeological assessment

Data source	Description
Parsons Brinckerhoff project library	▪ Parsons Brinckerhoff contaminated land study with supporting figures and groundwater level data (Parsons Brinckerhoff 2012c)
	▪ Wave Solutions (2011) memo on Bunbury Basalt
	▪ Maunsell (2006) geotechnical study and report – Shallow holes (<20 m depth) drilled during the geotechnical study and seismic geophysical survey results were used in drawing the site specific cross sections for Bunbury Berth 14A.
DoW online search and data request	▪ Various geotechnical reports with either regional aquifer information and/or more localised aquifer conditions.
	▪ Borehole data within a 10 km radius of Berth 14A, including bore logs (lithology and aquifer intersected), water quality (mostly conductivity and chloride values), and groundwater level information.
	▪ A 2 km radius search on licensed groundwater use information.
Online search results	Geological and hydrogeological reports – mainly related to regional lithology and hydrogeological information.

This available data was suitable to establish the:

- geological and hydrogeological characteristics underlying the site
- piezometric levels in the Yarragadee aquifer
- hydrogeological properties of the Bunbury Basalt
- hydrogeochemical characteristics of the aquifers and aquitards underlying the site
- groundwater dependant ecosystems (GDEs) and environmentally sensitive areas (ESAs) within the vicinity of the dredge footprint
- the use, quantity, distance from the dredge foot print, and aquifer from which water is being abstracted, of all known/registered groundwater users within 2 km of the dredge footprint
- potential environmental impacts to GDEs, ESAs and groundwater users
- risk of rock fracturing breaching the confining basalt layer of the Yarragadee aquifer.

8.2 Existing environment

This section summarises the existing groundwater environment within the vicinity of the site, used as the basis of the conceptual hydrogeological model. Further details on the existing environment are provided in Technical Report 14, Volume 2C of this PER.

8.2.1 Hydrogeology

Three main hydrogeological units underlay the Project area:

1. Superficial formation that forms an unconfined aquifer (superficial aquifer)
2. Bunbury basalt (aquiclude)
3. Yarragadee Formation (confined aquifer in this area).

These hydrogeological units are summarised in Table 8.2. Full descriptions of site hydrogeology are outlined in Technical Report 14, Volume 2C of this PER.

Table 8.2 Summary of hydrogeological units that occur in the vicinity of the Project area

Hydrogeological unit	Description
Superficial formation	The collective name given to the sediments on the coastal plains. These sediments, excluding coastal dunes, are typically less than 10m thick (saturated thickness).
Superficial aquifer	The water table located in coastal sand of Berth 14A. This aquifer is localised above the Bunbury Basalt and confinement zones of low permeability, and is recharged predominantly by rainfall.
Bunbury basalt	A highly fractured (vertically) impermeable bed of weathered basalt that unconformably overlies the Yarragadee Formation. The Bunbury Basalt is approximately 40 m thick within the Bunbury Port location.
Basalt Aquiclude	An impermeable aquiclude comprised of Bunbury basalt.
Yarragadee formation	A geological formation comprised of unconsolidated sand interbedded with silty clay. The aquifer thickness ranges from approximately 300 to 1700 m within the Bunbury Trough
Yarragadee aquifer	A mostly confined aquifer composed of the Yarragadee formation. Contains mostly fresh groundwater that is recharged by direct infiltration of rainfall and leakage from overlying formations. Recharge is inhibited by aquitards and aquicludes such as Bunbury basalt that directly overly.

8.2.2 Groundwater levels

This section summarises trends in depth to groundwater observed in the Superficial and Yarragadee formations.

8.2.2.1 Superficial aquifer

Historically, depth to groundwater in the Superficial Aquifer has ranged between approximately -0.494 mAHD (MW29) to 1.170 mAHD (MW47) and has been influenced by both seasonal and climatic variations (Coffey 2009).

Groundwater in the Superficial Aquifer flows to the west (Parsons Brinckerhoff, 2012c).

8.2.2.2 Bunbury Basalt

None of the groundwater bores that intersected the Bunbury Basalt contained water, confirming the impermeable nature of this formation.

8.2.2.3 Yarragadee aquifer

The Yarragadee aquifer is a mostly confined freshwater aquifer composed of the Yarragadee Formation, however is unconfined where it outcrops in areas on the Blackwood Plateau (50 km south of Berth 14) and sub-outcrops beneath the superficial aquifer on the coastal plains. The aquifer thickness ranges from approximately 300 to 1700 m within the Bunbury Trough and is shallowest south of Bunbury and in places on the Blackwood Plateau. A seawater interface intersects this aquifer along the Bunbury coastline (Irwin, 2006; DoW, 2009a)

Other than the influence of climate, groundwater utilisation has triggered a local pressure drop of 1.5–2 m, south of the Project area (Parsons Brinckerhoff 2012b).

Groundwater flow across the Project area range from west south west to north-west, in the west and northern portion of the Project area respectively (Parson Brinckerhoff 2012b). Hydraulic conductivity in the Project area is assumed to range between 4.1 (fine grained sand) and 16.5 metres per day (medium grained sand) (Davidson, 1995). Assuming an effective porosity of between 0.23 (fine sand) and 0.28 (medium sand) (Kruseman and de Ridder 1991), the seepage velocity of groundwater is estimated to be between 6.5 and 21.5 metres per year (Parsons Brinckerhoff 2012b).

Higher piezometric water levels in the Yarragadee indicate a hydraulic gradient from the confined Yarragadee to the Superficial Aquifer (Parsons Brinckerhoff 2012b).

8.2.3 Groundwater quality

The Project area occurs within the upper Southern Perth Basin which typically exhibits fresh groundwater with brackish water occurring in some areas, particularly in the superficial formations (Parsons Brinckerhoff 2012b).

Historically, groundwater quality throughout the site has been highly variable. The majority of this variation occurs when comparing data from bores intercepting different aquifers.

8.2.3.1 Superficial aquifer

Water quality analysis conducted during drilling indicated that EC in the Project area represents fresh to saline water, ranging from 2090–52,800 uS/cm in the Superficial Aquifer (Parsons Brinckerhoff 2012b). Subsequent to drilling, EC has been recorded ranging from 100–6500 uS/cm in the Superficial Aquifer (IT Environmental 2006). Salinity in the Superficial Aquifer in this coastal location can increase greatly as a result of interaction with sea water (Parsons Brinckerhoff 2012b; Irwin, 2006; DoW 2009),

The Superficial Aquifer has typically exhibited more variable EC over time when compared to the confined aquifers. This indicates that water quality in the Superficial Aquifer would be more sensitive to the effects of anthropogenic and seasonal inputs from the surface.

In addition to variable EC, elevated concentrations of copper, nickel and zinc have been recorded in groundwater of the Superficial Aquifer. These concentrations are considered to be a result of naturally occurring local geology and the presence of dredge material in the

area (Coffey 2009). Total petroleum hydrocarbons (TPH) have also been detected in groundwater. However, TPH levels did not exceed Marine Waters Investigation Levels for groundwater (Coffey 2009).

8.2.3.2 Yarragadee formations

The Yarragadee Formation groundwater is fresh to very fresh water (ranges from 150 to 520 mg/L Total Dissolved Solids (TDS)) (Strategen, 2005; Irwin, 2006).

Water quality analysis conducted during drilling indicated that EC in the Project area represents fresh to saline water, ranging from 515–519 uS/cm in the Yarragadee Aquifer (Parsons Brinckerhoff 2012b).

8.2.4 Groundwater dependant ecosystems and environmentally sensitive areas

The Yarragadee Formation groundwater is fresh to very fresh water (with Total Dissolved Solids (TDS) ranging from 150 to 520 mg/L) (Strategen, 2005; Irwin, 2006).

Water quality analysis from bores in proximity to the Project area are consistent with the freshwater characteristics of the Yarragadee Aquifer with 300 and 380mg/L TDS and EC values of 515 and 519 uS/cm (Parsons Brinckerhoff 2012b).

8.2.5 Groundwater users

The Superficial Aquifer of Berth 14A is not considered a usable groundwater source due to high salinity (Parsons Brinckerhoff 2012b).

100% of the water from the Yarragadee Aquifer has been allocated to groundwater users (DoW 2009).

Geophysical surveys and corresponding geotechnical drilling from previous studies have suggested that massive basalt is unlikely to be encountered in the dredge footprint for Berth 14A, except for the south west corner of Point Hamilla, where drilling encountered approximately 0.5 m of fresh basalt. It is expected that the Project will require minimal rock fracturing in the Bunbury basalt.

8.3 Impacts

8.3.1 Construction

8.3.1.1 Contamination of groundwater

Integrity of confining basalt layer

As illustrated in Figure 8.1, the Bunbury Basalt approximately is 40 m thick underneath the Berth 14A Project area. If basalt is encountered during dredging works, it is most likely to be weathered and able to be removed without rock fracturing. The risk of compromising the Bunbury Basalt is considered to be low however if it was it was compromised during construction there would be potential for contamination of the Yarragadee Aquifer by saline groundwater contained within the Superficial Aquifer.

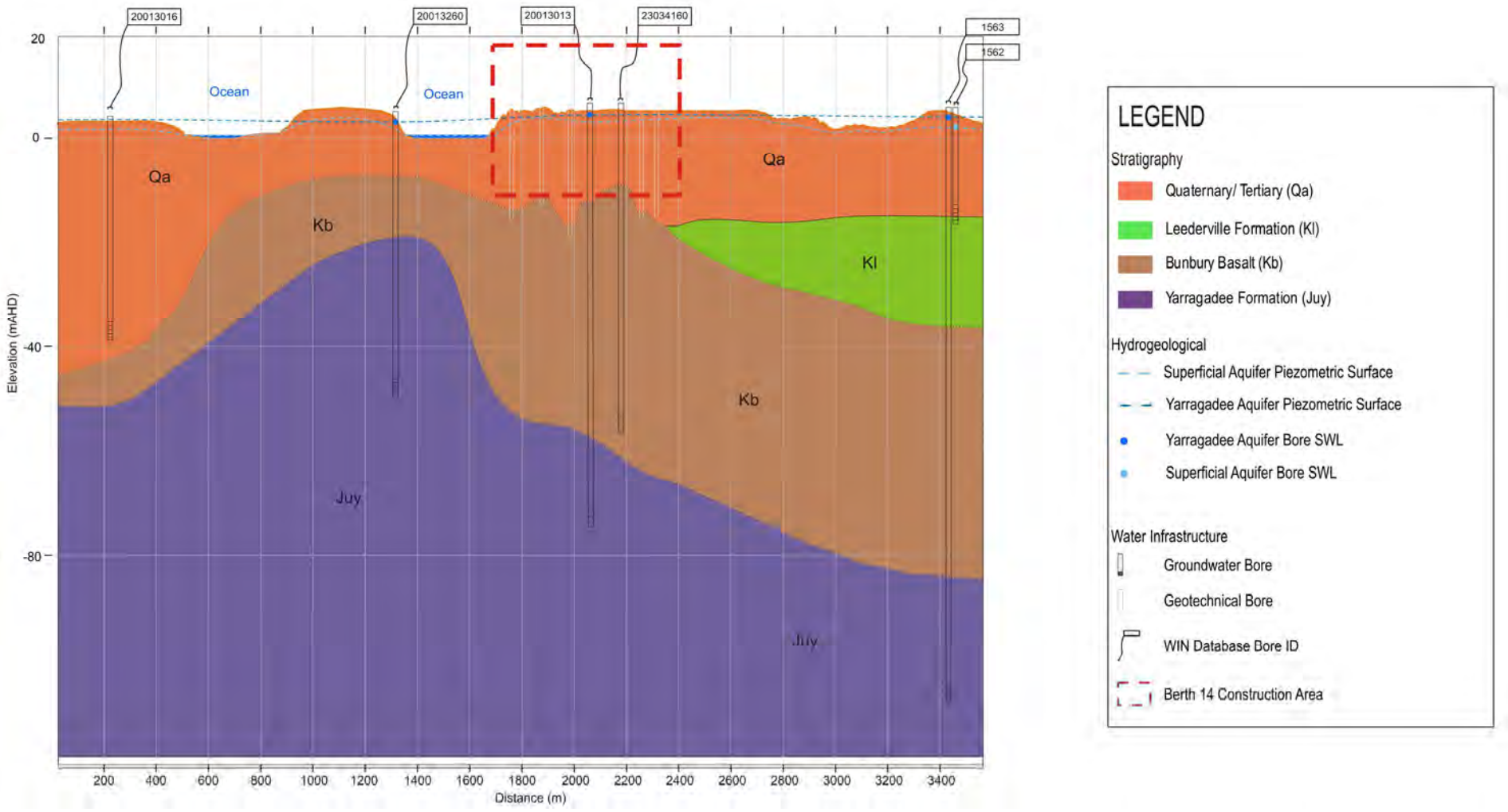


Figure 8.1 Cross section of Berth 14A

However, conclusions from the hydrogeological review indicate an upward hydraulic gradient exists from the Yaragadee to the superficial aquifer. Therefore the likelihood of saltwater intrusion into the Yarragadee as a result of breaching the confining basalt layer is very low.

Notwithstanding, geophysical surveys and data from geotechnical drilling suggest that large quantities of basalt is unlikely to be encountered in the dredge footprint (Refer to Technical Report 1 in Volume 2A). Therefore integrity of the Bunbury basalt is unlikely to be compromised during construction of Berth 14A and contamination of the Yarragadee Aquifer as a result of rock fracturing is not expected (Parsons Brinckerhoff, 2012b).

Disturbance of acid sulphate soil (ASS)

Dewatering and disturbance of acid sulphate soils (ASS) during construction may expose potential ASS to aerobic conditions leading to the acidification of soils and subsequently, acidification of the groundwater. Chapter 13 provides additional details regarding the extent and impact of ASS in the project area.

8.3.1.2 Aquifer drawdown

Dewatering during construction (including dredging) of the on-site infrastructure may result in drawdown of the superficial aquifer. It is considered unlikely that permanent aquifer drawdown will result as groundwater recharge in the area is thought to be dominated by tidal influences and dewatering activities will be localized and insignificant during the construction phase of the Project.

8.3.2 Operation

Generally, impacts on groundwater from operations within the Project area are not considered significant. As described above water quality in the Superficial Aquifer is variable due to historical and current land use, seasonal recharge and tidal influences in this location. The proposed operations will not alter this, with any stormwater and wash down collected treated.

The Yarragadee Aquifer is unlikely to be impacted by the proposed development due to the presence of the impermeable Bunbury basalt (Parsons Brinckerhoff, 2012b).

8.4 Management and mitigation measures

8.4.1 Construction

A Construction Management Plan (CMP) will be prepared, to identify management activities required to minimise the impact of construction activities on groundwater.

8.4.1.1 Contamination of groundwater

Integrity of confining basalt layer

As discussed in Section 8.3, the risk of encountering large quantities of unweathered basalt which require rock fracturing is considered low.

If required, rock fracturing and excavation activities would undergo comprehensive planning and design by experienced rock fracturing experts/engineers to determine the maximum blast energy to minimise the risk of breaching the Bunbury basalt.

Acid sulphate soil (ASS)

Prior to construction further investigations would be implemented to confirm the presence of ASS in areas of concern. An ASS Management Plan will be developed and implemented as part of the Construction Management Plan to identify management activities required to minimise the impact of ASS on the local environment from the Project activities, including dewatering.

8.4.2 Operation

8.4.2.1 Contamination of groundwater

Gross Pollutant Traps (GPT) will be installed to collect and treat stormwater prior to leaving the site.

Design of chemical storage areas will be in accordance with the DMP codes of practice and standards for storage of dangerous goods.

Preparation and implementation of an Environmental Management Plan that identifies the appropriate storage and disposal requirements to minimise the potential for leaks, spills or incorrect disposal of chemicals, hydrocarbons or wastes, including contaminated groundwater or runoff from areas of known contamination and management of spills.

The EMP will include a program for regular inspections of the storage areas to ensure integrity, good housekeeping and correct use of the area.

8.5 Predicted environmental outcome

Table 8.3 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Reduced integrity of the confining basalt layer	Design of rock fracturing and excavation activities to minimise blast energy.	Integrity of the Bunbury basalt is not compromised during construction activities.
Acidification of groundwater due to disturbance of acid sulphate soil during construction	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of water prior to disposal.	Appropriate management of acid sulphate soils during earthworks to avoid acidification of aquifer.
Abstraction of existing contaminated groundwater	Prior to dewatering to identify sources of contamination in groundwater on site. Collect and treat contaminated groundwater and dispose to appropriate licence facility	No discharge of contaminated water on site.
Operation		
Contamination of groundwater.	Design of hardstand areas to include GPT and sumps to treat stormwater prior to leaving the site. An operating EMP will identify actions for protection of groundwater from potential contamination sources.	No contamination of groundwater from operation of Berth 14A.

9. Marine environmental quality

This chapter discusses the existing marine water quality conditions of the marine environmental surrounding the Project and assesses the potential marine water quality impacts associated with the construction and operation of the Project. Mitigation measures and recommendations are also discussed in this chapter.

This chapter is based on the findings of the marine quality technical reports located in Technical Report 3 – Marine Environmental Quality Report prepared by Wave Solutions which is included in Volume 2A of this PER.

9.1 Assessment approach

9.1.1 Desktop review

A number of previous studies have been undertaken, on or behalf of BPA, as part of the development of the port, dredging and on-going environmental compliance. These studies include:

- water quality sampling undertaken between 1998 and 2006 (SKM 1998, 2002, 2005 and 2007a)
- sediment quality sampling undertaken between August 2001 and September 2010 (SKM 2001, 2003, 2004, 2007b, 2008a, 2008b, 2008c, 2009b, 2010a; 360 Environmental 2008)
- biota chemistry studies between September 2008 and February 2011 (SKM 2008b, 2009b, 2010b, 2010c and 2011).

These previous studies were undertaken using various techniques and provide a background to the existing nutrient composition, metal contamination levels, organic parameters, particle size distribution, existence of acid sulphate soil and biota chemistry in the surrounding marine environment.

An analysis of these previous studies was undertaken to determine information gaps relating to the existing environmental water quality features of the Project area and surrounds. Additional studies were subsequently undertaken to complete the data set, build on existing information and confirm findings from existing studies.

9.1.2 Marine environmental quality studies to characterise the existing environment

The following studies have been undertaken for the Project to describe the existing marine quality environment (refer to Technical Report 3 in Volume 2A of this PER):

- Study 1 – Water quality depth profiling
- Study 2 – Turbidity mapping based on MODIS Images
- Study 3 – Total Suspended Solids
- Study 4 – Rainfall and River Flow Study
- Study 5 – Surficial Sediment Grab Samples
- Study 6 – Sediment Quality (Physical and Chemical) Study
- Study 7 – Flushing Study of Inner Harbour and Koombana Bay
- Study 8 – Baseline Continuous Water Quality Monitoring

- Study 9 – Baseline Continuous Wave and Current Profiling
- Study 10 – Baseline Water Chemistry Monitoring
- Study 11 – Turbidity, Wave and Wind Analysis in Central Koombana Bay
- Study 12 – Dolphin baseline monitoring near Berth 14A.

A summary of the details and methodology for these studies is provided below. Technical Report 5 of Volume 2B of this PER should be referred to for further information.

9.1.2.1 Study 1 – Water quality depth profiling

A short term water quality study was undertaken to establish temperature, conductivity, pH, turbidity and dissolved oxygen levels throughout the depth within the Project area and surrounding marine environment.

This study was undertaken using a 'multi parameter sonde' during three sampling trips (21 July, 4 August and 10 August 2011). During these sampling trips water quality parameters were measured at various locations within Koombana Bay, adjacent to the Cut and along the path of the dredge material placement ground. These sampling locations are identified in Figure 9.1. Sampling was undertaken over the course of each day to record variability based on the influence of tides, waves and currents, and shipping movements on water quality.

Prior to final analysis, all data obtained from this sampling was passed through a quality control procedure with any suspect data being removed from the data set. The turbidity data was further analysed through an interpolation process, known as kriging, to create a prediction for the surface over the Project area and surrounds.

9.1.2.2 Study 2 – Turbidity mapping based on MODIS Images

A turbidity study was undertaken in 2012 to determine particular matter concentration and sediment parameters in the waters surrounding the Project area.

This study was undertaken using remotely sensed light reflectance measured in the red part of the spectrum, and a further calibration study, to identify the Total Suspended Mater (TSM) within the Koombana Bay. Water sampling was undertaken on 10 August 2011 at various locations around Koombana Bay and the location of the proposed dredge material placement ground. These samples were then sent to NATA accredited laboratory to be analysed for Total Suspended Solids (TSS).

The timing of water sampling was correlated with the passing of the MODIS (Moderate Resolution Imaging Spectroradiometer) satellite to calibrate TSS and therefore strengthen testing results. Final data from the MODIS was passed through a quality control procedure to ensure the quality of results.

Figure 9.1 Location of water quality parameter sampling

9.1.2.3 Study 3 – Total Suspended Solids

The objective of this study was to determine the TSS prior to the dredging activities that are to be undertaken for the Project. This study was undertaken with both an acoustic and optical analysis respectively.

The acoustic analysis involved the deployment of an Acoustic Doppler Current Profiler (ADCP) which along with measuring depth, current speed and direction provides non-intrusive estimates of TSS. Three of these ADCP's were deployed in Koombana Bay (11 May to 8 July 2011), adjacent to the Cut (11 May to 3 June 2011) and Geographe Bay (3 June to 8 July 2011). The use of the ADCPs were coupled with the deployment of a 'Nortek Acoustic Wavers and Currents' (AWAC) instrument which was deployed (from 11 July to 5 August) offshore, near the location of the proposed dredge material placement ground. Water sampling was also undertaken at the Koombana Bay, Geographe Bay and the proposed dredge material placement ground (on 8 June, 9 June, 8 July and 4 August) at various depths to further strengthen the results from the acoustic study. Analysis of this data gained by the ADCP and AWAC was undertaken by Sea Engineering Inc (SEI) using the MathWorks MATLAB software.

The optical analysis was undertaken to further develop a relationship between TSS and optical turbidity NTU and to determine the spatial variability of TSS. Water sampling was undertaken on 10 August 1011 at a number of locations from within and adjacent to the Project area. Water sampling was undertaken concurrently with measurements of optical turbidity levels and water depth by a YSI Incorporated Multiparameter Quality Sonde deployed as part of Study 1 (above).

9.1.2.4 Study 4 – Rainfall and river flow study

Another study (refer to Technical Report 3 in Volume 2A of this PER) was undertaken to investigation the relationship between rainfall and river flow from the Preston and Collie rivers both which discharge into the southern section of the Leschenault Estuary (adjoining Koombana Bay through the Cut). Rainfall data was obtained from the Bureau of Meteorology for the Bunbury Station (Number 009956). River flow data was obtained from the Department of Water for the Collie Rose Road (Number 612043) and Preston Boyanup Bridge (Number 611004) river monitoring stations. This data was subsequently graphed and analysed to determine the historic river flow levels (refer to Technical Report 3 in Volume 2A of this PER).

9.1.2.5 Study 5 – Surficial sediment grab samples

The purpose of this study was to investigate the baseline characteristics of the surface sediments through an analysis of particle size distribution (PSD) in Koombana Bay and the location of the proposed dredge material placement ground. Sampling of water was undertaken at Koombana Bay (on 7 July 2011) and around the location of the proposed dredge material placement ground (on 4 August 2011) using a 'grab sampling' method. These samples were then sent NATA accredited laboratory for analysis.

9.1.2.6 Study 6- Sediment quality (physical and chemical) study

The purpose of this study was to understand the existing physical and chemical characteristics of the marine sediment in the dredge footprint. Core samples were taken (on 26 July, 27 July and 4 August 2011) from the dredge footprint using a VibeCore instrument in accordance with National Assessment Guidelines for Dredging. The location of these core samples is shown in Figure 9.2. These core samples were sent to NATA accredited

laboratory for analysis. A similar study was conducted on the terrestrial component of the dredge footprint using a stem core auger drill to the bottom of the dredge profile.

Figure 9.2 Marine sediment sampling locations

9.1.2.7 Study 7 – Flushing time

A water flushing study was undertaken using the 3D hydrodynamic and transport model development for Berth 14A for Koombana Bay and the inner harbour to identify areas where residence time is high and water quality may be expected to be low.

A water flushing study was undertaken using the 3D hydrodynamic and transport model for Koombana Bay and the inner Harbour development for the dredging assessment of Berth 14A. This was used to identify areas where residence time is high and consequently water quality may be expected to be low and conversely.

9.1.2.8 Study 8 – Baseline Continuous Water Quality Monitoring

Continuous water quality loggers were deployed off shore (>6 m depth) at the Dolphin Discovery Centre, Power Station Beach and Central Koombana Bay from December 2011 to present to characterise turbidity and other key criteria to inform dredge monitoring.

9.1.2.9 Study 9 – Baseline Continuous Wave and Current Profiling

Continuous wave and current profiler was deployed at Central Koombana Bay from December 2011 to present to characterise wave height and currents and inform dredge monitoring and management.

9.1.2.10 Study 10 – Baseline Water Chemistry Monitoring

Sampling and analysis for metals and chlorophyll and depth profiles of physical chemistry conducted at 8 sites in Project area every six weeks from December to 2011 until present to characterise baseline water chemistry and inform dredge monitoring and management.

9.1.2.11 Study 11 – Turbidity, Wave and Wind Analysis in Central Koombana Bay

Analysis of wave height and wind speed on turbidity effects in central Koombana Bay to inform dredge monitoring and management

9.1.2.12 Study 12 – Dolphin baseline monitoring near Berth 14A

A passive acoustic monitoring program implemented to determine a 1-year baseline relative abundance and distribution of dolphins in the Inner Harbour and Koombana Bay using an array of continuous acoustic loggers that detect time stamped acoustic signal trains of dolphins in a local area. This baseline will be used to inform the assessment of project effects on dolphins during and after construction activities in the vicinity of the Inner Harbour.

9.1.3 Environmental protection approach

The environment protection approach used to manage the impacts of the construction and operational aspects of this proposal has been based on a risk management approach to manage uncertainty in achieving specified objectives. These objectives have been established by the EPA as set out in the Environmental Scoping Document for this Project (Assessment No. 1886). These objectives are listed in Table 9.1.

Table 9.1 Environmental factors and objectives relevant to the proposal (OEPA 2011, Assessment No. 1886)

Environmental factors	EPA Environmental Performance Objectives
Marine Environmental Quality	To maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected.
Marine Benthic Habitats	To maintain marine ecological integrity through protection, management and improved knowledge of benthic habitats, including benthic primary producer habitats.
Marine Fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse potential impacts and improvement in knowledge.

Environmental management of the proposed activities at Berth 14A are linked to the Environmental Values (EVs) and Environmental Quality Objectives (EQOs) (refer to Table 9.2) defined by the Western Australia EPA for Coastal Waters. These are aligned with the Perth's Coastal Waters: Environmental Values and Objectives, Environmental Protection Authority Position Statement (EPA, 2000). The framework is aimed at protecting the coastal waters of Western Australia from the effects of pollution. The framework EVs and EQOs guides both construction and operational aspects of the Project.

Table 9.2 Environmental values and environmental quality objectives for coastal waters (EPA 2000)

Environmental Values	Environmental Quality Objectives
Ecosystem Health	EQO1: Maintenance of ecosystem integrity (naturally diverse and healthy ecosystems)
Fishing and Aquaculture	EQO 2: Maintenance of aquatic life for human consumption (seafood safe to eat)
Recreation and Aesthetic	EQO 3: Maintenance of primary contact recreation values (waters safe for swimming) EQO 4: Maintenance of secondary contact recreation values (waters safe for boating) EQO 5: Maintenance of aesthetic values (pleasant, attractive environment)
Industrial Water Supply	EQO 6: Maintenance of industrial water supply values (water suitable for industry use)

9.1.3.1 Construction

The four Environmental values to be protected during the dredging program are those listed in Table 9.2. The EQO provides the basis for the risk management measures established in the Dredging and Spoil and Disposal Management Plan (DSDMP) (Refer to Technical Report 10 in Volume 2C of this PER). The Draft DSDMP has been prepared in alignment with the Commonwealth and State statutory guidelines in relation to dredging proposals.

The risk management system for construction has been guided by the statutory Environmental Assessment Guideline (EAG 7) for Marine Dredging Proposals in Western Australia (EPA, 2011). The guideline recommends the establishment of a spatially-based zonation scheme for proponents to use as a common basis to describe the predicted extent, severity and duration of impacts associated with their dredging proposals (EPA, 2011). The scheme consists of three zones that represent different levels of impact. EAG7 also outlines the proposed framework for monitoring which is fully described in Technical Report 10 in Volume 2C of this PER. An impact on benthic habitat is not anticipated from Berth 14A dredging operations due to low plume dispersion and absence of benthic habitat in Koombana Bay (refer to Chapter 10). Consequently, for the purpose of this Project a more conservative monitoring approach using in the Zone of Influence has been adopted. This Zone is the predicted extent to which the dredge plume may be seen by people up to 5% of the time in Koombana Bay (refer to Figure 9.7). The key values to be protected in relation to construction of Berth 14A are recreation and aesthetic value of Koombana Bay, fishing and aquatic animal health. These are reflected in the Environmental Performance Objectives (EPOs) stipulated for the Berth 14A assessment (refer to Table 9.1).

In order to manage uncertainty to as low as reasonably practicable in achieving the EPOs, a series of Implementation Strategies including for monitoring and reporting for the environmental aspects of the dredging program are presented in the DSDMP.

9.1.3.2 Operation

For the purposes of this assessment a draft Marine Environmental Management Plan (MEMP) at Berth 14A for coal export operations has been developed (Technical Report 11 of Volume 2C of this PER). The purpose of the MEMP is to provide information to the regulator and community on the proposed activity within the local and regional framework. The plan emphasises how the proposed operational activities at Berth 14A may impact on the relevant

environmental factors and how those impacts will be mitigated and managed to be environmentally acceptable. The MEMP has the following structure:

1. Describes the proposed activity.
2. Describes the receiving environment.
3. Defines Operational Environmental Performance Objectives (EPOs) for Berth14A MEMP.
4. Identifies potential impacts and risk management measures to reduce uncertainty in achieving EPOs.
5. Presents the Implementation Strategies to achieve the EPOs for Berth 14A MEMP.
6. Presents the monitoring and reporting protocols for each Implementation Strategy.

9.2 Existing environment

This section provides a summary of the existing water and sediment characteristics and quality based on previous studies and additional project specific studies discussed above. It also provides a discussion on rainfall and river flows which both influence the existing marine water characteristics and quality.

9.2.1 Marine environment overview

Figure 9.3 shows the location of key marine environmental areas relating to the Project Area. The Project area and surrounds is located within the Leschenault Catchment which is a complex hydrological network of natural rivers and artificial drains. The Leschenault Catchment includes the Wellesley, Brunswick, Ferguson and Preston rivers as well as the Collie River Catchment. The Preston and Collie rivers drain into a modified inlet, now estuary known as the Leschenault Estuary. Both the Preston River and Leschenault Estuary have been heavily modified by previous works which include river diversions, reclamation, and opening of the estuary (via 'the Cut') and creation of a separate inlet (known as the Leschenault Inlet). These works have been, in part to accommodate the creation of the Bunbury Port, on which the Project area is located.

The Leschenault Estuary is connected to the Koombana Bay, which connects to the Inner Harbour in which the Project Area is located. Koombana Bay is located within the Outer Harbour which extends to the off-shore marine environment. The off- shore marine environment includes the proposed dredge material emplacement ground which is to the north east of the Project Area.

