WEST MUNDIJONG INDUSTRIAL AREA

ENVIRONMENTAL ASSESSMENT

Prepared for:	Serpentine Jarrahdale Shire
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1 INTRODUCTION

1.1 Background

Mundijong is located approximately 40km south-south-east of the Perth Central Business District (Figure 1). Mundijong-Whitby has been identified as being a growth area in the future and to meet the growing demand for industrial land the proposed West Mundijong Industrial Area (the site) was identified by the Draft Southern Metropolitan Sub-Regional Structure Plan (WAPC, 2009). The area is defined by Mundijong Road (south), Tonkin Highway Road reserve (east), a railway reserve (north) and Kargotich Road (west) (Figure 2). The area is approximately 470ha. The same area has also been identified in the following documents:

- Industrial Land Capacity Assessment (WAPC, 2009a);
- Industrial Lands Needs Study (WAPC, 2008a); and
- Mundijong Whitby District Structure Plan (Masterplan, 2011).

The Site is zoned 'Rural' under the Metropolitan Region Scheme and 'Farmlet" and 'Rural' zone in the Serpentine Jarrahdale Shire Town Planning Scheme No. 2 (TPS 2). The Serpentine Jarrahdale Shire proposes to change the zoning of the site to 'Industrial'.

During initial discussions with the Office of the Environmental Protect Authority (OEPA) it was determined that the rezoning of the site would need to be accompanied by an Environmental Assessment report which would include:

- Prepare a noise assessment to ensure that an adequate buffer is provided around the proposed industrial area so that noise emissions from various industrial types will be contained within the buffer;
- Consider existing and proposed sensitive land uses within and around the proposed industrial area when determining the location of various industrial types during the preparation of the DSP;
- Include the Manjedal Brook and the Conservation category wetland within an ecological corridor; and
- Defer detailed vegetation surveys and reporting to the local structure planning stage recognising that there are likely to be declared rare flora, priority flora and threatened ecological communities in the vicinity of the subject land and potentially on the subject land.

This was outlined in correspondence between the Serpentine Jarrahdale Shire and the OEPA, in July and September 2012 (Appendix 1).

1.2 Scope of Work

This Environmental Assessment is a desktop assessment of the environmental values of the site. The assessment includes information on the following categories.

Physical characteristics including a description of:

- Landform;
- Drainage and water bodies;
- Geological, hydrogeological and hydrological characteristics; and
- Acid Sulphate Soil Risk Mapping.

Biological characteristics including:

- Declared Rare and Priority Flora and Fauna and Threatened Ecological Community searches of the Department of Environment and Conservation (DEC) Databases;
- Results from the Commonwealth Protected Matters Search Tool which will identify possible matters of National Environmental Significance listed under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) that may occur on the sites; and
- A site assessment of the likelihood of conservation significant flora, vegetation and fauna being present on the site.

Recent and present land use including:

- Federal, State and Local Government Environmental Policy areas search;
- Surrounding land uses and potential impacts (such as noise)*;*
- Any records from the Contaminated Sites Database; and
- Assessment of current and historical activities on the site and surrounding areas which have the potential to result in contamination issues.

1.3 Legislation, Policy and Guidelines

The following legislation, policy and guidelines have been considered during this environmental assessment and will guide the required and expected management outcomes from Commonwealth, State and Local government agencies.

- *Environment Protection and Biodiversity Conservation Act 1999*
  - *The Matters of National Environmental Significance. Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2012a)
- *Environmental Protection Act 1999*
- *Wildlife Conservation Act 1950*
- *Aboriginal Heritage Act 1972*
- State Policy
  - State Planning Policy No. 2.1 *Peel-Harvey Coastal Plain Catchment* (WAPC, 2003)
  - State Planning Policy No. 2.8 *Bushland Policy for the Perth Metropolitan Region* (WAPC, 2010)
  - State Planning Policy No. 2.9 *Water Resources* (WAPC, 2006)
  - State Planning Policy No. 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (WAPC, 2009b)
  - Environmental Protection Authority Position Statement No. 4 *Environmental Protection of Wetlands* (EPA, 2004)

- Environmental Protection Authority Guidance Statement No 33 *Environmental Guidance for Planning and Development* (EPA, 2008)

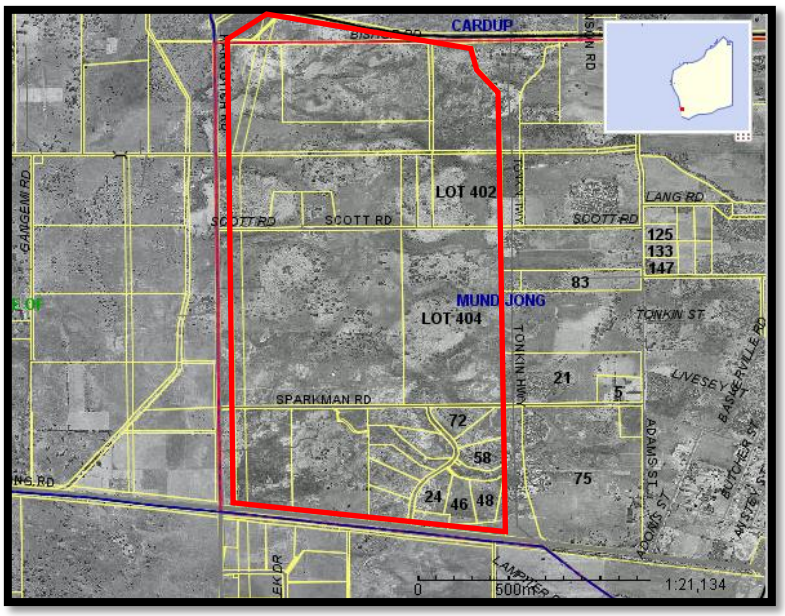
- Serpentine Jarrahdale Shire
  - Local Planning Policy (LPP) 4 *Revegetation Strategy* (SJS, 2010);
  - LPP 6 *Water Sensitive Design* (SJS, 2001);
  - LPP 8 *Landscape Protection* (SJS, 2002);
  - LPP 22 *Water Sensitive Urban Design* (SJS, 2009a); and
  - LPP 26 *Biodiversity Planning* (SJS, 2009b).

2 EXISTING ENVIRONMENT

2.1 Past and Existing Land Use

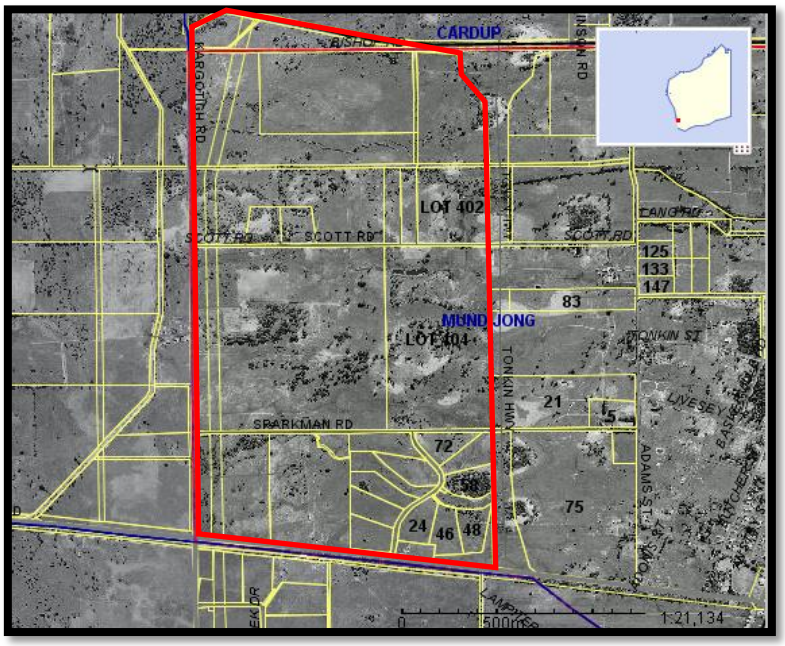
The site has historically been cleared for agricultural purposes. This is shown in the earliest aerial photography available from 1953 (Plate 1).

Plate 1: Aerial Photography from 1953 (Landgate, 2012a)



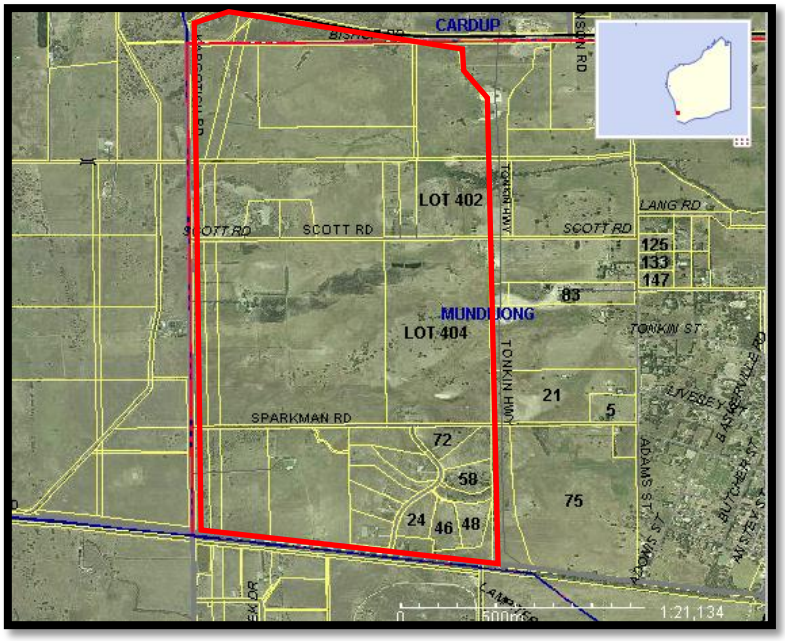
In photography from 1977 the town centre of Mundijong has developed further however there are no significant changes to the site (Plate 2).

Plate 2: Aerial Photography from 1977 (Landgate, 2012a)



In 2003 beginnings of the rural residential area surrounding Steel Blue Road is evident (Plate 3).

Plate 3: Aerial Photography from 2003 (Landgate, 2012a)



2.2 Surrounding Land Use

The site is bounded on the southern side by Mundijong Road. This road reserve also contains a Bush Forever site. To the west is Kargotich Road which adjoins a rural working property. The northern boundary is a railway which in February 2010 carried daily "bulk haul" traffic that was made up of:

- 8 coal trains;
- 18 bauxite trains;
- 4 caustic trains; and
- 4 alumina trains (Masterplan, 2011).

The eastern boundary of the site is the proposed future extension of Tonkin Highway. The Mundijong-Whitby District Structure Plan has been prepared to guide the development of the area to the east of the site. The DSP identifies the area immediately to the east of the proposed Tonkin Highway extension as residential (Masterplan, 2011).

2.3 Topography

The site gently slopes from east to west with elevations ranging from approximately 25m AHD to 15m AHD (Figure 2).

2.4 Geology and Soils

The site is located on the eastern side of the Swan Coastal Plain. The Swan Coastal Plain is generally flat and is approximately 20 to 30 kilometres wide, consisting of a series of geomorphic entities running parallel to the coastline. The youngest and most western of these geomorphic entities is the Quindalup Dunes, followed by the Spearwood Dunes and at the most eastern extent the Bassendean

Dunes. The Pinjarra Plain which is fluvatile in origin extends from the eastern side of the Bassendean Dunes to the western edge of the Darling Scarp, which joins the Ridge Hill Shelf and forms the denuded slope of the Darling Fault (Beard 1990). In areas the aeolian sands from the west may overlay the alluvial soils (NRM, 2008).

The site is situated in a transitional area between the soil systems with the Bassendean Dune System over most of the site. The south-western quarter and a small area in the north-west corner are mapped as part of the Pinjarra Plain System.

The Bassendean Dune and Sandplain System consists of very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains. These occur immediately west of, and partly overlie, the Pinjarra Plain. Topography becomes more subdued from west to east.

The Pinjarra Plain System consists of broad low relief plain west of the foothills, comprising predominantly Pleistocene fluvial sediments and some Holocene alluvium associated with major current drainage systems. The major soils are naturally poorly drained and many swamps occur.

The description of the soil phases present on the site is provided in Table 1 and soil mapping is shown in Figure 3.

Table 1: Soil Landscape Sub-Systems Found Within the Site

Reference	Description*
212Bs_B1	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m; Banksia dominant.
212Bs_B2	Flat to very gently undulating well drained sandplain. Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.
212Bs_B3	Closed depressions and poorly defined stream channels. Poorly to very poorly drained. Moderately deep, bleached sands with an iron-organic pan, or clay subsoil
212Bs_B4	Broad poorly drained sandplain. Deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5m by clay or less frequently a strong iron-organic hardpan.
212Bs_B6	Imperfectly drained sandplain and broad extremely low rises. Deep or very deep grey siliceous sands.
213Pj_P1b	Flat to very undulating plain with deep acidic mottled yellow duplex (or “effective duplex”) soils comprising moderately deep pale sand to sandy loam over clay; imperfectly drained and moderately susceptible to salinity in limited areas.
213Pj_P1d	Pale grey sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity
213Pj_P2a	Flat to very gently undulating plain, Poorly drained. Deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam with a silcrete hardpan at 50-100 cm depth genera
213Pj_P8	Moderately deep to deep sands over mottled clays
213Pj_P11	Poor to imperfectly drained flats over impermeable ironstone pavement. Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement

* From van Gool, 1990

2.5 Acid Sulphate Soils

Acid sulphate soils (ASS) are wetland soils and unconsolidated sediments that contain iron sulphides which, when exposed to atmospheric oxygen in the presence of water, form sulphuric acid. ASS form in protected low energy environments such as barrier estuaries and coastal lakes and commonly occurs in low-lying coastal lands such as Holocene marine muds and sands. When disturbed, these soils are prone to produce sulphuric acid and mobilise iron, aluminium, manganese and other heavy metals. The release of these reaction products can be detrimental to biota, human health and built infrastructure.

The ASS Risk on the site has been mapped by the DEC (Landgate, 2012b) as being Moderate to Low (<3m from the surface).

2.6 Hydrology

2.6.1 Groundwater

The Superficial Swan overlays the Leederville aquifer which is further described as the sub area Wanneroo member under the site and consists of poorly sorted fine- to medium-grained quartz with feldspar and occasionally trace heavy minerals. This overlays the Cattamara Coal Measures (DoW, 2012a).

Groundwater flows from east to west across the region. The Perth Groundwater Atlas (DoW, 2012b) shows a snapshot of groundwater levels as measured in May 2003 which are an indication of low groundwater levels and range from 23mAHD in the east to 16mAHD in the west of the site. The depth to groundwater from the natural surface ranges from approximately 3 to 5m (DoW, 2012b).

In the Mundijong area the groundwater tends to perch on the underlying clayey soils, causing large fluctuations of up to 3m between high and low groundwater levels (Masterplan, 2011).

2.6.2 Surface water

The site is within the Serpentine River Catchment and lower Serpentine Water allocation sub –area. Surface water in the Shire of Serpentine-Jarrahdale drains to the Serpentine River and ultimately the Peel Harvey Estuary.

Surface runoff from the site is via overland flow from east to west, following the natural topography. There are some very shallow farm drains (approximately 0.2 - 0.5m deep) which help to drain the site (Plate 4 and 5). The surface water also flows to Manjedal Brook.

Plate 4: Drainage line across part of the site off Pure Steel Road

Plate 5: Drainage line near the Leipold T junction with Kargotich Road

2.7 Wetlands

A significant portion of the site is shown in the DEC *Geomorphic Wetlands of the Swan Coastal Plain* dataset as being a Multiple Use Palusplain (Unique Feature Identifier (UFI) 15785) (Landgate, 2012b) (Figure 4). A Palusplain is defined as seasonally waterlogged flats. There is also a small Multiple Use Palusplain mapped on the north western boundary of the site (UFI 14903).

The dataset shows a Conservation Category wetland in the central eastern part of the site (Figure 4). This is classified as a Conservation Category Palusplain (UFI 14945). This wetland is actually part of Manjedal Brook which is a narrow, shallow ephemeral stream. The brook has been parkland cleared

and the vegetation consists of some paperbarks (*Melaleuca rhaphiophylla*) and Flooded Gums (*Eucalyptus rudis*) over a mixture of pasture and weed species (Plate 6).

Plate 6: Degraded vegetation in the Conservation Category Wetland, Manjedal Brook

The DEC Conservation Category wetland boundary has been mapped at a very broad scale and it is most likely that the spatial representation of the wetland is not accurate when considered at the individual lot scale.

2.8 Flora

2.8.1 Database Searches

A search of the DEC Threatened Flora Database (DEFL), the WA Herbarium database (WAHerb), the Declared Rare and Priority Flora Species List (TFPL) (Appendix 2), Naturemap (Appendix 3) and the EPBC Act Protected Matters Search Tool (Appendix 4) indicates a number of species listed as Endangered, Threatened or Priority have been located within a 5km radius of the site. The results from the database searches are shown in Table 2.

Table 2: Conservation Significant Flora known to occur in the Mundijong Area

Species	Common Name	Status Under Wildlife Conservation Act 1950	Status Under EPBC Act 1999
Caladenia huegelii	Grand Spider Orchid	Threatened	Endangered
Darwinia foetida	Muchea Bell	Threatened	Critically Endangered
Diuris purdiei	Purdie's Donkey Orchid	Threatened	Endangered
Drakaea elastica	Glossy-leaved Hammer Orchid	Threatened	Endangered
Eucalyptus balanites	Cadda Road Mallee	Threatened	Endangered

Species	Common Name	Status Under Wildlife Conservation Act 1950	Status Under EPBC Act 1999
Grevillea curviloba subsp. *incurva*	Narrow curved-leaf Grevillea	Threatened	Endangered
Synaphea sp. Fairbridge Farm		Threatened	Critically Endangered
Tetraria australiensis	Southern Tetraria	Threatened	Vulnerable
Verticordia plumosa var. *pleiobotrya*	Narrow-petalled Featherflower	Threatened	Endangered
Acacia lasiocarpa var. *bracteolata* long peduncle variant (G.J. Keighery 5026)		Priority 1	
Schoenus pennisetis		Priority 1	
Synaphea sp. Pinjarra Plain (A.S. George 17182)		Priority 1	
Johnsonia pubescens subsp. *cygnorum*		Priority 2	
Angianthus drummondii		Priority 3	
Baeckea sp. Perth Region (R.J. Cranfield 444)		Priority 3	
Dillwynia dillwynioides		Priority 3	
Jacksonia gracillima		Priority 3	
Meeboldina decipiens subsp. *decipiens*		Priority 3	
Synaphea sp. Serpentine (G.R. Brand 103)		Priority 3	
Centrolepis caespitosa		Priority 4	Endangered
Drosera occidentalis subsp. *occidentalis*		Priority 4	
Parsonsia diaphanophleba		Priority 4	
Verticordia lindleyi subsp. *lindleyi*		Priority 4	

Table 3 examines the preferred habitat of each species and the likelihood of the species listed in Table 2 to occur on the site.

Table 3: Likelihood of Identified Significant Flora Species occurring on the Site

Scientific Name	Preferred Habitat*	Likelihood of Presence on site
Caladenia huegelii	Grey or brown sand, clay loam	Highly Unlikely
Darwinia foetida	Grey-white sand on swampy, seasonally wet sites	Highly Unlikely
Diuris purdiei	Grey-black sand, moist. Winter-wet swamps	Highly Unlikely
Drakaea elastica	Low-lying situations adjoining winter-wet swamps. Does not survive in disturbed areas	Highly Unlikely

Scientific Name	Preferred Habitat*	Likelihood of Presence on site
Eucalyptus balanites	Sandy soils with lateritic gravel	Highly Unlikely
Grevillea curviloba subsp. *incurva*	Peaty and clay soils	Highly Unlikely
Synaphea sp. Fairbridge Farm	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses	Highly Unlikely
Tetraria australiensis	Grey sand over clay; sandy or clayey lateritic soils. Winter-wet swampy depressions	Highly Unlikely
Verticordia plumosa var. *pleiobotrya*	Seasonally inundated swamps, road verges	Highly Unlikely
Acacia lasiocarpa var. *bracteolata* long peduncle variant (G.J. Keighery 5026)	Grey or black sand over clay. Swampy areas, winter wet lowlands	Highly Unlikely
Schoenus pennisetis	Grey or peaty sand, sandy clay. Swamps, winter-wet depressions	Highly Unlikely
Synaphea sp. Pinjarra Plain (A.S. George 17182)	Grey sandy loam or clay, grey-brown clayey sand, brown clayey loam, laterite. Flats, seasonally wet	Highly Unlikely
Johnsonia pubescens subsp. *cygnorum*	Grey-white-yellow sand. Flats, seasonally-wet sites	Highly Unlikely
Angianthus drummondii	Grey or brown clay soils, ironstone. Seasonally wet flats	Highly Unlikely
Baeckea sp. Perth Region (R.J. Cranfield 444)	Orange sand, brown loam, white sandy clay. Low flats, winter-wet swamps, railway reserves.	Highly Unlikely
Dillwynia dillwynioides	Sandy soils. Winter-wet depressions	Highly Unlikely
Jacksonia gracillima	Grey and brown well-drained sand	Highly Unlikely
Meeboldina decipiens subsp. *decipiens*	Sand and sandy peat. Swamps	Highly Unlikely
Synaphea sp. Serpentine (G.R. Brand 103)	Brown sandy clay	Highly Unlikely
Centrolepis caespitosa	White sand, clay. Salt flats, wet areas	Highly Unlikely
Drosera occidentalis subsp. *occidentalis*	Sandy and clayey soils. Swamps and wet depressions	Highly Unlikely
Parsonsia diaphanophleba	Alluvial soils. Along rivers	Highly Unlikely
Verticordia lindleyi subsp. *lindleyi*	Grey, black or peaty sand. Winter-wet depressions	Highly Unlikely

* sourced from Florabase (DEC, 2012), SEWPaC SPRAT Database (SEWPaC, 2012a) as well as the DEC database searches.

Many of the species listed can be found in wetland areas of which the site has a large extent. However the site has been extensively cleared and grazed for at least 60 years. Therefore species on the list that may have once occurred on the site are not likely to be present now. Areas that contain

some native tress, including Manjedal Brook, have a completely cleared understorey in which the Conservation Significant species would not occur.

2.9 Vegetation

2.9.1 Vegetation Types

The site is in the Southwest Botanical Province within the Swan Coastal Plain Bioregion and is dominated by vegetation of the Pinjarra Plain and Bassendean System. Most of the native vegetation has been cleared. Large numbers of Swamp Sheoaks (*Casuarina obesa*) occur in paddocks with clay soils. Some Marris (*Corymbia calophylla*) and Spearwood (*Kunzea glabrescens*) and Sheoak (*Allocasuarina fraseriana*) occur in a large patch south of the Leipold Road reserve.

Manjedal Brook mostly contains Flooded Gum (*Eucalyptus rudis*) and Paperbark (*Melaleuca rhaphiophylla* and *M. preissiana*). A small stand of Holly Leafed Banksia (*Banksia ilicifolia*) occurs just to the south of Manjedal Brook.

Several Kingia (*Kingia australis*) trees are scattered in the northern part of the site.

Many exotic Australian native trees and shrubs have been planted in road reserves and paddock fence-lines including Rose Gums (*Eucalyptus grandis*), Broad-leafed Paperbark (*Melaleuca quinquenervia*), Swamp Mahogany (*E. robusta*) and River Red Gum (*E. camaldulensis*).

Therefore the vegetation on the site can be described as:

- Completely cleared containing pasture grasses, which is the predominant vegetation type over the entire site;
- *Casuarina obesa* Woodland over pasture grasses which is dominant in the south western corner of the site (Plate 7);
- *Melaleuca rhaphiophylla* (Paperbark) Woodland over pasture grasses which is associated with the Conservation Category Wetland (Plate 8) and has some *Eucalyptus rudis* (Flooded Gum).
- *Corymbia calophylla* Woodland over pasture grasses which is mainly in the area around Scott Road (Plate 9).
- *Kingia australis* and *Melaleuca rhaphiophylla* over pasture grasses, which occurs in the north of the site (Plate 10) near Bishop Road.

Plate 7: *Casuarina obesa* Woodland over pasture grasses

Plate 8: *Melaleuca rhaphiophylla* Woodland over pasture grasses

Plate 9: *Corymbia calophylla* Woodland over pasture grasses

Plate 10: *Kingia australis* and *Melaleuca rhaphiophylla* over pasture grasses

2.9.2 Vegetation Condition

The vegetation on the site has been historically cleared for rural purposes and is currently used for pasture and grazing. The condition of the vegetation was assessed according to the system devised by Keighery and described in Bush Forever (Government of Western Australia, 2000a). Keighery's condition rating scale ranges from Pristine where the vegetation exhibits no visible signs of disturbance to Completely Degraded where the vegetation structure in no longer intact and without native plant species (Table 5).

Table 5: Vegetation Condition Rating Scale.

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	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	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure 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 very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Government of Western Australia, 2000.

The site has been cleared of native vegetation and used for grazing purposes. A few native trees remain over pasture. The remnant vegetation on site consisted of parkland trees over pasture and weed species. The site is considered Completely Degraded based on the Bush Forever vegetation condition rating scale.

2.9.3 Regionally Significant Vegetation

A search of the DEC's Threatened (TEC) and Priority Ecological Communities (PEC) database was conducted for the site (Appendix 3; 11-0812EC). (Table 4).

Table 4: Threatened and Priority Ecological Communities known to occur in the Mundijong Area

Ecological Community	Description	Status under the Wildlife Conservation Act	Status under the EPBC Act
SCP3a	*Eucalyptus calophylla - Kingia australis* woodlands on heavy soils, Swan Coastal Plain	Critically Endangered	Endangered
SCP3c	*Eucalyptus calophylla - Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain	Critically Endangered	Endangered
SCP20b	*Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain	Endangered	
SCP02	Southern wet shrublands, Swan Coastal Plain	Endangered	
SCP3b	*Eucalyptus calophylla - Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain	Vulnerable	

Ecological Community	Description	Status under the Wildlife Conservation Act	Status under the EPBC Act
SCP08	Herb rich shrublands in clay pans	Vulnerable	Critically Endangered
	Casuarina obesa Association	Priority 1	

Due to the Completely Degraded structure and condition of the vegetation on the site, the TECs and PECs do not occur on the site.

The site does not contain any regionally significant vegetation.