9.2.1.1 Marine water characteristics and quality

Depth profiling

Little variation has been recorded in temperature, dissolved oxygen, pH and conductivity levels throughout Koombana Bay and offshore.

Temperature, dissolved oxygen and pH levels

Mean temperature levels within Koombana Bay were considerably constant for July to August and ranged from 14.86 to 15.86ºC. Off shore locations (such as the proposed dredge material placement ground) displayed greater variability in mean temperature levels (15.41 to 17.13ºC) and a slight reduction in temperature with depth.

Site boundary

Figure 9.3 Key marine environmental areas

Koombana Bay dissolved oxygen levels ranged from 7.1 to 8.27 mg/L, reducing slightly with depth, however little variability (0.13 mg/L) was shown in dissolved oxygen levels at off-shore locations. Koombana Bay exhibited a mean pH of 8.1 with the proposed dredge material placement area exhibiting a pH of 8.2.

Conductivity and turbidity levels

Mean conductivity levels within Koombana Bay ranged from 52,124 to 53,920 µS/cm with slightly higher levels recorded at the surface. Mean conductivity levels at offshore locations averaged 53,962 µS/cm.

Historically (from 2005 to 2010) turbidity levels, the highest average TSM levels within Koombana Bay were recorded during the third (July to September) and fourth (October to December) quarters with levels ranging from approximately 10 to 30 mg/L. The second quarter (April to July) had the lowest TSM levels (ranging from 4 to 15 mg/L) and the first quarter was quite variable with average TSM (ranging from 2 to 30 mg/L). Overall there has been a correlation between rainfall and river flow (with higher levels of rainfall resulting in higher levels of turbidity) from the Preston River and high TSM levels within Koombana Bay. Also there is a correlation between wind speed and direction and TSM levels within Koombana Bay, with high turbidity resulting from offshore easterly and south-westerly seabreezes.

Turbidity levels within Koombana Bay ranged from 9.6 to 316.1 NTU, with higher levels and variability in depths greater than 4 metres. Turbidity was less variable in offshore locations ranging 7.1 to 113.5 NTU with some variability at the surface.

These turbidity levels are influenced by the ebb tide which brings freshwater from the Leschenault Estuary, through the Cut into Koombana Bay. The highest levels of turbidity during the edd tide are located within the centre of Koombana Bay adjacent to the Cut and shoreline (approx. 2 kilometres from the Cut).

9.2.1.2 Water quality

Baseline water quality information is currently been collected on a monthly basis by Wave Solutions.

Nutrients

A previous analysis of nutrients has shown the following exceedences in the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality- Estuaries of SW Australia:*

- Nitrate (and nitrate levels) at the Inner and Outer Harbour surface waters in 2002
- Ammonium levels at all sampling locations in 1998, and Inner Harbour in 2006
- Orthophosphate levels at all locations in 2002, and Inner and Outer Harbour in 2006
- Total phosphate levels at all sites in 2002 and 2004
- Chlorophyll levels at Inner Harbour and the proposed dredge placement area in 2002 and Inner and Outer Harbour in 2004.

These higher nutrient levels are due to the harbour and channel being a natural trap for decaying seagrass and microalgae that is generally dislodged and transported by winter storms. In particular, the main channel has been found to contain 30% organic matter and high level of nutrients (SKM, 2001).

Metals

The previous analysis identifies the existing copper and other metals levels in the Project area and surrounds as follows:

- aluminium levels were above the environmental guidelines (ANZECC (2000)) (low reliability trigger value) at all locations
- all other metals were found to be below the 90% habitat protection level applicable for the harbour area.

These metal levels seem to be stable, with activities within the Inner Harbour not currently elevating metal levels in the marine environment.

9.2.1.3 Sediment characteristics and quality

Metals

An analysis of existing studies identified a number of exceedences, under the *National Ocean Disposal Guidelines for Dredged Material* (Environment Australia, 2002) (ODGDM), for metal contamination of sediment. Arsenic levels, above the screening level (20 mg/kg), were detected at the Inner Harbour, Outer Harbour and sites around Koombana Bay. The distribution of the elevated arsenic concentrations in water suggest this is naturally occurring outside of the Port area. They exist in the Inner Harbour and Outer Harbour through the Shipping Channel most likely due to tides, waves and shipping movements.

In addition to arsenic, previous studies have identified exceedences in nickel and cadmium in the Inner Harbour (2008 and 2009). However these exceedences have not been evident from any further studies after 2009.

Metal concentrations were identified by core sampling within the Project area with the highest variable levels shown in aluminium (ranging from 584 to 44,000 mg/kg) and iron (ranging from 1,300 to 52,000 mg/kg). There was little variation in antimony, cadmium, mercury, selenium and silver levels across the Project area. There were minor exceedences at two recorded locations for antimony (3 mg/kg) and one location for arsenic (21 mg/kg) and nickel (30 mg/kg).

Metal contamination concentrations within the proposed dredge material placement ground were analysed and identified to be below the screening level in accordance with the ODGDM.

Inorganic parameters

Inorganic parameters were sampled in the Project area and identified average ammonium levels of 4.62 mg/kg with typical higher levels (9 to 11 mg/kg) within the lower sampled levels. Total phosphorus ranged from 43 to 680 mg/L with little variation in total nitrogen, nitration and nitrite levels.

Organic parameters

Polychlorinated biphenyls, organochlorine pesticides and aromatic hydrocarbons were below detection levels in previous sediment quality testing undertaken in Bunbury Port.

An analysis of tributylin (TBT) levels, which is a common contaminant in ports due to the use of antifouling paints, were above screening levels (5 µg Sn/kg) in the ODGDM at Inner

Harbour and the proposed dredge material placement grounds. However, TBT was under the maximum levels at both of these locations.

Organochlorine and organophosphate pesticides were measured throughout the proposed dredge material emplacement ground. The organic levels were all below screening level (effects range-low) from the ODGDM.

Radionuclides

Radionuclides were measured at the location of the proposed dredge material placement ground. All samples were identified as below the radionuclides screening level (effects range-low) form ODGDM.

Particle size distribution

An analysis of PSD from previous studies shows the following:

- sediment in the Shipping Channel is predominantly less than 26 µm with a high organic content (28–35%)
- the Outer Harbour and Inner Harbours are both predominately medium silt with a very fine to medium sand and fine to course sand, respectively
- sediment to north of the Outer Harbour is predominately fine to medium sand and has a similar distribution at the surface and sub-surface.

The existing surface sediment contours identify the distribution of sediment throughout Koombana Bay as shown in Figure 9.4. Generally fine silt (50–65 µm) is distrusted in the centre of the bay with fine sand (66–250 µm) distributed from Koombana Beach along the entrance to Inner Harbour to the Power Station Beach and along the shipping channel around Casuarina Point. Medium sand (251–500 µm) and course sand (501–800 µm) extends from the opening of the Cut.

Surficial PSD at the location of the proposed dredge material placement ground shows a high average of high course sediment (>500 µm) with a low average of fine grain sediment (<250 µm).

Physical composition

Koombana Bay is predominately comprised of bare sand and silt with the exception of a line of reef on the north-eastern margin of the bay.

Studies undertaken within the Project area (refer to Figure 9.2 above) identify that the centre of Koombana Bay is characterised by fine silt (<65 µm) while fine sand occurs along Koombana Beach, along the entrance to the inner harbour and along Power Station Beach (66–250 µm) and coarse (501–800 µm) sand at the opening of the Cut. Shell fragments and/or twigs were found in the Project area reflecting its history as the former Preston River bed.

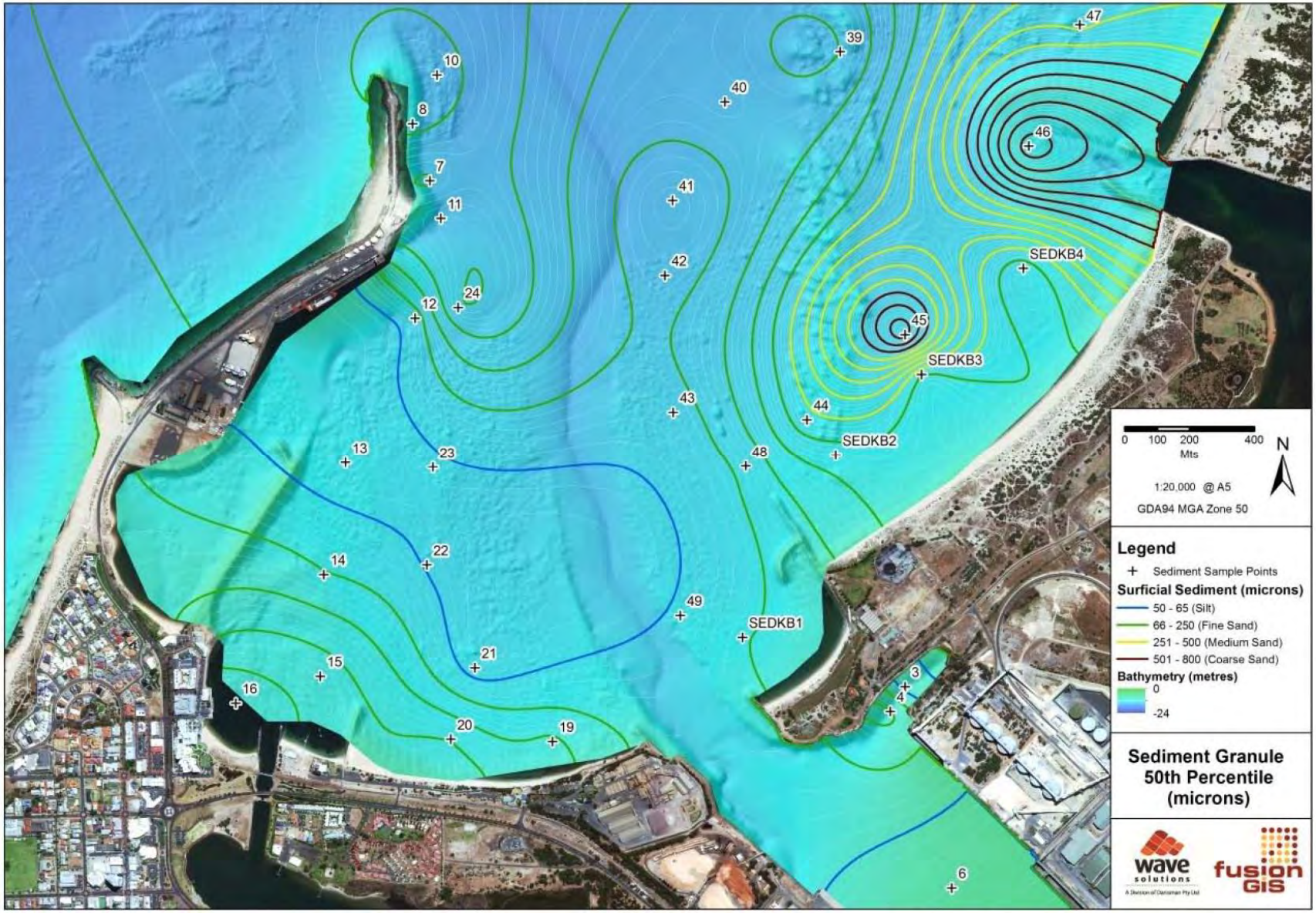


Figure 9.4 Surficial sediment map for Koombana Bay

Acid sulphate soil

Previous studies identify that the Project area is comprised of predominantly pyrite. Regional ASS risk mapping indicated that majority of the Inner Harbour has a high to moderate risk of ASS occurring, generally at depths of less than 3 metres. Further investigations (2009) have identified an absence of actual acid sulphate soils (AASS) but a presence of potential acid sulphate soils (PASS) located between 7 and 12.5 metres below ground level. These soils do not pose a risk to the surrounding environment unless exposed to oxygen.

Biota metal levels

An analysis of metal concentrations from biota (dissection of molluscs) indicated a number of exceedences in the relevant maximum level (ML) or generally expected level (GEL) food standard for molluscs (ANFA, 2005) including:

- arsenic levels at the Inner Harbour, Outer Harbour and Shipping Channel continuously exceeded levels
- copper in the Inner Harbour exceeded guideline levels
- mercury in some parts of the Inner Harbour exceeded guidelines
- selenium in the Inner Harbour, Outer Harbour and the shipping channel exceeded guidelines
- zinc at the Inner Harbour, Outer Harbour and the Shipping Channel exceeded guidelines.

These results are to be expected having regard to metal levels naturally occurring in the surrounding seawater (discussed above).

9.3 Impacts

9.3.1 Construction

The direct and indirect impacts attributable to dredging are expected to be due to

- the uncontaminated nature of sediments within the dredge footprint
- the negligible occurrence of benthic habitat in the Inner Harbour and Koombana Bay
- the highly turbid existing environment in Koombana Bay and surrounds.

The discussion below provides a summary of the construction impacts as they may impact on the marine environmental quality.

9.3.1.1 Flushing time

The water flushing study was undertaken for Koombana Bay and the inner harbour indicated that the e-folding times were relatively fast in Koombana Bay, ranging from 3.7 to 6.7 days however was slower in the inner harbour, ranging from 37 to 92 days.

The analysis also indicated that e-folding times varies seasonally and depends on the wind characteristics occurring with the lowest seasonal flushing rates are predicted during May (refer to Figure 9.5).

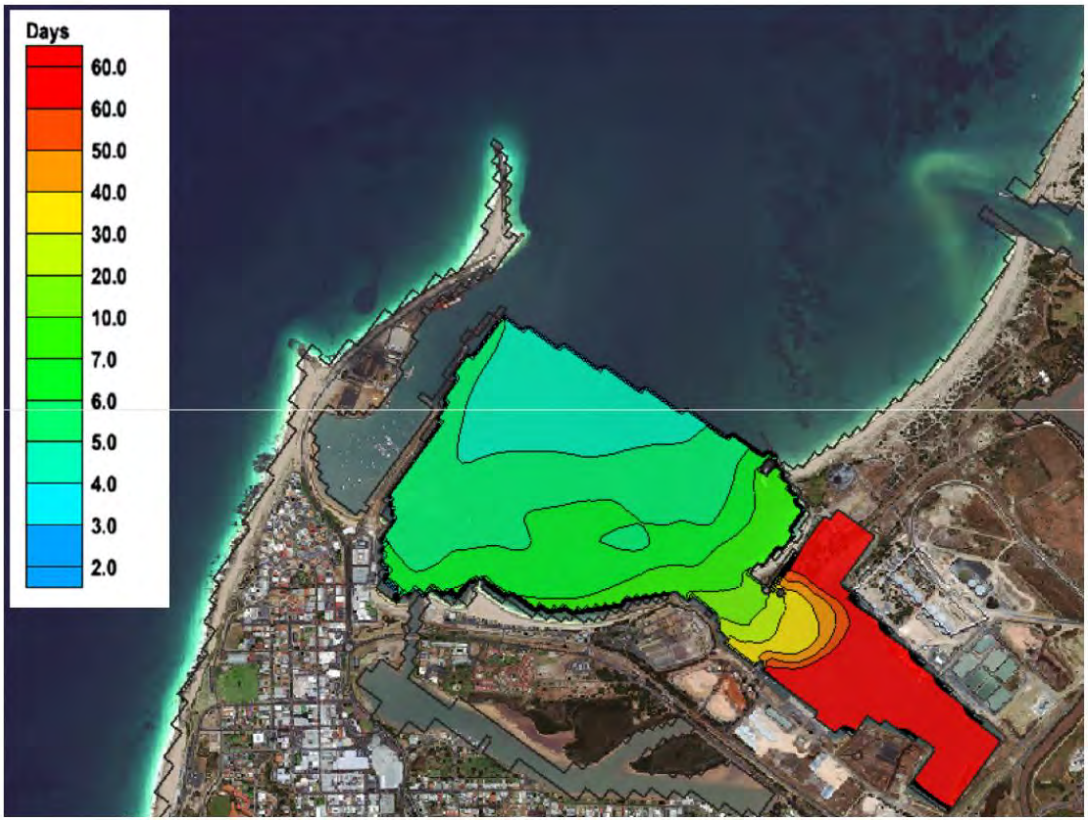


Figure 9.5 E-folding times for the May 2009 (worse case)

The study provided the basis for designing the sampling plan for baseline water and sediment quality monitoring (Technical Report 10 of Volume 2C of this PER) in Koombana Bay. Technical Report 3 of Volume 2A of this PER provides more information on the impacts of flushing.

9.3.1.2 Turbidity and TSS

Dredging activities are expected to create a dredge turbidity plume throughout the Inner harbour and south eastern portion of Koombana bay, extending partly along the Koombana and Power Stations beaches. Characteristics of this plume would include increased turbidity and TSS concentrations.

It is predicted that the dredge plume would only extend seaward for approximately 25% of the dredge period (Refer to Figure 9.6). For the purposes of this project the 10 mg/L contour represents the predicted limit of the Zone of Moderate Impact in accordance with EAG 7. However, the dredge period in combination with low flushing regime in Koombana Bay may have the potential to induce changes in other physico-chemical and biological characteristics of water quality during the dredging period and for a short period thereafter. Figure 9.7 illustrates contours showing depth-averaged concentrations exceeded 5% of the time based on a 40 week simulation. The 2 mg/L contour, which is the lowest limit of visible detection is contained within the outer harbour for this simulation. This represents the predicted limit of the zone of influence in accordance with EAG 7.

Figure 9.6 **Predicted zone of moderate impact represented by the 10 mg/L contour. Concentrations are in excess of ambient TSS concentrations**

Figure 9.7 **Predicted zone of influence boundary represented by the 2 mg/L contour. Concentrations are in excess of ambient TSS concentrations**

9.3.1.3 Chemicals of potential concern (COPCs)

Analysis of dredge sediments has indicated that chemicals of potential concern (COPCs) are not likely to occur in concentrations that would impact water quality. However, based on the known chemical characteristics of dredge sediment, there is potential for increased organic matter, associated nutrients and dissolved materials other than COPCs to be contained within the pore water and fine sediments of the dredge material. This material may be mobilised into the water column during dredging. Increased concentrations of nutrients and other chemical characteristics may result in a build-up of algal blooms etc. in areas of Koombana Bay where lower flushing occurs. Monitoring of metals and other water and sediment quality criteria will be undertaken prior to and throughout the dredging program in Koombana Bay to ensure compliance with specified trigger levels in the DSDMP (Technical Report 10 of Volume 2C of this PER).

9.3.1.4 Sedimentation

Sedimentation risks to the environment are considered to be minor during construction. Outside the Inner Harbour, sedimentation resulting from dredging is not expected to exceed 1 mm. However, the existing distribution of fine fraction sediments within Koombana Bay indicates that the central portion of the Bay including the shipping channel may present a natural location of increased deposition of fine fraction materials, which could potentially be exacerbated by maintenance dredging and shipping operations. This location is not predicted to affect benthic habitats or recreational and local tourism ventures such as the Dolphin Discovery Centre, due to their distance from the affected area.

Material proposed to be excavated below sea level in both the terrestrial and marine dredge footprints at Berth 14A has been assessed and determined as compliant with NAGD (2009) criteria. Consequently, potential impacts associated with the effects of COPCs on sediments in Koombana Bay are considered to be very low and this material is deemed suitable for unconfined ocean disposal.

- water column disturbance due construction and operation
- modelling results (spoil disposal areas)
- reduction of Infiltration rates
- sea Bed Disturbance due to Ocean disposal of dredging spoil
- loss of Topsoil
- groundwater pollution from inadequate material handling and storage.

9.3.2 Operational impacts

9.3.2.1 Vessel movements

The main operational impact of the Project on marine environmental quality would be the increased number of vessels (approximately 275 per annum) in the inner harbour and surrounds. An overall increase in ship movements would lead to an increased in turbidity and TSS.

Fewer vessel movements will result from the operational phase of the Project than from the construction phase. Additional vessel movements as a result of the Project will follow the current shipping channel. It is estimated that an additional 275 trips to the port per annum will be required. Currently approximately 400 trips are made to the port each year.

9.3.2.2 Coal dust

As part of the air quality model, a spatially predictive annual coal-dust dust deposition of total suspended particulates (TSP) was prepared. This model was developed as a predictive tool in an air quality assessment conducted for the proposed Berth 14 development (Technical Report 9 in Volume 2B of this PER). The modelling found that the increase in monthly dust deposition above existing baseline (ambient) conditions due to fugitive coal dust emissions from Berth 14 operations would be less than 0.1% at Dolphin Discovery Centre, 1.1% at Beacon 3 and 1.7% at Beacon 10. Therefore, coal dust emissions under normal operating conditions represent an insignificant addition to the ambient dust deposition in Koombana Bay and adjoining marine environs. Coal dust does not have a significant impact to water quality trace metal values compared to ambient conditions.

9.3.2.3 Sheet piling

Sheet piling to retain land within the new berth may be considered during detailed design with impressed current cathodic protection used to protect immersed steel from corrosion in the marine environment.

9.4 Management and mitigation

9.4.1 Construction

The marine environmental quality will be managed during construction in accordance with the dredge contractors CEMP and the final DSDMP. A draft DSDMP has been provided as Technical Report 10 in Volume 2C of this PER which provides detailed implementation strategies for each of the proposed monitoring programs. The draft DSDMP will be updated following engagement of the dredging contractor and prior to any dredging works commencing. The DSDMP sets out the means by which the dredge plume will be managed to conform with the zone of influence established for the Project. Lanco commits to developing a monitoring program that conforms with the zones of impact in accordance with EAG7.

The DSDMP commits Lanco to the monitoring of the following during construction:

- one year of baseline data (completed)
- dredge plume extent
- turbidity from the dredge plume
- water and sediment quality parameters
- dolphin monitoring.

Lanco also commits to protecting the relevant social environmental values (e.g. recreation, aesthetics, fishing and aquaculture) during the construction phase of the proposal within Koombana Bay. A monitoring program, including management strategies to be implemented if these values are not being protected, will be developed in liaison with BPA and to the satisfaction of the OEPA prior to construction.

9.4.2 Operational

A marine environmental management plan (MEMP) has been developed in close collaboration with BPA to provide an auditable commitment to practical and achievable strategies and design standards for the management of Berth 14A during the operation

phase. The MEMP has identified environmental values (EVs), environmental quality objectives (EQOs) and associated environmental levels of ecosystem protection (LEP) identified by the EPA (2000) have been used as guidance for the environmental framework of the MEMP.

Bunbury Port has been an operational Port for many years. This PER has suggested an interim Moderate LEP (Lanco management) (refer to Figure 9.8) for a 250 m radius around the operational area of the Project. An interim moderate LEP (BPA management) has also been identified within the inner harbour. The identified LEPs overlap due to use of the inner harbour by other port users however the management of this is under the operational control of the Port.

A copy of the MEMP has been provided as Technical Report 11 in Volume 2C of this PER however the marine environmental performance objective for operation of Berth 14A has been divided into four key areas, of which the following are relevant to marine environmental quality:

- Operational discharges.
  - Lanco are committed to regular audits of Berth 14A water management system including capture, treatment and outfall components of discharge points, waste management streams collection, recycling and disposal systems.
- Spills and leaks
  - Lanco are committed to monitoring any impacts associated with material being spilt, blown or unintentionally placed into marine waters from wharf and vessel hatches may occur in the Inner Harbour during loading.
  - All significant spills/releases occurring at Berth 14A during ship loading will be recorded by the proponent.
  - Lanco will undertake coal surveys to identify if coal deposition on adjacent beaches and other downwind sensitive sites is occurring.
- Maintenance activities.
  - Lanco will record any significant releases occurring at Berth 14A
  - Any complaints received from adjoining landholders or recreation users relating to general maintenance activities on Berth 14A will be recorded in a complaints register and investigated within 48 hrs.

Site boundary

Indicative turning circle

BPA interim moderate level of ecological protection

Lanco interim moderate level of ecological protection

Figure 9.8 Levels of ecological protection

Note: All other marine waters – interim high level of ecological protection.

9.5 Predicted environmental outcome

Table 9.3 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Activities associated with dredging	Dredging and Spoil Disposal Management Plan	Maintain primary and secondary contact, water quality conditions for moderate levels of ecological protection as defined in the MEMP.
Operation		
Operation discharges	Preparation and implementation of a marine environmental management plan	Conformation of the water quality criteria for moderate levels of environmental protection.

The predicted environmental outcome is to achieve the EPA Objectives established for this Project as listed in Table 9.4.

Table 9.4 Environmental factors and objectives relevant to the proposal (OEPA 2011, Assessment No. 1886)

Environmental factors	EPA Objectives
Marine Environmental Quality	To maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected.
Marine Benthic Habitats	To maintain marine ecological integrity through protection, management and improved knowledge of benthic habitats, including benthic primary producer habitats.
Marine Fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse potential impacts and improvement in knowledge.

10. Benthic habitat

This chapter defines the local benthic habitat and identifies the potential impacts on the habitat due to the construction and operation of the Project, including off-shore disposal area.

This chapter is based on the findings of the marine quality technical reports located in Technical Reports 5 and 6 prepared by Wave Solutions which is included in Volume 2B of this PER.

Benthic primary producer habitats (BPPH) are seabed communities within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals or combinations of these groups are prominent components. Benthic primary producer habitats also include sections of seabed that can support these communities.

10.1 Assessment approach

Assessments of the local benthic habitat have been undertaken in accordance with the *Environmental Assessment Guideline No. 3 Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment*.

10.1.1 Desktop review

A desktop study of previously prepared reports on the Bunbury Port and surrounding area was undertaken to determine the composition of sub tidal benthic marine flora and vegetation in the Project area as well as any gaps in the previously prepared data.

A multi-spectral image of the area surrounding the Project was captured on 2 November 2010 and was used as the base assessment of benthic habitats (refer to Figure 10.1). The image has a ground sample detection of 1.8 m and includes four spectral bands covering the blue, red, green and near infrared wavelengths (450–895 nm).

From the image's pixels, an automated GIS algorithm was used to separate the marine habitats in the image into areas of reef and sand and more highly resolved benthic habitat features. The locations of these discrete habitats were then used to identify a sampling plan for the benthic habitat surveys.

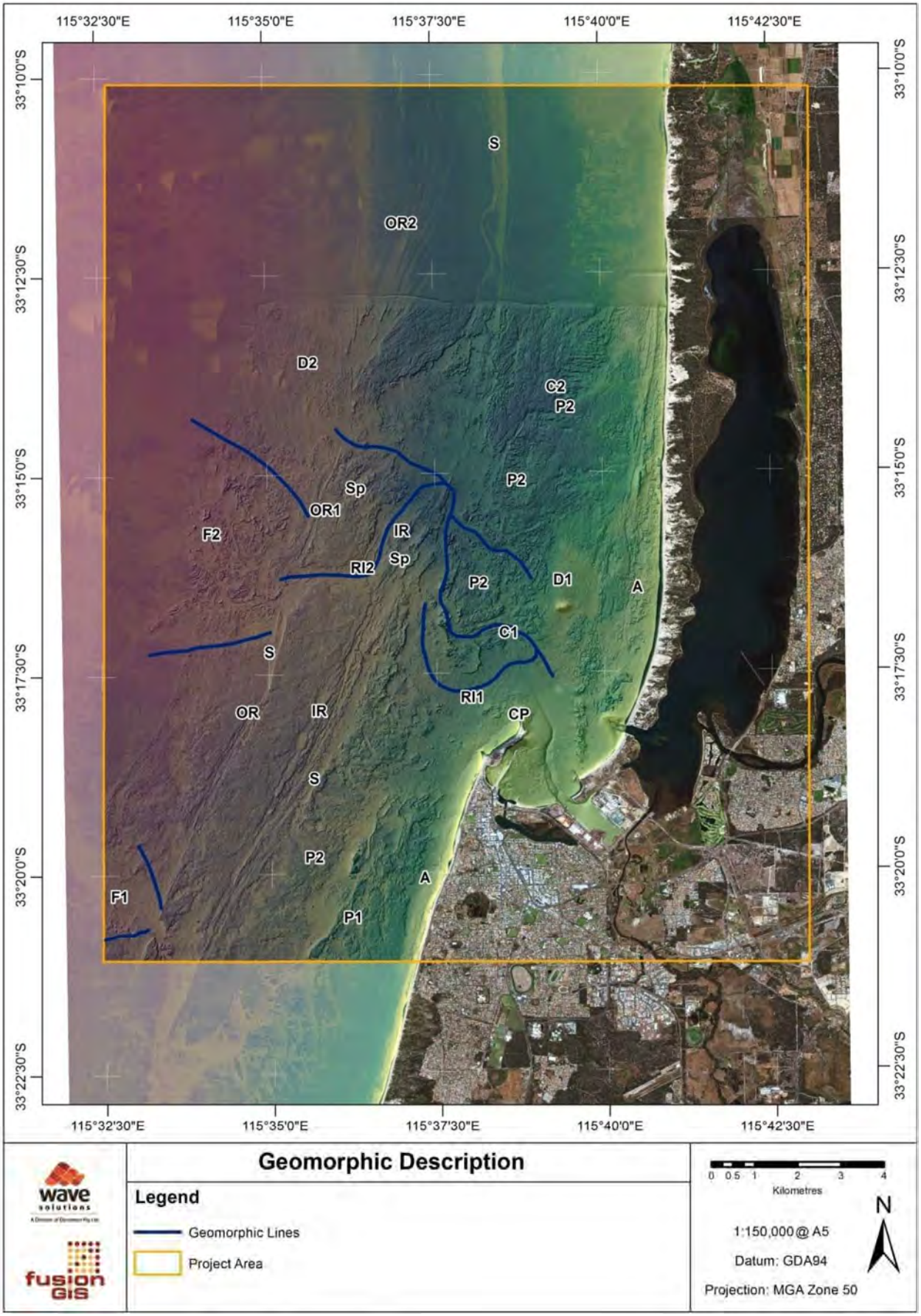


Figure 10.1 Sub tidal geomorphology of the Project area and surrounds

10.1.2 Ground-truthing of benthic habitats

A sampling plan was identified to ground-truth the discrete habitats identified from the benthic feature assessment of the high resolution image of the Project area. A number of sites (132) between the depths of 4 and 27 m were selected to cover the spatial extent of the Project area with a higher density of sampling sites in Koombana Bay and at the offshore dredge spoil disposal location which are the two locations are most likely to be impacted by the Project.

The field survey was undertaken by Wave Solutions in conjunction with Neptune Marine Services between 13 and 18 July 2011 in the Neptune Marine Services vessel 'Cross Country'. A remotely operated vehicle (ROV) equipped with a high-resolution 520 line, low light camera with a 270° range of view and high intensity LED lighting was utilised to record images using an iamm NTR83 HD multi-codec media player.

10.1.3 Analysis of benthic habitats

Images collected from the remote operating vehicle (ROV) were assessed using the EventMeasure program by the Centre for Marine Futures at the University of Western Australia.

The substrata occurring at each site was first subdivided into one of six categories: sand, bioturbated sand, sand inundated reef, low profile reef, medium profile reef and high profile reef. Biotic composition was then grouped into one of 26 biotic groups that included four abiotic and 22 biotic groups. Any samples that were identified as 'unknown' by the program were later classified into specific taxa groups in consultation with recognised experts.

10.1.4 Habitat modelling

Outputs from the image analysis provided data for the application of 'supervised classification procedures' to enable a prediction of the spatial abundance of benthic species across the Project area.

Habitat modelling was undertaken to determine the distribution of benthic habitats. For habitat modelling, biotic groups were separated into the following functional groups:

- canopy forming algae
- foliose algae
- Turf algae
- *Posidonia* spp.
- *Amphibolis* spp.
- other seagrass
- filter feeders
- abiotic groups (sand, bioturbated sand, bare rock, sand inundated reef).

10.1.5 Mapping

A quantitative benthic habitat map of the Project area was compiled (Refer to Technical Report 5 in Volume 2B of this PER) with the accumulated data. This map will be used as a baseline for BPPH loss assessment predictions that are required to determine the effect of dredging on the benthic habitats in the area.

10.1.6 Benthic Primary Produce Habitat Loss Assessment

Benthic habitats may be potentially impacted directly by the dredging process and/or indirectly as a result of the movement of the sediment plume into areas where benthic communities occur (EPA 2010).

The quantitative benthic habitat map was assessed and used to determine the direct impacts of dredging within the dredge footprint, an area of 13 ha.

A hydrodynamic modelling report was prepared to determine the movement of sediment as a result of dredging for the Project. Outputs of the model were used to determine the indirect impacts of dredging. Details of the sediment transport model are located in Technical Report 8 of Volume 2B of this PER.

10.2 Existing environment

Benthic habitats are those areas of seabed below the highest astronomical tide that support living organisms and influence the distribution and abundance of benthic primary producers and associated fauna. In coastal areas, they are often characterised by a high degree of spatial and temporal variance. They provide shelter, protection, food, and substrate for different life stages in coastal and offshore fisheries and for other marine fauna.

The substrata and coastal geomorphology of the Project area is characterised by a series of discontinuous limestone ridges (1 to 2 m high) that occur parallel to the coast. These ridges separate the Project area into natural sectors including a nearshore lagoon, nearshore and midshore reef system and offshore reef and sand areas.

The seabed topography is primarily reef. Unconsolidated fill may be located in bare areas of seabed between irregular and prominent surfaces, as well as on the active shore where sediments comprise the present day beach and dune systems. Overall, however, there is a limited amount of unconsolidated sediment on the 7 to 10 km of shelf that comprises the Project area, except along the shore.

The distribution of subtidal benthic biota occurring in the vicinity of the Project is shown in Figure 10.2.

Biotic coverage was typically low with an average of 32.0% across the Project area. Coverage varied with substrata, with reef (51.1%) and sand inundated reef (52.8%) having higher biotic coverage than sand areas (25.0%). Biotic coverage was also generally higher in the northern half of the Project area compared to the southern part of the Project area.

The biotic groups observed in this assessment are persistent with very little seasonal change in biotic coverage at a community level (Andrew 1999; Wernber et al. 2003).

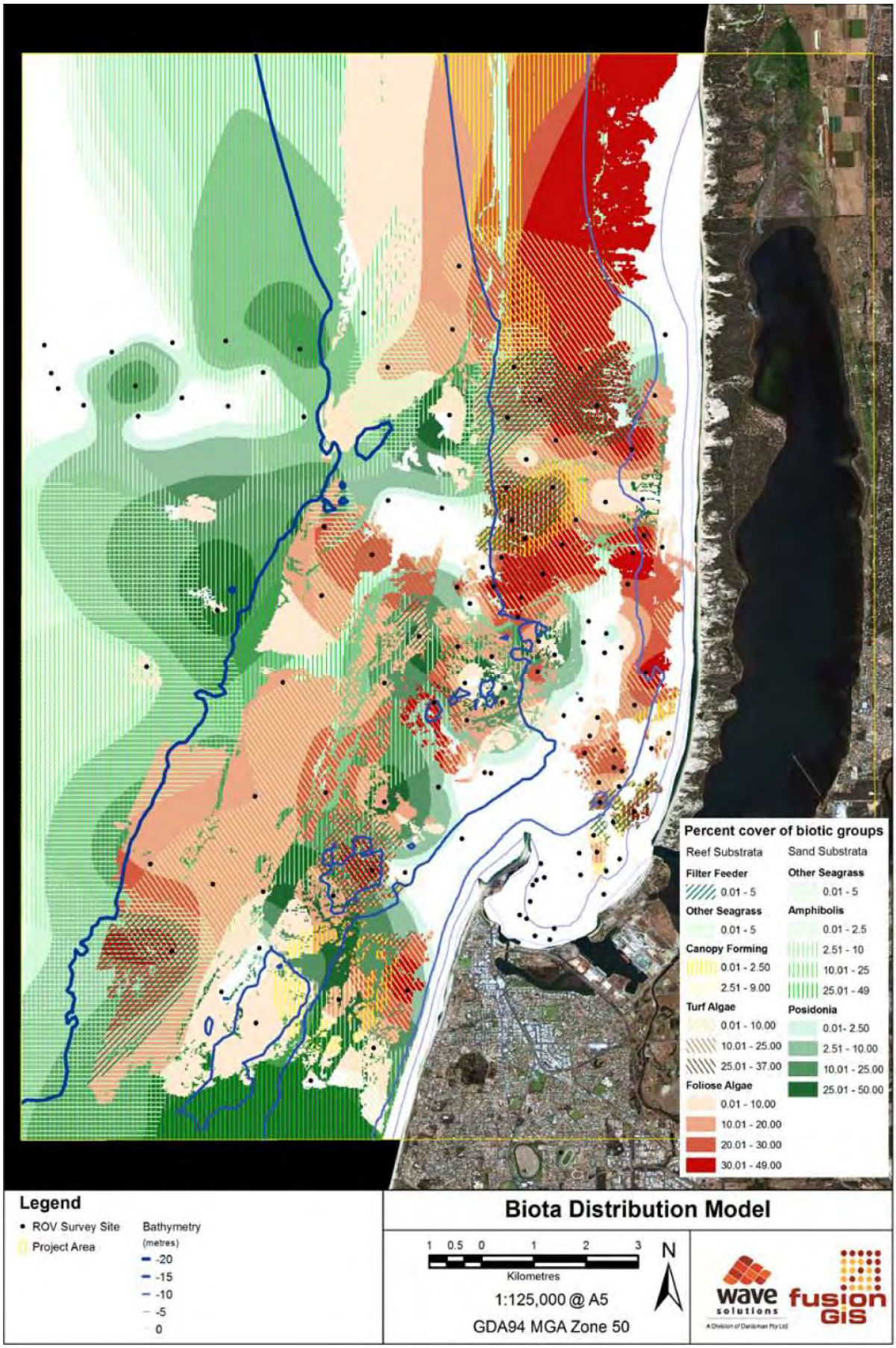


Figure 10.2 Quantitative habitat map showing distribution of benthic habitats

A summary of benthic assemblages identified across the Project area is included in Table 10.1.

Table 10.1 Benthic assemblages observed in the Project area

Benthic assemblages	Associated substrata	General location and density
Canopy forming algae	Reef	<2.5% across the Project area; 2.5–10% in 2 areas located on the deeper side of the nearshore reef complex, approximately 5 km north of Casuarina Point
Foliose Algae	Reef	25–50% coverage on the north nearshore, and 10–25% in the south nearshore and midshore
Turf Algae	Reef	Up to 50% across the Project, most abundant on nearshore and midshore complexes in the central part of the area, and nearshore on the eastern margin of Koombana Bay
Posidonia spp.	Sand	<10% considerable distance from shore, at least 9 m depth
Amphibolis spp.	Sand, some reef pavement	<10% considerable distance from shore, at least 9 m depth
Other seagrass	Sand	Limited distribution, mid-shore and offshore complexes in at least 12.5 m depth
Filter feeders, predominately sponges	Reef	2.5% across the Project; 2.5–10% on the nearshore north of 'The Cut' and on the midshore

White mangroves are present in the Leschenault Inlet and represent the most southerly occurrence of this species in Western Australia. The Leeuwin current is thought to be responsible for the occurrence of this species in the inlet through the delivery of seedlings and warm water.

The two areas most likely to be impacted by the Project are Koombana Bay and the offshore disposal location. More survey locations were assessed in these two specific areas to improve confidence in these results.

10.2.1 Koombana Bay

Koombana Bay is dominated by bare sand with one area of reef (approximately 15 ha) on the north-eastern margin of the bay. The dominating sand habitats in Koombana Bay had low biotic cover (<2%) with trace amounts of foliose and turf algae.

The reef habitat on the eastern margin was observed to have 29.1% biotic coverage, primarily foliose algae (22.0%) with some canopy algae (5.8% coverage of *Ecklonia radiate*).

No seagrass or sponges were observed in the bay. However, sponge gardens (6.0% coverage) were observed on the reef areas just north of Koombana Bay and 'The Cut', the manmade opening of the Leschenault Estuary to the Indian Ocean.

Sediment characteristics are assessed in detail in Chapter 9. The opening of the Leschenault Estuary to the Indian Ocean at The Cut and the realignment of the Preston River allowed the construction of the Inner Harbour, but also removed the capacity for normal estuary sediment filtration processes to occur in the lower reaches of the Leschenault Estuary. The discharge of water is from the central mud-basin of the estuary and is estimated to deposit an average of 210,000 m^3 of sediment in Koombana Bay each year

(Shore Coastal 2009). Over 50% of this sediment is delivered from the estuary via The Cut (Matt Eliot, Damara WA pers.comm 2011).

Microphytobenthos are photosynthetic algae with a high turnover rate that may exist on the bare sand of Koombana Bay. The productivity of microphytobenthic communities are known to be negatively affected by reductions in light availability, reductions in temperature and increases in sediment re-suspension (Barranguet et al 1998; Sundback et al 2000; Schreiber and Pennock 1995). Koombana Bay has low light availability and is subject to continued re-suspension of surface sediments. It is therefore unlikely to have a substantial population of microphytobenthos.

10.2.2 Offshore disposal location

The offshore disposal location is described in section 5.2.2.1 and is approximately 8.5 km directly west offshore and approximately 13 km north-west of the Inner Harbour in -22 m CD (Refer to Figure 5.3). Sand was the only substratum occurring in the location; no reef substratum was identified. Biota coverage on the sand at the proposed disposal location was low (12.2%) with biotic groups including *Amphibolis griffithii* (6.65% cover) *Posidonia angustifolia* (4.00% cover) and turf algae (0.13% cover).

10.3 Impacts

Almost all marine development proposals will result in some loss of benthic habitats. The Project will require dredging and potential ocean disposal of dredge spoil of up to 2.7 million m^3 of material. Sediments introduced to the water column by dredging may indirectly impact benthic habitats.

The disposal of dredge material is proposed to occur in Commonwealth water, and so is assessed through a separate Commonwealth approvals process and does not form part of the assessment of this PER.

10.3.1 Construction impacts

10.3.1.1 Direct impacts

The area directly affected by dredging is the dredge footprint located at Berth 14A that covers approximately 11.5 ha. The Inner Harbour is an artificial harbour and consists of sandy silt substrata with no biota. The depth of the Inner Harbour is maintained through regular maintenance dredging. No BPPH are likely to be directly impacted by dredging for the Project.

The white mangroves in the vicinity of the Project represent the most southerly population of the species in Western Australia. The location of the mangroves in the Leschenault Inlet means the population will not be impacted by the proposed development activities.

10.3.1.2 Indirect impacts

Indirect impacts of dredging result from the movement of sediment into areas where benthic communities exist. For the purposes of determining loss of benthic habitat, irreversible loss is defined as the inability to return or recover to a pre-impact state within a timeframe of five years (EPA 2010).

Dredging increases water turbidity levels through an increase in total suspended sediments (TSS) in the water column and an increase in sedimentation. Elevated TSS leads to a decrease in water transparency and a corresponding decrease in light that is available to benthic communities, which can affect their photosynthetic capacity. Suspended sediments can cause abrasion to soft tissues and interfere with filter feeding mechanisms (Philipp and Fabricius 2003; Erftemeijer and Lewis 2006). Increased sedimentation from dredging may also smother benthic fauna and hinder prey capture in sessile invertebrates (Philipp and Fabricius 2003; Erftemeijer and Lewis 2006).

Dredging to be undertaken for the Project may result in a sediment plume predicted to be largely confined to the Inner Harbour (an artificial harbour) with limited dispersion into Koombana Bay. Where the plume does extend into the bay, the suspended sediment concentration is approximately 1 mg/L. The turbidity of Koombana Bay regularly exceeds 20 mg/L, therefore 1 mg/L is considered negligible.

Loss of benthic habitat may result where the organisms' biological threshold of TSS is exceeded due to the cumulative impacts of dredging and background turbidity. The biotic groups that occur in Koombana Bay include foliose algae, turf algae and filter feeders. Similar communities are located to the north of Koombana Bay, adjacent to The Cut, where they are exposed to highly turbid waters from the Leschenault Estuary. Therefore, it is unlikely that cumulative impacts of the Project and background turbidity would cause a loss of habitat within Koombana Bay.

Although it is unlikely that microphytobenthos exist in Koombana Bay, the algae are characterised by high productivity and turnover rates on the order of 4 to 10 days (Sundback et al 2000; Webster et al 2002). Therefore, any microphytobenthos that may be lost due to indirect effects of dredging would rapidly recover.

The EPA has developed a spatially-based zonation scheme for proponents to use as a common basis to describe the predicted extent, severity and duration of impacts associated with their dredging proposals. The scheme consists of three zones that represent different levels of impact: EAG7 outlines the proposed framework for monitoring.

The Zone of Influence (ZOI) for dredging at Berth 14A is shown in Figure 10.3. These contours have been determined from the Hydrodynamic Model (Refer to Technical Report 4 in Volume 2b of this PER) to determine how these were derived. The 2 mg/L contour has been selected as the boundary of the ZOI for the Berth 14A development as this concentration of total suspended solids is approximately the lowest limit of visible detection which is appropriate for Koombana Bay where social impacts are of key concern as no impacts on benthic habitat are anticipated due to its absence in the Bay. The modelling predicts the extent of the Zone of Influence depicted in Figure 10.3 may occur 5% of the time (Refer to Section 9.3.1.2 and Figure 9.7).

The Zone of Moderate Impact (ZOMI) for dredging at Berth 14A is also shown in Figure 10.3. The 10 mg/L contour has been selected as the boundary of the ZOMI for the Berth 14A. This is equivalent to the ANZECC criteria for Water Quality Guideline trigger values for turbidity levels in estuarine systems of approximately 6 NTU based on the calibration derived in the baseline water quality monitoring in Koombana Bay. The modelling predicts the extent of the Zone of Moderate Impact may occur 25% of the time (Refer to Section 9.3.1.2 and Figure 9.6).

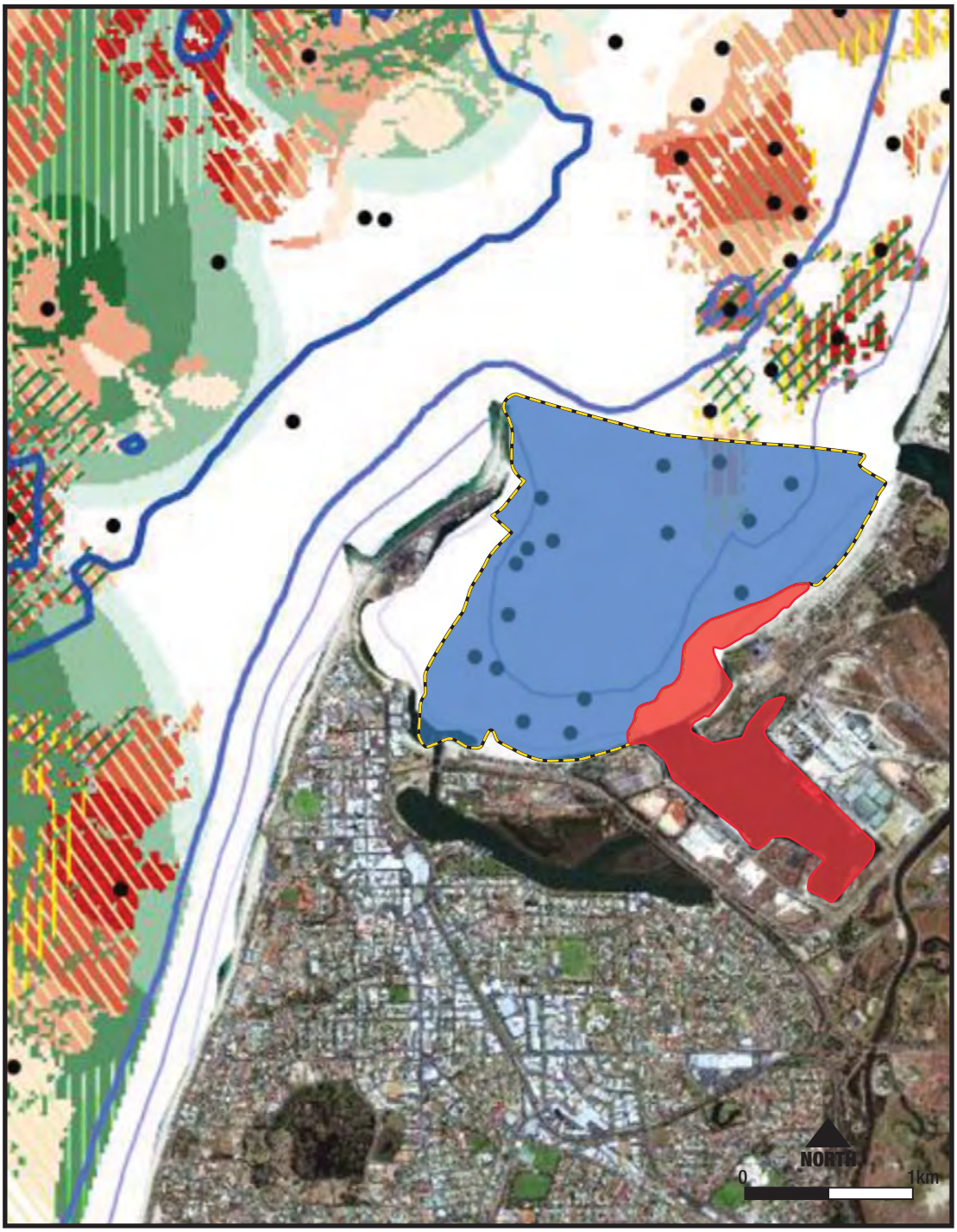


Figure 10.3 Predicted zone of impact

10.3.2 Operational impacts

All vessels used for the operational phase of the Project will utilise the existing shipping channel. No operational impacts on the benthic habitats in the Project area are expected as a result of the operation of the Project.

10.4 Management and mitigation

The assessment of benthic habitat did not identify any impacts that could potentially impact benthic habitat during construction or operation. Consequently, there are no specific mitigation or management measures to the preservation benthic habitat that would be required during the construction or operational phases of this project. It is proposed however to include some monitoring of benthic habitat during construction within the dredging and spoil disposal management plan.

10.5 Predicted environmental outcome

Table 10.2 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Loss of benthic habitat due to dredge impacts.	Dredging and Spoil Disposal Management Plan including identification of site suitable for the monitoring of benthic habitats during and following the dredge program.	No loss of benthic habitat due to dredging

11. Marine fauna

This chapter outlines the potential impacts on marine fauna associated with the construction and operation of the Project including an assessment under the *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and is based on the findings of the marine fauna studies located in Technical Report 7 of Volume 2B of this PER.

11.1 Assessment approach

11.1.1 Marine mammals and birds

11.1.1.1 Desktop review

A desktop review of marine fauna was undertaken by the Centre for Marine Futures at the University of Western Australia (UWA). The review assessed the current status of marine megafauna known to occur in the vicinity of the Project area. Marine megafauna include a variety of animal groups such as cetaceans (dolphins and whales), pinnipeds (sea lions), seabirds, sharks and predatory fish (Leatherwood and Reeves 1983). Various species of megafauna are present along the south-west coastline of Western Australia (Limbourn and Westera 2006), however, information on their occurrence, abundance, distribution, and movements is relatively limited, particularly for some of the less common species. A Review of Marine *Megafauna* in Koombana Bay and *Geographe Bay in the south western region of Western Australia* was prepared by Cummins and Meeuwig (2011) and is included in Appendix I.

An EPBC Act Protected Matters Report was generated on 12 April 2011 to encompass a 10 km radius from the centre of the Project. The EPBC Protected Matters Report identifies those species that are known, likely or possibly occur in the designated area, as well as the EPBC Act conservation status.

A literature review of noise impacts on marine life was also undertaken to determine the thresholds for various marine fauna for noise impacts resulting in mortality, injury, temporary hearing damage and behavioural modification.

11.1.1.2 Noise modelling

An assessment of the potential underwater noise impacts of construction activities associated with the Project has been prepared by SLR Consulting Australia Pty Ltd (Technical Report 7 of Volume 2C). The impact threshold, the level of sound at which a particular impact such as death, injury or annoyance is experience by a particular species, was determined to predict the impacts of underwater noise on local marine fauna.

The purpose of an underwater noise model is to determine Transmission Loss (TL) between a noise source and a receiver location. TL is effectively the change in signal strength with range. It is defined as the ratio in decibels between the acoustic intensity at a field point and the intensity at a distance 1 m from the noise source. TL can also be used to predict the noise level at a particular location, as it was in this assessment.

The underwater noise model was based on the Monterey-Miami Parabolic Equation Model, version ‘mmpe2dbbv2’. The model allowed the prediction of the underwater noise TL and, in turn, the noise levels across the Project area caused by Project construction activities. From

these predicted levels, the areas where noise impact criteria and thresholds were exceeded were determined.

Two noise source locations were used to predict underwater noise contours across Koombana Bay. The two locations were selected to represent the 'worst case' and a 'typical' construction location. The two locations are:

- Location 1 – Construction activities are assumed to take place in the entrance to the Inner Harbour. This represents a 'worst case' scenario in terms of noise impacts on the bay.

- Location 2 – Construction activities are assumed to take place in the Inner Harbour location as shown in Figure 11.1. This represents a 'typical' scenario in terms of noise impacts on Koombana Bay.

The model was used to predict underwater noise levels across the Project area for different construction scenarios. The likely sources of noise production and the noise levels at the above two locations were determined based on the proposed construction methods and plant/equipment. The following construction activities were assessed:

- rock fracturing
- piling
- cutter suction dredging
- backhoe dredging
- drilling.

To evaluate the severity of potential impacts due to construction noise, impact zones can be determined, within which various effects are expected. The criteria and thresholds for impact of noise on marine life (marine mammals, sea turtles and fish) is further justified in Technical Report 7 within Volume 2b of this PER. The zones include:

- Mortality zone – the smallest zone, which may result in death, acute injury or permanent hearing loss.
- Temporary hearing loss zone – may result in adverse effects on marine life including non-injurious effects such as Temporary Threshold Shift (TTS) (TTS is defined as slight, recoverable loss of hearing sensitivity).
- Responsiveness zone – may result in behavioural responses or may experience disturbance with potentially greater significance on the short and long term.
- Audibility zone – the rock fracturing sound is expected to be detectable by the animal.

These zones are graphically identified in Figure 11.2.

The predicted noise levels were assessed against the identified criteria for impacts on marine fauna, to identify zones where marine fauna may experience immediate adverse impacts in the absence of mitigation measures.

11.1.1.3 Benthic primary producer habitat loss assessment

Benthic habitats are those areas of seabed below the highest astronomical tide that support living organisms and influence the distribution and abundance of benthic primary producers and associated fauna. A benthic primary producer habitat map and loss assessment was prepared and is discussed in further detail in Chapter 10. An assessment of direct and indirect impacts of dredging was undertaken based on this habitat map.

Figure 11.1 Source locations assumed for noise modelling

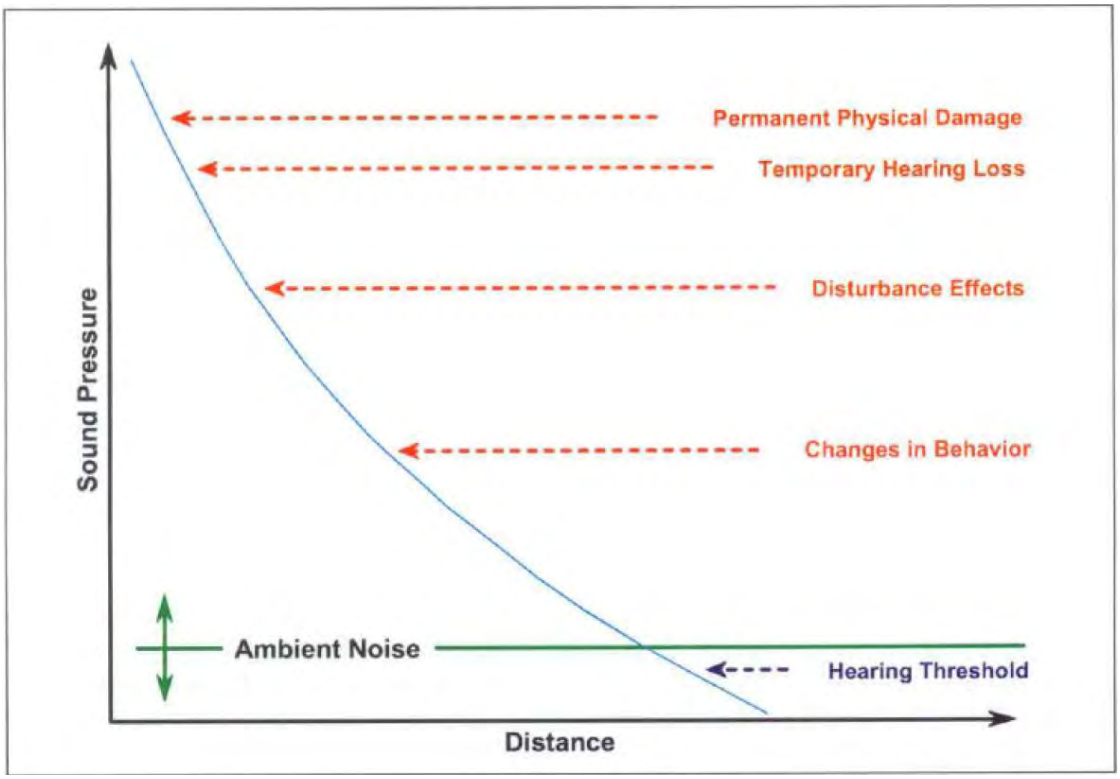


Figure 11.2 Potential zones of impact on marine life from construction noise

11.1.2 Fish and fisheries

The structure and function of fish assemblages in the estuarine and inshore waters of the south-west corner of Western Australia have been well studied. Potter *et al.* (2000) undertook and published a collation of information on the fish assemblage of Leschenault Estuary. A review of his work, in which eight six-weekly samples were collected in the area, was undertaken and included in this assessment.

11.1.3 Introduced marine organisms

Invasive marine species surveys have been undertaken every two years since 1998 by SKM in the Bunbury Port. The three sampling areas were the Outer Harbour, Koombana Bay and the Inner Harbour. A total of 37 introduced species are targeted during the surveys because they had been previously been identified in the Bunbury Port area from the biennial SKM surveys.

11.2 Existing environment

The study area is defined as the area including the inner harbour area, Koombana Bay and extending approximately 10 km to the north and 10 km to the west of Koombana Bay as shown in Figure 11.3. Because of the large area generally inhabited by marine fauna (megafauna particularly), the review includes information on species occurring in Geographe Bay, on the southern margin of the Project area and the south-west region of Western Australia.

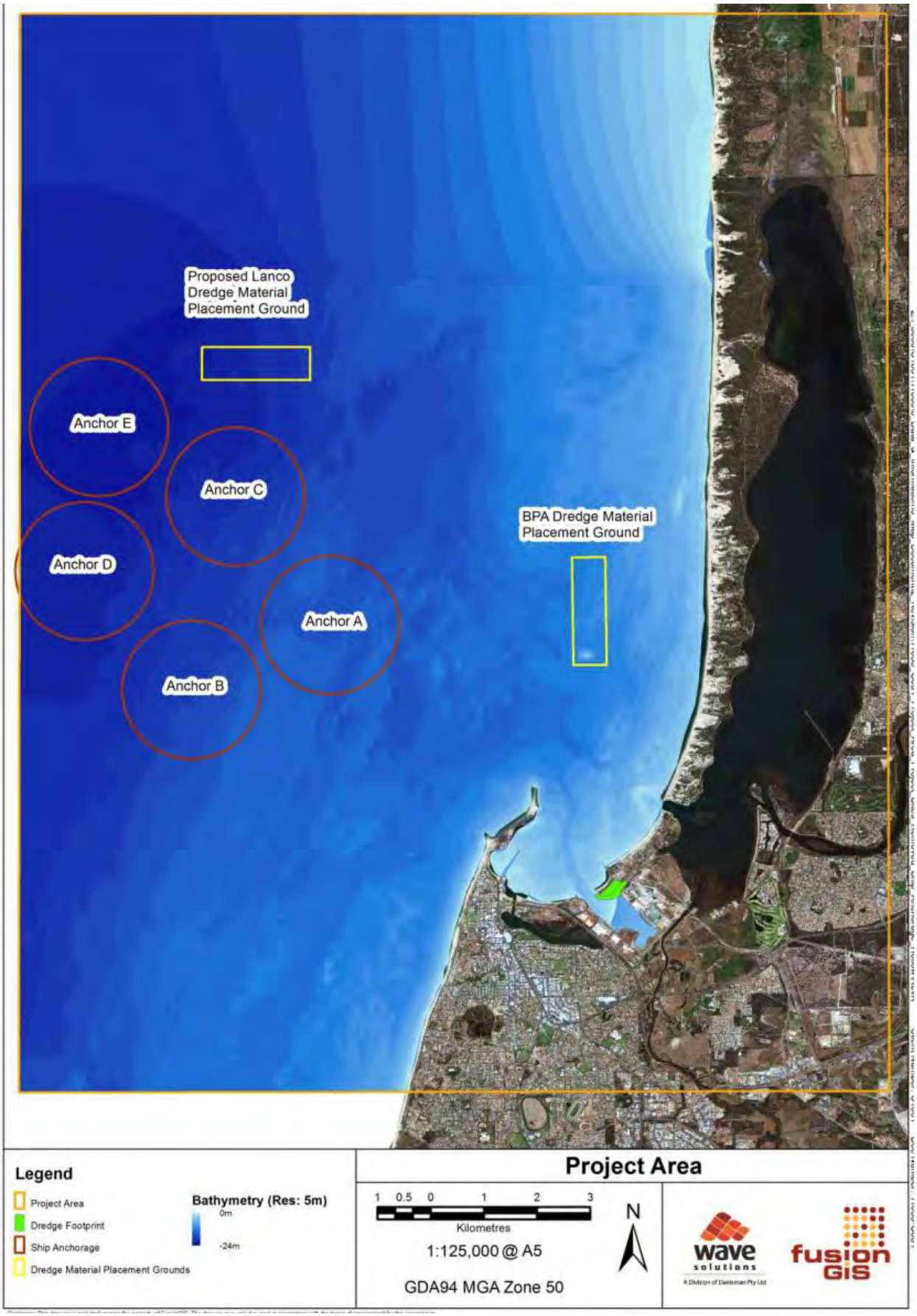


Figure 11.3 Locality plan

An EPBC Protected Matters report identified a total of 36 listed threatened species in the designated area. Of the 36, four are likely to occur and an additional three possibly occur in the area. Those species that are likely or possibly occur are identified in Table 11.1.

No threatened ecological communities were identified in the EPBC Protected Matters Report.