The Bush Forever Site No 360 Mundijong Road and Watkins Road Bushland are in the Mundijong Road reserve adjacent to the southern boundary of the site. Bush Forever Site No. 360 contains plant communities representative of the eastern side of the Swan Coastal Plain that are considered to be regionally significant (WAPC, 2000).

The road alignment within the road reserve is in the northern half of the site. The portion of the road reserve south of Mundijong Road contains the TECs SCP3a, SCP3c and SCP9 in the portion in close proximity to the site. The portion of the road reserve to the north of Mundijong Road does not exhibit any conservation values and the vegetation would not be classified as these TECs. This part of the road reserve contains scattered trees largely over a weedy understorey.

2.10 Conservation Significance of Vegetation and Flora

The site is highly unlikely to contain any conservation significant flora.

The vegetation on the site is too degraded to assign a Floristic Community Type therefore it is highly unlikely that any Threatened or Priority Ecological Communities listed under the State or Commonwealth occur on the site.

2.11 Fauna

2.11.1 DEC Database Search Results

A search of the DEC Threatened Fauna Database (Appendix 5) indicates fourteen species listed as rare or priority have been located in the vicinity of the site. No additional species were identified in the Naturemap database searches (Appendix 3) and seven additional species were identified in the Protected Matters Search Tool (Appendix 4). Table 6 lists the species identified in these database searches.

Table 6: List of Fauna Species Identified from Database Searches.

Scientific Name	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Calyptorhynchus banksii subsp. *naso*	Forest Red-tailed Black-Cockatoo	Schedule 1	Vulnerable
Calyptorhynchus baudinii	Baudin's Cockatoo	Schedule 1	Vulnerable
Calyptorhynchus latirostris	Carnaby's Cockatoo	Schedule 1	Endangered

Scientific Name	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Dasyurus geoffroii	Chuditch, Western Quoll	Schedule 1	Vulnerable
Leipoa ocellata	Mallee Fowl	Schedule 1	Vulnerable
Phascogale tapoatafa subsp. ssp. (WAM M434)	Brush-tailed Phascogale	Schedule 1	
Rostratula benghalensis	Painted Snipe	Schedule 1	Vulnerable
Setonix brachyurus	Quokka	Schedule 1	
Synomen gratiosa	Graceful Sun-moth	Schedule 1	Endangered
Apus pacificus	Fork-tailed Swift	Schedule 3	Migratory
Ardea alba	Great Egret	Schedule 3	Migratory/ Wetland
Ardea ibis	Cattle Egret	Schedule 3	Migratory/ Wetland
Haliaeetus leucogaster	White-bellied Sea-eagle	Schedule 3	Migratory
Meeorps ornatus	Rainbow Bee-eater	Schedule 3	Migratory
Falco peregrinus	Peregrine Falcon	Schedule 4	
Morelia spilota subsp. *imbricata*	Carpet Python	Schedule 4	
Arbanitis inornatus	Trapdoor Spider	Priority 1	
Acanthophis antarcticus	Southern Death Adder	Priority 3	
Ardeotis australis	Australian Bustard	Priority 4	
Westralunio carteri	Fresh water mussel	Priority 4	
Isoodon obesulus subsp. *fusciventer*	Southern Brown Bandicoot	Priority 5	

The DEC classifies fauna under five different Priority codes and rare and endangered fauna are classified under the *Wildlife Conservation (Specially Protected Fauna) Notice 2008* into four schedules of taxa (DEC, 2011).

2.11.2 Fauna Habitat

The site contains four habitat types (Plates 7 to 9):

- Completely cleared pasture;
- Parkland cleared with scattered *Casuarina obesa* (Swamp Sheoak);
- Parkland cleared wetland area with *Eucalyptus rudis* (Flooded Gum) *Melaleuca rhaphiophylla* (Paperbark); and
- Parkland cleared *Corymbia calophylla*.

The completely cleared pasture dominates the site with the Parkland cleared with scattered *Casuarina obesa* (Swamp Sheoak) occurring mainly in the south west of the site. The wetland area is mainly in the area mapped as the Conservation Category Wetland (Manjedal Brook) with the Parkland cleared *Corymbia calophylla* (Marri) occurring in the north west of the site.

Fauna habitat can be assessed according to the following categories:

High quality fauna habitat *– These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.*

Very good fauna habitat *- These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.*

Good fauna habitat *– These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.*

Disturbed fauna habitat *– These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.*

Highly degraded fauna habitat *– These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.* (Coffey Environments, 2009)

Although these fauna habitat provide different species they all have been mostly cleared for agriculture and fully grazed for a number of years. There is no linkage and all the habitats on site are classified as Highly Degraded Fauna Habitat.

2.11.3 Conservation Significant Species

Outlined below is a short description of each of the species that were identified in the DEC database searches and Protected Matters Search Tool search and their preferred habitat in Table 3. The preferred habitat has been compared to the habitats on the site described above and the likelihood of each species to be present on the site determined.

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia, Dryandra, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp. It is nomadic often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (SEWPaC, 2012b).

The site contains some Marri (*Corymbia calophylla*) which are known feeding trees for Carnaby's Black Cockatoo (Higgins 1999). Carnaby's Black-Cockatoos have been recorded during other fauna surveys in the general area and are likely to feed and potentially roost on the site. The likelihood of this species breeding on the site is low as there are no recent records and the potential breeding hollows are not common in the area.

Baudin's Black Cockatoo (*Calyptorhynchus baudinii*)

This species is most common in the far south-west of Western Australia. It is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Black Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah and Marri woodlands, where it feeds mainly on Marri seeds and various Proteaceous species. This species are seasonally present on the Swan Coastal Plain, therefore Baudin's Black Cockatoo are potentially seen in the vicinity of the site (Garnett *et al.* 2011).

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Forest Red-tailed Black Cockatoos frequent the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (SEWPaC, 2012a). It nests in tree hollows with a depth of 1-5m, that are predominately Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) and Karri (*E. diversicolor*) and it feeds primarily on the seeds of Marri.

Red-Tailed Black Cockatoos have been recorded during other fauna surveys in the general area and were observed on the site during the site visit. Evidence of this species feeding on-site was also observed (Plate 11). They may occasionally roost in the large trees on-site. There is no record to indicate that they breed in the vicinity of the site (Johnstone and Kirkby 2011).

Plate 11: Evidence of Forest Red-tailed Black Cockatoos feeding on the site

Chuditch, Western Quoll (*Dasyurus geoffroii*)

The Chuditch was originally found in over 70% of Australian woodlands; however, since European settlement its range has diminished to a patchy distribution throughout the Jarrah forest and mixed Karri - Marri - Jarrah forest of south-west WA. They have been known to occupy a wide range of habitats including woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. The Chuditch creates dens in hollow logs or burrows and have also been recorded in tree hollows and cavities. They are opportunistic feeders, and forage on the ground at night, feeding on invertebrates, small mammals, birds and reptiles (SEWPaC, 2012b).

The Chuditch is unlikely to occur within the site due to previous agricultural activities which have removed cover for protection, fragmented habitats and the presence of exotic predators.

Malleefowl (*Leipoa ocellata*)

Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Malleefowl are now only found throughout these regions in fragmented patches due to clearing of land for agriculture, increased fire frequency, competition with exotic herbivores (sheep, rabbits, goats and cattle) and kangaroos, predation by foxes and cats, inbreeding as a result of fragmentation and possibly hunting for food (SEWPaC, 2012b).

Malleefowl are highly unlikely to be found on the site due the lack of appropriate Mallee habitat.

Southern Brush-tailed Phascogale (*Phascogale tapoatafa*)

Southern Brush-tailed Phascogales are arboreal marsupials which require tree hollows in suitable woodland or forest and rely on abundant invertebrate prey to sustain populations (Pescott, 2012).

This species is highly unlikely to occur on the site as the woodland it too disturbed and due to the presence of predators.

Painted Snipe (*Rostratula benghalensis*)

The Painted Snipe predominately occurs on the eastern coast of Australia and inhabits inland and coastal shallow ephemeral and permanent freshwater wetlands particularly where there is a cover of vegetation, including grasses.

There is no suitable habitat on the site therefore this species is highly unlikely to be present.

Quokka (*Setonix brachyurus*)

Quokkas were originally very common on the Swan Coastal Plain, however, their distribution is now limited to Rottnest Island and a few isolated areas in the south-west of WA. On the mainland, they prefer densely vegetated areas around wetlands and streams, whereas on Rottnest Island they inhabit low scrubby coastal vegetation where water is not readily available year-round. Quokkas breed once a year and produce a single joey. They are herbivorous, and feed on leaves, bark, succulent plants and grasses.

The Quokka is unlikely to occur within the project area due to a lack of suitable habitat and a lack of recent records of this species in the area.

Graceful Sun-moth (*Synemon gratiosa*)

The Graceful Sun-moth is a diurnal moth with dull coloured brown to black forewings and brightly coloured orange hind wings. The larvae burrow into the rhizomes of *Lomandra maritima* and *Lomandra hermaphrodita* exclusively and therefore require the presence of one or both of these species to be present in an area.

Neither of the species of *Lomandra* is likely to be present on the site and therefore the Graceful Sun-moth would not be present.

Fork-tailed Swift (*Apus pacificus*)

The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities (SEWPaC, 2012b).

It is unlikely this species would visit or rely on this site.

Great Egret, White Egret (*Ardea alba* (*modesta*))

The Eastern Great Egret has been reported in a wide range of wetland habitats and usually frequents shallow waters (SEWPaC, 2012b). This species feeds on fish, insects, crustaceans, molluscs, frogs, lizards, snakes and small birds and mammals (SEWPaC, 2012b).

The habitat on the site would not be suitable for this species.

Cattle Egret (*Ardea ibis*)

The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands with breeding in Western Australia recorded in the far north in Wyndham in colonies in wooded swamps such as mangrove forests (SEWPaC, 2012b). This species forages away from water on low lying grasslands, improved pastures and croplands generally in areas that have livestock eating insects, frog, lizards and small mammals (SEWPaC, 2012b).

This species may rarely visit the site but is not likely to rely on the site for survival.

White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

The White-bellied Sea-Eagle is found in coastal habitats with large areas of open water, especially those close to the sea-shore. This species feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal (SEWPaC, 2012b).

The habitat on site is not suitable for this species

Rainbow Bee-eater (*Merops ornatus*)

The Rainbow Bee-eaters that breed in southern Australia are migratory. After breeding, they move north and remain there for the duration of the Australian winter. However, populations that breed in northern Australia are considered to be resident, and in many northern localities the Rainbow

Bee-eater is present throughout the year (SEWPaC, 2012b). The Rainbow Bee-eater nests in a burrow dug in the ground. It is found across the better-watered parts of WA including islands preferring lightly wooded, sandy country near water (SEWPaC, 2012b).

The habitat disturbance on the site means the Rainbow Bee-eater is unlikely to be present on the site.

Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is found in a variety of habitats from woodlands to open grasslands and coastal cliffs. It feeds almost entirely on other birds and sometimes rabbits and other moderate sized mammals, bats and reptiles (DEC, 2012c).

This species is known to be easily frightened and flighty (SEWPaC, 2012b) and therefore is highly unlikely to utilise the site due to the proximity of human activity.

Carpet Python (*Morelia spilota imbricata*)

The South-west Carpet Python is a large snake found across the south-west of Western Australia, north to Geraldton and Yalgoo, and east to Kalgoorlie, Fraser Range and Eyre. They inhabit forest, heath, or wetland areas and shelter in hollow logs or in branches of large trees. Carpet Pythons are often found in colonies, particularly when breeding in spring. This species is widespread within the southwest, but is not in high densities across its distribution.

This species is unlikely to inhabit the site as it is cleared and degraded.

Trapdoor Spider (*Arbanitis inornatus*)

Trapdoor spiders dig burrows down into the ground, which they live in. The burrow is sealed with a lid or 'trapdoor,' which the spiders can emerge from to feed. They are ambush predators, relying on crawling insects such as ants and beetles. Much of these spiders habitat has been modified through land clearing. They are also quite vulnerable to disturbance, as they are sedentary creatures, with poor dispersal ability (Wheatbelt NRM).

This species is not likely to be found on the site as it is highly disturbed.

Southern Death Adder (*Acanthophis antarcticus*)

Southern Death Adders inhabit a range of habitats, including rainforest, scrubland, semi-arid zones and rocky outcrops. Typically during the day they remain mostly buried beneath sand, soil or debris, with just the tail and top of the head exposed. They do not actively hunt their prey but are cryptic snakes which sit motionlessly, sometimes for months on end, constantly watching for any animal which unwittingly comes within striking distance (Pilbara Pythons, 2012).

The habitat on site is not likely to be suitable to this species due to disturbance.

Australian Bustard (*Ardeotis australis*)

The Australian Bustard is a large ground bird of grassland, woodland and open agricultural country across northern Australia and southern New Guinea. It is also commonly referred to in Central Australia as the Bush Turkey, particularly by Aboriginal people.

This species is more common in the north and is unlikely to be present on the site.

Fresh Water Mussel (*Westralunio carteri*)

Westralunio carteri is a freshwater mussel and will not be present on the site as there is no appropriate habitat.

Southern Brown Bandicoot (*Isoodon obesulus* subsp. f*usciventer*)

Southern Brown Bandicoots are small grey marsupials that prefer dense scrub (up to one metre high), often in or near swampy vegetation. Their diet includes invertebrates (including earthworms, adult beetles and their larvae), underground fungi, subterranean plant material, and very occasionally, small vertebrates (DEC, 2002).

This species prefers dense scrub and therefore is not likely to be present on the site.

The likelihood of each species identified in the database searches being present on the site is summarised in Table 7.

Table 7: Likelihood of Conservation Significant species being present on the site

Scientific Name	Common Name	Likelihood to occur on the site
Calyptorhynchus banksii subsp. *naso*	Forest Red-tailed Black-Cockatoo	Recorded
Calyptorhynchus baudinii	Baudin's Cockatoo	Possible
Calyptorhynchus latirostris	Carnaby's Cockatoo	Likely
Dasyurus geoffroii	Chuditch, Western Quoll	No
Leipoa ocellata	Mallee Fowl	No
Phascogale tapoatafa subsp. ssp. (WAM M434)	Brush-tailed Phascogale	Highly Unlikely
Rostratula benghalensis	Painted Snipe	Unlikely
Setonix brachyurus	Quokka	No
Synemon gratiosa	Graceful Sun-moth	No
Apus pacificus	Fork-tailed Swift	Highly Unlikely
Ardea alba	Great Egret	Highly Unlikely
Ardea ibis	Cattle Egret	Possible
Haliaeetus leucogaster	White-bellied Sea-eagle	Highly Unlikely
Meeorps ornatus	Rainbow Bee-eater	Highly Unlikely
Falco peregrinus	Peregrine Falcon	Highly Unlikely
Morelia spilota subsp. *imbricata*	Carpet Python	Highly Unlikely
Arbanitis inornatus	Trapdoor Spider	Highly Unlikely
Acanthophis antarcticus	Southern Death Adder	Highly Unlikely
Ardeotis australis	Australian Bustard	Highly Unlikely

Scientific Name	Common Name	Likelihood to occur on the site
Westralunio carteri	Fresh water mussel	No
Isoodon obesulus subsp. *fusciventer*	Southern Brown Bandicoot	Unlikely

Therefore one Endangered species *Calyptorhynchus banksii* subsp. *naso* (Forest Red-tailed Black-Cockatoo) has been recorded on the site with two species, *Calyptorhynchus baudinii* (Baudin's Cockatoo) and *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo) likely to be present on the site at some times of the year. The Schedule 3 Marine/Migratory listed Cattle Egret may also be an irregular visitor to the site.

2.11.4 Biodiversity Value

The cleared pasture has almost no ecological value from a native fauna perspective. There are a few mature trees in the paddocks.

2.11.5 Ecological Linkages

The site is mostly cleared. There is some ecological linkage to the east of the site through Manjedal Brook which is recognised in the Mundijong-Whitby Structure Plan (Masterplan, 2011). The scattered trees on the site also provide some linkage for avifauna, including Black Cockatoos, flying from the Scarp to the Swan Coastal Plain and back.

2.12 Heritage

2.12.1 Aboriginal heritage

A search of the Aboriginal Heritage Inquiry System indicates that there is one Aboriginal Heritage Site that is located partially within the boundary of the site (DIA, 2012). The site identification number is 450 and is an artefacts scatter (Appendix 6).

There are three other sites in the vicinity of the proposed West Mundijong Industrial Area that are also registered artefacts scatters. Two of these are located to the east of the proposed West Mundijong Industrial Area within and close to the Tonkin Highway alignment. These are sites 18187 and 18188 (Appendix 6). Site 449 is located to the north of the railway line.

There are two listed 'Heritage Places' located close to the proposed West Mundijong Industrial Area. These are listed as sites 17923 and 18189 and are also described as artefact scatters (Appendix 6).

2.12.2 European Heritage

Heritage sites can be listed under the following lists/registers:

- World Heritage Sites;
- National Heritage Sites;
- Commonwealth Heritage Sites;
- Sites on the register of the National Estate; and
- Sites listed in the Shire of Serpentine-Jarrahdale Municipal Heritage Inventory List.

There are no listed Heritage Sites or Interim Heritage Sites on the site (Landgate, 2012b; Heritage Council of Western Australia, 2012; SEWPaC, 2012c, Burgess, 2000).

3 IMPACT OF DEVELOPMENT

3.1 Past and Existing Land Use

The site has been cleared and used for grazing and there are a number of homesteads, sheds and associated farm infrastructure on the site including a private airstrip.

Therefore a Preliminary Site Investigation is recommended prior to development to ensure there are no contaminated areas. The past and existing land use does not impede development as if any contaminated areas such as leaking fuel tanks, pesticide/herbicide dumps or spills, asbestos in existing structures are located then these can be managed under the *Contaminated Sites Act 2003*.

3.2 Noise

The development of the proposed West Mundijong Industrial Area has the potential to create noise emissions from industry. The Preliminary Environmental Noise Assessment by Herring Storer (2012) (Appendix 7) concluded that the placement of industry within the area will be key to the management of noise. This will involve the placement of the potentially noisiest industries in the centre of the site. Noise emissions will need to be managed during the subdivision or development application process pursuant to the *Environmental Protection (Noise) Regulations 1997.*

Environmental noise from the proposed Tonkin Highway and realignment of the railway is likely to impact on the amenity of lots on and around the site. Under State Planning Policy No. 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4) (WAPC, 2009) transport noise from within major transport corridors, including freight routes, and its impact on noise sensitive land uses must be investigated. The policy aims to:

- Protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of proposals.
- Protect major transport corridors and freight operations from incompatible urban encroachment.
- Encourage best-practice design and construction standards for new development proposals and new or redeveloped transport infrastructure proposals.
- Facilitate the development and operation of an efficient freight network.
- Facilitate the strategic co-location of freight handling facilities.

There are a variety of mitigation measures available to mitigate noise from walls to bunds etc. An acoustic assessment at the subdivision stages of planning should be undertaken once the industry to be placed in areas is determined and, if required, mitigation measures put into the design of the industry. The Preliminary Environmental Noise Assessment by Herring Storer (2012) (Appendix 7) concluded that this process must be undertaken by negotiations with the transport providers and developers in a collaborative fashion.

The final civil design for the development and proposed noise amelioration measures are required inputs for acoustic models to determine the level of impact. The final civil design should be completed as part of the future subdivision process with collaboration between the developer and

infrastructure provider. Further acoustic assessments will be required as part of the planning process. Therefore noise can be managed by planning and design and is not an impediment to the potential development of the site for industrial purposes. Section 8 of the Preliminary Environmental Noise Assessment by Herring Storer (2012) (Appendix 7) details recommended mitigation measures that have been considered in consultation with the DEC and Conservation and the office of the EPA

3.3 Industrial Buffers

The land to the north and west of the site have been identified as 'buffer' areas that will be maintained as rural and thereby maintaining setbacks to potentially noisy industry. Additional buffers may need to be imposed during the detailed design process as the development of the site for industrial purposes may impact on noise, air quality, vibration and public health and safety. "Quieter" light industry is to be located at the periphery of the site to the east and south to provide a separation and internalised buffer to residential and rural residential development. General industry is to be located in the core of the site and adjacent to less sensitive rural land uses to the west and north.

The EPA preferred method for determining buffers to sensitive land uses (such as residential development) involves site-specific technical studies however EPA Guidance Statement No. 3 *Separation Distances Between Industrial and Sensitive Land Uses* (EPA, 2005) does provide generic separation distances. Site specific studies are only required if a reduction of the buffer is required.

The generic distance is:

> *Not intended to be absolute separation distances, rather they are a default distance for the purposes of:*
> - *Identifying the need for specific separation distance or buffer definition studies; and*
> - *Providing general guidance on separation distances in the absence of site specific technical studies (EPA, 2005).*

The State Industrial Buffer Policy (WAPC 1997) sets out the regulations as to what is required for the determination of buffers. This policy states:

> *Where an industry, infrastructure or encroaching sensitive use seeks to vary the boundary of a buffer area once defined, the variation shall not be allowed unless justified by the proponent seeking the variation in a scientifically based study. The study should comply with adopted environmental and planning criteria to the satisfaction of the Environmental Protection Authority and the Western Australian Planning Commission State Industrial Buffer Policy.*
>
> *A final decision on the variation of the buffer area would need to take into account the results of that study, the needs of industry and infrastructure (including any arrangements between the proponent seeking the variation, and the industry or infrastructure, to upgrade a facility to reduce the off-site buffer requirement) environmental needs and the rights of adjacent landowners.*

This policy states that the assessment of buffers will be undertaken at the time of assessment of a scheme amendment. However the lack of a specific proposal for the development indicates that buffers should be determined for individual developments.

The *State Industrial Buffer Statement of Planning Policy 4.1* Draft Policy (Amended) (WAPC for Public Comment 2009) does not override the 1997 policy. This policy identifies the environmental criteria specified to determine buffers.

> *The following types of environmental criteria shall be applied on a site or area-specific basis by the developer for the purpose of determining the size of buffer areas and for protecting buffer areas from inappropriate uses. These include—*
>
> - *risk (individual and societal);*
> - *air quality (e.g. dust, sulphur dioxide);*
> - *noise; and*
> - *odour.*

Therefore the surrounding land use and roads will require further consideration and planning, however this does not impede the rezoning of the site and can be managed during the assessment of Development Applications and Subdivisions with buffers determined during subdivision.

3.4 Geomorphology and Soils

The site does not contain any unique topographical or geological formations and therefore these factors are not an impediment to the development of the site for industrial purposes. Some of the soil types on the site are prone to waterlogging and ponding. Surface water management will be required to manage these soil types.

To minimise potential for soil erosion to occur the following management measures are recommended:

- Ground disturbing activities should be kept to a minimum and carried out 'as required' (in stages) immediately prior to lots being released for sale as part of a 'staged' development of the site;
- Landscaping/stabilising/dust suppression of areas where ground disturbance has occurred should be scheduled to occur immediately after clearing/and or infrastructure construction has been completed; and
- Clearing activities have the potential to add clay 'fines' into the drainage channels or the Conservation Category Wetland and the installation of temporary drop-out basins to capture and aid in the settling of clay fines should be considered.

3.5 Acid Sulphate Soils

The ASS Risk on the site is mapped as being Moderate to Low (<3m from the surface). The WAPC *Acid Sulphate Soils Planning Guidelines* (WAPC, 2009c) indicate that "*acid sulphate soils are technically manageable in the majority of cases*". ASS Investigation and, if required, Management Plans should be prepared at subdivision stage once the detailed design of the site is finalised. This should be undertaken in accordance with the *Acid Sulphate Soils Guideline Series: Identification and*

Investigation of Acid Sulphate Soils and Acidic Landscapes (DEC, 2009a) and Draft *Treatment and Management of Soils and Water in Acid Sulphate Soil Landscapes* (DEC, 2009b).

3.6 Groundwater

Groundwater management will be outlined in the District Water Management Strategy and will be detailed in the Local Water Management Strategies and Urban Water Management Plans that will be prepared for each stage of development.

Therefore potential impacts on groundwater can be mitigated and managed and does not impede development of the site for industrial purposes.

3.7 Surface Water

As for groundwater the management of surface water will be outlined in the District Water Management Strategy and will be detailed in the Local Water Management Strategies and Urban Water Management Plans that will be prepared for each stage of development

The broad-scale planning for the site has identified two of the drainage channels (one of which links to the Conservation Category Wetland) as ecological corridors that will be revegetated and contain some passive recreation. The corridors should be designed to create a living stream as part of the development on the site.

Development of the site has the potential to increase the ecological value of the degraded channels through rehabilitation.

3.8 Wetlands

3.8.1 Manjedal Brook

The Conservation Category Wetland on the site is part of Manjedal Brook. A large proportion of the site is mapped as a palusplain Multiple Use Wetland.

As per guidance from the EPA the brook has been identified in the planning for West Mundijong as an ecological corridor which will result in the wetland and the drainage line that links to the west of the wetland being rehabilitated as a living stream within the development. A Wetland Management Plan for Manjedal Brook should be developed when planning for the area around the wetland is underway. The plan should be prepared acknowledging the following relevant policies and guidelines:

- Attachment B4-5 in *Environmental Guidance for Planning and Development – Guidance Statement 33* (EPA, 2008);
- *Guidelines Checklist for Preparing a Wetland Management Plan* (DEC, 2008); and
- *Environmental Protection of Wetlands – Position Statement No.4* (EPA 2001).

The Wetland Management Plan should detail measures to maintain the hydrology and improve the environmental values of the creekline. It should also include rehabilitation measures and outline the methodology to provide the ecological corridor in the development.

3.8.2 Wetland Buffers

The part of Manjedal Brook on the site is in similar condition to the brook to the east of the site. Planning for this part of the brook is underway and it has been determined that as a riverine wetland the responsible authority for the brook is the Department of Water. The Water Quality Protection Note 6: *Vegetation buffers to sensitive water resources* (DoW, 2006) outlines the manner in which buffer distances are to be measured:

> *Horizontal buffer distances are measured at right angles to the margins of streams or waterbodies, while buffers are normally circular for water supply wellheads. Where margins to ephemeral waterways are unclear, buffers should be measured outward from grade changes defining run-off channels.*

The section of Manjedal Brook that is classified as Conservation Category on the site has clearly defined banks and it is suggested that the buffer be consistent with that to the east of the site. This will be a 30m buffer measured from the top of the bank. This buffer is partially vegetated however in areas that are completely degraded drainage infrastructure could be placed in the buffer area, consistent with the eastern part of the brook. The eastern part of the brook has wetland tree vegetation present beyond 30m from the bank. This vegetation should be retained and the buffer extended to 50m from the edge of the bank or to the extent of the wetland vegetation, whichever is greater, to ensure the vegetation is protected.