There were also 29 listed migratory species identified in the report. Twenty of the migratory species are also listed as threatened. Of the species that are listed as migratory (but not threatened), one has been recorded at the site, two are likely to occur and two possibly occur in the area covered by the EPBC search and are also identified in Table 11.1.

Table 11.1 Existing marine fauna

Common name	Scientific name	Values and significance	Critical windows of sensitivity	Comments
Cetaceans				
Bottlenose dolphin	*Tursiops aduncus*	IUCN Red List – Data deficient EPBC Act – listed cetacean	February–March	Local importance due to Dolphin Discovery Centre
Humpback whale	*Megaptera novaeangliae*	IUCN Red List – Least concern EPBC Act – endangered and migratory species, listed cetacean Wildlife Conservation (Specially Protected Fauna) Notice 2012	Southern migration. October–November	Likely to occur in the EPBC report area
Southern right whale	*Eubalaena australis*	IUCN Red List – Least concern EPBC Act – endangered and migratory species, listed cetacean Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna	May to November	Likely to occur in the EPBC report area
Blue whale	*Balaenoptera musculus*	IUCN Red List – Endangered EPBC Act – endangered and migratory species, listed cetacean Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna	October – December	Likely to occur in the EPBC report area
Pinnipeds				
Australian Sea Lion	*Neophoca cinerea*	EPBC Act – Vulnerable		Possibly occurs in EPBC report area
Birds				
Shy albatross	*Thalassarche cauta cauta*	EPBC – Vulnerable, migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Possibly occurs in EPBC report area
Great egret	*Ardea modesta*	EPBC – Migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012		Likely to occur in EPBC report area

Common name	Scientific name	Values and significance	Critical windows of sensitivity	Comments
Fork-tailed swift	*Apus pacificus*	EPBC – Migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012		Likely to occur in EPBC report area
Rainbow bee-eater	*Merops ornatus*	EPBC – Migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012		Possibly occurs in EPBC report area
White-bellied sea eagle	*Haliaeetus leucogaster*	EPBC – Migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012		Possibly occurs in EPBC report area
Common sandpiper	*Actitis hypoleucos*	EPBC – Migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012		Known to occur in EPBC report area
Marine Turtles				
Loggerhead turtle	*Caretta caretta*	EPBC Act – Endangered and migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Likely to occur in EPBC report area
Green turtle	*Chelonia mydas*	EPBC Act – Vulnerable and migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Likely to occur in EPBC report area
Leatherback turtle	*Dermochelys coriacea*	EPBC Act – Endangered and migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Unlikely to occur in EPBC report area
Sharks				
Great white shark	*Carcharodon carcharias*	EPBC Act – Vulnerable and migratory Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Unlikely to occur in EPBC report area
Grey nurse shark	*Carcharias taurus*	EPBC Act – Vulnerable Wildlife Conservation (Specially Protected Fauna) Notice 2012 WA declared threatened fauna		Unlikely to occur in EPBC report area

11.2.1 Marine mammals and birds

11.2.1.1 Cetacean

The order cetacean includes marine mammals such as dolphins and whales.

Koombana Bay has a resident Indo-Pacific bottlenose dolphin population and is home to the Bunbury Dolphin Discovery Centre, which facilitates supervised dolphin feeding, wading and swimming with the dolphins. The dolphin population in Koombana Bay and the broader

region is the focus of the South West Marine Research Program (SWMRP), a partnership between the Dolphin Discovery Centre, Murdoch University, Government, Industry and the Community. This program has led to substantial current and ongoing research on aspects of dolphin biology, dolphin health and the surrounding ecosystem.

Studies undertaken to date have identified 196 individual dolphins occurring in the region. Dolphin abundance varies seasonally, with greater numbers occurring during summer and autumn. Some coastal dolphins travel extremely limited distances and reside only within the estuary and inshore waters (Moller and Beheregaray 2001; Moller *et al*. 2002; Smith *et al*. in prep).

The adult female dolphins in Bunbury form nursery groups. Birth rates were found to vary seasonally, with a calving activity commencing in December and peaking in February and March. The birthing season is a critical time to dolphin populations as newborn calves are particularly vulnerable to disturbance.

The location of females spotted throughout the year varies with the season. During winter, the location of dolphins are evenly distributed across the SWMRP study area, while in summer and autumn, the density of female dolphin sightings was concentrated in Koombana Bay and around the mouth of the Leschenault Estuary.

Humpback whales are known to occur beyond the outer harbour and specifically in Geographe Bay (McCauley *et al*. 2000; Jenner *et al*. 2001; Bannister *et al*. 2006). Mother and calf pairs are known to migrate through protected waters close to the shore with Geographe Bay a final resting location en route to Antarctic feeding grounds.

The whales migrating along the Western Australian coast belong to the Group IV population of Humpback whales that undergoes an annual migratory path between their feeding grounds in the Southern Ocean and their calving grounds in the Kimberley (Jenner et al. 2001). The whales migrate southbound along the Western Australian coast during September and October, with a peak in the Bunbury region during the first two weeks in October (Jenner et al. 2001) when whales are consistently sighted within 20 m of the coastline. The northbound migration along the Western Australian coast is between mid-June and mid-July but whales are less often sighted so near the coast as during the southbound migration.

Blue whale sightings are widespread throughout Australian waters. The Australian continental shelf and coastal waters are not thought to have a particular significance to the whales and are used only for migration and opportunistic feeding. Within Geographe Bay, blue whales are primarily observed in the southern section of the shallow bay adjacent to Cape Naturaliste from October to December. Occasionally blue whales aggregate in Geographe Bay, north of Cape Leeuwin, which may possibly be due to a migratory bottleneck.

Infrequent sightings of southern right whales have been recorded in the Geographe Bay.

A number of other species have been recorded in the region, however, the region does not represent a frequent or regular habitat for the follow species: minke whales, false killer whales, long finned pilot whales and Gray's beaked whales.

11.2.1.2 Pinnipeds

Seals, sea-lions and walruses belong to the sub-order Pinnipedia. The Australian sea lion and the New Zealand fur seal may migrate through Koombana Bay and Geographe Bay.

The majority of Australian sea lions are located in South Australia and all of the key breeding areas are located in that state. A population of New Zealand fur seals occurs on the south-west coast of Western Australia, however, no New Zealand fur seal colonies are recorded in the Bunbury region and the species is considered non-migratory. Although it is possible that individuals may transit through the region, the occurrences are rare.

11.2.1.3 Birds

Shy albatross

The shy albatross ranges over all Australian coastal waters south of 25°S. It is most commonly observed over the shelf waters around Tasmania and south-eastern Australia. Although the species plausibly occurs in the Bunbury region, the region is not considered important habitat for the species.

Little penguins

Little Penguins (*Eudyptula minor*) breed across southern Australia from the Shoalwater Island Group (Penguin and Carnac Islands), near Perth in Western Australia, across the south coast and up the east coast as far as South Solitary Island in New South Wales (Marchant and Higgins, 1990). No recorded published information of the presence of little penguins nesting along the Bunbury foreshore was located, however, information from the Bunbury Dolphin Discovery Centre identified that penguins may utilise the Bunbury foreshores as nesting habitat.

11.2.2 Marine turtles, fish and fisheries

11.2.2.1 Marine turtles

Six of the world's seven marine turtle species occur in Australian waters. Two species are known to occur in southern Western Australian waters, the loggerhead turtle and leatherback turtle, and there is anecdotal evidence to suggest that green turtles may also occur. The southern Western Australian region does not constitute important nesting habitat for any species of marine turtle.

Loggerhead turtles nest on beaches and use various marine habitats for foraging. In Australia, the loggerhead turtle occurs in the waters of coal and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia (Limpus *et al*. 1992). Loggerhead turtles are one of the most commonly sighted turtles south of Perth with resident adult and large sub-adult individuals sometimes found (WA DEC 2010).

The leatherback turtle is known to occur in the south-west waters of Western Australia. It is believed that the species only venture near the coast during nesting and no nesting sites are known to occur in the Project area.

Green turtles typically occur in the northern half of Western Australia, however, some green turtles have been sighted in the Geographe Bay region. The exact identification of the species observed has not been verified.

11.2.2.2 Sharks

Two species of shark may occur in the Bunbury region, the great white shark and western population of the grey nurse shark. Both of these species are of conservation significance.

Western Australian waters are thought to be a potential migratory pathway for great white sharks migrating between South Australia, the southern and Indian Oceans and South Africa. Sightings and attacks have occurred in Geographe Bay.

The grey nurse shark has been widely recorded in Australian waters. In Australia, there are two distinct populations of the grey nurse shark; the east coast and west coast populations. The west coast population is predominately found in the south-west coastal waters of Western Australia.

11.2.2.3 Fish

The fish assemblages of Leschenault Estuary have been studied in detail by Potter et al. (2000).Samples were collected from sites in shallow waters of the basin of Leschenault Estuary and Koombana Bay. Fish were also sampled from deeper and more offshore waters in the basin and at three sites in the saline region of the Collie River of Leschenault Estuary.

The species of fish comprising the top 5 most common fish identified in shallow waters are identified in Table 11.2 and identified in deeper waters in Table 11.3.

Table 11.2 Fish identified in the shallow waters of the Leschenault Estuary and Koombana Bay

Species	Percentage of total fish collected	Ranking
Leschenault Estuary		
Favonigobius lateralis	33.9	1
Hyperlophus vittatus	22.5	2
Leptatherina presbyteroides	16.6	3
Atherinosoma elongata	10.1	4
Aldrichetta forsteri	2.8	5
Koombana Bay		
Lesueurina platycephala	24.8	1
Aldrichetta forsteri	16.7	2
Sillago bassensis	15.4	3
Contusus brevicaudus	14.9	4
Favonigobius lateralis	8.1	5

Table 11.3 Fish collected in offshore, deeper waters of the Leschenault Estuary basin and Collie River

Species	Percentage of total fish collected	Ranking
Leschenault Estuary basin		
Aldrichetta forsteri	26.9	1
Nematalosa vlaminghi	18.2	2
Pomatomus saltatrix	12.2	3
Sillago schomburgkii	7.9	4
Arripis georgianus	6.5	5

Species	Percentage of total fish collected	Ranking
Collie River		
Nematalosa vlaminghi	50.0	1
Mugil cephalus	13.6	2
Aldrichetta forsteri	11.8	3
Pomatomus saltatrix	6.8	4
Sillago schomburgkii	3.1	5

The fish assemblage in the deeper waters of the estuary basin and Collie River comprised larger species and, unlike the situation in shallow waters, were dominated by marine estuarine opportunists and the semi-anadromous Perth herring (*Nematalosa vlaminghi*).

The fish fauna of Koombana Bay is largely distinct from that of Leschenault Estuary. The dominant species in Koombana Bay (*Lesueurina platycephala*) was not recorded in Leschenault Estuary. The fish caught in the shallow waters of Koombana Bay contained six species that were not recorded in the estuary and five that only occasionally strayed into the estuary.

11.2.2.4 Fisheries

Commercial fisheries, recreational and traditional (customary) fishing are undertaken in the vicinity of the Project. Commercial fisheries are generally focused on food production. Recreational fishing is defined as any fishing for which the primary motivation is leisure rather than profit while traditional fishing is undertaken by persons of Aboriginal and Torres Strait Islander decent to satisfy personal, domestic, ceremonial, educational or non-commercial communal needs in areas significant to Aboriginal tradition (Franklyn 2003; Kearney and Kildea 2003).

A variety of commercial fisheries have the potential to exist in the Bunbury region, however, information on the exact location is limited due to the scale at which data is collected and reported on by the Department of Fisheries. Of those possible fisheries in the Bunbury region, Blue Swimmer Crab Fisheries was identified as being particularly important in the Bunbury region.

The distribution of blue swimmer crabs extends along Western Australia's entire coast with most of the fished stock concentrated in coastal embayments between Geographe Bay and Port Headland. The crab is known to spawn in Koombana Bay (Kangas, 2000). Mean monthly densities of crabs, in nearshore, shallow waters of the Leschenault Estuary, were highest between mid-spring and mid-autumn and declined to very low or zero levels during winter and early spring.

Two commercial fisheries in the area, the Leschenault Estuary and Geographe Bay fisheries closed in 2000 and 2005, respectively. Other commercial crabbing around Bunbury still exists, and these are likely to be important given the restrictions on commercial crabbing in other locations.

11.2.3 Introduced marine organisms

There are approximately 250 introduced marine species in Australia, 60 of which were introduced to Western Australia (Wells *et al* 2009). Most (37 species) are cool water,

temperate species that occur south of Geraldton; 6 are tropical species that occur to the north of Shark Bay and 17 introduced species occur in both the southern and northern halves of Western Australia.

The majority of marine pests were introduced via international ships from biofouling or ballast waters. Biofouling, considered the major source of introduced marine pests, occurs on any vessel in seawater where a surface is available for marine organisms to grow. Many vessels have the capacity to use ballast waters to maintain a specific position or depth in the water. As a vessel takes on cargo, ballast water may be expelled with potential mature and/or larval introduced species.

In Bunbury Port, the presence of introduced species has been determined based on biennial surveys undertaken by SKM (SKM 2006 and 2009a). Three survey locations, the Outer Harbour, Koombana Bay and the Inner Harbour were selected as the areas are considered at high risk for containing introduced marine species. The areas have:

- frequent and persistent domestic and international vessel activity (commercial and recreational)
- permanent artificial structures (e.g. moorings, berths and pylons)
- reduced flow or high residence times of the water column
- known intertidal and sub-tidal habitat characteristic of the region.

Of the 37 introduced species targeted by the SKM surveys, the presence of only 2 species were confirmed in the summer 2008 survey. Both of these were dinoflagelettes and were likely to have been introduced via ballast waters. In the previous survey, undertaken in 2006, only one species, the Japanese Goby, was identified in the inner harbour area.

11.3 Impacts

11.3.1 Construction impacts

This section summarises a review of the potential impacts of the Project's construction on marine species based primarily on assessment of the Project against the Matters of National Environmental Significance Impact Guidelines 1.1.

The review of impacts on marine fauna suggests that bottlenose dolphins and humpback whales are the two key marine species that should be considered throughout construction of the Project.

Impacts to marine fauna may occur as a result of construction related activities including:

- rock fracturing of basalt (if required) and removal of limestone
- pollution (including acoustic pollution)
- incidents involving vessels/plant/equipment
- incidental trapping or drowning during the dredging process
- introduction of marine pests
- inhibition of access.

11.3.1.1 Rock fracturing

While marine fauna are generally mobile, individual animals who are stressed or confused may find it difficult to avoid the area should rock fracturing be required. Fauna injury or death is most likely to occur during the period if rock removal is required.

Any marine fauna may be directly impacted upon if within the immediate area of any required rock fracturing. The resident dolphin population is potentially the most likely fauna to be present in the immediate rock fracturing location.

Specific noise impacts as a result of rock fracturing are discussed in further detail in section 11.3.1.2.

11.3.1.2 Pollution

Various types of pollution may result from the construction of the Project including runoff of contaminants, diesel/oil spill and noise pollution.

This risk of runoff of contaminants and spills (is addressed in Chapter 12) and will be managed in accordance with an approved CEMP.

Noise pollution

Potential noise pollution may result from construction activities such as rock fracturing, piling, dredging, dredging and drilling. The noise impacts have been assessed against the methodology stated in the Indicative Dredge Plan provided in Technical Report 1 in Volume 2A of this PER.

The potential impact of Project-related noise on marine animals depends on the level of noise exposure. At moderate exposure levels, underwater noise may cause an overt change in the behaviours of a marine animal. At high exposure levels, underwater noise can induce a reduction in hearing sensitivity or even physical injury.

The identification of marine fauna impact thresholds is based on the best available information. It is recognised that variation in the response of different species and individual animals to underwater noise are likely. Behavioural responses of animals are difficult to predict and it is possible that there will be longer term impacts on marine fauna that extend beyond the identified Exceedance Zones (zones predicted to exceed the controlling underwater noise criterion which is the level identified with the onset of Temporary Threshold Shift (TTS).

The predicted noise contours for each construction activity were compared. The scenario with the highest potential impacts is rock fracturing using explosives which are considered to be worse case with a low probability of occurring given the location and quality of the basalt. Further details on rock fracturing can be found in Technical Report 14 in Volume 2C of this PER.

Piling impacts has the second highest impact with impacts characterised by multiple rapid increases and decrease in sound pressure over time lasting approximately 300 to 500ms. Most pile driving acoustic energy is relatively low frequency (2000 Hz) and analysis of frequency spectra for each pile condition indicates that most noise energy from pile driving is in the range of 80 to 1250 Hz.

A summary of the predicted noise impacts is found in Table 11.4.

Table 11.4 Summary of predicted noise impacts

Construction scenario	Maximum distance to edge of exceedance zone[1]	
	Source location 1	Source location 2
Rock fracturing	990 m	630 m
Piling	20 m	20 m
Cutter suction dredging	< 1 m	< 1 m
Backhoe dredging	< 1 m	< 1 m
Drilling	< 1 m	< 1 m

Note 1: In all cases, the exceedance zone is determined by the Sound Exposure Level criteria rather than the Peak Pressure Criteria. This is the case for the blast design assumed, but may change for different blast designs.

Figures 11.4 and 11.5 show the predicted underwater noise contours for rock fracturing activities at the worst case scenario location and the typical location, respectively. In both figures, the outer shaded area indicates the areas where marine mammals may experience temporary hearing loss (TTS) (temporary hearing loss zone). The inner, darker shaded area indicates where marine mammals may experience permanent hearing loss or injury (mortality zone). Noise from the rock fracturing is generally extends along the existing dredged channel.

In the worst case scenario (Figure 11.4), temporary hearing loss may be experienced at distances up to 990 m from the source. The injury threshold is exceeded at approximately 280 m from the source.

Exceedences of the noise criteria for piling (and other construction activities excluding rock fracturing) are not predicted to extend significantly beyond the entrance to the Inner Harbour and the noise impacts on dolphins and other marine fauna are expected to be limited to the Inner Harbour.

The impacts from other construction activities are less than for rock fracturing and exceedences are not predicted to extend beyond the entrance of the Inner Harbour. Noise impacts for piling and other construction activities (other than rock fracturing) are expected to be limited to those dolphins and other mammals inside the Inner Harbour.

For rock fracturing undertaken in a typical location, exceedences of the criterion are expected at distances of up to 630 m from the source.

The assessment of underwater noise indicates that for most construction scenarios (with the exception of rock fracturing), adverse impacts on marine fauna are not expected away from the immediate vicinity of the works. Noise from rock fracturing has the potential to impact on marine fauna a at distances of up to 1000 m from the source, if rock fracturing occurs near the entrance to the Inner Harbour. However, the impact of rock fracturing on Koombana Bay is reduced for locations further inside the inner harbour and nearer the northern end of Berth 14A.

Figure 11.4 Location 1 (worst case) rock fracturing underwater noise criterion exceedance area

Figure 11.5 Location 2 (typical) rock fracturing underwater noise criterion exceedance area

11.3.1.3 Vessel movements

Increased vessel activity during construction may lead to an increased risk of collisions between vessels and fauna (in particular, whales). Vessel activity during the construction phase will be predominantly within the Inner Harbour area, with the exception of dredge hoppers that will transit between the Inner Harbour and the proposed offshore disposal location, approximately 13 km north-west of the Inner Harbour.

11.3.1.4 Dredging activities

Dredges are nearly stationary during dredging activities, therefore, the likelihood of striking marine fauna is remote. Dredge hopper barges will use the existing shipping channel to transit through Koombana Bay. Slow displacement type vessels such as barges and tugs are not considered to pose a significant risk to megafauna include whales (Laist *et al* 2001). No interactions between dredge vessels and marine fauna have been recorded during maintenance dredging activity in Bunbury Port.

The migratory path of Humpback whales along the Western Australian coast is inshore of the continental shelf boundary. The whales are known to come closer to the coastline during the southbound migration. During the southbound migration, there is evidence that mother and calf pairs use Geographe Bay as their final resting stop en route to Antarctic feeding grounds (Salgado-Kent *et al*., in review). The specific area for resting is identified as Bunker Bay, located approximately 55 km to the south-west of Bunbury Port and so vessel movements resulting from dredging will not affect this location.

While southern right whales and blue whales are also known to occur in coastal waters, sighting of these species in nearshore areas near Bunbury Port are rare.

Habitat destruction may also occur as a result of dredging or displacement. Impacts are most substantial when habitat destruction affects critical areas such as breeding and nursery areas. Dredging activities are proposed for the Inner Harbour, which is not utilised by whales. The dredge material placement location is in offshore waters, which will ensure that current regimes are not altered.

Dredging may impact dolphins by causing a temporary displacement and may cause longer lasting changes in the distribution and abundance of the dolphin population in Koombana Bay (Sini *et al*. 2005). Mobilisation of metals within the sediments through dredging activities may occur.

No nesting habitats for any species of marine turtle occur in the Project area, and therefore, impacting processes (e.g. changes to light regime) that affect animals in nesting areas are not relevant. While loggerhead, leatherback and green turtles may be present in the Bunbury region, the region is not identified as an important foraging area for these species. Turtle mortality from dredging activities has been documented in regions where the abundance of marine turtles is high (Greenland *et al.* 2001). With the low abundance of turtles in the Project area compared to other locations where mortalities are recorded, the chance of interaction between dredging equipment and marine turtles in the current instance is extremely unlikely. Overall, it is concluded that the impacts of the Project will not significantly impact marine turtles.

11.3.1.5 Introduced marine organisms

Construction of the Project will result in an increased number vessels, plant and equipment exposed to the marine environment in the Project area. Items required for construction may include working platforms, drilling equipment, drilling and rock fracturing barges, dredging

vessels and hopper barges. Vessels, plant and equipment may all be carriers of marine pests and may result in the introduction of non-native species to the Bunbury Port waters. Vessels used of the Project must adhere to Commonwealth and State Government requirements for marine pest management.

11.3.1.6 Inhibiting access

Increased activities in the inner harbour during construction activities may limit access to fishing grounds for commercial, recreational and/or traditional fishers. Limited access to historically accessible fishing grounds may have a socio-economic impact on the commercial fisheries and the local recreational fishing associated businesses. Limiting traditional fishing may impact upon the local communities' diets and/or cultural practices.

11.3.1.7 Other impacts

Fish and fisheries

There is not predicted to be any effects on benthic habitats or other critical fish habitats in the Bunbury area as a result of the dredging program.

Socio-economic impacts

The dolphins are an important asset for the local community as they are among the biggest draw-cards to the city of Bunbury for tourism activities, primarily based at the Dolphin Discovery Centre. If the dolphins leave the area for shorter or longer periods, it could impact the Centre financially as well as the general tourism industry in Bunbury.

Introduced mammalian predators (e.g. foxes, dogs and cats) are considered to be the most significant threat to penguins on land. Indirect threats, such as habitat loss through weed invasion, erosion, grazing and housing developments, have had an impact on the distribution and abundance of penguins in some areas (Harris and Bode, 1981). Foreshore disturbance is not expected to be significant in terms of penguin habitat use in the region.

11.3.1.8 Summary

The main threats to the majority of marine fauna potentially located in the Project area are not likely to be substantially affected by the Project. The key activity to threaten particular species is:

- Australian sea lion and the New Zealand fur seal – mortality due to interactions with fisheries, aquaculture and entanglement with marine debris.
- Shy albatross – incidental capture and subsequent mortality in various commercial fishing apparatus.
- Sharks – related to fisheries that either target shark species or interact with shark species as by-catch.

It is not expected that the Project will increase the risk of mortality to any of these species and no specific monitoring of marine turtles, sea lions, fur seals, shy albatross or sharks is proposed.

11.3.2 Operational impacts

11.3.2.1 Vessel movements

The main operational impact of the Project on marine fauna would be the increased number of vessels (approximately 275 per annum) in the inner harbour and surrounds. An overall increase in ship movements would lead to an increased risk to marine fauna of injury or death.

Fewer vessel movements will result from the operational phase of the Project than from the construction phase. Additional vessel movements as a result of the Project will follow the current shipping channel. It is estimated that an additional 275 trips to the port per annum will be required. Currently approximately 400 trips are made to the port each year. No deceased cetaceans identified in the Bunbury area have displayed any evidence of ship strikes. The speed of vessel within the nearshore area encompassing the port boundaries is dictated by harbour regulations (and towed by harbour tugs) with the vessels only reaching cruising speed once they are well clear of the port in deep water.

11.3.2.2 Introduced marine organisms

With the increased number of vessels visiting the port each year, there is an increased risk of the introduction of marine pests through ballast water and/or biofouling. Vessels used for the Project will be subject to Commonwealth and State Requirements for introduced pest management.

11.3.2.3 Maintenance dredging

Routine maintenance dredging is currently undertaken to maintain the depth of the Inner Harbour. No interactions between dredge vessels and marine fauna have been recorded during maintenance dredging activities in Bunbury Port.

11.4 Management and mitigation measures

This section details management and mitigation measures that would be implemented during construction and operation of the proposed project to prevent and manage potential impacts described in section 11.3.

11.4.1 Construction

A dredging and spoil disposal management plan (DSDMP) will be prepared prior to any dredging works commencing on site. A draft DSDMP has been prepared and is presented as Technical Report 10 in Volume 2C of this PER. The draft DSDMP will be finalised once a dredging contractor has been engaged and any condition of consent, if approved, has been considered.

The DSDMP requires consultation with the Dolphin discovery centre to determine an appropriate monitoring program however it also outlines the following mitigation measures proposed during construction including:

- An underwater noise monitoring implementation plan to be prepared prior to the commencement of rock fracturing (if required). This plan should outline the proposed methodologies, implementation strategies and issue response protocols for the proposed noise monitoring program.

- Visual inspection of presence of dolphins within the potential zone of noise influence and surrounds. Soft start-up of piling machinery to enable adjustment and adaptive response in the event that dolphins are in the area.

- Measurement of underwater sound transmission loss during rock fracturing (if required) to validate the assumptions and outcomes of the noise modelling.

- A bottlenose dolphin management plan will be implemented including:
  - a passive acoustic monitoring program to determine the relative abundance and distribution of dolphins in the Inner Harbour and Koombana Bay
  - a visual monitoring program to be implemented before and after the dredging program to characterise behaviour of dolphins and assess changes in the distribution and abundance of individual dolphins at the scale of the proposed development. Data will be collected by an experienced marine dolphin observer familiar with the dolphin population in the area
  - dredging and disposal activities only commencing if no dolphins have been observed in a 300m monitoring zone from the dredge area.
  - if any dolphins are sighted in the vicinity of the dredge footprint, dredging and dumping activities must not commence until after the last dolphin mammal is observed to leave the 300m monitoring zone.
  - if dolphins are observed to enter the dredge footprint during dredging then adaptive management response protocols will need to be development with the TACC.
  - the dredger's pump will start operation only after the cutter head touches the seabed and stop working on clearing the sea bed.

- All vessel masters involved in dredging and construction will be made aware of the Wildlife Conservation (closed seasons for marine mammals) Notice 1998 and adhere to its requirements to minimise the disturbance to marine mammals.

11.4.2 Operational

A marine environmental management plan (MEMP) will be prepared and implemented to manage and mitigate any operational impacts on marine fauna. Particular management of introduced marine pests will be implemented including:

- Vessel clearance – to achieve clearance (of containing marine species of concern), all vessels and equipment will undergo a risk assessment prior to mobilisation based on a format endorsed by the Department of Fisheries (DoF). Risk assessments are required to be submitted to DoF at least 14 days prior to departure for a determination of the risk level.

- Ballast water management – ballast water management for vessels from international waters shall be managed in accordance with the *Quarantine Act* 1908 and Quarantine Regulations 2000; and AQIS (2011) Australian Ballast Water Management Requirements.

11.5 Predicted environmental outcome

Table 11.5 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Impacts to the resident dolphin and turtle population	Dredging and Spoil Disposal Management Plan including passive acoustic monitoring of dolphins, a visual monitoring program pre and post dredging and no dredging to occur if dolphins are observed with the observation zone.	No detectable adverse effects on dolphin movements in Project area or Project attributable impacts to dolphin population health or no change in the abundance, diversity, geographic distribution and productivity of fauna at the species level.
Rock fracturing on marine mega fauna	Dredging and Spoil Disposal Management Plan including preferential timing for high impact activities, validation of noise modelling and visual observation of marine mega fauna	Adopt industry best-practise measures to minimise the risk of harm to marine megafauna should rock fracturing be required.
Operation		
Introduction of marine pests from vessels entering Berth 14A	Preparation and implementation of a MEMP	No additional introduced marine pests entering and/or becoming established within the Inner Harbour as result of activities from Berth 14A.
General maintenance activities	Preparation and implementation of a MEMP	Conformance with BPA tenant requirements and no more than 12.5% of total complaints received by BPA to be related to Berth 14A.

12. Soil

This chapter provides an assessment of soil quality at the site based on the available information detailed and summarised within Parsons Brinckerhoff's *Preliminary Site Investigation Report - Bunbury Port Berth 14A, Leschenault Drive, Vittoria, Western Australia* (2012) (Technical Report 15 in Volume 2C of this PER).

12.1 Assessment approach

Assessment of soil quality was undertaken in accordance with the DEC's *Contaminated Sites Management Series*. A detailed review of previous soil investigations was undertaken to develop an understanding of soil contamination issues on site.

Resources utilised during the desktop assessment encompassed the following:

- historical certificates of titles (CoTs) provided by Landgate
- current and historical aerial photography provided by Landgate
- current and historical dangerous goods storage licences from the Department of Mines and Petroleum (DoMP)
- available groundwater data utilising the Department of Water (DoW) WIN database of registered groundwater bores
- geological data from the Geological Survey of Western Australia (GSWA) 1:50,000 Urban Geology Series Map, Bunbury-Burekup
- hydrological data from aerial photographs and the Site walkover identifying the nearest surface water receptors
- DEC contaminated sites register
- DEC online Geographic Database to determine ASS classification
- ASS and other soil data from previous investigation (360 Environmental, 2009) carried out on site.

12.2 Existing environment

This section summarises the existing soil environment within the site. Further details on the existing environment are provided in Technical Report 15, Volume 2C of this PER.

The soils within the vicinity of the berth are highly altered from the diversion of the Preston River in 1968/9 and land reclamation when the inner harbour was constructed (Refer to Figure 11 of Technical Report 15 in Volume 2C of this PER).

Geological information obtained from the Geological Survey of Western Australia (GSWA) 1:50,000 Urban Geology Series Map, Bunbury-Burekup indicate Lots 1, 2, 428 and 429 are located within coastal dune formations of calcareous quartz Safety Bay Sand, overlying Tamala Limestone. The foreshore areas of the Project area, adjacent to the water's edge, have been mapped as alluvial deposited Safety Bay Sands. Part of Lots 2 and 963 are predominately reclaimed estuary, and as such, the filling of some areas has occurred using dredge spoil and bottom ash.

The typical lithology encountered onsite is summarised in the Table 12.1.

Table 12.1 Geological and hydrogeological summary

Depth (mBGL)	Soil description
0.0–1.0	FILL/SAND: gravelly, orange/red, fine grained, dry
0.0–4.0	SAND: white/grey, fine to medium grained, subrounded, well sorted
2.0–6.0	SAND: grey/brown, fine to medium grained, subrounded well to moderately sorted, wet

Source**:** Coffey Environments (2009)

The south bottom ash dam has fine black silt (bottom ash) from the surface to approximately 1.5 mBGL underlain by light yellow, medium grained sands.