3.9 Vegetation

The vegetation on the site is Completely Degraded and in small areas Degraded to Completely Degraded. The site does not contain any areas with an intact understorey. The development of the site will result in clearing the majority of the vegetation on the site. This vegetation is not significant however during the detailed design process it is recommended that the retention of any trees that can be retained in landscaped area, parking areas and in road/entry areas should be included in the plans for the area. Mature trees to be retained or transplanted must be identified and marked appropriately prior to commencement of any pre-construction activities.

Kingia australis plants should be retained or salvaged and replanted in the development or in Public Open Space nearby wherever possible.

The Mundijong Road reserve contains TECs to the south of the constructed road. To protect these TECs any further construction to provide services or to upgrade this road should be undertaken to the north of the constructed road. Management procedures should be in place to ensure that the vegetation to the south is not disturbed.

3.10 Flora

No Declared Rare Flora are likely to be on the site and no priority species are likely to be present.

It is recommended that no further study on the site be required and therefore flora is not an impediment to the development of the proposed Mundijong West Industrial Area.

3.11 Fauna

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii* subsp. *naso*), and possibly Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) could be impacted by the development of the site.

The three species of black cockatoo that do or may occur on the site are listed under Section 18 of the EPBC Act. Under the EPBC Act, a significant impact is determined by the sensitivity, value and quality of the environment which is to be impacted and the intensity, duration, magnitude and geographic extent of the impacts. If a proposed action is deemed to have a significant impact, this action should be referred to the Minister. Therefore development of the site for industrial purposes will need to be examined in the context of the *Matters of National Environmental Significance. Significant Impact Guidelines 1.2 Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2012c). If, according to the Significant Impact Guidelines 1.2, an action is likely to have a significant impact on an endangered and vulnerable species it will need to be referred under the EPBC Act.

The habitat requirements for the Black Cockatoos include foraging (Marris, Flooded Gums, *Banksia* species, Parrot Bush and other Proteaceous shrubs), roosting (tall eucalypts and pines) or breeding habitat (specific Eucalypt trees). There are very few Proteaceous shrubs and only scattered Marri trees on the site therefore it is concluded that the site contains very little suitable habitat for Black Cockatoos. Development of the site is not likely to significantly impact on Black Cockatoo species. However each individual development will need to make its own assessment to determine the implications of the proposed development under the EPBC Act. This will particularly apply to developments that contain Marri trees such as the area to the north of Scott Road on the western end and the lots immediately to the north of Manjedal Brook.

To mitigate potential impact on Black Cockatoos it is suggested that in future planning phases as many Marri and Flooded Gum trees and significant trees (those greater than 500mm in diameter at breast height) be retained. There is also the potential to improve the Black Cockatoo habitat by planting appropriate species in drainage corridors, open space and road reserves.

The Cattle Egret is potentially a brief visitor to the site but would not be impacted by the proposed development. There are no other conservation species identified that are likely to be present on the site.

As stated the development of the site has the potential to increase the ecological value of the degraded channels through rehabilitation which may also increase the ecological linkage over the site.

3.12 Heritage

Aboriginal Heritage Site 450, located partially on the site, is registered with the Department of Indigenous Affairs and as such advice on the implications under the *Aboriginal Heritage Act 1976* of the Heritage Site will need to be investigated.

4 SUMMARY AND CONCLUSIONS

The Environmental Factors that were studied in this environmental assessment were:

- Past and Existing Land Use
- Surrounding Land Use
- Topography
- Geomorphology and Soils
- Surface and Groundwater
- Vegetation
- Flora
- Fauna
- Heritage

The desktop studies resulted in the following conclusions and recommendations:

- Past land uses indicate that rural activities may have some small localised areas that are contaminated. Therefore it is suggested that a Preliminary Site Investigation be undertaken at subdivision stage to identify if there is any potential contamination present that may require further investigation and remediation in order for the site to be suitable for the proposed industrial development.
- The adjacent and future major road and rail alignments will require further acoustic studies to determine the impact of these activities on future industries. Buffers and management should be undertaken in collaboration with the infrastructure provider and developers.
- Some industries that could be considered in the industrial estate have the potential to impact on neighbouring residential development. Appropriate siting of industries requiring buffers will need to be considered at Structure Planning. Impacts can be mitigated with planning and engineering solutions. Therefore it is most appropriate to address these issues at subdivision to ensure the latest information and technology is available.
- Buffers required outside of the industrial site will depend on individual industries, taking into account emissions, noise, odour and public health, and should be determined during development applications or subdivision.
- The topography and geology on the site is not an impediment to development.
- The soils have a Low to Moderate risk of ASS. Therefore this is not considered a constraint to development. Individual industries will need to consider site specific soil types for ASS risk at subdivision or development application stage.
- Surface water and groundwater will be managed under the hierarchy outlined in *Better Urban Water Management* (WAPC, 2008).
- Rehabilitation of the drainage channels has the potential to increase the ecological value of the degraded channels and may also increase the ecological linkage over the site.
- The site has a Conservation Category Wetland (UFI 14945) that is Manjedal Brook. It is recommended that a Wetland Management Plan be prepared for the mapped wetland and adjoining drainage line to be rehabilitated as an ecological corridor in the development. This

should be during subdivision in areas adjacent to the brook and outline measures to maintain the hydrology and improve the environmental values of the wetland.

- A buffer of 30m to the drainage line (top of bank) should be imposed as well as a 50m buffer the outer extent of wetland vegetation, whichever is greater, to the well vegetated eastern part of Manjedal Brook.
- The site is not in a priority surface or groundwater area. Therefore these factors do not constrain development on the site.
- The development of the site will result in clearing small pockets of remnant vegetation and individual trees. The majority of the vegetation has been cleared and is not a constraint to development.
- Wherever possible, trees should be retained in the development particularly in road reserves and carparks. Drainage corridors, open space and road reserves can be enhanced by planting native species.
- No Declared Rare or Priority Flora or TECs are likely to be on the site.
- There are TECs to the south of the constructed Mundijong road and any construction and/or upgrading of this road should be constructed to the north of the existing road.
- Consideration will need to be given to retaining Marri trees to protect habitat for the three species of Black Cockatoo. Development is highly unlikely to have a significant impact according to the Significant Impact Guidelines 1.1 however each individual development should do its own assessment to determine the degree of impact under the EPBC Act. This will particularly apply to developments that contain Marri trees such as the area to the north of Scott Road on the western end and the lots immediately to the north of Manjedal Brook.
- There is a registered Aboriginal heritage site (Site ID 450) in the proposed Mundijong West Industrial Area and therefore advice will need to be sought to determine what approvals, if any, are required under the *Aboriginal Heritage Act, 1976*.

The results of desktop assessment, preliminary field investigations and mitigation measures identified, concludes the potential for deleterious impacts of industrial development on the biophysical environment are considered to be low. Potential impacts of industrial development on the existing residences adjacent to the site will need to be managed through siting industries with emissions away from residences can be managed with a high degree of confidence to minimise environmental harm. The impact of noise from road and rail on the industries will also need to be managed.

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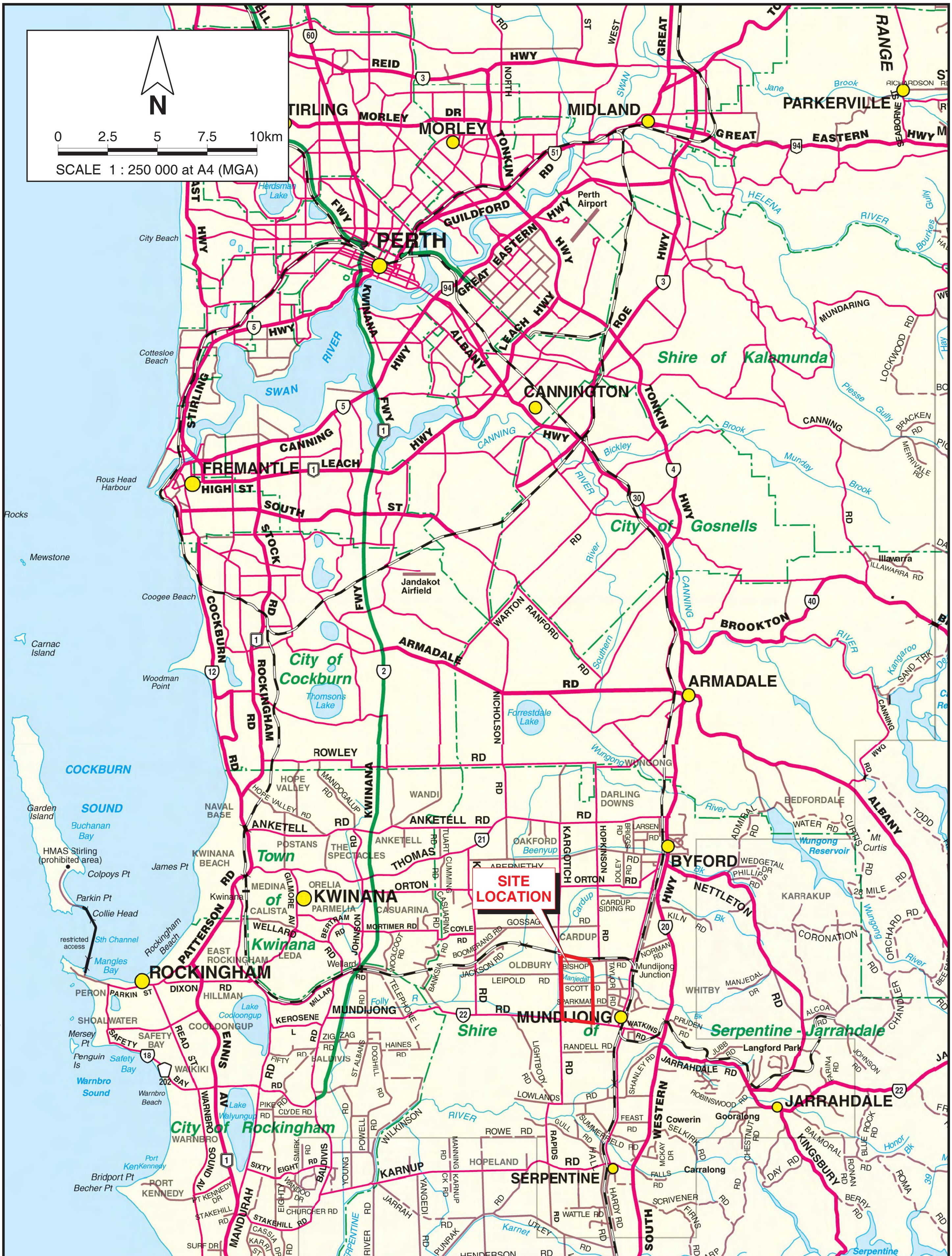
FIGURES



Shire of Serpentine Jarrahdale
ENVIRONMENTAL ASSESSMENT
WEST MUNDIJONG INDUSTRIAL AREA

pgv ENVIRONMENTAL

Drawn: J. Hams | Date: 22 Nov 2012
Job: 10109 | Revision: A

SITE LOCATION

Figure 1

2012-063-f01.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

PINPOINT CARTOGRAPHICS (08) 9562 7136 2012-063-f02.dgn

N

0 100 200 300 400 500m

SCALE 1 : 10 000 at A3 (MGA)

401 000mE 402 000mE

6 429 000mN 6 428 000mN 6 427 000mN 6 426 000mN

BISHOP ROAD

SCOTT ROAD

KARGOTICH ROAD

MUNDIJONG ROAD

STEEL LANE

PURE

R 46312 174

R 23793 1724

VCL 47 VCL 46 VCL 179

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Topographic Contour

CADASTRAL SOURCE: Landgate, November 2012.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2012.
CONTOURS SOURCE: Landgate, 1:50,000 Topographic Mapping.

pgv ENVIRONMENTAL

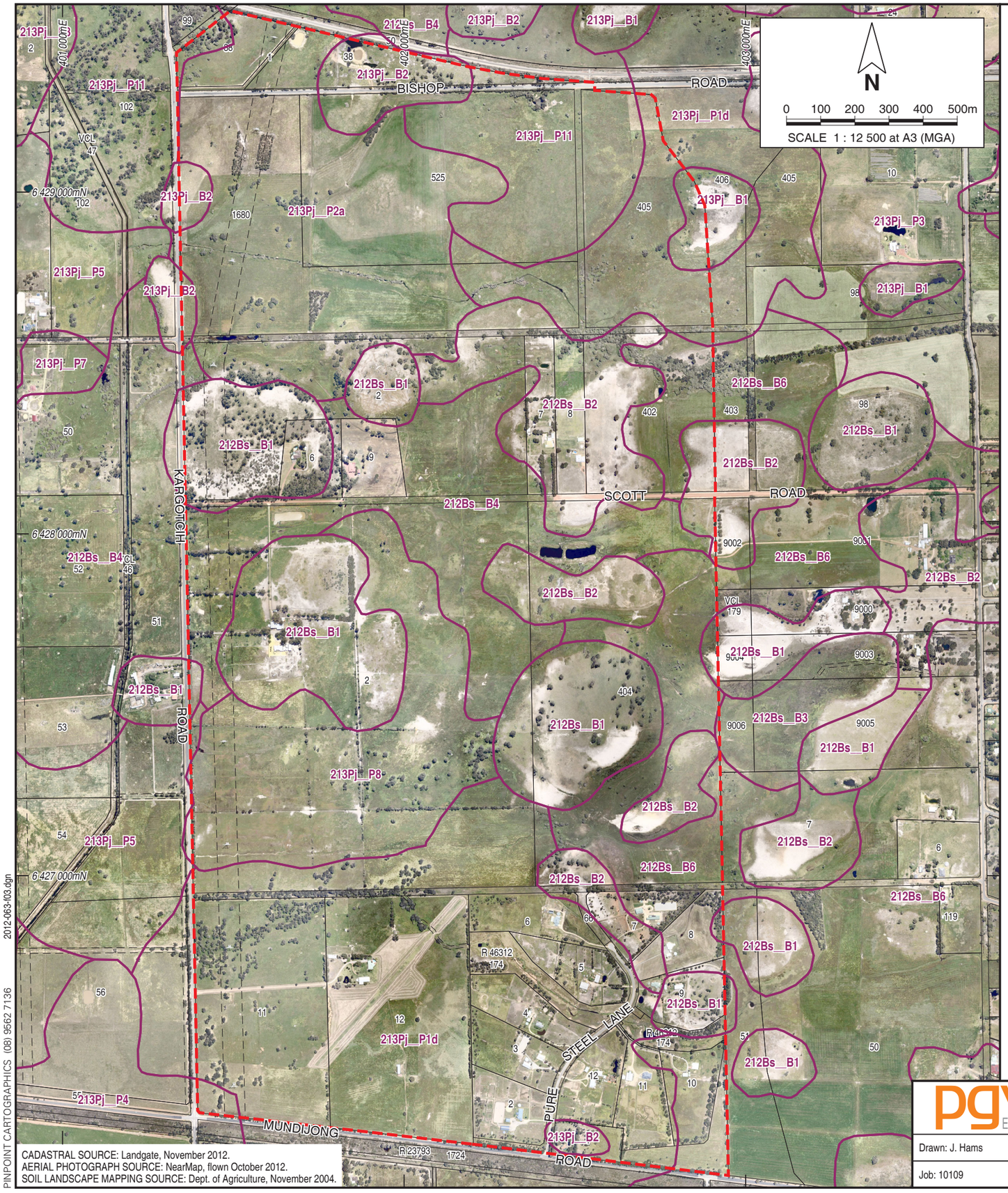
Shire of Serpentine Jarrahdale
ENVIRONMENTAL ASSESSMENT
WEST MUNDIJONG INDUSTRIAL AREA

Drawn: J. Hams | Date: 22 Nov 2012

Job: 10109 | Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2



CADASTRAL SOURCE: Landgate, November 2012.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2012.
SOIL LANDSCAPE MAPPING SOURCE: Dept. of Agriculture, November 2004.

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Soil Landscape Mapping Boundary
- 213Pj__B1 Soil Landscape Type

Soil Landscape Mapping

212Bs__B1 Bassendean B1 Phase
Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.

212Bs__B2 Bassendean B2 Phase
Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2m.

212Bs__B3 Bassendean B3 Phase
Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.

212Bs__B4 Bassendean B4 Phase
Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.

212Bs__B6 Bassendean B6 Phase
Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.

213Pj__B1 Pinjarra, B1 Phase
Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.

213Pj__B2 Pinjarra, B2 Phase
Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2m.

213Pj__P11 Pinjarra P11 Phase
Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement which is a clear barrier to drainage.

213Pj__P1d Pinjarra P1d Phase
Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity.

213Pj__P2a Pinjarra P2a Phase
Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam with a silcrete hardpan at 50-100 cm depth generally on top of an olive-grey clay.

213Pj__P3 Pinjarra P3 Phase
Flat to very gently undulating plain with deep, imperfect to poorly drained acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.

213Pj__P4 Pinjarra P4 Phase
Poorly drained flats, sometimes with gilgai microrelief and with moderately deep to deep black, olive grey and some yellowish brown cracking clays and less commonly non-cracking friable clays with generally acidic subsoils.

213Pj__P5 Pinjarra P5 Phase
Poorly drained flats, commonly with gilgai microrelief and with deep black-grey to olive-brown cracking clays with subsoils becoming alkaline.

213Pj__P7 Pinjarra P7 Phase
Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley sandy duplex and effective duplex soils.

213Pj__P8 Pinjarra P8 Phase
Broad poorly drained flats and poorly defined stream channels with moderately deep to deep sands over mottled clays; acidic or less commonly alkaline gley and yellow duplex soils to uniform bleached or pale brown sands over clay.

PGV ENVIRONMENTAL

Shire of Serpentine Jarrahdale
ENVIRONMENTAL ASSESSMENT
WEST MUNDIJONG INDUSTRIAL AREA

Drawn: J. Hams	Date: 22 Nov 2012
Job: 10109	Revision: A

SOIL LANDSCAPE MAPPING

Figure 3

PINPOINT CARTOGRAPHICS (08) 9562 7136 2012-063-I03.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136 2012-063-f04.dgn

N

0 100 200 300 400 500m

SCALE 1 : 10 000 at A3 (MGA)

401 000mE 402 000mE

6 429 000mN 6 428 000mN 6 427 000mN 6 426 000mN

BISHOP ROAD

SCOTT ROAD

KARGOTICH ROAD

MUNDIJONG ROAD

STEEL LANE

PURE LANE

VCL 47 VCL 46 VCL 179

R 46312 174 R 46312 174

14903 14904 14945 15785 14817

1680 1724

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary

Geomorphic Wetlands

- Conservation Category
- Multiple Use
- 15785 Wetland UFI

WETLANDS SOURCE: DEC, October 2012.
CADASTRAL SOURCE: Landgate, November 2012.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2012.

pgv ENVIRONMENTAL

Drawn: J. Hams | Date: 22 Nov 2012

Job: 10109 | Revision: A

Shire of Serpentine Jarrahdale
ENVIRONMENTAL ASSESSMENT
WEST MUNDIJONG INDUSTRIAL AREA

GEOMORPHIC WETLANDS

Figure 4

APPENDIX 1

Correspondence between OEPA and Serpentine Jarrahdale Shire

All enquiries to Peter Varelis on 9526 1111
Our ref: A2078 PV:kc
Electronic Ref: OC12/9476

26 July 2012

Attention: Mr. Gary Williams
Chief Executive Officer
Office of the Environmental Protection Authority
Locked Bag 33, Cloisters Square
PERTH WA 6850

Dear Sir

RE: WEST MUNDIJONG INDUSTRIAL AREA: PROPOSED DISTRICT STRUCTURE PLAN AND AMENDMENT TO THE METROPOLITAN REGION SCHEME

We write with regards to our recent meeting held 19 July 2012 in relation to the West Mundijong Industrial Area.

The Shire of Serpentine Jarrahdale (the Shire) would like to confirm the following points:

Background

In February 2012 the Shire completed a Feasibility Assessment for industrial development at West Mundijong. The assessment concluded that the area would be suitable for low to moderate emission general industry.

You are probably aware that future industrial development of the land is foreshadowed in the following key planning documents:

a) *Directions 2031*
b) Draft Southern Metropolitan Sub – Regional Structure Plan 2009
c) Mundijong Whitby District Structure Plan
d) Economics and Employment Lands Strategy: non-heavy industry (2012)

It should be noted that *Directions 2031* also identified a potential intermodal facility within the West Mundijong area. The feasibility of an intermodal facility is currently being progressed by the Department of Transport.

In response to the Feasibility Assessment and the above planning documents, the Shire is preparing a District Structure Plan (DSP) for the West Mundijong area. The purpose of the DSP is to support an amendment to the Metropolitan Region Scheme to include the land within the 'Industrial' zone.

So far, progression of the necessary planning for the site embodies a 'whole of government approach'. Funding for the proposal has been sourced from a number of agencies including the Department of Planning, Department of Agriculture and Food WA and the Department of Transport. The Shire is committed to collaboration with key agencies in order to progress planning and ultimately the development of West Mundijong.

Likely Industrial Development Scenarios

It is important to note that the above documents envisage the development of 'non heavy industry' at West Mundijong. The Feasibility Assessment recommended a range of general industry uses including, but not limited to:

a) Agribusiness, including food distribution;
b) Warehousing and logistics;
c) Transport, heavy machinery sales, servicing and distribution;
d) Service industry, light industry and limited showroom development; and,
e) Manufacture and fabrication of building products: plasterboard, lime production and brickworks.

A Schematic Plan was prepared as part of the Feasibility Assessment and outlines the proposed uses and their potential disposition within the future estate. The plan is attached for your information.

Environmental Factors

The West Mundijong Feasibility Assessment also included a desktop analysis of environmental opportunities and constraints. The following is noteworthy:

a) The vast majority of the site has been cleared of remnant vegetation in order to enable the land to be used for broad acre agriculture;

b) Manjedal Brook bisecting the site East/West. The eastern portion of the Brook is a designated conservation category wetland. The Brook is also identified as a place of environmental beauty in the Shire's Local Town Planning Scheme; and,

c) The proximity of existing and planned sensitive uses. It is noted that the Mundijong Whitby District Structure Plan provides for future residential development to the extension of Tonkin Hwy. The Highway reservation forms the eastern boundary of the site.

Flora and Fauna

It is estimated that less than 3% of the original vegetation remains.

Nevertheless there may be the possibility of rare and endangered flora on the fringes of the site mainly in association with remnant vegetation on the southern side of Mundijong Road. Such vegetation may also support endangered fauna. The subject portion of Mundijong Rd is also a 'Bush Forever' (reference 360).

Given the very limited extent of remnant vegetation, detailed surveys and reporting are not envisaged as required at the DSP and MRS amendment stage. Rather such surveys, if required, can be deferred to the subsequent local structure planning phase. This approach would be consistent with the development of the Mundijong Whitby District Structure Plan immediately to the East.

Similarly it is our view that any Commonwealth referrals can and should be deferred to the Local Structure Planning phase.

Noise

Potential noise emissions are likely to be the most important environmental consideration in the future planning and development of West Mundijong.

Herring Storer Acoustics (HSA) has been engaged to prepare a Noise Assessment to support the preparation of a DSP. The assessment will model noise emissions based upon the industrial land use scenarios identified in the West Mundijong Industrial Feasibility Assessment.

The following points are acknowledged:

a) *The assessment will be completed in accordance with SPP 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning;*

b) *In relation to a), it is acknowledged that the assessment and management of locomotive noise will ultimately be the responsibility of a future proponent of such rail infrastructure. Nevertheless, the Noise Assessment will need to account for all other associated activities / uses that otherwise would be associated with a future intermodal facility;*

c) *The report will model two options for the location of the proposed intermodal facility; and,*

d) *The outcomes of the assessment will primarily determine the buffer distance for the Estate.*

As agreed at our meeting it would be useful if HSA could collaborate with the Department of Environment and Conservation's Noise Branch in the development of the assessment. In particular, a further meeting of the relevant personnel to discuss the draft assessment report prior to finalisation would be beneficial.

Buffer

The location of existing and proposed sensitive uses will be a key consideration in the development of the DSP. As outlined above the outcomes of the noise modeling will be instrumental in determining a suitable buffer distance for the future industrial estate.

The DSP report will make recommendations as how best to implement the buffer in order to meet the requirements of SPP 4.1: *State Industrial Buffer Policy*. Suffice to note:

a) *The Shire is completing a review of its Rural Land Strategy. The review incorporates a buffer for West Mundijong which seeks to prevent further development of sensitive uses within proximity of the area;*

b) *Local Structure Planning for land to the East within the Mundijong Whitby area is cognisant of potential noise impacts that may arise from the future industrial development; and,*

c) *The Feasibility Assessment foreshadowed a need to accommodate low emission industrial uses on the eastern and southern perimeter of the future state in order to reduce the potential for impacts on nearby sensitive uses. It is envisaged that structure planning will need to develop both an 'internal' and 'external' buffer for the estate.*

Wetlands

The majority of the site is designated a 'multiple use' wetland according to Department of Environment and Conservation's geomorphic wetland data base.

As discussed above, the northern portion of the site is traversed by Manjedal Brook. The eastern portion of the Brook is identified as a CCW. The Brook is also identified as an 'area of natural beauty' in the local scheme.

The Shire is not seeking to de-classify the CCW. Subject to further planning and consultation, there might some potential to incorporate the Brook into an ecological corridor incorporating rehabilitation, drainage and passive recreation features. The corridor would also seek to make provision for adequate buffers between the Brook and future industrial development consistent with Department of Environment and Conservation's relevant policy.

The portion of Mundijong Road forming the southern boundary of the site is also identified as a CCW.

Proposed Environmental Reporting

Accompanying the MRS amendment will be an Environment Assessment Report (EAR). The EAR will include:

a) *Desktop review of flora and fauna, including threatened ecological communities. As discussed above it is envisaged that surveys, if required, can deferred to the local structure planning phase;*
b) *An explanation as to how wetland issues will be addressed via structure planning;*
c) *Outcomes of the noise modeling report and in particular how potential noise impacts will be managed; and,*
d) *Recommended buffer distance including mechanisms for implementation via the planning system;*
e) *Transition strategy for existing sensitive uses within the proposed estate and nearby.*

We respectfully seek your agreement to the matters and approach raised in this correspondence.

Again, the Shire expresses its gratitude for your advice and cooperation to date.

Should you have any queries please do not hesitate to contact Mr. Peter Varelis, Senior Strategic Planner, on 9526 1167.

Yours sincerely

Suzette van Aswegen
DIRECTOR STRATEGIC COMMUNITY PLANNING

CC:
Craig Shepherd – Department of Planning
Don Challis – Department of Transport
Lindsay Broardhurst – Main Roads WA

Enclosure: 1. Schematic Plan

Government of **Western Australia**
Office of the **Environmental Protection Authority**

Your Ref: A2078 PV:kc
Our Ref: A527988: OEPA2012/000339
Enquiries: Gary Williams, 6467 5425
Gary.Williams@epa.wa.gov.au

Suzette van Aswegen
Director Strategic Community Planning
Shire of Serpentine - Jarrahdale
6 Paterson Street
MUNDIJONG WA 6123

Attention: Peter Varelis

Dear Ms van Aswegan

WEST MUNIDIJONG INDUSTRIAL AREA PROPOSED DISTRICT STRUCTURE PLAN AND PROPOSED METROPOLITAN REGION SCHEME AMENDMENT

Thank you for your correspondence dated 26 July 2012 seeking confirmation from the Office of the Environmental Protection Authority (OEPA) in relation to the matters described in your letter and discussed with the OEPA at meetings on the 21 June and 19 July 2012, in relation to the West Mundijong Industrial Area District Structure Plan (DSP) and proposed Metropolitan Region Scheme (MRS) amendment.

Your letter accurately reflects the matters discussed at the meetings between the Shire of Serpentine - Jarrahdale and the OEPA. It also satisfactorily outlines the environmental issues and the scope of work the OEPA requires to consider the potential environmental impacts of the proposed DSP and to recommend a level of assessment to the EPA on the MRS amendment.

In particular, the OEPA supports the Shire's intentions to:

(a) prepare a noise assessment to ensure that an adequate buffer is provided around the proposed industrial area so that noise emissions from various industrial types will be contained within the buffer;

(b) consider existing and proposed sensitive land uses within and around the proposed industrial area when determining the location of various industrial types during the preparation of the DSP;

(c) include the Manjedal Brook and the Conservation category wetland within an ecological corridor; and

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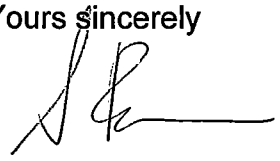
Locked Bag 33, Cloisters Square, Perth WA 6850
www.epa.wa.gov.au

(d) defer detailed vegetation surveys and reporting to the local structure planning stage recognising that there are likely to be declared rare flora, priority flora and threatened ecological communities in the vicinity of the subject land and potentially on the subject land.

I trust this advice is of assistance.

Yours sincerely



Sally Bowman
Manager
Planning and Infrastructure Branch

11 September 2012

APPENDIX 2

DEC Flora Database Searches

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DECLARED RARE AND PRIORITY FLORA LIST
16 September 2010

SPECIES / TAXON	CONS CODE	DEC REGION	DISTRIBUTION	FLOWER PERIOD
Acacia horridula	3	SW	Helena Valley - Serpentine	May-Aug
Acacia lasiocarpa var. bracteolata long peduncle variant (GJ Keighery 5026)	1	SW	North Dandalup, Mundijong, Gosnells, Jandakot, Serpentine, Mundijong	My,Aug
Acacia oncinophylla subsp. oncinophylla	3	SW,MW,WA	Mogumber, Mundaring, John Forrest NP, Serpentine, Mt Lennard, Dwellingup, Winnejup	
Andersonia audax ms	3	SW	Armadale, Jarrahdale, Monadnocks C.P.	Oct
Andersonia saxatilis ms	1	SW	Jarrahdale, Monadnocks C.P.	
Aponogeton hexatepalus	4	SR,SW	Perth, Pinjarra, Capel, Bunbury, Boyanup, Nannup, Bertram, Mundijong	Aug-Sep
Centrolepis caespitosa	4	SC,SW,WB	South Stirling, Pearce, Meckering, (Byford), Youngs Siding, Narrikup, Orange Grove	Nov
Cyathochaeta teretifolia	3	SW,WA	Whiteman Park, Lake Gnangara, Ellenbrook, Muchea, Denbarker, Yelverton, Wellard, Mundijong	Dec
Dillwynia dillwynioides	3	SW	Harvey, Pinjarrah, Yunderup, Gingin, Perth, Karnup, Mundijong, Serpentine	Aug-Oct
Eryngium pinnatifidum subsp. palustre ms	3	SW	Serpentine, Kenwick, Upper Swan, Gingin, Forrestdale, Bullsbrook, Mandurah, Arrowsmith, Capel	-
Eucalyptus rudis subsp. cratyantha	4	SR,SW	Yallingup, Eagle Bay, Mandurah, Cape Naturaliste, Meelup, Busselton, Serpentine	-
Grevillea crowleyae	2	WB,SW	Dardadine, Dryandra, Jarrahdale	
Grevillea manglesii subsp. ornithopoda	2	SW	Murray River, Pinjarra, York, Jarrahdale, Mundaring, North Bannister	Sep-Oct
Jacksonia gracillima	3	SW,SR	Mundijong, Forrestdale, Capel, Elgin, Modong N.R., Forrestfield, Ambergate	Oct-Nov
Johnsonia pubescens subsp. cygnorum	2	SW	Serpentine, Cardup, Lowlands	Sep-Nov
Lasiopetalum pterocarpum	T	SW	Serpentine Falls	Aug
Meeboldina decipens subsp. decipens ms	3	SW,SR	Cannington, Waroona, Byford, Capel	
Paracaleana gracilicordata	1	SW	Jarrahdale	Oct-Nov
Paracaleana granitica	1	SW	Jarrahdale, Sullivan Rock	Oct-Dec
Parsonsia diaphanophleba	4	SW	Murray River, Coolup, Serpentine	Jan-Feb,May-
Schoenus pennisetis	1	SW,WB	Cannington, Byford, Kenwick, Wongan Hills	Aug-Dec
Stylidium ireneae	4	SW,SR	Waroona, Lane Poole, Serpentine Dam, North Dandalup, Augusta, Kwinana	Oct-Nov
Stylidium longitubum	3	SW,WB,SR	Upper Swan, Bullsbrook, Bunbury, Midland, Busselton, Arthur River, Jandakot, Mundijong, Karnup	Nov
Synaphea odocoileops	1	SW,SR	Serpentine, Elgin, Byford, Wagerup	Aug-Oct
Synaphea sp. Pinjarra plain (AS George 17182)	1	SW	Mundijong, Serpentine	Oct
Synaphea sp. Serpentine (G.R. Brand 103)	3	SW,SR	Serpentine, Mundijong, Byford, Yarloop	Aug-Nov
Tetraria australiensis	T	SW,SR	Mundijong, Busselton, (Cannington, Serpentine River)	Dec

DECLARED RARE AND PRIORITY FLORA LIST

16 September 2010

SPECIES / TAXON	CONS CODE	DEC REGION	DISTRIBUTION	FLOWER PERIOD
Verticordia lindleyi subsp. lindleyi	4	SW,MW	Gillingarra-Forrestdale, Cannington, Guildford, Muchea, Gingin, Murray River, Moore River, Serpentine	Nov-Jan
Verticordia plumosa var. ananeotes	T	SR,SW	Busselton, Serpentine - Blackwood	Dec
Verticordia plumosa var. pleiobotrya	T	SW	Mundijong West Road, Bullsbrook NR	Nov

SHEET_NO	SPECIES	CONSCODE	SITE	VEGETATION	LOCALITY	DATE_
PERTH 00619884	Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)	1	Low lying sand over clay. Winter wet, open.		6 km WNW of Mundijong	05 08 1982
PERTH 03377962	Baeckea sp. Perth Region (R.J. Cranfield 444)	3	Dry summer swamp. Sandy white clay soil.	Heath type vegetation.	Abernethy Road, Oakford	23 03 1981
PERTH 04099672	Baeckea sp. Perth Region (R.J. Cranfield 444)	3	Winter wet. Brown clay over ironstone.	Heath of Calothamnus hirsutus, Jacksonia, Melaleuca and Baeckea emergent.	Mundijong road, 4 km W of Mundijong	20 01 1992
PERTH 04497864	Dillwynia dillwynioides	3	Soil: Grey sand. Topography/drainage: Seasonally wet poorly drained flat. Geomorphology: Bassendean sands.	Vegetation: Kunzea ericifolia Scrub over Pericalymma ellipticum Open Low Scrub B over mixed Open Herbs.	Remnant vegetation on Lowlands property (M103) 9 km WNW of Serpentine (plot low09a).	12 09 1992
PERTH 04457811	Dillwynia dillwynioides	3	Soil: Dark brown sand. Topography/drainage: Seasonally wet flat. Geomorphology: Bassendean sands.	Vegetation: Melalueca raphiophylla Open Low Woodland A over Kunzea ericifolia Thicket over Astartea fascicularis Low Scrub A over mixed Herbs.	Remnant vegetation on Lowlands property (M103) 9 km WNW of Serpentine (plot low08).	06 11 1993
PERTH 1096478	Diuris purdiei	T	Sand.		Mundijong.	09 1903
PERTH 05811953	Drosera occidentalis subsp. occidentalis	4	Damp flat. Grey sandy clay. Edge of cleared firebreak.	In regenerating Pericalymma ellipticum heath.	0.9 km SSw of Byford Siding between Soldiers Road and Turner Road, N of small creek,	27 11 1990
PERTH 04916980	Jacksonia gracillima	3	Wetland. Seasonally moist littered black clay.	Dense Heath B (Muir).	Mundijong Road, 200 m E of intersection with Kargotich Road	06 11 1997
PERTH 07127499	Jacksonia gracillima	3	Winter wet flats; brown clay.	Melaleuca uncinata tall shrubland over low shrubland of Calothamnus, Verticordia spp over sedges.	Road verge, 2 km W Mundijong	05 11 2004
PERTH 01969625	Johnsonia pubescens subsp. cygnorum	2			Whitby Falls near Mundijong,	09 10 1923
PERTH 01969528	Johnsonia pubescens subsp. cygnorum	2	Yellow sand.	In open low woodland A with Jarrah and Banksia.	Cardup Nature Reserve	21 09 1988
PERTH 4497686	Johnsonia pubescens subsp. cygnorum	2	Soil: Grey sand. Topography/drainage: Seasonally wet poorly drained flat. Geomorphology: Bassendean sands.	Vegetation: Kunzea ericifolia Scrub over Pericalymma ellipticum Open Low Scrub B over mixed Open Herbs.	Remnant vegetation on Lowlands property (M103) 9 km WNW of Serpentine (adj. to plot low09a).	13 08 1992
PERTH 4497880	Johnsonia pubescens subsp. cygnorum	2	Soil: Grey white sand. Topography/drainage: Well drained flat. Geomorphology: Bassendean sands.	Vegetation: Eucalyptus marginata Forest over Melalueca preissiana Low Forest A over Chaemascilla corymbosa, Dasypogon bromilifolius Open Herbs over Loxocarya fascicularis, Hypolaena exsulca Very Open Low Sedges.	Remnant vegetation on Lowlands property (M103) 9 km WNW of Serpentine (plot low06b).	12 09 1992
PERTH 07130023	Meeboldina decipiens subsp. decipiens	3	Eastern Swan coastal plain - seasonal wetland. Seasonally wet, grey loamy sand.	Low Corymbia calophylla woodland A (Muir, 77). Kingia australis, Xanthorrhoea preissii, Pericalymma spongicaule, Mesomelaena tetragona, Tricostularia neesii.	Brickwood Reserve, Bygord, between Turner and Soldier Roads	14 11 2003
PERTH 07130031	Meeboldina decipiens subsp. decipiens	3	Eastern Swan coastal plain - seasonal wetland. Seasonally wet, grey loamy sand.	Low Corymbia calophylla woodland A (Muir, 77). Kingia australis, Xanthorrhoea preissii, Pericalymma spongicaule, Mesomelaena tetragona, Tricostularia neesii.	Brickwood Reserve, Bygord, between Turner and Soldier Roads	14 11 2003

SHEET_NO	SPECIES	CONSCODE	SITE	VEGETATION	LOCALITY	DATE_
PERTH 04684591	Parsonsia diaphanophleba	4	Riverbank. Dry sand/loam.	With Eucalyptus rudis, Melaleuca rhaphiophylla, Casuarina obesa.	Serpentine River, Lowlands Road	23 04 1997
PERTH 03017656	Parsonsia diaphanophleba	4	Light brown sandy clay, river edge.		Lowlands, Mardella, N side of Serpentine River, NE of old house	31 05 1993
PERTH 02239086	Schoenus pennisetis	1	On cleared track, sandy clay, flat.	With other herbs and grasses.	Between Turner road and Mead Street on track past Aged Peoples Home, 500 m SW of Byford	27 11 1990
PERTH 02239094	Schoenus pennisetis	1	Damp depression, sand and clay.	Cleared break on edge of Pericalymma ellipticum dense low heath C.	Track along E boundary of Geoff Brickwood Reserve, 0.9 km SSW of Byford, adjacent to Soldier's road, just N of small creek	27 11 1990
PERTH 05427452	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Flat. Moist, grey, sandy clay. Pinjarra Plain?	Heath. Characteristic species: Marri, other Synaphea.	Hall Road, Serpentine	01 09 1999
PERTH 07463723	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Brown, moist clay loam. Area between road and rail.	Shrubland with Xanthorrhoea preissii, Kingia australis, Dryandra nivea, Conospermum huegelii, Synaphea petiolaris, Mesomelaena tetragona, Gompholobium marginatum, Conostylis, Laxmannia, Drosera, Restionaceae spp. and weeds - Aira cupaniana, Ursinia anthe	4.65 km S of Abernathy Road rail crossing on Soldiers Road, S of Cardup siding	29 10 2003
PERTH 07463758	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Flora Road reserve. Moist brown clay loam.	Open Hakea and Melaleuca shrubland on edge of Corymbia calophylla remnant woodland. Associated species: Synaphea petiolaris (RB 1075), S. sp. Serpentine (G.R. Brand 103) (RB 1076), 3 x Verticordia spp., Pimelea, Xanthorrhoea preissii, Kingia australis, C	2.1 km W of rail crossing at Mundijong on Mundijong Road; W of Mundijong	18 10 2003
PERTH 07463871	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Brown, moist clay loam. Area between road and rail.	Shrubland with Xanthorrhoea preissii, Kingia australis, Dryandra nivea, Conospermum huegelii, Synaphea petiolaris, Mesomelaena tetragona, Gompholobium marginatum, Conostylis, Laxmannia, Drosera, Restionaceae spp. and weeds - Aira cupaniana, Ursinia anthe	4.65 km S of Abernathy Road rail crossing on Soldiers Road, S of Cardup siding	29 10 2003
PERTH 05140056	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Flat, litter yellow sand. Bassendean sand / Ridgehill shelf.	Woodland, Jarrah, Marri.	Brandale Park, Whitby,	19 08 1997
PERTH 05125820	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	In sandy loam.	In Jarrah - Marri woodland on road verges.	Just N of Mundijong, in Paterson Road,	25 10 1993
PERTH 07463693	Synaphea sp. Pinjarra Plain (A.S. George 17182)	1	Seasonally wet area. Brown loam.	Shrubland. Sedges, grasses, Xanthorrhoea, Allocasuarina, Jacksonia, Calothamnus.	Mundijong Road, 2 km W of South West Highway	26 10 1999
PERTH 04923022	Synaphea sp. Serpentine (G.R. Brand 103)	3	Orange brown clay. Topography/drainage: Seasonally wet poorly drained flat. Geomorphology: Guildford formation (pinjarra plain).	Melalueca uncinata Open Scrub over Verticordia plumosa Dwarf Scrub D over mixed Open Herbs over Leptocarpus canus, Chorizandra enodes Open Low Sedges.	Roadside remnant Mundijong Rd, 2 km W of Mundijong (adj. to plot mud-9)	07 08 1992
PERTH 05297133	Synaphea sp. Serpentine (G.R. Brand 103)	3	Brown sandy clay.		1.3 km W of Mundijong along Watkins Road,	21 09 1998

SHEET_NO	SPECIES	CONSCODE	SITE	VEGETATION	LOCALITY	DATE_
PERTH 04931017	Synaphea sp. Serpentine (G.R. Brand 103)	3	Wetland. Seasonally moist, littered black clay.	Dense Heath B.	Mundijong Road, 200 m E of intersection with Kargotich Road	06 11 1997
PERTH 05427487	Synaphea sp. Serpentine (G.R. Brand 103)	3	Flat. Wet, grey sand clay. Pinjarra Plain?	Heath. Characteristic species: Marri, Synaphea petiolaris?	Hall Road, Serpentine,	01 09 1999
PERTH 07463561	Synaphea sp. Serpentine (G.R. Brand 103)	3	Moist, brown, clay-loam.	Flora road. Open Melaleuca and Hakea shrubland on edge of Corymbia calophylla woodland remnant with Xanthorrhoea preissii, Kingia australis, Synaphea sp. Pinjarra Plain (A.S. George 17182), S. petiolaris, 3 x Verticordia spp., Pimelea, Dillwynia, Calotha	2.1 km W of rail crossing at Mundijong on Mundijong Road	18 10 2003
PERTH 07463588	Synaphea sp. Serpentine (G.R. Brand 103)	3	Rail reserve. Grey-very light brown, sandy loam.	Emergent Corymbia calophylla with understorey of Xanthorrhoea preissii, Kingia australis, Mesomelaena tetragona, Anigozanthos viridis, Synaphea petiolaris, Drosera and weed species Eragrostis curvula, Ehrharta calycina, Briza maxima.	5.25 km S of Abernathy Road rail crossing on Soldiers Road (ca 20 m N of Bishops Road), S of Cardup siding	
PERTH 04164911	Tetraria australiensis	T	Winter wet flats. Grey sand over clay.	Sedgeland and edging Marri woodland.	2 km E of Mundijong	04 01 1993
PERTH 05899133	Tetraria australiensis	T	Low plain. Moist sand-loam. New highway extension.	Marri/Kingias TEC 3a.	Mundijong Road, Mundijong, 150-250 m E of Webb Road on the southern side of Mundijong Road within flora/road reserve, Serpentine/Jarrahdale Shire,	03 12 2001
PERTH 05039274	Tetraria australiensis	T	Gentle slope, winter damp, brown clayey sand.	Eucalyptus calophylla woodland over sedges.	Mundijong townsite, beside Mundijong Road by tennis courts	23 06 1996
PERTH 06427669	Tetraria australiensis	T	Dune Ridge, gentle slope, W aspect, dark brown clayey sand over orange clayey sand, well drained.	Associated species: Eucalyptus marginata.	Private property in Norman Road Bushland (Bush Forever Site 354) South Western Highway, Whitby/Cardup, in System 6 Update quadrat norm02	01 11 1995
PERTH 06513328	Tetraria australiensis	T	Low dune, white and grey sand.	Scattered Eucalyptus calophylla over Banksia menziesii and Banksia attenuata Low Woodland over Tetraria australiensis Tall Sedges.	Watkins Road Reserve on N boundary between fire break and fence line. Watkins Road E of Mundijong (Bush Forever Site 360)	20 02 1996
PERTH 06532888	Tetraria australiensis	T	Low sand dune above a sumpland with exposed ironstone, grey sand.	Scattered Marri over Banksia menziesii and Banksia attenuata Low Woodland.	Private property adjacent to N boundary of Watkins Road Reserve, Mundijong (Bush Forever Site 360)	20 02 1996
PERTH 06532993	Tetraria australiensis	T	Dune flat, grey sand over sandy clay.	Mixed Low Heath D over Open Herbs and Low Sedges.a attenuata Low Woodland.	Watkins Road Reserve (on the low sandy rise to the NW of the original population), Mundijong (Bush Forever Site 360)	26 02 1996

SHEET_NO	SPECIES	CONSCODE	SITE	VEGETATION	LOCALITY	DATE_
PERTH 08124981	Tetraria australiensis	T	Very gentle slope with dry clayey sand.	Corymbia calophylla woodland over Xanthorrhoea preissii and Kingia australis over sedges. Associated vegetation include Corymbia calophylla, Kingia australis, Xanthorrhoea preissii, Hibbertia hypericoides, Tetaria octandra, Haemodorum sp., and grassy wee	Mudijong Townsite Lot 232, Mundijong. Population is scattered throughout the remnant vegetation to the S and W of the old tennis courts	09 12 2008
PERTH 08284628	Tetraria australiensis	T	Plain. Grey sand.	Open sedgeland amongst open Marri woodland. With Corymbia calophylla, Hakea sp., Kingia ausgtralis, Nuytsia floribunda, Stirlingia latifolia, Xanthorrhoea sp.	Watkins [Road] Nature Reserve, ca 250 m ENE of gate on Mundijong Road. Plant growing both sides of shire road	10 03 2010
PERTH 1057251	Verticordia lindleyi subsp. lindleyi	4	Dry summer swamp. Sandy white clay soil.	Heath type.	Abernethy Road, Oakford	23 03 1981
PERTH 1894242	Verticordia plumosa var. pleiobotrya	T	In clay on road verge.		Kargotich Road, S of Randell Road, SW of Mundijong	27 12 1988
PERTH 1883577	Verticordia plumosa var. pleiobotrya	T	Clay flat.	Low heath.	Mundijong road, 0.9 km E of Kargotich road, W of Mundijong	07 11 1986
PERTH 01894382	Verticordia plumosa var. pleiobotrya	T	In sand/clay.	With Marri, Jacksonia, Kingia and Xanthorrhoea.	Rockingham Road, Mundijong (near junction with Kargotich Road)	13 11 1988
PERTH 04521099	Verticordia plumosa var. pleiobotrya	T	Soil: Orange brown clay. Topography/drainage: Seasonally wet poorly drained flat. Geomorphology: Guildford formation (pinjarra plain).	Vegetation: Melalueca uncinata Open Scrub over Verticordia plumosa Dwarf Scrub D over mixed Open Herbs over Leptocarpus canus, Chorizandra enodes Open Low Sedges.	Roadside remnant Mundijong Rd, 2 km W of Mundijong (plot mud-9).	25 10 1992
PERTH 05290384	Verticordia plumosa var. pleiobotrya	T	Flat, damp - winter wet. Yellow sandy clay. Pinjarra Plain.	Shrubland, Verticordia sp., Viminaria juncea.	Between Kargotich (800 m E of) and Webb roads on Mundijong Road,	25 11 1998
PERTH 05580188	Verticordia plumosa var. pleiobotrya	T	Flat, roadside. Litter, brown sandy clay. Pinjarra plain.	Roadside vegetation. Acacia.	kargoyich road, 200 m N of Gossage Road, Mundijong,	30 11 1999
PERTH 07933983	Verticordia plumosa var. pleiobotrya	T	Low lying plain with brown clay / loam.	Low shrubland amongst Melaleuca shrubland to 2 m with Allocasuarina sp., Calothamnus sp., Hakea sp., Melaleuca sp., Verticordia densiflora and Viminaria juncea.	Mundijong Road, 0.7 km E of Kargotich Road	08 01 2008
PERTH 04363698	Verticordia plumosa var. pleiobotrya	T	Brown clay loam over laterite.	Calothamnus hirsutus/Verticordia low heath.	Mundijong Road; W of Mundijong	04 11 1992
PERTH 04931122	Verticordia plumosa var. pleiobotrya	T	Littered, brown clayey sand.	Roadside vegetation.	Kargotich Road, 4.9 km S of Thomas Road	06 11 1997
PERTH 1886851	Verticordia plumosa var. pleiobotrya	T	On sandy loam flat on road verge.	Among scrub.	Kargotich Road, 0.8 km S of Mundijong Road, W of Mundijong	07 11 1986

SHEET	SPNAME	CONSVCODE	POPID1	POPID2	VESTING	PURPOSE1	PURPOSE2	STATUS	OWNERDATE
	Acacia lasiocarpa var. bracteolata long peduncle								
5152	variant(G.J.Keighery 5026)		1	1	SHI				5/08/1982 0:00
7897	Baeckea sp. Perth Region (R.J. Cranfield 444)		3	2	SHI	VER			23/03/1981 0:00
7896	Baeckea sp. Perth Region (R.J. Cranfield 444)		3	4	SHI	VER	DRA		20/01/1992 0:00
7851	Dillwynia dillwynioides		3	3	PRI				15/06/1994 0:00
25828	Dillwynia dillwynioides		3	25	PRI				28/10/1993 0:00
48389	Drakaea elastica	T		22	PRI				31/08/2010 0:00
23667	Johnsonia pubescens subsp. cygnorum		2	1	CC	CFF			21/09/1988 0:00
23670	Johnsonia pubescens subsp. cygnorum		2	4	PRI				13/08/1992 0:00
23671	Johnsonia pubescens subsp. cygnorum		2	5	PRI				12/08/1992 0:00
42590	Tetraria australiensis	T		1 A	CC	CFF			1/12/2009 0:00
42591	Tetraria australiensis	T		1 B	SHI	SNN			27/09/2009 0:00
42592	Tetraria australiensis	T		1 C	RAI	UNK			8/02/2010 0:00
42666	Tetraria australiensis	T		5 A	PRI				8/02/2010 0:00
42667	Tetraria australiensis	T		5 B	PRI				8/02/2010 0:00
42589	Tetraria australiensis	T		8	SHI	REC			9/12/2008 0:00
42689	Tetraria australiensis	T		10	SHI	GVT			28/10/2009 0:00
6161	Verticordia lindleyi subsp. lindleyi		4	2	UNK				23/03/1981 0:00
16286	Verticordia plumosa var. pleiobotrya	T		1	SHI	VER			24/11/1999 0:00
16285	Verticordia plumosa var. pleiobotrya	T		2	SHI	VER			24/11/1999 0:00
16284	Verticordia plumosa var. pleiobotrya	T		3	SHI	VER			24/11/1999 0:00
16287	Verticordia plumosa var. pleiobotrya	T		7 A	SHI	DRA			28/03/2000 0:00
16288	Verticordia plumosa var. pleiobotrya	T		7 B	PRI				28/03/2000 0:00

APPENDIX 3

Naturemap Database Search

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Jackalyn Hams on 29/10/2012

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115°57' 37" E,32°17' 17" S
Buffer	2km
Group By	Conservation Status