The north bottom ash dam, located in the north-western corner of the Site, has a grassed surface with fine, black silt to between 1 and 2 mBGL, underlain by light yellow, medium grained sands.

12.2.1 Acid sulphate soils

ASS risk maps prepared by the CSIRO's Australian Soil Resource Information System (ASRIS) identify the north-western half of the site as having a moderate to low risk of ASS, occurring generally at depths less than 3 m. The south-eastern half of the site is classified as having high to moderate risk of ASS occurring generally at depths less than 3 m. This ASS risk has been increased by the historical use of dredge spoils from the Bunbury Inner Harbour and channel to reclaim land on Lots 2 and 963.

A preliminary ASS and contamination assessment was conducted by 360 Environmental in February 2009 at six locations (on Lots 1 and 2 (east)) to a depth of 19 m or to bedrock. The investigation found evidence of potential acid sulfate soils (PASS) at depths ranging between 7.0 mBGL and 12.5 mBGL. PASS was also identified in two samples at a depth of 15.5 mBGL. Based on the outcomes of the 360 Environmental investigation, the ASS risk map was amended to be more site-specific (refer to Figure 12.1), given that the DEC's working definition of a moderate – high risk ASS are found within 3 m of the actual ground surface.

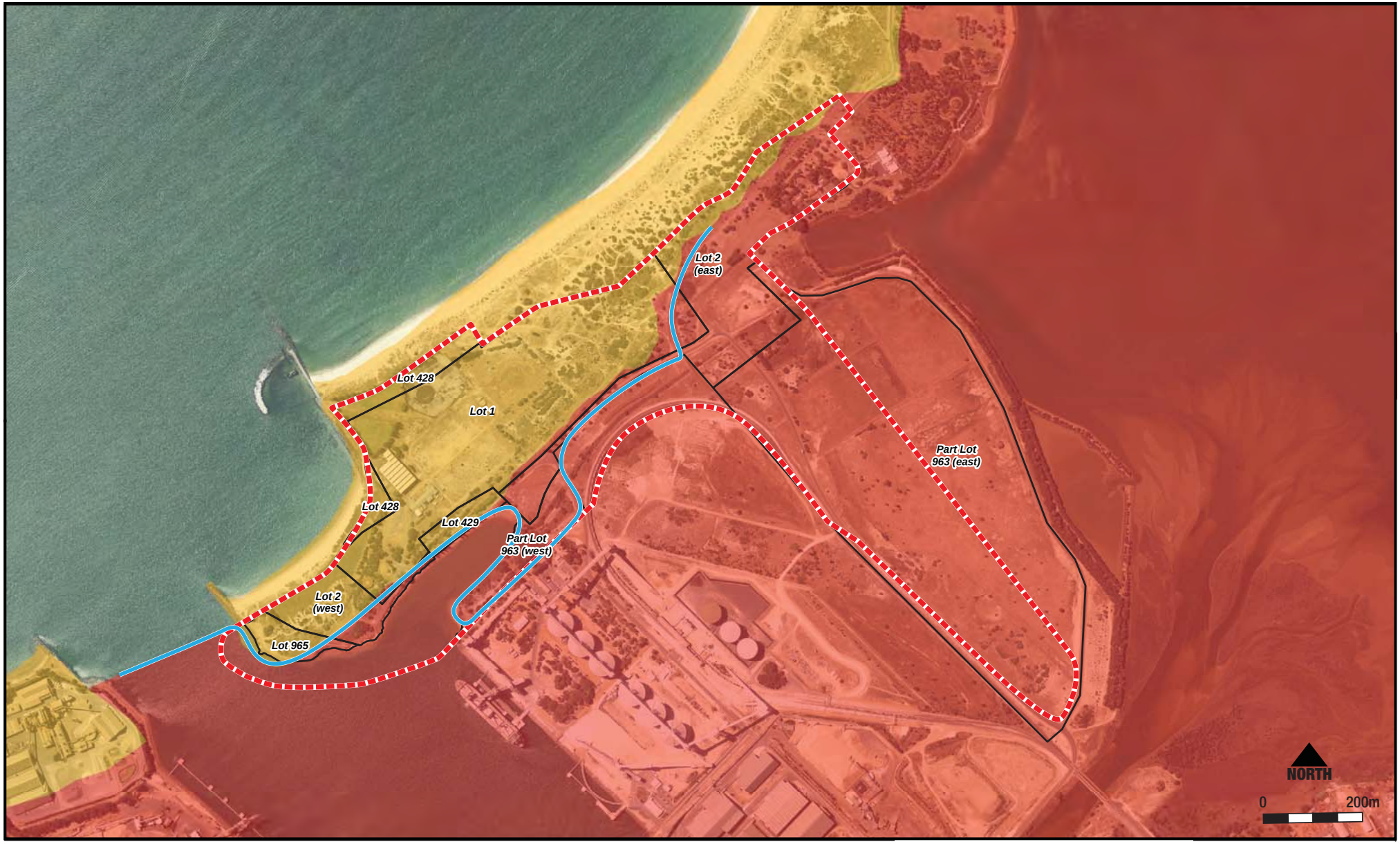
12.2.2 Land contamination

Soil quality in the vicinity of the Project site is the result of different land uses and activities historically undertaken.

Historically, a portion of the site (Lots 1, 2 (west), 428 and 429 Leschenault Drive) was occupied by the former Western Power Bunbury Power Station. The coal fired power station was commissioned in 1957, decommissioned in 1999 and demolished in 2000. A number of structures from the power station still exist on the site. Further details are provided in the Technical Report 15 of Volume 2C of this PER.

No contaminated land investigations have previously been undertaken for Lot 2 (east), Lot 965 and part of Lot 963 (east and west) Leschenault Drive. It is known that Lot 2 (east) was used as a railway yard and still contains railway infrastructure, whereas part of Lot 963 (east) was used for the disposal of dredge spoil and fly ash.

Based on the information reviewed in the PSI, potential areas of land contamination may be found in the areas identified in Figure 12.2 and summarised in Table 12.1 below.



Site boundary

Lot boundary

Revised/amended boundary of acid sulfate soil risk

Acid sulfate soil risk (<3m from surface)

High to moderate

Moderate to low

Figure 12.1 Acid sulphate risk map

Ref No.	Historical areas of environmental concern
1	Northern soak
2	Railway embankment soak
3	Transformers
4	Diesel AST
5	Instrument room
6	Septic tanks (3)
7	Lead Acid battery maintenance room & drain
8	Hydraulic coupling cooling water area
9	Chemical store
11	Below all building slabs
12	Workshop sump & Station A & B sumps
13	Vehicle ramp
14	Locomotive shed AST
15	Stormwater sump
18	Scrap metal area
19	Emergency diesel store
21	Empty drum area
23	Oil store
25	Compressor room sump
26	Neutralising tank (resin treatment)
28	Site outfalls
29	East end of site
31	Fuel oil pump
32	Locomotive servicing shed
33	Remediated buried asbestos area (north)
34	Burnt Rubbish/asbestos area (south)
35	Air conditioners/chillers assumed to be in administration building
36	Boiler water circuit assumed to be in power station
37	Diesel motor/generator assumed to be in power station
39	Possible asbestos in all buildings
40	Potential synthetic mineral fiber in all buildings
41	Hot water basin

PARSONS BRINCKERHOFF

LANCO
Always Inspiring

N

0 50 100 m

Scale: 1:4,000 at A4

Coord. System.: MGA50 GDA94

Drawing No.:	2162530A_GIS_F024		
Revision:	A2	Date:	26/08/2011
Drawn By:	SH	Checked by:	HOB/SH

GIS File: \\auperf\proj\L\Lanco_Infratech\2162530a_LANCO_PB_LABOUR\10_GIS\Projects\Drawings_Figures_Sketches\2162530A_GIS_F024_A2.mxd

Table 12.2 Areas of environmental concern and chemicals of potential concern

Location	Areas	Source	CoPCs/Parameters	Comments
On-site point sources				
Lot 1	(6) Two septic tanks	Septic tanks in the vicinity of the administration building and warehouse	▪ Nutrients and Pathogens	Information included in the IT Environmental (2002a) report indicated that the CoPC had been identified as TRH and metals. To date it is believed that pathogens and nutrients have not been investigated.
Lot 1	(10) Water treatment plant	Deionisation of process water and storage of chemicals in former ASTs	▪ Acid/alkali ▪ Mercury ▪ Sulphuric acid (concentrated) ▪ pH ▪ Sodium hydroxide ▪ Sodium hypochlorite	Previous investigations indicated the presence of low pH in soil and groundwater in the vicinity of the former water treatment plant and the associated ASTs. Due to the low pH it is assumed that concentrated sulphuric acid may have leached into soil and groundwater in this region.
Lot 1 and Lot 428	(16) North bottom ash dam	Bottom ash/Fly ash	▪ Radionuclides ▪ TDS (groundwater) ▪ Sulfur ▪ TPH ▪ PAH ▪ Dioxins ▪ Phenols ▪ Metals ▪ Cyanide	The north bottom ash dam has been historically investigated by IT Environmental (2002a). The south bottom ash dam has been impacted by heavy metals associated with the disposal of bottom ash.
Lot 1	(20) Underground petrol storage tank	Former underground petrol storage tank, petrol bowser and associated pipework	▪ TPH ▪ BTEX ▪ PAH ▪ Metals - lead	No investigations have been conducted since 1998 to verify that the petroleum infrastructure was removed and validated appropriately. Ground penetrating radar should be used to determine if tanks are present prior to drilling/excavation work.
Lot 1	(22) Fuel oil tanks	Former fuel oil tanks	▪ TPH ▪ BTEX ▪ PAH ▪ Metals	This area was investigated by IT Environmental (2002a), and the results (Table A, Appendix K) identified one exceedance of the HIL-F guideline for TRH in soil and a minor exceedance in the marine water guideline for zinc.

Location	Areas	Source	CoPCs/Parameters	Comments
Lot 1 and Lot 429	(27) Rail embankment	Fill material – possible dredge spoils and impacted soils	▪ Metals ▪ SPOCAS ▪ TPH ▪ BTEX ▪ PAH ▪ Phenols ▪ Creosote ▪ Nutrients ▪ Carbamates ▪ OC/OP Pesticides ▪ Herbicides	A portion of the railway embankment in Lot 429 has been investigated by test pit excavations (IT 2003a). Further investigation across the remainder of the rail embankment is required to determine if fill material and possible dredge spoil were used to construct the embankment.
Lot 2	(30) Former South Bottom Ash Dam	Nickel contamination in groundwater and in soil at Koombana Bay	▪ Radionuclides ▪ TDS (groundwater) ▪ Sulfur ▪ TPH ▪ PAH ▪ Metals ▪ Cyanide ▪ Dioxins ▪ Phenols	Heavy metals have been detected in soil and groundwater near the south bottom ash dam stormwater outlet. The area has been delineated but some impact to the area may still remain (Woodward-Clyde, 1998; IT Environmental, 2002a; and Coffey, 2008). Parsons Brinckerhoff considers that previous investigations checked for a limited screen of contaminants. It is considered there is a requirement to identify if the dredging work will mobilise dissolved metals in the groundwater.
Part Lot 963 (east)	(38) Mill Point Fly Ash Dam	Fly ash	▪ Radionuclides ▪ TDS (groundwater) ▪ Sulfur ▪ TPH ▪ PAH ▪ Metals ▪ Cyanide ▪ Dioxins ▪ Phenols	Mill Point fly ash dam has not been investigated previously.
Lot 1	(42) Two remaining ASTs	A hydrocarbon sheen was identified in the water in the two remaining ASTs on-site.	▪ TPH ▪ BTEX	There are a number of potential sources that can cause hydrocarbon sheen on water. Water sampling should be undertaken and analysis of TPH with silica gel clean up should be undertaken to determine if the sheen is naturally occurring from the decomposition of organic material at the base of the tank or if petroleum hydrocarbons are contaminating the water.

Location	Areas	Source	CoPCs/Parameters	Comments
Lot 1, Lot 2	(44) Possible asbestos on soil surface across the site	Presence of asbestos fragments on the soil surface at Lot 1 and Lot 2.	▪ Asbestos minerals	The site walkover identified the potential for ACM to be present in these two specific areas. Complete asbestos in soils investigation should be completed for these two areas. In addition to this a more comprehensive site walkover should be undertaken by an asbestos consultant to identify if asbestos is present in other areas on site. This should coincide with a full asbestos survey of current site buildings.
Lot 1 and Lot 428	(45) Coal storage compound	Coal	▪ TPH ▪ PAH ▪ BTEX ▪ OCP/OPP ▪ Metals ▪ Sulfur ▪ Cyanide	No previous investigations were conducted through the concrete of the coal stockpile slab. The site walkover (Section 3) identified a number of holes and cracks in the bitumen in the storage area providing potential migration pathways.
Lot 1, 2 (west), 428, 429 and part Lot 963 (west)	(46) Dredge Footprint	Acid Sulfate Soils (ASS)	▪ pH Fox ▪ SPOCAS ▪ ASS Groundwater quality parameters	A detailed ASS investigation should be undertaken across the dredge footprint in accordance with DEC (2009) - *Identification and investigation of acid sulfate soils and acidic landscapes*.
Lot 2 (west)	(47) Water storage tank and pump set	Spillage and works conducted in the vicinity of the water storage tank.	▪ TPH ▪ Metals ▪ BTEX ▪ PAH	This area has not been sampled during previous investigations. The primary concern is from the pump (potential fuel and oil held in the pump and from refuelling).
Lot 1 and Lot 428	(48) Hydrocarbon impacted groundwater	Former power station main building, warehouse, garage, UST, chemical storage.	▪ TPH ▪ BTEX ▪ PAH ▪ VOC ▪ Natural attenuation parameters	Groundwater sampling should be conducted in this area to determine the current hydrocarbon contamination status. Only limited analysis is required due to only hydrocarbons having been identified during historical sampling.

Location	Areas	Source	CoPCs/Parameters	Comments
Lot 1	(49) Warehouse, administration building and chemical storage area	Pesticides underneath the slab and potential chemical impacts from Quantum Energy (current site use) and historical land uses	▪ OC/OP Pesticides ▪ TPH ▪ BTEX ▪ VOC ▪ PAH ▪ Metals including potassium (Microcline), manganese and iron (Bixbyite) and calcium (Calcite)	It is understood that the buildings will remain in place throughout, and after construction; therefore only limited sampling will be required to address this issue. Soil investigations have not been conducted underneath the slab of the remaining buildings - TRH, VOC, PAH and metals should be tested under the warehouse and chemical storage area.
Lot 1	(50) Stockpile	Stockpile of material including building rubble and some black fine-grained sand.	▪ TPH ▪ BTEX ▪ PAH ▪ Metals ▪ Asbestos	As this stockpile has not been previously sampled, it is necessary to: ▪ assess the contents of the stockpile ▪ identify the chemical composition of the stockpile material ▪ identify the potential for contaminants to have leached into the surrounding soil.
Part Lot 963 (east)	(51) Dredge Spoils	Potential dredge spoils	▪ SPOCAS ▪ ASS Groundwater quality parameters ▪ Metals ▪ TPH ▪ PAH ▪ Phenols ▪ TBT OC/OP pesticides (antifouling paint residues) ▪ Chlorinated hydrocarbons Ammonia ▪ Acids/alkalis (pH/Caustic soda) ▪ Flocculants (sulfate, cyanide) ▪ Creosote ▪ Carbamates	This area has not been investigated previously and an investigation is required to obtain background concentrations. Dredged harbour spoil may potentially contain a range of contaminants associated with surrounding land uses (i.e. timber treatment, alumina production, railway uses etc.).

Location	Areas	Source	CoPCs/Parameters	Comments
Lot 2 (east), Lot 429 and Lot 1	(52) Railway lines and wooden sleepers	Original railway lines and wooden sleepers for railway yard	▪ TPH ▪ BTEX ▪ Phenols ▪ Metals ▪ Creosote ▪ Nutrients ▪ Carbamates ▪ OC/OP Pesticides ▪ Herbicides	Sections of the railway embankment were previously investigated by IT Environmental (2003a) through the establishment of shallow test pits. It is recommended that more intense sampling be conducted across the former railway lines to assess potential contamination.
Lot 1	(53) Leach drains	Leach drains located near the administration building	▪ Nutrients ▪ Pathogens ▪ TPH ▪ BTEX ▪ PAH ▪ Metals	The leach drains located near the administration building has not been investigated previously for contamination in soil or groundwater.
Lot 1 and Lot 2 (west)	(54) Former vehicle access road from mainland	Possible historical railway	▪ TPH ▪ BTEX ▪ Phenols ▪ Metals ▪ Creosote ▪ Nutrients ▪ Carbamates ▪ OC/OP Pesticides ▪ Herbicides	A vehicle access road/possible railway from the mainland was observed during a review of the aerial photography. This road has not been investigated in the previous reports.

Location	Areas	Source	CoPCs/Parameters	Comments
Off-site sources				
Lot 963 (off-site)	(43) Alumina and caustic soda storage	Details presented in section 5.4.5 indicate the presence of hydrocarbons (including free-phase hydrocarbons), caustic soda and PAH in groundwater.	▪ TPH ▪ PAH ▪ Acids/alkalis (pH/Caustic soda) ▪ BTEX Metals ▪ Flocculants (sulfate, cyanide)	Further information is required to identify if the groundwater contamination plume has migrated under the site and how it may affect potential receptors (i.e. the dredging work).

Notes:

Potential sources and CoPCs are generally based on DoE (2004) *Potentially Contaminating Activities, Industries and Land uses*. However where there is evidence to suggest contaminants are not present, they have been excluded; also, where there is evidence to suggest other contaminants are present, they have been included.

TPH	Total petroleum hydrocarbons
BTEX	Benzene, toluene, ethylbenzene and xylenes
VOC	Volatile organic compounds
PAH	Polycyclic aromatic hydrocarbons
OC/OP	Organochloride/Organophosphate
Nutrients	Total nitrogen, total phosphorus, total kjeldahl nitrogen, nitrite, nitrate and ammonia.
Pathogens	E Coli, Total coliforms, Faecal coliforms and Faecal streptococci (indicator for the presence of pathogens, if pathogens are identified further investigation might be required)
SPOCAS	Suspension Peroxide Oxidation Combined Acidity & Sulfur
ASS field testing	pHf and pH
TDS	Total Dissolved Solids
ASS Groundwater	pH, electrical conductivity, alkalinity, acidity, TDS, total suspended solids, nutrients, Total metals (Al, Fe), Dissolved metals (standard nine).
Metals	Aluminium, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Nickel, Manganese, Mercury, Selenium, Zinc

12.3 Impacts

12.3.1 Construction

12.3.1.1 Disturbance of acid sulphate soils

Excavations and dewatering during construction, especially dredging activities associated with the construction of Berth 14A are likely to disturb acid sulphate soils, potentially causing acidification of soil and groundwater.

Previous investigations have identified that there are PASS located generally below 7 m of the ground surface. Therefore any earthworks in the top 6 m of the soil profile are unlikely to be at risk of disturbing ASS. Deep-set footings for the conveyors and other general infrastructure installed to bed rock (and any dewatering associated with such works), as well as dredging activities in the estuary are however, likely to intersect PASS during construction works. If ASS identified at depth are not appropriately managed, disturbance and subsequent exposure through excavation or dewatering of the PASS may result in the oxidisation of PASS and subsequent release of acidity. Potential leaching of heavy metals into the surrounding environment could occur under acidic conditions.

12.3.1.2 Disturbance of existing contaminated soil

Dredging and excavation activities would potentially be undertaken within contaminated areas. Figure 12.2 indicates the current suspected areas where contamination occurs as identified in the PSI. Based on current site plans, it is likely that some disturbance of contaminated soil may occur during site works.

12.3.1.3 Contamination of soil

Leaks, spills or the incorrect disposal of chemicals, hydrocarbons or wastes has the potential to contaminate soils. This impact is likely to be small, localised in nature and restricted to the surface layer of the soil profile.

During demolition of existing infrastructure, the soil may become contaminated with asbestos containing material (ACM).

Dewatering discharge may need to be managed or at least appropriately contained to prevent contamination of soil from potentially contaminated groundwater.

12.3.2 Operation

12.3.2.1 Contamination of soil

Storage of potential hazardous materials for the operation and maintenance of heavy machinery within the Berth 14A would potentially generate contamination of soils by uncontrolled leakage and spills.

12.4 Management and mitigation

12.4.1 Construction

12.4.1.1 Acid Sulphate soils

Disturbance of ASS may be minimised or avoided through further investigations to delineate the occurrence of ASS. Where disturbance of ASS is unavoidable (at depths >7 mBGL),an ASS Management Plan (ASSMPO) may also be required to manage earthworks and dewatering for dredging activities and the construction of deep footings.

12.4.1.2 Disturbance of contaminated soil

A detailed site investigation (DSI) shall be carried out to verify and delineate the presence of any contaminants identified within the PSI. A Sampling and Analysis Plan (SAP) has been prepared to the satisfaction of a DEC accredited contaminated site auditor to determine the methodology and scope of the DSI. The contamination status of the identified areas of concern (AEC) will be confirmed once the DSI has been implemented prior to construction.

A CEMP would be prepared to identify management activities required to ensure contaminated soil is contained within the contaminated area and no contamination of waters or other areas occur during earthworks. Management of contaminated soil stockpiles and areas of disturbed contaminated soil will include treatment measures to reduce dust. Refer to Chapter 13 for further detail on dust impacts and management measures.

To minimise the impact of soil being contaminated by asbestos during the demolition of existing infrastructure a Hazmat survey of the administration building and warehouse would be conducted to identify synthetic mineral fibres, ACM and lead based paint, prior to demolition.

12.4.1.3 Contamination of soil

To reduce the impacts and likelihood of contaminating soil during construction a CEMP would be prepared and implemented by the construction contractor.

The detailed design on the Project would ensure that hardstand areas incorporated GPT and sumps to treat stormwater prior to leaving the site.

A Hazmat survey of the administration building and warehouse conducted to identify synthetic mineral fibres, ACM and lead based paint, prior to demolition. An asbestos survey of the site would be undertaken prior to construction works.

12.4.1.4 Compaction of soil profile

The construction footprint is to consider the location of operational infrastructure with heavy machinery and vehicles restricted to designated and approved access roads where feasible.

12.4.2 Operation

12.4.2.1 Contamination of soil

Preparation and implementation of an EMP to include waste management measures and management of hazardous materials which are required for the normal operation of the Berth 14A.

The detailed design of hardstand areas should incorporate GPT and sumps to treat stormwater prior to leaving the site.

12.5 Predicted environmental outcome

Table 12.3 Potential impacts, management measures and predicted outcomes

Impact	Management measure	Predicted outcome
Construction		
Disturbance of Acid Sulphate Soils	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of contaminated material.	Exposure of acid sulphate soils during earthworks is appropriately managed. Dewatering of acid sulphate soils during earthworks is appropriately managed.
Disturbance of existing contaminated soil	SAP developed and DSI implemented. Procedures developed and implemented that include the storage, treatment and disposal of contaminated soil.	Contaminated soil encountered is disposed and treated in accordance with procedure with no impact to surrounding environment.
Compaction of soil profile	Construction footprint to consider operational footprint. Heavy machinery and vehicles restricted to designated access paths	Areas of soil compaction minimised and rehabilitated where appropriate.
Contamination of soil from demolition of buildings and/or excavation of contaminants.	Preparation and implementation of CEMP. Design of hardstand areas to incorporate GPT and sumps to treat stormwater prior to leaving the site. A Hazmat survey of the administration building and warehouse conducted to identify synthetic mineral fibres, ACM and lead based paint, prior to demolition. Development of an asbestos management plan.	No contamination of soil during construction of Berth 14A and demolition of existing infrastructure.

Impact	Management measure	Predicted outcome
Operation		
Contamination of soil from general activities	Preparation and implementation of Environmental Management Plan. EMP to include waste management measures. Design of hardstand areas to incorporate GPT and sumps to treat stormwater prior to leaving the site.	No contamination of soil from the operation of Berth 14A.
Disturbance of acid sulphate soils	Preparation and implementation of ASSMP. Dewatering procedures to include treatment of contaminated material.	Dewatering of acid sulphate soils during operation of train unloading station appropriately managed and contained.

13. Air quality

This chapter outlines the potential air quality impacts associated with the construction and operation of the proposed activities at Berth 14A. The chapter provides a summary of the *Air quality – dust emissions* report prepared by Advanced Environmental Dynamics Pty (2012) and contained as Technical Report 9 in Volume 2B of this PER.

13.1 Assessment approach

A description of the existing air quality environment was determined using a combination of ambient air monitoring data and explicit modelling of dust generating activities at Bunbury Port.

Full description of methodology employed during air quality assessment is outlined in Technical Report 9, Volume 2B of this PER.

13.1.1 Site based dust emissions inventory

Dust emission sources associated with current activities at the port were developed based on the methodology undertaken by Air Assessment (2009) and considering a range of background studies which were undertaken in the vicinity of Bunbury Port. Using this information, two dust emission scenarios were developed:

- Scenario 1 – representation as far as practicable of the actual port activities during the period 1/7/08 through 31/12/10. Model predictions from this scenario were used in a model validation exercise through which was determined a 'suitable' reporting percentile for the model predicted 24-hour average concentrations of total suspended particulates (TSP) and particulate matter less than 10 um in diameter (PM_{10}).
- Scenario 2 – a worst-case year of port activities was developed based on a review of actual port volumes for each of the materials of interest. This worst-case year of activities is then simulated using six years of developed meteorology in order to assess the impact of variations in meteorology that can occur from year to year. The choice of years (2005-2010) corresponded to that used in the MODIS analysis and corresponds to high and low energy years.

13.1.2 Dispersion modelling

In order to provide estimates of current dust levels associated with TSP, PM_{10} and dust deposition, dispersion modelling was undertaken using a combination of The Air Pollution Model (TAPM) and CALMET/CALPUFF modelling tools for six years of hourly meteorological conditions (2005–2010).

A comparison of model predicted impacts was also undertaken at the four Bunbury Port Authority (BPA) current ambient air monitoring locations. The existing air quality environment is described through a combination of predicted impacts at specific sensitive receptors and regional contour plots.

The use of the 30th highest when reporting the results for the existing environment is based on the findings of a model comparison with monitoring data. The model comparison with observational data was undertaken to demonstrate that the model trend to over predict the highest percentiles and to identify a reasonable percentile for reporting of the existing environment results for the worst-year of port activities scenario (Refer to Appendix G of Technical Report 9 in Volume 2B of this PER).

Given the uncertainty of design at the time this air assessment was undertaken two options were modelled reflecting different shed orientations, including the final concept design as described in this PER (Scenario B). Contour diagrams were generated (Figures 13.2 to 13.6) reflecting a worst-case 24 hour operations in which all coal delivered to the port was stacked and reclaimed within the proposed shed. The contour plots for both scenarios were not significantly different (Refer to Section 13.3.2) and the resultant figures are reflective of both modelling outputs.

13.1.3 Project adopted cumulative ambient air quality goals

The air quality goals which have been adopted for the Project have been derived from a range of standards including the Air Quality National Environmental Protection Measure (NEPM) for PM_{10} and $PM_{2.5}$, the Kwinana Environmental Protection Policy (EPP) and the NSW DECCW Criteria for dust deposition.

Table 13.1 Project adopted cumulative ambient air quality goals

Pollutant	Averaging period	Project goal	Source
TSP	24-hour	90 µg/m^3	Kwinana EPP Area C
PM_{10}	24-hour	50 µg/m^3	NEPM
$PM_{2.5}$	24-hour	25 µg/m^3	NEPM
	annual	8 µg/m^3	
Dust deposition	Monthly	130 mg/m^2/day(1)	NSW DECCW

Note (1): This is equivalent to 4 g/m^2/month. Due to the small values of deposition associated with the Project, it is expressed here in mg/m^2/day.

13.2 Existing environment

13.2.1 Existing sources of dust emissions

Existing dust emission sources that may contribute to dust loading within the local airshed include, but are not limited to:

- activities at the port such as:
  - ship and truck loading and unloading
  - material handling by front end loaders
  - on-site processing of wood into woodchips
  - conveyors and conveyor transfer points
  - mineral sands processing
  - wind erosion of stockpiles, spillage areas and bare areas
- vehicle movements
- non port-related industrial activities
- natural sources such as sea spray, dust storms bushfires etc.

13.2.2 Estimate of background levels

Generally, background levels of pollutants are ground-level concentrations that would occur in the absence of any anthropogenic emission sources. It is anticipated that the ground-level concentrations surrounding the study area would be both spatially and temporally varying depending on receptor location, wind direction, wind speed and atmospheric characteristics.

Based on the Victorian EPA recommended 70th percentile background levels of PM_{10} and TSP, the following background levels of PM_{10} and TSP have been estimated for this assessment:

- a 24-hour average concentration of PM_{10} of 21.2 ug/m^3
- a 24-hour average concentration of TSP of 26.2 ug/m$^{3.}$

Data for $PM_{2.5}$ concentrations are not available, consequently, background $PM_{2.5}$ concentrations have been conservatively estimated as 80% of PM_{10} for the 24-hour averaging period.

Background levels of dust deposition is difficult to estimate as there is limited data available however a dust monitoring program found that the samples contained a significant fraction of salts, particularly in winter (ATA Environmental 2006) and that the NSW DECCW goal of 4 g/m^2/month was frequently exceeded.

13.2.3 Existing port environment

The dispersion modelling of the existing environment did not highlight any significant air quality issues relating to existing activities in the Port. Predicted exceedences of the relevant ambient air criteria are predicted to remain within or in close proximity to the boundary of the Port's Inner and Outer Harbour. The exception to this is a region to south and west of Berth 3 (including the dolphin centre) which is affected by current activities at Berth 3 and Berth 5, including material handling and processing of wood chip and mineral sand.

The model validation study indicated that the existing environment, in a 'worst case' scenario, presented the following:

- the 30th highest 24-hour average ground level concentration of TSP, including a background estimate of 26.3 ug/m^3
- the 30th highest 24 hour average ground level concentration of $PM_{10,}$ including a background estimate of 21.2 ug/m^3
- the 30th highest 24 hour average ground level concentration of $PM_{2.5,}$ including a background estimate of 16.9 ug/m^3
- the maximum annual average concentration of $PM_{2.5}$. A background level is not included in the results
- the maximum monthly dust deposition (reported in mg/m^2/day).

Table 13.2 presents a summary of results at receptor locations for the existing environment based on worst case port volumes. Refer to Technical Paper 9 in Volume 2B of this PER for a diagram of receptor locations.

Table 13.2 Summary of results of worst case scenario at receptor location from 2005 to 2010 (units ug/m^3 and mg/m^2/day) (AED 2012)

Pollutant	Averaging period	Est. Drive	Stirling Street	Workshop	Dolphin Centre	South Bunbury	Beacon 3	Bunbury BoM	Naval Cadets	Beacon 10
		1	2	3	4	5	6	7	8	9
TSP[1,3]	24 hour	73.9	81.5	64.5	**145.1**	29.9	39.6	27.5	65.2	**101.5**
PM_{10}[1,3]	24 hour	48.2	**55.1**	44.7	**98.9**	24.7	30.1	23.1	46.6	**70.5**
$PM_{2.5}$[1,3]	24 hour	22.3	23.9	21.7	35.9	17.6	18.9	17.3	23.0	28.4
$PM_{2.5}$[2]	Annual	0.7	0.9	0.6	3.1	0.1	0.3	0.0	0.9	2.1
Dust deposition[2]	Monthly	127.9	76.9	48.4	**304.1**	4.3	5.2	3.5	38.9	32.0

Notes:
1 30th highest maximum presented
2 Maximum presented
3 Includes background estimates
Bold indicates exceedences of the relevant project goal.