Conservation Status	Species	Records
Rare or likely to become extinct	3	13
Protected under international agreement	1	1
Priority 1	1	2
Priority 3	4	9
Priority 5	1	1
Non-conservation taxon	213	437
TOTAL	**223**	**463**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
2.	1033	*Tetraria australiensis*		T	
3.	12452	*Verticordia plumosa var. pleiobotrya*		T	
Protected under international agreement					
4.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
Priority 1					
5.	30751	*Synaphea sp. Pinjarra Plain (A.S. George 17182)*		P1	
Priority 3					
6.	7829	*Angianthus drummondii*		P3	
7.	20421	*Baeckea sp. Perth Region (R.J. Cranfield 444)*		P3	
8.	20462	*Jacksonia gracillima*		P3	
9.	28354	*Synaphea sp. Serpentine (G.R. Brand 103)*		P3	
Priority 5					
10.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
Non-conservation taxon					
11.	11519	*Acacia lasiocarpa var. bracteolata*			
12.	3442	*Acacia microbotrya (Manna Wattle)*			
13.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
14.	6205	*Actinotus leucocephalus (Flannel Flower)*			
15.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
16.	1734	*Allocasuarina microstachya*			
17.	197	*Amphipogon debilis*			
18.	200	*Amphipogon turbinatus*			
19.	24316	*Anas superciliosa (Pacific Black Duck)*			
20.	1416	*Anigozanthos viridis (Green Kangaroo Paw)*			
21.	24561	*Anthochaera carunculata (Red Wattlebird)*			
22.	7411	*Anthotium humile (Dwarf Anthotium)*			
23.	12724	*Anthotium junciforme*			
24.	1117	*Aphelia cyperoides*			
25.	20350	*Astartea affinis*			
26.	24319	*Biziura lobata (Musk Duck)*			
27.	1272	*Borya scirpoidea*			
28.	7867	*Brachyscome bellidioides*			
29.	244	*Briza maxima (Blowfly Grass)*	Y		
30.	245	*Briza minor (Shivery Grass)*	Y		
31.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
32.	1276	*Caesia micrantha (Pale Grass-lily)*			
33.	1214	*Calectasia grandiflora (Blue Tinsel Lily)*			
34.	19307	*Calectasia grandiflora subsp. grandiflora*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
35.	36600	*Callitris pyramidalis (Swamp Cypress)*			
36.	5411	*Calothamnus hirsutus*			
37.	5441	*Calytrix aurea*			
38.	2951	*Cassytha flava (Dodder Laurel)*			
39.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
40.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
41.	1130	*Centrolepis humillima (Dwarf Centrolepis)*			
42.	1132	*Centrolepis mutica*			
43.	1280	*Chamaescilla corymbosa (Blue Squill)*			
44.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
45.	763	*Chorizandra enodis (Black Bristlerush)*			
46.	6543	*Cicendia filiformis (Slender Cicendia)*	Y		
47.	24399	*Columba livia (Domestic Pigeon)*			
48.	25592	*Corvus coronoides (Australian Raven)*			
49.	7946	*Cotula cotuloides (Smooth Cotula)*			
50.	25595	*Cracticus tibicen (Australian Magpie)*			
51.	25596	*Cracticus torquatus (Grey Butcherbird)*			
52.	6663	*Cuscuta epithymum (Lesser Dodder)*	Y		
53.	768	*Cyathochaeta avenacea*			
54.	24322	*Cygnus atratus (Black Swan)*			
55.	283	*Cynodon dactylon (Couch)*	Y		
56.	815	*Cyperus tenellus (Tiny Flatsedge)*	Y		
57.	7454	*Dampiera linearis (Common Dampiera)*			
58.	3832	*Daviesia physodes*			
59.	1259	*Dianella revoluta (Blueberry Lily)*			
60.	306	*Dichelachne crinita (Longhair Plumegrass)*			
61.	7961	*Dittrichia graveolens (Stinkwort)*	Y		
62.	10791	*Diuris carinata (Bee Orchid)*			
63.	1632	*Diuris emarginata (Tall Donkey Orchid)*			
64.	3101	*Drosera heterophylla (Swamp Rainbow)*			
65.	3106	*Drosera macrantha (Bridal Rainbow)*			
66.	11853	*Drosera menziesii subsp. menziesii*			
67.	13216	*Drosera menziesii subsp. penicillaris*			
68.	8911	*Drosera rosulata*			
69.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
70.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
71.	29940	*Euphorbia maculata*	Y		
72.	34757	*Euphorbia prostrata*	Y		
73.	3880	*Eutaxia virgata*			
74.	25622	*Falco cenchroides (Australian Kestrel)*			
75.	25727	*Fulica atra (Eurasian Coot)*			
76.	1518	*Gladiolus angustus (Long Tubed Painted Lady)*	Y		
77.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
78.	3951	*Gompholobium marginatum*			
79.	12551	*Goodenia micrantha*			
80.	1964	*Grevillea bipinnatifida (Fuchsia Grevillea)*			
81.	2066	*Grevillea pilulifera (Woolly-flowered Grevillea)*			
82.	1464	*Haemodorum brevisepalum*			
83.	1468	*Haemodorum laxum*			
84.	1472	*Haemodorum simplex*			
85.	1475	*Haemodorum spicatum (Mardja)*			
86.	2137	*Hakea ceratophylla (Horned Leaf Hakea)*			
87.	2166	*Hakea incrassata (Marble Hakea)*			
88.	2179	*Hakea marginata*			
89.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
90.	2216	*Hakea varia (Variable-leaved Hakea)*			
91.	24295	*Haliastur sphenurus (Whistling Kite)*			
92.	1068	*Harperia lateriflora*			
93.	5108	*Hibbertia acerosa (Needle Leaved Guinea Flower)*			
94.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
95.	12741	*Hyalosperma cotula*			
96.	6226	*Hydrocotyle callicarpa (Small Pennywort)*			
97.	6229	*Hydrocotyle diantha*			
98.	5817	*Hypocalymma angustifolium (White Myrtle)*			
99.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
100.	1070	*Hypolaena exsulca*			
101.	1503	*Hypoxis occidentalis*			
102.	11	*Isoetes drummondii (Quillwort)*			
103.	912	*Isolepis cyperoides*			
104.	14540	*Isolepis hystrix*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
105.	919	*Isolepis oldfieldiana*			
106.	4029	*Jacksonia sternbergiana (Stinkwood)*			
107.	1178	*Juncus bufonius (Toad Rush)*	Y		
108.	1180	*Juncus capitatus (Capitate Rush)*	Y		
109.	1221	*Kingia australis (Kingia)*			
110.	5835	*Kunzea micrantha*			
111.	17461	*Kunzea micrantha subsp. micrantha*			
112.	5841	*Kunzea recurva*			
113.	1307	*Laxmannia ramosa (Branching Lily)*			
114.	1309	*Laxmannia squarrosa*			
115.	1075	*Lepidobolus preissianus*			
116.	925	*Lepidosperma angustatum*			
117.	1088	*Lepyrodia macra (Large Scale Rush)*			
118.	1090	*Lepyrodia muirii*			
119.	6445	*Leucopogon squarrosus*			
120.	24581	*Lichenostomus virescens (Singing Honeyeater)*			
121.	7408	*Lobelia tenuior (Slender Lobelia)*			
122.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
123.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
124.	4059	*Lotus angustissimus (Narrowleaf Trefoil)*	Y		
125.	17683	*Meeboldina cana*			
126.	17678	*Meeboldina kraussii*			
127.	37580	*Melaleuca acutifolia*			
128.	36296	*Melaleuca armillaris subsp. armillaris*	Y		
129.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
130.	5946	*Melaleuca pauciflora*			
131.	5978	*Melaleuca teretifolia (Banbar)*			
132.	5984	*Melaleuca uncinata (Broom Bush)*			
133.	5987	*Melaleuca viminea (Mohan)*			
134.	957	*Mesomelaena tetragona (Semaphore Sedge)*			
135.	4100	*Mirbelia spinosa*			
136.	7410	*Monopsis debilis*	Y		
137.	492	*Neurachne alopecuroidea (Foxtail Mulga Grass)*			
138.	2401	*Nuytsia floribunda (Christmas Tree)*			
139.	14292	*Oenothera stricta subsp. stricta*	Y		
140.	8133	*Olearia elaeophila*			
141.	4352	*Oxalis glabra*	Y		
142.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
143.	1550	*Patersonia occidentalis (Purple Flag)*			
144.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
145.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
146.	16478	*Pericalymma ellipticum var. floridum*			
147.	20391	*Petrophile juncifolia*			
148.	2308	*Petrophile seminuda*			
149.	2311	*Petrophile squamata*			
150.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
151.	18529	*Philotheca spicata (Pepper and Salt)*			
152.	1172	*Philydrella drummondii*			
153.	1173	*Philydrella pygmaea (Butterfly Flowers)*			
154.	14306	*Philydrella pygmaea subsp. pygmaea*			
155.		*Phytophthora cinnamomi*			
156.	11404	*Pimelea imbricata var. major*			
157.	11402	*Pimelea imbricata var. piligera*			
158.	25704	*Podiceps cristatus (Great Crested Grebe)*			
159.	2419	*Polygonum aviculare (Wireweed)*	Y		
160.	6012	*Regelia ciliata*			
161.	1556	*Romulea rosea (Guildford Grass)*	Y		
162.	7619	*Scaevola lanceolata*			
163.	6263	*Schoenolaena juncea*			
164.	975	*Schoenus bifidus*			
165.	1002	*Schoenus nanus (Tiny Bog Rush)*			
166.	1006	*Schoenus odontocarpus*			
167.	1011	*Schoenus rigens*			
168.	1019	*Schoenus subflavus (Yellow Bog-rush)*			
169.	1026	*Schoenus unispiculatus*			
170.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
171.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
172.	1558	*Sparaxis bulbifera*	Y		
173.	4733	*Stackhousia monogyna*			
174.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
175.	30278	*Stylidium androsaceum*			
176.	7696	*Stylidium calcaratum (Book Triggerplant)*			
177.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
178.	7713	*Stylidium dichotomum (Pins-and-needles)*			
179.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
180.	7742	*Stylidium inundatum (Hundreds and Thousands)*			
181.	7749	*Stylidium leptophyllum (Needle-leaved Triggerplant)*			
182.	7773	*Stylidium petiolare (Horn Triggerplant)*			
183.	7782	*Stylidium pulchellum (Thumbelina Triggerplant)*			
184.	7790	*Stylidium roseoalatum (Pink-wing Triggerplant)*			
185.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
186.	24331	*Tadorna tadornoides (Australian Shelduck)*			
187.	1034	*Tetraria capillaris (Hair Sedge)*			
188.	1036	*Tetraria octandra*			
189.	1701	*Thelymitra antennifera (Vanilla Orchid)*			
190.	1705	*Thelymitra crinita (Blue Lady Orchid)*			
191.	24844	*Threskiornis molucca (Australian White Ibis)*			
192.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
193.	1328	*Thysanotus dichotomus (Branching Fringe Lily)*			
194.	1338	*Thysanotus manglesianus (Fringed Lily)*			
195.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
196.	1351	*Thysanotus sparteus*			
197.	1481	*Tribonanthes australis*			
198.	1482	*Tribonanthes brachypetala*			
199.	1485	*Tribonanthes violacea*			
200.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
201.	1362	*Tricoryne humilis*			
202.	1038	*Tricostularia neesii*			
203.	4292	*Trifolium campestre (Hop Clover)*	Y		
204.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
205.	1139	*Trithuria bibracteata*			
206.	8255	*Ursinia anthemoides (Ursinia)*	Y		
207.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
208.	6070	*Verticordia acerosa*			
209.	12388	*Verticordia acerosa var. preissii*			
210.	6076	*Verticordia densiflora (Compacted Featherflower)*			
211.	15432	*Verticordia densiflora var. densiflora*			
212.	6088	*Verticordia huegelii (Variegated Featherflower)*			
213.	15433	*Verticordia huegelii var. huegelii*			
214.	12430	*Verticordia huegelii var. stylosa*			
215.	6107	*Verticordia pennigera*			
216.	6110	*Verticordia plumosa (Plumed Featherflower)*			
217.	4325	*Viminaria juncea (Swishbush)*			
218.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
219.	1566	*Watsonia marginata*	Y		
220.	1567	*Watsonia meriana (Bulbil Watsonia)*	Y		
221.	18118	*Watsonia meriana var. meriana*	Y		
222.	1256	*Xanthorrhoea preissii (Grass tree)*			
223.	25765	*Zosterops lateralis (Grey-breasted White-eye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX 4

Protected Matters Search Tool Search

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

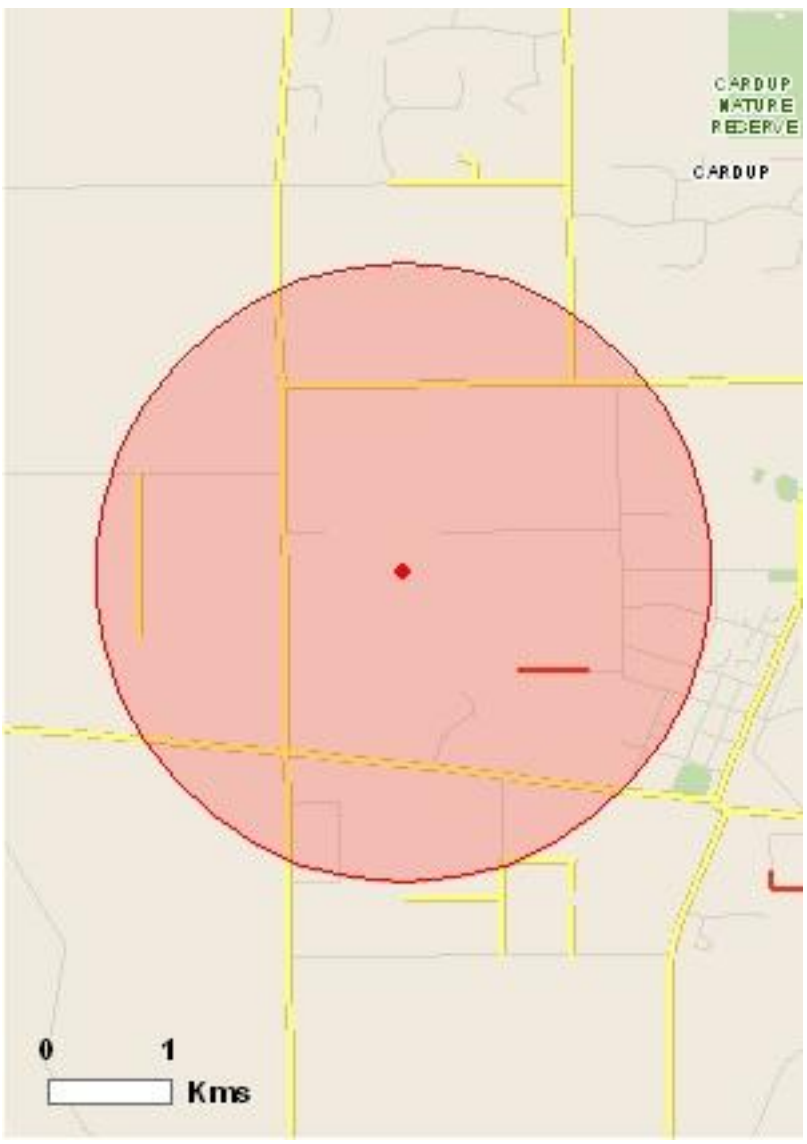
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

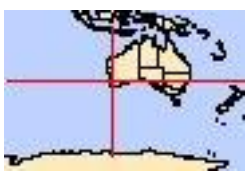
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/10/12 17:19:37



Coordinates

Buffer: 2.5Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	18
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	6
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR) [Resource Information]

Name	Proximity
Peel-yalgorup system	Upstream from Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Endangered	Community known to occur within area
Claypans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii		
Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Roosting known to occur within area
Calyptorhynchus latirostris		
Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Insects		
Synemon gratiosa		
Graceful Sun Moth [66757]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Phascogale calura Red-tailed Phascogale [316]	Endangered	Species or species habitat may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leaved Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus balanites Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D.Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area
Verticordia plumosa var. pleiobotrya Narrow-petalled Featherflower [55803]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and		Species or species

Name	Status	Type of Presence
Sterile Pussy Willow [68497]		habitat likely to occur within area
[Salvinia molesta](#) Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
[Tamarix aphylla](#) Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Coordinates

-32.28258 115.96119

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Canberra ACT 2601 Australia
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APPENDIX 5

DEC Fauna Database Searches

NAME	SOURCE_CODE	SOURCE_ID	NAME_ID	FAMILY	GENUS	SPECIES	INFRARANK	INFRANAME	AUTHOR	VERNACULAR	KINGDOM	CONSERVATION_CODE	CLASS	DAY	MONTH	YEAR	LOCALITY_NAME	LOCALITY_POSTCODE	SITE_NAME
Calyptorhynchus banksii subsp. naso	TFAUNA	1505	24731	Psittacidae	Calyptorhynchus	banksii	subsp.	naso	Gould	Forest Red-tailed Black-Cockatoo	Animalia	T	BIRD	12	12	1997	CARDUP	6122	Cardup Nature Reserve
Calyptorhynchus baudinii	BIRDATLAS1	79564	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	14	07	1978	OLDBURY	6121	
Calyptorhynchus baudinii	BIRDATLAS2	1026019	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	10	02	2005	MUNDIJONG	6123	Tonkin Street Flora Reserve
Calyptorhynchus baudinii	BIRDATLAS2	328106	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	26	10	1996	MARDELLA	6125	Ti-tree thicket
Calyptorhynchus baudinii	BIRDATLAS2	673816	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	21	09	2002	WHITBY	6123	Manjedal Brook
Calyptorhynchus baudinii	BIRDATLAS2	673826	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	20	11	2002	WHITBY	6123	Manjedal Brook
Calyptorhynchus baudinii	BIRDATLAS2	915385	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	26	10	2006	WHITBY	6123	Whitby
Calyptorhynchus baudinii	TFAUNA	12200	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	22	09	2005	MUNDIJONG	6123	Mundijong
Calyptorhynchus baudinii	WAMSPECIMENS	A36109	24733	Psittacidae	Calyptorhynchus	baudinii			Lear	Baudin's Cockatoo	Animalia	T	BIRD	22	09	2005	MUNDIJONG	6123	
Calyptorhynchus latirostris	BIRDATLAS2	673825	24734	Psittacidae	Calyptorhynchus	latirostris			Carnaby	Carnaby's Cockatoo	Animalia	T	BIRD	20	10	2002	WHITBY	6123	Manjedal Brook
Calyptorhynchus latirostris	BIRDATLAS2	915384	24734	Psittacidae	Calyptorhynchus	latirostris			Carnaby	Carnaby's Cockatoo	Animalia	T	BIRD	26	10	2006	WHITBY	6123	Whitby
Dasyurus geoffroii	TFAUNA	3090	24092	Dasyuridae	Dasyurus	geoffroii			Gould	Western Quoll	Animalia	T	MAMMAL	05	05	2000	MARDELLA	6125	Lowlands property near Serpentine
Dasyurus geoffroii	TFAUNA	6783	24092	Dasyuridae	Dasyurus	geoffroii			Gould	Western Quoll	Animalia	T	MAMMAL	28	04	2000	MARDELLA	6125	Lowlands property (LL1)
Phascogale tapoatafa subsp. ssp. (WAM M434)	TFAUNA	7688	34045	Dasyuridae	Phascogale	tapoatafa	subsp.	ssp. (WAM M434)	Meyer	Brush-tailed Phascogale	Animalia	T	MAMMAL	27	12	2003	MUNDIJONG	6123	1255 Kargotich Rd, Mundijong. On the NE corner at the intersection with Mundijong Rd
Setonix brachyurus	WAMSPECIMENS	M7684	24145	Macropodidae	Setonix	brachyurus			(Quoy & Gaimard)	Quokka	Animalia	T	MAMMAL	25	08	1967	CARDUP	6122	ALBANY HIGHWAY
Falco peregrinus	BIRDATLAS2	672518	25624	Falconidae	Falco	peregrinus			Tunstall	Peregrine Falcon	Animalia	S	BIRD	13	04	2003	WHITBY	6123	Manjedal Brook
Morelia spilota subsp. imbricata	WAMSPECIMENS	R11812	25240	Boidae	Morelia	spilota	subsp.	imbricata	(Smith)	Carpet Python	Animalia	S	REPTILE				MARDELLA	6125	MUNDIJONG
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96037	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	16	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96038	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	16	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96039	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	16	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96040	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	16	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96042	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	16	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96044	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	17	04	2010	CARDUP	6122	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96046	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	17	04	2010	CARDUP	6122	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96048	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	17	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96052	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	17	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96053	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	17	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96057	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	18	04	2010	CARDUP	6122	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96058	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	18	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96060	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	18	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96062	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	CARDUP	6122	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96063	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96064	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96065	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96066	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	FAUNASURVEY	96068	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	19	04	2010	WHITBY	6123	Whitby - Norman Road Bushland
Isoodon obesulus subsp. fusciventer	TFAUNA	10399	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	30	10	2005	CARDUP	6122	South Western Hwy, 100m N of Shale Rd
Isoodon obesulus subsp. fusciventer	TFAUNA	1506	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	12	12	1998	CARDUP	6122	Cardup Nature Reserve
Isoodon obesulus subsp. fusciventer	TFAUNA	7689	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL	09	01	2004	MUNDIJONG	6123	1255 Kargotich Rd, Mundijong. On the NE corner at the intersection with Mundijong Rd
Isoodon obesulus subsp. fusciventer	WAMSPECIMENS	M2896	24153	Peramelidae	Isoodon	obesulus	subsp.	fusciventer	(Gray)	Southern Brown Bandicoot	Animalia	S	MAMMAL				MUNDIJONG	6123	
Ardeotis australis	WAMSPECIMENS	A1020	24610	Otididae	Ardeotis	australis			(J.E. Gray)	Australian Bustard	Animalia	4	BIRD				MUNDIJONG	6123	
Westralunio carteri	FAUNASURVEY	138689	34113	Hyriidae	Westralunio	carteri					Animalia	4	INVERT	15	11	2009	WHITBY	6123	Harvey River
Westralunio carteri	FAUNASURVEY	138696	34113	Hyriidae	Westralunio	carteri					Animalia	4	INVERT	24	06	2010	WHITBY	6123	Mandejal Brook
Acanthophis antarcticus	TFAUNA	16184	25242	Elapidae	Acanthophis	antarcticus			(Shaw & Nodder)	Southern Death Adder	Animalia	3	REPTILE	01	01	1957	BYFORD	6122	Byford
Acanthophis antarcticus	WAMSPECIMENS	R12374	25242	Elapidae	Acanthophis	antarcticus			(Shaw & Nodder)	Southern Death Adder	Animalia	3	REPTILE			1957	BYFORD	6122	BYFORD
Arbanitis inornatus	TFAUNA	13030	33903	Idiopidae	Arbanitis	inornatus				trapdoor spider	Animalia	1	INVERT	01	09	2006	WHITBY	6123	southern creekline on Lots 22,23&29 Norman Rd/Sth Hwy Whitby. Bush Forever Site 354

APPENDIX 6

Aboriginal Heritage Enquiry System Search Results

Aboriginal Heritage Inquiry System

Aboriginal Sites Database

Search Criteria

6 sites in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6426000	401222
6429699	403189

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registered.

Copyright

Legend

Restriction

N	No restriction
M	Male access only
F	Female access

Access

C	Closed
O	Open
V	Vulnerable

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

[Reliable]	The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.
[Unreliable]	The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information reported.

Status

L - Lodged		ACMC Decision Made
Information lodged, awaiting assessment	→	R - Registered Site I - Insufficient information S - Stored Data

Spatial Accuracy

Index coordinates are indicative locations and may not necessarily represent the centre of sites, especially for sites with an access code “closed” or “vulnerable”. Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting / Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Sites Shown on Maps

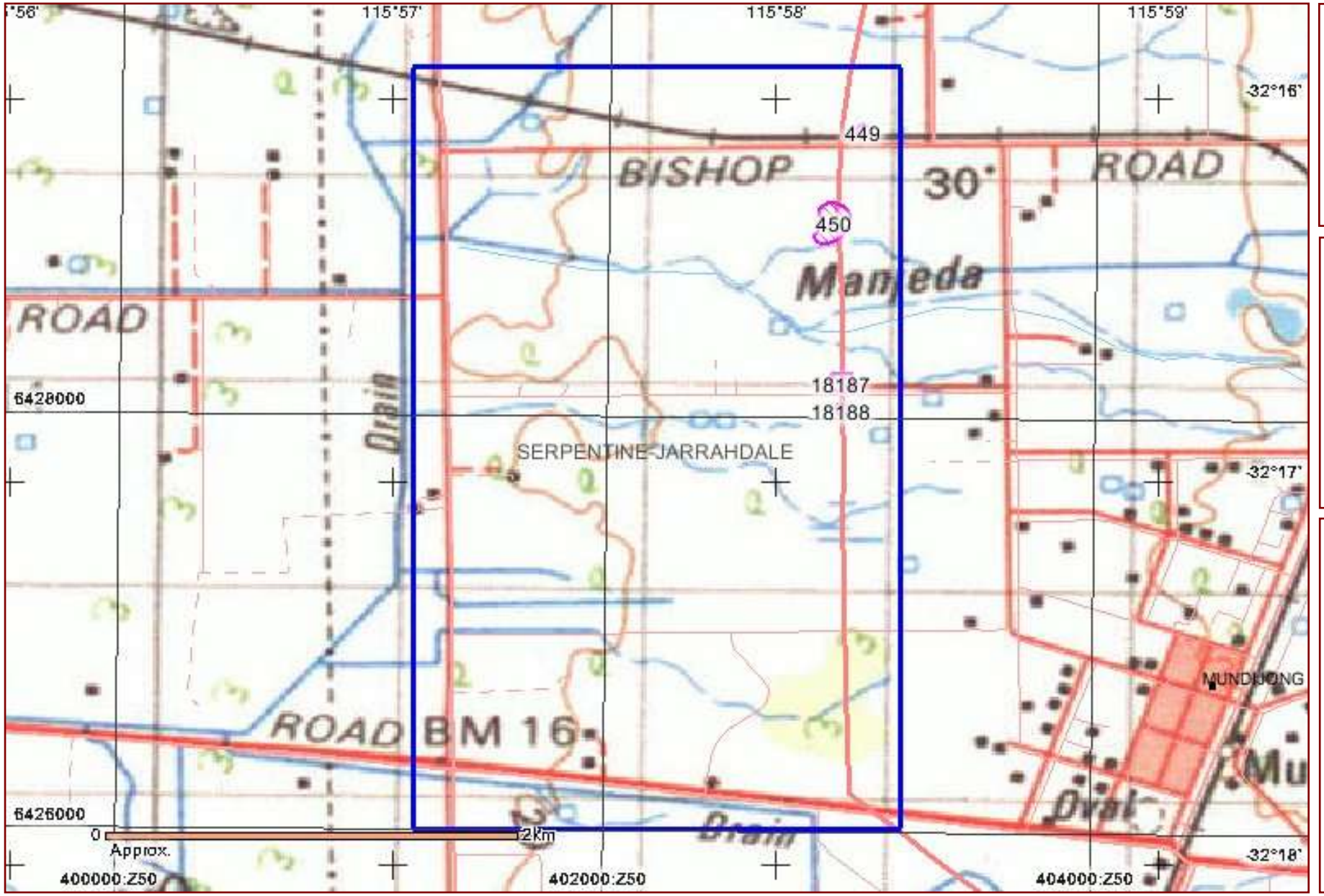
Site boundaries may not appear on maps at low zoom levels

List of 4 Registered Aboriginal Sites with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
449	R	O	N	South-East Corridor 02	Artefacts / Scatter			403039mE 6429389mN Zone 50 [Reliable]	S02954
450	R	O	N	South-East Corridor 03	Artefacts / Scatter			402915mE 6428941mN Zone 50 [Reliable]	S02955
18187	R	O	N	Tonkin Highway - Mundijong Road Scatter # 11	Artefacts / Scatter			402958mE 6428173mN Zone 50 [Reliable]	
18188	R	O	N	Tonkin Highway - Mundijong Road Scatter # 12	Artefacts / Scatter			402961mE 6428042mN Zone 50 [Reliable]	

Aboriginal Heritage Inquiry System

Aboriginal Sites Database



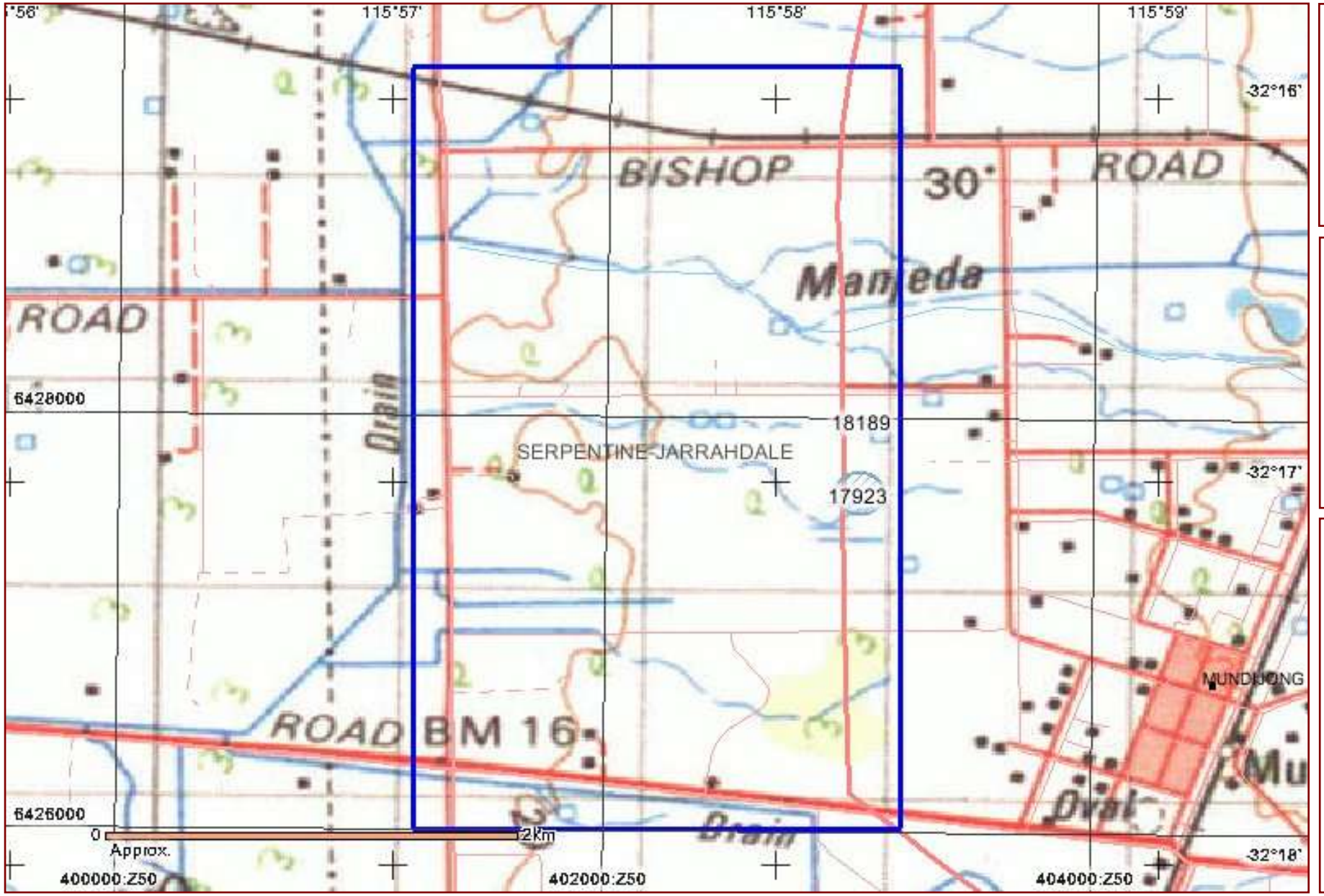
Legend

Selected Heritage Sites

- Registered Sites
- Town
- Map Area
- Search Area

List of 2 Other Heritage Places with Map

Site ID	Status	Access	Restriction	Site Name	Site Type	Additional Info	Informants	Coordinates	Site No.
17923	S	O	N	If #2	Artefacts / Scatter			403038mE 6427638mN Zone 50 [Reliable]	
18189	S	O	N	Tonkin Highway - Mundijong Road Scatter # 13	Artefacts / Scatter			403043mE 6427990mN Zone 50 [Reliable]	



Legend

Selected Heritage Sites

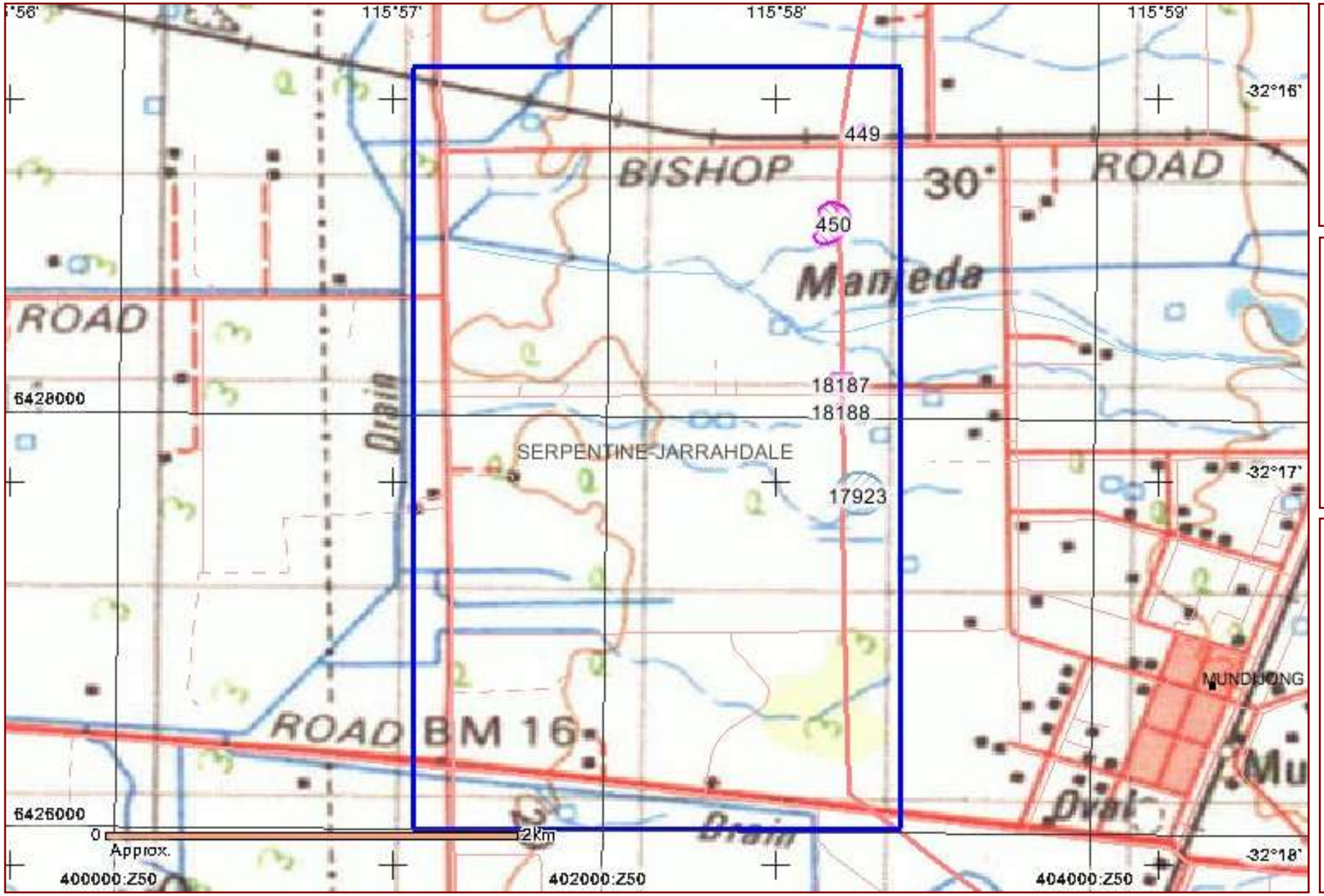
Other Heritage Places

Town

Map Area

Search Area

Map Showing Registered Aboriginal Sites and Other Heritage Places



Legend

Selected Heritage Sites

- Registered Sites
- Other Heritage Places
- Town
- Map Area
- Search Area

Aboriginal Heritage Inquiry System

Heritage Survey Database

Search Criteria

7 surveys in a search box. The box is formed by these diagonally opposed corner points:

MGA Zone 50	
Northing	Easting
6425985	401217
6429698	403213

Disclaimer

Heritage Surveys have been mapped using information from the reports and / or other relevant data sources. Heritage Surveys consisting of small discrete areas may not be visible except at large scales. Reports shown may not be held at DIA. Please consult report holder for more information. Refer to www.dia.wa.gov.au/heritage for information on requesting reports held by DIA.

Copyright

Legend

Access

Some reports are restricted. The type of restriction is shown as a code in brackets following the catalogue number. No code indicates an unrestricted report.

[CLOSED]	Closed
[OWE]	Open with exception
[TBD]	To be determined
[RESTRICTED PENDING]	Restricted pending

Survey 2848

Project	Tonkin Highway Extension, Albany Highway to South Western Highway, Mundijong.
Start Date	31 Jul 2001
Proponents	Main Roads Western Australia Western Infrastructure
Consultants	Australian Interaction Consultants
Survey Types	Ethnographic
Aboriginal People Consulted?	Yes

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
105723	HSR MW 2001 PAR	Consultation for a Section 18 Application under the Aboriginal Heritage Act (1972) of the Proposed route of the Tonkin Highway Extension Albany Highway/Mills Road West, Martin, to South Western Highway, Mundijong	Ronald T. Parker	DIA

Survey 2784

Project	Tonkin Highway Extension, Mills Road West, Martin to South Western Highway, Mundijong.
Start Date	28 Jan 1999
Proponents	Main Roads Western Australia
Consultants	BSD Consultants
Survey Types	Ethnographic
Aboriginal People Consulted?	Yes

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
19122	HSR MW 2001 BSD [OWE]	Summary report section 18 notice to disturb Aboriginal Sites : Tonkin Highway extension Mills Road West, Martin to South Western Highway, Mundijong	BSD Consultants	DIA

Survey 2682

Project	Tonkin Highway Extension and Mundijong Road Realignment.
Start Date	03 Dec 1998
Proponents	BSD Consultants Main Roads Western Australia
Consultants	McDonald, Hales and Associates Pty Ltd
Survey Types	Archaeological and Ethnographic
Aboriginal People Consulted?	Yes

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
19121	HSR MW 1999 EDW [OWE]	Report of an Aboriginal Heritage Survey : proposed Tonkin Highway extension and Mundijong Road Realignment Project	Adele Millard C. Coomer E. McDonald K. Edwards Andrea Staub E. Pollard Guida Coventry	DIA

Survey 2563

Project	South-East Corridor Structure Plan.
Start Date	21 Jun 1995
Proponents	Ministry for Planning
Consultants	McDonald, Hales and Associates Pty Ltd
Survey Types	Archaeological and Ethnographic
Aboriginal People Consulted?	Yes

Survey 2563 (continued)

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
102051	HSR MW 1996 BLO	Revised Report of an Aboriginal Heritage Survey South-East Corridor Structure Plan. March. 1996.	A. Murphy Clint Hammond E. Blockley E. McDonald K. Edwards Paul Greenfeld	DIA
17927	HSR SW 1995 BLO [CLOSED]	List of Informants (For Report 95/139). Oct. 1995.	McDonald, Hales and Associates Pty Ltd	

Survey 3641

Project	South-East Corridor Structure Plan.
Start Date	21 Jun 1995
Proponents	Minister for Planning and Infrastructure
Consultants	McDonald, Hales and Associates Pty Ltd
Survey Types	Archaeological and Ethnographic
Aboriginal People Consulted?	Yes

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
101972	HSR SW 1995 BLO [OWE]	Report of an Aboriginal Heritage Survey, South-East Corridor Structure Plan. Oct.1995	Clint Hammond E. Blockley Paul Greenfeld	DIA

Survey 3737

Project	Ballaruk, (Traditional Owners of Whadjuk territory) Site Recording Project
Start Date	01 Jan 1994
Proponents	Heritage Council of Western Australia
Consultants	Tamora Pty Ltd
Survey Types	Ethnographic
Aboriginal People Consulted?	Yes

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
21817	HSR MW 1994 MAC	Ballaruk (traditional owners) Aboriginal site recording project	Barrie Machin	Department of Indigenous Affairs
21818	HSR MW 1995 MAC	Ballaruk (traditional owners of Whadjuk territorial boundaries the lands of the Ballaruk Peoples) Aboriginal site recording project : additional material	Barrie Machin	

Survey 2274

Project	The Perth Area.
Start Date	01 Apr 1970
Proponents	University of Western Australia
Consultants	University of Western Australia
Survey Types	Archaeological and Archaeological and Ethnographic
Aboriginal People Consulted?	No

Related Reports

Report ID	Catalogue Number	Title	Recorders	Held At
103564	HSR MW 1972 UWA	An Archaeological Survey Project: The Perth Area, Western Australia. Apr 1972.	University of Western Australia H. Polach	DIA

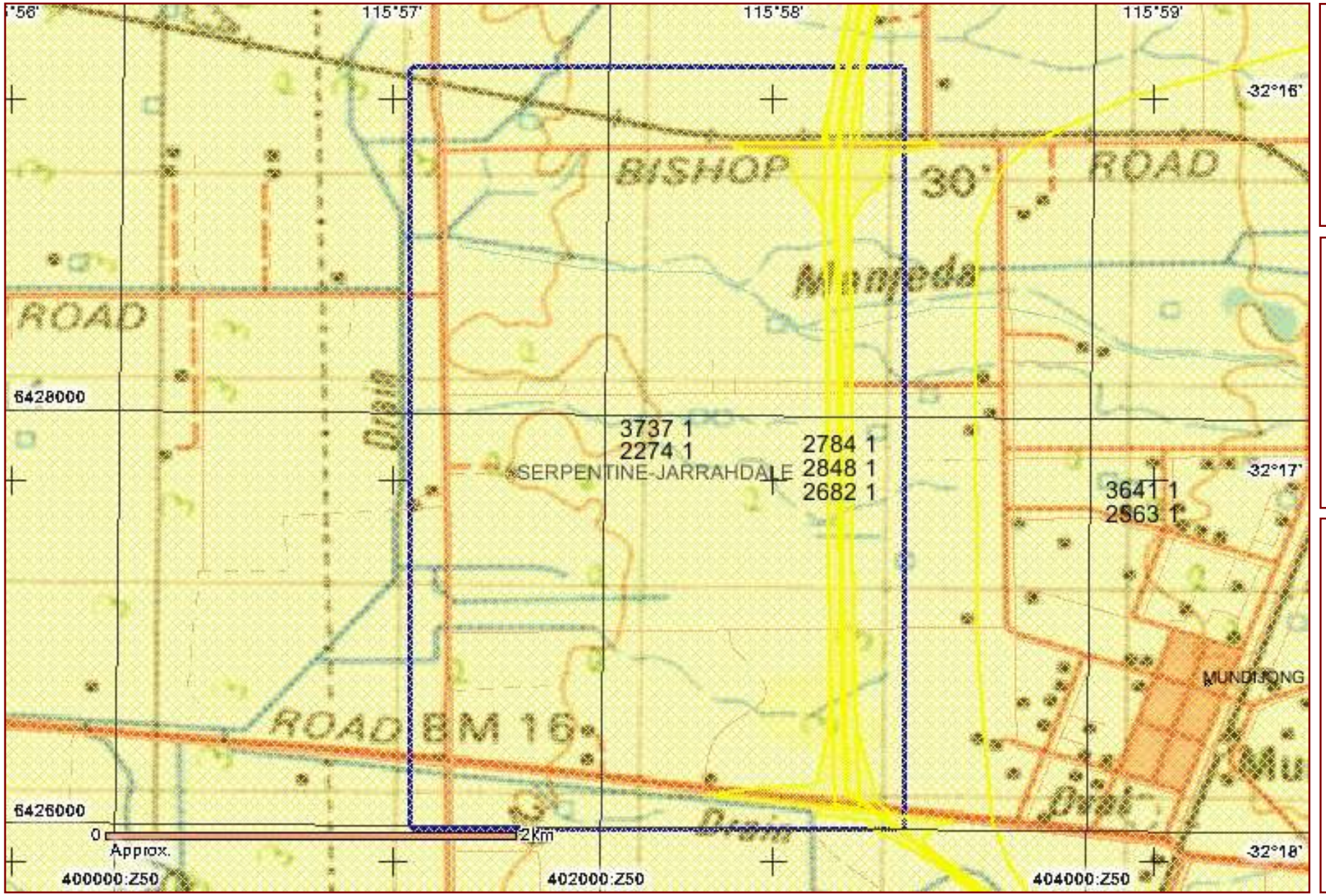
Survey 2274 (continued)

Related Reports (continued)

Report ID	Catalogue Number	Title	Recorders	Held At
104023	Not in Catalogue	An Archaeological Survey Project. The Perth Arch. Area. Western Australia Report no.4 April 1971.	University of Western Australia H. Polach	DIA

Aboriginal Heritage Inquiry System

Heritage Survey Database



Legend

Selected Heritage Surveys

- Heritage Survey
- Town
- Map Area
- Search Area

APPENDIX 7

West Mundijong Preliminary Environmental Noise Assessment

(Herring Storer, 2012)

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
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SHIRE of SERPENTINE-JARRAHDALE

WEST MUNDIJONG INDUSTRIAL AREA

PRELIMINARY ENVIRONMENTAL NOISE ASSESSMENT

AUGUST 2012

OUR REFERENCE: 15033-4-12113

DOCUMENT CONTROL PAGE

ENVIRONMENTAL NOISE ASSESSMENT
WEST MUNDIJONG

Job No: 12113

Document Reference: 15033-4-12113

FOR

SHIRE of SERPENTINE JARRAHDALE

DOCUMENT INFORMATION			
Author:	P. Daly / T. Reynolds	**Checked By:**	G. Watts
Date of Issue :	17 August 2012		

REVISION HISTORY

Revision	Description	Date	Author	Checked
1	Added Appendix C	12/09/2012	PLD	
2	Include comments from Shire of Serp / Jarrah	04/10/2012	TR	
3	Additional comments from Shire of Serp / Jarrah	10/10/2012	PV – SJS	TR

DOCUMENT DISTRIBUTION

Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Shire of Serp / Jarrah		✓
2	1	TME		✓
1	2	Shire of Serp / Jarrah		✓
2	2	TME		✓
1	3	Shire of Serp / Jarrah		✓
2	4	TME		✓
1	4	Shire of Serp / Jarrah		✓

CONTENTS

APPENDICIES

1.0 INTRODUCTION

Herring Storer Acoustics have been engaged by TME to develop an acoustic model to predict noise emissions for possible development of the West Mundijong Industrial Area on behalf of the Shire of Serpentine-Jarrahdale.

The objective of this study was to predict noise emissions from possible future industries and determine the maximum noise level for possible industries that will comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

The proposed development is based on the use of 'non heavy industry' at West Mundijong. The Feasibility Assessment recommended a range of general industry uses including, but not limited to the following:

a) Agribusiness, including food distribution;
b) Warehousing and logistics;
c) Transport, heavy machinery sales, servicing and distribution;
d) Service industry, light industry and limited showroom development; and,
e) Manufacture and fabrication of building products i.e. plasterboard, lime production and brickworks

The 'representative industry' sound power emissions are based on typical industry spectrum and are considered a conservative indication of the expected noise emissions. Generally, new industrial plants are designed to control noise emissions and minimise internal noise levels for occupational health reasons.

Although outside the scope of this acoustic study, comment is also provided on compliance criteria of the possible freight railway.

2.0 ACOUSTIC CRITERIA

2.1 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997

The criteria used are in accordance with the *Environmental Protection (Noise) Regulations 1997 (as amended)*. These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor, which is then added to the base levels shown below. The influencing factor is calculated for the usage of land within the two circles, having radii of 100m and 450m from the premises of concern. The baseline assigned noise levels for the different types of receivers and during the different periods of the day are listed in Table 2.1.

TABLE 2.1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55
Further than 15m from a noise sensitive premises building	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

As this is an initial assessment of noise levels, future zoning is yet to be implemented. Information provided by the shire is that the west and north surrounding areas will be zoned rural for up to 1km from the boundary of the Area. This land area has limited residential properties and it will be protected from high-density residential development by the proposed zoning.

For locations to the east outside the industrial Area (as it is understood that the land would be zoned industrial to the edge of the Area) the influencing factor would range around 8 for those adjacent to the industrial Area to 0 for those residences located at a greater distance of 450 metres from the boundary of the Area. This influencing factor also considers the future development of the Tonkin Highway, which will be located between residents and the industrial Area. It is also understood that the land on the eastern boundary is proposed for high-density residential development, up to the Tonkin Highway, bringing noise sensitive premises to within 100m of the industrial Area. The critical location for compliance, due to how the influencing factor is determined, would be those residence located at just over 100 metres from the edge of the industrial Area. At these residences, the influencing factor would be around 3. The range of assigned noise levels is listed in Table 2.2, with the assigned noise levels for the critical residential locations (i.e. to the east of Tonkin Highway, at 100 metre from the edge of the Area) listed in Table 2.3.

TABLE 2.2 – BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	45 – 53	55 – 63	55 – 73
	0900 - 1900 hours Sunday and Public Holidays	40 – 48	50 – 58	65 – 73
	1900 - 2200 hours all days	40 – 48	50 – 58	55 – 63
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35 – 43	45 – 53	55 – 63
Further than 15m of a noise sensitive premises building	All hours	60	75	80
Commercial premises	All hours	60	75	80

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

TABLE 2.3 – ASSIGNED OUTDOOR NOISE LEVEL AT CRITICAL LOCATIONS

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	48	58	68
	0900 - 1900 hours Sunday and Public Holidays	43	53	68
	1900 - 2200 hours all days	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	38	48	58

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

For other locations, it is understood that it is proposed that there be a 1000-metre buffer zone around the industrial area. Therefore, at any residence at the edge of the buffer zone, being greater than 450 metres from the industrial area, the influencing factor would be 0 and the assigned outdoor noise levels would be as listed in Table 2.4.

TABLE 2.4 - ASSIGNED OUTDOOR NOISE LEVEL AT BUFFER BOUNDARY

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Within 15m of a noise sensitive premises building	0700 - 1900 hours Monday to Saturday	45	55	65
	0900 - 1900 hours Sunday and Public Holidays	40	50	65
	1900 - 2200 hours all days	40	50	65
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	35	45	55
Further than 15m of a noise sensitive premises building	All hours	60	75	80

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
The L_{A1} noise level is the noise that is exceeded for 1% of the time.
The L_{Amax} noise level is the maximum noise level recorded.

Under the Regulations it is also a requirement that noise from the site be free of annoying characteristics (tonality, modulation and impulsiveness) at other premises, defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15 dB when determined for a single representative event;

"modulation" means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3dB $L_{A\ Fast}$ in any one-third octave band;

(b) is present for more at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Where the above characteristics are present and cannot be practicably removed, the adjustments as listed in Table 2.5 are made to the measured or predicted level at other premises.

TABLE 2.5 - ADJUSTMENTS TO MEASURED LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB

With respect to residential receivers, noise emissions may be tonal in characteristic, particularly under conditions where received noise levels are predicted to be above 35 dB(A). Under strong wind conditions, the generation of local noise from trees and the like will generally mask plant noise emissions and will most likely not have a measurable 'tonal' characteristic. The most significant acoustic parameter is the L_{A10} noise level.

For the case of an industrial estate such as West Mundijong, it is expected that more than one individual industry will contribute to noise levels at noise sensitive premises surrounding the estate. Should the cumulative noise emission approach the 'assigned level' under the regulations, then the requirements of Regulation 7(2) apply. This sub-regulation is:

*7(2) For the purposes of sub-regulation (1)(a), a noise emission is taken to "**significantly contribute to**" a level of noise if the noise emission as determined under sub-regulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.*

Thus, under the requirements of the *Environmental Protection (Noise) Regulations 1997* there are two criteria that can be used to achieve compliance with the Regulations. The first is the overall noise level received from all industries. In this case, if the overall noise level received at premises complies with the applicable assigned noise level (L_{A10} during the night period of between 35 – 43 dB(A) depending on locations), then noise emissions from all industries would be deemed to comply with the requirements of the Regulations. However, if the overall noise level received at premises exceeds the applicable noise level, compliance will still be achieved, if the noise received at a premises from an individual industry is at least 5 dB(A) below the applicable assigned noise level.