13.3 Impacts

This section summarises potential impacts that could occur during construction and operation of the Projects. Potential impacts would be controlled based on mitigation and management measures that are summarised in section 13.4.2. Consequently, no significant air quality issues are expected to result from the Project.

13.3.1 Construction impacts

Dust emissions estimations have not been conducted for the construction phase of project. However, it is expected that dust emissions would be generated by earthworks and vehicle movement during construction of the coal warehouse shed, administration building, shuttle building and workshop building. The amount of dust produced would vary substantially, depending on time of day, level of activity, specifications of operations, and prevailing meteorological conditions.

Minor quantities of NO_x, SO_x and CO may also be released from earthmoving equipment, other mobile vehicles and stationary generators. Whilst potential fossil fuel emissions have not been calculated they are expected to be low.

13.3.2 Operational impacts

13.3.2.1 Emissions inventory

A project specific emissions inventory has been developed and is presented in full in the Technical Report 9 in Volume 2B of this PER.

Dust emissions associated with the Project are summarised below and the source locations have been identified in Figure 13.1:

Figure 13.1 Dust emission sources

- fugitive emissions from the partially enclosed train unloading facility
- conveyors and their transfer points
- ship load out facilities
- emissions from the dust extraction system associated with the storage sheds.

13.3.2.2 Project emissions

Given that the conveyors are fully enclosed, the emissions associated with the conveying of coal have been assumed to be negligible.

Table 13.3 summaries the Project only impacts at receptor locations with no background levels included.

Table 13.3 Scenario B: Project only impacts at receptor locations, 2005 through 2010

Pollutant	Averaging period	Estuary Drive	Stirling Street	Workshop	Dolphin Centre	South Bunbury	Beacon 3	Bunbury BoM	Naval Cadets	Beacon 10
		1	2	3	4	5	6	7	8	9
TSP(1)	24-hour	0.5	0.8	0.6	2.5	0.2	0.5	0.1	1.0	3.0
PM_{10}(1)	24-hour	0.4	0.5	0.4	1.6	0.2	0.4	0.1	0.7	2.1
$PM_{2.5}$(1)	24-hour	0.1	0.1	0.1	0.3	0.0	0.1	0.0	0.1	0.3
$PM_{2.5}$(2)	Annual	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Dust deposition(2)	Monthly	0.2	0.1	0.1	0.2	0.0	0.1	0.0	0.2	0.5

Note (1): Maximum presented
Note (2): Maximum presented
Units:ug/m^3 and mg/m^2/day

The low level of predicted impacts associated with the Project suggests that the operation of Berth 14A and the associated coal handling infrastructure will not lead to a measureable increase in either suspended or deposited particulate matter at sensitive receptor locations.

Contour plots including the operation of Berth 14A illustrate that the future ambient air quality environment would not be significantly different from the current situation (Figures 13.2 – 13.5). This is due to the high level of engineering controls that have been proposed for Berth 14A (refer to section 13.4.2 below). Impacts associated with Project related dust emissions is not predicted to lead to measurable changes in air quality as would be recorded in any of the four BPA ambient air monitoring locations.

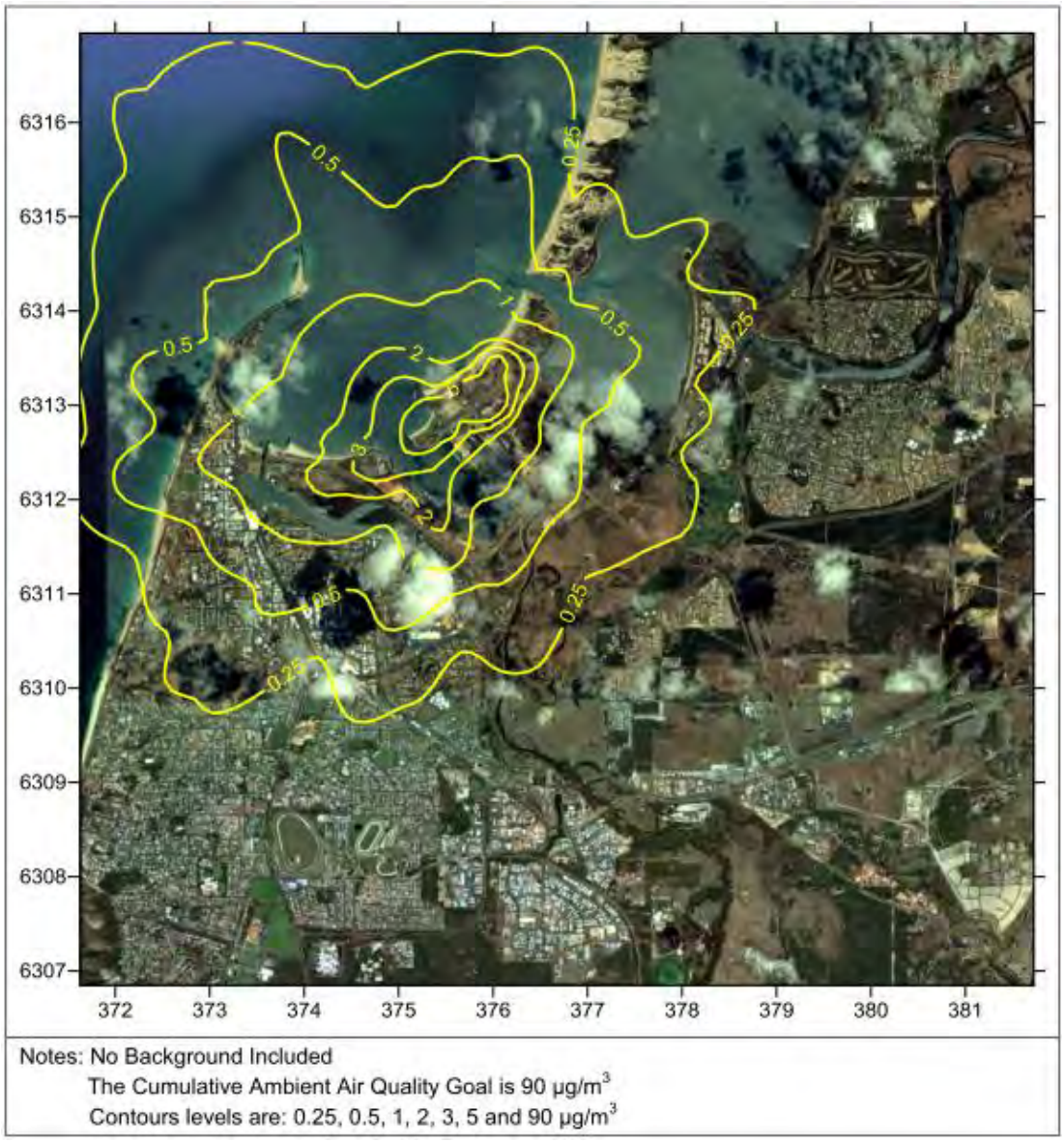


Figure 13.2 Maximum 24-hour average ground-level concentration of TSP

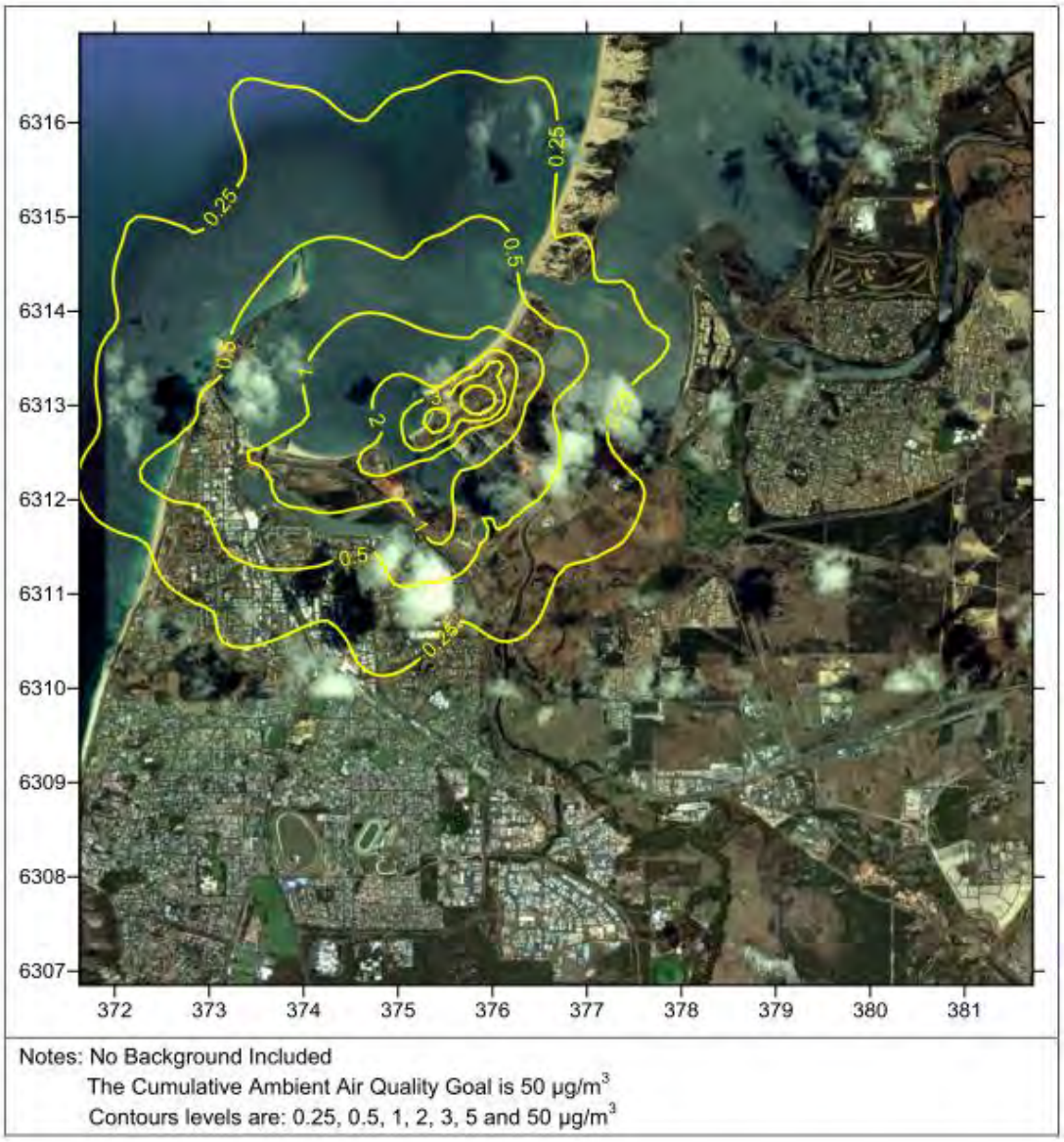


Figure 13.3 Maximum 24-hour average ground-level concentration of PM_{10}

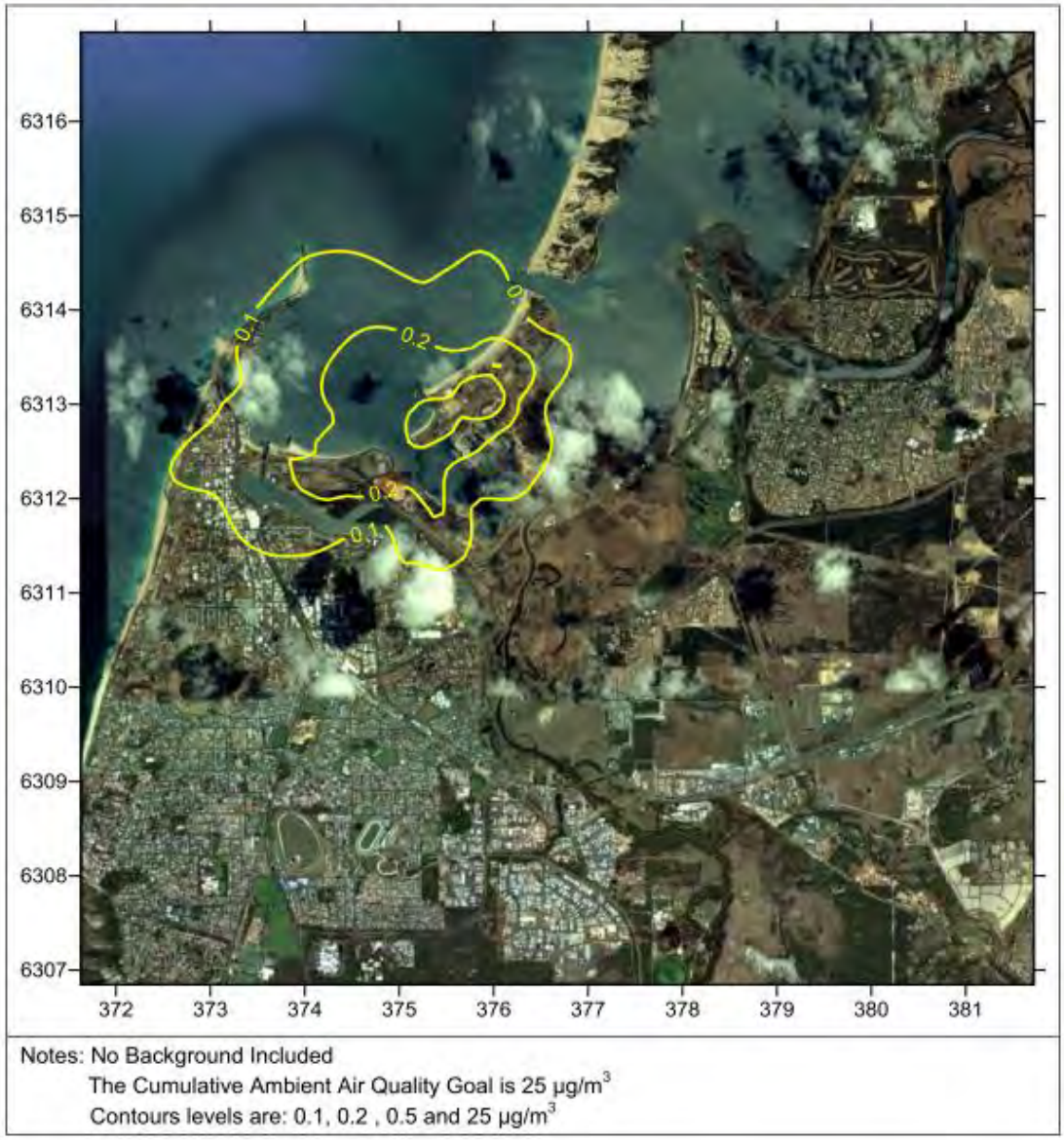


Figure 13.4 Maximum 24-hour average ground-level concentration of $PM_{2.5}$

Figure 13.5 Maximum annual average ground level concentration of $PM_{2.5}$

Figure 13.6 Maximum monthly dust deposition

13.3.2.3 Spontaneous combustion

The coal that is to be processed through Berth 14A is sub-bituminous and under certain conditions can be subject to spontaneous combustion, this is a chemical reaction that requires certain preconditions but is most common in stockpiles and usually when the product has been stored for some time, as well as when left to accumulate, on conveyor rollers. If spontaneous combustion occurs, particulate matter may be dispersed as a result of the fire. The many variables associated with spontaneous combustion means that the impact cannot be modelled however mitigation measures have been recommended to reduce the likelihood of it occurring.

13.4 Management and mitigation measures

Compared with other coal terminals throughout Australia, the amount of dust mitigation engineering that has been considered in the proposal is representative of present industry best-practice technology (AED 2012). The proposed dust mitigation and management measures would potentially limit dust to ship load out activities and a minor amount of fugitive emissions associated with the partially enclose train unloading facility.

13.4.1 Construction

During times when high emissions are likely (e.g. adverse meteorological conditions or execution of activities known to create high concentrations of dust) dust suppression techniques will be employed. Dust control measures typically involve treatment of dust sources such as temporary roads and stockpiles, with water.

Prior to the commencement of any construction works, a construction dust management plan will be prepared and included in an overall construction environmental management plan (CEMP) which will be developed following finalisation of the detailed design. The dust management plan will include a risk assessment and classification score based on '*site risk classification assessment chart for generating uncontaminated dust',* provided in '*A guideline for managing the impacts of dust and associated contaminants from land development sites'* (DEC 2011a).

13.4.2 Operational

Engineering controls have been incorporated into the design of project infrastructure to manage dust and will be further developed during the detailed design phase. These controls include:

- fully enclosed conveyors
- fully enclosed transfer points
- dust extraction on the main shed feeder transfer station
- dust extraction system on the storage shed
- chute and water sprays at ship load out
- water sprays in the storage shed
- partially enclosed train unloading facility with dust extraction associated with the bottom dump hopper system.

During the operation of the Project, specifically when the ship loaders are operating, a 'no visible dust' requirement would be enforced in addition to the proposed air monitoring program as described below.

13.4.3 Ambient air monitoring program

An on-site ambient air monitoring program is proposed to collect and analyse representative dust samples taken using a high volume sampler (HVS) or via dust deposition gauges (DDG).

All monitoring is to be undertaken in accordance with the following relevant Australian Standards:

- DR AS 3580.14 Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications. (Draft AS)
- AS 2922 Ambient Air – Guide for the siting of sampling units
- AS 3580.10.1 (2003) Methods for sampling and analysis of ambient air – determination of particulate matter – deposited matter – gravimetric methods
- 3580.9.8 (2008) Methods for sampling and analysis of ambient air -Determination of suspended particulate matter - PM10 continuous direct mass method using a tapered element oscillating microbalance analyser
- 3580.9.3 (2003) Methods for the Sampling and Analysis of Ambient Air – Determination of Suspended Particular Matter – Total Suspended Particulate Matter (TSP) – High Volume Air Sampler Gravimetric Method.

13.4.3.1 Spontaneous combustion management

The board principle for spontaneous combustion management is avoidance of a fire situation. The management of coal is not in isolation at the Project site rather the risk is managed from the mine to the loading of the ships. The following management measures are proposed to be incorporated into the detailed design and environmental management systems for the Project:

- implementation of early warning and response systems to detect fires before they develop into a hazardous situation
- installation of rapid and reliable environmental monitoring systems to detect fires early, (e.g. use of liner heat detectors, CO and/or other fire detection systems)
- use of plant condition monitoring systems (sensors) such as -bearing temperature, vibration, infra-red sensors, brake release, belt tracking, blocked chute, belt slip, etc.
- installation of systems for communications to all persons at the facility and external response agencies (FESA etc.)
- implementation of a comprehensive and effective inspection system.

13.5 Predicted environmental outcome

Impact	Management measure	Predicted outcome
Construction		
Dust emission exceedences during construction	Construction dust management plan	No exceedance in dust deposition goals.
Operation		
Significant increase in existing exceedences at sensitive receptors	Ambient air monitoring program	No visible dust during operation. Continuous review of operational emission impacts. No significant increase in current emission exceedences within the Port.
Spontaneous combustion	Preparation of a spontaneous combustion management plan	Reduced likelihood of spontaneous combustion.

14. Noise and vibrations

This chapter summaries the *Terrestrial Noise Impact Assessment For Lanco's Bunbury Coal Export Facility* prepared by SVT Engineering Consultants (2012), which is contained as Technical Report 16 in Volume 2C of this PER.

It outlines the potential terrestrial noise impacts associated with the Project, including impacts of construction and operation phases. The chapter also sets out mitigation and management measures to minimise impacts during construction and operation.

Assessment of the underwater noise and vibration impacts is provided separately in Chapter 11 *Marine Fauna* and within Technical Report 7 in Volume 2B of this PER.

14.1 Assessment approach

The assessment was undertaken in accordance with the Environmental Protection (Noise) Regulations 2007 which specify maximum noise levels at noise-sensitive premises, commercial and industrial premises.

Reference to the *EPA Draft Guidance Statement No.8: Environmental Noise, Statement Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning and the EPA Guidance No 14 – Road and Rail Transportation Noise (Preliminary Draft)* has also been undertaken.

The following terms are used to describe noise emissions in the following sections:

- assigned noise levels – highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises
- influencing factor – used for noise sensitive premises such as residences and incorporated into the assigned noise levels. The factor depends on the land use zonings within a radius from the noise receiver
- L_{Amax} assigned noise level which is not to be exceeded at any time
- L_{A1} assigned noise level which is not to be exceeded for more than 1% of the time
- L_{A10} assigned noise level which is not to be exceeded for more than 10% of the time.

The terrestrial noise study is limited to the immediate area surrounding the port. Discussion on noise associated with the rail only includes the rail loop located within the site boundary, beginning and terminating to the north west of the Preston River.

The following work has been undertaken as part of this terrestrial noise assessment:

- review of ambient noise in Bunbury by reference to recent studies undertaken by Bunbury Port Authority (BPA)
- determination of noise limits for noise sensitive premises
- development of a noise model for construction and operation of the facility
- prediction of noise levels at noise sensitive premises for worst-case meteorological conditions
- comparison of predicted noise levels with environmental noise limits
- identification of key noise sources with the potential to contribute to exceedance of noise limits

- provision of noise mitigation recommendations
- screening level review of rail noise.

Noise level predications have been taken from the five receiving locations which the BPA use when assessing their noise impacts from the port operations. These locations are:

- R1 Caravan Park on Koombana Drive
- R2 Stirling Street, midway along waterfront section
- R3 Oliver Street, midway along street
- R4 Venn/Burt Street, near intersection
- R5 Pickworth Retreat, north west corner (near Pelican Point).

14.1.1 Operational assigned noise levels

Table 14.1 illustrates the assigned noise levels for the operation of the Project. These assigned noise levels have been specified in the Environmental Protection (Noise) Regulations 2007.

Table 14.1 Assigned noise levels

Type of premises receiving noise	Time of day	Assigned noise level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use	0700 to 1900 hrs Monday to Saturday	45 + influencing factor	55+ influencing factor	65+ influencing factor
	0900 to 1900 Sunday and public holidays	40+ influencing factor	50+ influencing factor	65+ influencing factor
	1900 to 2200 hours all days	40+ influencing factor	50+ influencing factor	55+ influencing factor
	2200 hrs on any day to 0700 hrs Monday to Saturday and 0900 hr Sunday and public holidays	35+ influencing factor	45+ influencing factor	55+ influencing factor
Noise sensitive premises at locations further than15 metres of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial premises	All hours	65	80	90

The influencing factor at R1, R2, R4 and R5 is zero however at R3 the influencing factors is 7, this is illustrated in Table 14.2.

Table 14.2 Assigned noise level for selected receptors

Time of day	Assigned noise level (L_{A10} dB(A))			
	Locations R1, R2, R4 & R5	Location R3	Commercial premises	Industrial premises
0700 to 1900 hrs Monday to Saturday	45	52	60	65
0900 to 1900 Sunday and public holidays	40	47	60	65
1900 to 2200 hours all days	40	47	60	65
2200 hrs on any day to 0700 hrs Monday to Saturday and 0900 hr Sunday and public holidays	35	42	60	65

14.1.2 Cumulative operational noise impacts

The Regulations require that noise emissions must not significantly contribute to any exceedance of the assigned noise level. Noise levels considered to contribute to an exceedance if they are within 5 dB of the assign noise level.

As discussed below the ambient noise from existing port operations has the potential to approach or exceed the assigned noise levels and therefore noise emissions from the Project must be at least 5 dB below the assigned noise levels to comply with the Regulations. The cumulative noise impacts are provided in Table 14.3 below.

Table 14.3 Project noise limits for selected noise sensitive receptors with consideration of cumulative impacts

Time of day	Assigned noise level (L_{A10} dB(A))	
	Locations R1, R2, R4 & R5	Location R3
0700 to 1900 hrs Monday to Saturday	40	47
0900 to 1900 Sunday and public holidays	35	42
1900 to 2200 hours all days	35	42
2200 hrs on any day to 0700 hrs Monday to Saturday and 0900 hr Sunday and public holidays	30	37

14.2 Existing environment

Several studies have already been undertaken on the cumulative noise impacts associated with the existing port operations. These studies demonstrate that noise levels from the port vary widely depending on both the port operating conditions and the prevailing weather conditions.

These studies indicate that:

- the highest noise levels are observed at noise sensitive locations to the south-west of the port for light down-wind conditions (i.e. winds from the north, north-east and north-west)
- noise received at locations to east of the port (Pelican Point) is somewhat lower, and the highest levels at these locations occur for westerly and south-westerly winds
- traffic noise dominates noise from the port during the day. However, during the night traffic flows fall sharply and, under favourable weather conditions, noise from the port can become dominant.

14.3 Impacts

14.3.1 Construction impacts

At the time of this assessment detailed construction methodologies were not known however it is anticipated that high level noise emissions will be required for pile driving operations for the construction of the jetty and for site earth works. Indicative noise modelling was undertaken for both of these activities.

It was assumed that a single pile driver would be operating near the southern end of the jetty and earth works would include a front end loader, dozer and haul truck operating near the jetty area has been developed to represent a worst-case for noise emissions.

Table 14.4 illustrates the predicted noise levels at each of the receiving locations for construction activities under worst case meteorological conditions for sound propagation. Noise contours for pile driving and earthworks are provided in Figure 14.1 and Figure 14.2 respectively.

Table 14.4 Predicted worst case noise levels for construction

Receiving location	Predicted noise level (L_{A10} dB(A))		Assigned noise level (L_{A10} dB(A))
	Pile driving*	Earth works	
R1	54	37	35
R2	59	35	35
R3	58	41	45
R4	55	37	35
R5	46	30	35

*Pile driving is considered impulsive

Figure 14.1 Noise contours from piling operations

Figure 14.2 Noise contours for earth works

Assessment of the operational impacts of the Project demonstrated that when considered in isolation the Project can comply with the assigned noise levels (refer to). However the Environmental Protection (Noise) Regulations 1997 require that noise emissions must not exceed or significantly contribute to an exceedance of the assigned noise levels. Table 14.5 summarises the noise levels accounting for the cumulative impact under various meteorological conditions.

Table 14.5 Predicted worst case noise levels for normal operations

Receiving location	Predicted Noise Level v Wind Direction L_{A10} dB(A)								
	Calm	N	NE	E	SE	S	SW	W	NW
R1	26	31	31	31	31	26	23	23	26
R2	30	35	35	35	33	27	26	28	35
R3	32	37	37	35	29	28	30	36	37
R4	28	33	33	33	26	24	25	31	33
R5	24	29	21	21	22	29	30	30	30

As demonstrated in Table 14.5, compliance is dependent on port operating conditions in addition to the prevailing weather conditions. It should also be noted that the worst case operating scenario has been modelling on two ship loaders operating simultaneously operating which won't always occur.

Further analysis of wind data was undertaken in Technical Report 16 in Volume 2C of this PER to demonstrate that the frequency of worst case winds (up to 3 m/s) during the night time hours in Bunbury. Table 14.6 represents the upper limit of the risk of non-compliance as it doesn't account for the frequency of simultaneous night time operations from other Port uses or how frequently the two ship loaders are likely operate simultaneously. The ship loaders dominate the predicted noise levels at all receptors.

Table 14.6 Percentage occurrence of weather conditions which may cause noise from the Project to exceed the assigned noise levels

Receiving location	% Occurrence
R1	20
R2	21
R3	0
R4	14
R5	0

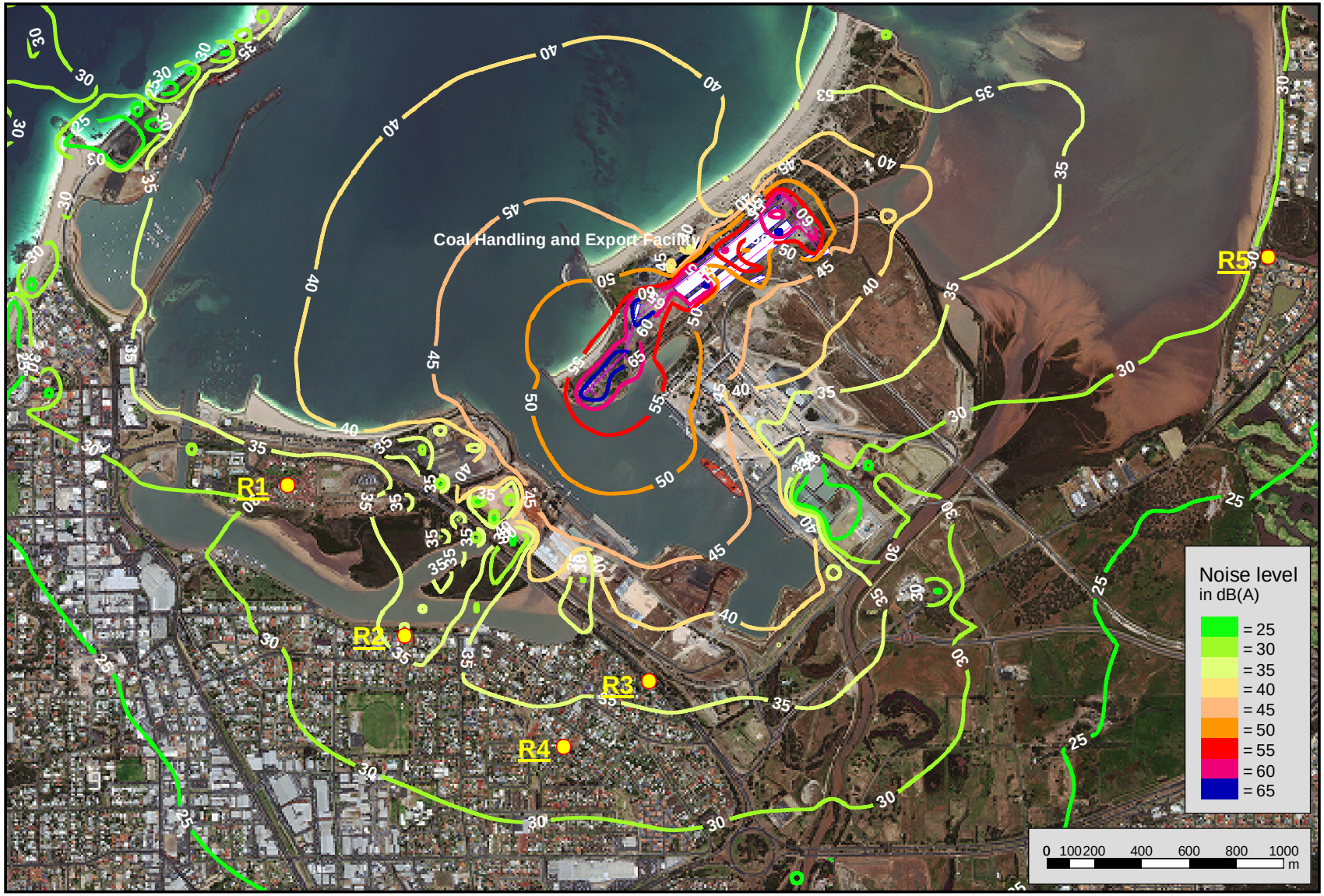


Figure 14.3 Worse case noise contours for normal operations

14.3.2 Operational impacts

As currently designed, the Project is unable to fully comply with the applicable noise limits when accounting for cumulative noise emissions from other port users. When operating two ship loaders predicted noise levels exceed the night time assigned nose levels at some locations in certain wind conditions (refer to Table 5-2 of Technical Paper 16 of Volume 2C of this PER).