We believe any new industry would need to be considered NOT significantly contributing. Therefore, noise received at any residence (including possible future residence) would need to be 5 dB(A) below the assigned noise level. For this Industrial Area (i.e. east of Tonkin Highway), the critical location for compliance would be residences located at 100 metres from the edge of the Area and the L_{A10} noise level received at these residences needs to be less than 33 dB(A), this being the assigned night period noise level of 38 dB(A) less 5 dB(A). For other locations, the L_{A10} noise level received at a residence needs to be less than 30 dB(A) (i.e. the night period L_{A10} noise level of 35 dB(A) less 5 dB(A)).

2.2 STATE PLANNING POLICY 5.4

The Western Australian Planning Commission (WAPC) released on 22 September 2009 State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

"5.3 - NOISE CRITERIA

Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.

These criteria do not apply to—

- *proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
- *proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations—

- *for new road or rail infrastructure proposals, at 1m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *for new noise-sensitive development proposals, at 1m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

Further information is provided in the guidelines.

Table 1: Outdoor Noise Criteria

Time of day	*Noise Target*	*Noise Limit*
Day (6 am–10 pm)	$L_{Aeq(Day)}$ *= 55 dB(A)*	$L_{Aeq(Day)}$ *= 60 dB(A)*
Night (10 pm–6 am)	$L_{Aeq(Night)}$ *= 50 dB(A)*	$L_{Aeq(Night)}$ *= 55 dB(A)*

The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to greenfield sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved.

Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.

The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.

5.3.1 Interpretation and application for noise-sensitive development proposals

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot[1].*

If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.

In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in at least one outdoor living area on each residential lot[1]. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.

For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms[2]. For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.

These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.

If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."

5.4 Policy measures for infrastructure redevelopment proposals and freight handling facilities

5.4.1 Redevelopment proposals for existing major road and rail infrastructure

Where policy measures have been triggered by a redevelopment proposal for existing major road or railway infrastructure under section 5.2.2 or 5.2.3, the following policy measures apply.

1) *A screening noise assessment and, if necessary, a detailed assessment should be conducted in accordance with the guidelines.*

2) *Practicable noise management and mitigation measures should be considered in accordance with sections 5.6 and 5.8 of this policy, having regard to –*
   - *the existing transport noise levels;*
   - *the likely changes in noise emissions resulting from the proposal; and*
   - *the nature and scale of the works and the potential for noise amelioration.*

2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

3) The proponent should prepare a noise management plan for the redevelopment works in accordance with the guidelines, and in consultation with the state environmental agency and local government.

5.4.2 Proposed new freight handling facilities

In determining appropriate policy measures for proposed new freight handling facilities, it should be recognised that some noise emissions (for example, from trucks on the premises) are required to meet the Environmental Protection (Noise) Regulations 1997. The noise emissions from the operation of trains at the freight handling facility will depend on the nature of the operations; in the case of a proposed new freight handling facility, appropriate noise criteria must be developed in consultation with the state environmental agency.

If major or minor redevelopments of the railways in a freight handling facility trigger policy measures under section 5.2.3, the procedure in section 5.4.1 should be followed.

5.5 Noise assessment

All noise assessments carried out for the purposes of this policy should be conducted in accordance with the guidelines, and they are the responsibility of the developer and/or infrastructure provider.

The guidelines give detailed information on methods for measuring and predicting transport noise levels for the purpose of undertaking noise assessments.

For new noise-sensitive developments, noise assessments should generally be conducted as early as is practicable in the planning process, typically at the scheme amendment or structure planning stage. The implementation of the outcomes of a noise assessment may become a condition of approval of a subdivision.

In complex cases, it may be appropriate for the detailed assessment report or noise management plan to be referred to the state environmental agency for review.

5.6 Possible noise management and mitigation measures

A range of noise mitigation measures are available to meet the noise criteria. These include –

- *using distance to separate noise-sensitive land uses from noise sources;*
- *construction of noise attenuation barriers such as earth mounds and noise walls;*
- *building design, such as locating outdoor living areas and indoor habitable rooms away from noise sources;*
- *building construction techniques, such as upgraded glazing, ceiling insulation and sealing of air gaps. Note that where upgraded glazing is required, the benefit is only realised when windows are kept closed and, as such, mechanical ventilation should also be considered in these circumstances;*
- *planning and design of the road or rail project such as construction in cut, traffic management or the use of low-noise road surfaces.*

The guidelines provide more detail on the range of noise mitigation measures and their potential for noise reduction. It is expected that noise management and mitigation strategies will be identified and implemented through a noise management plan, having regard to the guidelines, and will be –

- *effective in reducing noise;*
- *practical and appropriate for the situation; and*
- *compatible with other relevant planning policies.*

5.7 Notification on Title

If the measures outlined previously cannot practicably achieve the target noise levels for new noise-sensitive developments, this should be notified on the certificate of title.

Notifications on certificates of title and/or advice to prospective purchasers advising of the potential for noise impacts from major road and rail corridors can be effective in warning people who are sensitive to the potential impacts of transport noise. Such advice can also bring to the attention of prospective developers the need to reduce the impact of noise through sensitive design and construction of buildings and the location of outdoor living areas.

The notification is to ensure that prospective purchasers are advised of –

- *the potential for transport noise impacts; and*
- *the potential for quiet house design requirements to minimise noise intrusion through house layout and noise insulation (see the guidelines).*

Notification should be provided to prospective purchasers and be required as a condition of subdivision (including strata subdivision) for the purposes of noise-sensitive development as well as planning approval involving noise-sensitive development, where noise levels are forecast or estimated to exceed the target outdoor noise criteria, regardless of proposed noise attenuation measures. The requirement for notification as a condition of subdivision and the land area over which the notification requirement applies, should be identified in the noise management plan in accordance with the guidelines.

An example of a standard form of wording for notifications is presented in the guidelines.

3.0 METHODOLOGY

Predictions of noise level propagation to surrounding areas were achieved utilising the computer program SoundPlan version 7. This program incorporates various parameters including ‘source’ sound power levels, ground topography and atmospheric conditions in determining propagation of noise from the site. Using recognised algorithms (ConCAWE) the program calculates the sound levels at distances from the source resulting in noise levels at receiver locations.

It has been assumed that industries located within the Industrial Area would operate during the night period.

Weather conditions for the modelling were generally in accordance with the Environmental Protection Authority's *"Draft Guidance for Assessment of Environmental Factors No.8 - Environmental Noise"* for the night period and as listed in Table 3.1.

TABLE 3.1 - WEATHER CONDITIONS

Condition	Night Period
Temperature	15 ^{o}C
Relative humidity	50%
Pasquil Stability Class	F
Wind speed	3 m/s

From information received and outlined in the strategic land use plan, the plan allows for:

- Option 1 – Staged industries in the northern section, with the Intermodal area located on the eastern side of the area next to the future development of Tonkin Highway.

- Option 2 – Staged industries in the northern section, with the Intermodal area located on the western side of the area.

From the strategic land use plan provided, we also note residential development would eventually occur up to the boundary of the Area, thus as outlined in Section 2 – Criteria we believe that the critical location for compliance would be those residences at a distance of 100m from the boundary of the Area. However, compliance would still need to be achieved at the residences located at the edge of any buffer.

To determine basic acoustic requirements, preliminary modelling was carried out with:

- Light industry (101 SWL) located within the eastern side of the Area;
- Various industries (104 to 109 SWL) located within the proposed industrial area; and
- The incorporation of an Intermodal Freight area into the above options.

For acoustic modelling purposes, a light industry was taken to be a premises with a maximum overall Sound Power Noise Level of 101 dB(A), with general industries taken to be those with an overall Sound Power Level greater than 104 dB(A).

Note: From previous study, it was determined that the maximum plant Sound Power Noise Level that could be accommodated by the Area was 109 dB(A) based on a 200m x 200m land area. Thus for this study, 109 dB(A) per 40,000m^2 was used as the maximum plant Sound Power Noise Level.

Additional to the above, some general industries were modelled with stacks. These stacks were taken to 40m high and a maximum Sound Power Level of 105 dB(A). This stack noise is in addition to the plant noise level.

Additional to the above, incorporation topography of the future Tonkin Highway and Bishop Road overpass have been taken into account for modelling purposes. From information provided by MRWA, Tonkin Highway has been designed with the inclusion of the rail re-alignment, hence does not account for the rail line crossing Tonkin Highway. Bishop Road, which runs east west, has a future design which allowed the road to be elevated over the rail line as an overpass on Tonkin Highway. As final design levels are not available, preliminary elevations have been used to calculate the potential noise barriers of the roadways from the proposed Mundijong Industrial Area noise emissions. Figure 1 shows the design of Tonkin and Bishop Road, including the re-alignment of the existing rail line.

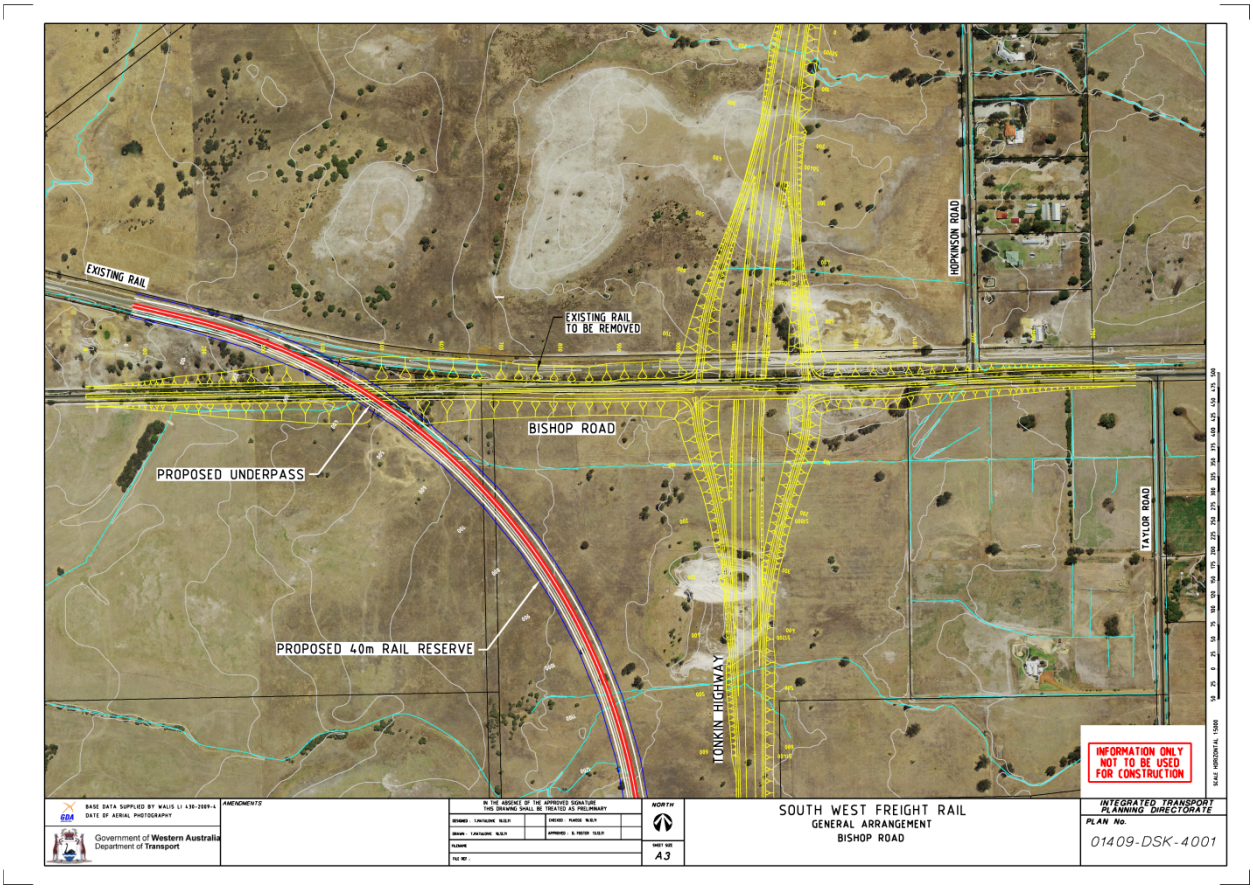


Figure 1 – Proposed Bishop Rd and Tonkin Highway Interchange

4.0 PREDICTED NOISE EMISSIONS

Noise emissions were been calculated for the possible West Mundijong Industrial Area under night conditions of 3m/s wind speed and Pasquil Stability class F as per the Department of Environment Draft 8 guidelines.

The predicted maximum combined noise contour for Option 1 is shown as Figures 1 and 2 in Appendix B.

The predicted maximum combined noise contour for the Option 2 for industries are shown as Figures 3 and 4 in Appendix B

The noise contours shown are the combined noise level contour plots of the noise emissions from each individual industry. The contours shown are the maximum noise level that would be received at a location from the individual industries.

5.0 ASSESSMENT OF PREDICTED NOISE LEVELS

Initial noise modelling indicated that in locations where residence could be developed up to the edge of the industrial Area, that in these locations, the industry would need to be limited to those that emit minimal noise such as:

- Warehouses/showrooms;
- Where any noise is contained within a building; or
- Operations are limited to day period only.

Modelling is based on the inclusion of “light industries” located on the eastern side of the Area. These industries range for approximately 500 metres into the industrial area.

Any larger industries would need to be located within the centre of the Area and south of Bishop Road. However, modelling indicates that the size of the existing buffer zone would limit the Sound Power Level of an industry to between 102 and 109 dB(A) depending on their location in the Area. Achieving these noise levels would not be practicable for some industries and an alternative site would need to be found. Any industries requiring stacks would also need to be located within the centre of the Area.

The sound power level of other industries would vary between 102 dB(A) and 108 dB(A), depending on the location and distance to noise sensitive premises.

For noise emissions from an industry to achieve compliance with the requirements of the Environmental Protection (Noise) Regulations 1997 at residence located outside the area, we believe that the following 2 cases need to be considered :

1 to east of Tonkin Highway; and
2 boundary of any buffer zone.

Given the number of industries that could be located within the area, the criteria for each industry should be to achieve compliance with the “significantly contributing” criteria outlined in the Regulations. To achieve this, even with the above constraints placed on future industry, noise received at a residence from each industry needs to be :

- 33 dB(A) for the residence to the east of Tonkin Highway; and
- 30 dB(A) for other residence located at edge of buffer zone.

6.0 DISCUSSION OF POTENTIAL NOISE IMPACT OF INDUSTRY

Noise modelling indicates that noise emissions from light industries located near the boundary of the Area could result in exceedance of the regulation and a graduation of "quieter" industries such as warehousing or day only operations is recommended around the periphery of the estate where it immediately adjoins residential development. The maximum Sound Power Noise Level for industries located in the “quieter” industries area would be 101 dB(A). Given the potential residence that could be built around the area, new industries located within proximity of existing or potential residence be restricted to sound power levels such that the resultant noise level they generate complies with the following:

1 to the east, at 100 metre from the boundary of the Area does not exceed 33 dB(A).
2 other residence, at edge of any buffer zone does not exceed 30 dB(A).

Larger general industry with Sound Power Levels of around 108 - 110 dB(A) should be limited to the central core of the Area, south of Bishop Road (i.e. away from residence).

The specific location of other industries would be dependent on the Sound Power Level. If the overall Sound Power Level is proposed to be higher, then the proposed industry would be required to locate further away from sensitive receptors such as residential development.

7.0 FUTURE RAILWAY

It is noted that noise emissions from a railway is exempt from the requirements of the Environmental Protection (Noise) Regulations 1997. Noise emissions from any railway line, including as part of a freight handling facility would need comply with the requirements of State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning".*

Under SPP 5.4, noise received at any residence would need to comply with the "Noise Limits", these being:

EXTERNAL
$L_{Aeq(day)}$ of 60 dB(A); and
$L_{Aeq(night)}$ of 55 dB(A).

As this is a new rail infrastructure in the vicinity of a future extension to Tonkin Highway and proposed noise-sensitive land uses, it is noted that under the policy "in these instances, the infrastructure provider and developer are both responsible for ensuring that the objectives of this policy are achieved, and a mutually beneficial noise management plan, including individual responsibilities, should be negotiated between the parties." Thus under SPP 5.4 all parties should enter into discussions / negotiations to obtain the optimum outcome.

Note: In this case, there would actually be two (2) infrastructure providers.

In this case, we believe that there is the potential, if the railway was to be located on the eastern side of the proposed industrial area, for a bund / barrier to be located on the eastern side of the proposed Tonkin Highway extension that would provide the required noise mitigation to the residence from both road and rail noise.

8.0 MITIGATION OF POTENTIAL NOISE IMPACTS

From information received, we understand that, as a result of this modelling exercise and in consultation with senior officers of the Department of Environment and Conservation and Office of the Environmental Protection Authority the following mitigation measures are proposed:

1. "Quieter" light industry is to be located at the periphery of the Area to the east and south to provide a separation and internalised buffer to residential and rural residential development. General industry is to be located in the core of the Area and adjacent to less sensitive rural land uses to the west and north.

2. Consideration be given at further detailed stages of planning to explore the merits and potential of constructing a noise attenuation barrier to mitigate emissions to residential development.

3. Recommend through the Local Structure Plans associated with Precinct E of the Mundijong-Whitby District Structure Plan that Detailed Area Plans be required for those lots adjoining the Water Corporation reservation will need to comply with the requirements of State Planning Policy 5.4. This could include the following building design elements:

    - Noise received at an outdoor area should, where practicable, also achieve an L_{Aeq} of 50 dB(A) during the night period.

    - Where appropriate, locate habitable rooms away from noise sources

- Appropriate use of Quiet House Design to achieve compliance with the following internal criteria :

  INTERNAL
  $L_{Aeq(day)}$ of 40 dB(A) in living and work areas; and
  $L_{Aeq(night)}$ of 35 dB(A) in bedrooms.

4. Concurrently with the preparation of the planning for the Area the Shire is undertaking a review of its strategic land use planning framework. The draft Rural Land Strategy identifies land to the north and west of the Area as a "buffer". The buffer seeks to achieve the following:

   - Identify the land that is the subject of the buffer;
   - Ensure that the land use is maintained as rural;
   - Protect the future subdivision and development of noise sensitive receptors; and
   - Reflect the historic rural use of the land within the buffer.

Additionally, modifications of rail noise should be added to titles of residence located adjacent to possible future railway.

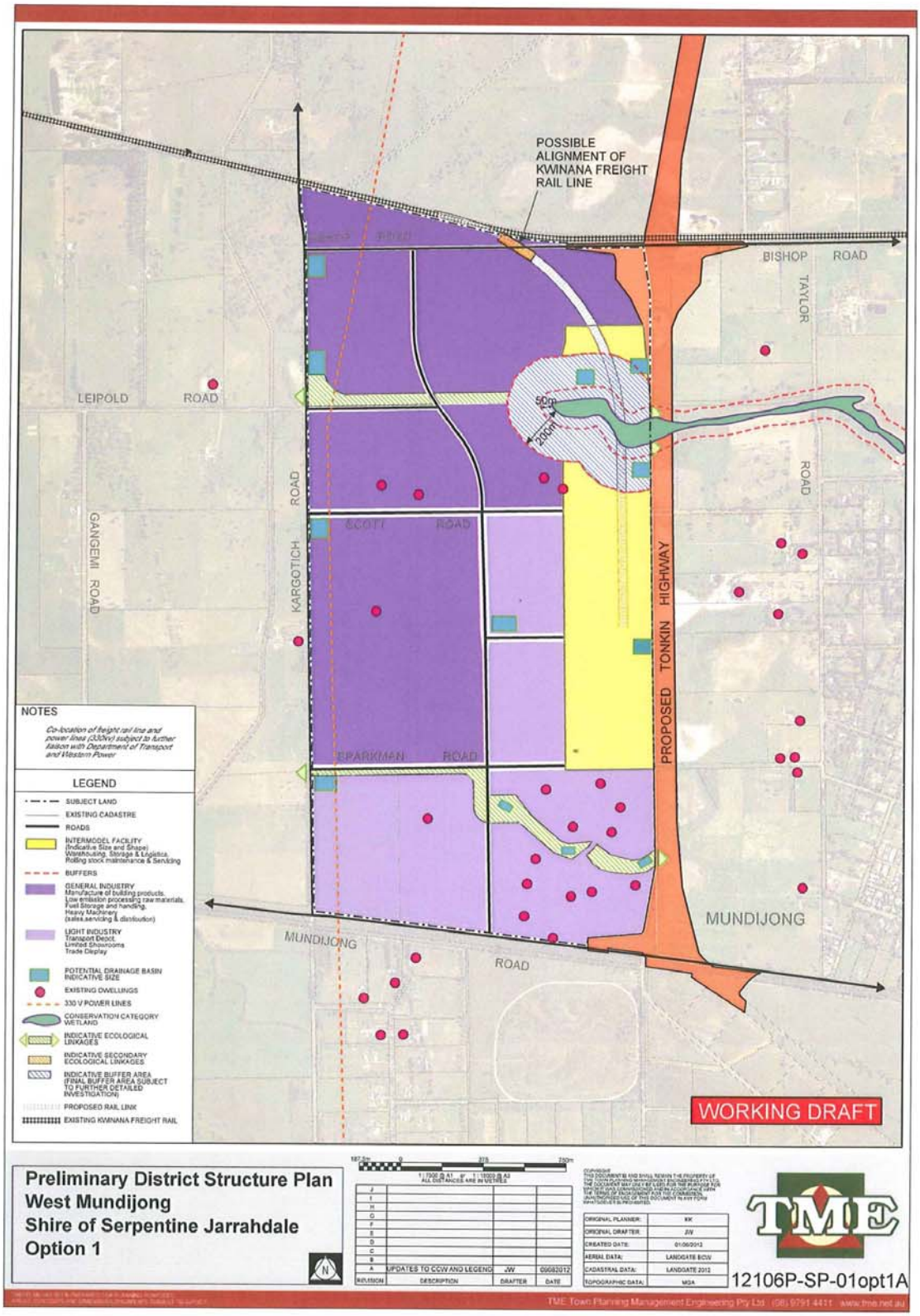
9.0 FUTURE REQUIREMENTS

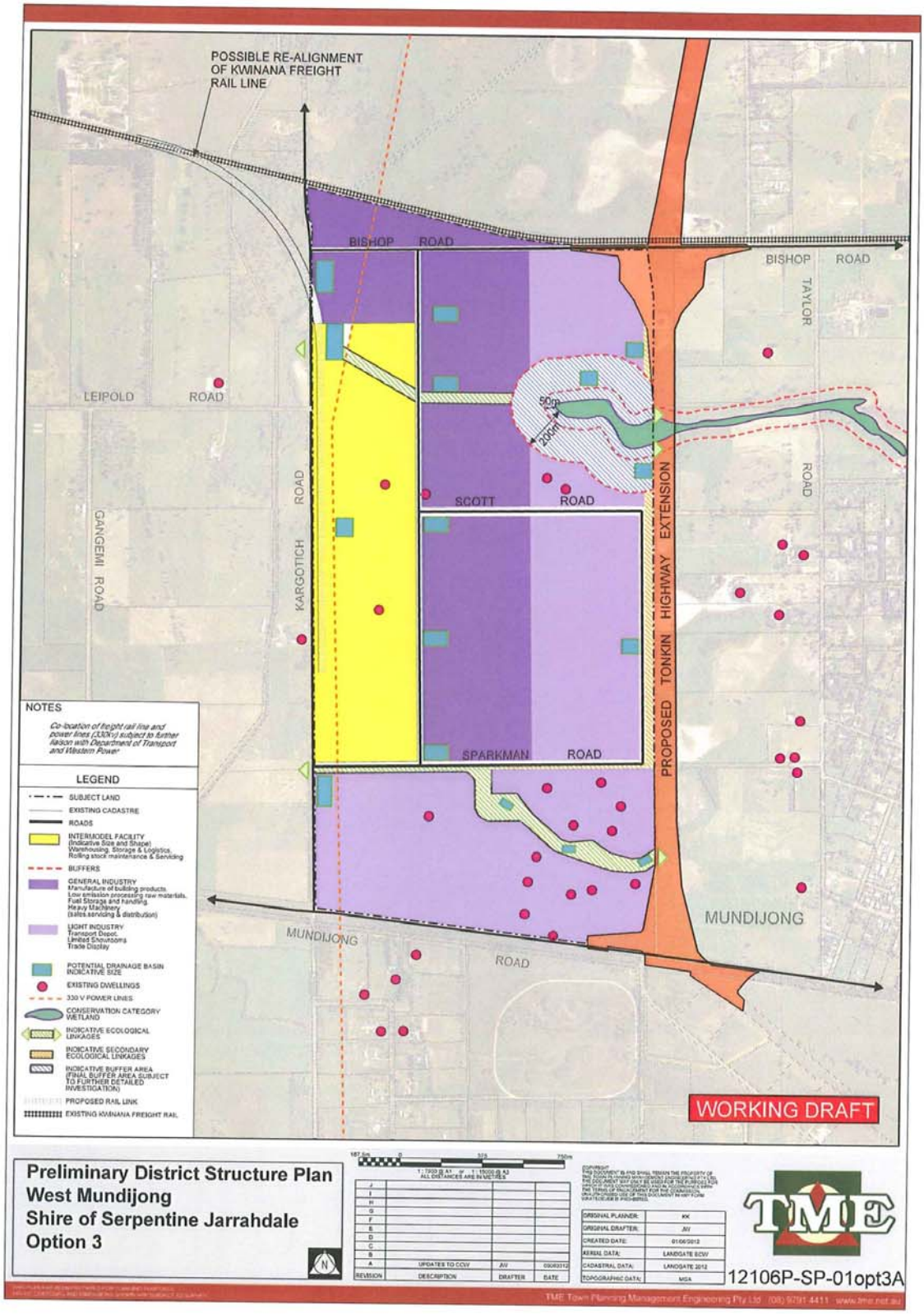
The requirements of the *Environmental Protection (Noise) Regulations 1997* will apply to each industry that locates within the West Mundijong Industrial Area. While there is no obligation to impose a special noise requirement on such industry, to minimise the risk of breaching the *Environmental Protection (Noise) Regulations 1997* it would be prudent to require developments to provide an acoustic assessment by a 'competent' acoustic consultant prior to development approval indicating that the industry would be considered as NOT significantly contributing to the noise received at a residence. This assessment and any associated noise modelling should be provided to the appropriate authorities for approval. Additionally, when each new industry commences operation, verification measurements should be taken of sound power emissions and/or of received noise at the buffer boundary.