14.4 Management and mitigation

14.4.1 Management of impacts during construction

The predicted noise levels for the terrestrial construction activities are above the assigned levels at all receiving levels, therefore effective management of noise during construction is required. The following management measures will be implemented:

- All construction work will be carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'.
- Equipment used during construction will be the quietest which is reasonably available.
- For out of hours construction (work outside of 0700 to 1900 hrs Monday to Saturday) the following additional controls will be undertaken:
  - The contractor must advise all nearby occupants or other sensitive receivers who are like to receive noise levels which fail to comply with the standard under Regulation 7, of the work to be done at least 24 hrs before it commences.
  - The contractor must show that it was reasonably necessary for the work to be done out of hours.
  - The contractor must submit to the local authority a Noise Management Plan at least seven days before the out of hours work starts, and the plan must be approved. The plan will include details on the following:
    - need for the work to be done out of hours
    - types of activities which could be noisy
    - predictions of the noise levels
    - control measures for noise and vibration
    - procedures to be adopted for monitoring noise emissions
    - compliant response procedures.

14.4.2 Management of impacts during operation

As previously discussed, the ship loaders are the most significant noise emitters for the Project. To achieve full compliance with the applicable noise limits, the ship loaders would require substantial reduction in noise.

To achieve compliance, a reduction of approximately 8 dB would be required from the ship loaders and 2 dB from the remaining equipment. As it has been demonstrated that the Project has the potential to exceed, noise control measures will need to be incorporated into the detailed design and compliance monitoring undertaken once operational.

14.5 Predicted environmental outcomes

Table 14.7 Summary of potential impacts and management measures associated with noise

Impact	Management measure	Predicted outcome
Construction noise	Preparation of a noise management plan to be submitted to DEC	Work carried out in accordance with control of noise practices set out in Section 6 of the Australian Standard 2436 -1981 *Guide to Noise Control on Construction Maintenance and Demolition Sites*
Operational noise	Further consultation with DEC and EPA when undertaking the detailed design of the facility, particularly the ship loaders.	Operational noise emissions reduced as far as feasibly possible to reduce any cumulative emission exceedences during operation.

15. Other environmental issues

This chapter provides a review of additional potential environmental issues associated with the construction and operation of the Project that are not discussed in previous chapters.

15.1 Surface drainage and leachate

15.1.1 Assessment approach

No detailed hydrology studies have been undertaken for the Project given the limited impacts proposed. In the preliminary design of the Project, Mott MacDonald (2011) prepared a water management plan to reduce any undesirable discharges into the environment and to supply, capture, treat and recycle water within the Project area.

15.1.2 Existing environment

Surface water throughout the Project area drains into the inner harbour or a few small artificial wetlands on site. Offsite surface water receptors include:

- Koombana Bay Beach to the north, which is zoned as recreational land use, and is followed by the Indian Ocean
- the inner harbour to the south
- Vittoria Bay to the east
- Pelican Point wetlands approximately 1.3 km to the east
- Collie River approximately 2.2 km to the east
- Preston River approximately 150 m to the south
- Leschenault Inlet to the east and west.

15.1.3 Impacts

15.1.3.1 Construction impacts

Water quality

During the construction phase of the Project, proposed earthworks have the potential to generate erosion and sedimentation to the artificial wetlands or the Berth 14A pocket.

Erosion and sedimentation may occur from runoff associated with earthworks and soil stockpiles during site establishment works.

Contamination

During construction, surface water may be contaminated by:

- discharge of contaminated groundwater into water bodies adjacent to the areas undergoing dredging works
- runoff over contaminated soils exposed during earthworks
- leaks, spills or the incorrect disposal of chemicals, hydrocarbons or wastes.

Further discussion on potential contamination is discussed in section 12.3.1.3.

15.1.3.2 Operational impacts

Sedimentation

Sedimentation of surface water may result from runoff over coal stockpiles. However, the likelihood of this occurring is low due to mitigation and management measures that will be employed to control sedimentation.

Contamination

Contamination of surface water may occur if chemical spills associated with project infrastructure, equipment and machinery (including hydrocarbon spills such as diesel and other fuels) are not appropriately managed or in the event of a fire and fire fighting water is incorrectly managed.

15.1.4 Management and mitigation measures

15.1.4.1 Construction

To minimise potential surface water impacts during construction a CEMP will be prepared and implemented that identifies appropriate storage and disposal options to minimise the potential for leaks, spills or incorrect disposal of chemicals, hydrocarbons or wastes, including contaminated groundwater or runoff from areas of known contamination.

The CEMP would also include measures to manage erosion and sedimentation including appropriate staging of works to minimise the extent of disturbance and control of the movement of water.

15.1.4.2 Operational

To minimise potential operational impacts, the preliminary water management plan outlined in Technical Report 18 of Volume 2C of this PER (Mott Macdonald 2011) would be finalised and implemented into the an overall environmental management system for the facility. Key management measures proposed include:

- leachate management
- separation of coal dust and stormwater
- separation roof water and runoff from hardstand areas
- capture and treatment of the first flush from hardstand areas
- filtration of hose down water
- sewerage treatment.

15.2 Solid and liquid waste

15.2.1 Assessment approach

For the preparation of this PER, no specific assessment for the disposal of waste was required. Notwithstanding this, waste disposal should be considered so that any potential impacts are addressed.

15.2.2 Existing environment

As the site is currently not operated to support berth operations very little waste is generated. All waste disposal is in accordance with BPA management conditions.

15.2.3 Impacts

15.2.3.1 Construction

The construction of the Project has the potential to generate waste both from the demolition of existing buildings and the construction of infrastructure. Key wastes streams generated during construction include:

- demolition of existing buildings, including potential hazardous materials
- contamination of spoil material
- scrap metal
- general construction waste
- fuel, oils, liquids and chemicals
- waste water.

15.2.3.2 Operational

Waste generating activities during the operation of the project would include maintenance of the infrastructure and the use of the facilities. Operational waste streams include:

- oils, grease and other chemicals from the servicing of the infrastructure
- waste water from any fire fighting activities
- sewerage
- general rubbish from support services.

15.2.4 Management and mitigation

15.2.4.1 Construction

Construction waste will be managed and disposed of in accordance with the requirements of BPA and DEC requirements. Standard mitigation measures to manage construction waste would be detailed in the CEMP prepared prior to construction. These measures may include:

- ensuring that any wastewater collected is appropriately treated prior to discharge
- maximise re-use of construction spoil
- investigating opportunities for potential reuse or recycling of construction or demolition waste.

15.2.4.2 Operational

The operation of the Berth 14A would generate some waste. A Waste Management Plan (WMP) would be developed as part of the EMP of the Project. The WMP would detail the standard environmental management measures to manage resource consumption and to avoid waste generation in particular the management of hazardous waste, if any.

Any waste generated from docked vessels are to be disposed of in accordance with BPA and Quarantine requirements.

15.3 Aboriginal and European heritage

15.3.1 Assessment approach

15.3.1.1 Aboriginal

Aboriginal heritage advice was provided by Brad Goode and Associates and is included as Technical Report 17 in Volume 2C of this PER. This advice has been prepared to provide an assessment of the potential impact of the Project on aboriginal heritage in accordance with the ESDs.

The advice was prepared based on the following:

- a review of previous Aboriginal studies (Goode & Yates 2008, Goode & Listeman 2009) conducted in the area
- a review of the review of the Department of Aboriginal Affairs (DIA) Aboriginal Heritage Inquiry System, Aboriginal Sites Database
- consultation with DIA.

Together this review and consultation provided an understanding of the status and evidence of Aboriginal heritage located within the Project area and surrounds.

15.3.1.2 European

Online searches of the Heritage Council of Western Australia Database (HCWA 2011) and the Western Australian Museum Shipwreck Databases (WAM, 2011) were conducted. The results of these desktop searches provided details on European heritage places located in the vicinity of the Project area.

15.3.2 Existing environment

15.3.2.1 Aboriginal

As previously discussed in section 12.2, the Preston River has been diverted to the southern part of the Leschenault Estuary, to create the Inner Harbour, in which the Project area is located. Previous studies undertaken on the Project area have incorrectly identified the location of the Preston River. These studies have shown the Preston River in its historic form, prior to diversion, traversing the Project area. The Preston River has been identified as a ‘Registered Site’ of Aboriginal significance. This incorrect location and therefore heritage significance has been reflected in the DIA database.

A discussion was undertaken with DIA to identify and clarify this potential error. Subsequent to this discussion DIA has updated the Aboriginal Sites Database to show correct (and current) location of the Preston River, and associated Aboriginal significance.

The Preston River, and the Registered (Aboriginal) Site, is located to the south of the Project area. The Project area does not include any Registered (Aboriginal) Sites.

15.3.2.2 European

Desktop searches identified one heritage listed shipwreck, known as Carbet Castle (Place No: 05633), located immediately north of the proposed project area. The Bunbury Port Structure Plan Scoping Document (BPA 2011) identified a 100m protection buffer around the

location of the shipwreck. This buffer intersects the northern boundary of the proposed project area.

No other heritage places were identified within one kilometre of the proposed project area.

15.3.3 Impacts

15.3.3.1 Construction impacts

Aboriginal

The Project area does not include any Registered (Aboriginal) Sites. The Preston River, a Registered (Aboriginal) Site is located to the south of the Project area. The construction of the Project will utilise the existing bridge crossing over the Preston River to ensure there are no detrimental impacts on Aboriginal heritage.

European

It is not expected that construction of the Project would impact on the Carbet Castle shipwreck or any other registered places of European heritage. A CEMP would be prepared for the Project which would include management measures to limit access to this heritage site and ensure it is not impacted.

No other heritage places are known to occur within the Project area. However, if artefacts of cultural significance are identified during construction, the appropriate authorities (e.g. HCWA) would be notified and construction works would be modified.

15.3.3.2 Operational impacts

Aboriginal

The Project does not propose any development over, or on the banks of the Preston River. The operation of the Project will not adversely impact on the water quality or morphology of the river and therefore have no detrimental impacts on Aboriginal heritage within the Project area and surrounds.

European

Operation of the Project is not expected to impact any places registered places of European heritage, including the Carbet Castle shipwreck. This shipwreck occurs beyond the development footprint of the proposed project.

No other heritage places occur within the vicinity of the Project.

15.3.4 Management and mitigation measures

15.3.4.1 Construction

A CEMP would be prepared for the Project and would detail management measures to mitigate any potential impacts to Aboriginal or European heritage. These mitigation measures will include limiting access to the Preston River and Carbet Castle shipwreck. If any artefacts of cultural significance are identified during construction works construction

activities would be postponed and the appropriate authorities would be notified (e.g. DIA or HCWA).

15.3.4.2 Operational

The operational phase of the Project is not expected to impact on any Aboriginal or European heritage place. To ensure potential impacts are mitigated access to known heritage places such as the Carbet Castle shipwreck would be limited. If any artefacts of cultural significance are identified during operation then the appropriate authorities would be notified.

15.4 Visual amenity

15.4.1 Assessment approach

A desktop visual impact assessment of the proposed Project was focussing on viewsheds of adjacent users and public vantage points around the Project that could be impacted by the proposed development. Assessment methodology included:

- a site inspection
- an assessment of receptor sensitivity
- a photomontage
- an assessment of landscape impact.

15.4.2 Existing environment

The existing landscape has been extensively altered for port and industrial purposes. Previous modifications of the landscape include clearing of native vegetation, alterations of natural landform and native soil profile, and the construction of the inner harbour with associated dredging activities.

Areas surrounding Berth 14A are comprised of industrial buildings and infrastructure such as bulk storage tanks containing alumina and caustic soda and wood chip facilities.

15.4.3 Impacts

15.4.3.1 Construction

Construction work at the Project would be visible from known receptors with high sensitivity. However, these viewpoints are already exposed to the established industrial and port facilities. Consequently, construction activities are not expected to have a significant impact on visual amenity.

While the Project may make a cumulative contribution to impacts on visual landscape produced by established industry, this contribution is expected to be neutral.

15.4.3.2 Operation

The operational phase of the Project is not expected to create any additional impacts to visual amenity. Facilities associated with the Project will be visible to adjacent stakeholders. However, as previously discussed, given the amount of industrial and port activity occurring

in the area, operation of project is not expected to have a significant impact on visual amenity.

15.4.4 Management and mitigation

Minimal to no visual impacts have been identified of the Project. However, the following strategies can still be considered in the planning and execution of the project:

- Waste can cause visual nuisance during the construction phase. Storage of solid waste is required at all times prior to disposal. Appropriate containment of general rubbish is to be in place so as to minimise rubbish blown to publicly accessible locations.
- The type of lighting and its visual impact should be given consideration during the procurement stage. Some of the issues to observe are light fittings with lower lux ratings, shielded fittings and downlighting.
- The buildings are intended to adopt site appropriate materials to withstand surrounding environmental elements. Being a port facility building, the materials used need to be resistant to corrosion and have a lasting tidy appearance over time. These materials should also have positive impact to enhance the overall appearance of the port structures.

15.5 Predicted environmental outcome

Table 15.1 Summary of potential impacts and management measures associated with general environmental issues

Impact	Management measure	Predicted outcome
Construction		
Surface drainage	Preparation of a CEMP	Minimisation of erosion, sedimentation and contamination of surface water during construction
Waste	Preparation of a waste management plan for inclusion in the CEMP	Commitment to reuse and recycling wherever possible.
Heritage	Preparation and implementation of a CEMP including management measures to protect identified heritage items.	No impact to any European or Aboriginal heritage item.
Operation		
Surface drainage Waste	Finalisation of the water management plan, including leachate management	Management of surface water including leachate to reduce impacts to the aquatic environment.

16. Conclusions

This PER has been prepared in accordance with Section 38 of the EP Act. In particular, it addresses the requirements of the ESD prepared by the EPA (dated 22 September 2011) and addresses each of the key factors raised. The PER also includes consideration of issues raise by the community and stakeholders during the development of the Project and completion of the PER.

Whilst not assessed in this PER, the Project forms part of a larger project including expansions to the Griffin coal mine in Collie and the upgrade of the existing rail line from Collie to Bunbury Port.

The Project has several benefits to the local economy including additional revenue, employment creation (during both construction and operation) and provision of additional services to support the operations.

Whilst the Project is expected to have several benefits, some adverse impacts would be unavoidable due to the nature of the project. Marine and noise impacts are likely to occur, particularly during construction. The marine impacts are expected to reduce in the long term once the facility is operational and the proposed management measures have been implemented.

Various management and mitigation measures are recommended to avoid and/or manage the identified impacts associated with the Project's construction and operation. These would be incorporated in a construction environmental management plan to be developed by the construction contractor, and environmental management plan to be prepared of the operation of the facility and a marine environmental management plan to manage any impacts to the marine environment.

In the preparation of this PER, the object of the *Environmental Protection Act* being to protect the environment of the State and its principles have been considered.

Provided the measures and commitments specified in this PER are applied and adhered to during the Project's construction and operation, it's considered that the overall environmental impacts are manageable.

17. References

360 Environmental 2008. Bunbury Port Inner Harbour (Berth 14A Expansion) Old Hot Water Basin: Preliminary Marine Sediment Quality Analysis Plan Report.

360 Environmental. 2009 Bunbury Inner Harbour, Berth 14A Expansion, Preliminary Acid Sulfate Soil and Contaminant Assessment, Bunbury, February 2009.

AED 2012 Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886). Technical Report 9: Air Quality – dust emissions.

Air Assessments 2009 Bunbury Port dust buffer assessment. Prepared for the Bunbury Port Authority. March 2009.

Andrew, N. L. 1999 Under Southern Seas: the ecology of Australia's rocky reefs. UNSW Press, Sydney.

ANZECC and ARMCANZ. 2000, Australian Water Quality Guidelines for Fresh and Marine Waters, National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation Council, Canberra.

ANZFA 2005 Australia and New Zealand Food Standards Code: Incorporating amendments up to and including Amendment 76.

AQIS 2011 National Seaports Program: Australian Ballast Water Management Requirements. Department of Agriculture, fisheries and Forestry. Canberra.

Australian Standard 2436-1981. Guide to noise control on construction, maintenance and demolition sites.

Australian Standard 5062-2006. Fire protection for mobile and transportable equipment.

Australian Standard 3580.14-2011. Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications.

Australian Standard 3580.1.1:2007 Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment.

Australian Standard 3580.10.1:2003 Methods for sampling and analysis of ambient air – determination of particulate matter – deposited matter – gravimetric methods.

Australian Standard 3580.9.8:2008 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM10 continuous direct mass method using a tapered element oscillating microbalance analyser.

Australian Standard 3580.9.3:2003 Methods for the Sampling and Analysis of Ambient Air – Determination of Suspended Particular Matter – Total Suspended Particulate Matter (TSP) – High Volume Air Sampler Gravimetric Method.

ATA Environmental 2006 Bunbury Port Authority – Results of deposition dust monitoring – Bunbury Port. Version 2, report N. 2005/232.

Bannister, J. l., Burton, C. L. K., Dunlop, R., Hedley, S. L. and Paxton, C. 2006 Aerial Survey for Humpback whales off Shark Bay, WA 2005. Final report to the Department of Environment and Heritage. Canberra.

Barranguet C, Kromkamp J, Peene J. 1998 Factors controlling primary production and photosynthetic characteristics of intertidal microphyobenthos. Marine Ecology Progress Series 173:117-126.

Bennett, AF 1990, Habitat corridors: Their role in wildlife management and conservation, Arthur Rylah Institute for Environmental Research, Melbourne Bennett 1993.

Bennett, E. 2008. Flora and vegetation, Port expansion, City of Bunbury. Report prepared for Bunbury Port Authority. (Bennett Environmental Consulting Pty Ltd, Kalamunda).

Bennelongia Pty Ltd. 2008. Report on the Shorebird and Waterbird Values of the Bunbury Inner Harbour. Unpublished report prepared by Bennelongia Pty Ltd for 360 Environmental Pty Ltd., Bennelongia Pty Ltd, Jolimont WA.

BPA 2011 Bunbury Port Inner Harbour Structure Plan (IHSP) – Scoping Document. Structure Plan Scoping Document. Prepared by Bunbury port Authority.

Brad Goode & Associates 2009 An aboriginal heritage survey of the Bunbury Inner harbour Redevelopment, Western Australia. Prepared for the Bunbury Port Authority.

Coffey. 2008. Detailed Site Investigation Report (February 2008), Former Western Power Bunbury Port Station, Leschenault Drive, Bunbury, Western Australia. Prepared for Western Power Corporation, June 2008, Report Ref:ENVIBURW096321A.

Coffey. 2009. Detailed Site Investigation Report (October 2008), Former Western Power Bunbury Port Station, Leschenault Drive, Bunbury, Western Australia. Prepared for Western Power Corporation, May 2009, Report Ref:EP2009/013, V1.

Commonwealth of Australia 2009. National Assessment Guidelines for Dredging (NAGD). Department of the Environment, Water, Heritage and the Arts. Commonwealth of Australia, Canberra, Australia.

Cropper SC 1993. Management of Endangered Plants. CSIRO Australia, Melbourne.

Davidson, WA 1995, Hydrogeology and Groundwater Resources of the Perth region, Western Australia. Geological Survey of Western Australia Bulletin 142.

DEC 2004. The Leschenault Inlet/Estuary – A changing environment.

DEC 2011a. A guideline for managing the impacts of dust and associated contaminants from land development sites

DEC 2011b. Geomorphic wetlands database. Available at: http://www.dec.wa.gov.au/content/category/31/781/1556/

DoW 2009. South West groundwater areas, Hydrogeology. WET 200, Water resource allocation and planning series, Report no. 30.Government of Western Australia, Department of Water, Australia.

Environment Australia 2002. National Ocean Disposal Guidelines for Dredged Material. Commonwealth of Australia, Canberra.

EPA 1998. EPA Guidance Statement for EIA No 14 – Road and Rail Transportation Noise (Preliminary Draft).

EPA 2007. Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) - EPA Draft Guidance Statement No.8: Environmental Noise.

EPA 2004. Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 51.

EPA 2009. Environmental Assessment Guideline No. 3 Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment.

EPA 2010. Environmental Assessment Guidelines. No. 7 – Marine Dredging Proposals (Draft).

EPA and DEC 2010. Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. (eds BM Hyder, J Dell and MA Cowan). Perth, Western Australia.

Erftemeijer PLA and Lewis RRR 2006. Environmental impacts of dredging on seagrasses: A review. Marine Pollution Bulletin 52: 1553-1572. Franklyn 2003.

Geological Survey of Western Australia (GSWA) 1: 50,000 Urban Geology Series Map, Bunbury-Burekup

Greenland, J.A., Limpus, C.J. and Currie, K.J. (2002) Queensland Marine Wildlife Stranding and Mortality Database Annual Report 2001-2002 II. Marine Turtles. Queensland Environmental Protection Agency. 73pp.

Harewood G 2008. Fauna assessment (Level 1), Bunbury Inner Harbour, Proposed redevelopment. The author, Bunbury.

Harris MP and Bode KG. 1981. Populations of Short-tailed Shearwaters and Little Penguins, and other seabirds on Phillip Island, 1978. Emu 81: 20-28.

HCWA 2011. State Register of Heritage Sites, Heritage Council of Western Australia. Available at: http://register.heritage.wa.gov.au/.

IT Environmental 2006. Additional Environmental site Assessment Report – March 2006- Former Western Power Bunbury Power Station, North Shore Drive, Bunbury, Western Australia. Prepared for Western Power Corporation, August 2006. Report Ref: J409632H-R01.

Irwin R. 2006, Hydrogeology of the eastern Scott Coastal Plain, Hydrogeology Record Series HG 19. Government of Western Australia, Department of Water, Australia.

Jenner KCS, Jenner MNM and McCabe KA 2001. Geographical and temporal movements of humpback whales in Western Australian waters. APPEA Journal. 41: 749-765.

Johnson M, Reich P & MacNally R 2007, 'Bird assemblages of a fragmented agricultural landscape and the relative importance of vegetation structure and landscape pattern', Wildlife Research, vol. 34, no. 3, pp. 185-93.

Kangas MI 2000. Synopsis of the biology and exploitation of the blue swimmer crab, Portunus pelagicus Linnaeus, in Western Australia Western Australia 6020. Fisheries Research Report 121, (121).

Kearney RE and Kildea MA 2003. The management of Murray cod in the Murray-Darling basin. Australasian Journal of Environmental Management. 11: 42-54.

Keighery BJ 1994. Bushland plant survey: A Guide to Plant Community Survey for the Community, Wildflower Society of WA (incl), Nedlands, Western Australia. Kruseman and de Ridder 1991.

Laist DW, Knowlton AR, Mead JG, Collet AS and Podesta M 2001. Collisions between ships and whales. Marine Mammal Science 17(1): 35-75.

LI and IEMA 2002. Guidelines for Landscape and Visual Impact Assessment Second Edition published by the Landscape Institute and institute of Environmental management and Assessment. Eds Sue Wilson.

Limpus CJ, Miller JD, Parmenter CJ, Reimer D, McLachlan N and Webb R 1992. Migration of green (Chelonia mydas) and loggerhead (Caretta caretta) turtles to and from eastern Australian rookeries. Wildlife Research 19(3): 347-358.

Longcore T and Rich C 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment. 2 (4): 191-198.

Marchant S and Higgins PJ (eds.) 1990. Handbook of Australian, New Zealand and Antarctic Birds. Volume 1. Part A. Oxford University Press, Melbourne.

Maunsell 2006. Bunbury Port Development Planning. Factual Geotechnical Report prepared for the Bunbury Port Authority. Maunsell Australia Pty Ltd, Leederville, WA.

McCauley RD, Fewtrell J, Duncan AJ, Jenner C, Jenner MN, Penrose JD, Prince RIT, Adhitya A, Murdoch T and McCabe K 2000. Marine Seismic Surveys – A study of environmental implications. Australian Petroleum Production and Exploration Association (APPEA) Journal. 2000: 692-705.

Möller LM and Beheregaray LB 2001. Coastal bottlenose dolphins from south-eastern Australia are Tursiops aduncus according to sequences of the mitochondrial DNA control region. Marine Mammal Science. 17:249-263.

Mott Macdonald 2012. Bunbury Port Development – Water Management (Preliminary). Prepared for Lanco

Parsons Brinckerhoff 2011a. Development of Berth 14A at Bunbury Port: Flora and Fauna Assessment. Prepared for Lanco Resources Australia Pty Ltd.

Parsons Brinckerhoff 2011b. Visual Impact Assessment – Bunbury Port Berth 14A, Western Australia. Prepared for Lanco Infratech Australia Pty Ltd.

Parsons Brinckerhoff 2012a. Level 2 Surveys – Waterbirds and Western Ringtail, Bunbury Port, Western Australia. Lanco.

Parsons Brinckerhoff 2012b. Groundwater Assessment – Proposed berth 14A, Bunbury Port. Prepared for Lanco Resources Australia Pty Ltd.

Parsons Brinckerhoff 2012c. Preliminary Site Investigation Report – Bunbury Port Berth 14A, Leschanault Drive, Vittoria, Western Australia.

Philipp E and Fabricius K 2003. Photophysiological stress in scleractinian corals in response to short-term sedimentation. Journal of Experimental Marine Biology and Ecology 287: 57–78.

Potter IC, Chalmer PN, Tiivel DJ, Steckis RA, Platell ME and Lenanton RCJ 2000. The fish fauna and finfish fishery of the Leschenault Estuary in south-western Australia. Journal of the Royal Society of Western Australia. 83: 481-581.

Quartermaine G 2005. Report on a Preliminary Archaeological Investigation for Aboriginal Sites Bunbury Port Development 2005-2007. Prepared for Sinclair Knight Merz.

Ramsar and wetland directory. 2012. Available at: http://www.environment.gov.au/water/topics/wetlands/database/index.html

Salgado-Kent C, Marley S, Bouchet P and Nagy J (In review). A theodolite tracking study of baleen whales in Geographe Bay, Western Australia.

Schreiber RA, Pennock JR 1995. The relative contribution of benthic microalgae to total microalgal production in a shallow sub-tidal estuarine environment. Ophelia 42: 335-352.

Schwartz A and Henderson RW 1991. Amphibians and reptiles of the West Indies: descriptions, distributions and natural history.

SEWPaC 2010a. Protected Matter Search Tool. Department of Sustainability, Environment, Water, Population and Communities. Available at: http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst.jsf

SEWPaC 2010b. Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

SEWPaC 2011. Environment Protection and Biodiversity Conservation Act 1999 draft referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris; Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii; Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Shore Coastal (2009). Bunbury Harbour Siltation Investigation. Prepared for Bunbury Port Authority.

Sini MI, Canning SJ, Stockin KA and Pierce GJ 2005. Bottlenose dolphins around Aberdeen harbour, north-east Scotland: a short study of habitat utilization and the potential effects of boat traffic. Journal of the Marine Biological Association of the United Kingdom 85: 1547-1554. SKM 1998 invasive marine species survey

SKM 1998. BPA Water Quality – Measurements of Nutrients and Chlorophyll a in Bunbury Harbour. Prepared for Bunbury Port Authority.

SKM 2001. Sediment Assessment. Assessment of Shipping Channel Sediment Origin. Prepared for Bunbury Port Authority.

SKM 2002. BPA Water Quality - Measurements of Nutrients and Chlorophyll in Bunbury Harbour. Prepared for Bunbury Port Authority.

SKM 2003. Maintenance Dredging – Sea Dumping Application. Prepared for Bunbury Port Authority.

SKM 2004. Maintenance Dredging 2004 – Monitoring of TBT at the Spoil Ground. Prepared for Bunbury Port Authority.

SKM 2005. Biennial Water Quality Monitoring – Harbour Water Nutrients 2004. Prepared for Bunbury Port Authority.

SKM 2006. Marine Pest Species Survey. Fifth Biennial Surveillance of Bunbury Harbour 2006. Prepared for Bunbury Port Authority.

SKM 2007a. Biennial Water Quality Monitoring – Harbour Water Nutrients 2006. Prepared for Bunbury Port Authority.

SKM 2007b. Maintenance Dredging 2007 – Sampling and Analysis Plan Report. Prepared for the Bunbury Port Authority.

SKM 2008a. Maintenance Dredging 2007 – Post-disposal Spoil Ground TBT Survey. Prepared for the Bunbury Port Authority.

SKM 2008b. Bunbury Port Environmental Management – Baseline Copper Monitoring. Prepared for the Bunbury Port Authority.

SKM 2008c. Emergency Dredging Program – Sampling and Analysis Plan and Report Prepared for the Bunbury Port Authority.

SKM 2009a. Bunbury Port Authority Invasive Marine Species Survey Part II – Winter Survey. Prepared for Bunbury Port Authority.

SKM 2009b. Bunbury Port Environmental Management Long-term Monitoring Programme – Final Baseline Copper and Other Metals Monitoring. Prepared for the Bunbury Port Authority.

SKM 2010a. Long-term Sea Dumping Application – Sampling and Analysis Plan and Implementation Report. Prepared for the Bunbury Port Authority.

SKM 2010b. Bunbury Port Environmental Management Long-term Monitoring Programme – Routine Copper and Other Contaminants Monitoring February 2010. Prepared for Bunbury Port Authority.

SKM 2010c. Bunbury Port Environmental Management Long-term Monitoring Programme – Routine Copper and Other Contaminants Monitoring May 2010. Prepared for Bunbury Port Authority.

SKM 2011. Bunbury Port Environmental management Long-term Monitoring Programme – Routine Copper and Other Contaminants Monitoring November 2010. Prepared for Bunbury Port Authority

Strategen, 2005. Hydrogeology of the Southern Perth Basin, South West Yarragadee Water Supply Development, Information Series Report No 1. Prepared for Water Corporation by Strategen.

Sundbäck K, Miles A, and Göransson E 2000. Nitrogen fluxes, denitrification and the role of microphytobenthos in microtidal shallow-water sediments: an annual study. Marine Ecology Progress Series 200: 59-76. SVT Engineering Consultants Terrestrial Noise Impact Assessment for Lanco's Bunbury Coal Export Facility.

Thompson McRobert Edgeloe. 2009. Bunbury Port Inner Harbour Structure Plan. Prepared for the Bunbury Port Authority.

UWA. 2011 A Review of Marine Megafauna in Koombana Bay and Geographe Bay in the south western region of Western Australia was prepared by Cummins and Meeuwig of Marines Futures for Wave Solutions.

WA DEC 2010. Marine Turtles in Western Australia, DEC (Perth). Available at: http://www.naturebase.net/content/view/2462/1401. WAM, 2011.

WAPC 2003. Greater Bunbury Region Scheme. Report and recommendations of the Environmental Protection Authority.

Wave Solutions 2011a. Occurrence of Basalt in Berth 14A Dredge Footprint, Memo.

Wave Solutions 2011b. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) - Marine Environmental Quality Report. Prepared for LRAPL.

Wave Solutions 2011c. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) - Subtidal Benthic Marine Flora and Vegetation near Bunbury, Western Australia. Prepared for Lanco Resources Australia Pty Ltd.

Wave Solutions 2011d. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) - Marine fauna Studies. Prepared for LRAPL.

Wave Solutions 2012a. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886). Marine Environmental Management Plan (draft). Prepared for Lanco Resources Australia Pty Ltd.

Wave Solutions 2012b. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886). Draft Dredging and Spoil Disposal Management Plan. Prepared for Lanco Resources Australia Pty Ltd.