Note: To be considered as NOT significantly contributing, the noise received at any residence needs to be at least 5 dB(A) below the assigned noise level.

APPENDIX A

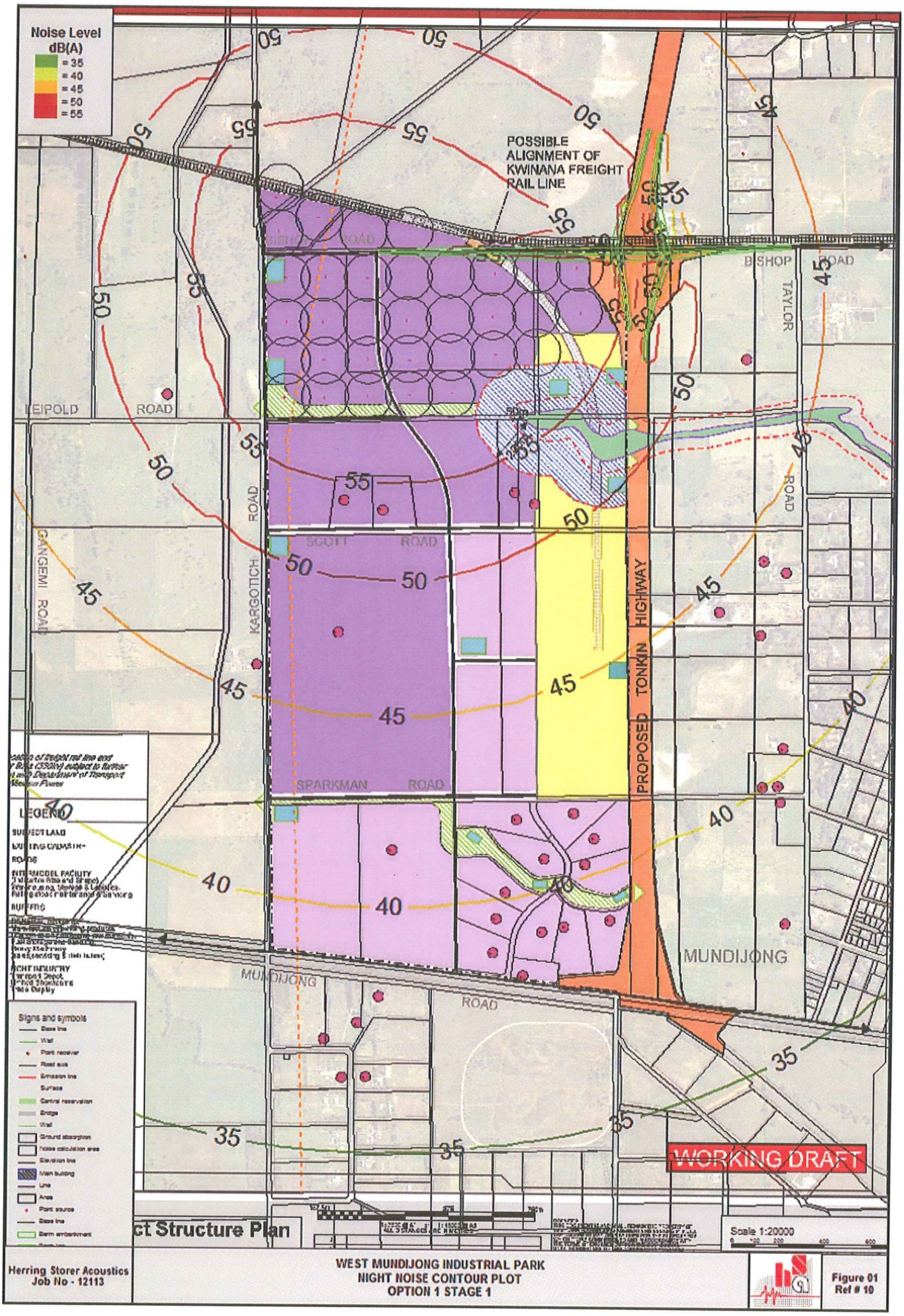
West Mundijong Industrial Park Strategic Land Use Plan

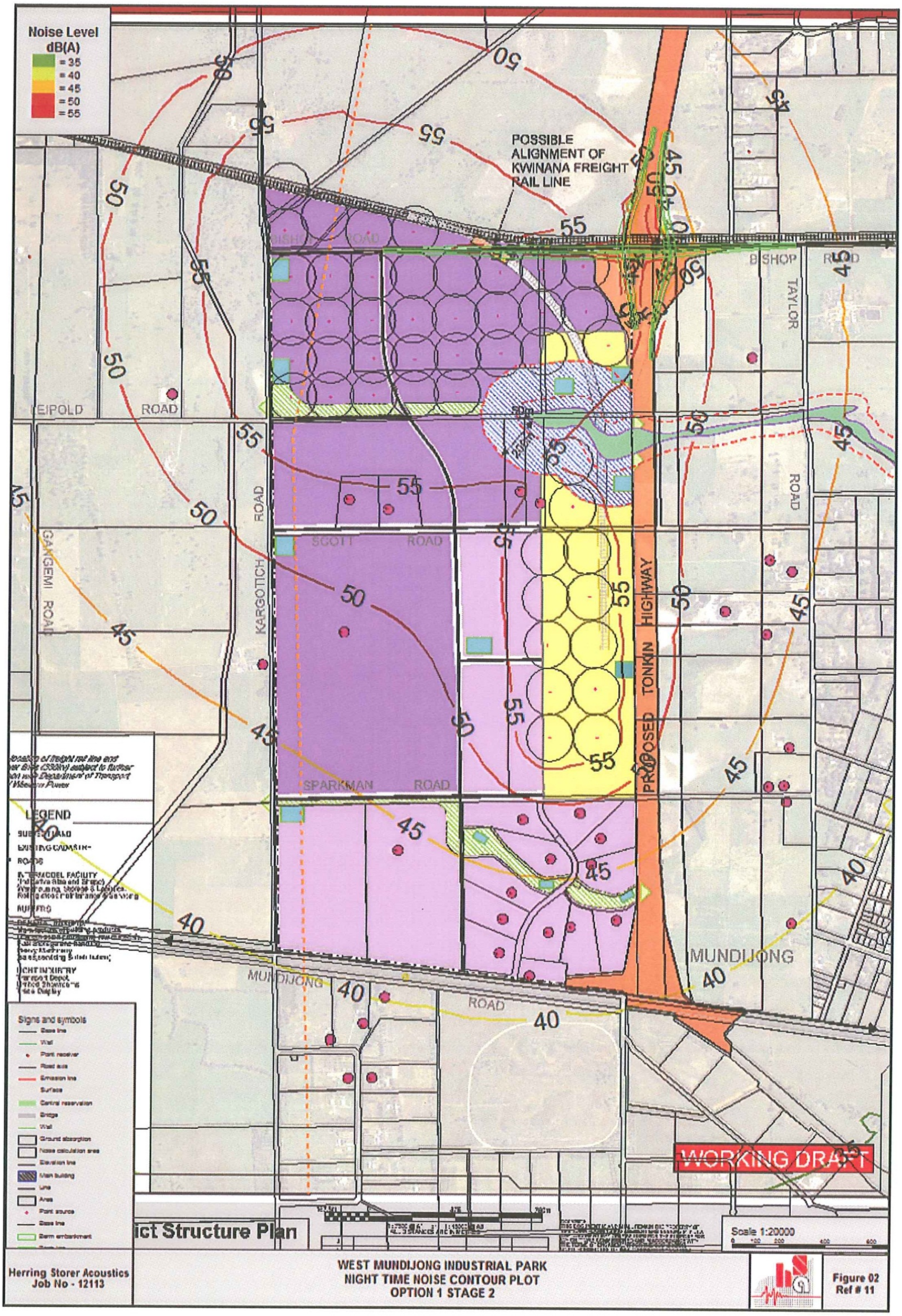

POSSIBLE ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
TAYLOR ROAD
LEIPOLD ROAD
GANGEMI ROAD
KARGOTICH ROAD
SCOTT ROAD
TPARKMAN ROAD
PROPOSED TONKIN HIGHWAY
MUNDIJONG ROAD
MUNDIJONG
50m
200m
NOTES
Co-location of freight rail line and power lines (330kV) subject to further liaison with Department of Transport and Western Power
LEGEND
SUBJECT LAND
EXISTING CADASTRE
ROADS
INTERMODEL FACILITY (Indicative Size and Shape) Warehousing, Storage & Logistics, Rolling stock maintenance & Servicing
BUFFERS
GENERAL INDUSTRY Manufacture of building products. Low emission processing raw materials. Fuel Storage and handling. Heavy Machinery (saliea servicing & distribution)
LIGHT INDUSTRY Transport Depot. Limited Showrooms Trade Display
POTENTIAL DRAINAGE BASIN INDICATIVE SIZE
EXISTING DWELLINGS
330 V POWER LINES
CONSERVATION CATEGORY WETLAND
INDICATIVE ECOLOGICAL LINKAGES
INDICATIVE SECONDARY ECOLOGICAL LINKAGES
INDICATIVE BUFFER AREA (FINAL BUFFER AREA SUBJECT TO FURTHER DETAILED INVESTIGATION)
PROPOSED RAIL LINK
EXISTING KWINANA FREIGHT RAIL
WORKING DRAFT
Preliminary District Structure Plan
West Mundijong
Shire of Serpentine Jarrahdale
Option 1
UPDATES TO CCW AND LEGEND
JW
03/08/2012
DESCRIPTION
DRAFTER
DATE
ORIGINAL PLANNER: KK
ORIGINAL DRAFTER: JW
CREATED DATE: 01/08/2012
AERIAL DATA: LANDGATE BCW
CADASTRAL DATA: LANDGATE 2012
TOPOGRAPHIC DATA: MGA
12106P-SP-01opt1A
TME Town Planning Management Engineering Pty Ltd (08) 9791 4411 www.tme.net.au

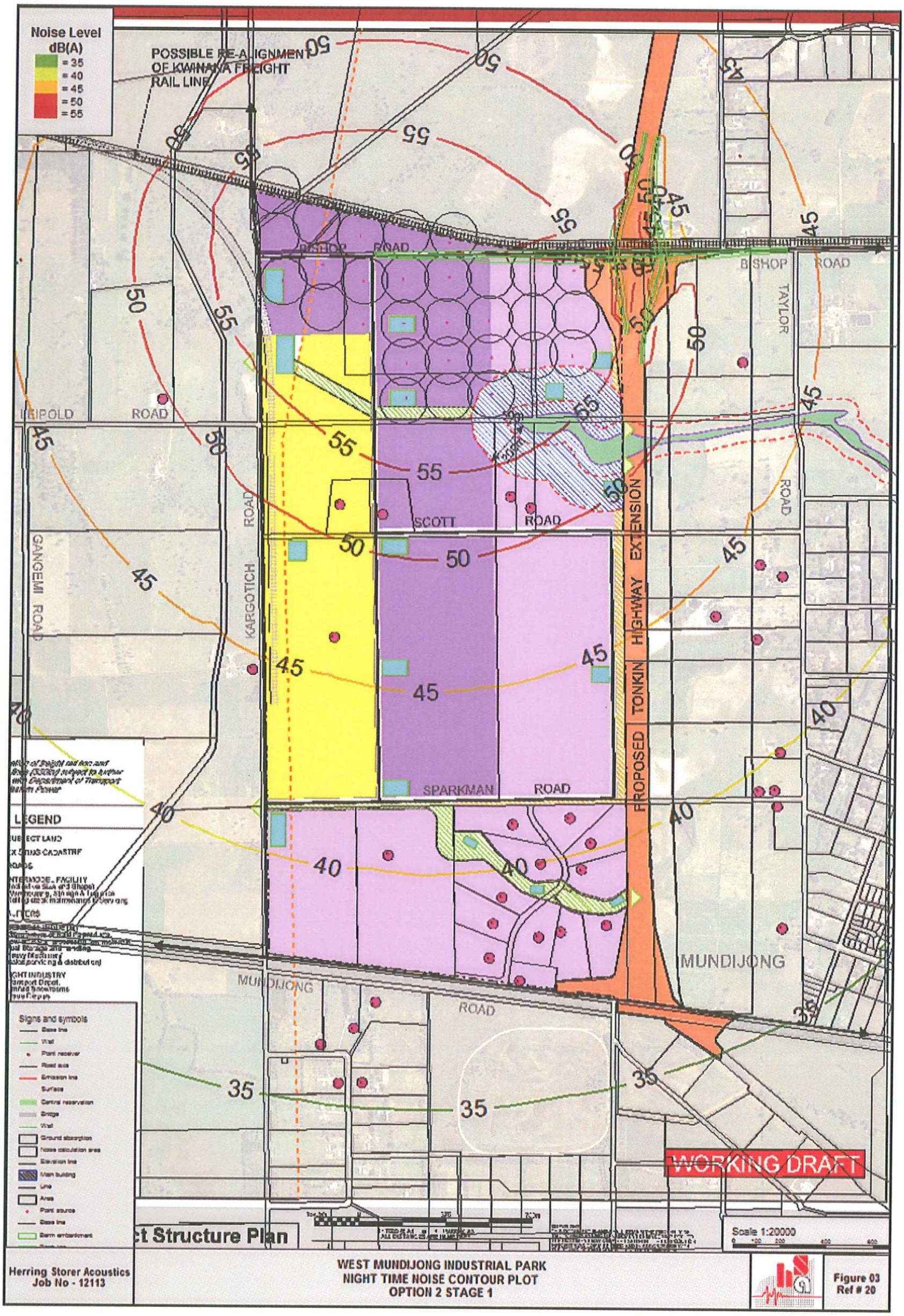

POSSIBLE RE-ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
BISHOP ROAD
TAYLOR ROAD
LEIPOLD ROAD
GANGEMI ROAD
KARGOTICH ROAD
SCOTT ROAD
SPARKMAN ROAD
PROPOSED TONKIN HIGHWAY EXTENSION
MUNDIJONG ROAD
MUNDIJONG
50m
200m
NOTES
Co-location of freight rail line and power lines (330kV) subject to further liaison with Department of Transport and Western Power
LEGEND
SUBJECT LAND
EXISTING CADASTRE
ROADS
INTERMODEL FACILITY (Indicative Size and Shape) Warehousing, Storage & Logistics, Rolling stock maintenance & Servicing
BUFFERS
GENERAL INDUSTRY Manufacture of building products, Low emission processing raw materials, Fuel Storage and handling, Heavy Machinery (sales,servicing & distribution)
LIGHT INDUSTRY Transport Depot, Limited Shoursoms Trade Display
POTENTIAL DRAINAGE BASIN INDICATIVE SIZE
EXISTING DWELLINGS
330 V POWER LINES
CONSERVATION CATEGORY WETLAND
INDICATIVE ECOLOGICAL LINKAGES
INDICATIVE SECONDARY ECOLOGICAL LINKAGES
INDICATIVE BUFFER AREA (FINAL BUFFER AREA SUBJECT TO FURTHER DETAILED INVESTIGATION)
PROPOSED RAIL LINK
EXISTING KWINANA FREIGHT RAIL
WORKING DRAFT
Preliminary District Structure Plan
West Mundijong
Shire of Serpentine Jarrahdale
Option 3
REVISION
DESCRIPTION
DRAFTER
DATE
A
UPDATES TO CCW
AV
03/08/2012
ORIGINAL PLANNER: KK
ORIGINAL DRAFTER: AV
CREATED DATE: 01/06/2012
AERIAL DATA: LANDGATE ECW
CADASTRAL DATA: LANDGATE 2012
TOPOGRAPHIC DATA: MGA
TME
12106P-SP-01opt3A
TME Town Planning Management Engineering Pty Ltd (08) 9791 4411 www.tme.net.au

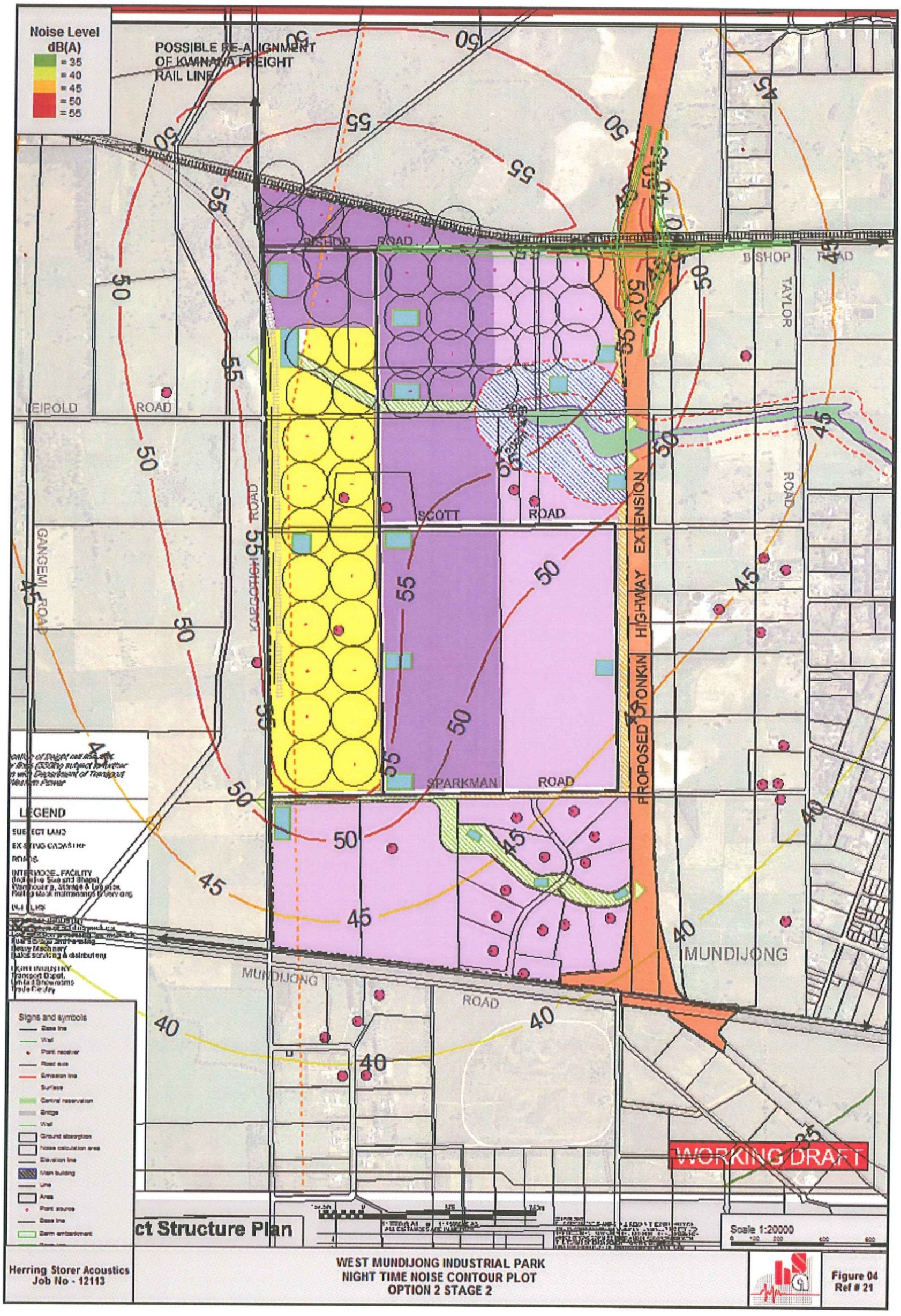
APPENDIX B

Predicted Noise Contours


Noise Level dB(A)
= 35
= 40
= 45
= 50
= 55
POSSIBLE ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
TAYLOR ROAD
LEIPOLD ROAD
KARGOTICH ROAD
SCOTT ROAD
SPARKMAN ROAD
GANGEMI ROAD
PROPOSED TONKIN HIGHWAY
MUNDIJONG ROAD
MUNDIJONG
50m
LEGEND
Signs and symbols
WORKING DRAFT
Scale 1:20000
Herring Storer Acoustics
Job No - 12113
WEST MUNDIJONG INDUSTRIAL PARK
NIGHT NOISE CONTOUR PLOT
OPTION 1 STAGE 1
Figure 01
Ref # 10

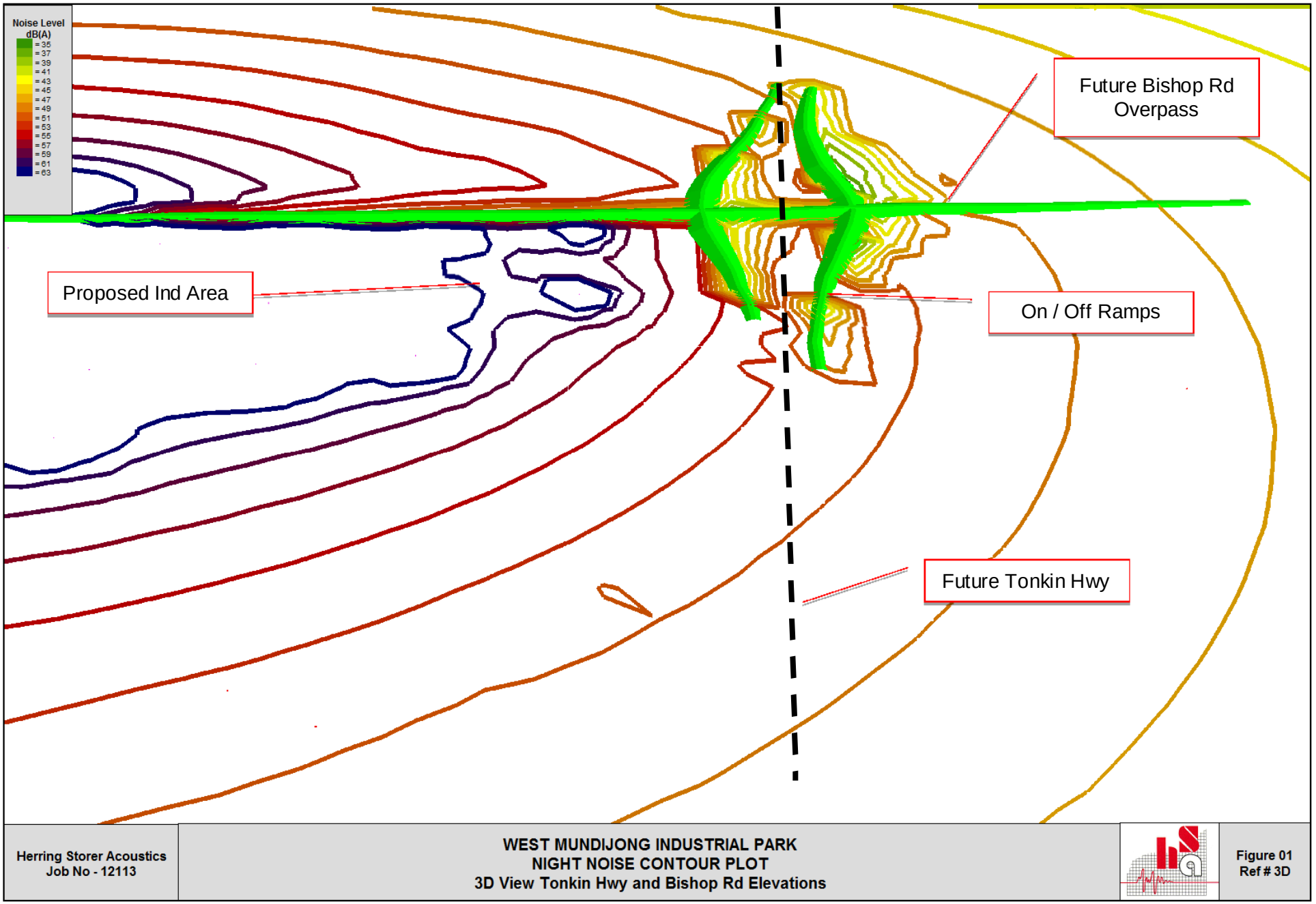

Noise Level dB(A)
= 35
= 40
= 45
= 50
= 55
POSSIBLE ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
TAYLOR ROAD
EIPOLD ROAD
GANGEMI ROAD
KARGOTICH ROAD
SCOTT ROAD
SPARKMAN ROAD
PROPOSED TONKIN HIGHWAY
MUNDIJONG ROAD
MUNDIJONG
LEGEND
Signs and symbols
WORKING DRAFT
Scale 1:20000
ict Structure Plan
Herring Storer Acoustics
Job No - 12113
WEST MUNDIJONG INDUSTRIAL PARK
NIGHT TIME NOISE CONTOUR PLOT
OPTION 1 STAGE 2
Figure 02
Ref # 11


Noise Level dB(A)
= 35
= 40
= 45
= 50
= 55
POSSIBLE RE-ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
TAYLOR
LEIPOLD ROAD
SCOTT ROAD
GANGEMI ROAD
KARGOTICH ROAD
PROPOSED TONKIN HIGHWAY EXTENSION
SPARKMAN ROAD
MUNDIJONG ROAD
MUNDIJONG
WORKING DRAFT
Scale 1:20000
Herring Storer Acoustics
Job No - 12113
WEST MUNDIJONG INDUSTRIAL PARK
NIGHT TIME NOISE CONTOUR PLOT
OPTION 2 STAGE 1
Figure 03
Ref # 20


Noise Level dB(A)
= 35
= 40
= 45
= 50
= 55
POSSIBLE RE-ALIGNMENT OF KWINANA FREIGHT RAIL LINE
BISHOP ROAD
TAYLOR
LEIPOLD ROAD
KARGOTICH ROAD
SCOTT ROAD
GANGEMI ROAD
SPARKMAN ROAD
PROPOSED STONKIN HIGHWAY EXTENSION
MUNDIJONG ROAD
MUNDIJONG
LEGEND
Signs and symbols
WORKING DRAFT
Scale 1:20000
ct Structure Plan
Herring Storer Acoustics
Job No - 12113
WEST MUNDIJONG INDUSTRIAL PARK
NIGHT TIME NOISE CONTOUR PLOT
OPTION 2 STAGE 2
Figure 04
Ref # 21

APPENDIX C

3D NOISE CONTOUR PLOT –
BISHOP ROAD and TONKIN HIGHWAY OVERPASS



Herring Storer Acoustics
Job No - 12113

WEST MUNDIJONG INDUSTRIAL PARK
NIGHT NOISE CONTOUR PLOT
3D View Tonkin Hwy and Bishop Rd Elevations

Figure 01
Ref # 3D