Webster IT, Ford PW, and Hodgson B 2002. Microphytobenthos contribution to nutrient-phytoplankton dynamics in a shallow coastal lagoon. Estuaries 25 (4A): 540-551.Wells et al 2009.

Wernberg T, Kendrick GA and Phillips JC. 2003. Regional differences in kelp-associated algal assemblages on temperate limestone reefs in south-western Australia. Diversity and Distributions 9: 427–441.

Appendix A

Environmental scoping document

GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

The Atrium,
Level 8, 168 St Georges Terrace,
Perth, Western Australia 6000.
Telephone: (08) 6467 5000.
Facsimile: (08) 6467 5557.

Postal Address: Locked Bag 33,
Cloisters Square, Perth, Western Australia 6850.
Website: www.epa.wa.gov.au

Mr James Riordan
Approval Manager
Lanco Resources Australia Pty Ltd
c/- Allen & Avery
Level 27 Exchange Plaza
PERTH WA 6000

Our Ref: OEPA2011/000311-1
Enquiries: *Matt Spence (6467 5536)*
Email: *matt.spence@epa.wa.gov.au*

Dear Mr Riordan

PROJECT NAME: **Bunbury Port Berth 14 Expansion and Coal Storage and Loading Facility**
ASSESSMENT NO: **1886**
LEVEL OF ASSESSMENT: **Public Environmental Review (6 weeks)**

The attached Environmental Scoping Document (ESD), specifying the scope and content of the Public Environmental Review (PER) document for the above proposal, was considered by the Environmental Protection Authority (EPA) at meeting number 1013 on 15 September 2011. The ESD has been approved as providing an acceptable basis for the preparation of the PER document.

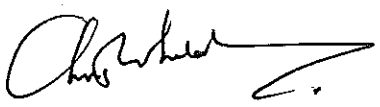
A number of issues were raised in meeting number 1013 and, where appropriate, the attached Final ESD has been amended accordingly. These issues were as follows:

- The requirement for blasting and associated rock fracturing must be detailed in the PER, including the potential removal of, and impact to, the confining groundwater basalt layer below Berth 14;
- A Level Two Targeted survey for waterbirds and shorebirds that are protected by national and international agreements must be undertaken;
- Cathodic protection of the sheet pile wall must be considered in relation to ongoing threats to the marine environmental quality;
- Coal stockpile fire management must be outlined in the PER, including the management of associated particulate matter;
- A Leachate Management Plan must be developed for the PER to address how leachate from the coal stockpiles will be collected, assessed and discharged in a manner that will mitigate potential environmental impacts; and

- The approved *Environmental Assessment Guideline No. 7 Marine Dredging Proposal* has been incorporated into the Final ESD, and should be considered in the preparation of the PER.

During the preparation of the PER you are encouraged to consult with Matt Spence, the Office of the EPA assessment officer for the project, who can be contacted on telephone number 6467 5530.

Yours sincerely



Dr Chris Whitaker
DEPUTY CHAIRMAN

22 September 2011

Encl.

cc: Adam Parker
Parsons Brinckerhoff
PO Box 7181
CLOISTERS SQUARE WA 6850

ENVIRONMENTAL SCOPING DOCUMENT

PROPOSAL:	**Bunbury Port Berth 14 Expansion and Coal Storage and Loading facility (Assessment No. 1886)**
LOCALITY:	**City of Bunbury**
PROPONENT:	**Lanco Resources Australia Pty Ltd**
LEVEL OF ASSESSMENT:	**Public Environmental Review with an 6 week public review period**

This scoping document is provided to define the requirements for the proponent's environmental review document (Public Environmental Review). The specific environmental factors to be addressed are identified in Section 2. The generic guidelines for the format of an environmental review document are provided in Attachment 2.

The environmental review document must adequately address all elements of this scoping document prior to approval being given to commence the public review.

The environmental review document must also address any requirements of the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999*, where the assessment is being undertaken under the bilateral agreement.

The Environmental Protection Authority expects the proponent to fully consult with interested members of the public and relevant stakeholders, and to take due care in ensuring any other relevant environmental factors which may be of interest to the public and stakeholders are addressed. The PER should document the results of all consultation undertaken.

1. Introduction

The *Environmental Protection Act 1986* (EP Act) sets out that where a proposal is considered to have a significant environmental impact it will be subject to an assessment by the Environmental Protection Authority (EPA) under section 38 of the EP Act. This proposal is being assessed by way of a Public Environmental Review (PER) because it raises significant environmental factors.

Where a proposal is subject to PER, the proponent is required to produce a PER document in accordance with an approved Environmental Scoping Document (ESD). The purpose of the ESD is to:

- develop proposal-specific guidelines to direct the proponent on the key environmental issues for the proposal that should be addressed in preparing the PER document; and

- identify the necessary impact predictions required for the assessment of the proposal, and the information on the environmental setting required to carry out the assessment.

The EPA has determined that it will prepare and issue the ESD outlining the scope and content of the PER in relation to this proposal.

The EPA, in its formulation of the ESD, undertakes consultation with the proponent regarding the details of the proposal, its environmental setting and the environmental surveys and investigations required and expected outcomes. In addition the EPA will consult with the relevant government agencies, including Decision Making Authorities. The Office of the EPA (OEPA) provides services and facilities for the EPA. In many cases the OEPA will act for the EPA.

The proponent will then be required to prepare a PER document in accordance with the ESD. When the EPA is satisfied that the PER document has adequately addressed all of the environmental factors and studies identified in the ESD, the proponent will be required to release the document for a public review period normally between 4 and 12 weeks.

ESDs prepared by the EPA are not subject to a public review period. The ESD will be available on the EPA website (www.epa.wa.gov.au) upon finalisation and should be included as an appendix in the PER document.

The proposal that is the subject of this assessment is Lanco Resources Australia Pty Ltd's proposed Bunbury Port Berth 14 Expansion and Coal Storage and Loading Facility. The proposal description is provided in Section 2 of this guideline and a map showing the approximate location of the proposal is shown in Attachment 1.

An important aspect of the environmental impact assessment process is the review by the public. The EPA requires public input into the possible environmental impacts of this proposal and its implementation. To facilitate adequate public input, the Public Environmental Review should be made available as widely as possible and at a reasonable cost.

2. Specific Guidelines for the Preparation of the Environmental Review

2.1 The proposal

Lanco Resources Australia Pty Ltd's proposal aims to progress the development of Berth 14 located within Bunbury Port Inner Harbour. The proposal is consistent with the Bunbury Port Authority's Inner Harbour Structure Plan, which is currently being assessed separately by the EPA as a Strategic Environmental Assessment. Key objectives of the Structure Plan are to guide future development and associated decision making within the Inner Harbour. The Structure Plan conforms to the strategic planning requirements under the *Port Authorities Act 1999*. The project area is indicated in the attached plan (Attachment 1). The construction and operation of Berth 14 will accommodate 15 million tonnes per annum of coal exports from Bunbury Port.

Key Characteristics Table

Marine Components	Description
Berth Pocket	Berth pocket dredged to -12.7m Chart Datum (CD) to accommodate Panamax sized vessels. Associated approach navigational area dredged to -12.2mCD. The PER should state the area (ha) of the dredged berth pocket.
Dredging • Capital • Maintenance	Dredge volume up to 2.7 million cubic metres. Underwater blasting may be required to remove 20,000 cubic metres of rock. Required approximately every 4 years.
Spoil Disposal	The offshore spoil disposal site has been identified to occur in Commonwealth waters, and as such does not form part of this assessment. The suitability of this site, as well as the disposal of spoil, will be assessed by the Commonwealth DSEWPaC under the Commonwealth *Environmental Protection (Sea Dumping) Act 1981*. Other disposal options include landside placement for re-use for onsite construction requirements and beach nourishment as a coastal protection measure will form part of the proposal.
Berth Structure	The final quantities will be determined as the final designs for berth 14 are prepared. It is likely that construction of a rock armour seawall with sheet pile walls along the Berth length will be undertaken, in addition to rock armoured slope protection at the entrance to the basin and the construction of the wharf facility.

Terrestrial Components	Description
Material Handling Infrastructure	Train unloader, conveyors, stackers, coal storage facility and ship loading equipment.
Rail	New dump station and rail loop. The assessable section of the rail loop is located within the site boundary, beginning and terminating to the north west of the Preston River.
Throughput	15 Million tonnes per annum.
Construction Period	Approximately 18 months.

Water requirements	The volume of water required is still to be determined as designs for the Berth14 are still under preparation.
Vegetation Loss	Approximately 2ha of native vegetation would be lost. Additional vegetation would be lost however this is either highly disturbed or planted.
Terrestrial Ground Disturbance	50ha.

2.2 Environmental factors, scope of works and policy documents relevant to this proposal

The PER should give a detailed assessment of each of the environmental factors identified for this proposal. At this preliminary stage, the Office of the Environmental Protection Authority (OEPA) believes the relevant environmental factors, objectives and work required is detailed in Table 2.

Table 2 also identifies a list of relevant policy documents for this proposal, which set out how the expects the environmental factors to be considered. The EPA expects that the treatment of environmental factors will be consistent with the approaches set out in these policy documents.

Table 2: Environmental factors and scope of works relevant to the proposal

Terrestrial flora and vegetation	
EPA objective	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
	Construction and Operational Phase
Potential Impact	The Proposal will have a direct impact on native vegetation through the clearing of approximately 2 ha. There is also potential for indirect impacts to occur on the flora and vegetation communities in the adjacent Leschenault Estuary.

Work and output required	- Complete a Level 1 (Reconnaissance) flora and vegetation survey as described in EPA Guidance Statement 51 within the proposal footprint and immediate adjacent area. The survey should identify flora present, and describe and map the vegetation communities present and condition as per Keighery (1994), as well as identify the ecological value of the proposal area in local, regional and State context using the criteria for determining regional significance in EPA Guidance Statement 10. Identify the construction and operational elements of the proposal that may affect significant flora and vegetation. - Describe and assess the potential direct and indirect impacts that may result from construction and operations of the proposal on flora and vegetation. This should be done in accordance with EPA Guidance Statement No. 51 and the degree to which the advice has been followed should be provided. - Identify and assess all direct and indirect impacts to native vegetation in regional and public open space and the adjacent Leschenault Estuary from the proposal. - Identify any coastal set-backs or buffer zones that will be required between the development and adjacent flora and vegetation as well as how they will be incorporated into the design of the proposal. - Define the specific environmental outcome(s) to be achieved for loss of native vegetation consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions. - Identify management measures to mitigate[1] adverse impacts on the significant flora and vegetation so that the EPA's objectives can be met.
Relevant policy/guidance documents	EPA Position Statement No. 3 *Terrestrial biological surveys as an element of biodiversity protection.* EPA Position Statement No. 7 *Principles of environmental protection.* EPA Guidance Statement No. 6 *Rehabilitation of terrestrial ecosystems.* EPA Guidance Statement No. 51 *Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia.* EPA Guidance Statement No. 10 *Level of Assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region.*
Terrestrial Fauna	
EPA objective	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 in knowledge.
	Construction and Operational Phase
Potential Impact	The Proposal will potentially include disturbance to an area of 50 Ha. These activities would have the potential to impact fauna values within the proposal footprint, as well as water bird habitat in the adjacent Leschenault Estuary.

[1] To mitigate means a sequence of proposed actions designed to help manage adverse environmental impacts, and which includes (in order of preference):
1. avoidance – avoiding the adverse environmental impact altogether;
2. minimisation – limiting the degree or magnitude of the adverse impact;
3. rectification – repairing, rehabilitating or restoring the impacted site as soon as possible; and
4. reduction – gradually eliminating the adverse impact over time by preservation and maintenance operations during the life of the action.

Work and output required	- Design and detail a Level 2 target survey for waterbirds and shorebirds which are protected by national and international agreements. The level of target survey should be carried out as outlined in EPA Guidance Statement No. 56 and Section 3 of the Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010). The survey should target the distribution, nesting and roosting habits of all waterbird and shorebird species with consideration of survey timing to meet suitable weather conditions, time of day and season for presence of waterbirds. - Identify the construction and operational elements of the proposal that may affect significant fauna and fauna habitat. - Describe and assess the potential direct and indirect impacts that may result from construction and operation of the proposal on waterbirds and shorebirds and their habitat. Define the specific environmental outcome to be achieved for terrestrial fauna consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions. - Identify measures to mitigate adverse impacts on significant fauna and fauna habitat so that the EPA's objectives can be met.
Relevant policy/guidance documents	EPA Position Statement No. 3 *Terrestrial biological surveys as an element of biodiversity protection.* EPA Guidance Statement No. 20 *Sampling of short-range endemic invertebrate fauna for environmental impact assessment in Western Australia.* EPA Guidance Statement No. 56 *Terrestrial fauna surveys for environmental impact assessment in Western Australia.* EPA Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment EPA Checklist for documents submitted for environmental impact assessment on marine and terrestrial biodiversity should be completed and submitted.
Groundwater Quality	
EPA objective	To maintain the quality and quantity of groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected.
	Construction and Operation Phase
Potential Impact	Potential impact to the confining basalt layer through blasting and dredging activities, exposing fresh confined groundwater systems to saline water intrusion.

Work and output required	- Characterise the hydrogeology of the groundwater system and the quality and quantity of the groundwater within the project areas and surrounding area. Where the groundwater is contaminated, determine the extent of the contamination. - Identify the potential direct and indirect impacts to groundwater from the proposal. This should include potential impacts to groundwater dependent ecosystems and impacts to current groundwater allocation within the area. - Develop a conceptual hydrogeological model and predict the hydrogeological changes that will result from the proposal (including dewatering). The extent, severity and duration of potential impacts should be predicted and include changes to local and regional groundwater flows and levels, extent of drawdown, impacts to local water quality through management of dewater effluent and impacts to other groundwater users. - Predict the likelihood that rock fracturing will breach the confining basalt layer of the Yarragadee aquifer, potentially allowing saline water to intrude into the public water supply. - Define the specific environmental outcome to be achieved for groundwater quality consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions. - If contaminated groundwater is encountered, prepare a remediation and/or disposal plan for contaminated material. This should be independently reviewed by an accredited contaminated sites auditor. - Describe contingency and monitoring plans should a breach of the confining layer of the Yarragadee Aquifer occur, including methods to seal the breach to prevent saline intrusion into the public drinking supply.
Policy context	*Waterways Conservation Act 1976* *Rights in Water and Irrigation Act 1914* *Contaminated Sites Act 2003* Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) EPA Position Statement No. 7 *Principles of environmental protection* DEC Contaminated Sites Management Series, including - Assessment Levels for Soil, Sediment and Water - Development of Sampling and Analysis Programs - A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities. Department of Health (2006) Contaminated Sites Reporting Guideline for Chemicals in Groundwater
Marine Environmental Quality	
EPA objective	To maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected.
	Construction Phase
Potential Impact	The proposal will involve dredging of a berth pocket to -12.7m CD and reclamation. There is potential for dredging and reclamation to result in: • Temporary sediment plumes; and • Adverse effects of contaminant release and dispersion on ecological and human use environmental values.

Work and output required	- Conduct a baseline water and sediment quality survey program to characterise pre-development marine water and sediment quality in the area of the proposal and to identify background levels of toxicants and physio-chemical parameters, with the scope of survey parameters to be informed by an assessment of threats and pressures to marine water and sediment quality. - Provide for inclusion into the PER of any baseline data collected to date, with the aim to complete the birds survey and present the remaining data to the OEPA prior to the response to submission period. - Complete a sampling and analysis plan to the satisfaction of OEPA and in consultation with the Department of Environment and Conservation (DEC) and Commonwealth Department of Sustainability, Environment, Water, Population and Communities for ocean disposal and reclamation. - Undertake analysis of sediment samples and interpret resultant data in accordance with the National Assessment Guidelines for Dredging. Detail the proposed dredging and spoil placement methods– eg. type of dredge, management of dredge overflow etc. - Assessment to determine if the EVs, EQOs and associated levels of protection proposed for operations phase (see below) would be temporarily compromised for the duration of the construction phase. If so, then the proponent shall predict the extent, severity and duration of temporary potential impacts of construction on the relevant EVs, EQOs and associated levels of protection. - Detail management measures and contingency plans proposed to protect the environmental values, and achieve objectives and levels of ecosystem protection during construction. - Propose the environmental protection outcome to be achieved for marine water and sediment quality consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions. - Consider cumulative impacts of the proposal in the context of existing and approved developments and activities in the area, including consideration of the loss of marine water quality to other industrial uses of marine water in the area.
	Operational Phase
Potential Impact	Deepening of the entrance channel and harbour at the Berth 14 has the potential to impact on the flushing and mixing rate of the harbour. This combined with inputs from Port operation activities including surface water inputs can affect quality in the proposal area.

Work and output required	- Conduct water, sediment and/or biota quality surveys as necessary, with survey parameters informed by an assessment of threats and pressures to environmental quality and taking into account seasonality where necessary, to establish the existing environmental quality in the area potentially affected by the proposal. - Propose Environmental Values (EVs), Environmental Quality Objectives (EQOs) and spatially define the levels of ecological protection that are to be achieved by the proposal throughout the operations phase, consistent with *State Water Quality Management Strategy Document No.6* (Government of WA, 2004) and the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ) and considering principles established in the Cockburn Sound SEP and Pilbara coastal waters Outcomes. - Identify and assess ongoing threats and pressures to marine water and sediment quality within the berth pocket and its approach (excluding the navigation channel) from operation of the proposal and the measures taken, or proposed to be taken, to avoid or minimise those threats and pressures. Descriptions of threats and pressures should include, but not be limited to, the frequency and quantity of maintenance dredging, ship loading, stormwater and groundwater inputs and uncontrolled contaminant discharges. - Predict consequences of the threats and pressures identified in accordance with the point above and couch the outcomes of those predictions in the context of proposed EVs, EQOs and levels of ecological protection. Examine the likely effectiveness of the design of the proposal and proposed management measures. If, during the assessment, it is determined that there is a high risk of not meeting the ecological and/or social EVs and EQOs, and levels of ecological protection, then evaluate and spatially define the degree of conformity and non-conformity of the proposal. - Develop a Marine Environmental Management plan in close collaboration with the Bunbury Port Authority. This marine environmental management plan should be designed to give effect to the proposed EVs, EQOs and associated levels of protection for the operation phase of the proposal and include procedures for environmental monitoring using appropriate water and sediment quality indicators and environmental quality criteria, and a suitable decision framework for interpreting monitoring results. Cathodic protection of the sheet pile wall must be considered in relation to ongoing threats to the marine environmental quality and detailed in the management plan. - Detail management measures and contingency plans proposed to meet the environmental values, objectives and levels of ecosystem protection during operations.
Relevant policy/guidance documents	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) National Assessment Guidelines for Dredging (Australian Government, 2009) State Water Quality Management Strategy Document No.6 (Government of WA, 2004) EPA Environmental Assessment Guideline No. 7 Marine Dredging Proposals McAlpine K.W., Wenziker , K.J. Apte S.C., Masini R.J. (2005) Background quality for coastal marine waters of Perth, Western Australia, Department of Environment, Perth, Western Australia, 6000 EPA Position Statement (2000) Perth's Coastal Waters: Environmental Values and Objectives State Environmental (Cockburn Sound) Policy (2005) Revised Draft Environmental Protection (Cockburn Sound) Policy (EPA, 2002)Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives (2006)

Benthic Habitats (including benthic primary producer habitats)	
EPA objective	To maintain marine ecological integrity through protection, management and improved knowledge of benthic habitats, including benthic primary producer habitats (BPPH).
	Construction Phase
Potential Impact	The proposal will involve dredging and potential ocean disposal of dredge spoil of up to 2.7 million cubic metres of material. There is potential for indirect impacts on benthic habitats and communities from the effects of sediments introduced to the water column by dredging.
Work and outputs required	- Using scientifically sound approaches, conduct surveys to identify the key components of different benthic habitats and report the findings of those surveys, noting levels of confidence and any assumptions that underpin the surveys and associated reporting. Notes: • Benthic surveys should cover the area potentially affected by the proposal. • Seasonality of key biota should be addressed where appropriate. • Surveys and data interpretation should provide confidence in habitat boundaries and the communities they represent. • Key components of different benthic habitats should be described to a taxonomic resolution that is sufficient to inform the application of relevant guidance (e.g. EAG No.3 and EAG No.7) and to inform the design and implementation of a scientifically robust, relevant and cost-effective environmental monitoring program. - Based on the findings of benthic surveys, produce spatially-accurate maps showing the extent and distribution of the different benthic habitats and present these at an appropriate scale. - Identify the proposal-related activities that would potentially impact benthic habitats. - Detail the measures exercised to avoid and, where avoidance is not possible, minimise impacts of the proposal on benthic habitats. - Provide scientifically sound predictions of the likely extent, severity and duration of direct and indirect impacts of the proposal on benthic habitats. Impacts on benthic habitats should be couched in the context of the guidance set out in EAG No.7 (Marine Dredging Proposals). - Implement guidance set out in EAG No.3 (Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment) when losses of, or serious damage to, BPPH are predicted. - Detail the proposed environmental monitoring and management arrangements designed to minimise impacts and ensure that the environment will be protected to at least the level indicated by the predictions. - Propose the specific environmental protection outcome(s) to be achieved for BPPHs consistent with the EPA's Draft Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions.
Relevant policy/guidance documents	Environmental Assessment Guideline No. 3 Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment (EAG3) Environmental Assessment Guideline No. 7 Marine Dredging Proposal

Marine Fauna	
EPA objective	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 in knowledge.
	Construction and Operation Phase
Potential Impact	The Proposal has the potential to disturb marine fauna from impacts such as noise (blasting, pile driving and dredging) and introduction of invasive marine organisms. The proposal also has the potential to conflict with fisheries and impact on fish, their habitats and fisheries production.
Work and output required	- Identify and assess the values and significance of marine faunal assemblages within the proposal area and immediate adjacent area and describe these values in a local, regional and State context. - Identify critical windows of environmental sensitivity for marine mammals and key fisheries in the area. *Marine mammals* - Describe the presence of marine mammals, particularly bottlenose dolphins, in the proximity of the proposal and any known uses of the area by them (e.g. foraging, calving and nursing etc). - Undertake underwater noise modelling to determine the potential noise exposure levels result from blasting, pile driving and wharf construction on marine fauna. - Consult with the Bunbury Dolphin Discovery Centre on measures to mitigate effects of the proposal on the dolphin population in Koombana Bay. - Describe management and monitoring protocols to be implemented during blasting, pile driving and wharf construction that will reduce the risk of marine fauna being exposed to noise transmitted through water. *Fisheries* - Describe the major fisheries in the Geographe Bay/Bunbury region and Leschenault estuary that may be affected by the proposal. - Describe and assess the potential direct and indirect impacts on recreationally and commercially important marine species, including impacts to migratory patterns, spawning areas and nursery areas. *Introduced Marine Organisms (IMOs)* - Surveys to indentify and describe the abundance and extent of any invasive marine species already present in the project area. - Evaluate risk of invasive marine species introduction from dredging plants and from ongoing operations. - Describe management and monitoring protocols to be implemented during dredging and construction to avoid introduction of IMOs. Describe controls available to manage risk of IMOs from ongoing operations. - Define the specific environmental outcome(s) to be achieved for marine fauna consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions.
Relevant policy/guidance documents	National Biofouling Management Guidance for Non-trading Vessels (Commonwealth of Australia, 2009).
Soil Quality	
EPA objective	To ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.
	Construction Phase
Site Specific	The Proposal includes excavation and dredging activities in soil and sediment

Impact	known to contain PASS, which may become acid producing ASS.
Work and output required	- Carry out investigations to indentify land where there is a risk of disturbing acid sulphate soils based on the DEC's acid sulphate soil guidelines. - Identify and map known and suspected contaminated sites (consider guidance in the DEC Contaminated Sites Management Series). - Identify known and suspected contaminated sites and complete investigations to characterise the nature of the contamination. A Sampling and Analysis Plan should be prepared *to the satisfaction of an accredited contaminated sites auditor.* - Describe and assess the potential direct and indirect impacts from acid sulphate soils resulting from the proposal on the receiving environment. This should include the potential for monosulphidic black oozes to form in the Inner Harbour. - Identify areas where disturbance of contaminated sites will result from the construction of the proposal. Where contaminated sites are to be disturbed, describe and assess the potential direct and indirect impacts resulting from the disturbance of contaminated material. This should include impacts where there is the potential for contaminated material to be liberated into the environment, such as through water or dust. - Describe the potential to generate acidic conditions during dewatering activities in areas known to contain acid sulphate soils. - Describe the measures that will be implemented to ensure that contaminated sites are identified and remediated to a standard that protects the environment, is compatible with the intended land use system, and is consistent with the appropriate criteria and legislation. - Define the specific environmental outcome(s) to be achieved for soil quality consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions.
Relevant policy/guidance documents	DEC Contaminated Sites Management Series DEC Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes
Air Quality	
EPA objective	To ensure that dust emissions do not adversely affect environment values of the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.
Site Specific Impact	Air quality impacts associated with the Proposal include dust and air emissions from various sources during the construction and operational phases. Sources include fugitive, process and stack emissions.

Work and output required	**Construction** - Develop a Dust Management Plan for those areas that are likely to be affected consistent with DEC's *'A guideline for managing the impacts of dust and associated contaminants from land development sites'* **Operational** - Identify all sources of air emissions from the proposal as a result of material handling and loading activities. - Describe the control measures that will be implemented (e.g. sheds and enclosed systems) to ensure that dust emissions from material handling infrastructure and stockpiles are managed to a standard that protects the surrounding environment and NEPM standards. - Undertake modelling of all emission sources incorporating proposed control measures consistent with the Department of Environment (2006) Air Quality Modelling Guidance Notes. Identify and map the likely extent of dust emissions, taking into consideration local air-sheds and wind patterns. - Describe the air quality monitoring procedures that will be carried out. - Detail management measures to be implemented to prevent, control and mitigate the risk of fire occurring within the coal stockpiles, including management of the associated particulate matter dispersed as a result of fire. - Define the specific environmental outcome to be achieved for operational dust consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions.
Relevant policy/guidance documents	DEC (2011) - A guideline for managing the impacts of dust and associated contaminants from land development sites. Department of Environment (2006) Air Quality Modelling Guidance Notes EPA Guidance Statement No.18: Prevention of air quality impacts from land development sites
Noise and Vibrations	
EPA objective	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.
	Construction & Operational Phase
Work and output required	- Identify the likely noise emission sources during the construction and operational phases of the proposal. - Evaluate the potential noise impacts of the proposal consistent with EPA's Draft Guidance Statement No.8: Environmental Noise. - Evaluate the potential noise impacts from the transport of material to the port using the noise exposure levels in the Statement Planning Policy 5.4 - Road and Rail Transport Noise and Freight Considerations in Land Use Planning and EPA Guidance No 14 - Road and Rail Transportation Noise (Preliminary Draft). - Identify management and amelioration measures to mitigate noise impacts of the proposal. - Define the specific environmental outcome to be achieved for noise emissions consistent with the Draft EPA Environmental Assessment Guideline No. 4 - Towards Outcome Based Conditions.
Relevant policy/guidance documents	Environmental Protection (Noise) Regulations 2007 EPA Draft Guidance Statement No.8: Environmental Noise Statement Planning Policy 5.4 - Road and Rail Transport Noise and Freight Considerations in Land Use Planning EPA Guidance No 14 - Road and Rail Transportation Nois e (Preliminary Draft).

Surface Water Flow - Coal Stockpile Management	
EPA Objective	To maintain the quality of water and air emissions so that existing and potential environmental values, including ecosystem maintenance, are protected.
	Construction & Operational Phase
Work and output required	- Develop a Leachate Management Plan for the coal stockpiles at the storage and loading facility. The management plan should indicate how leachate will be collected, assessed and discharged in a manner that will mitigate potential environmental impacts.

These factors must be addressed within the environmental review document for the public to consider and make comment to the EPA. The EPA anticipates addressing these factors in its report to the Minister for the Environment.

2.3 Other Environmental Issues

The EPA expects the proponent to take due care in ensuring all other relevant environmental impacts which may be of interest to the public are addressed and that management is covered in the environmental review.

The EPA has identified other environmental factors which it considers to be relevant to the proposal which are considered to be significant enough to warrant attention as part of the environmental review of this proposal to the extent that the PER should show how these factors will be managed. These include but are not limited to the following;

- Surface drainage
- Solid and liquid wastes
- Aboriginal and European Heritage

This list is provided to assist with the preparation of the Environmental Review document, but during the course of the preparation of the document other factors may be found also to be relevant, and they should be included in the detailed discussion.

2.4 Agreed Assessment Milestones

EPA Environmental Assessment Guideline No. 6 "Timelines for EIA of Proposals" addresses the responsibilities proponents and EPA for achieving timely and effective assessment of proposals.

This timeline (Table 3) is agreed between the EPA and proponent. Proponents are expected to meet the agreed proposal assessment timeline, and in doing so, provide adequate, quality information to inform the assessment. Proponents will need to allocate sufficient time to undertake the necessary studies to the appropriate standard and incorporate the outcomes of the studies into the PER.

Where an agreed timeline is not being met by the proponent, or if adequate information is not submitted by the proponent, the timeline for subsequent steps will be re-established. Where the OEPA is unable to meet a date in the agreed timelines the proponent will be advised and the timeline adjusted.

The EPA will report to the Minister for Environment on whether the agreed proposal assessment timeline has been met. Where the timeline has not been met, the reasons for this will be identified.

Table 3: Agreed Milestones for the proposal

Key Stage of Proposal	Agreed Milestone
EPA approval of ESD Document	23 September 2011
Proponent submits first adequate draft of PER Document	28 October 2011
OEPA provides comment on first draft PER Document	6 weeks
Proponent submits adequate revised draft PER Document	January 2012
EPA authorises release of PER Document	2 weeks
Proponent releases approved PER Document	19 January 2012
Public Review of PER Document	6 weeks
Response to Public Submissions	2 weeks
OEPA assesses proposal for consideration by EPA	7 weeks
Preparation and finalisation of EPA Report (including 2 weeks consultation on draft conditions with proponent and key Government agencies)	5 weeks from receipt of final information

2.5 Decision Making Authorities

At this preliminary stage, the Environmental Protection Authority (EPA) had identified the following Decision Making Authorities (DMAs) **(see Table 4)**. These Decision Making Authorities are constrained from making any decision that could have the effect of causing or allowing the proposal to be implemented. Throughout the assessment process further DMAs may be identified.

Table 4: Nominated Decision Making Authorities

Decision Making Authority	Relevant Legislation
Department of Environment and Conservation	*Part V of the Environmental Protection Act 1986*
Minister for Water	Dewatering Licence Bore Application for Dust Suppression
Bunbury Port Authority	Port Authorities Act
Minister for State Development	State Agreements Act

DMAs are not prevented from parallel processing, up to the point of their decision, so that their views can inform the ministerial consultation process.

2.6 Preparation of the Environmental Review Document

The recommended format for the Environmental Review document is enclosed as Attachment 2.

When the EPA is satisfied with the standard of the environmental review document (see EAG 6 Section 4.3) it will provide a written sign-off, giving approval to advertise the document for public review. The review document may not be advertised for release before written approval is received.

The proponent is responsible for advertising the release and availability of the Public Environmental Review (PER) in accordance with the guidelines which will be issued to the proponent by the OEPA. The EPA must be consulted on the timing and details for advertising the document.

Attachment 1

Approximate Location of Proposal

Attachment 2

Generic Guidelines for the preparation of an Public Environmental Review document